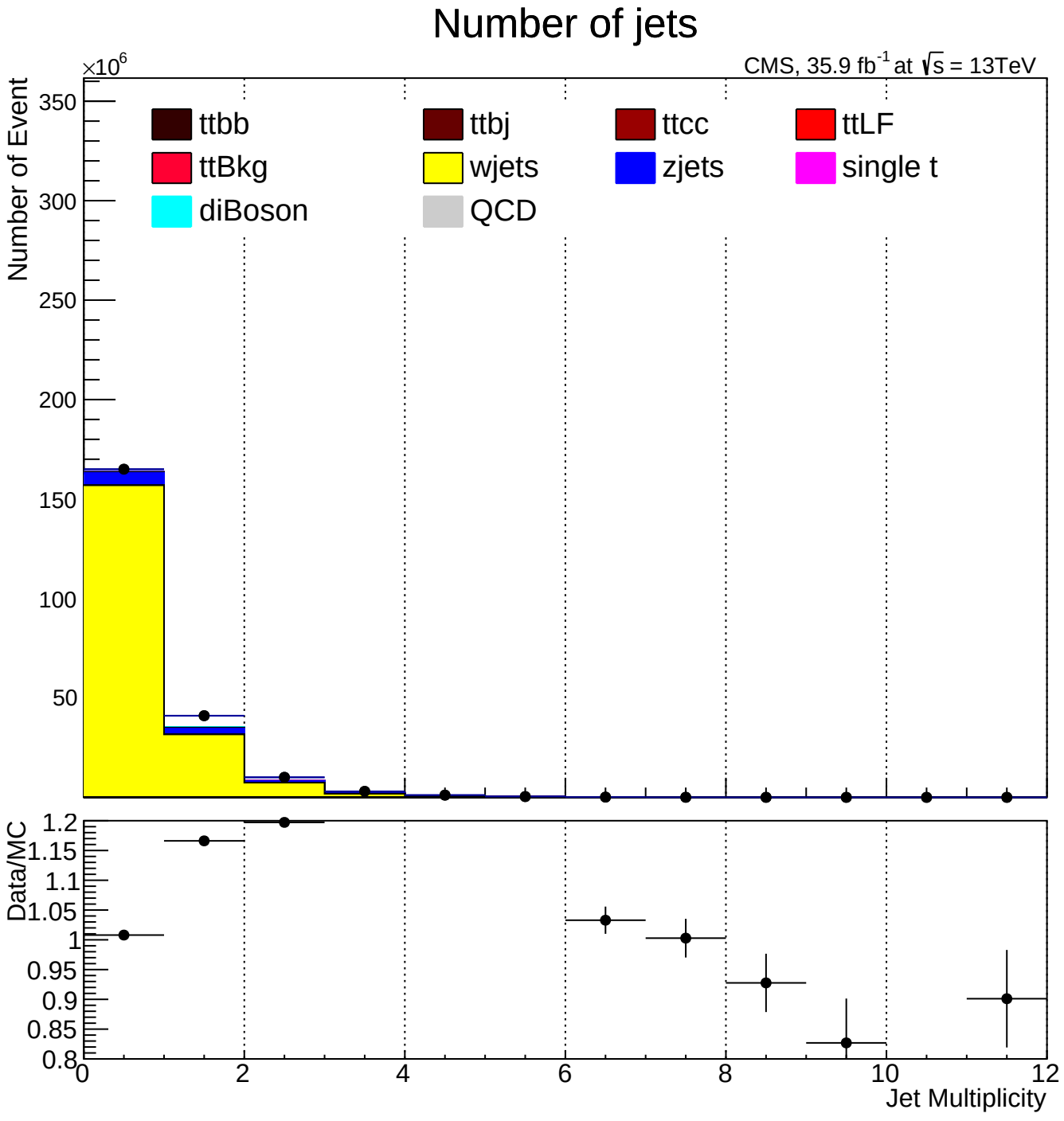
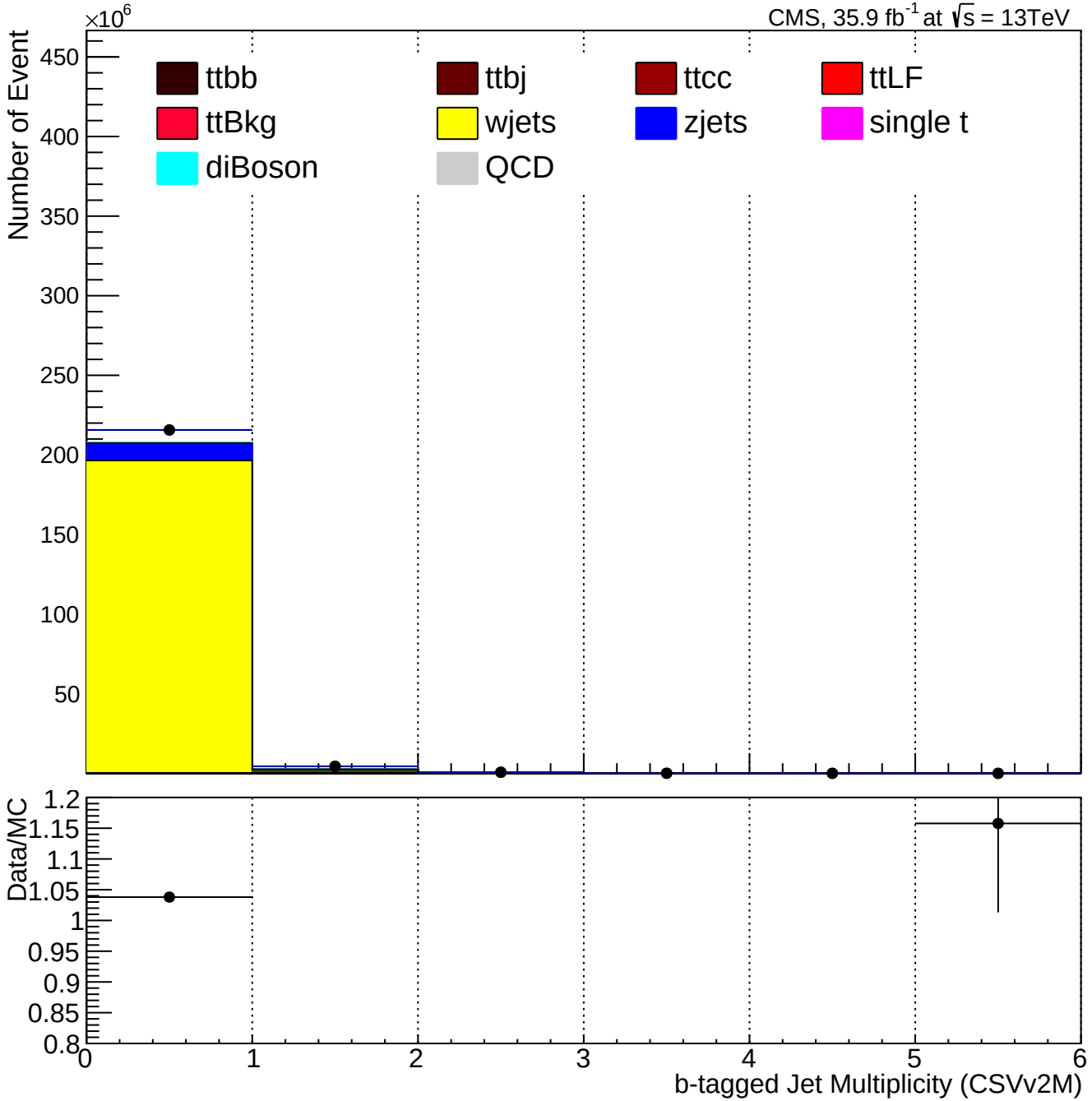
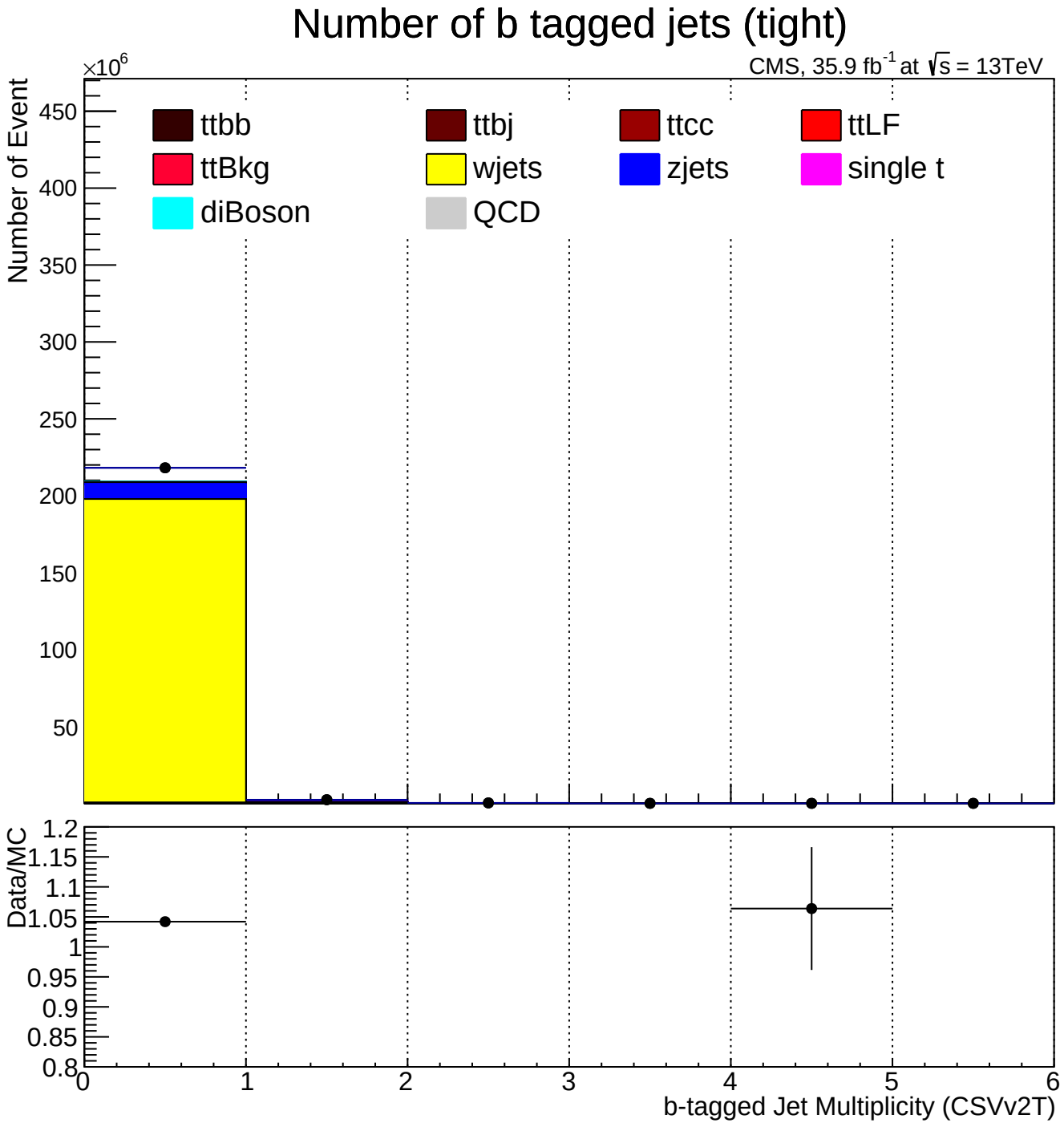
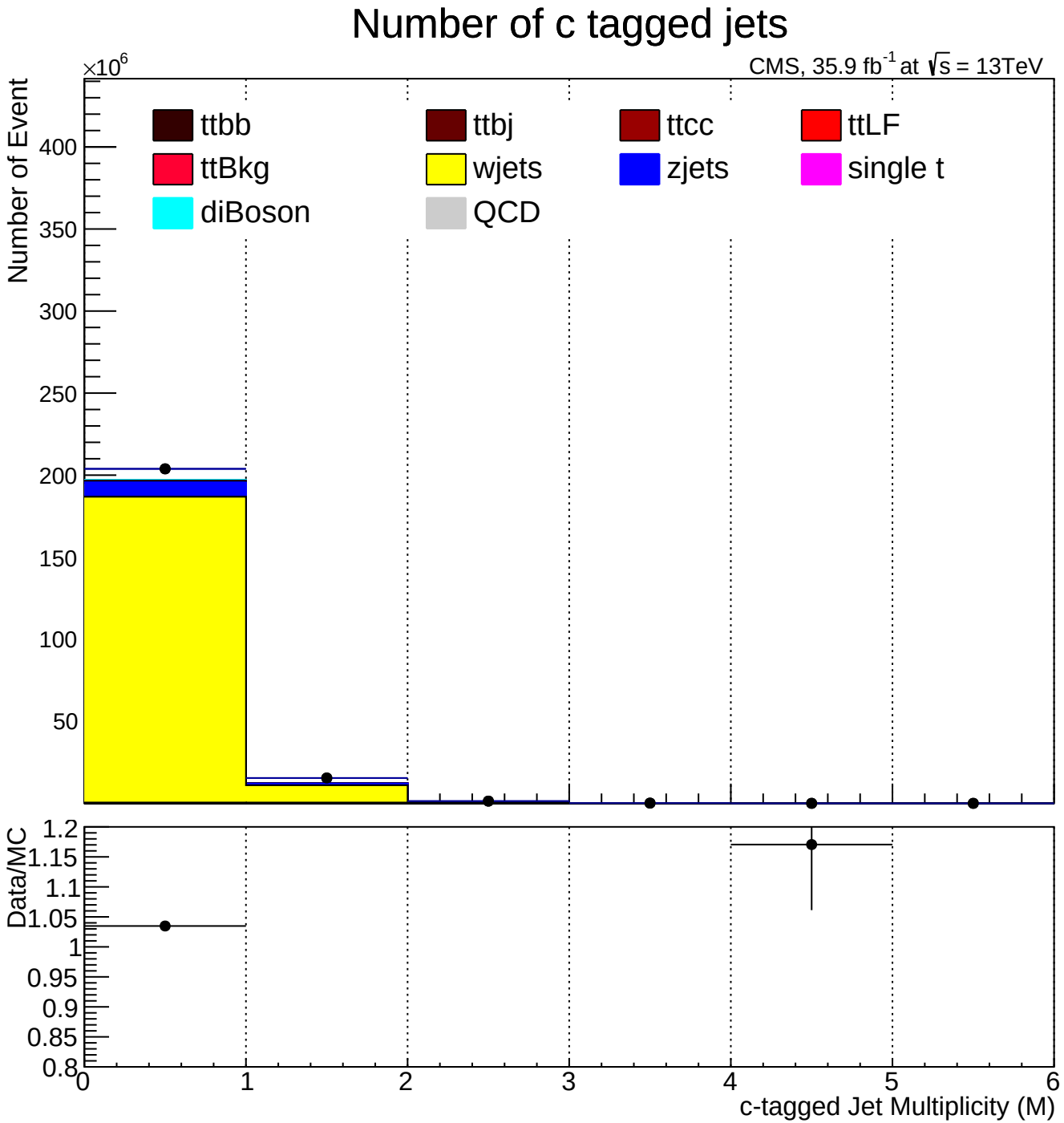
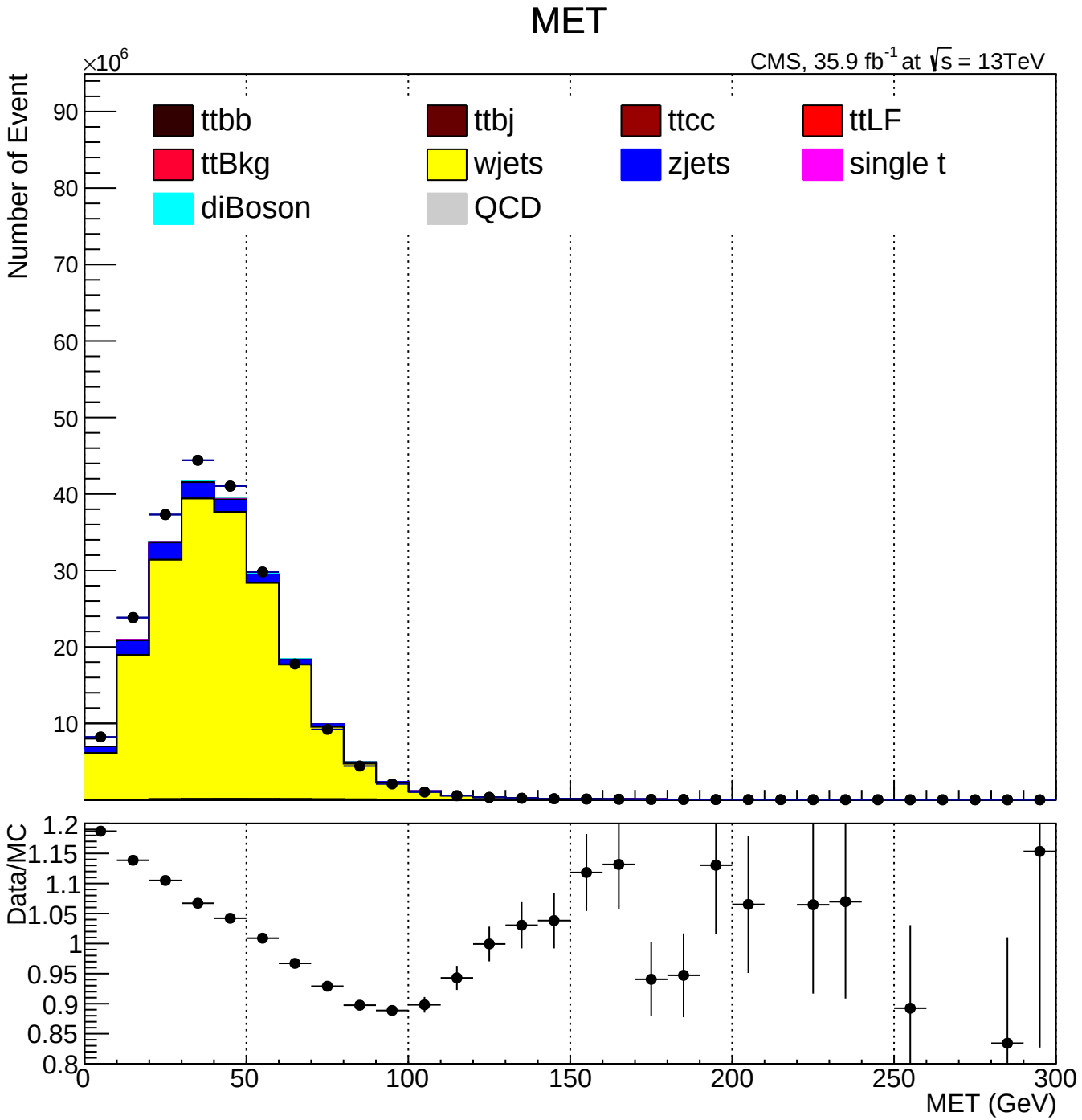

Number of jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
$\times 10^6$
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Jet Multiplicity

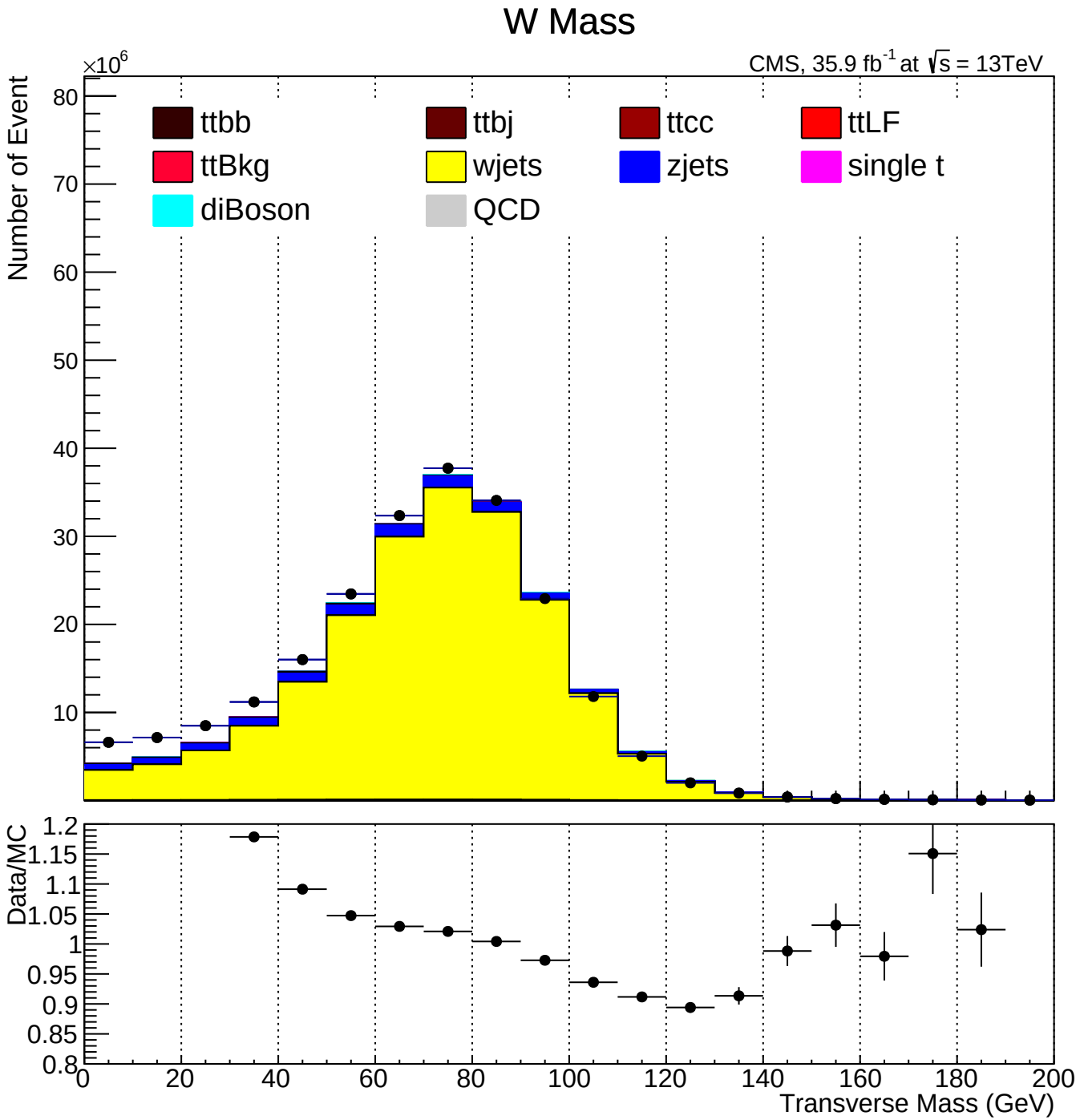
Number of b tagged jets (medium)



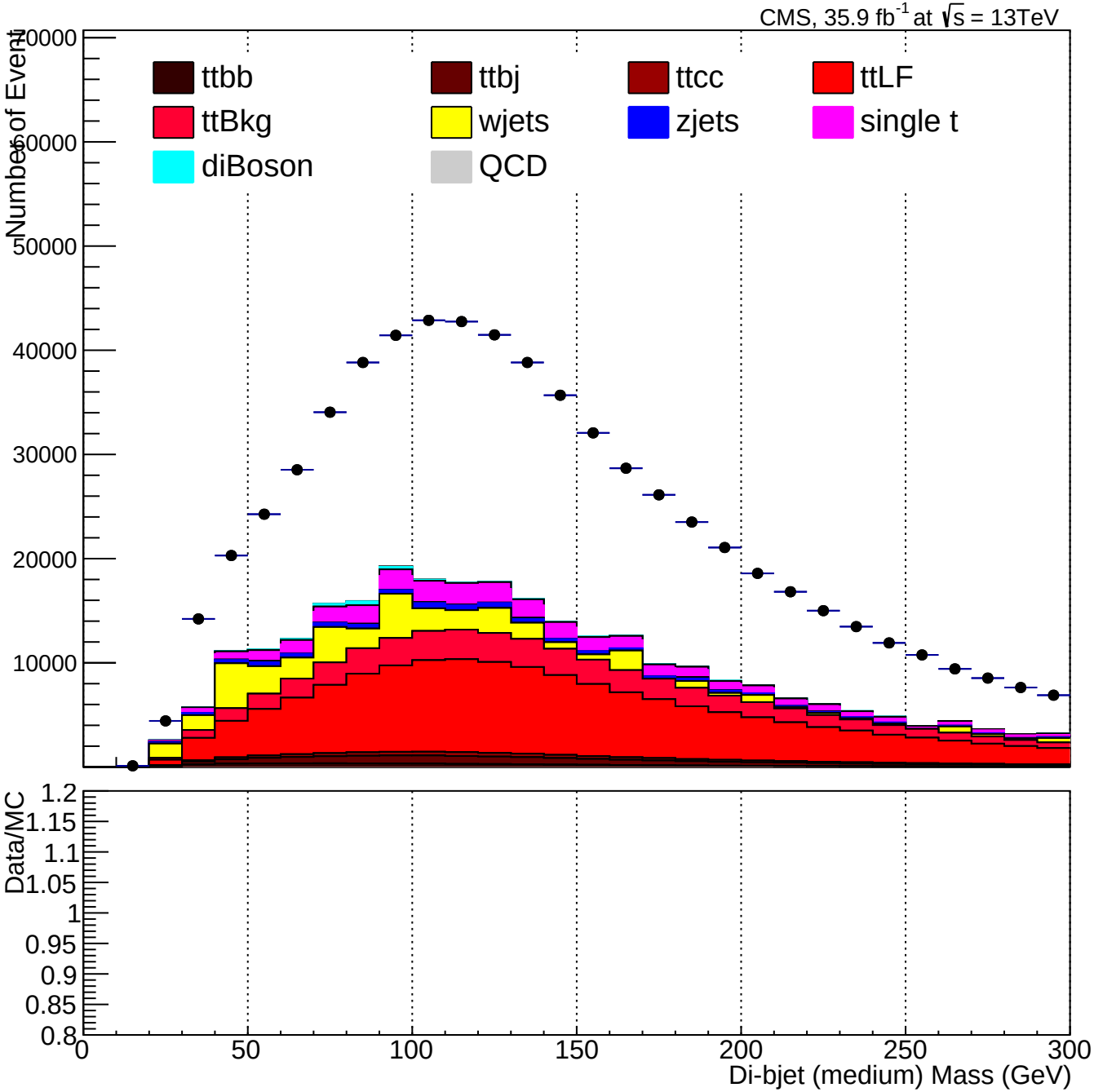

Number of b tagged jets (tight)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
$\times 10^6$
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b-tagged Jet Multiplicity (CSVv2T)

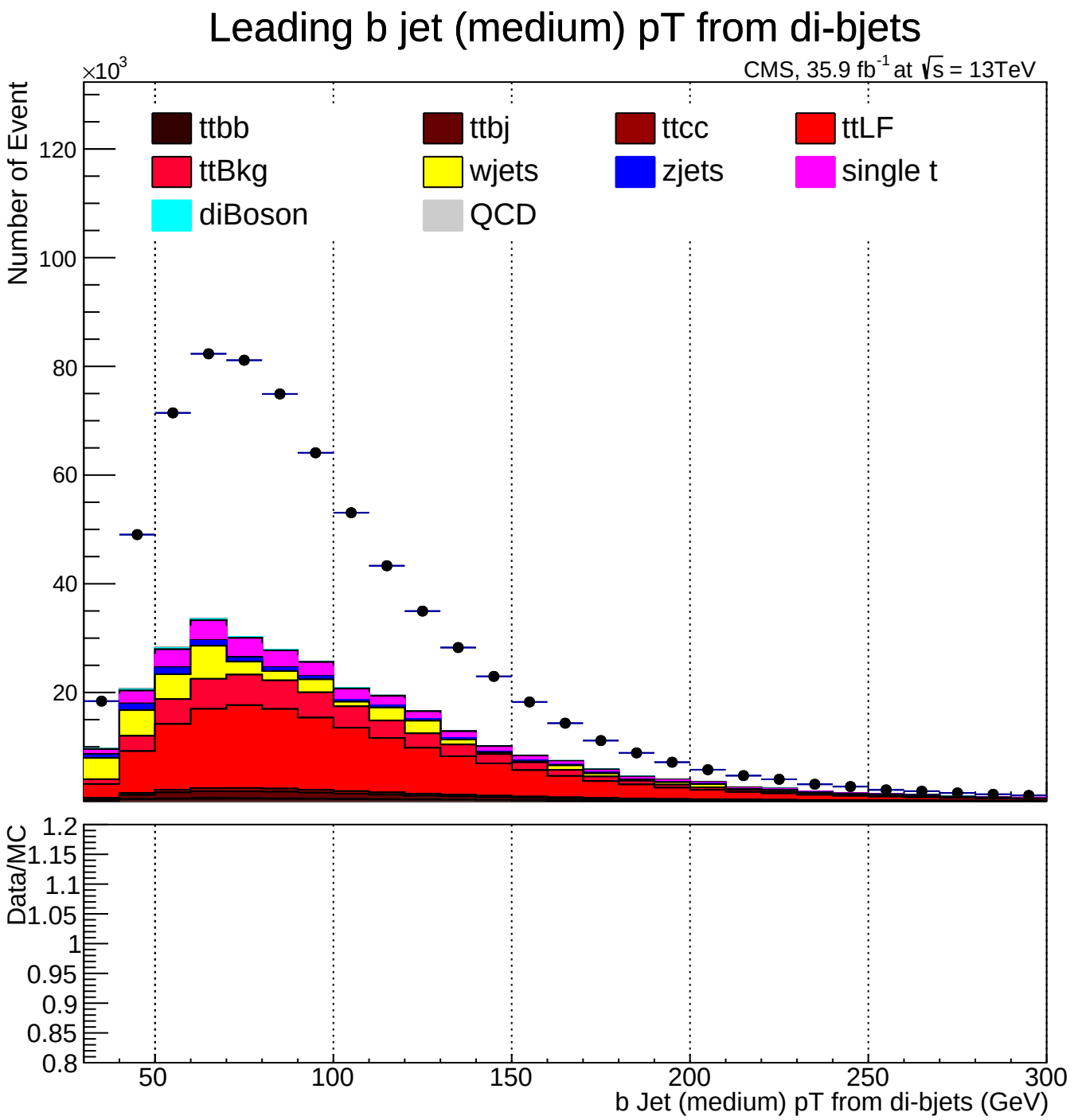

Number of c tagged jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^6
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
c-tagged Jet Multiplicity (M)

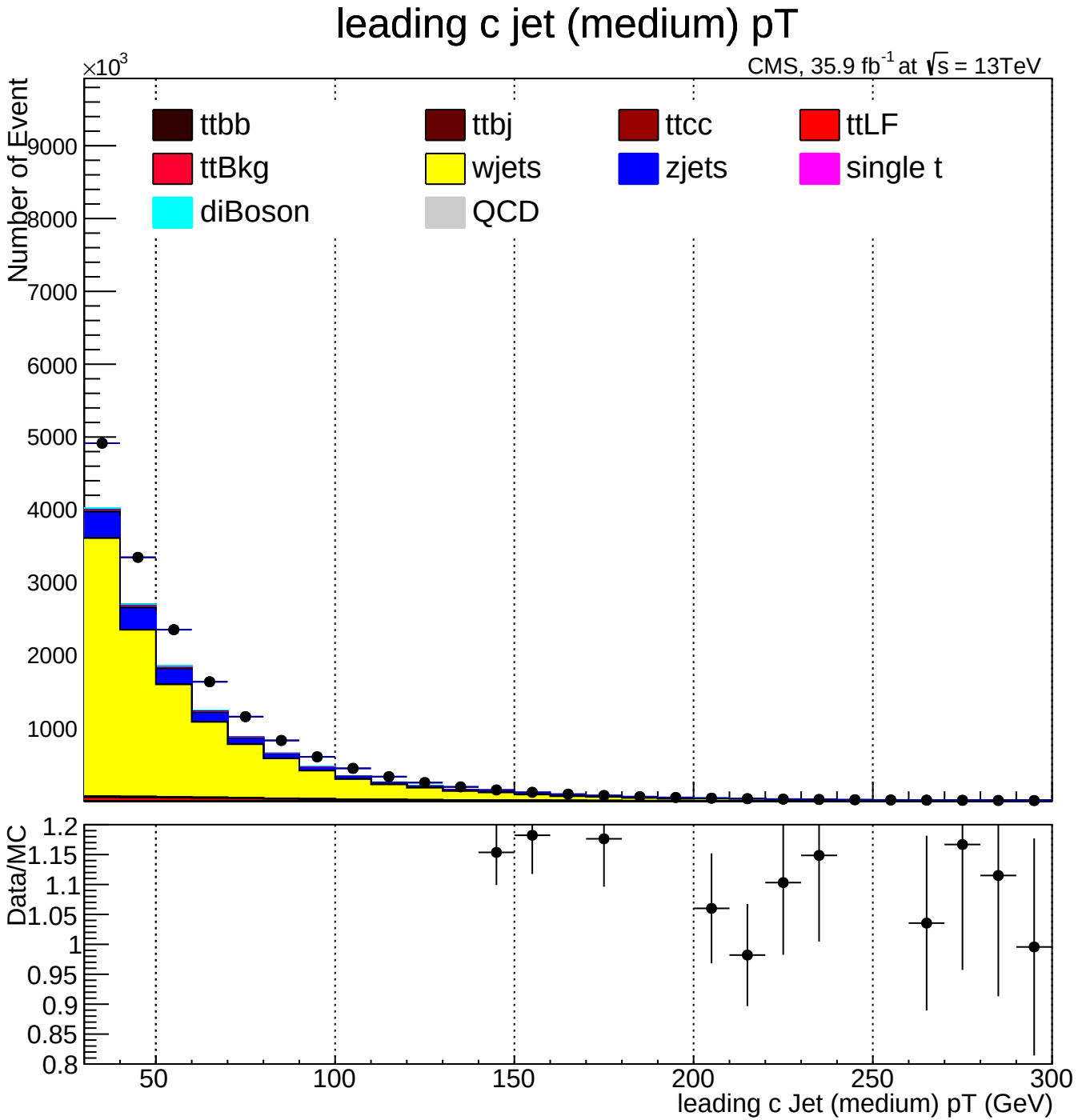

MET
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^6
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
MET (GeV)

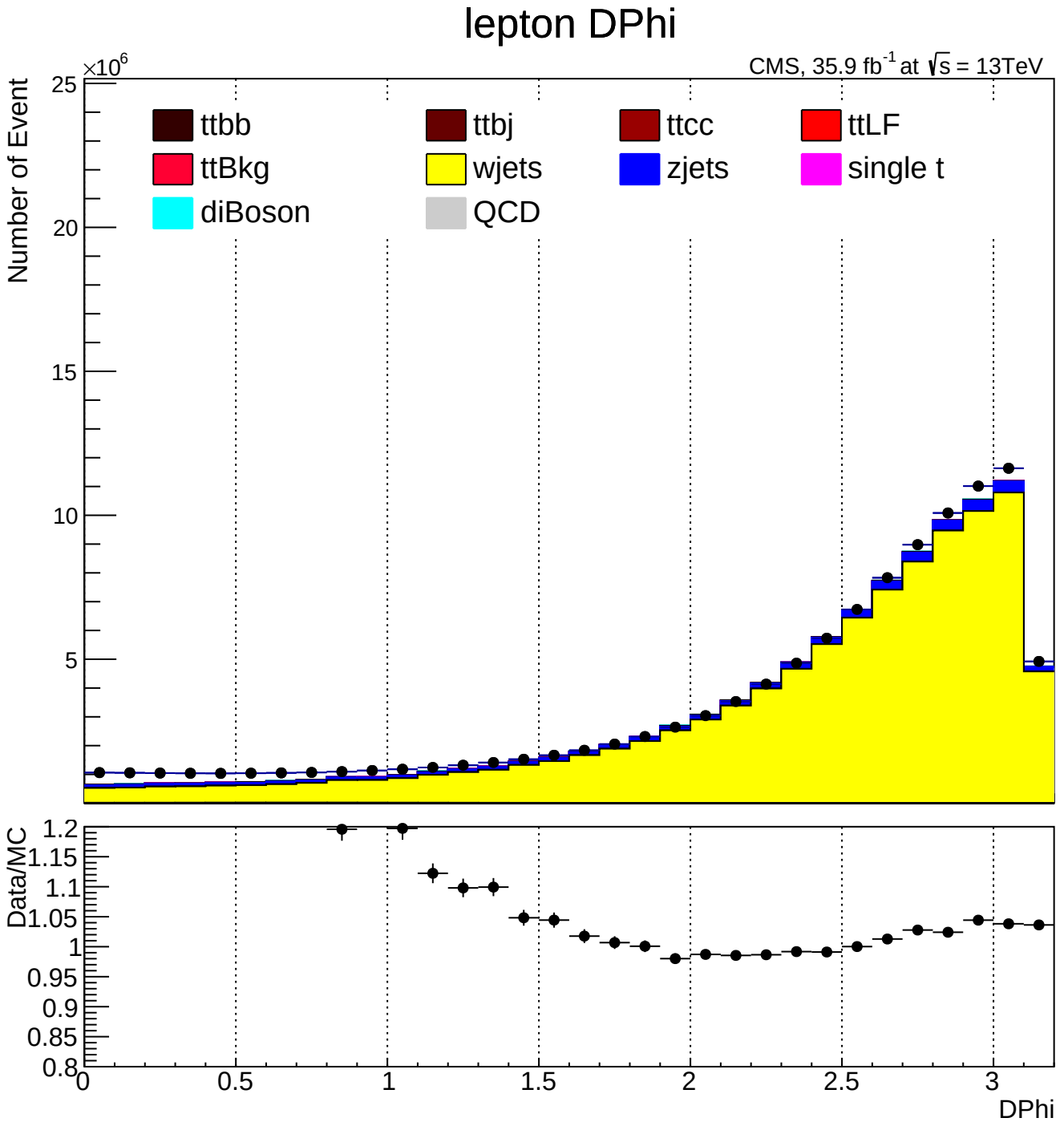

W Mass
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^6
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Transverse Mass (GeV)

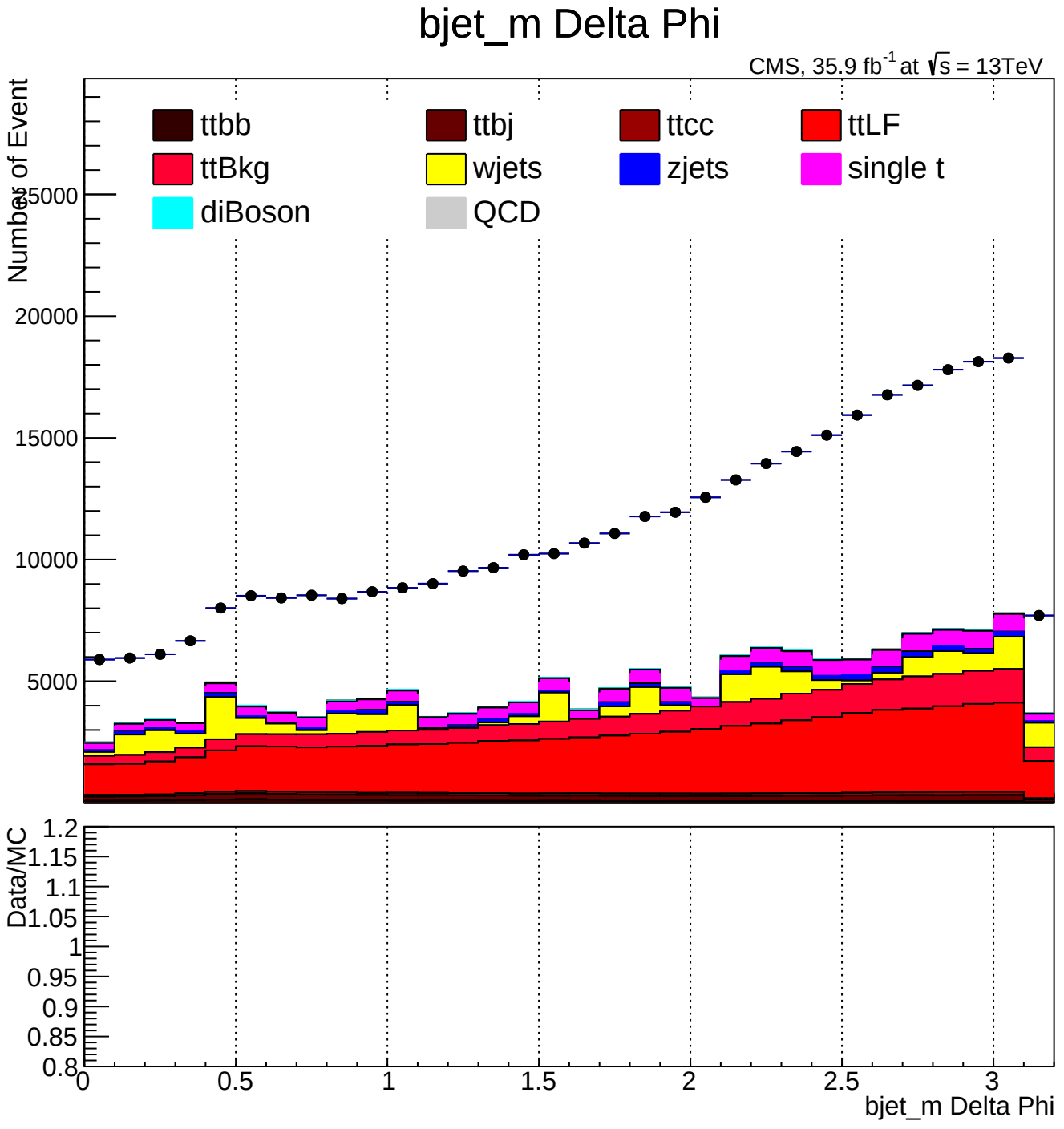
Di-bjet Mass (medium) wrt min DR

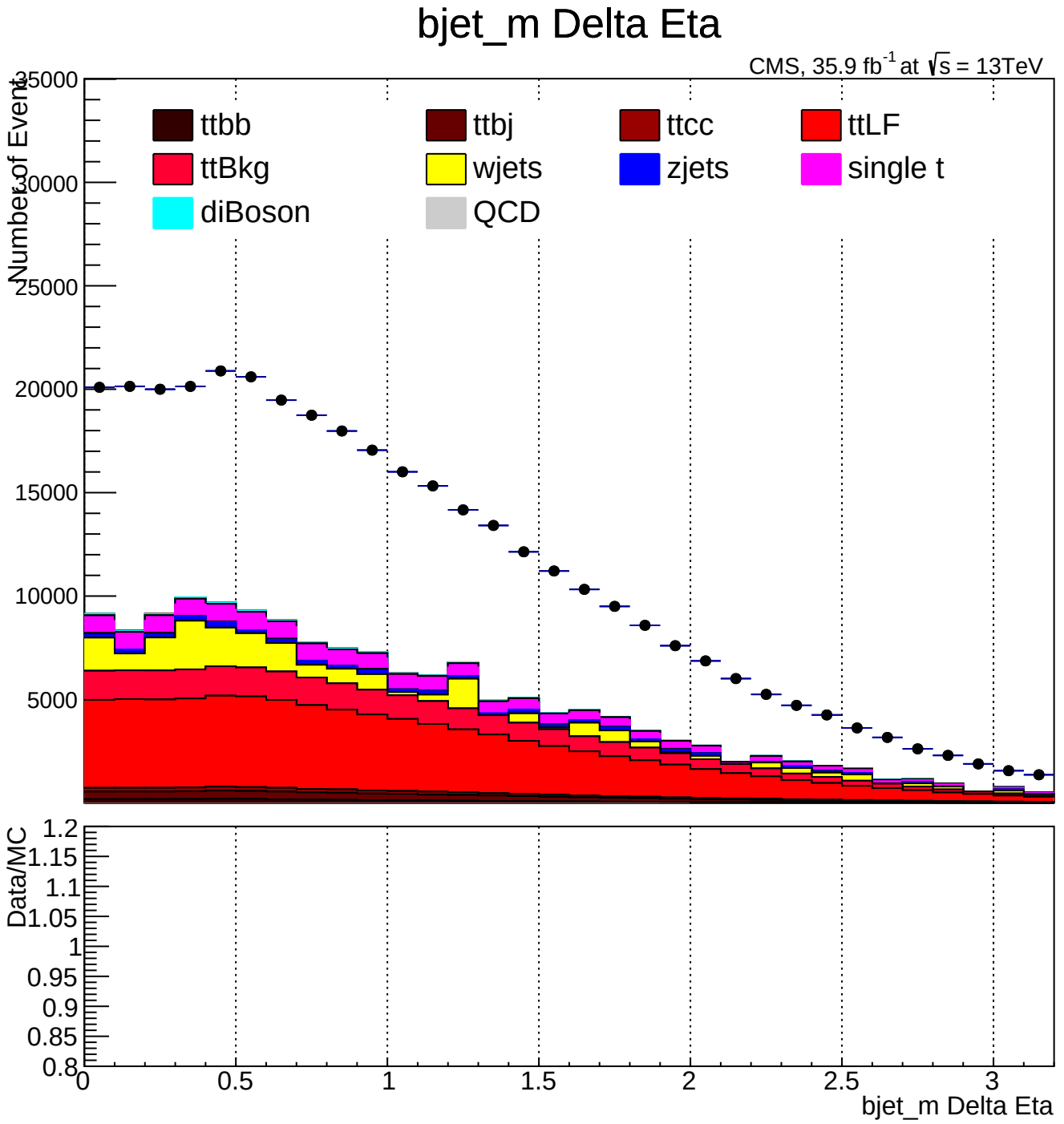


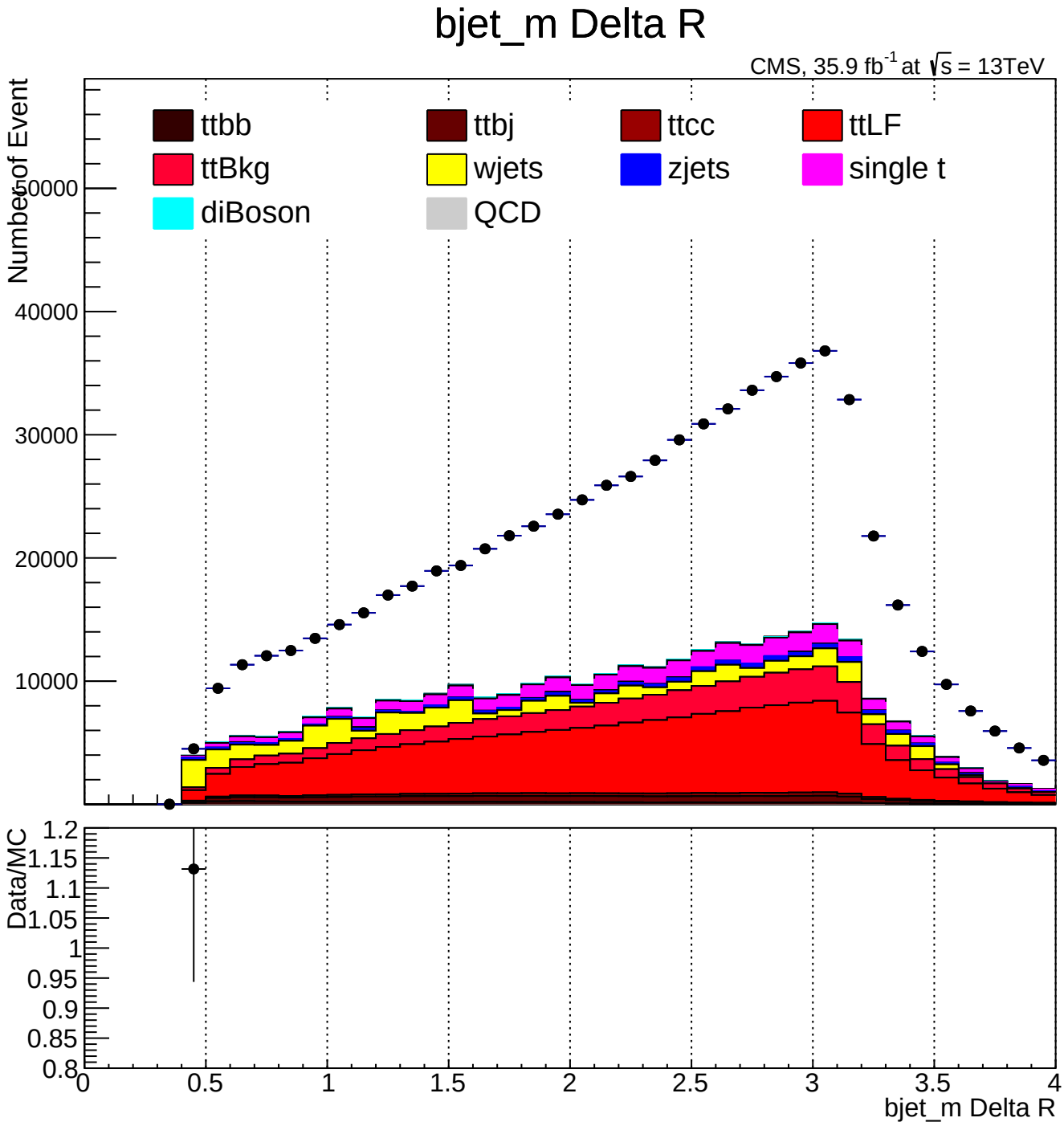

Leading b jet (medium) pT from di-bjets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b Jet (medium) pT from di-bjets (GeV)

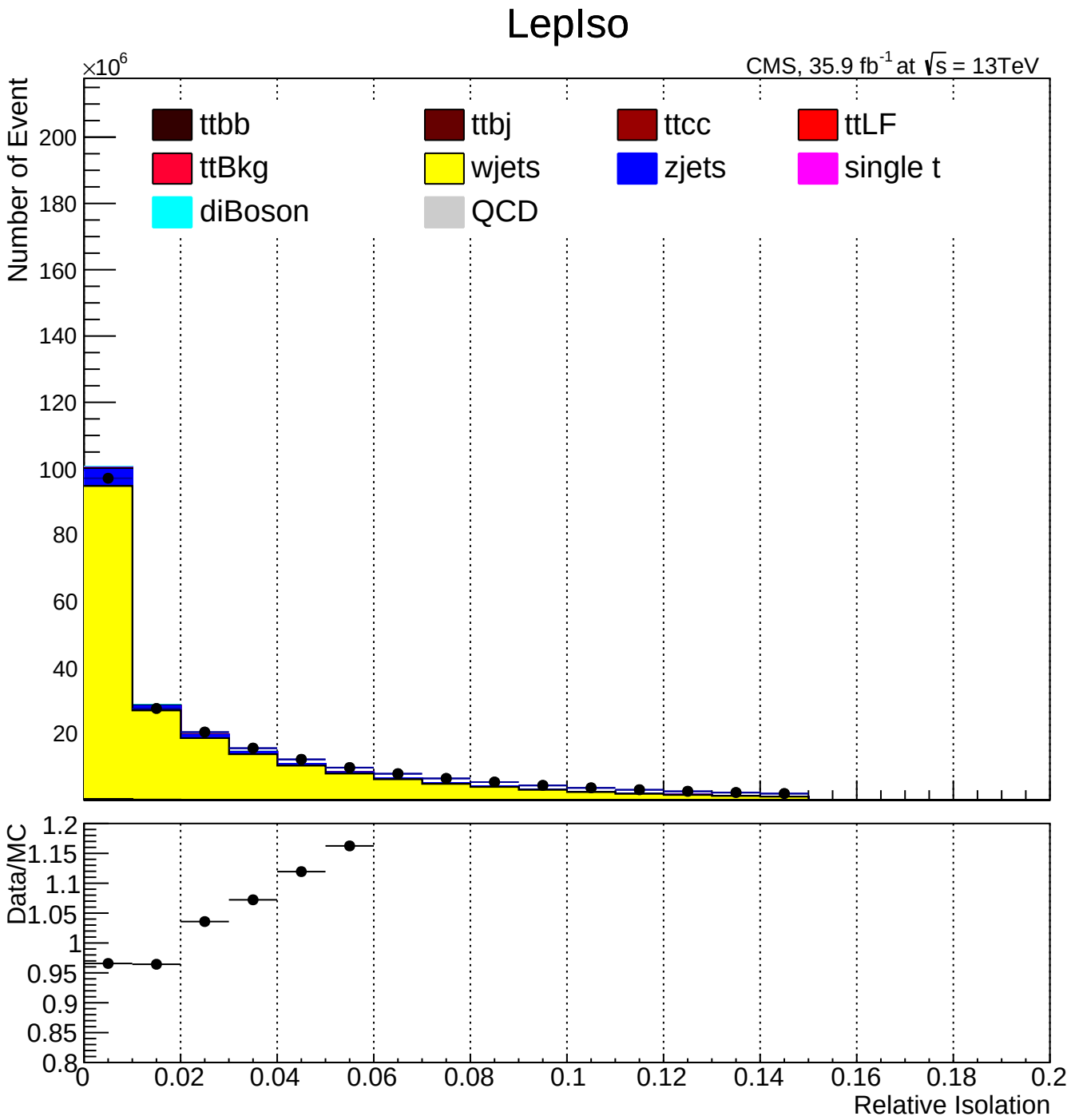

leading c jet (medium) pT
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
leading c Jet (medium) pT (GeV)

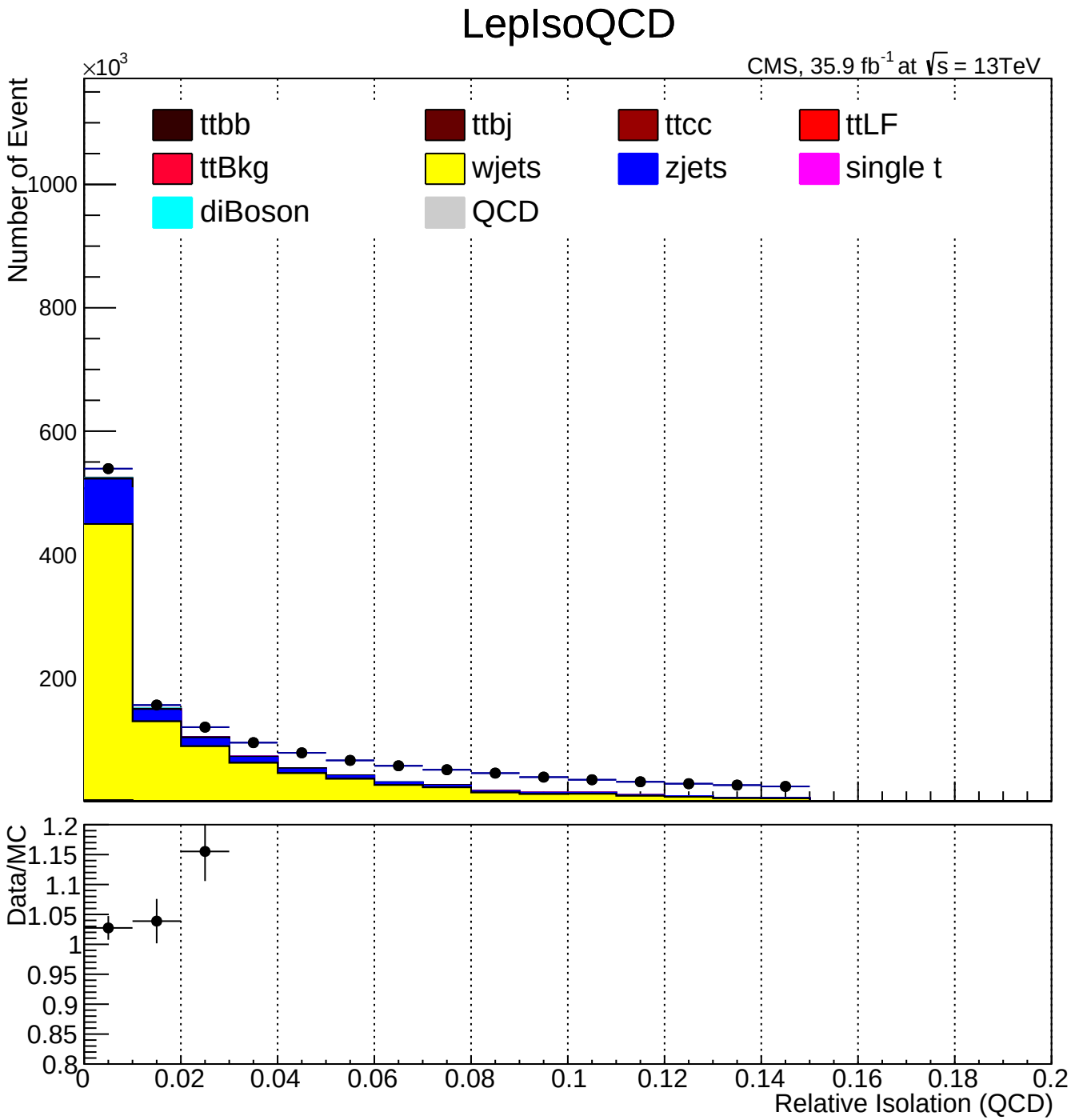

lepton DPhi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^6
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
DPhi

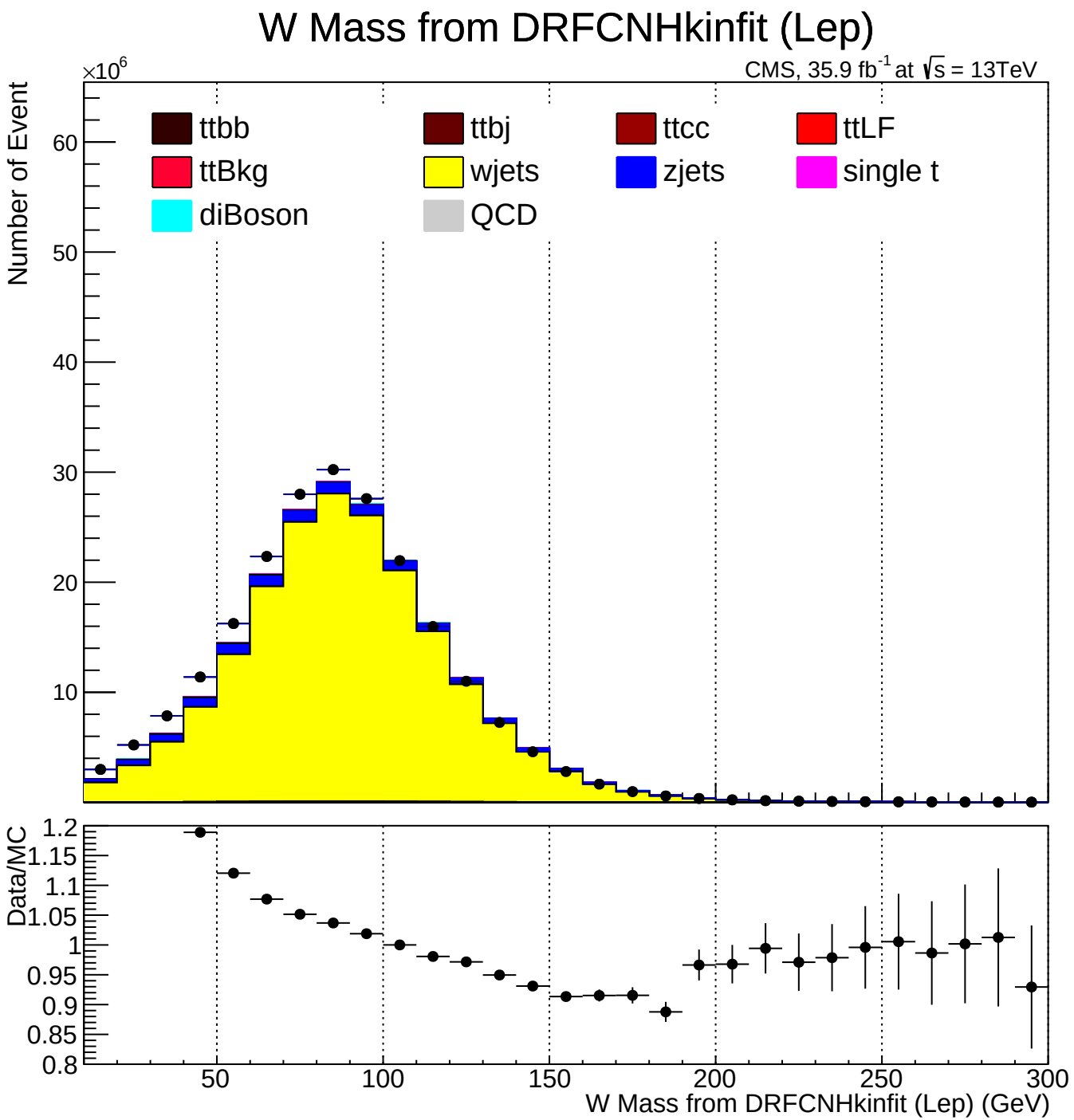

bjet_m Delta Phi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
25000
20000
15000
10000
5000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Phi

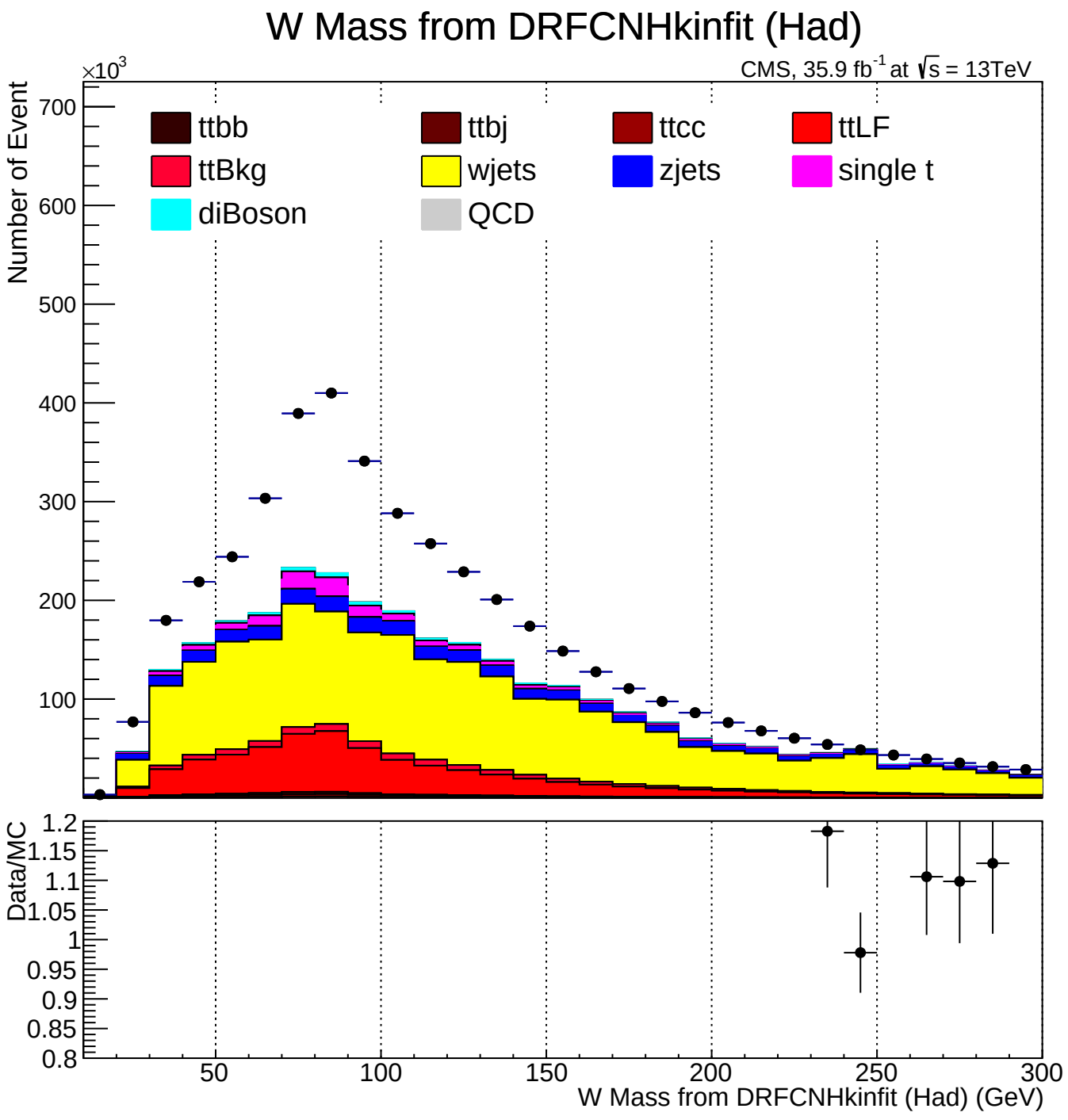

bjet_m Delta Eta
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Events
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
35000
30000
25000
20000
15000
10000
5000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Eta

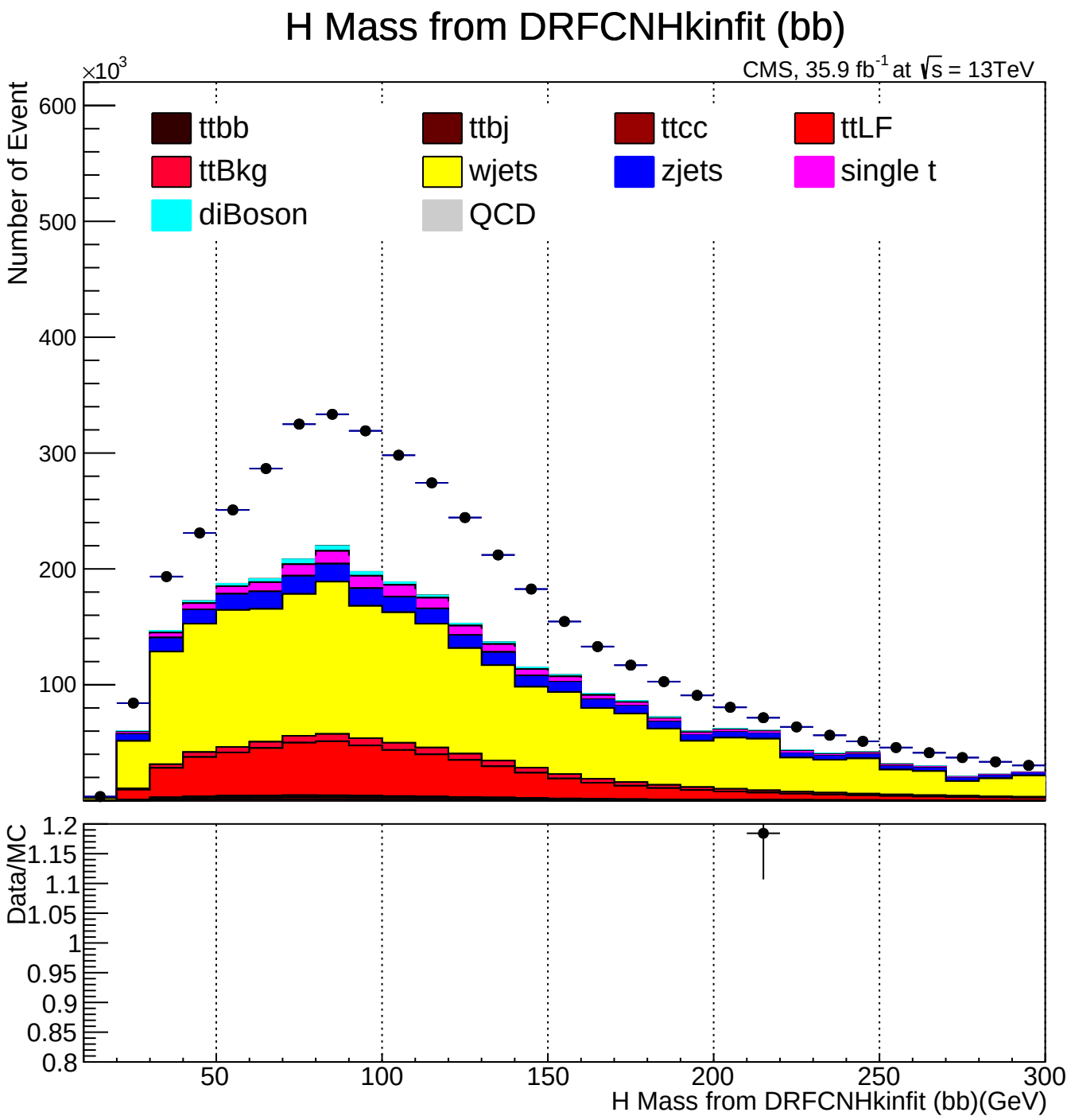

bjet_m Delta R
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
50000
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
3.5
4
bjet_m Delta R

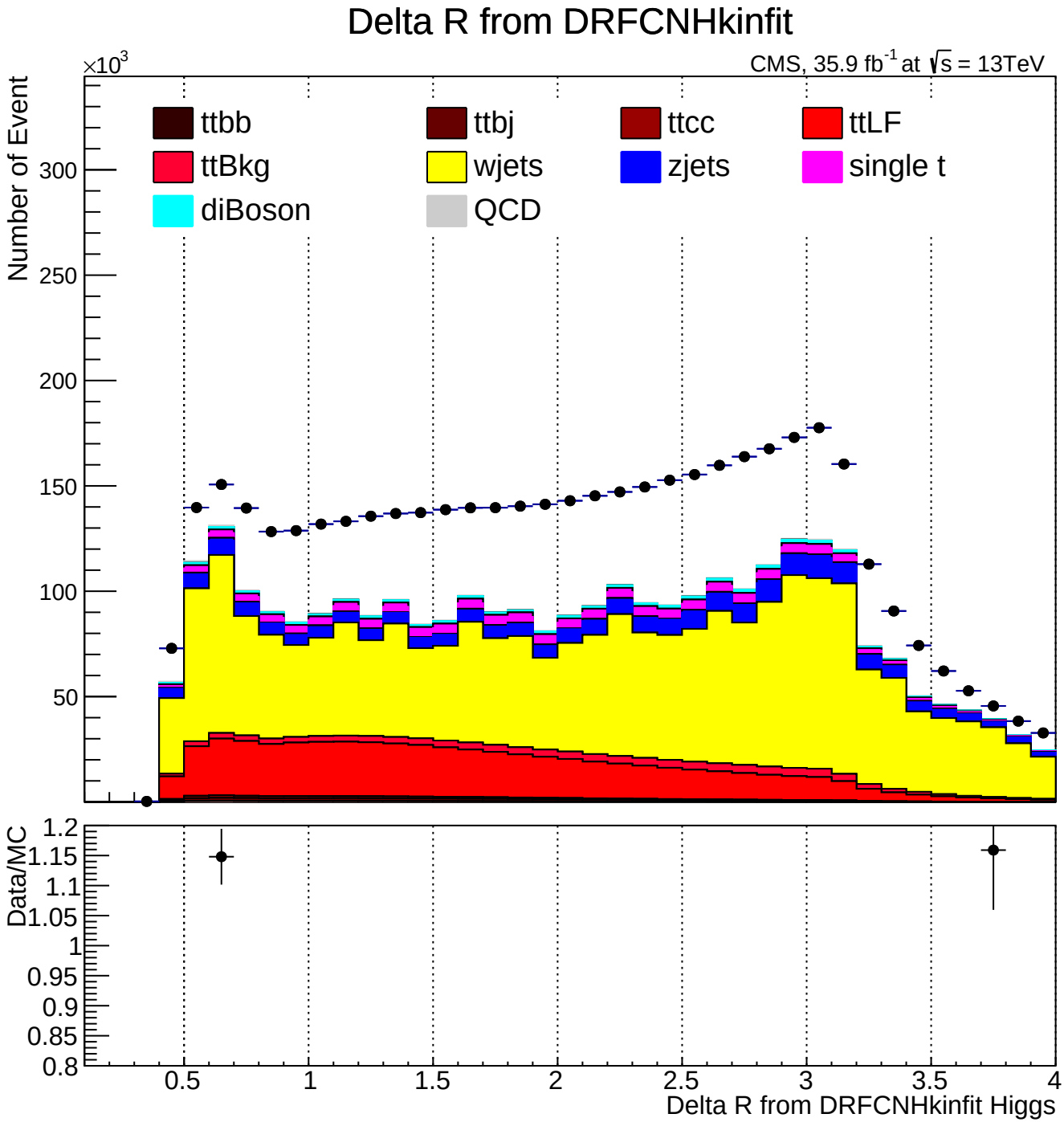

LepIso
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^6
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation

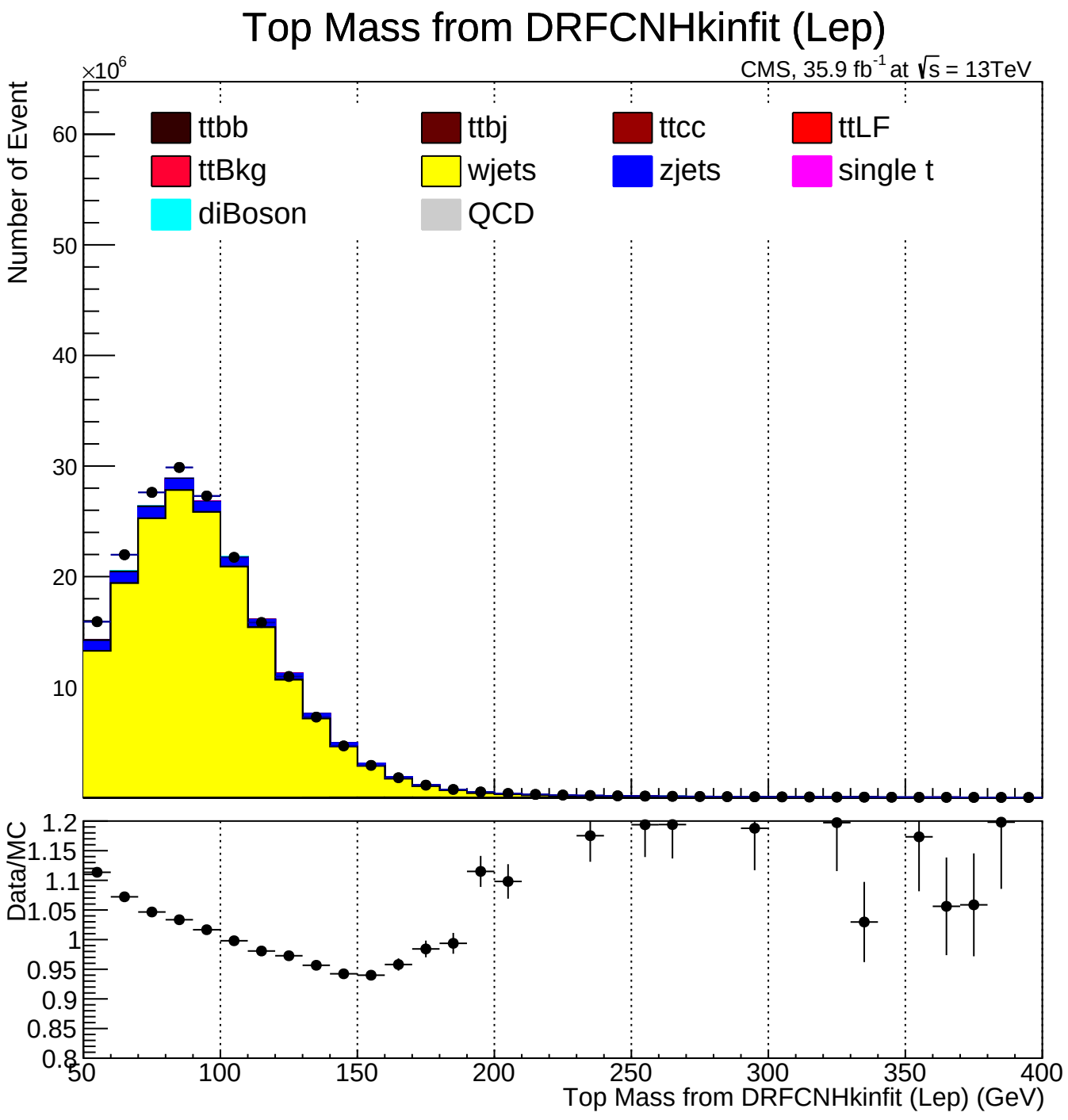

LepIsoQCD
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation (QCD)


W Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^6
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
W Mass from DRFCNHkinfit (Lep) (GeV)

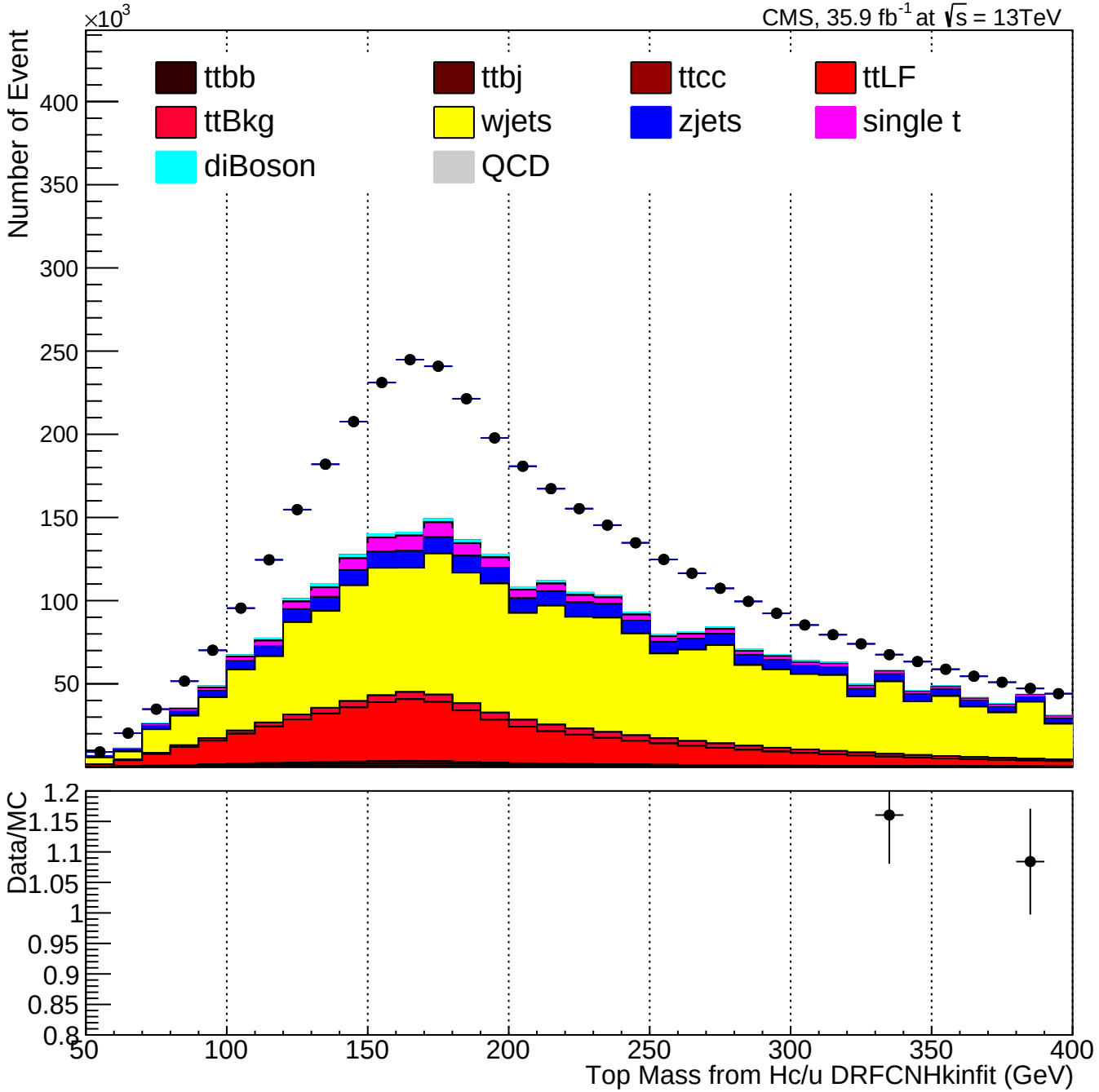

W Mass from DRFCNHkinfit (Had)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
W Mass from DRFCNHkinfit (Had) (GeV)

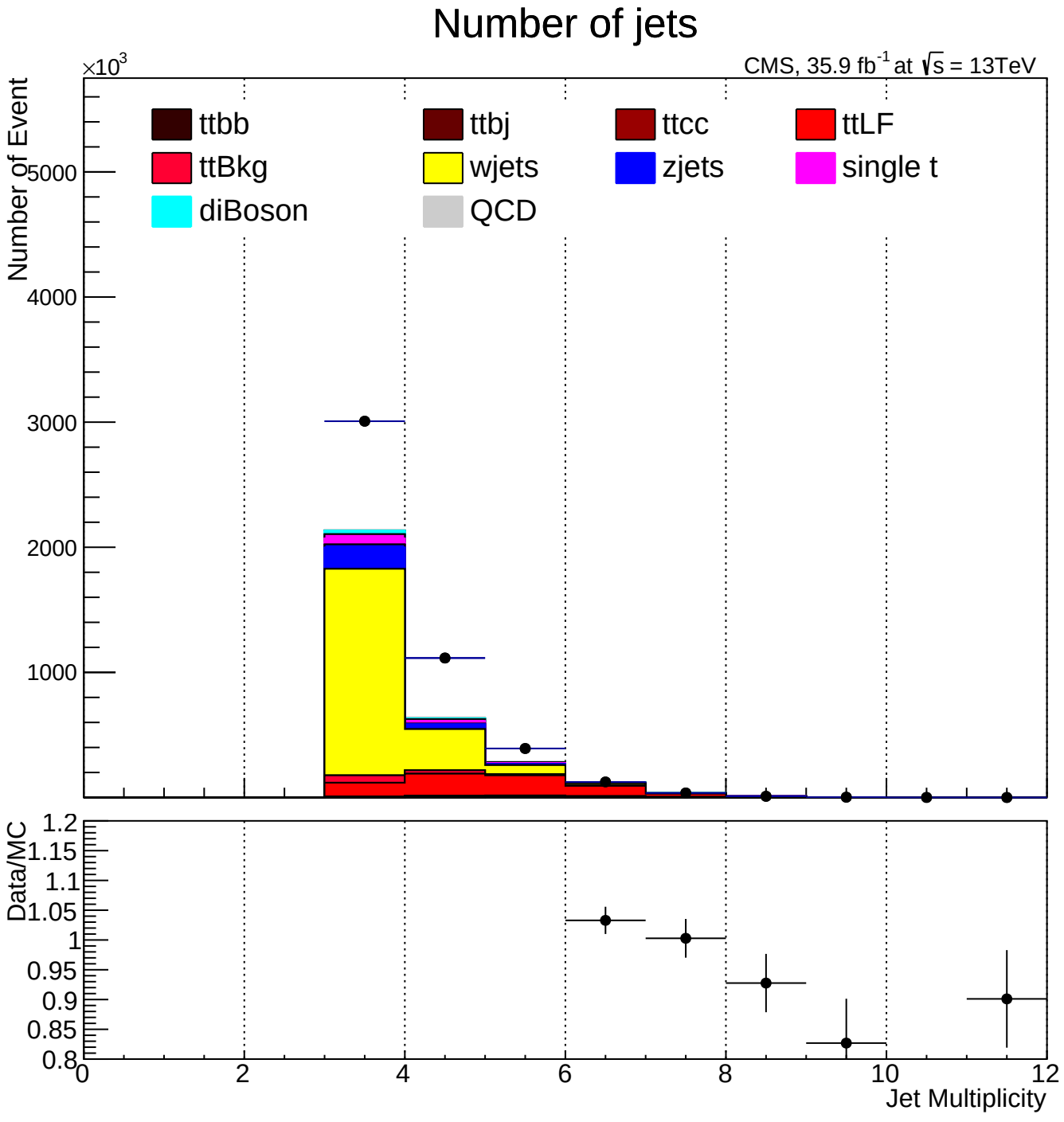

H Mass from DRFCNHkinfit (bb)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
H Mass from DRFCNHkinfit (bb)(GeV)

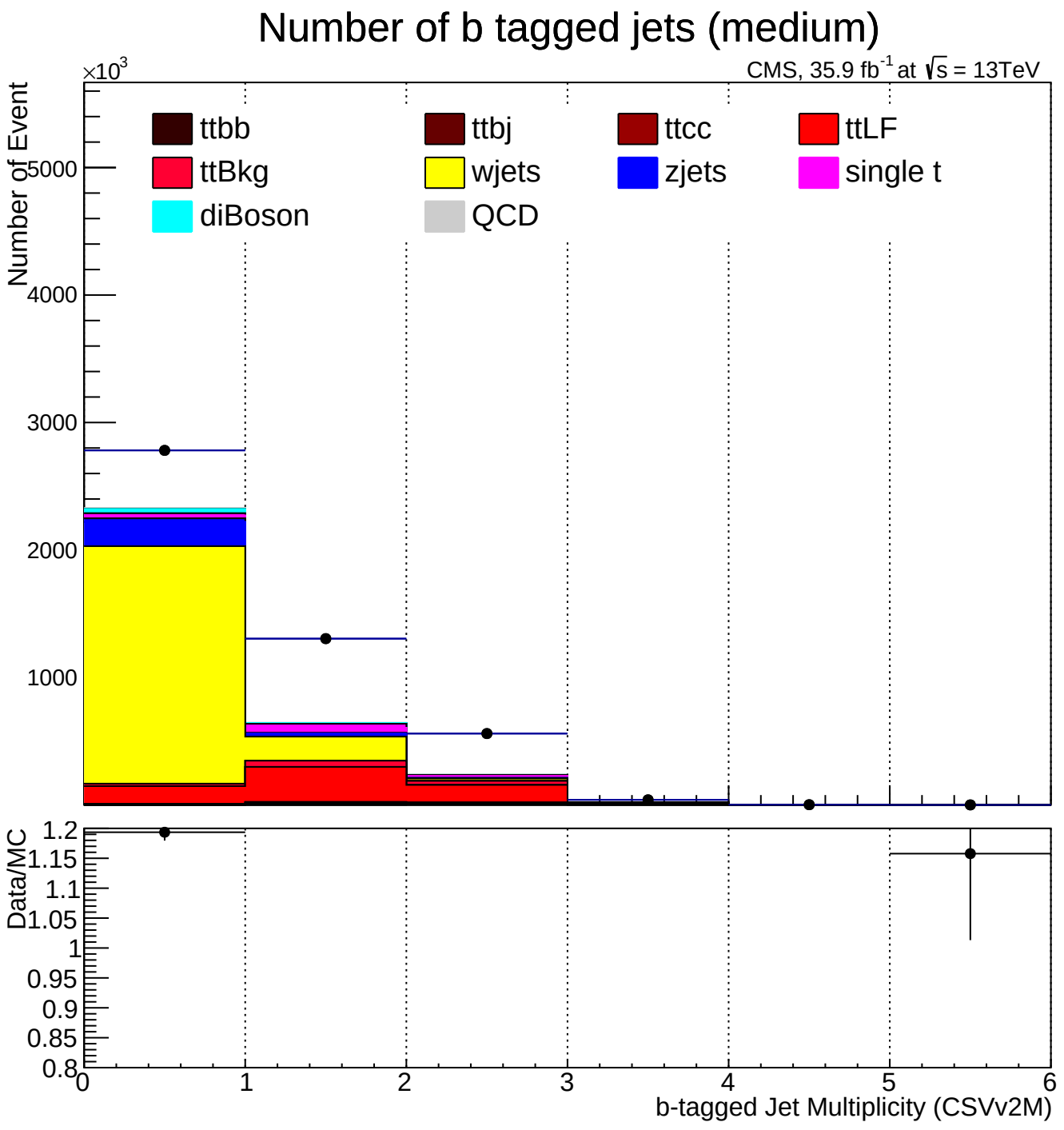

Delta R from DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Delta R from DRFCNHkinfit Higgs

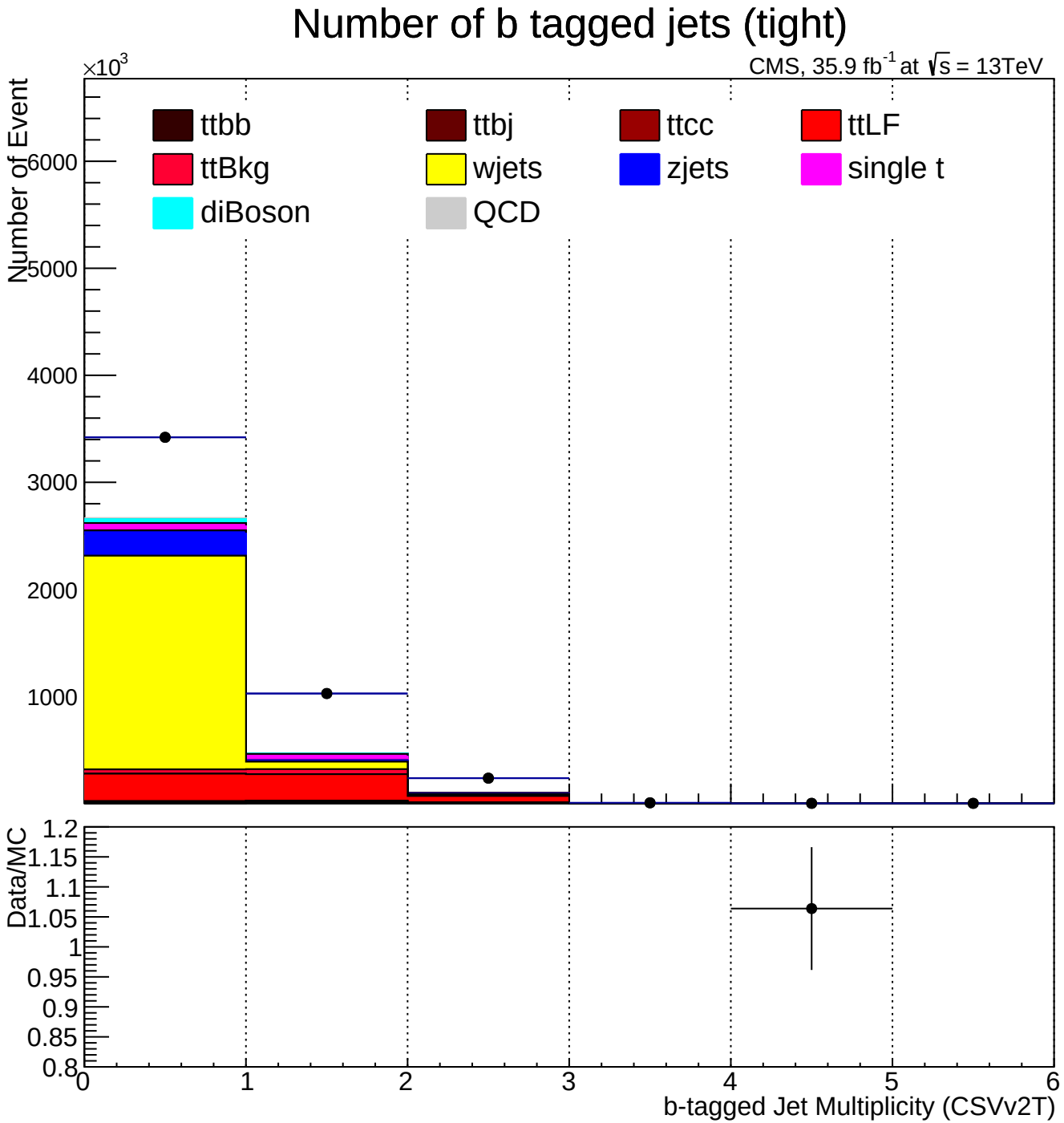

Top Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^6
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Top Mass from DRFCNHkinfit (Lep) (GeV)

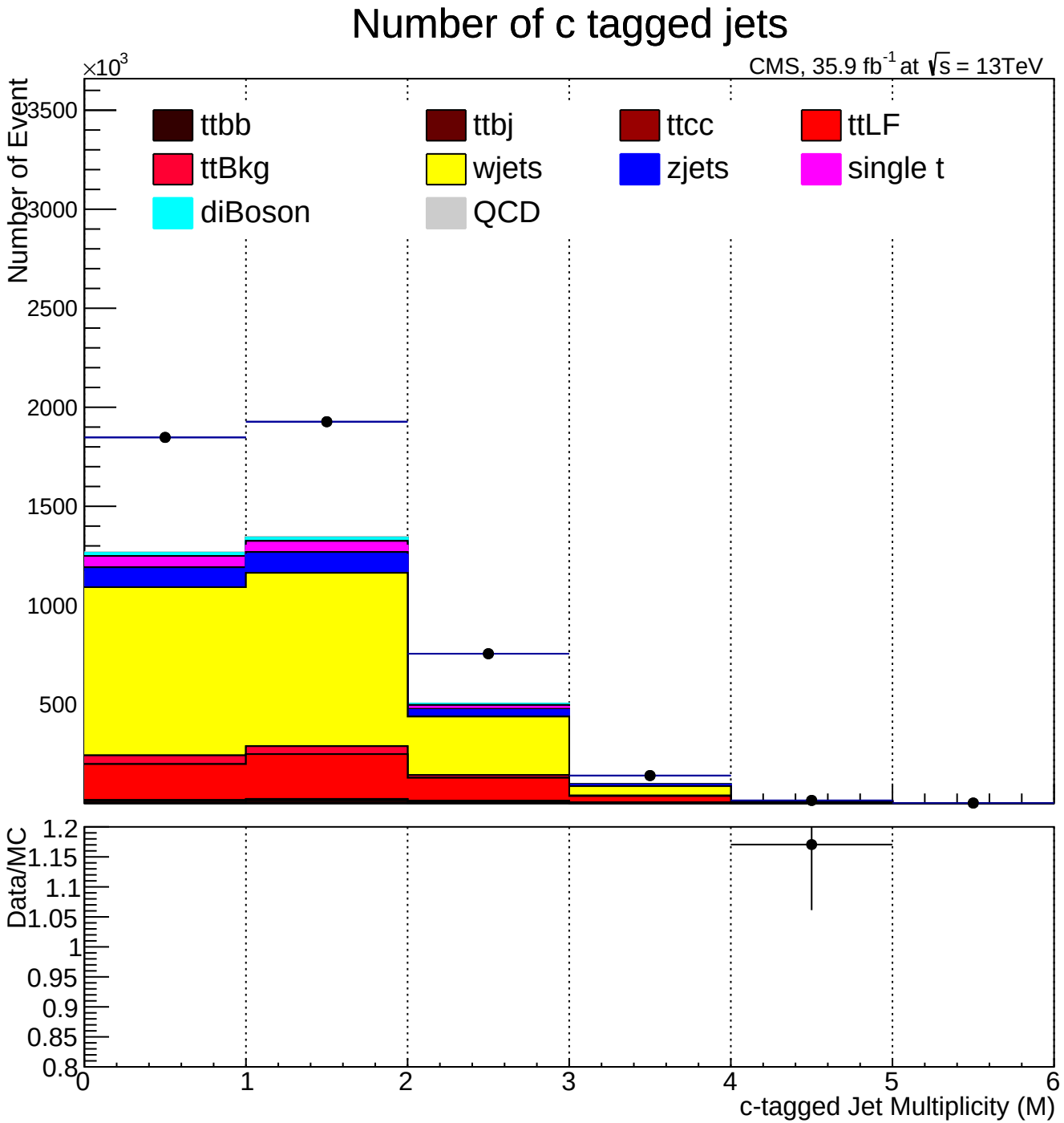
Top mass from Hc/u DRFCNHkinfit

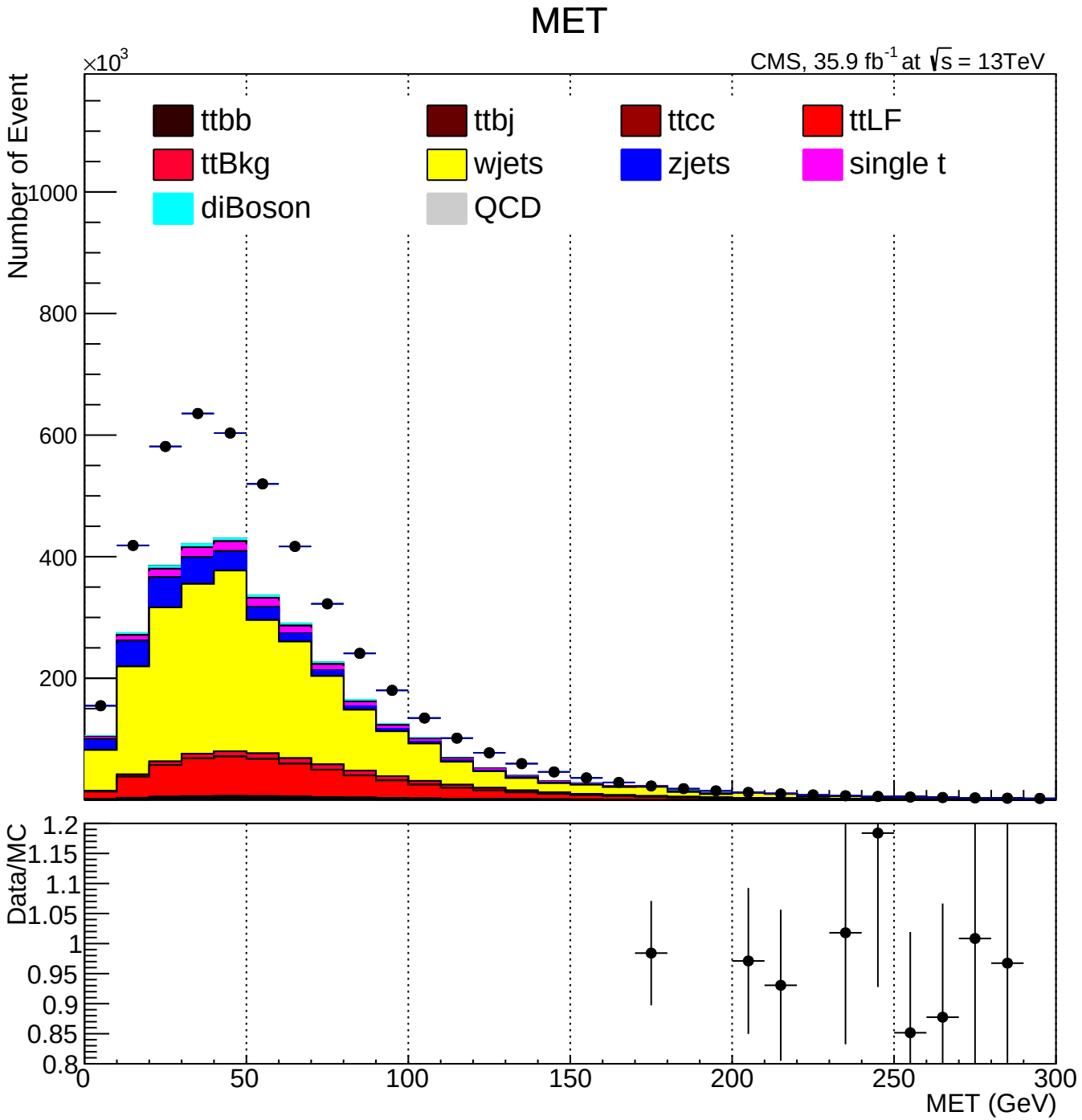


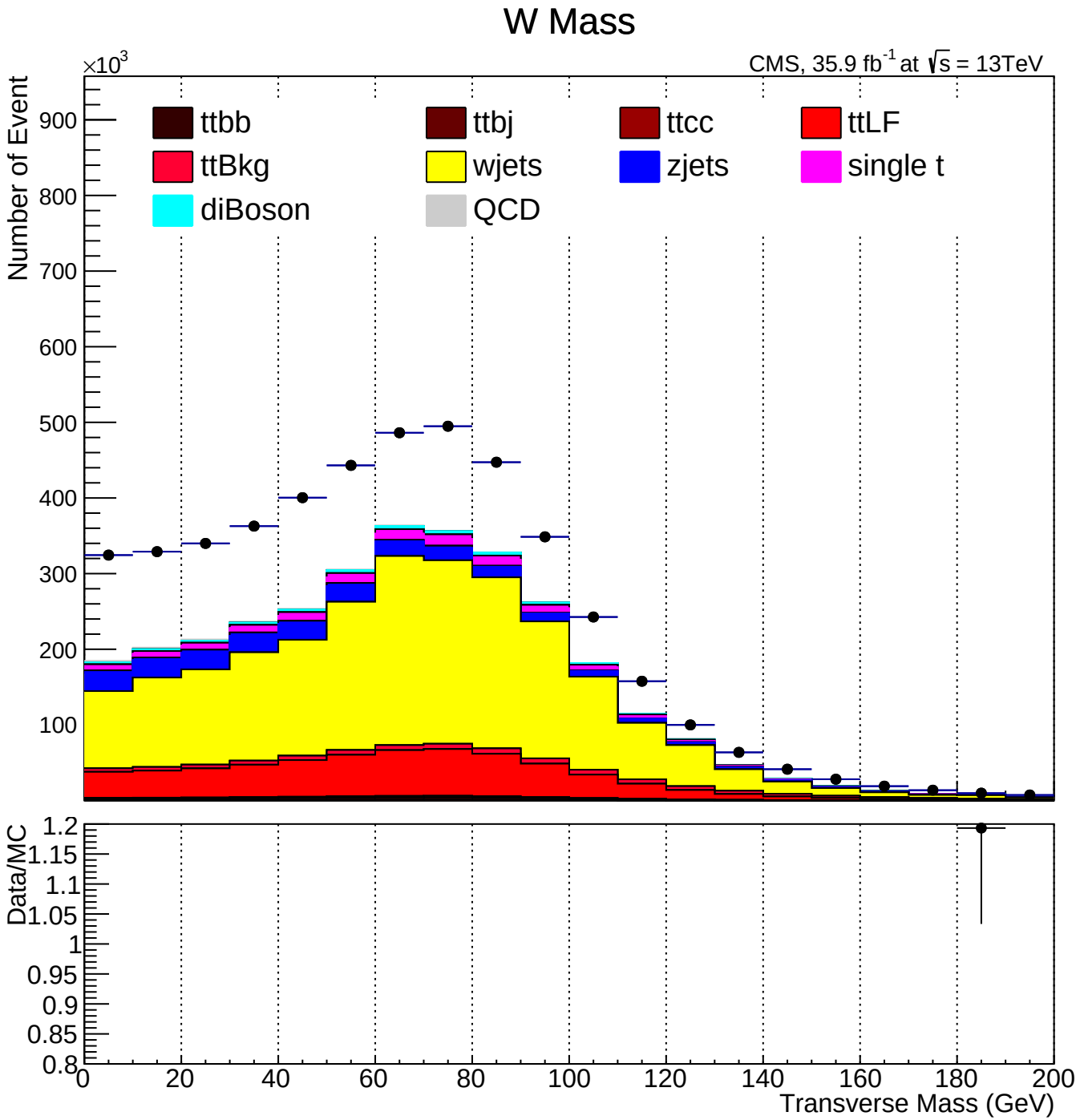

Number of jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
2
4
6
8
10
12
Jet Multiplicity

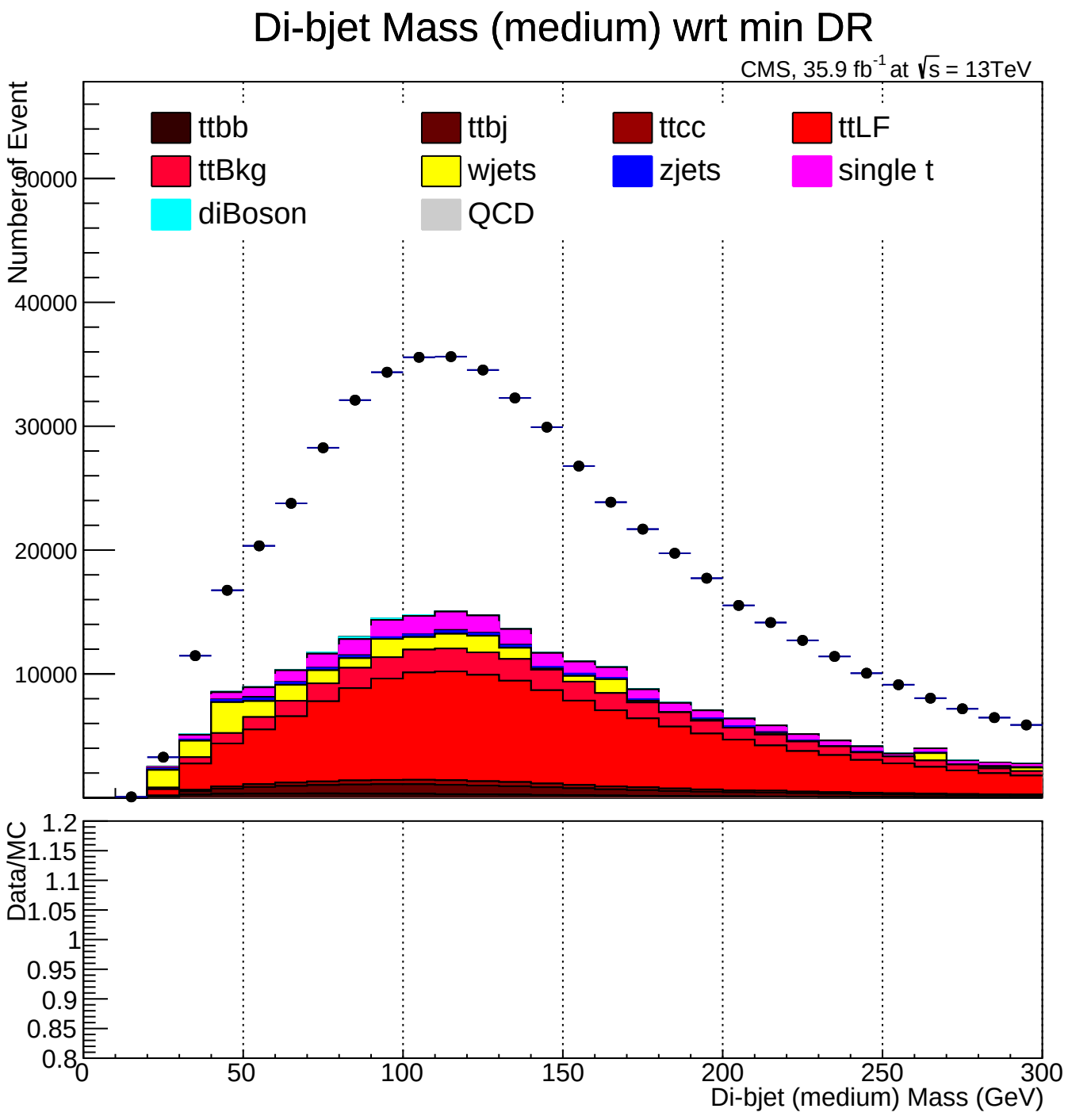

Number of b tagged jets (medium)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b-tagged Jet Multiplicity (CSVv2M)

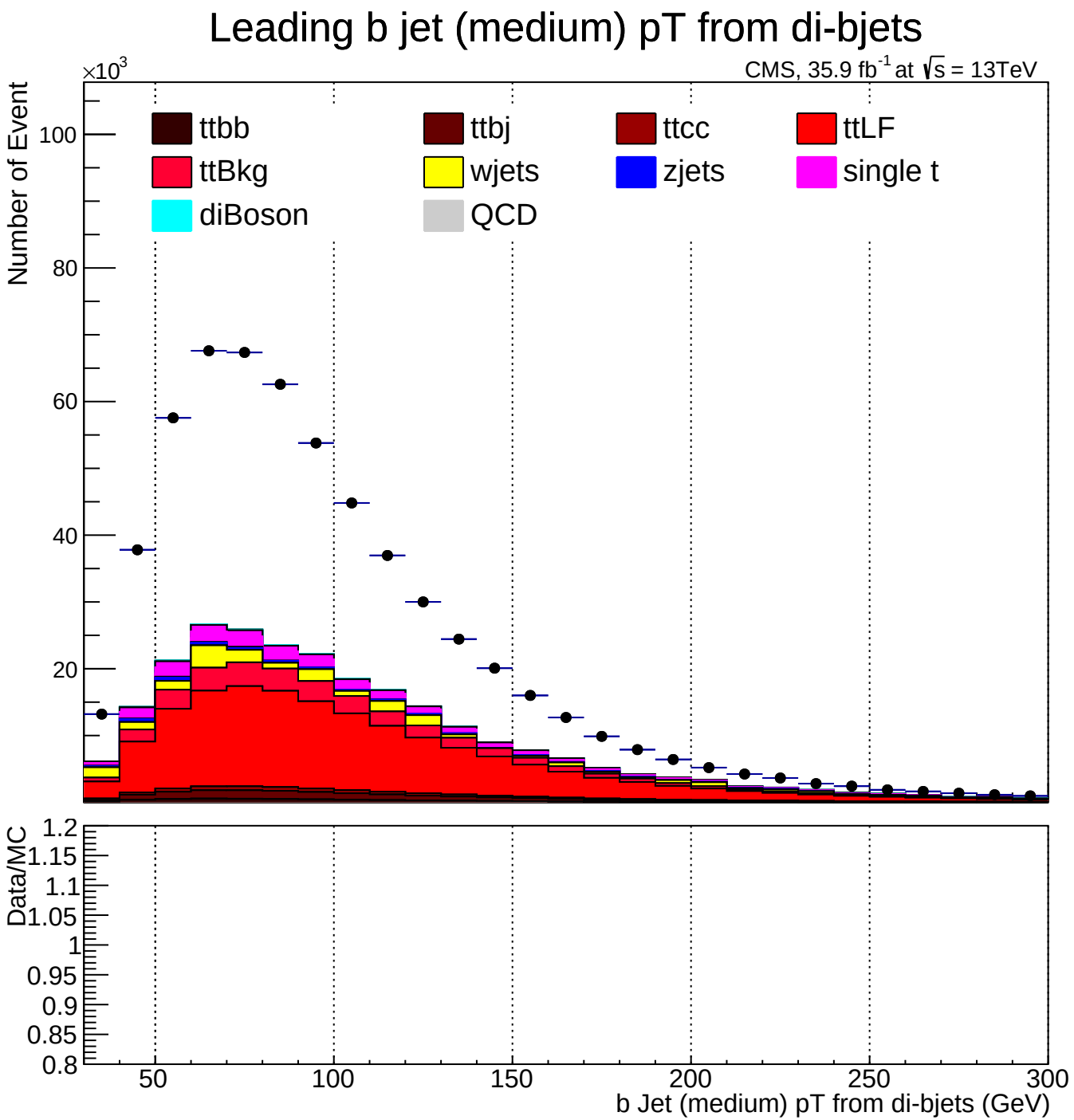

Number of b tagged jets (tight)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
6000
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2T)

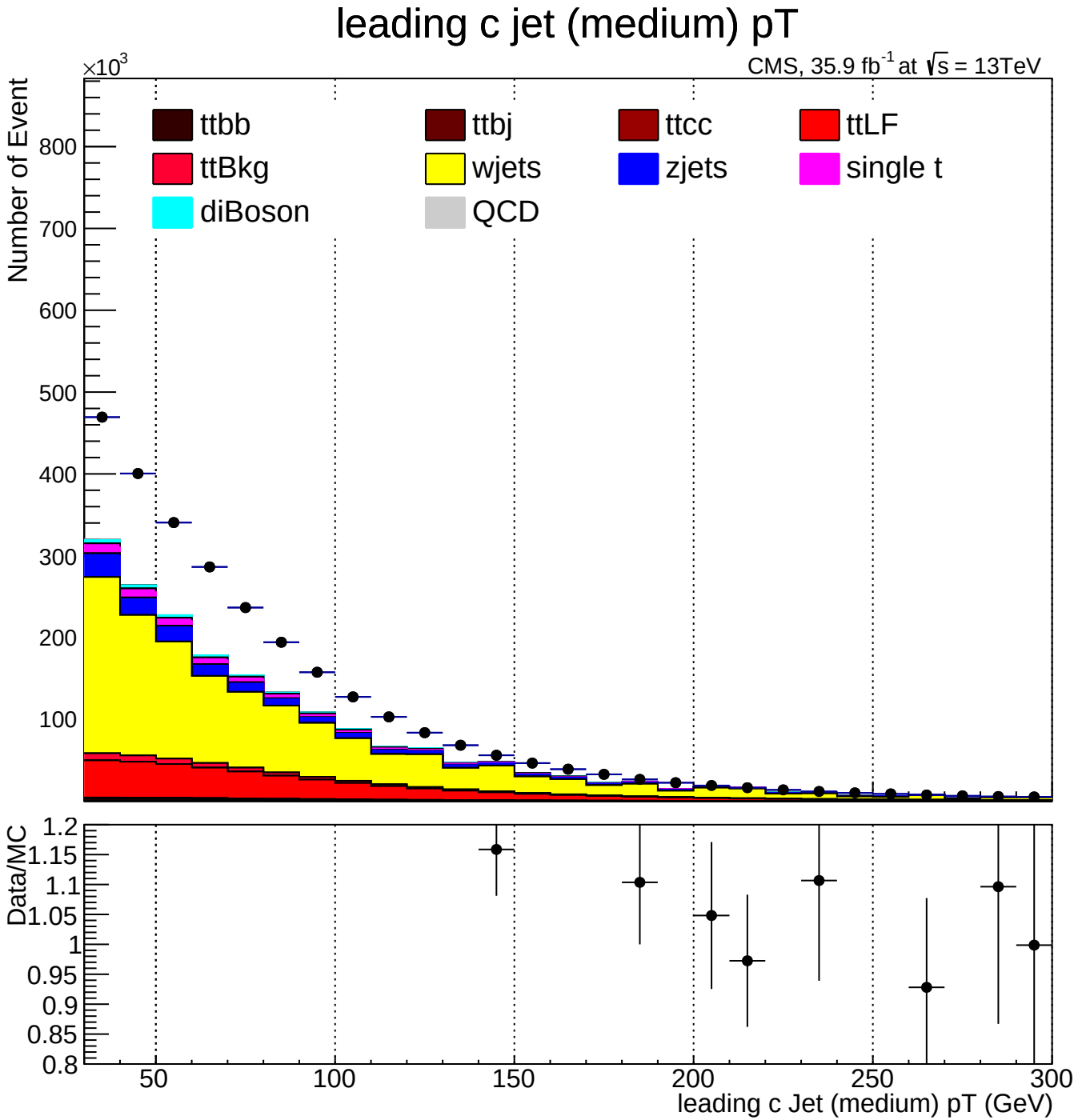

Number of c tagged jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
c-tagged Jet Multiplicity (M)

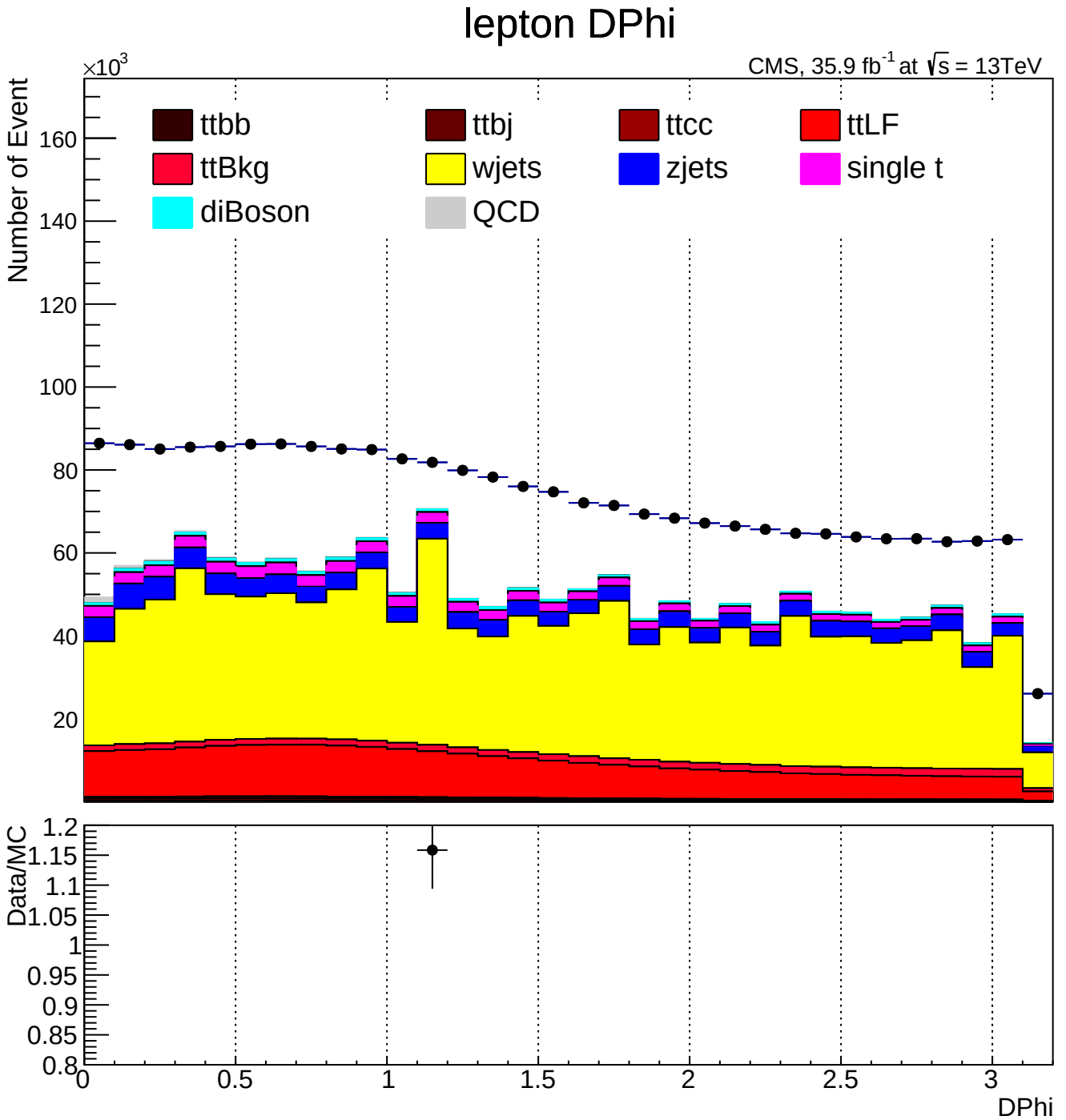

MET
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
1000
800
600
400
200
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
50
100
150
200
250
300
MET (GeV)

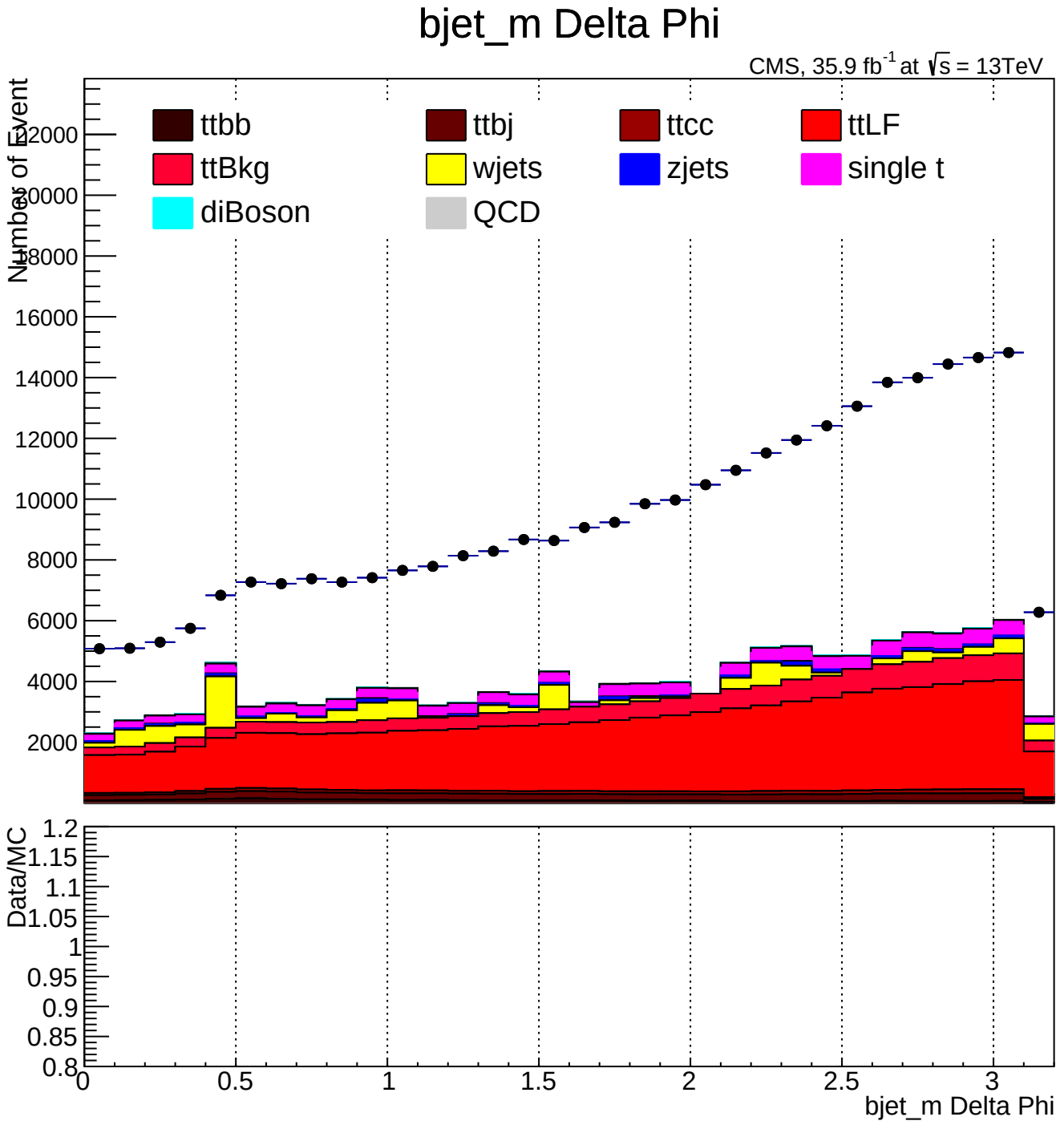

W Mass
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Transverse Mass (GeV)

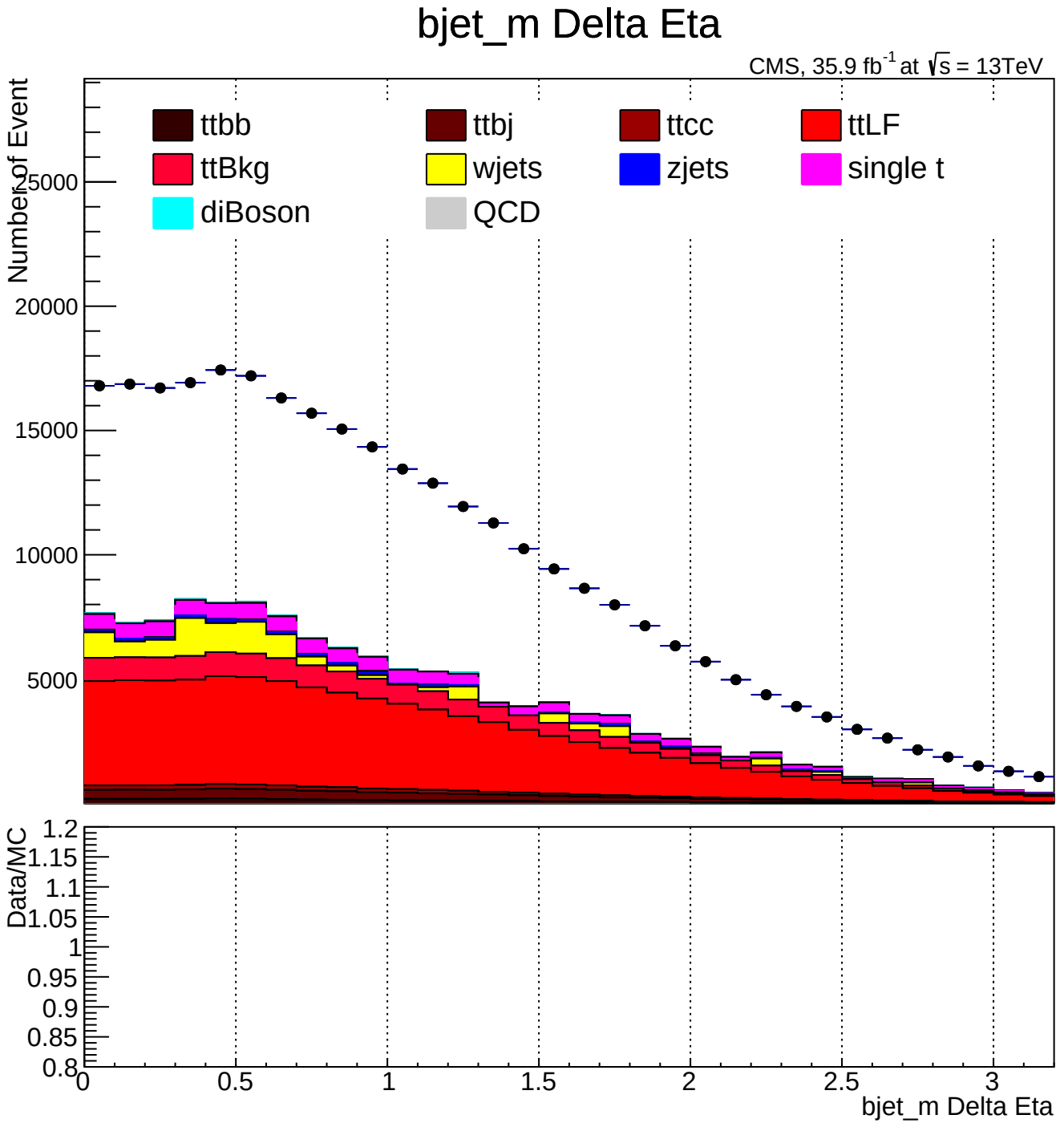

Di-bjet Mass (medium) wrt min DR
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
50000
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
50
100
150
200
250
300
Di-bjet (medium) Mass (GeV)

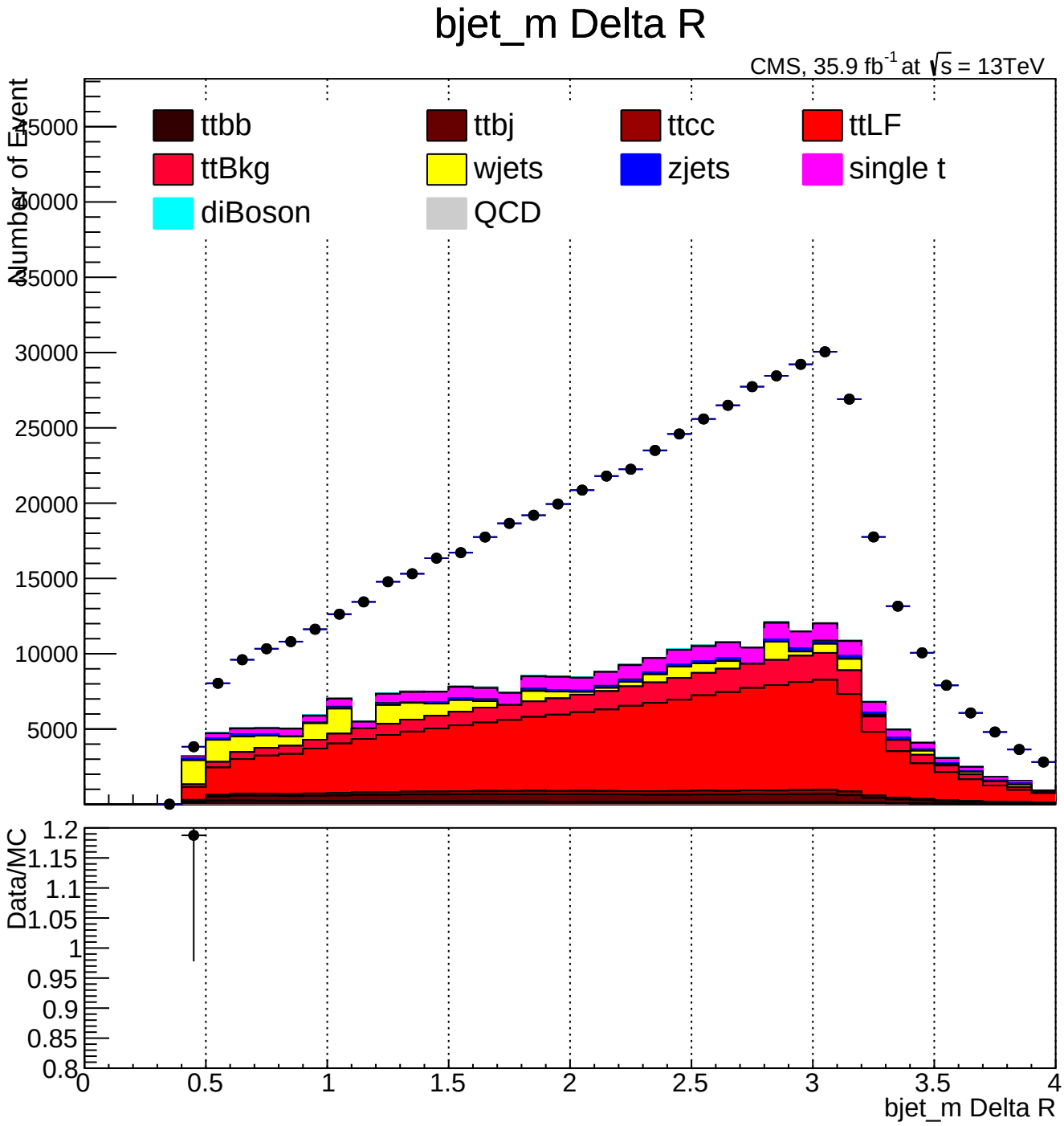

Leading b jet (medium) pT from di-bjets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b Jet (medium) pT from di-bjets (GeV)

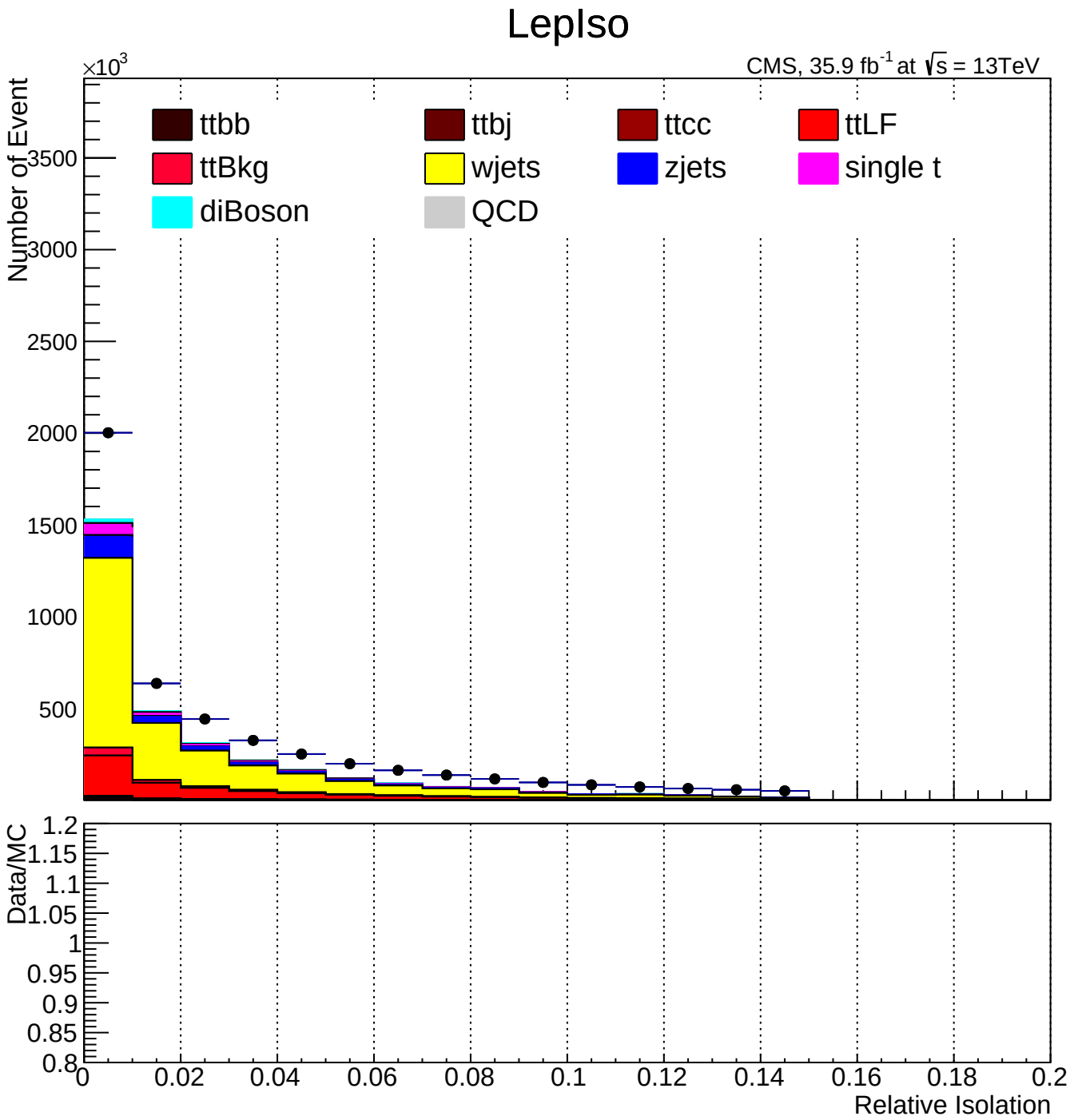

leading c jet (medium) pT
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
800
700
600
500
400
300
200
100
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
leading c Jet (medium) pT (GeV)

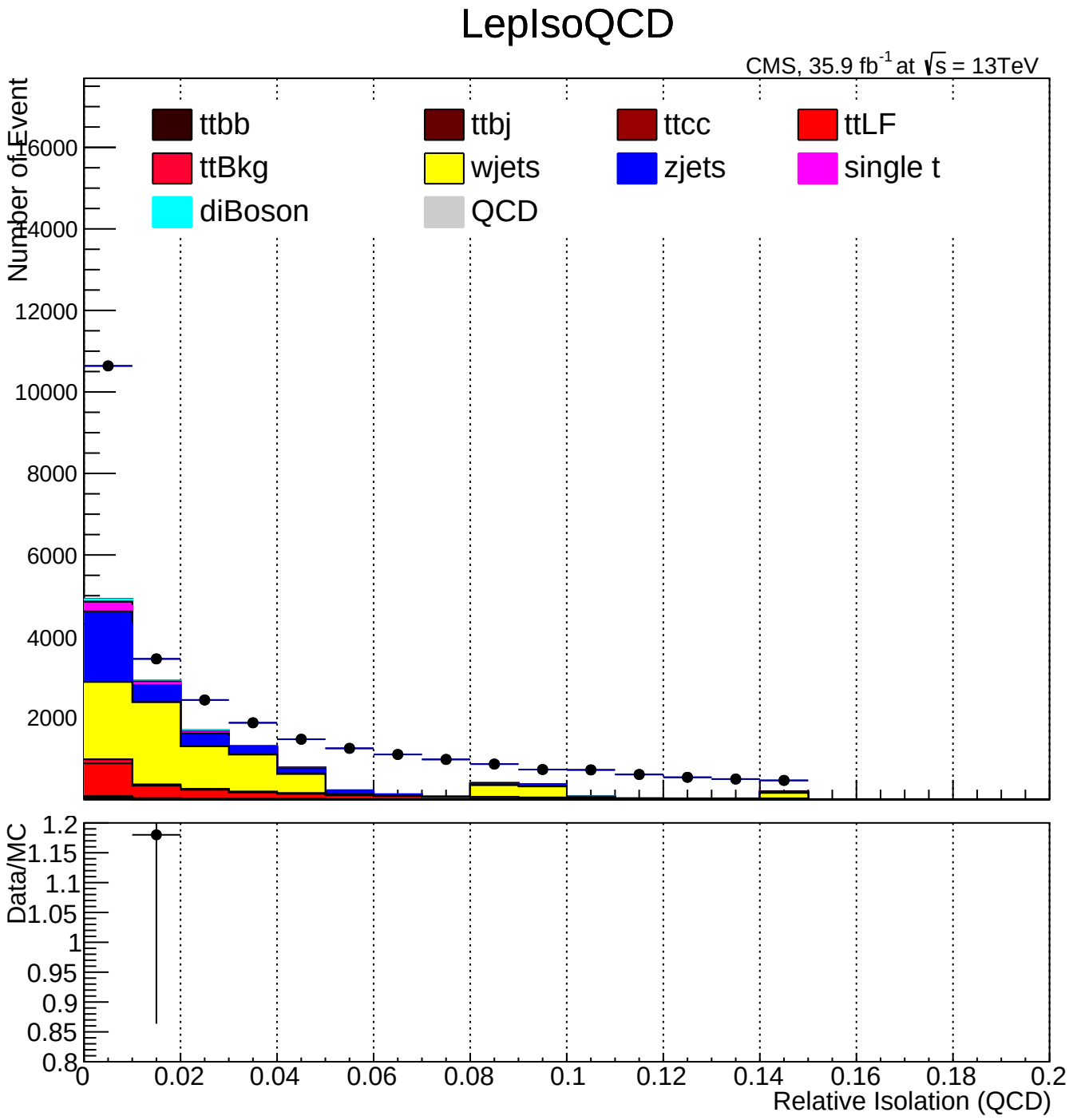

lepton DPhi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
DPhi

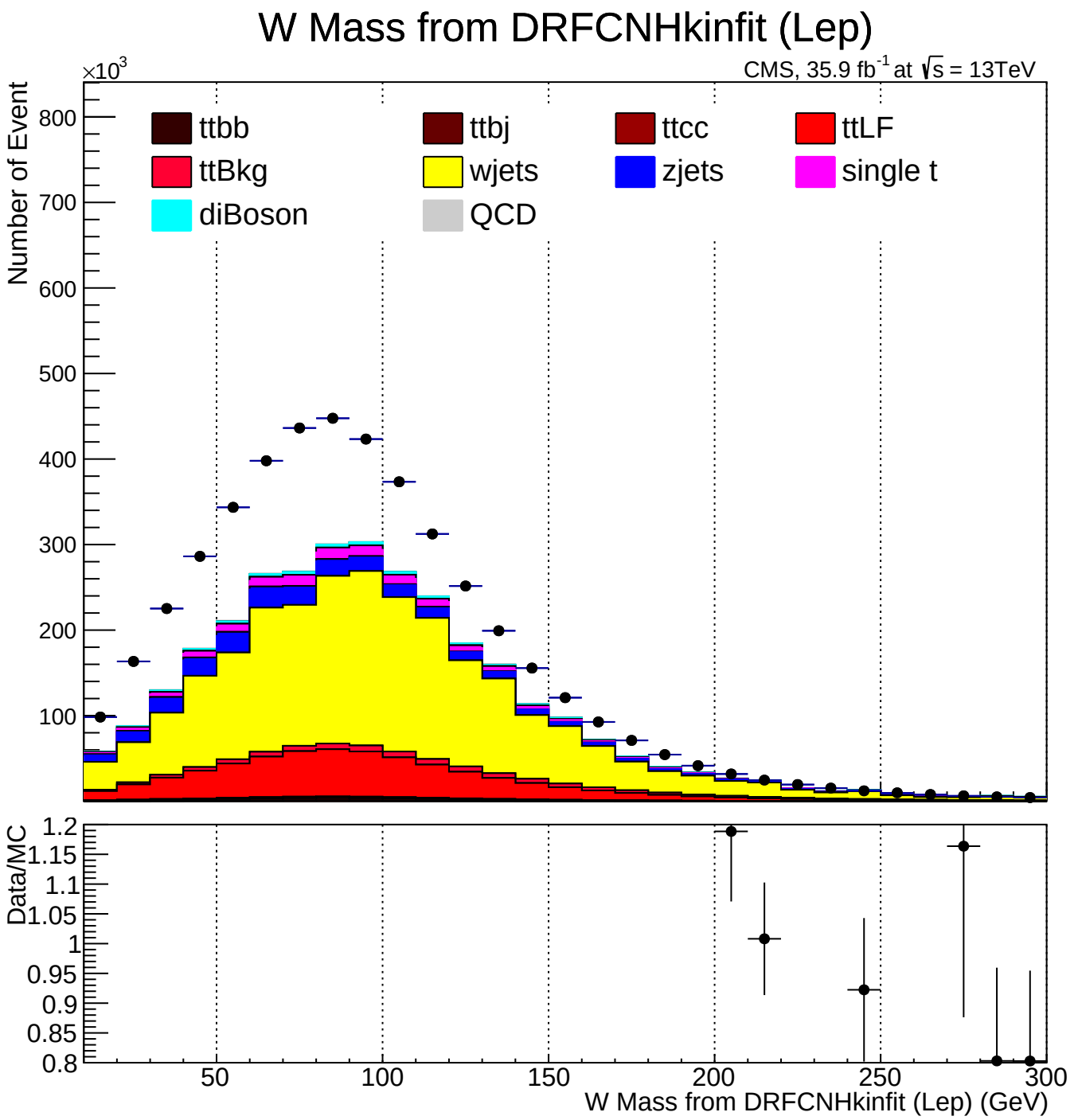

bjet_m Delta Phi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta Phi

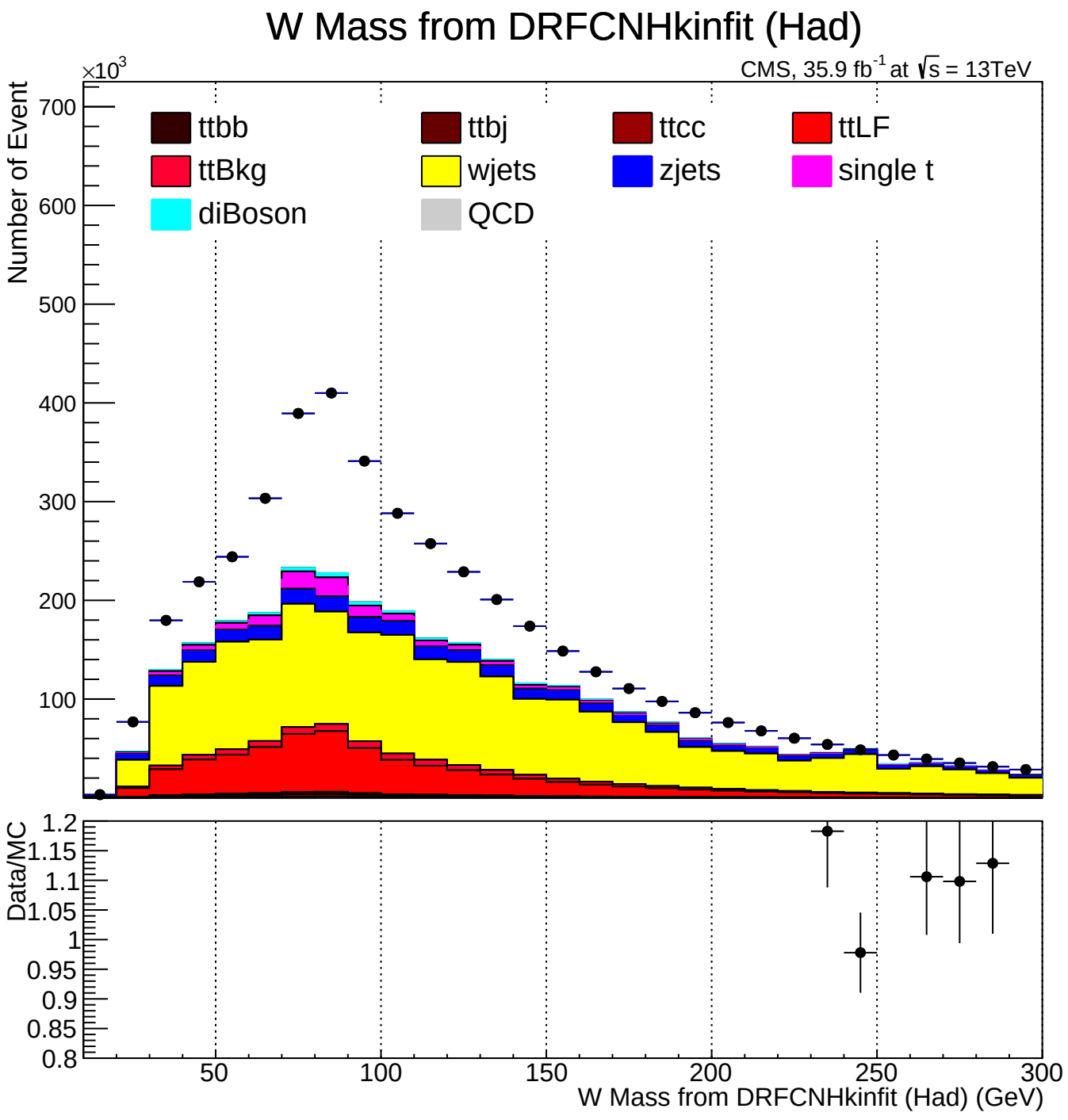

bjet_m Delta Eta
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
5000
10000
15000
20000
25000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Eta

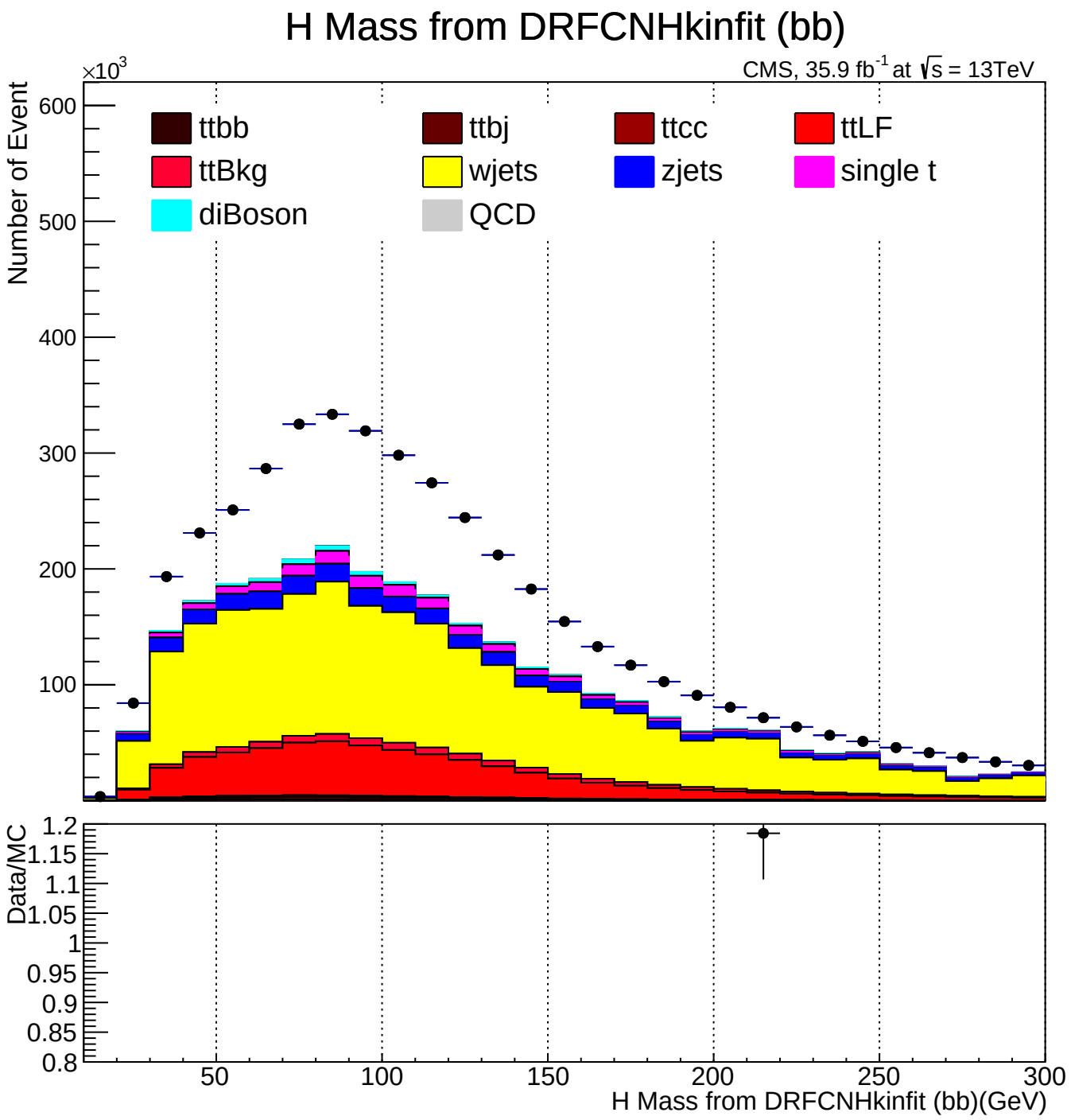

bjet_m Delta R
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta R

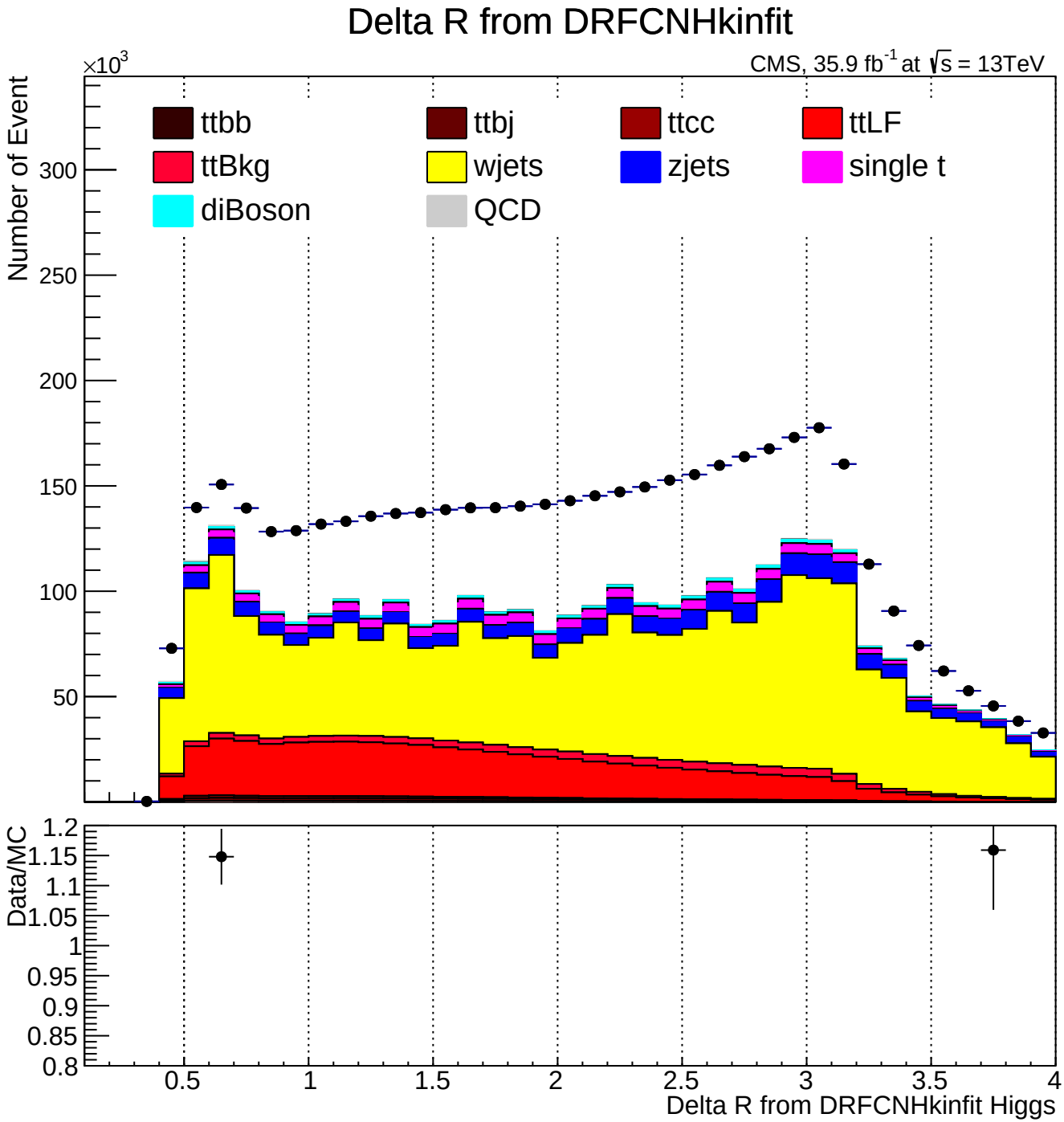

LepIso
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation

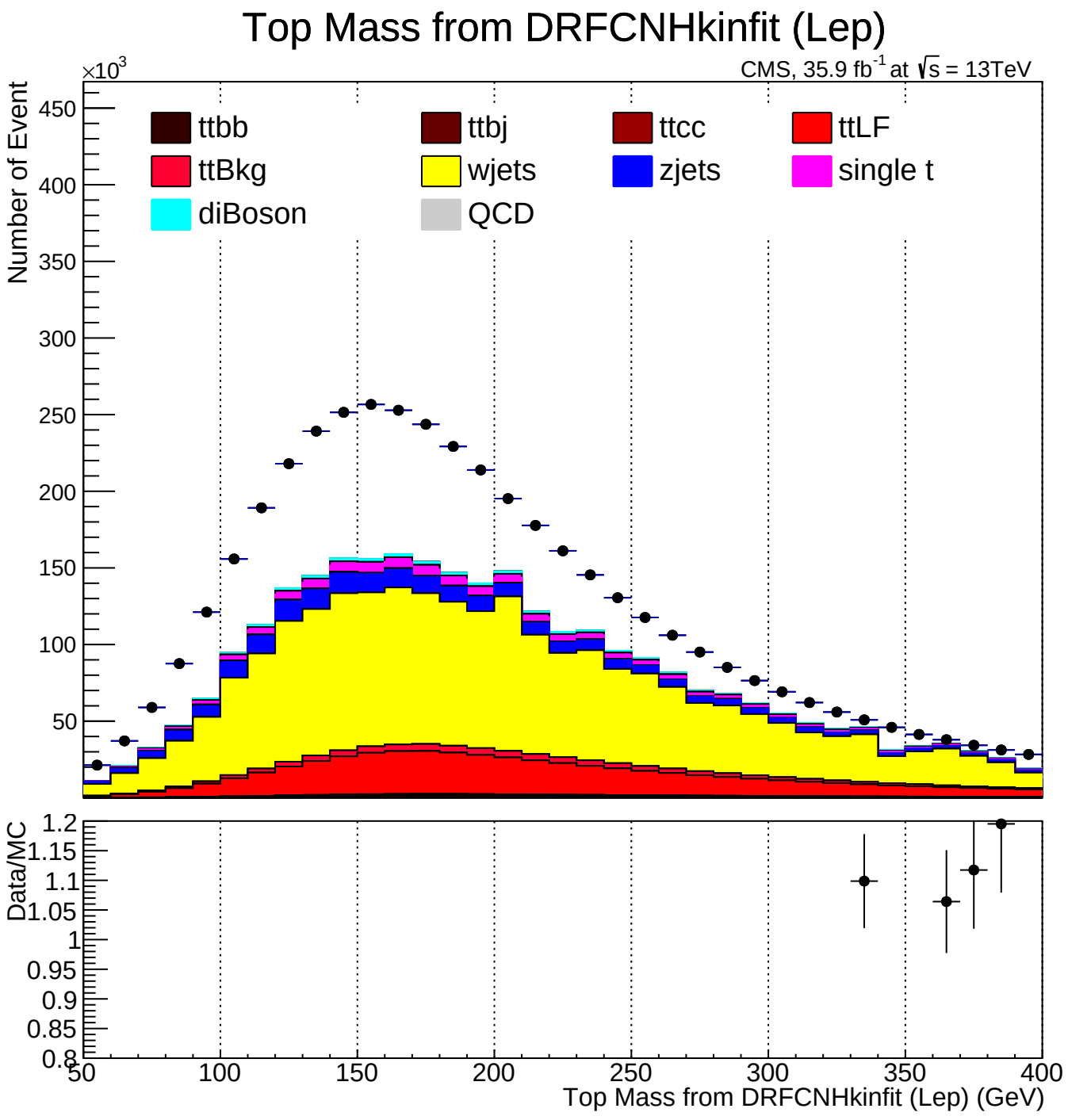

LepIsoQCD
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
16000
14000
12000
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation (QCD)


W Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
W Mass from DRFCNHkinfit (Lep) (GeV)

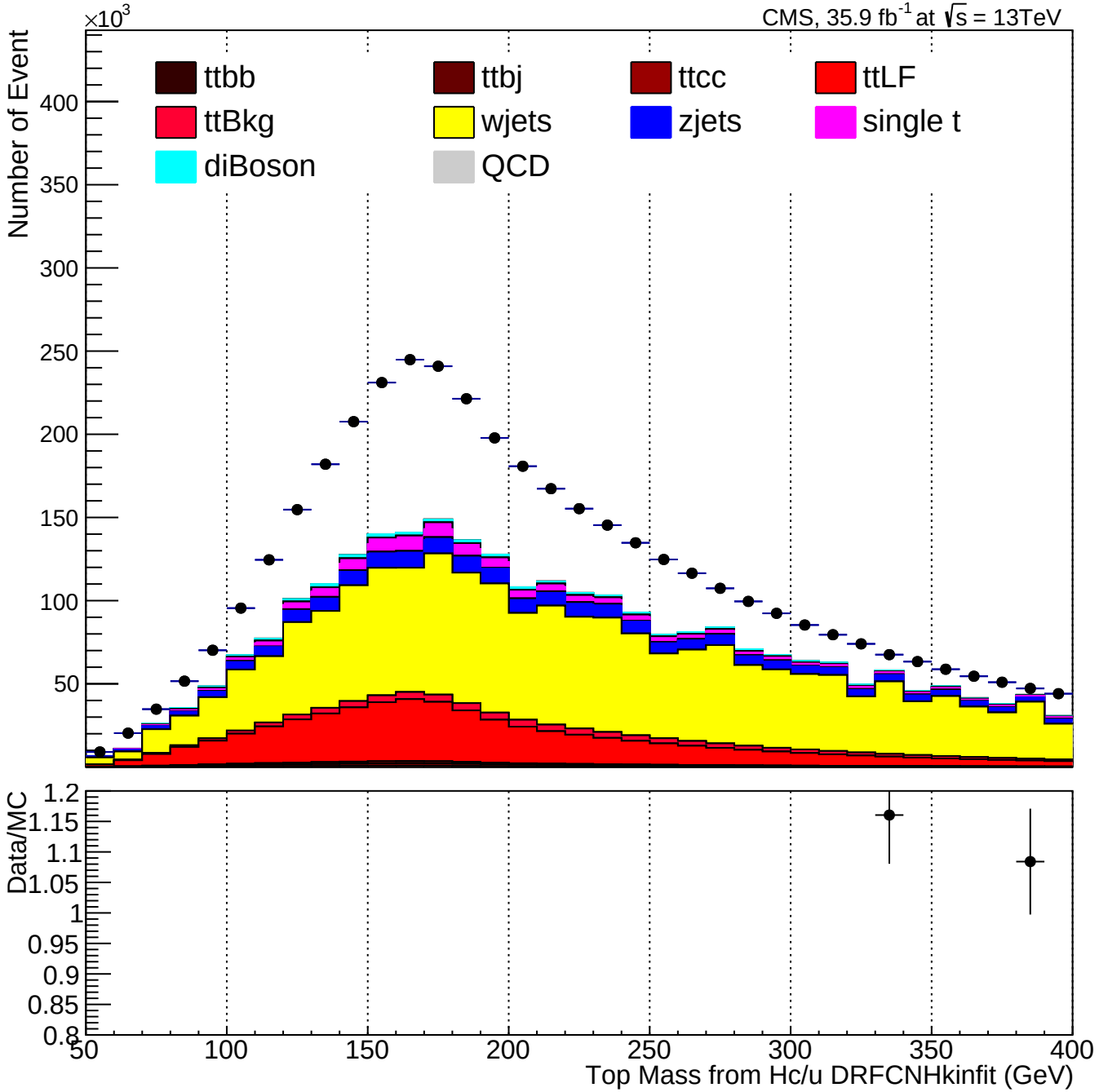

W Mass from DRFCNHkinfit (Had)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
W Mass from DRFCNHkinfit (Had) (GeV)

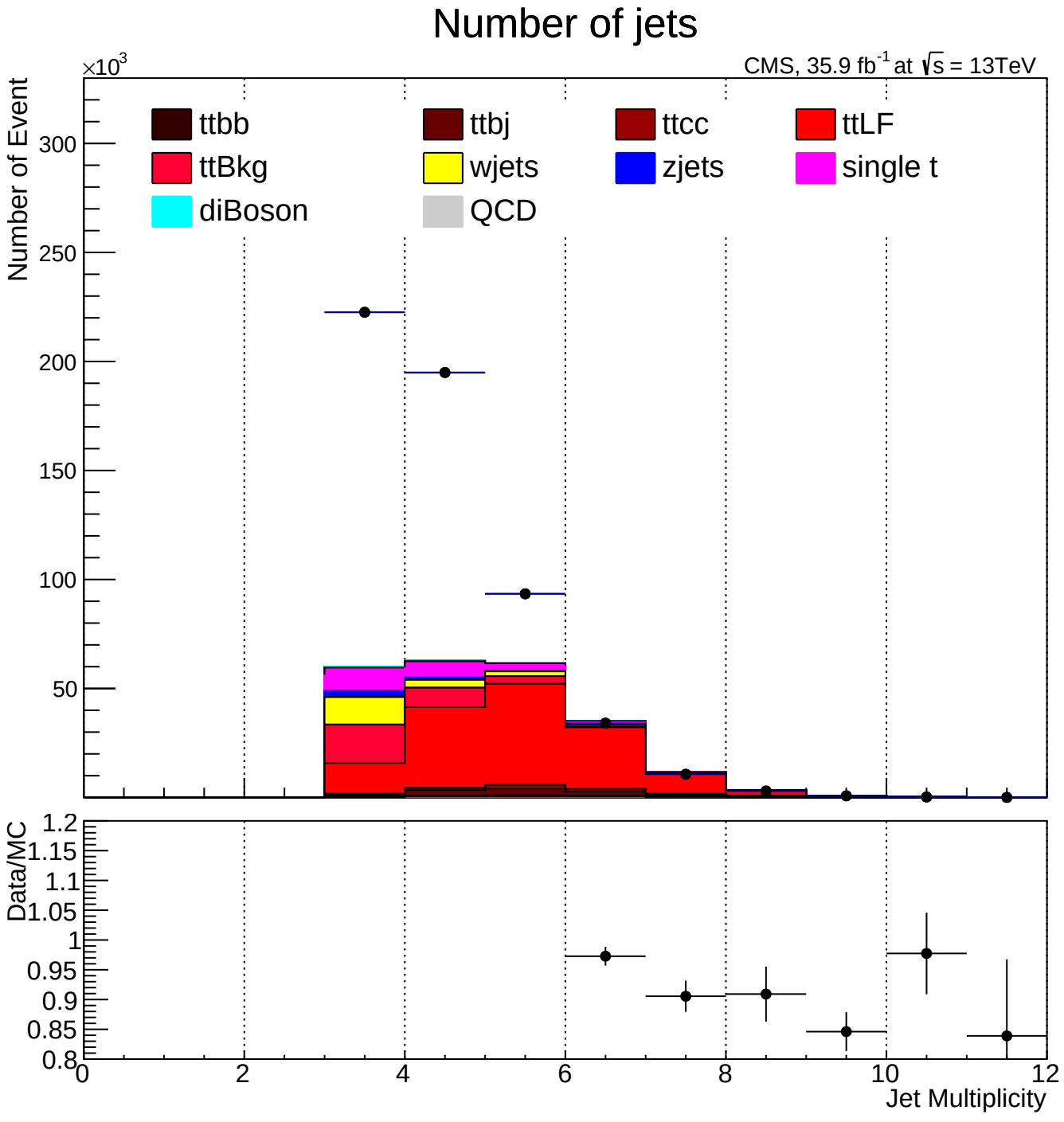

H Mass from DRFCNHkinfit (bb)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
H Mass from DRFCNHkinfit (bb)(GeV)

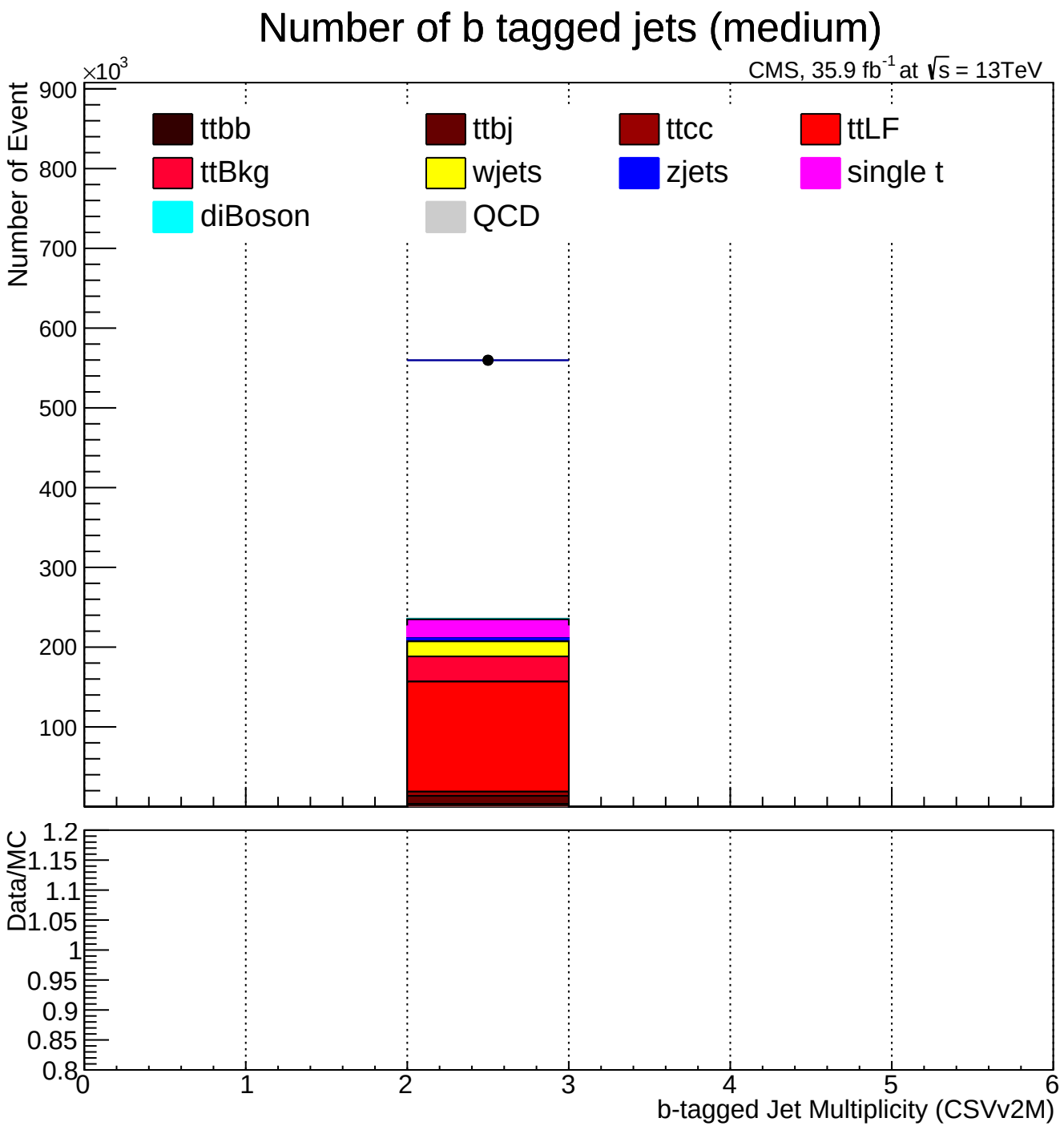

Delta R from DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Delta R from DRFCNHkinfit Higgs

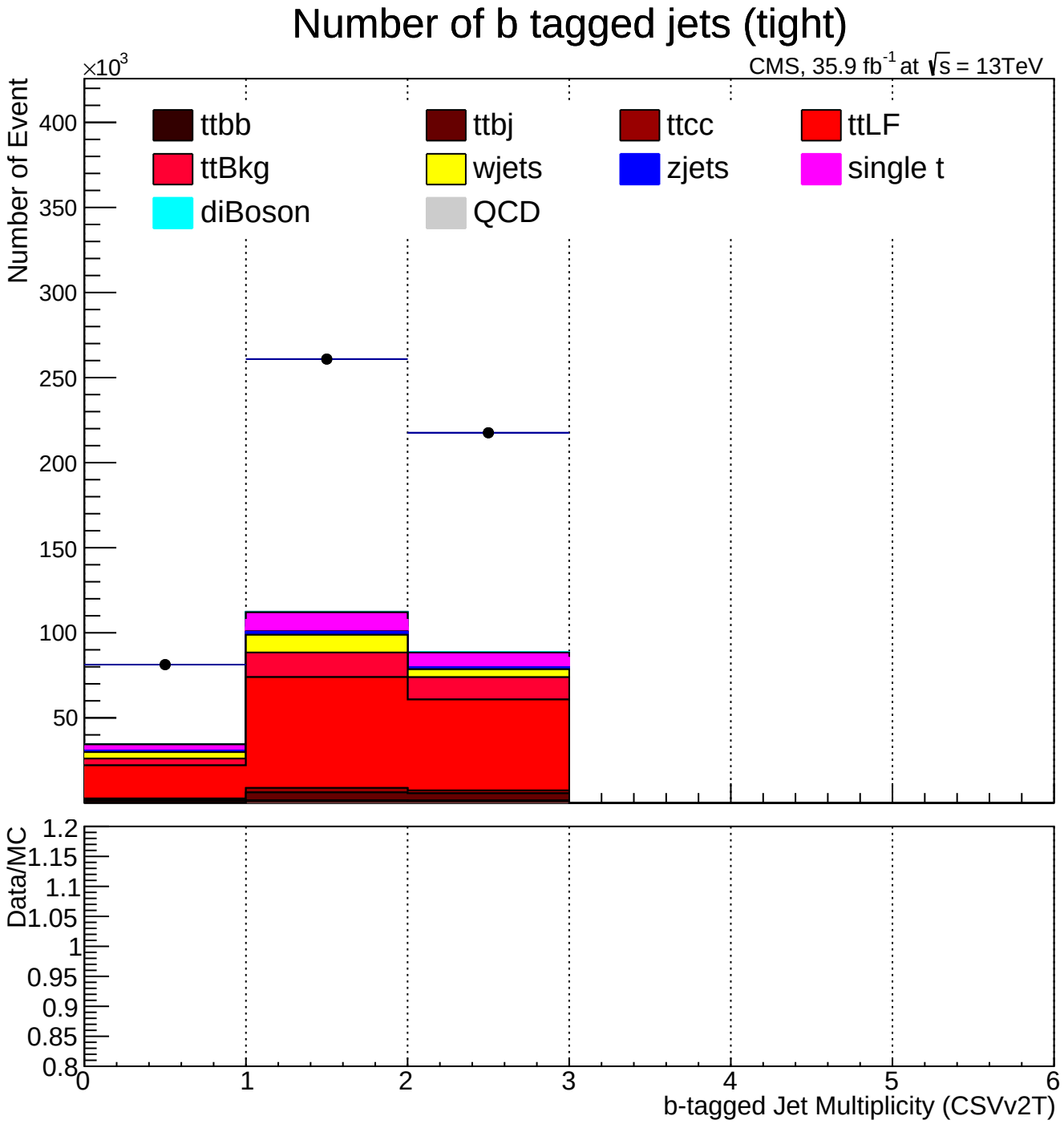

Top Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Top Mass from DRFCNHkinfit (Lep) (GeV)

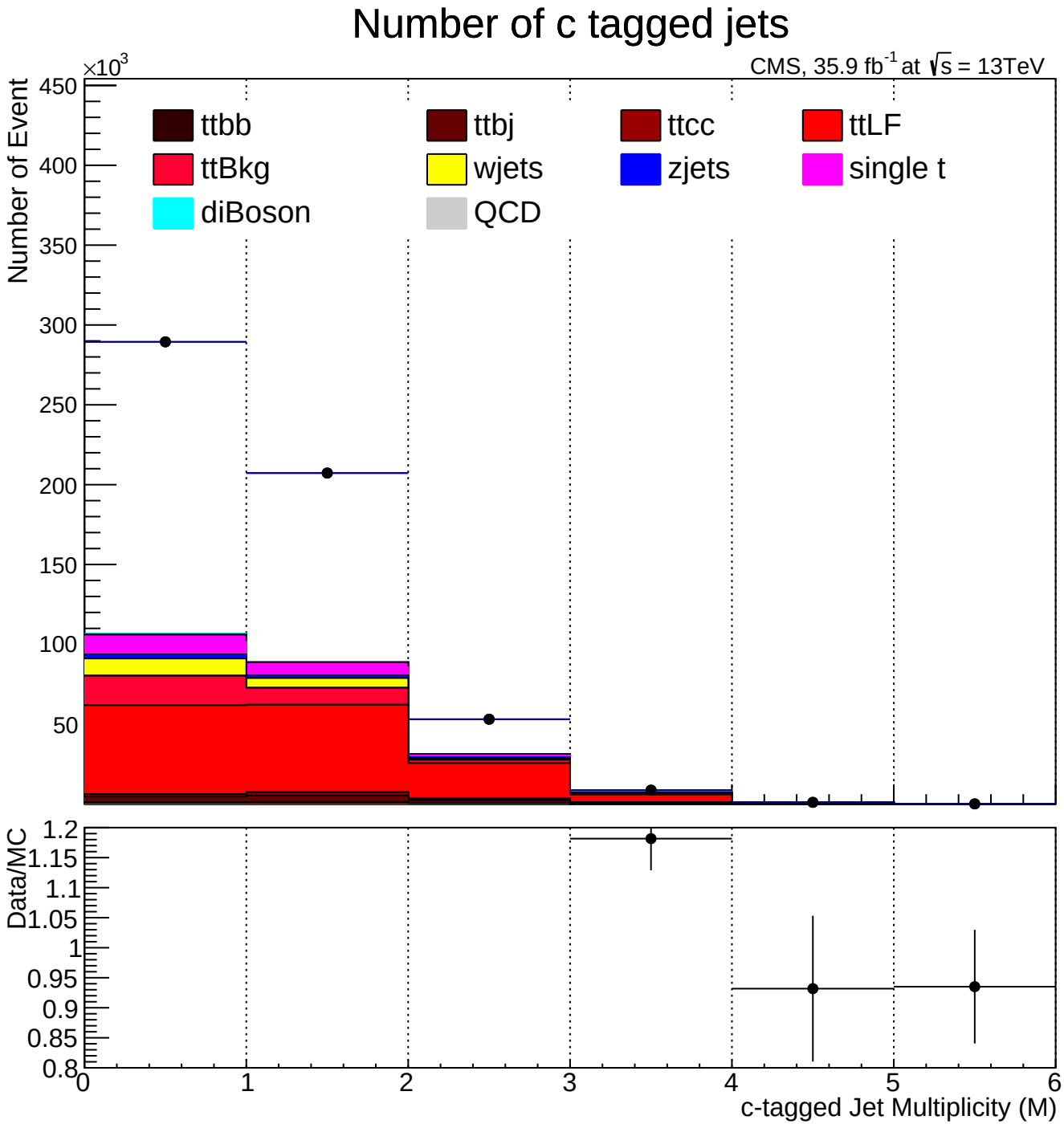
Top mass from Hc/u DRFCNHkinfit

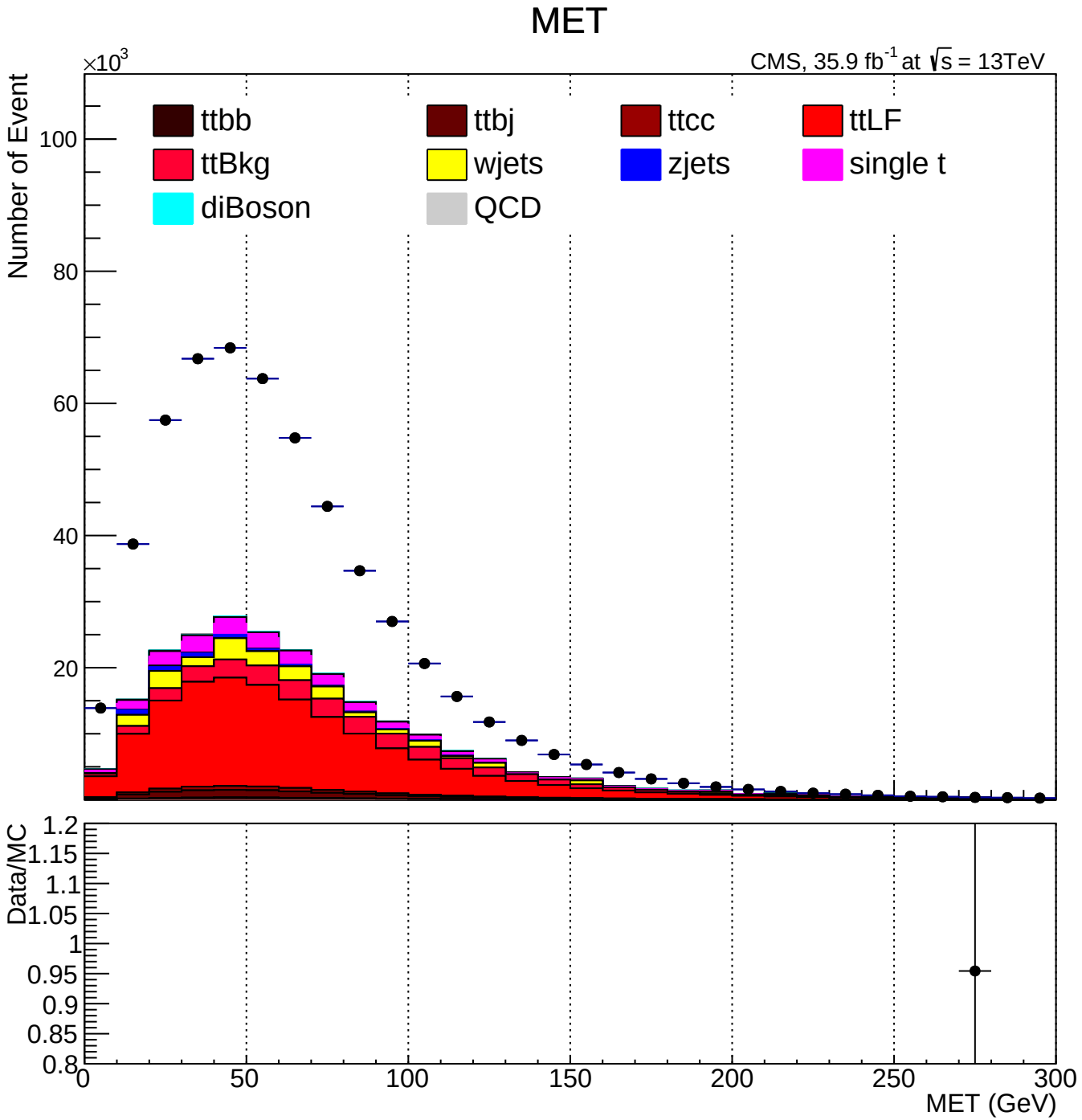


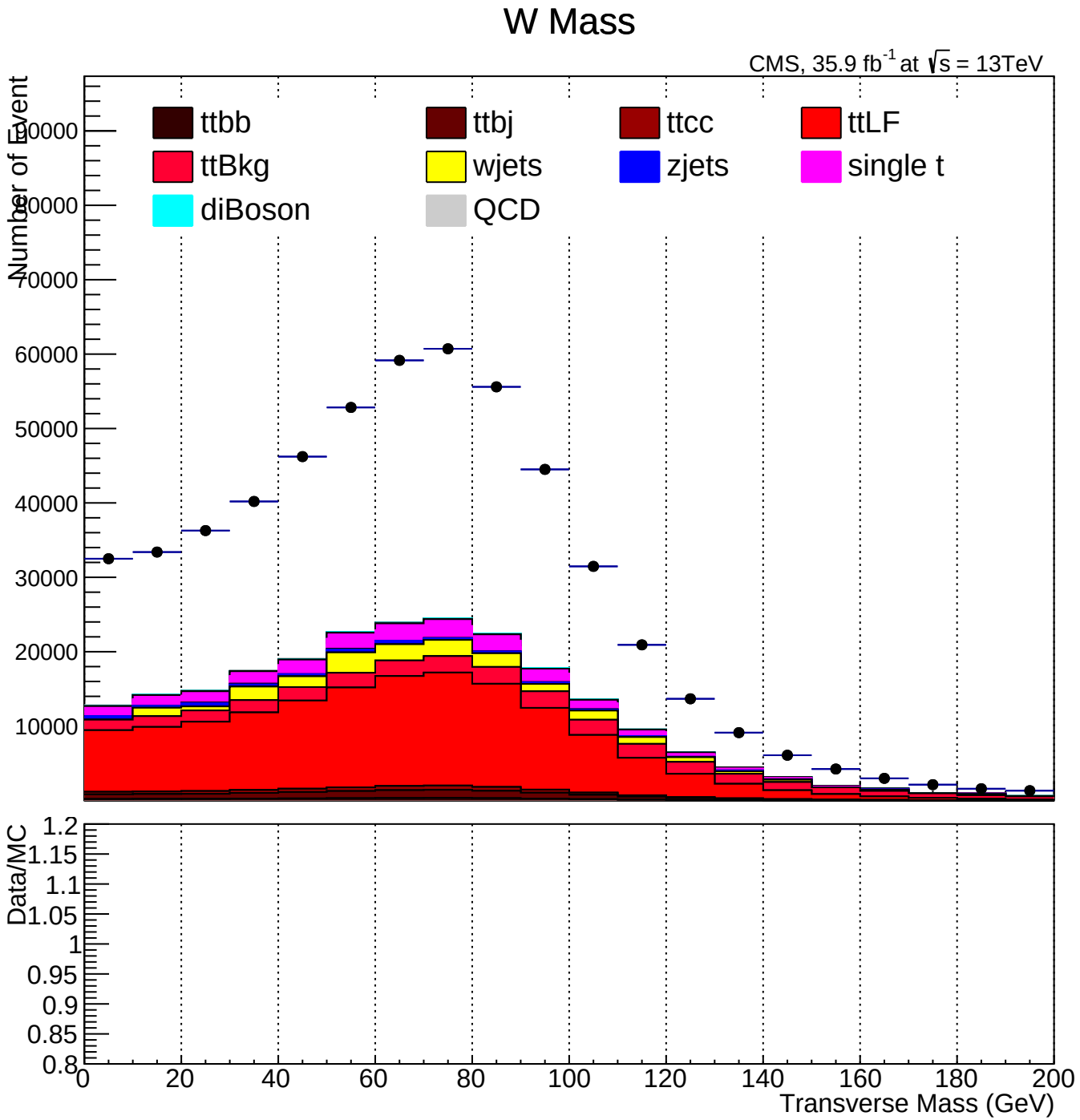

Number of jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Jet Multiplicity

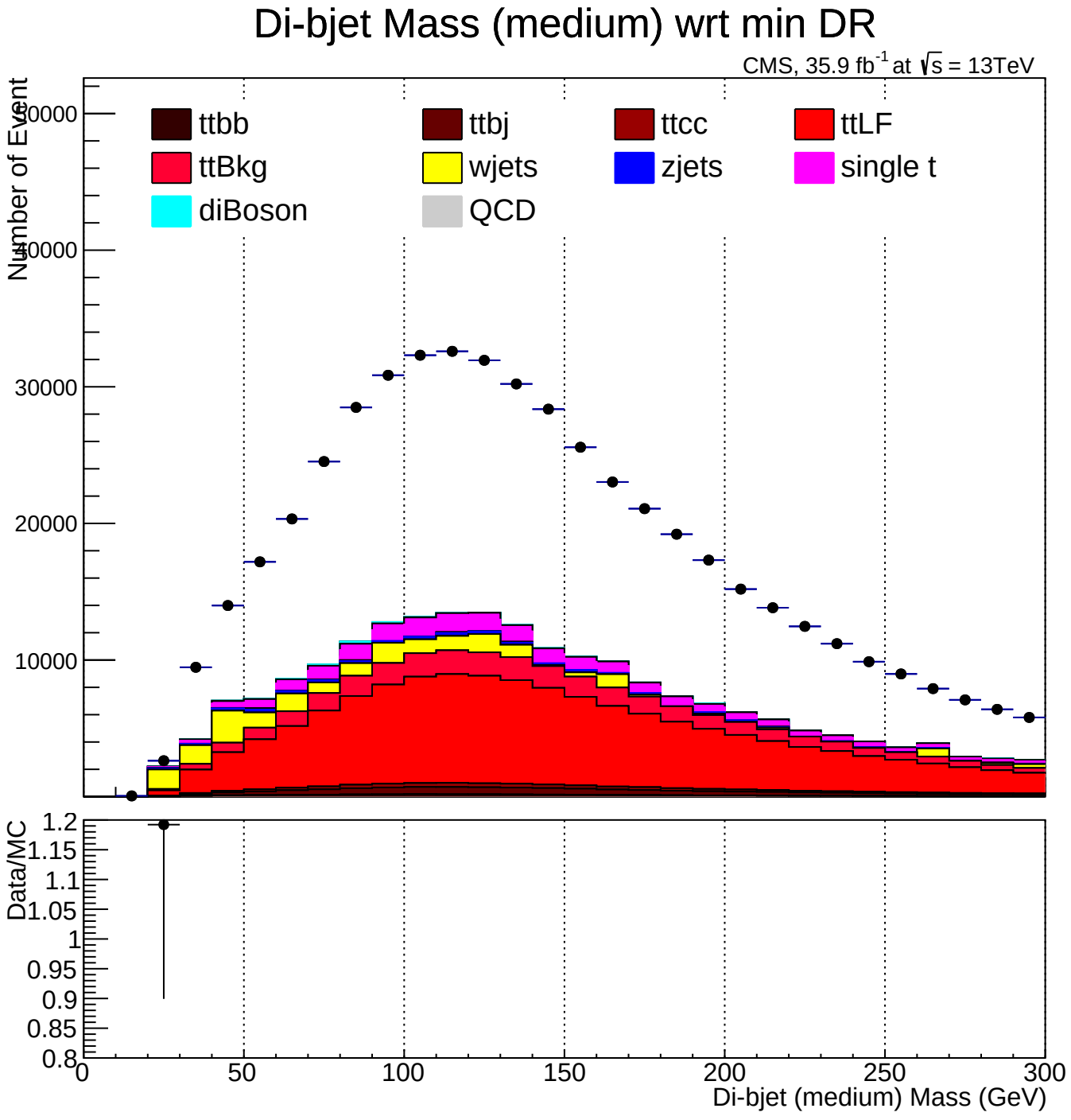

Number of b tagged jets (medium)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
900
800
700
600
500
400
300
200
100
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2M)

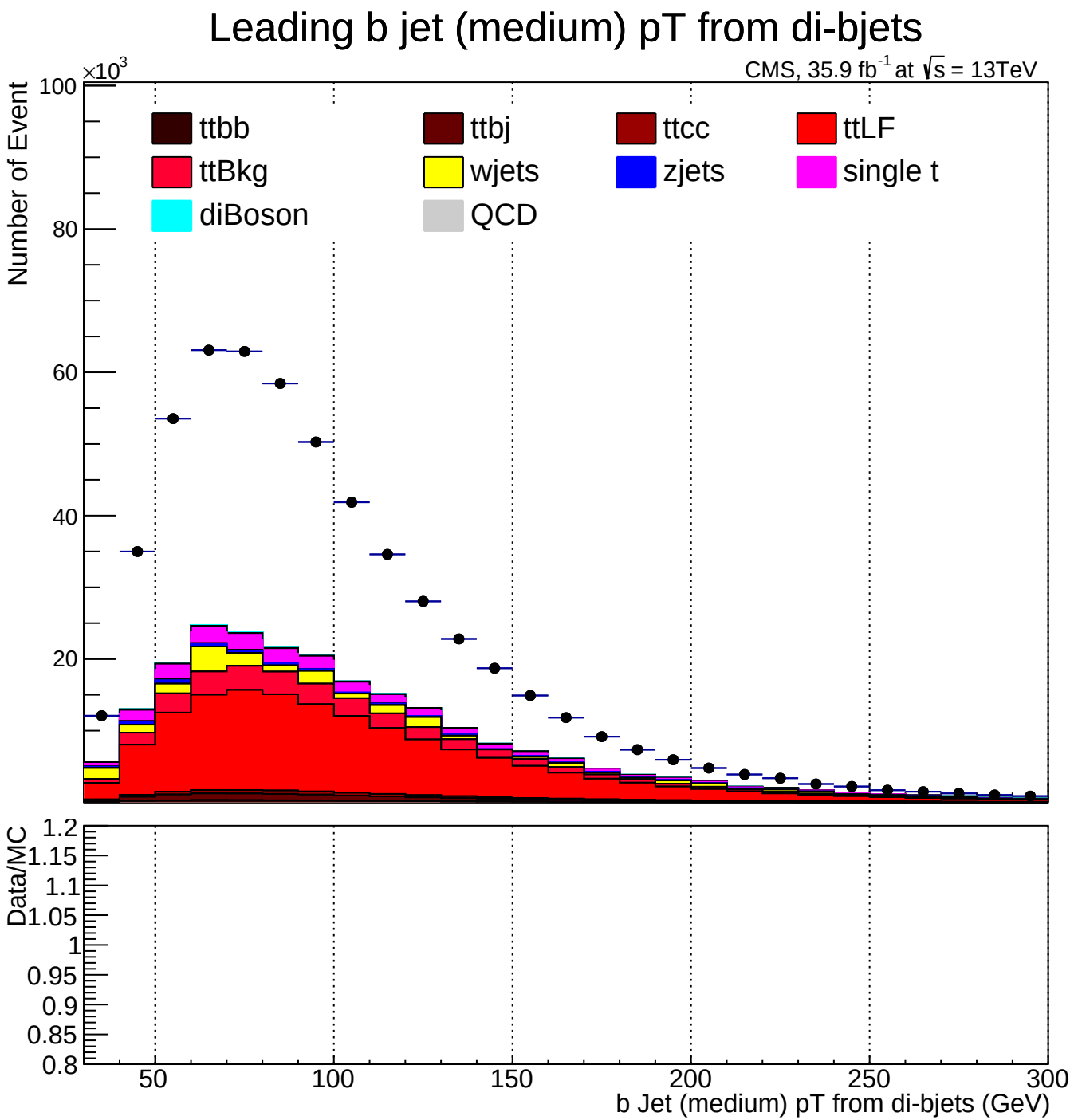

Number of b tagged jets (tight)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
400
350
300
250
200
150
100
50
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2T)

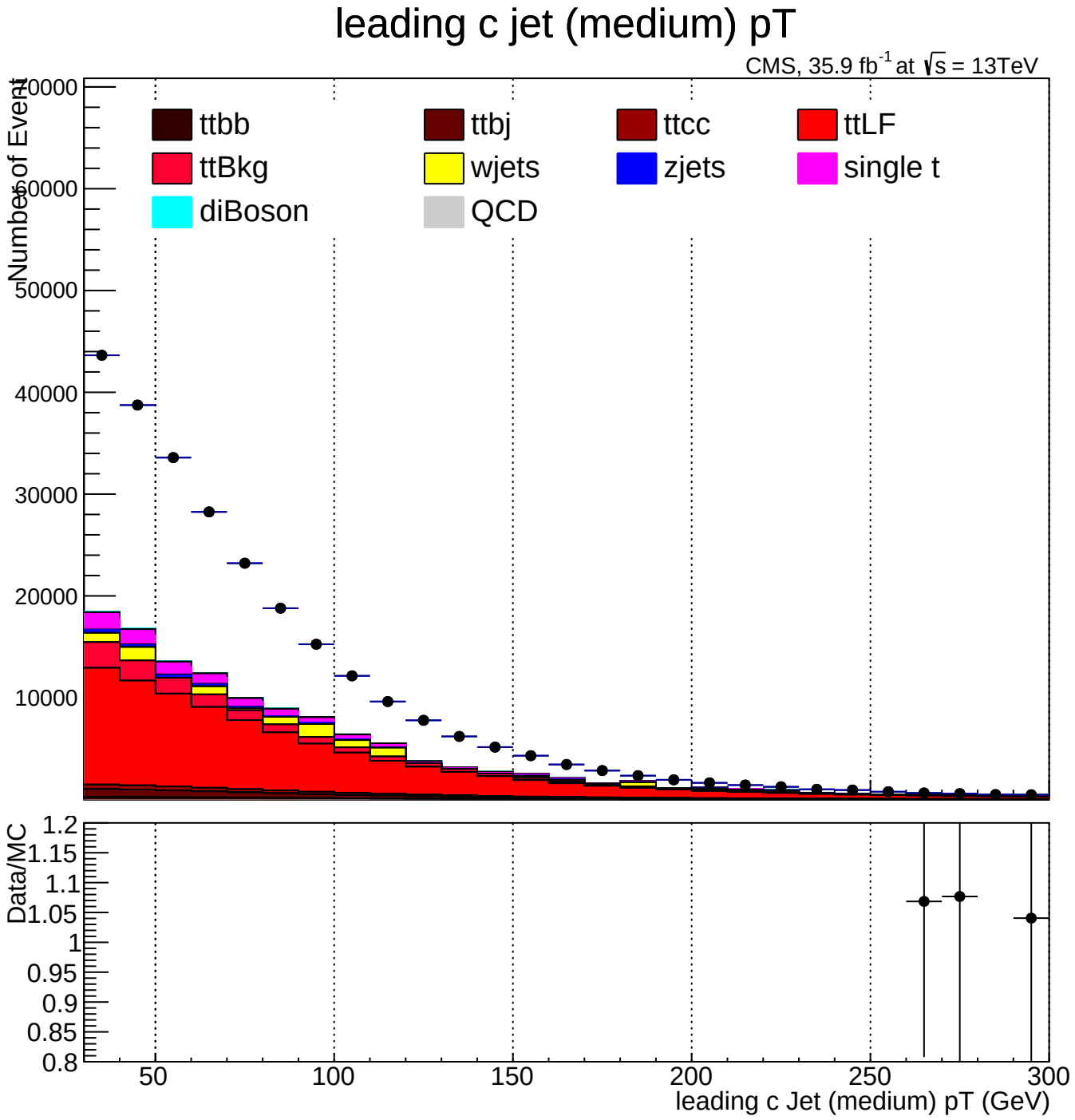

Number of c tagged jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
c-tagged Jet Multiplicity (M)

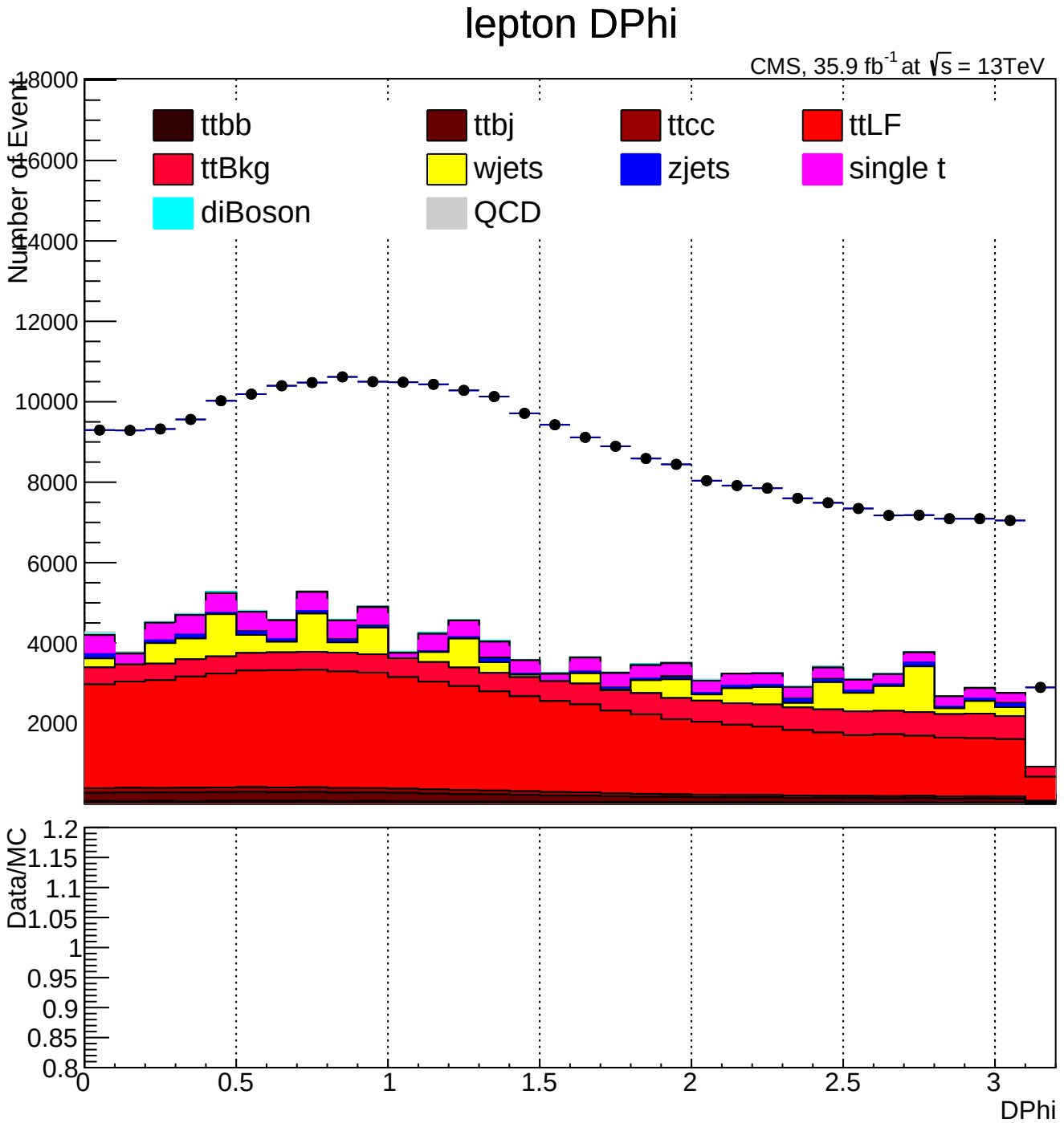

MET
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
MET (GeV)

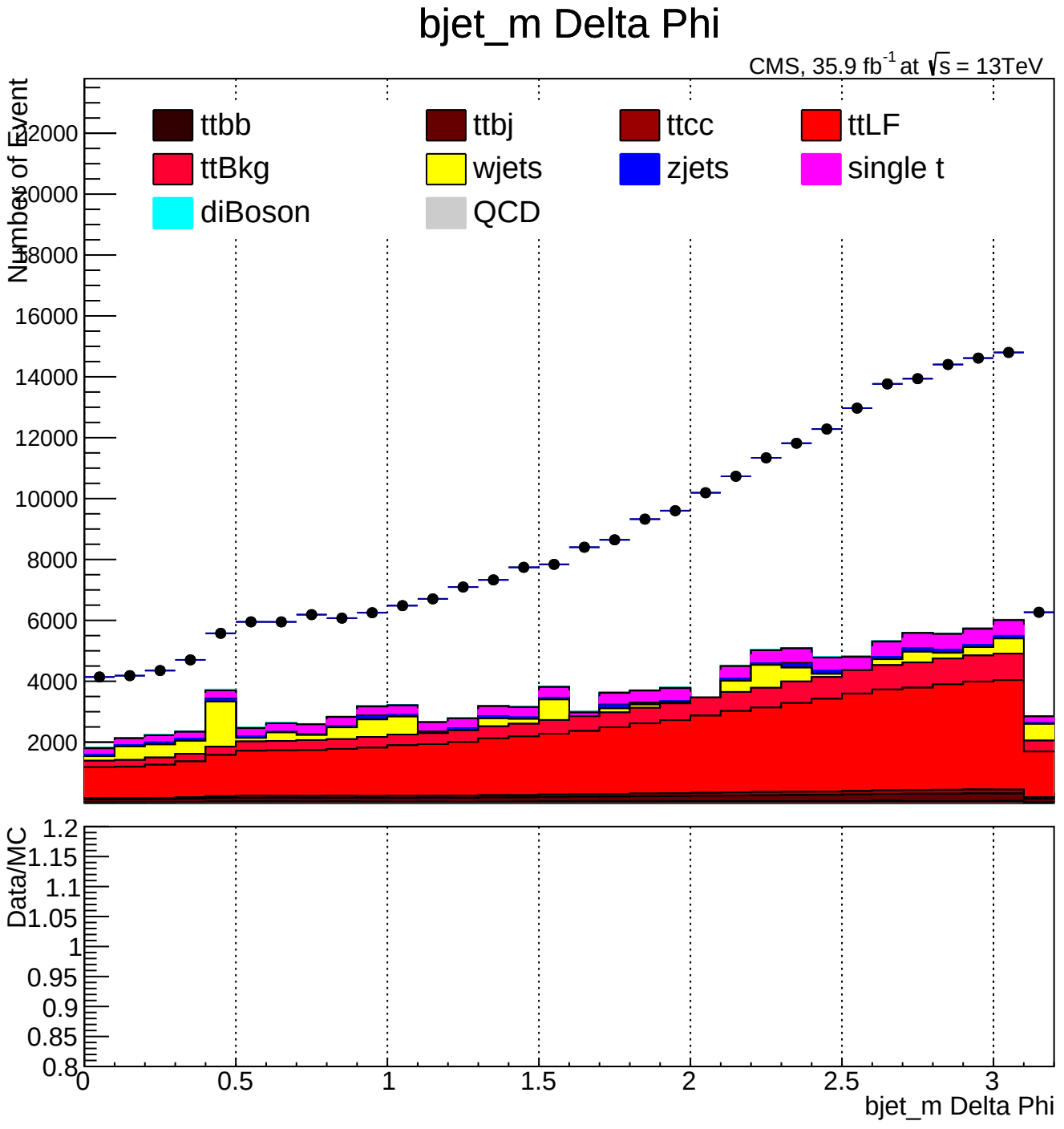

W Mass
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
Transverse Mass (GeV)

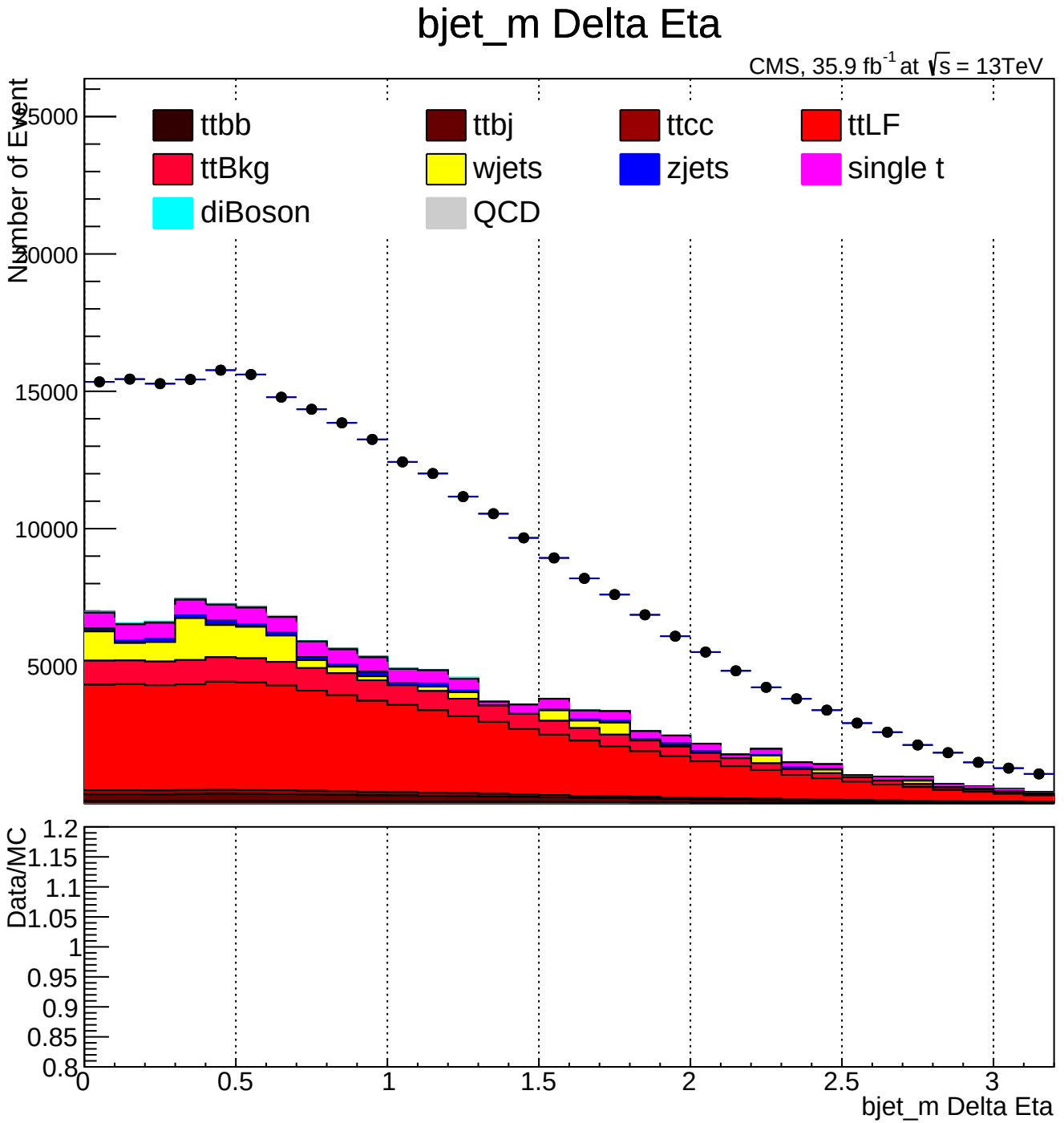

Di-bjet Mass (medium) wrt min DR
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
50
100
150
200
250
300
Di-bjet (medium) Mass (GeV)

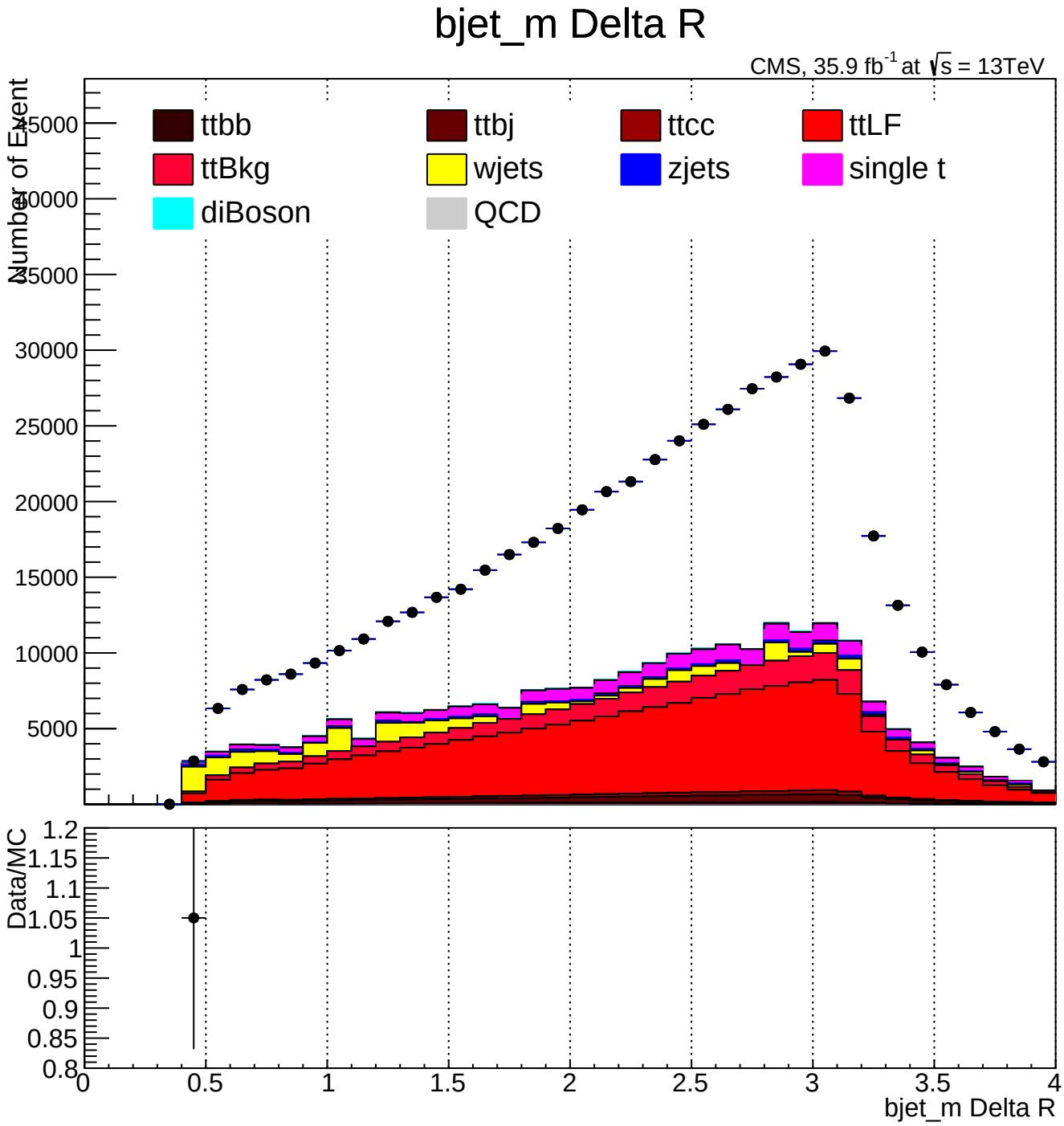

Leading b jet (medium) pT from di-bjets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b Jet (medium) pT from di-bjets (GeV)

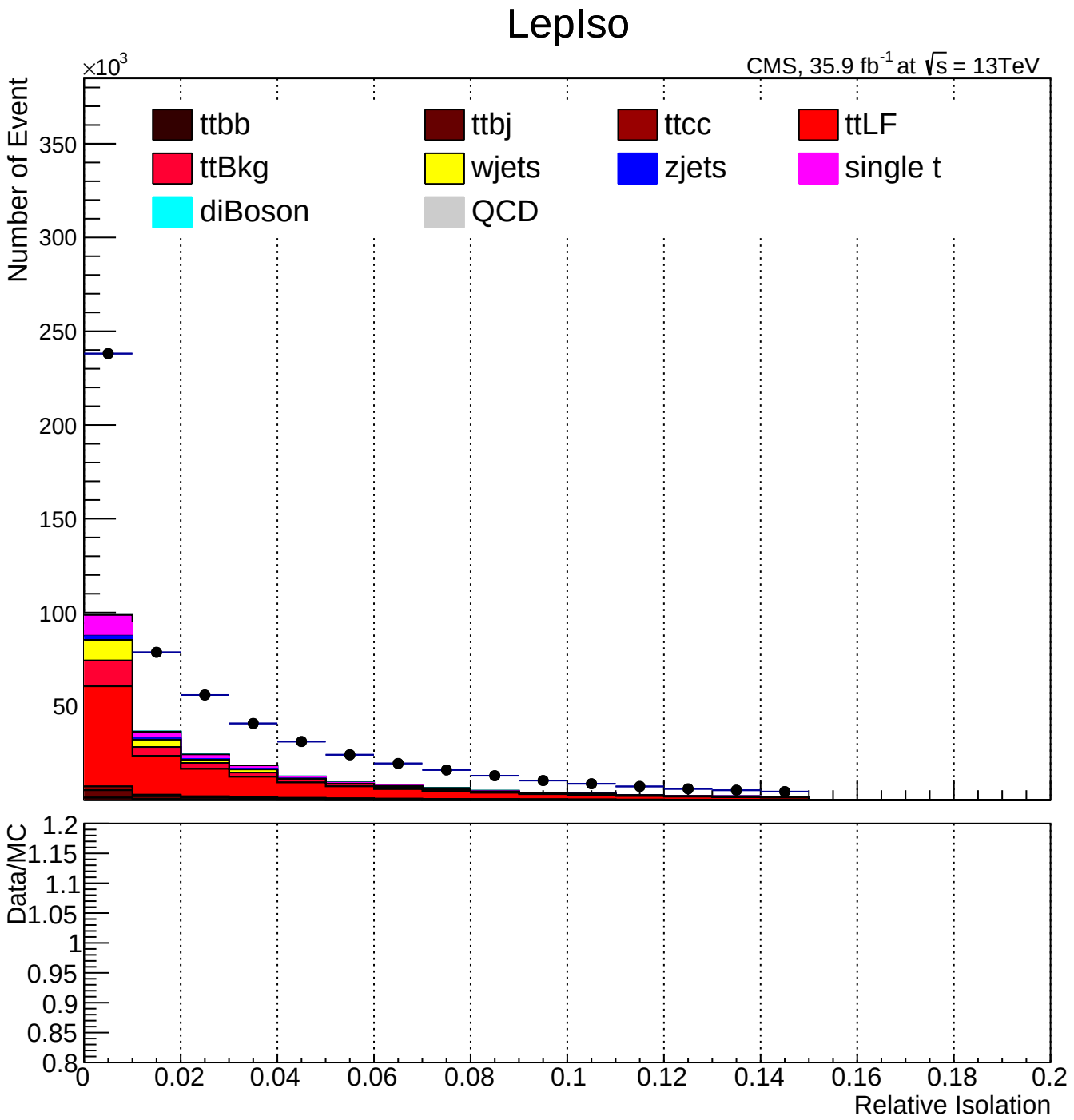

leading c jet (medium) pT
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
leading c Jet (medium) pT (GeV)

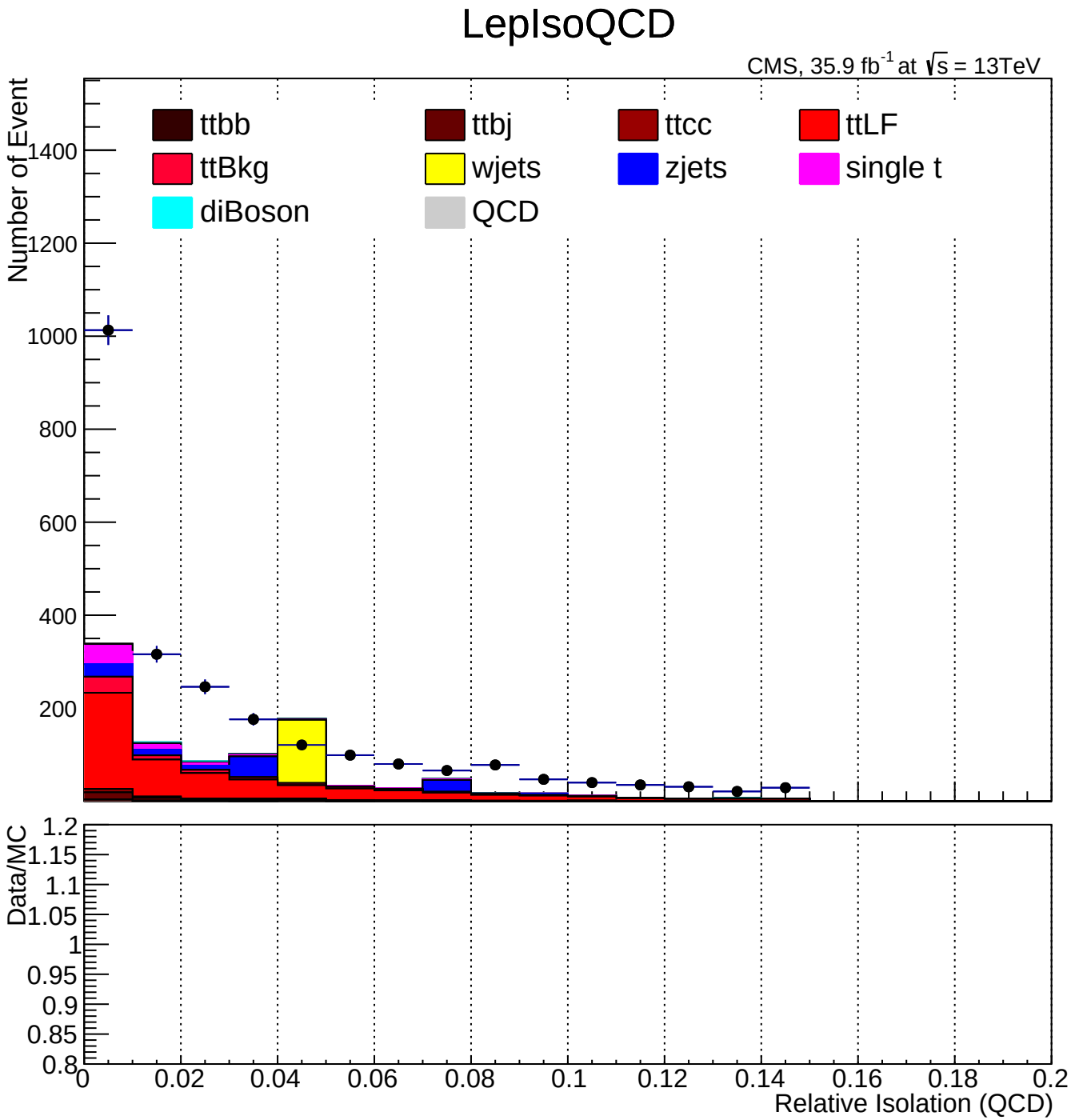

lepton DPhi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
18000
16000
14000
12000
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
DPhi

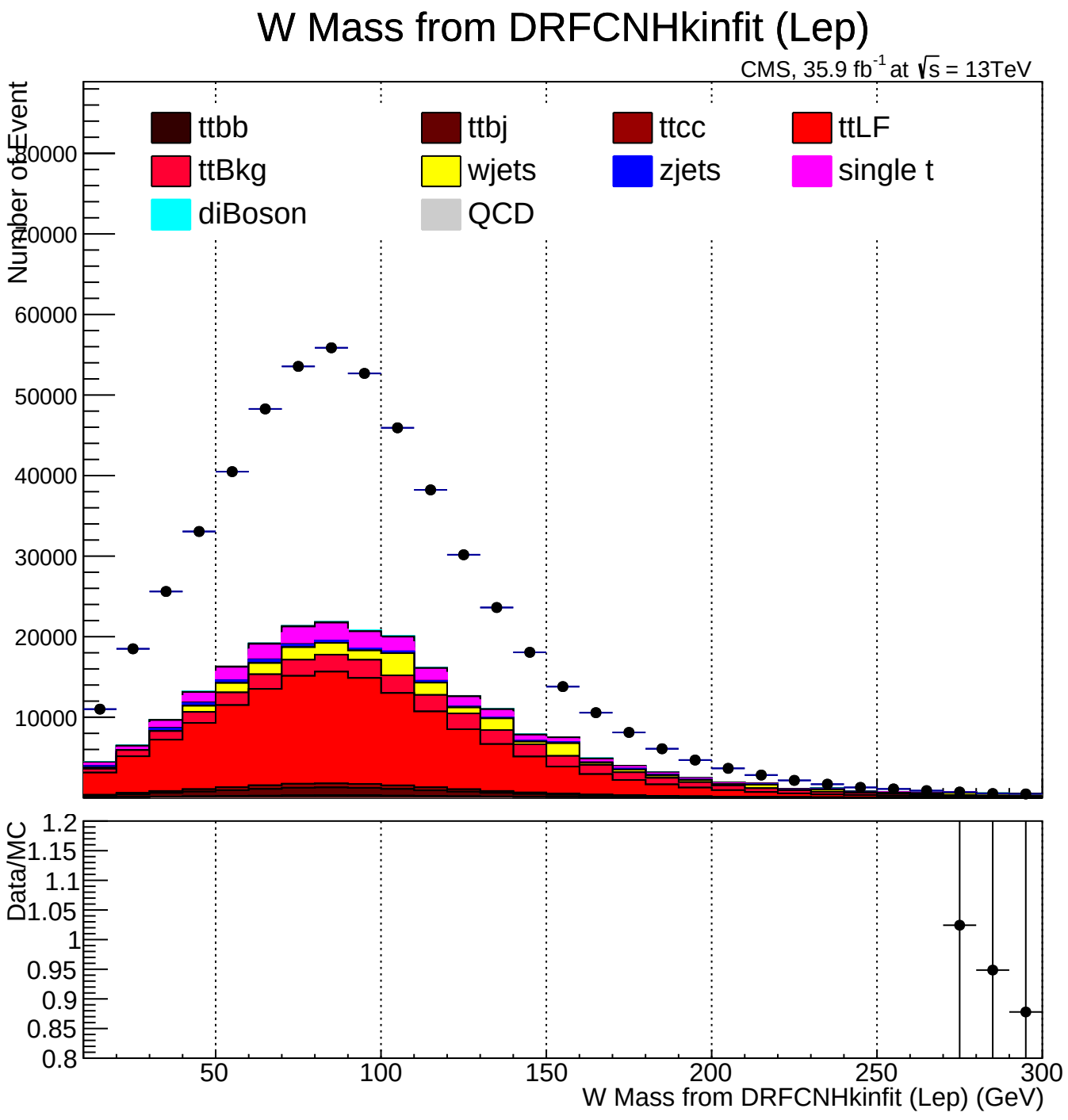

bjet_m Delta Phi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta Phi

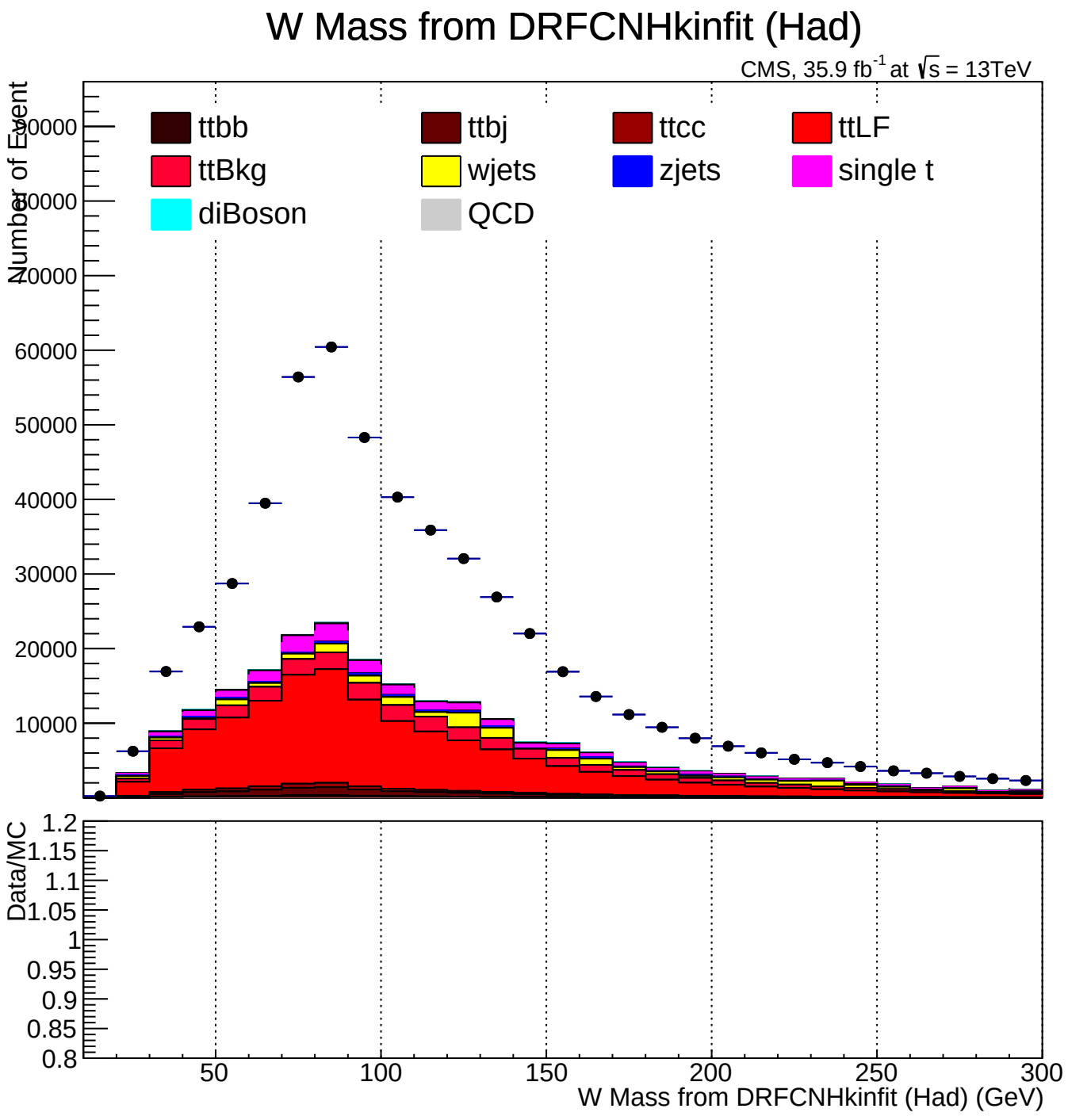

bjet_m Delta Eta
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
25000
20000
15000
10000
5000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Eta

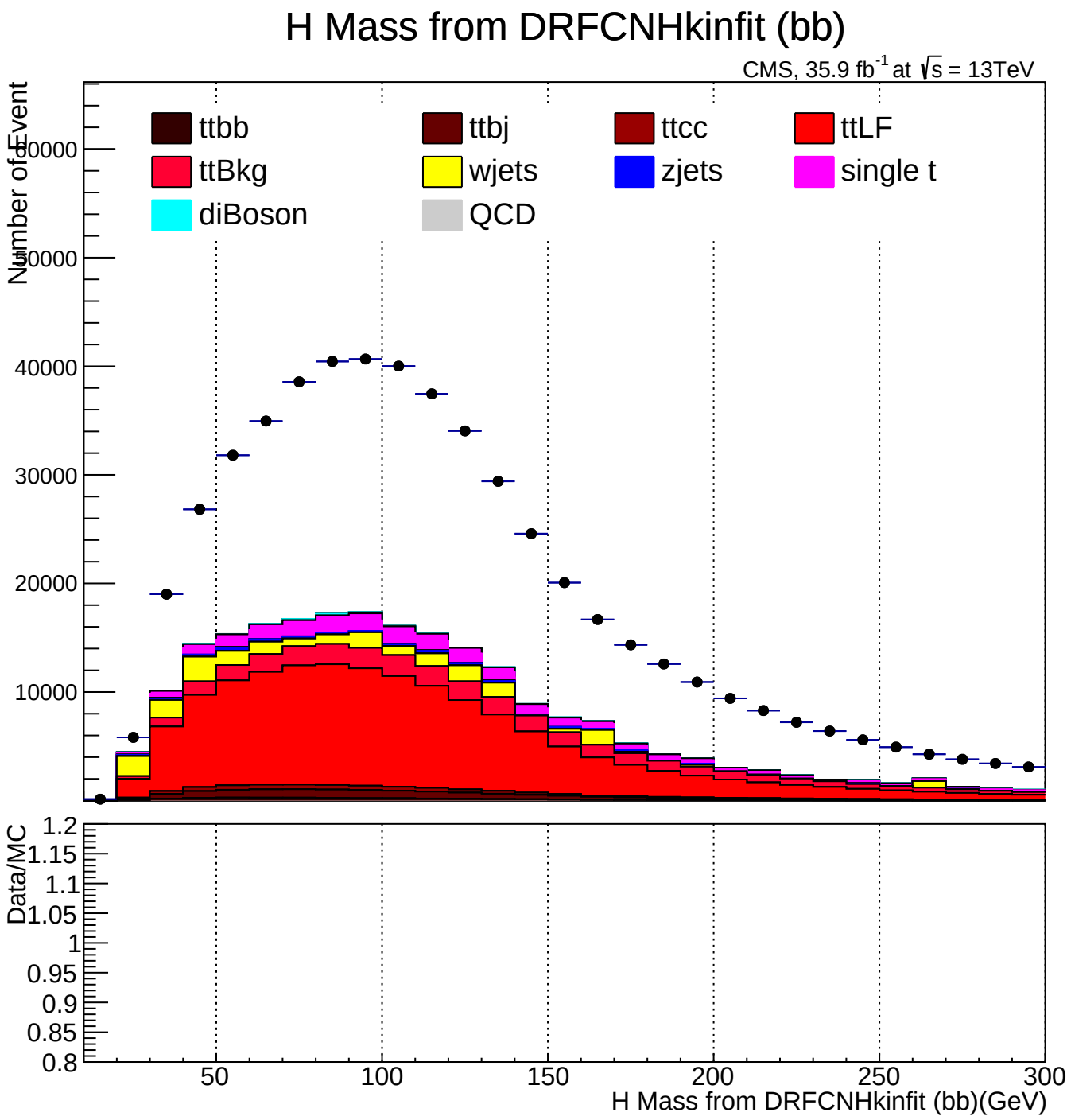

bjet_m Delta R
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta R

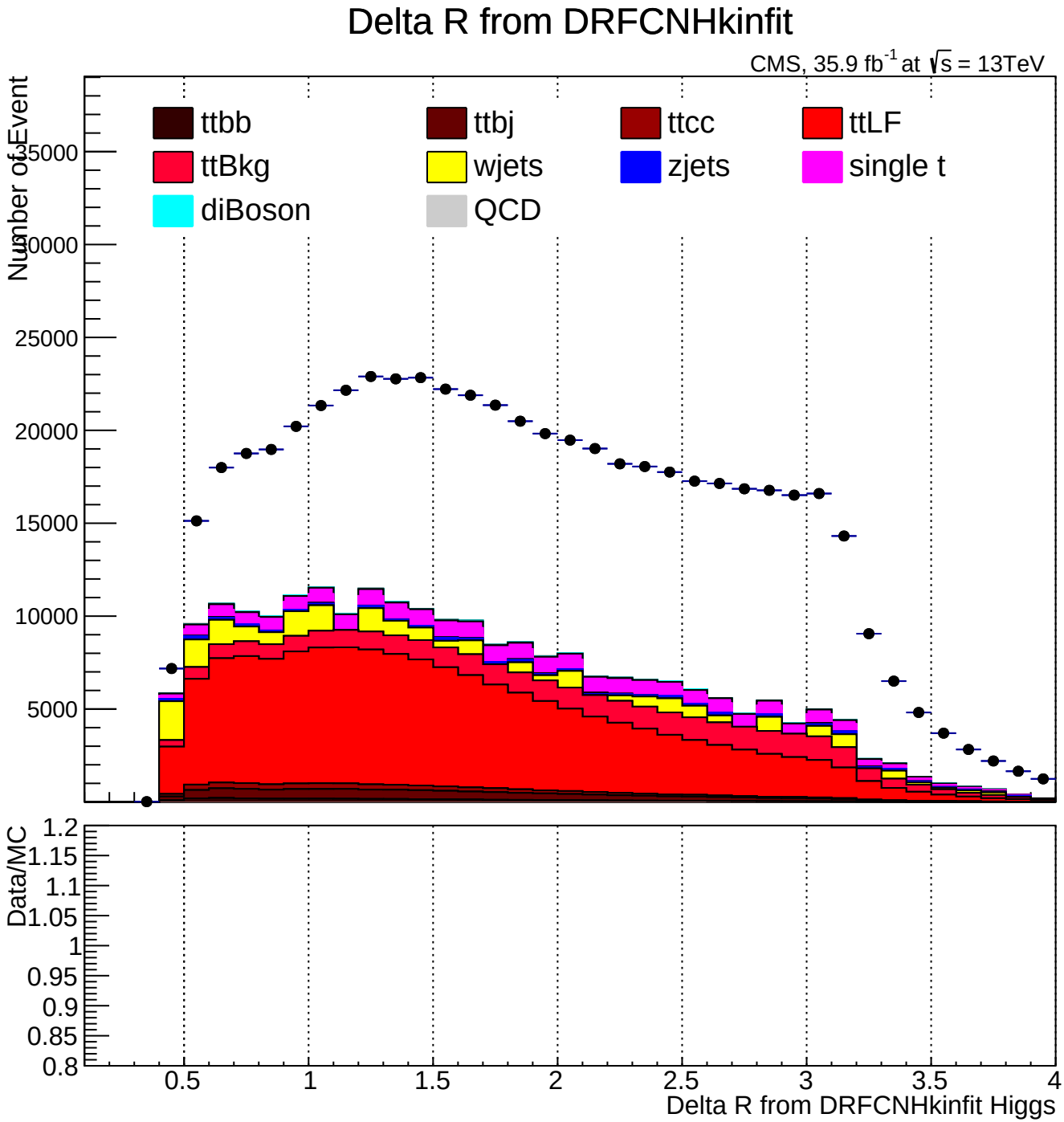

LepIso
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation

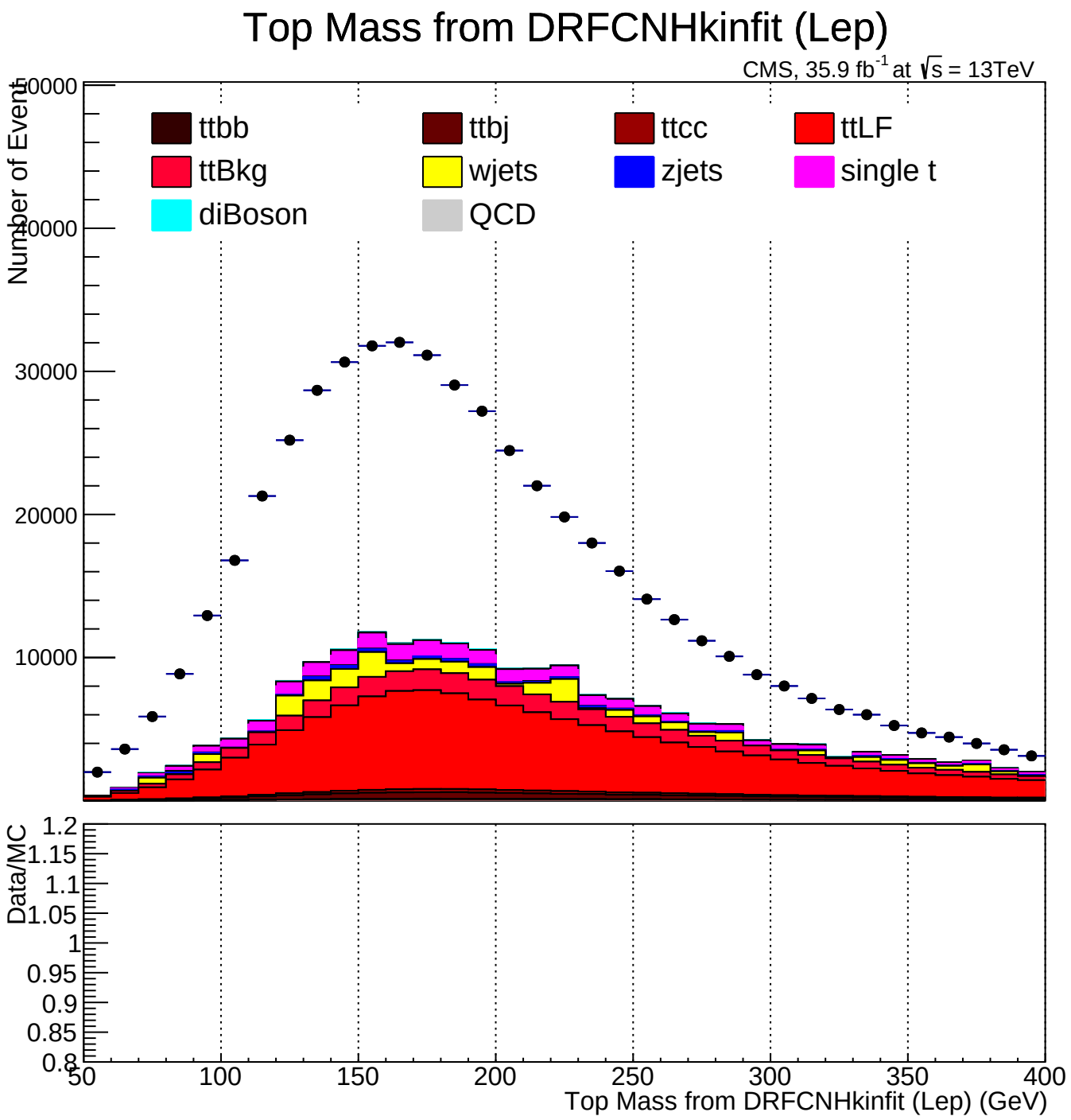

LepIsoQCD
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
1400
1200
1000
800
600
400
200
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation (QCD)

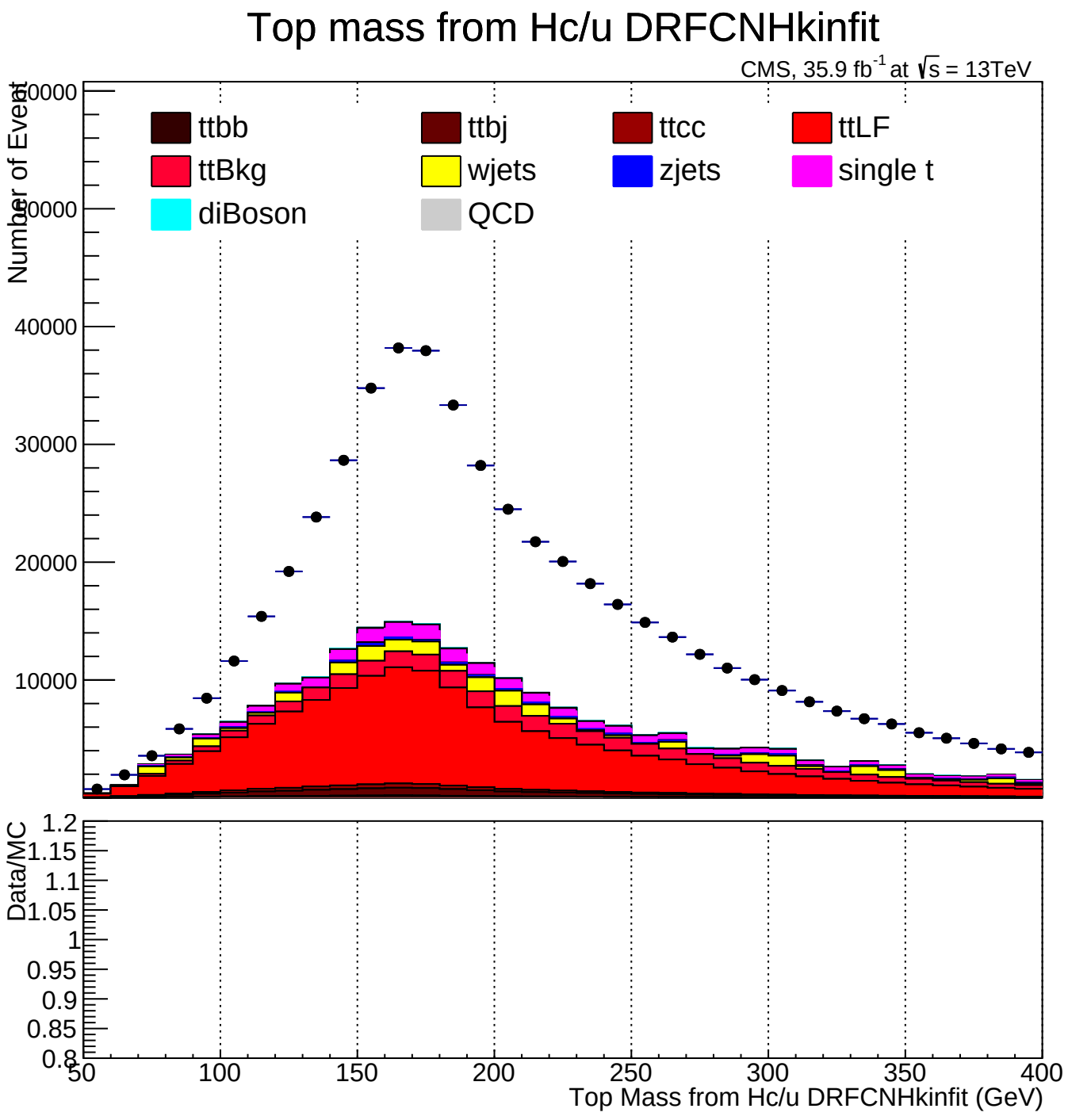

W Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
W Mass from DRFCNHkinfit (Lep) (GeV)

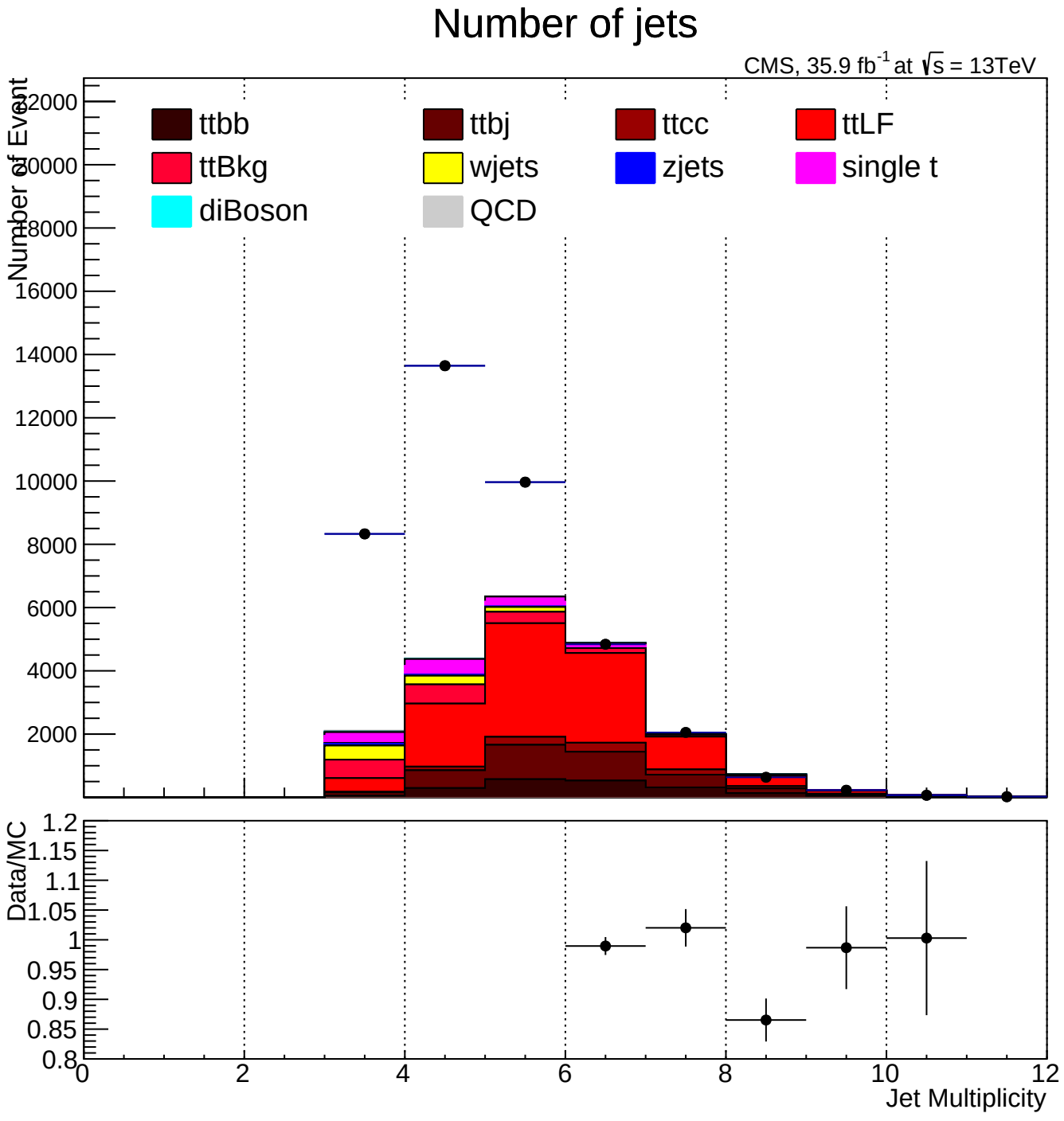

W Mass from DRFCNHkinfit (Had)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
W Mass from DRFCNHkinfit (Had) (GeV)

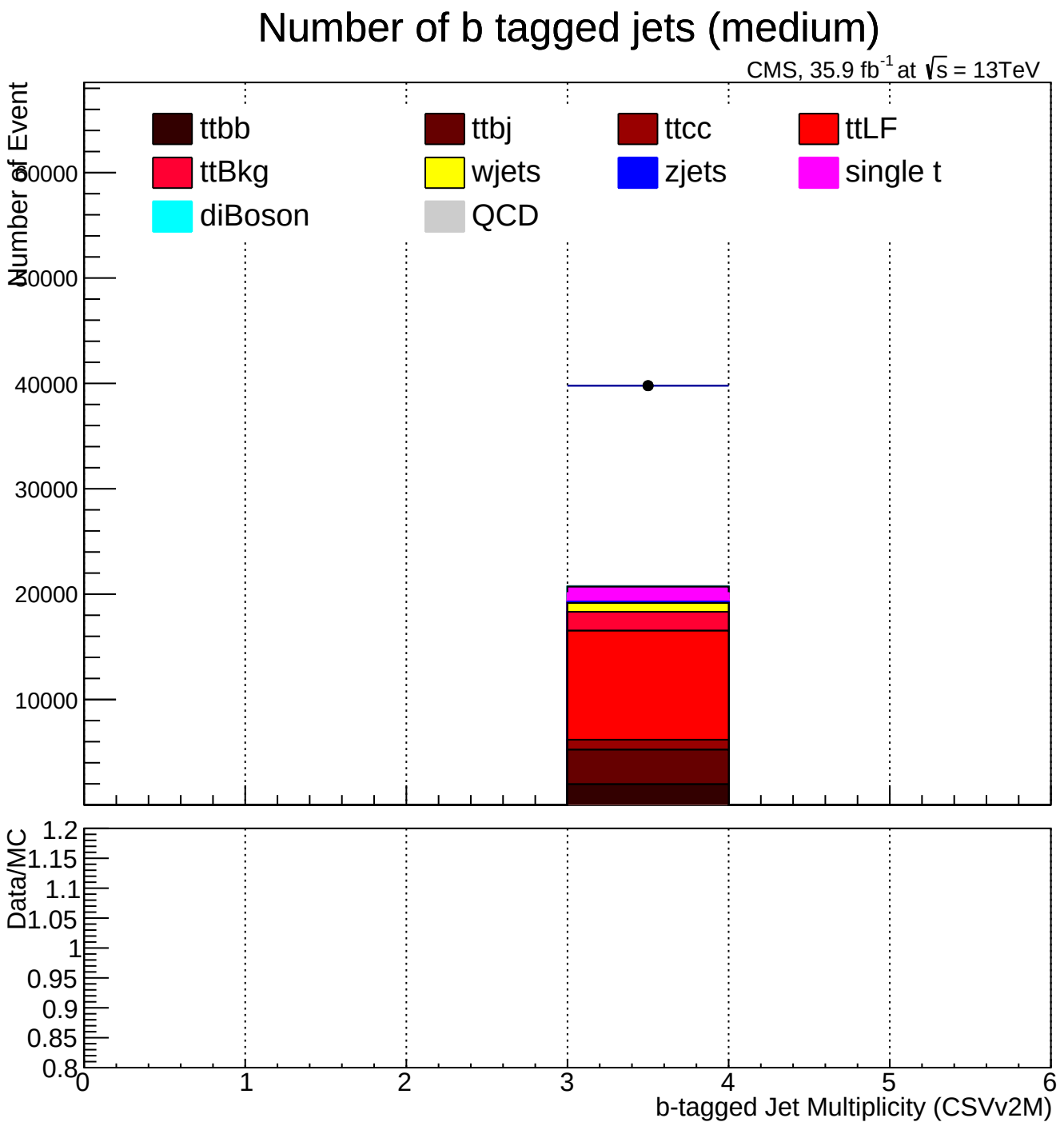

H Mass from DRFCNHkinfit (bb)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
50000
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
H Mass from DRFCNHkinfit (bb)(GeV)

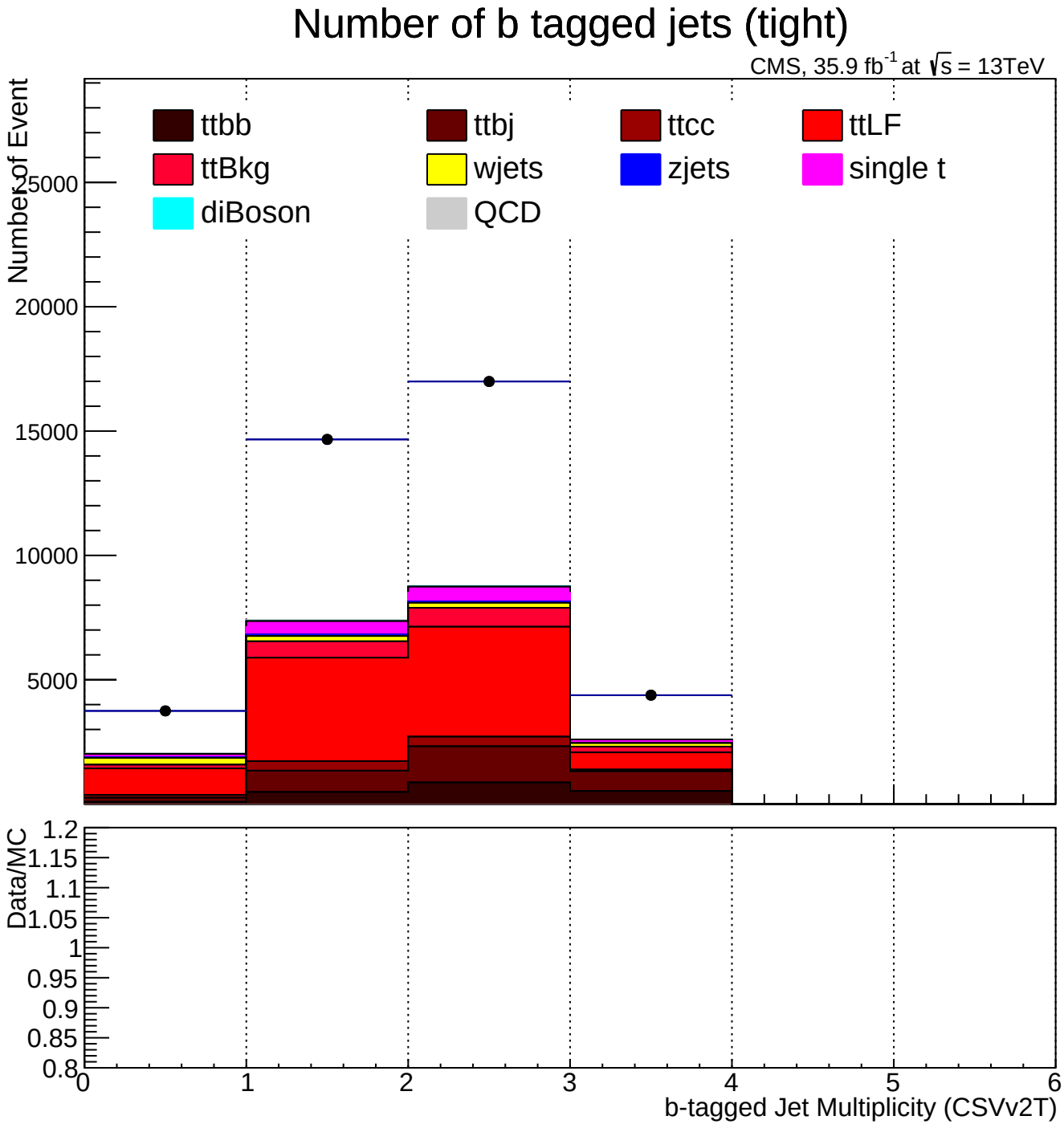

Delta R from DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
Delta R from DRFCNHkinfit Higgs

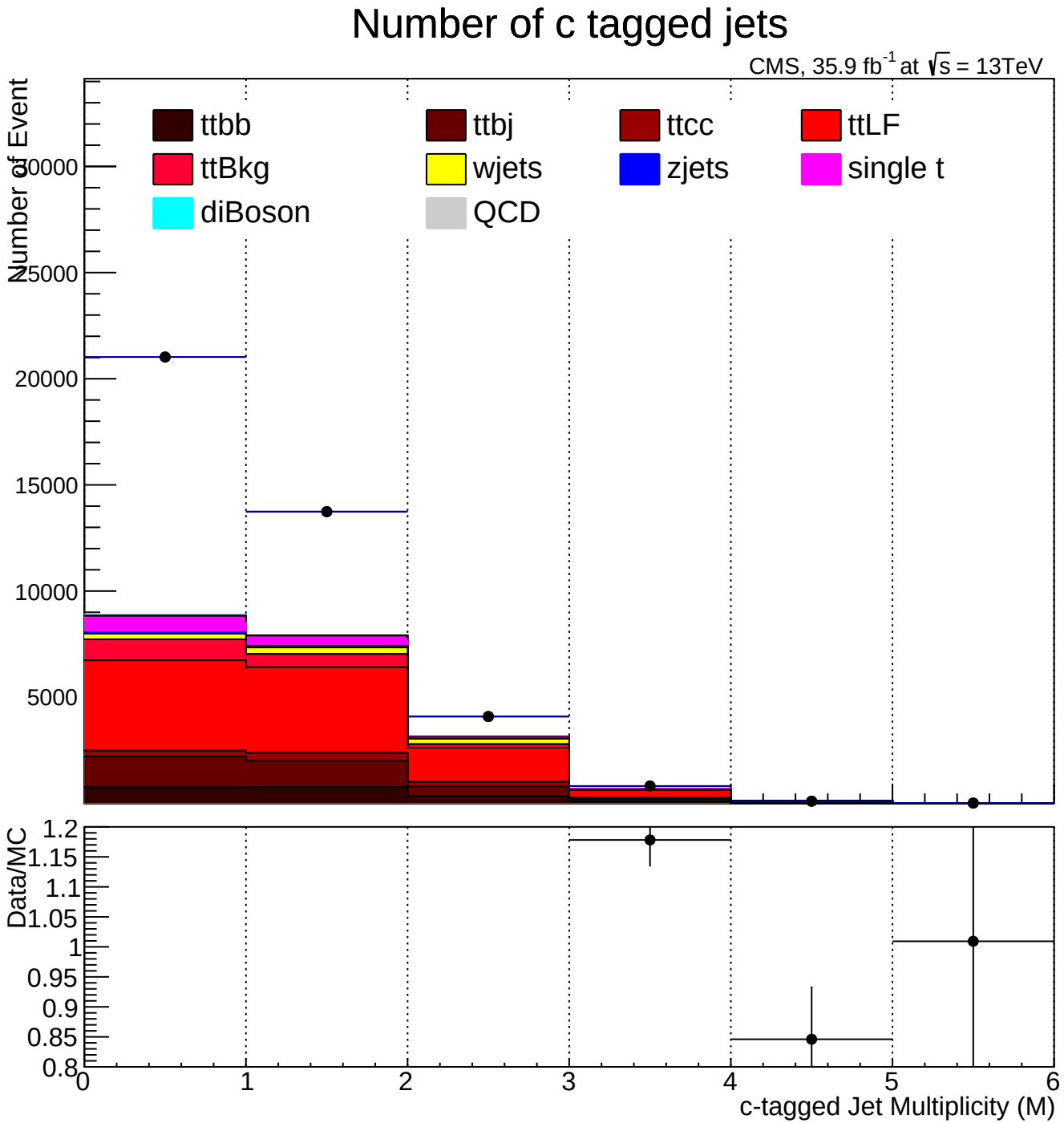

Top Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Events
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Top Mass from DRFCNHkinfit (Lep) (GeV)

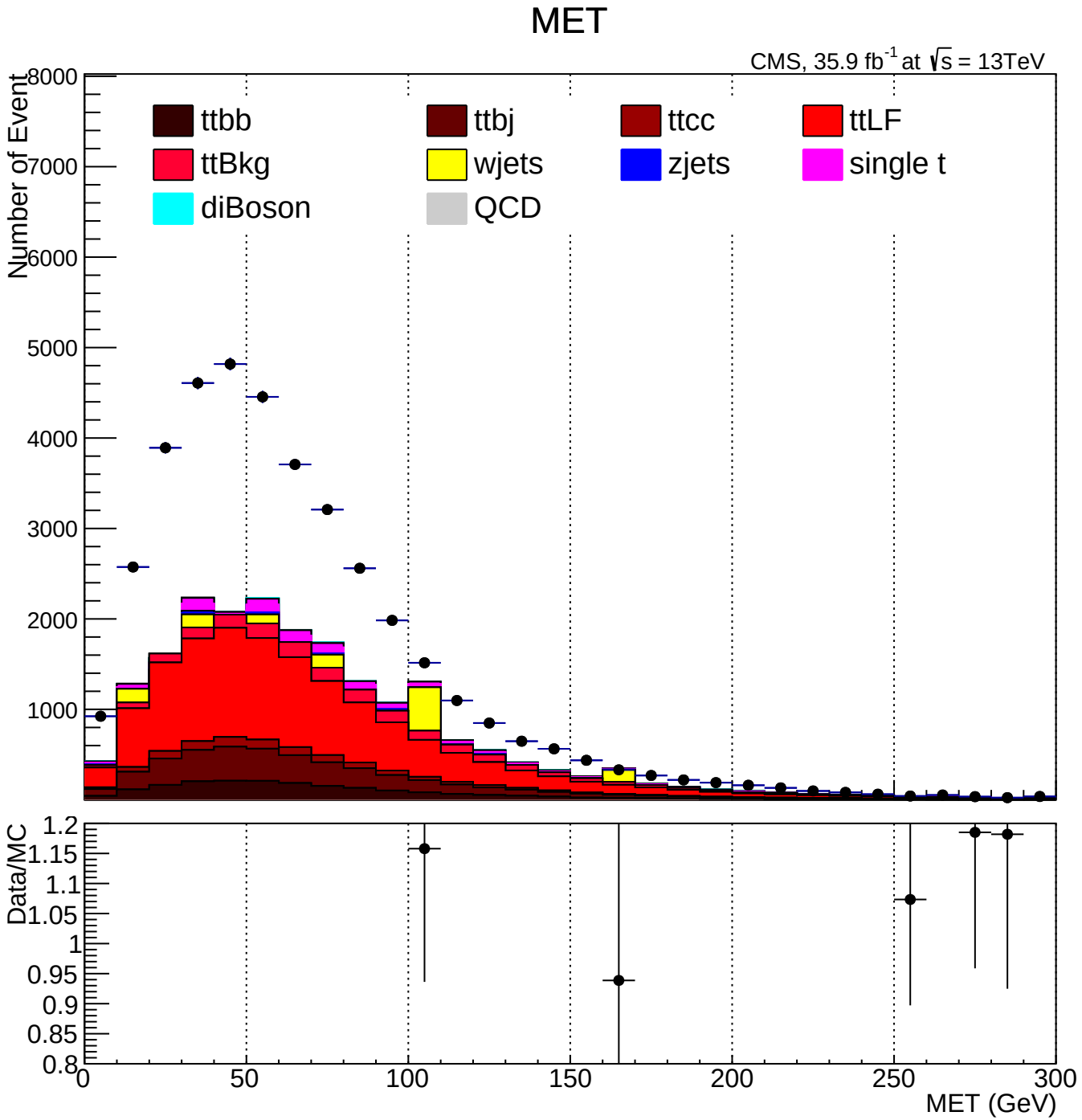

Top mass from Hc/u DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Events
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Top Mass from Hc/u DRFCNHkinfit (GeV)

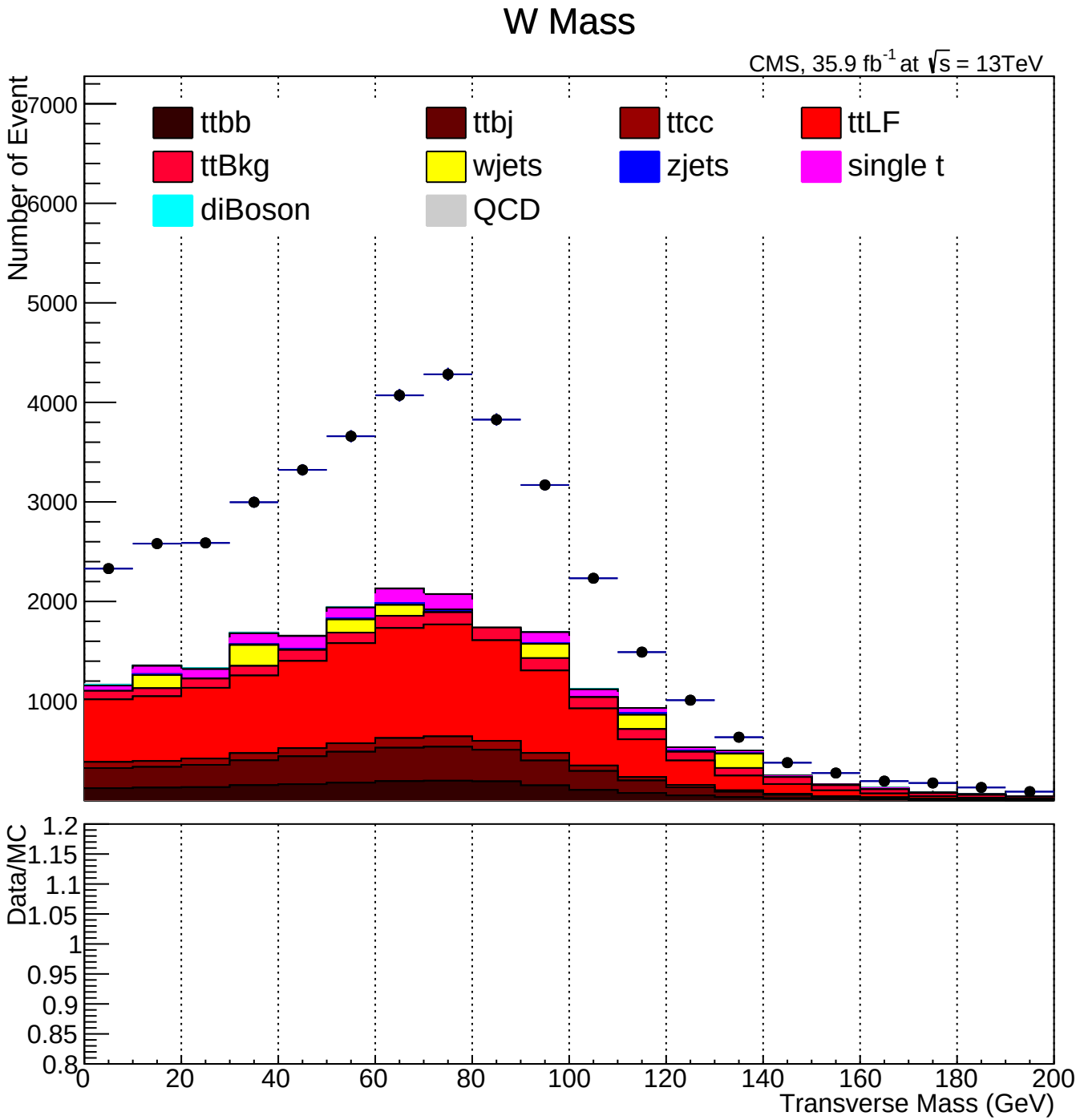

Number of jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Jet Multiplicity


Number of b tagged jets (medium)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
50000
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2M)

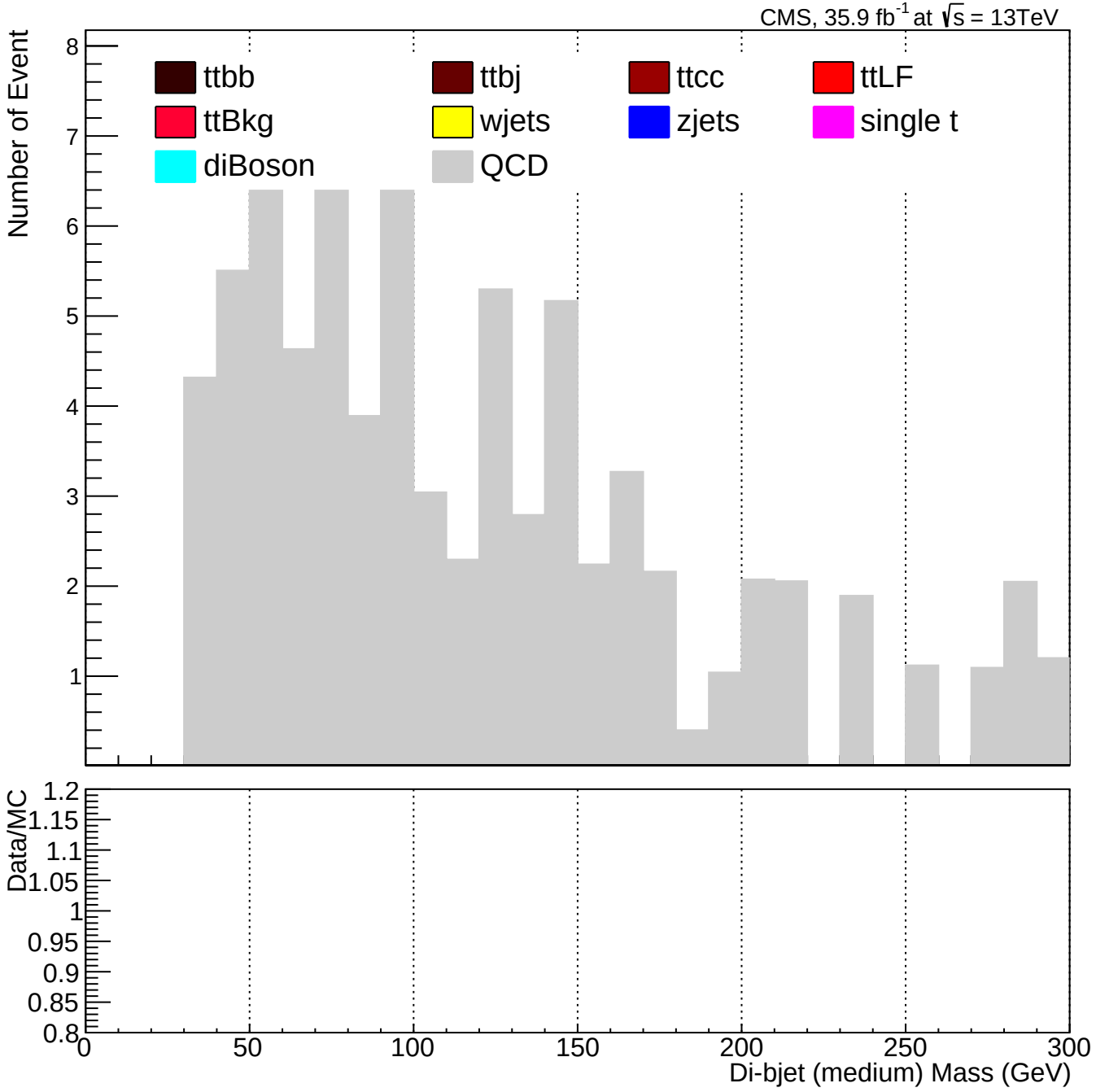

Number of b tagged jets (tight)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
25000
20000
15000
10000
5000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2T)

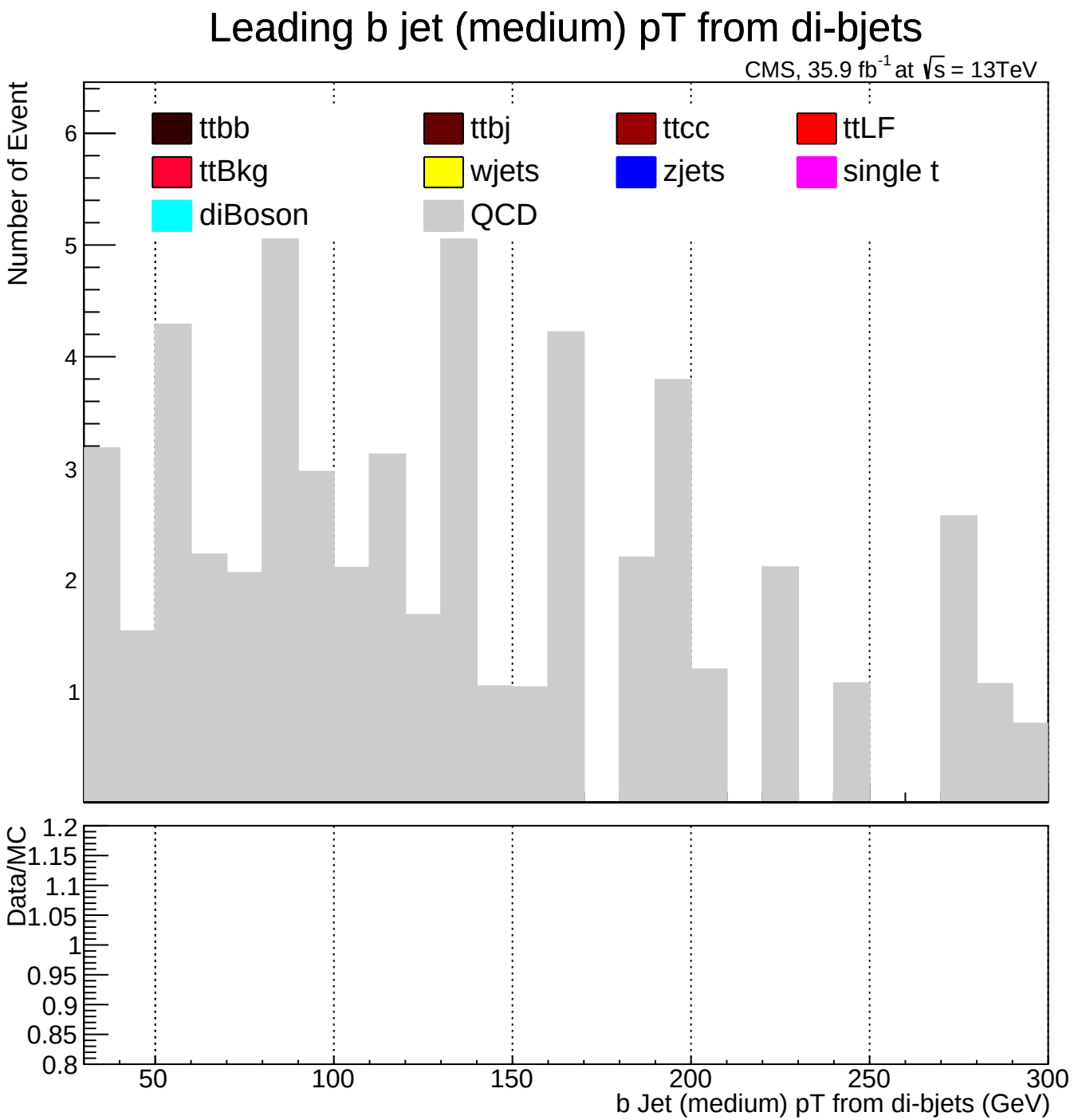

Number of c tagged jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
30000
25000
20000
15000
10000
5000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
c-tagged Jet Multiplicity (M)

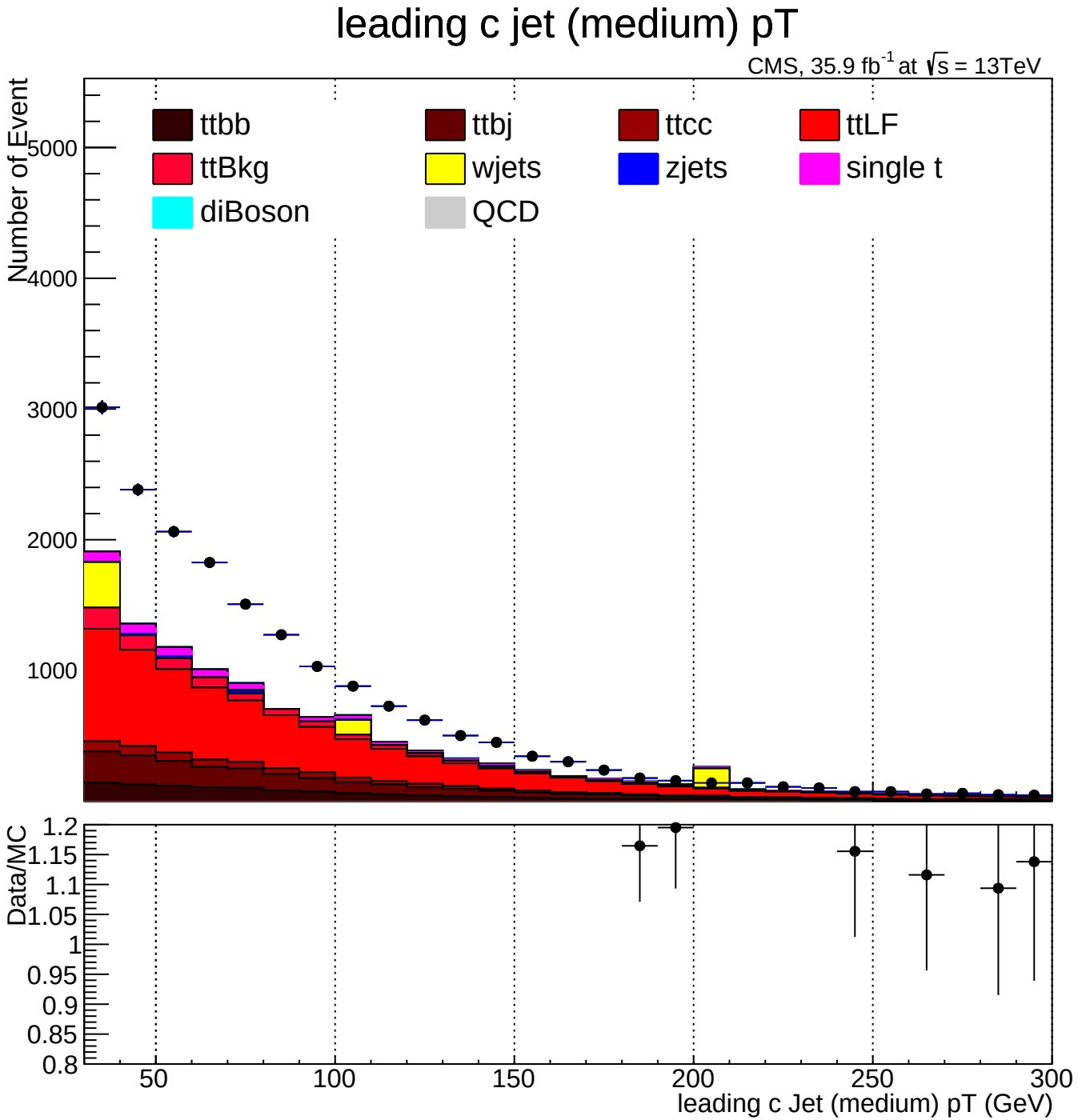

MET
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
8000
7000
6000
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
50
100
150
200
250
300
MET (GeV)

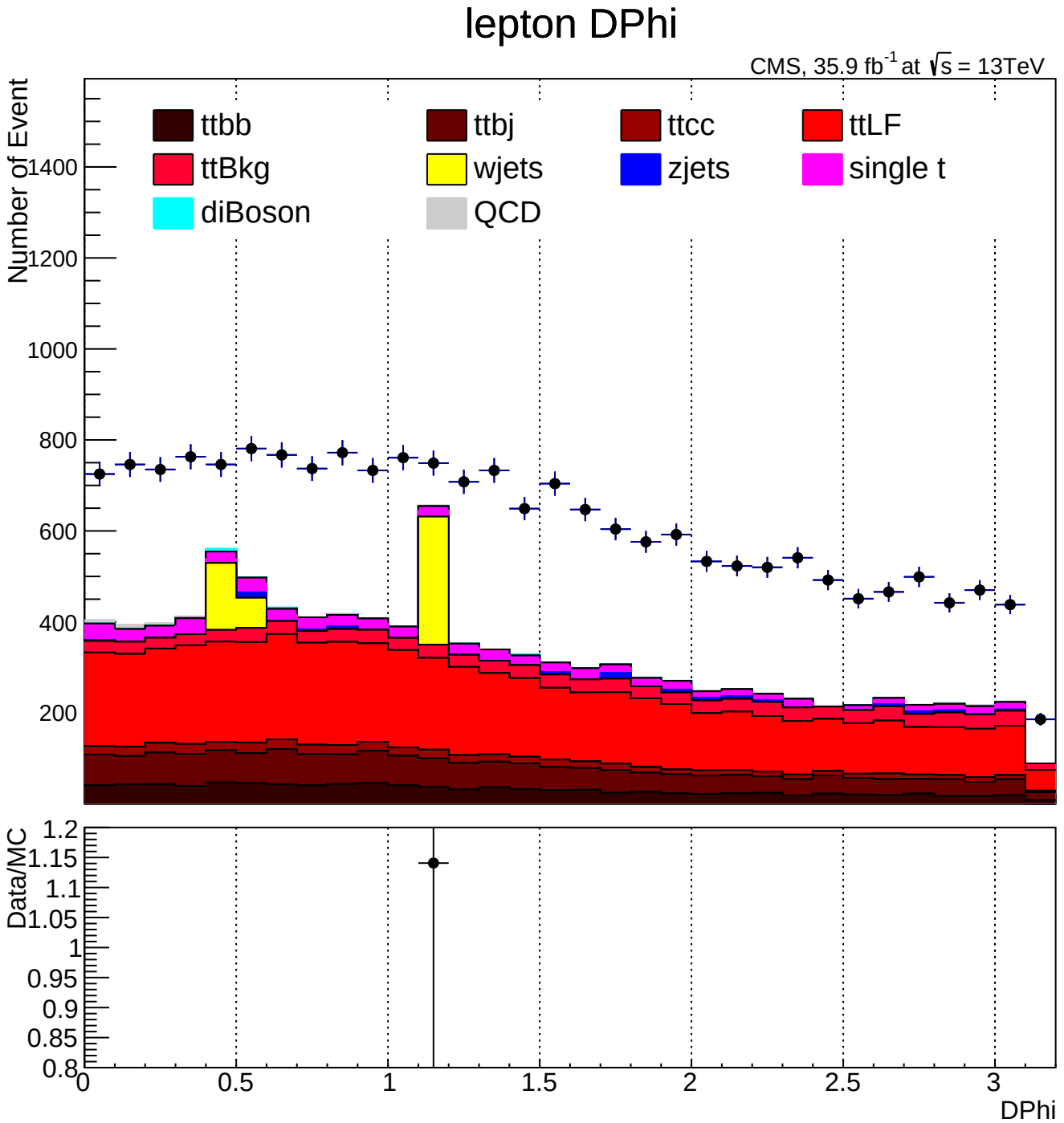

W Mass
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
7000
6000
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
20
40
60
80
100
120
140
160
180
200
Transverse Mass (GeV)

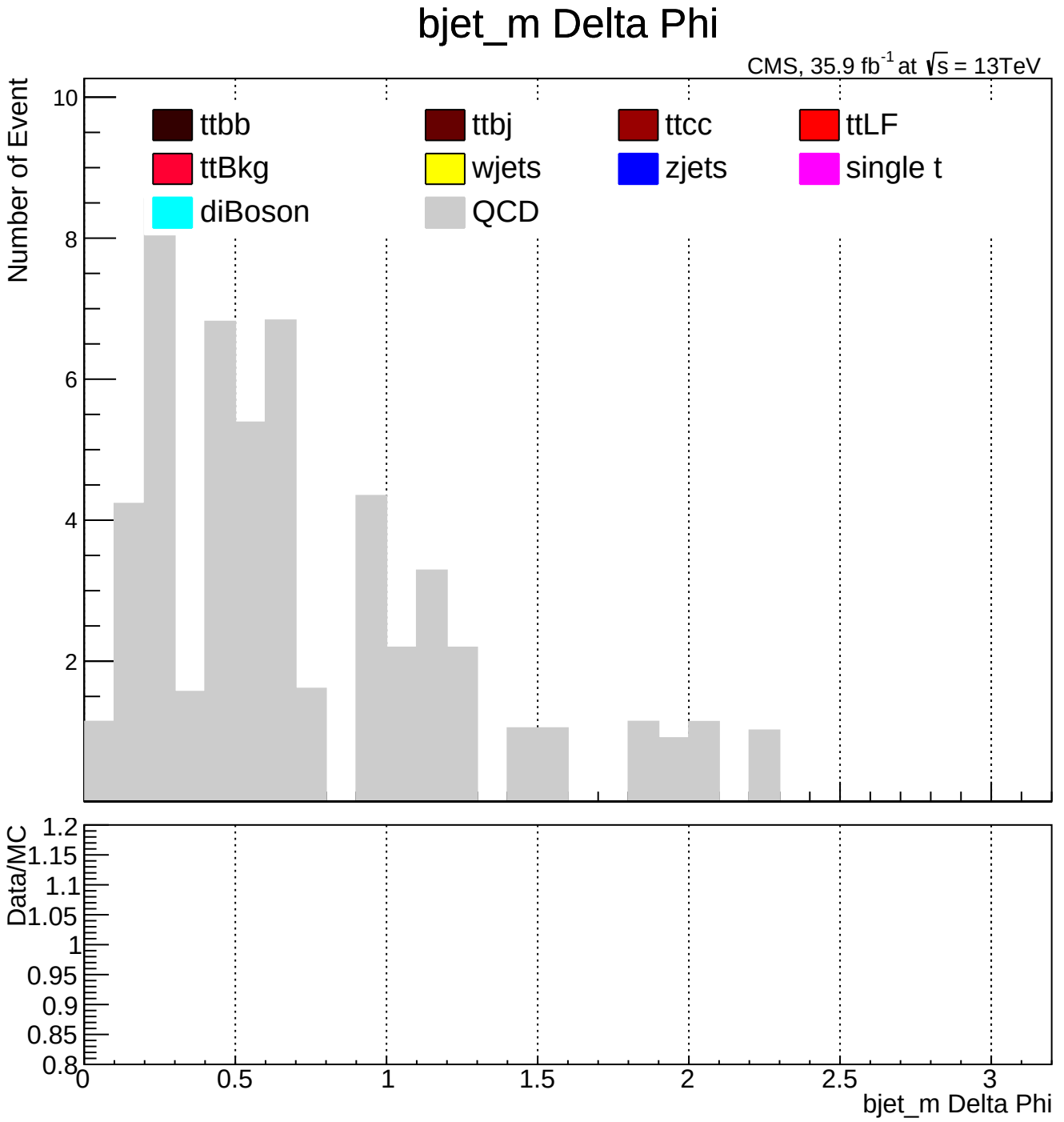
Di-bjet Mass (medium) wrt min DR

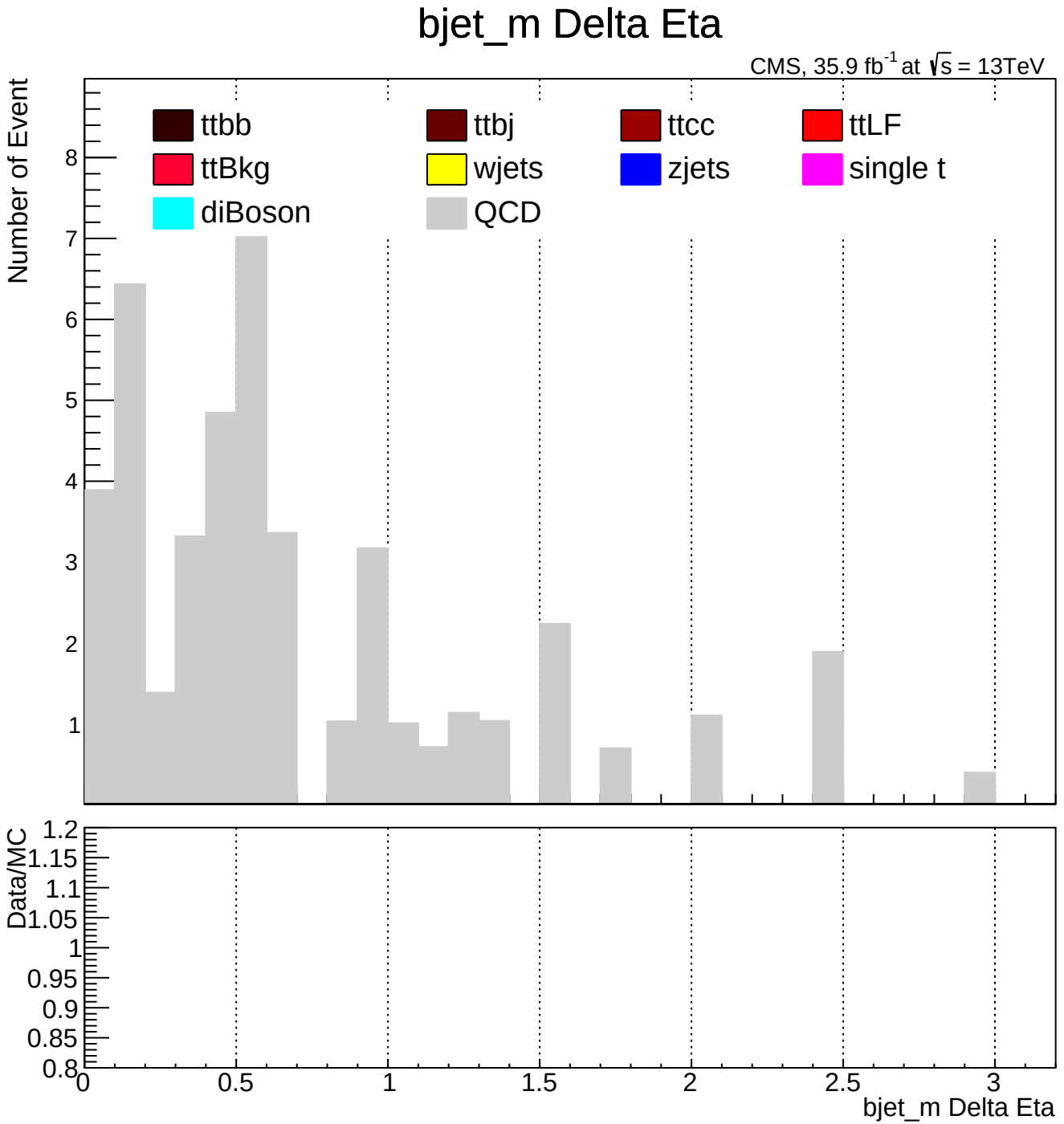


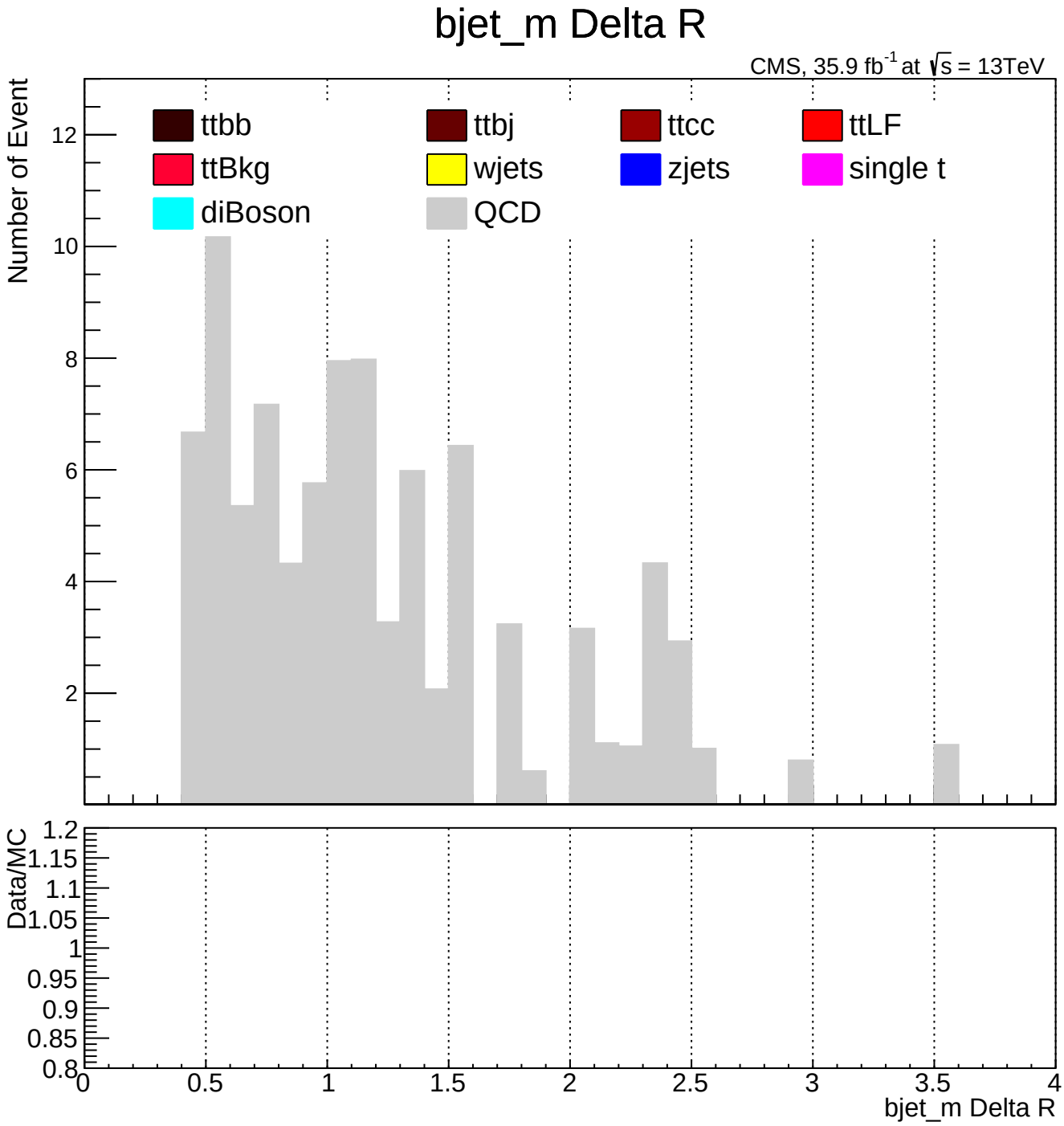

Leading b jet (medium) pT from di-bjets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b Jet (medium) pT from di-bjets (GeV)

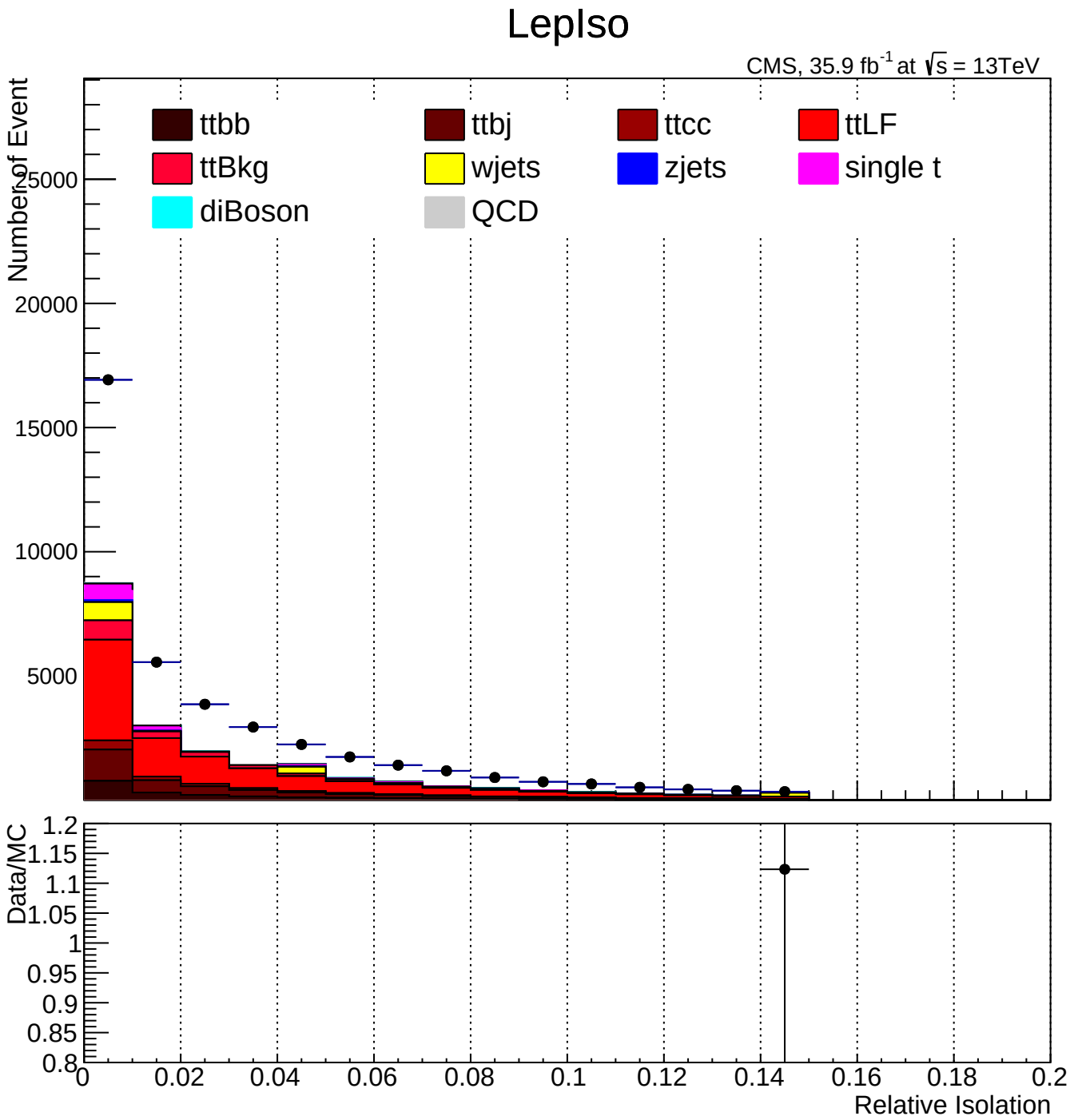

leading c jet (medium) pT
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
leading c Jet (medium) pT (GeV)

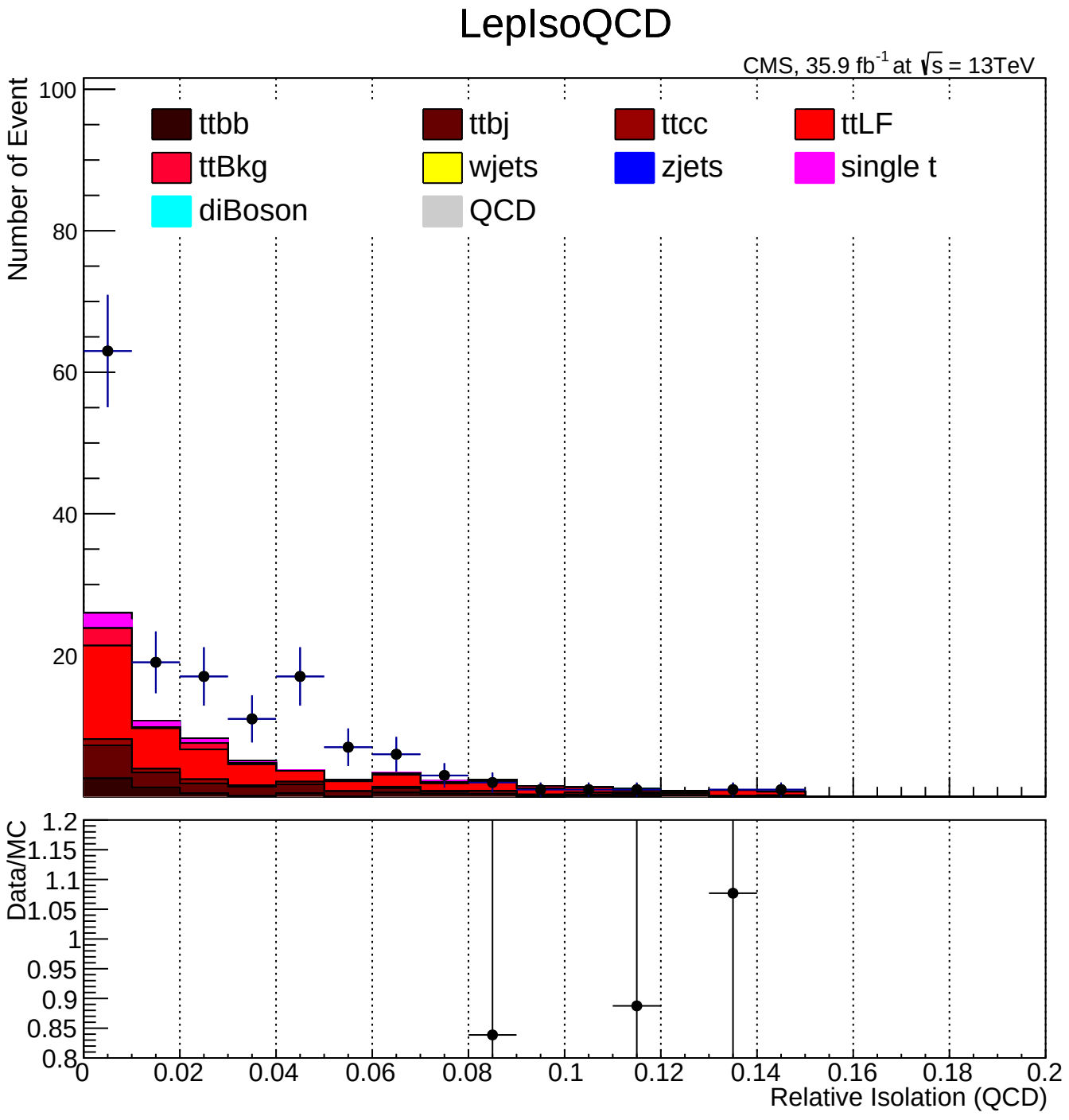

lepton DPhi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
1400
1200
1000
800
600
400
200
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
DPhi

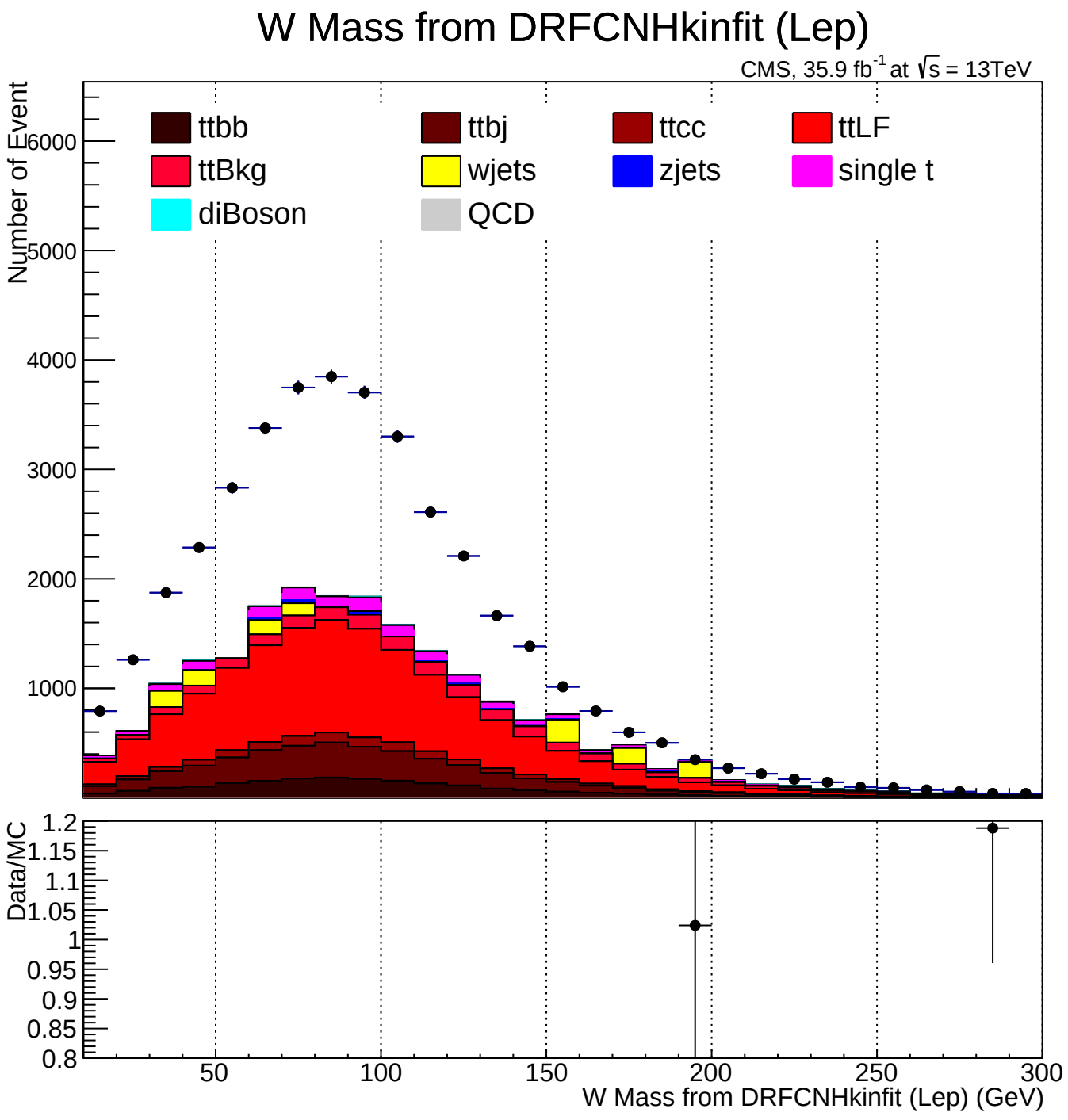

bjet_m Delta Phi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta Phi

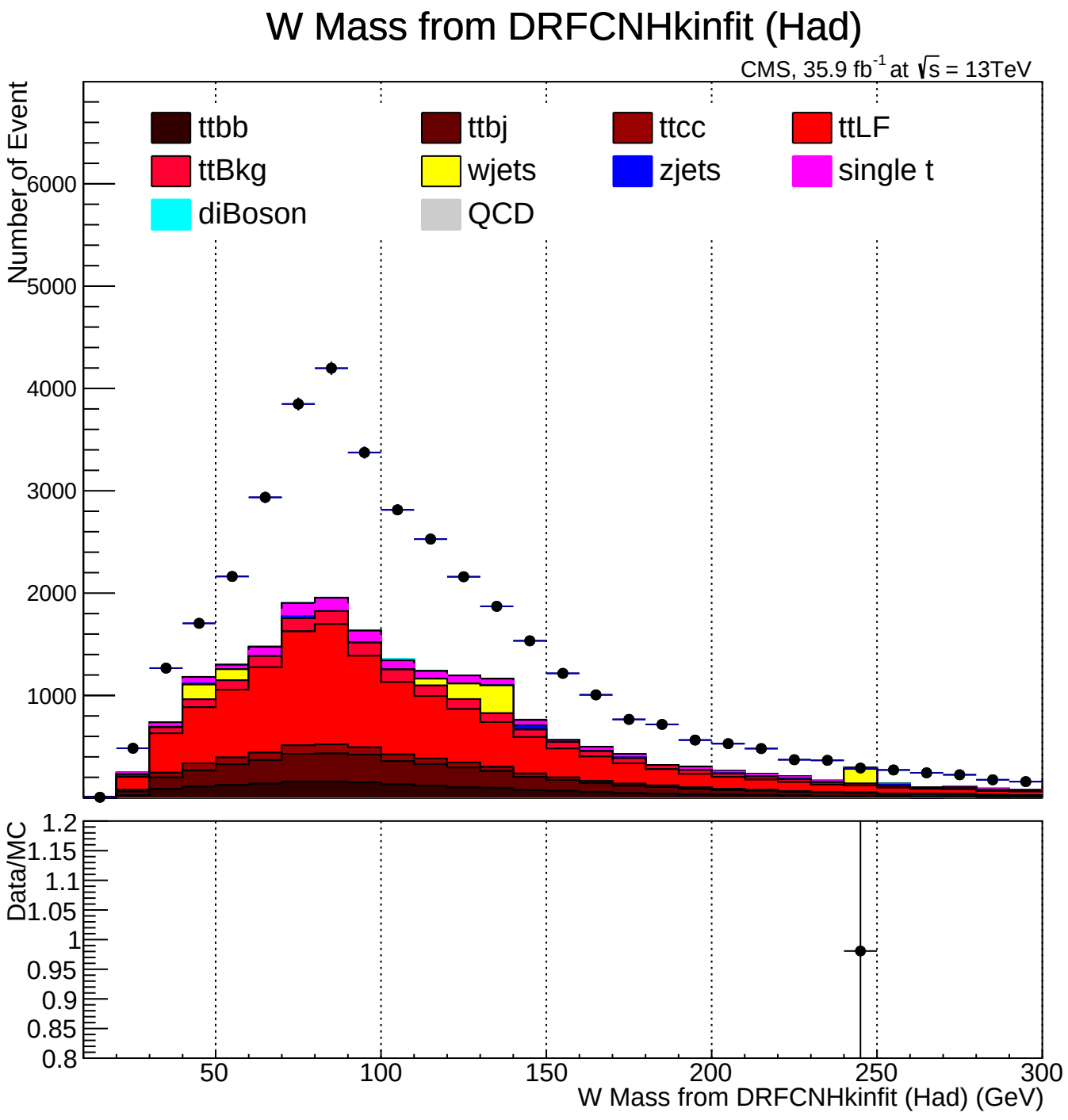

bjet_m Delta Eta
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta Eta

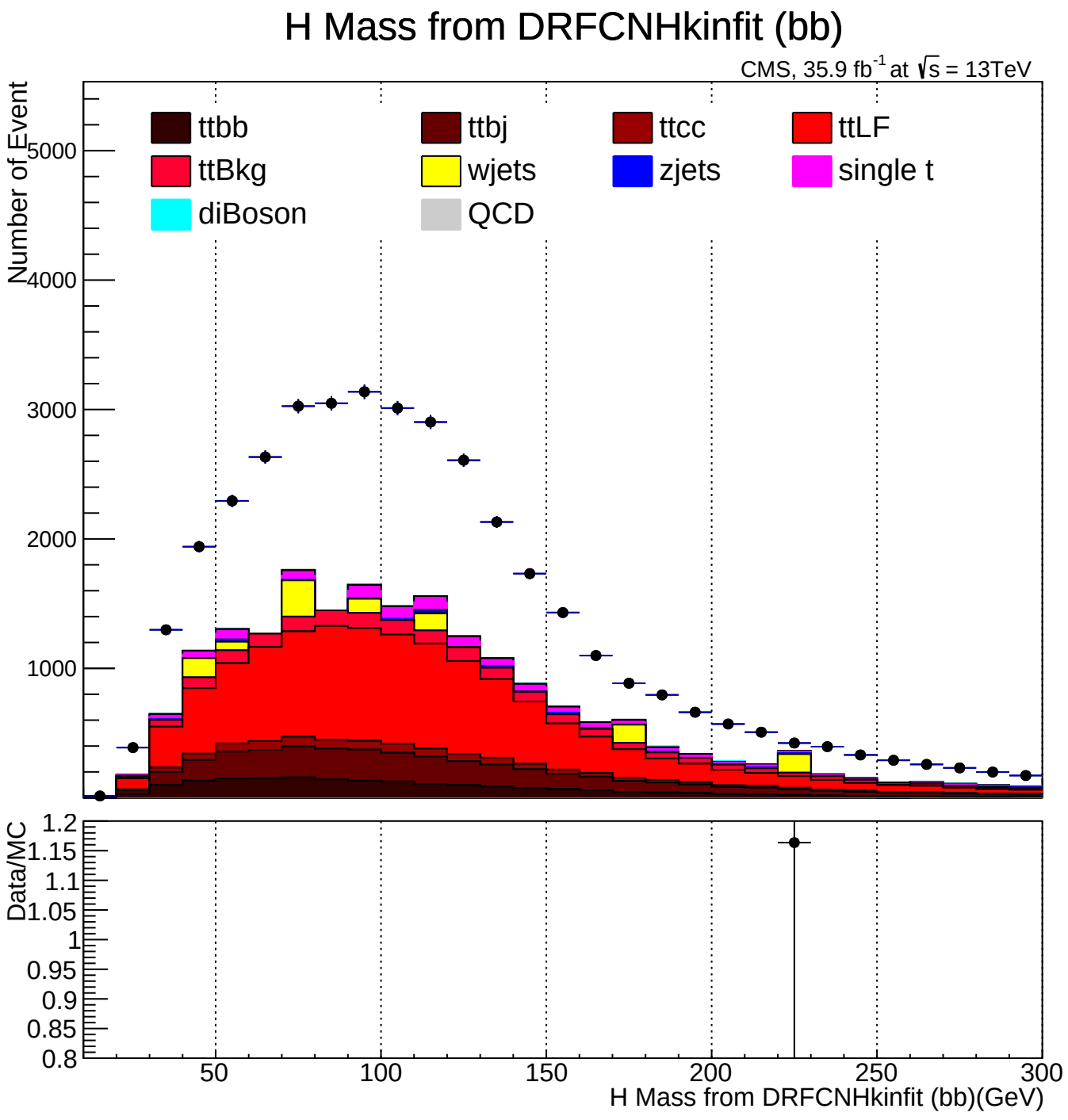

bjet_m Delta R
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta R

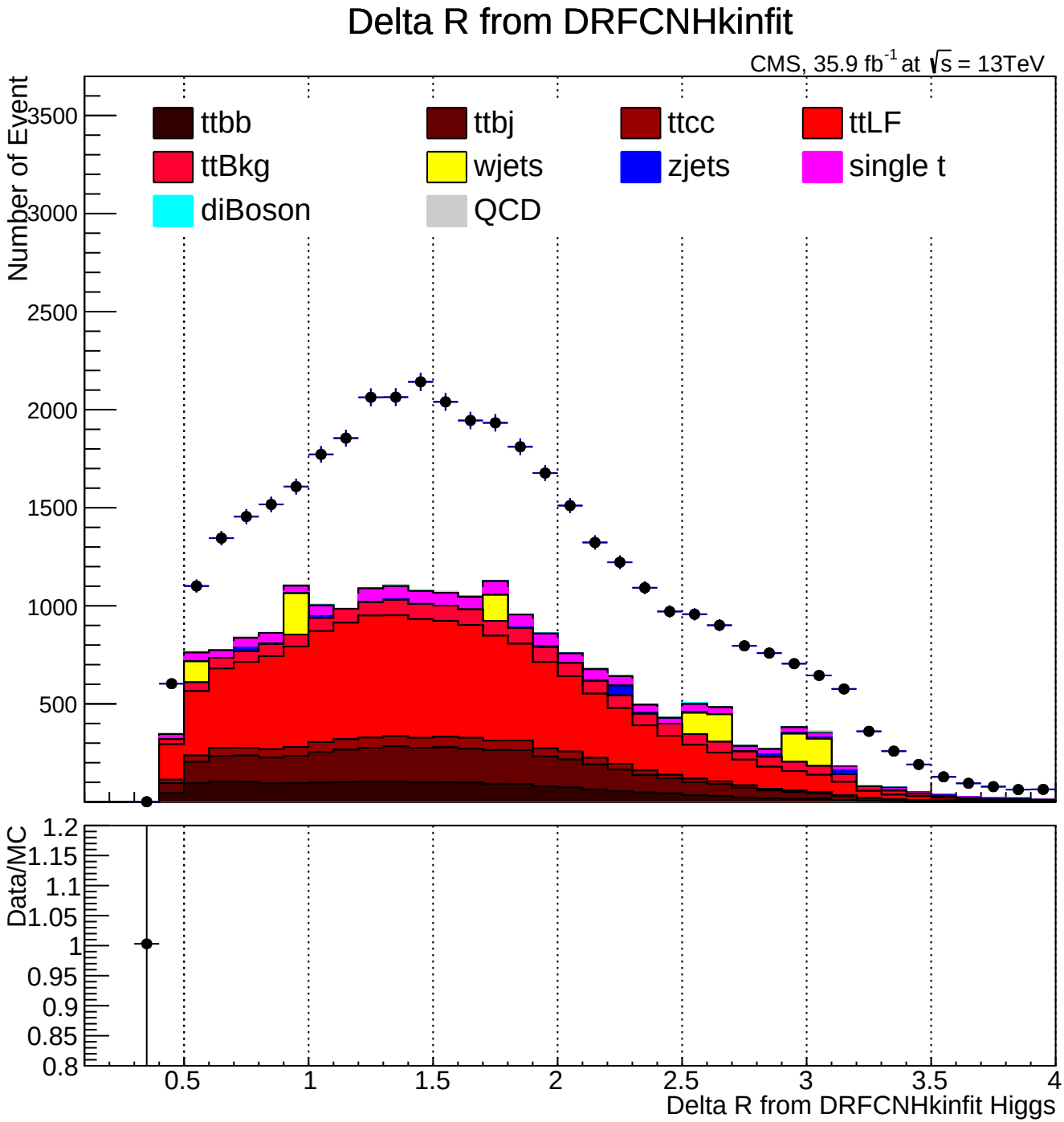

LepIso
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
25000
20000
15000
10000
5000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation

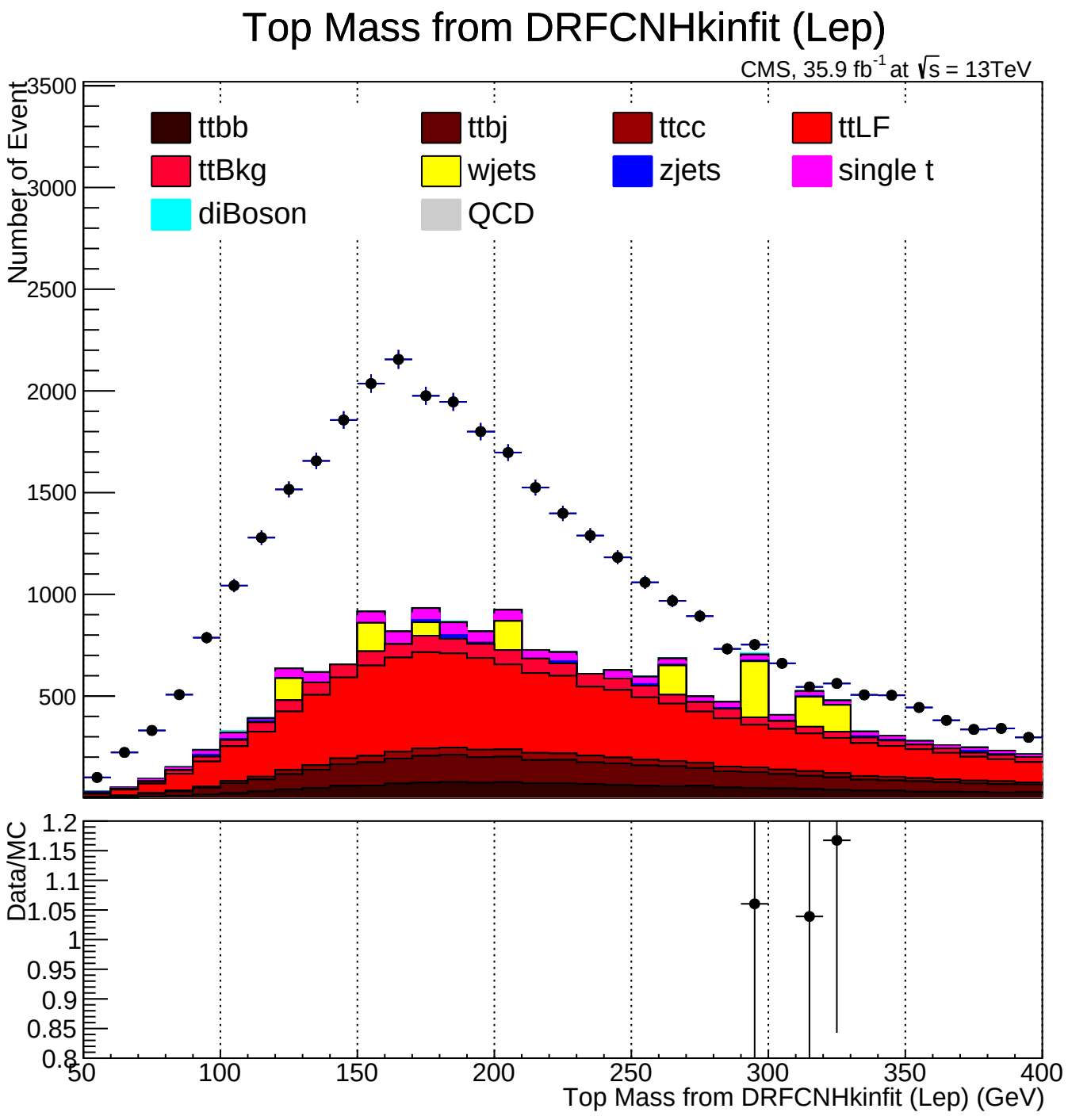

LepIsoQCD
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation (QCD)

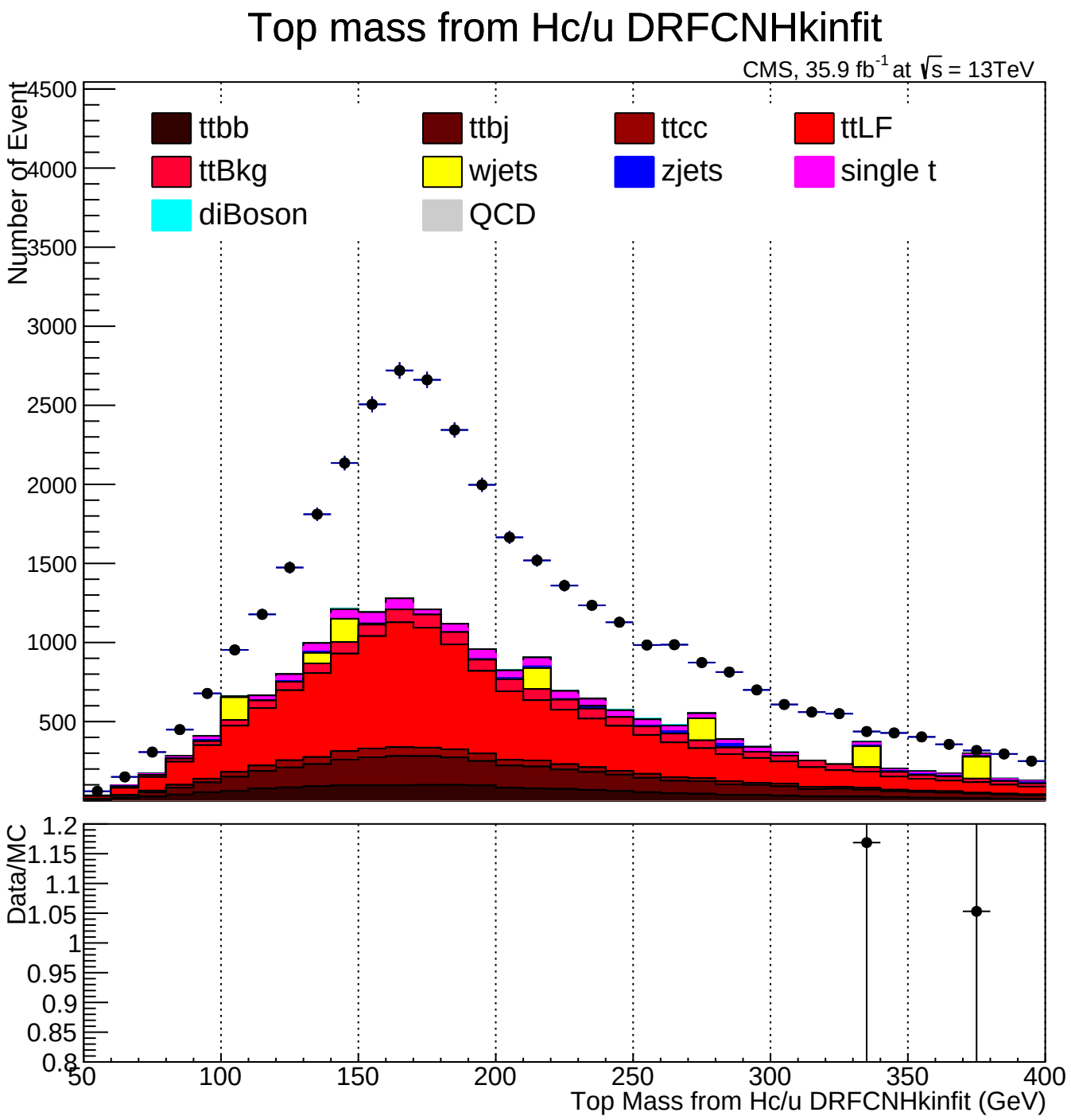

W Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
6000
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
W Mass from DRFCNHkinfit (Lep) (GeV)

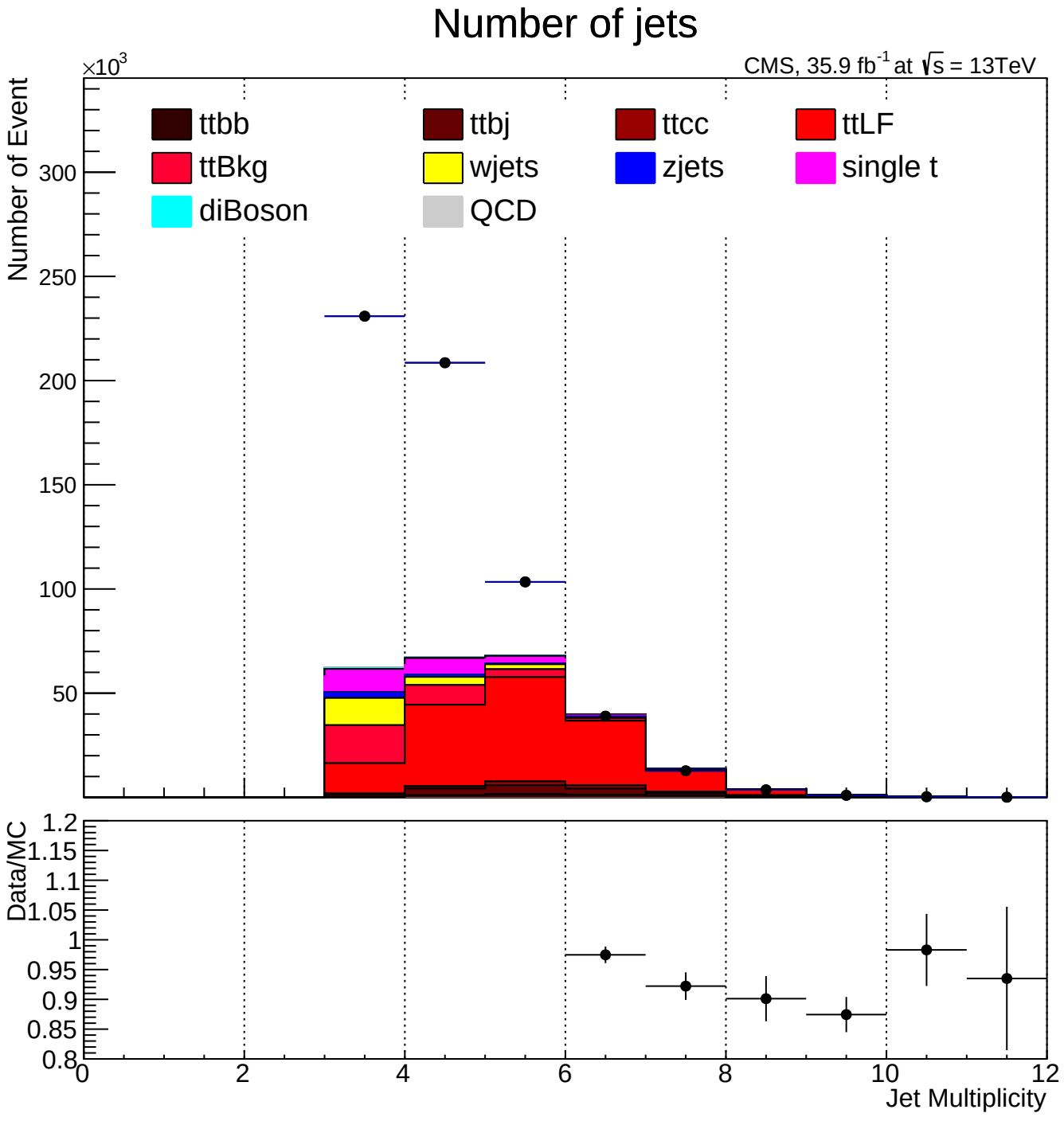

W Mass from DRFCNHkinfit (Had)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
W Mass from DRFCNHkinfit (Had) (GeV)

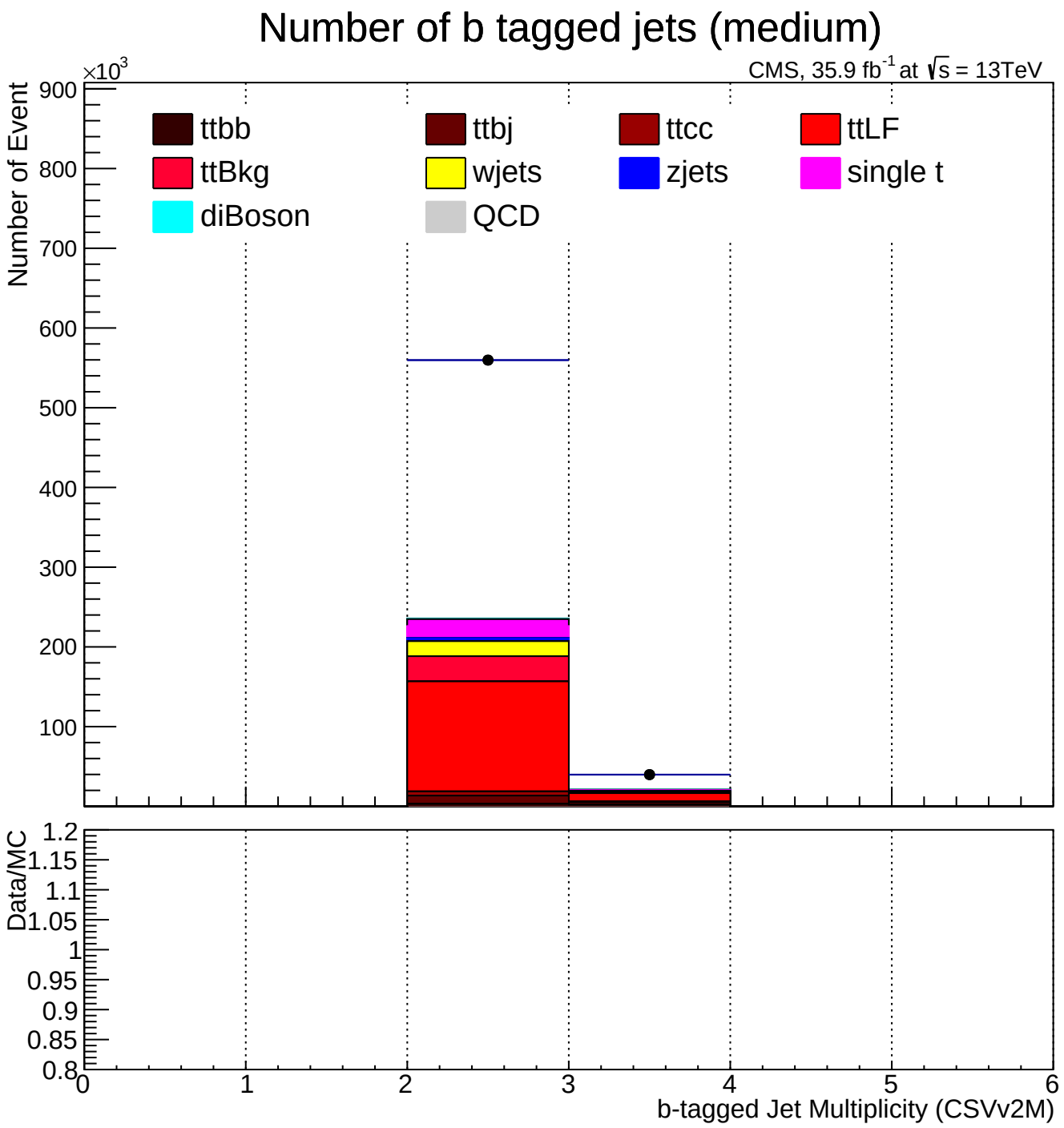

H Mass from DRFCNHkinfit (bb)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
H Mass from DRFCNHkinfit (bb)(GeV)

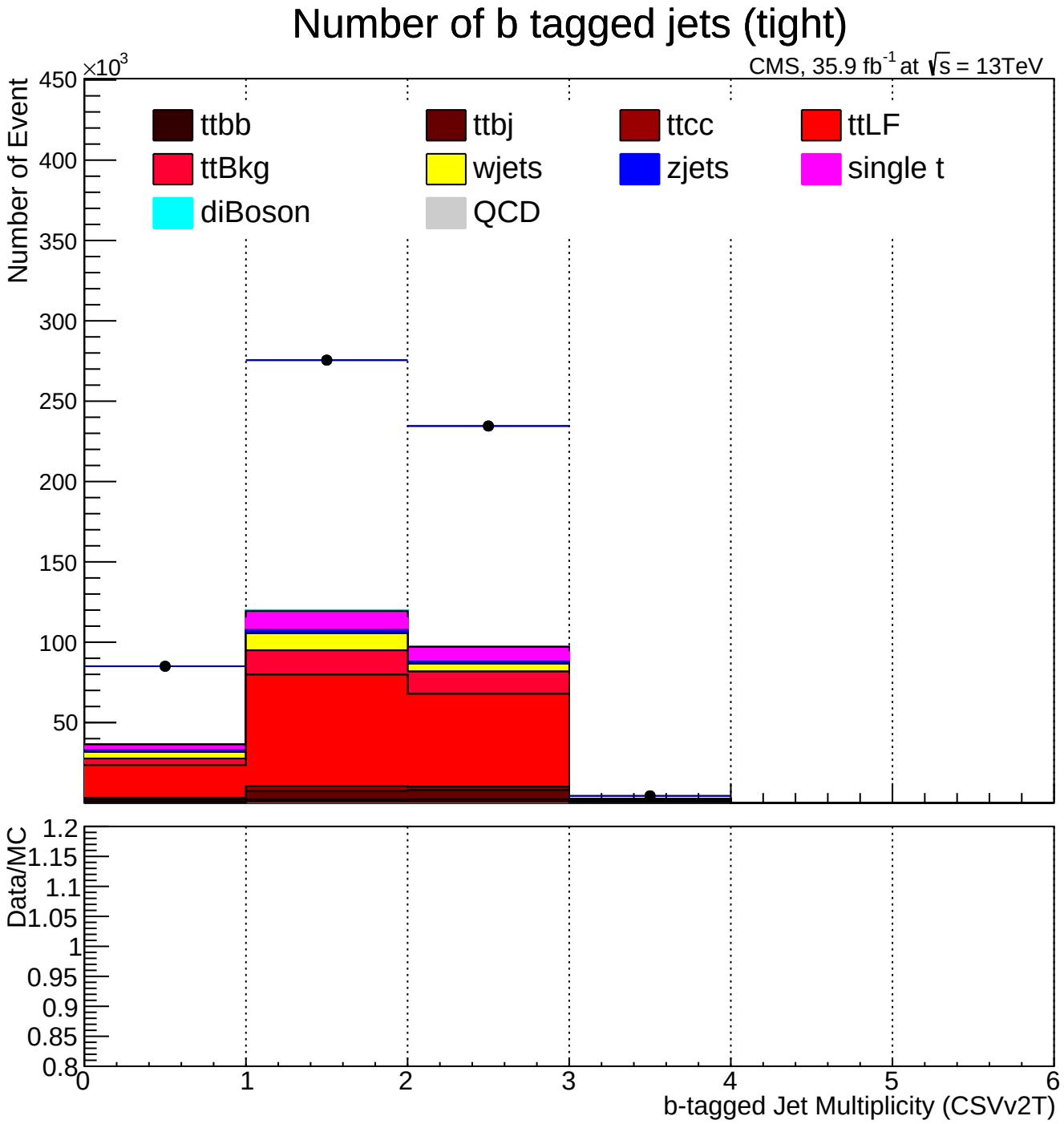

Delta R from DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Delta R from DRFCNHkinfit Higgs

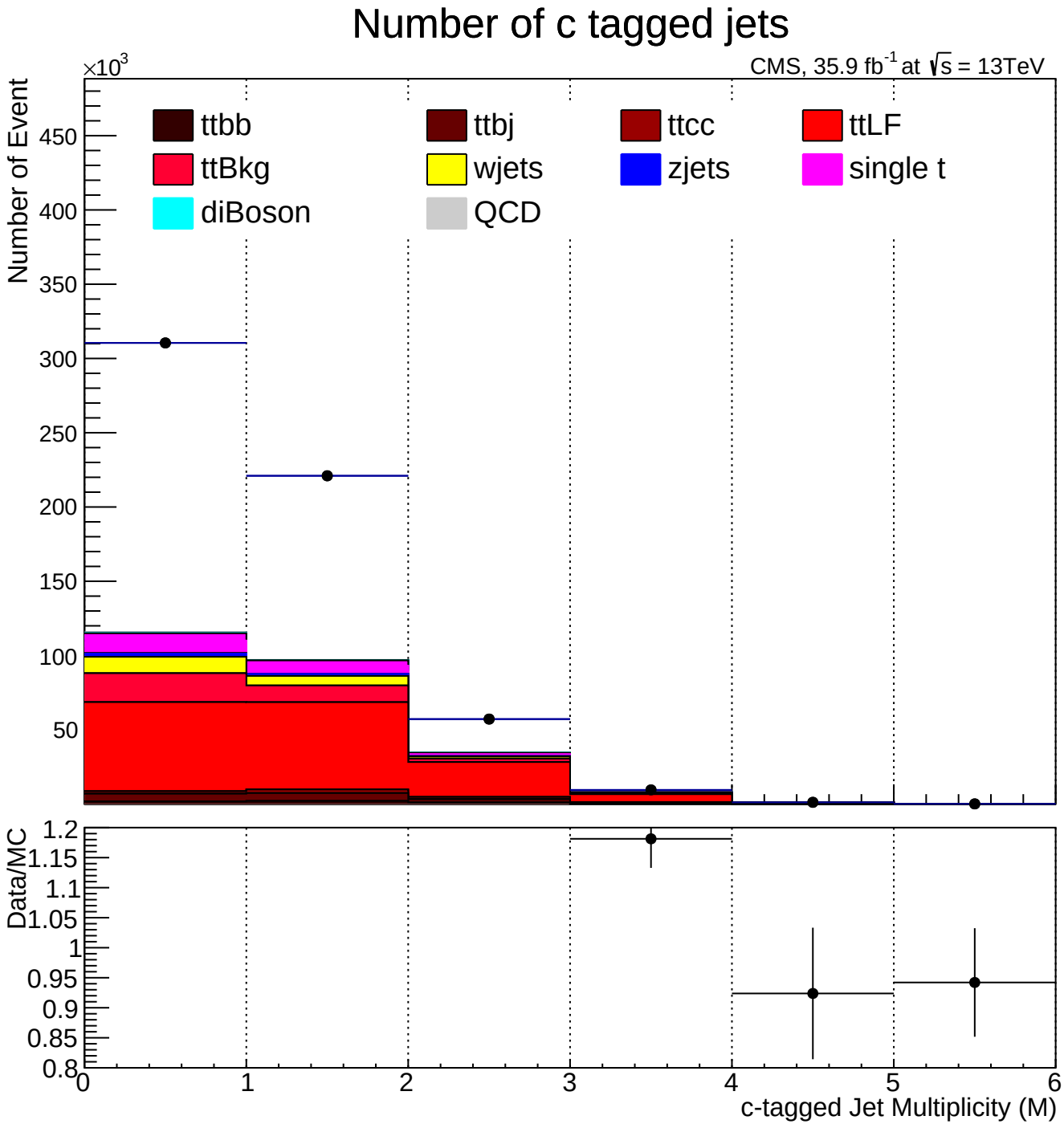

Top Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Top Mass from DRFCNHkinfit (Lep) (GeV)

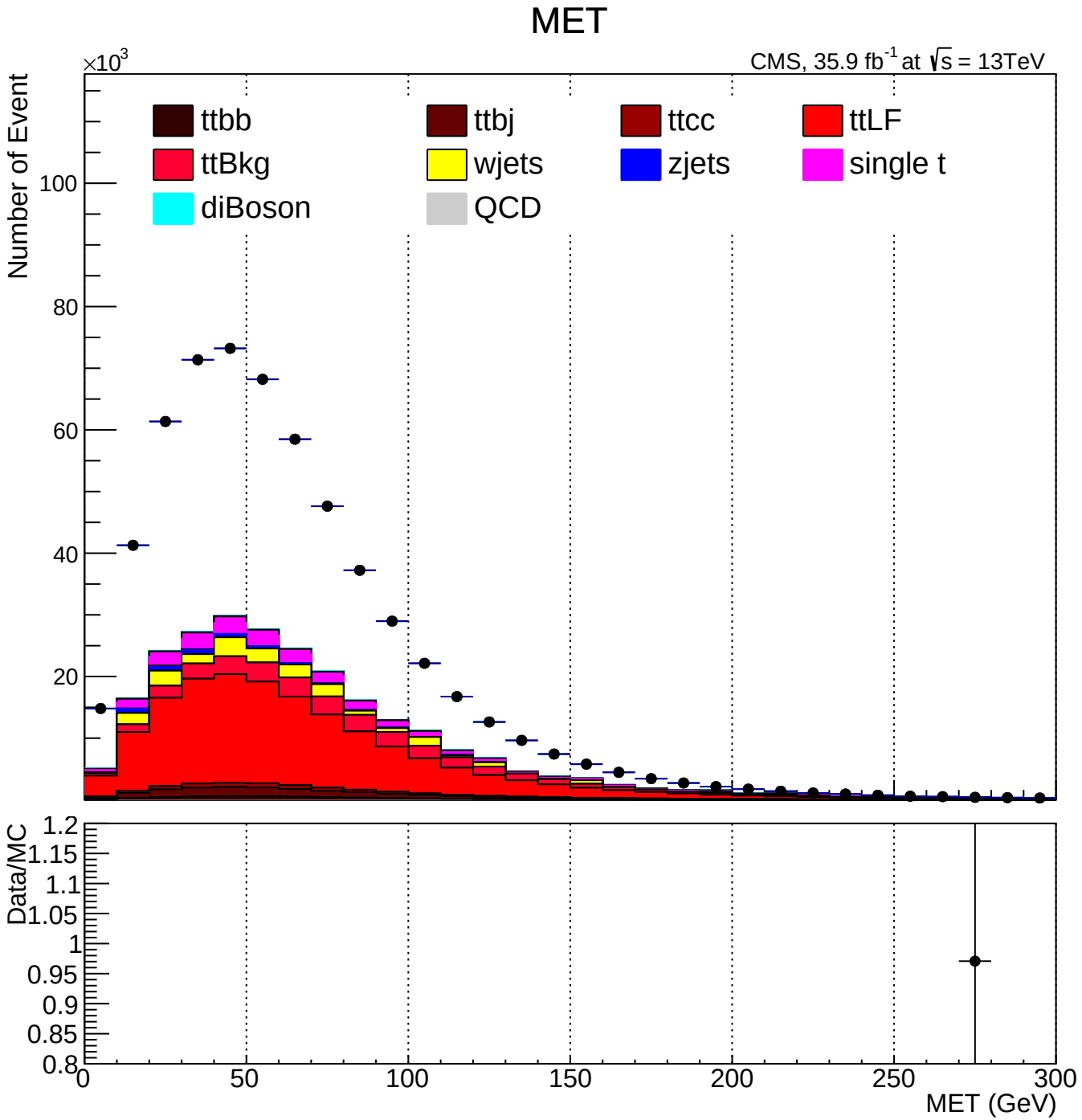

Top mass from Hc/u DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Top Mass from Hc/u DRFCNHkinfit (GeV)

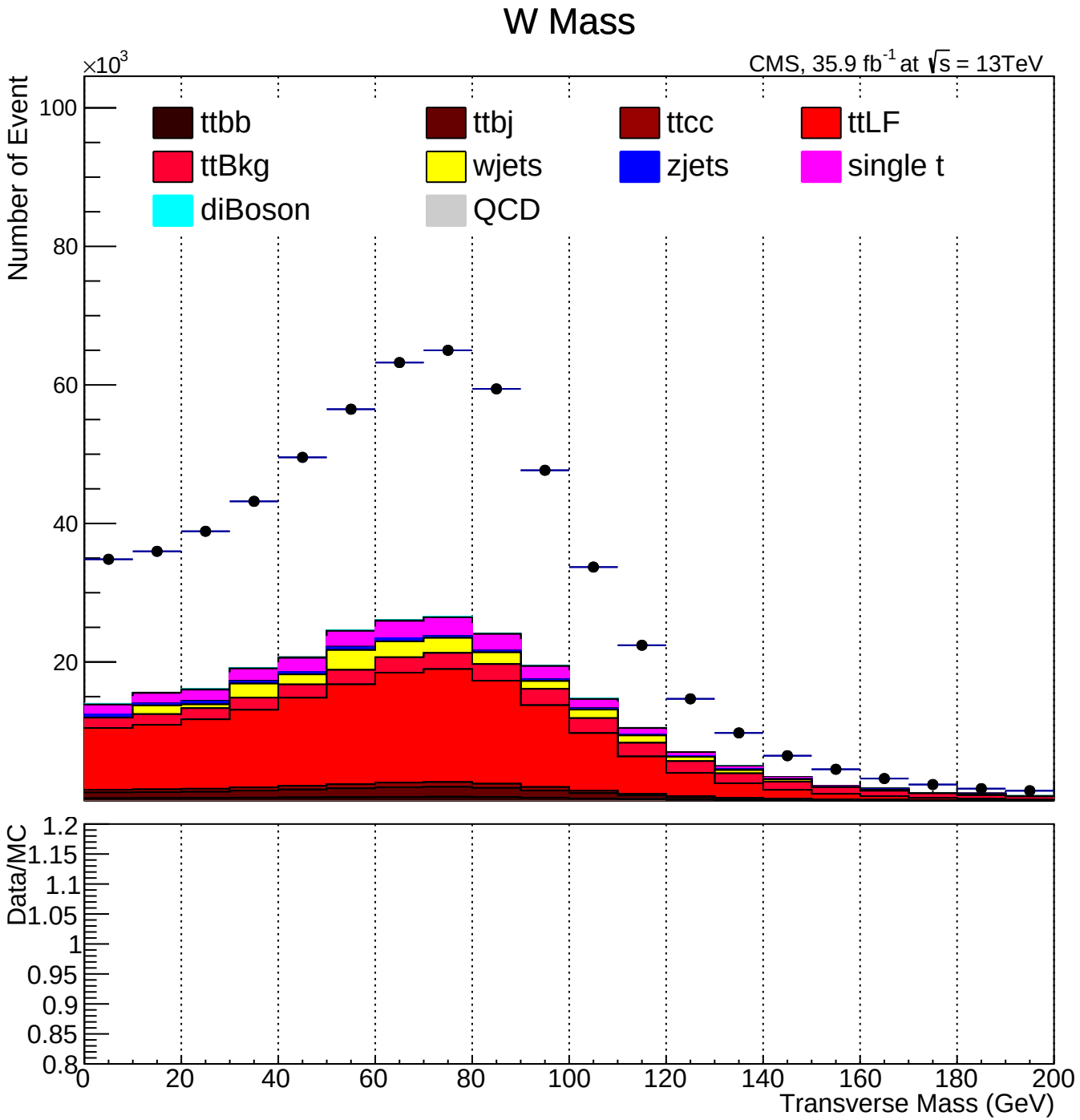

Number of jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Jet Multiplicity

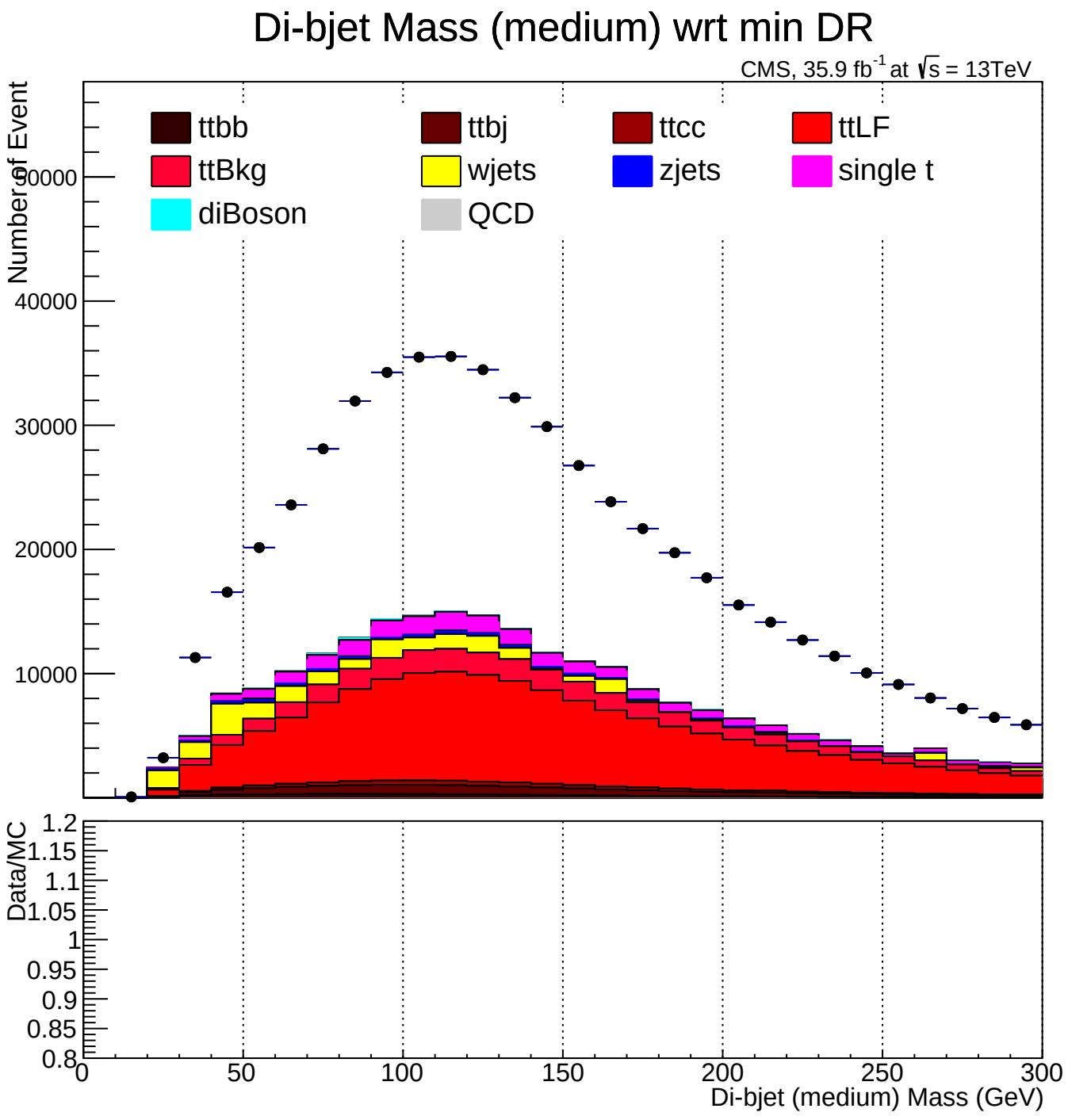

Number of b tagged jets (medium)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b-tagged Jet Multiplicity (CSVv2M)

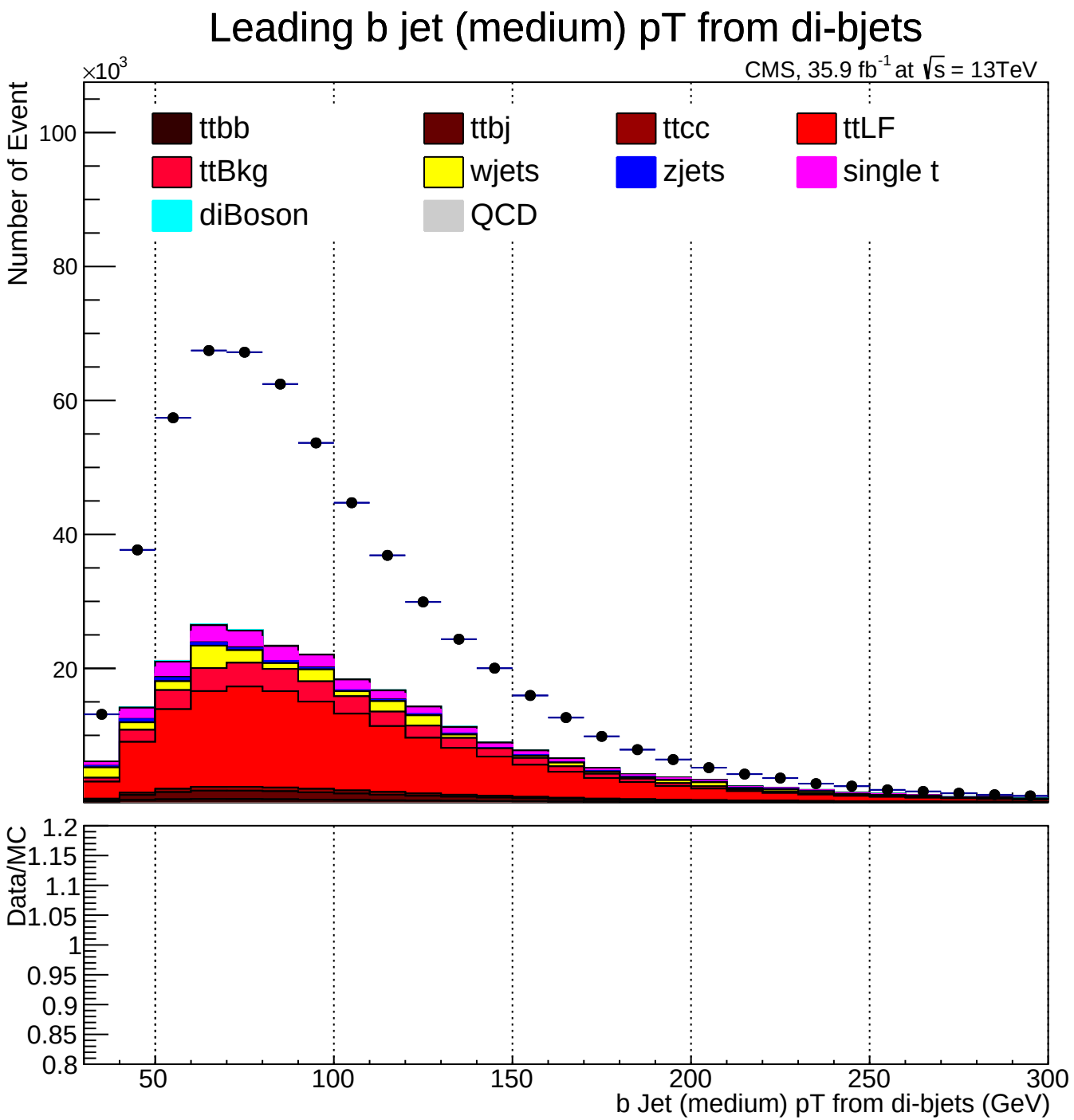

Number of b tagged jets (tight)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b-tagged Jet Multiplicity (CSVv2T)

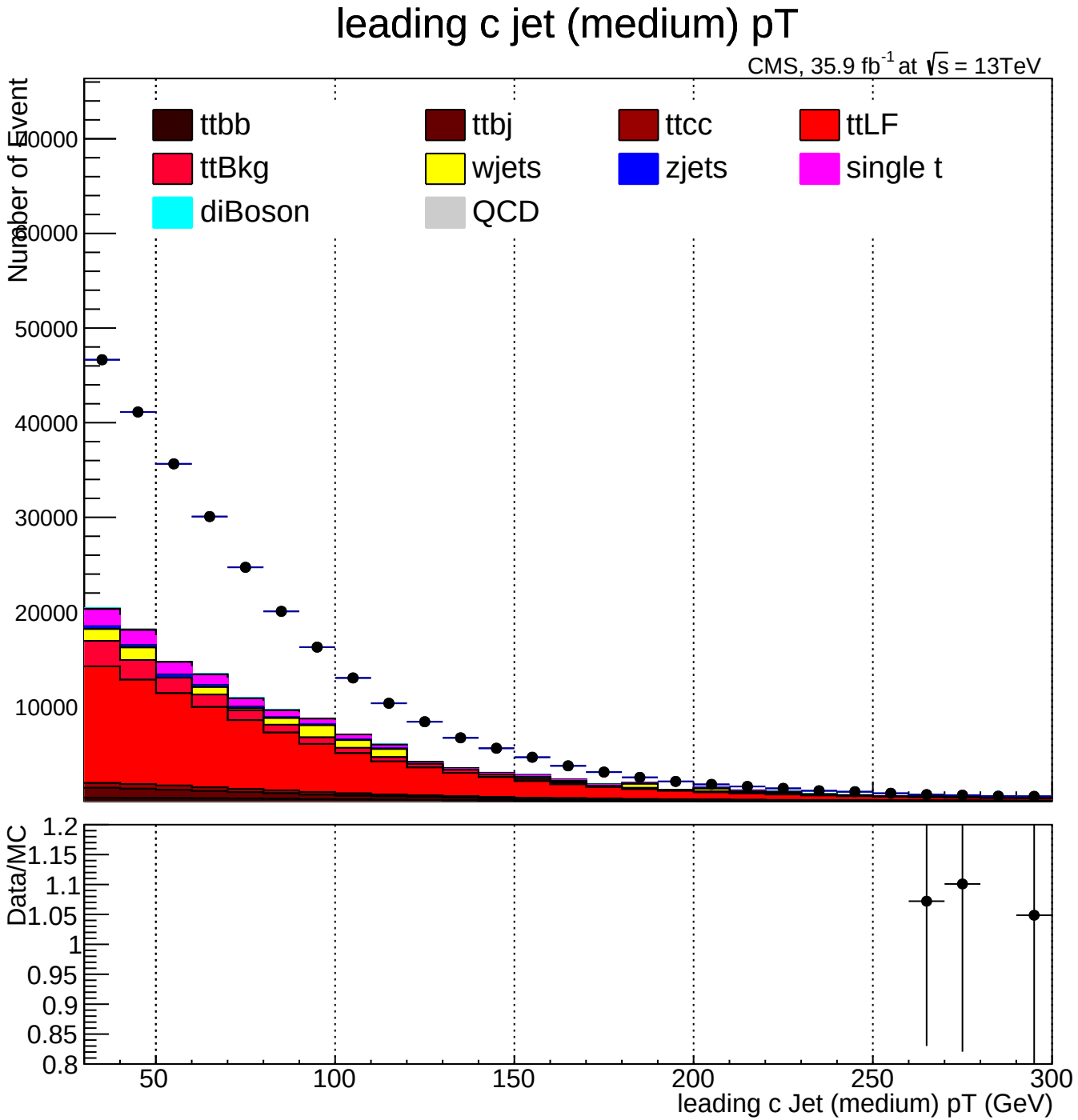

Number of c tagged jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
c-tagged Jet Multiplicity (M)

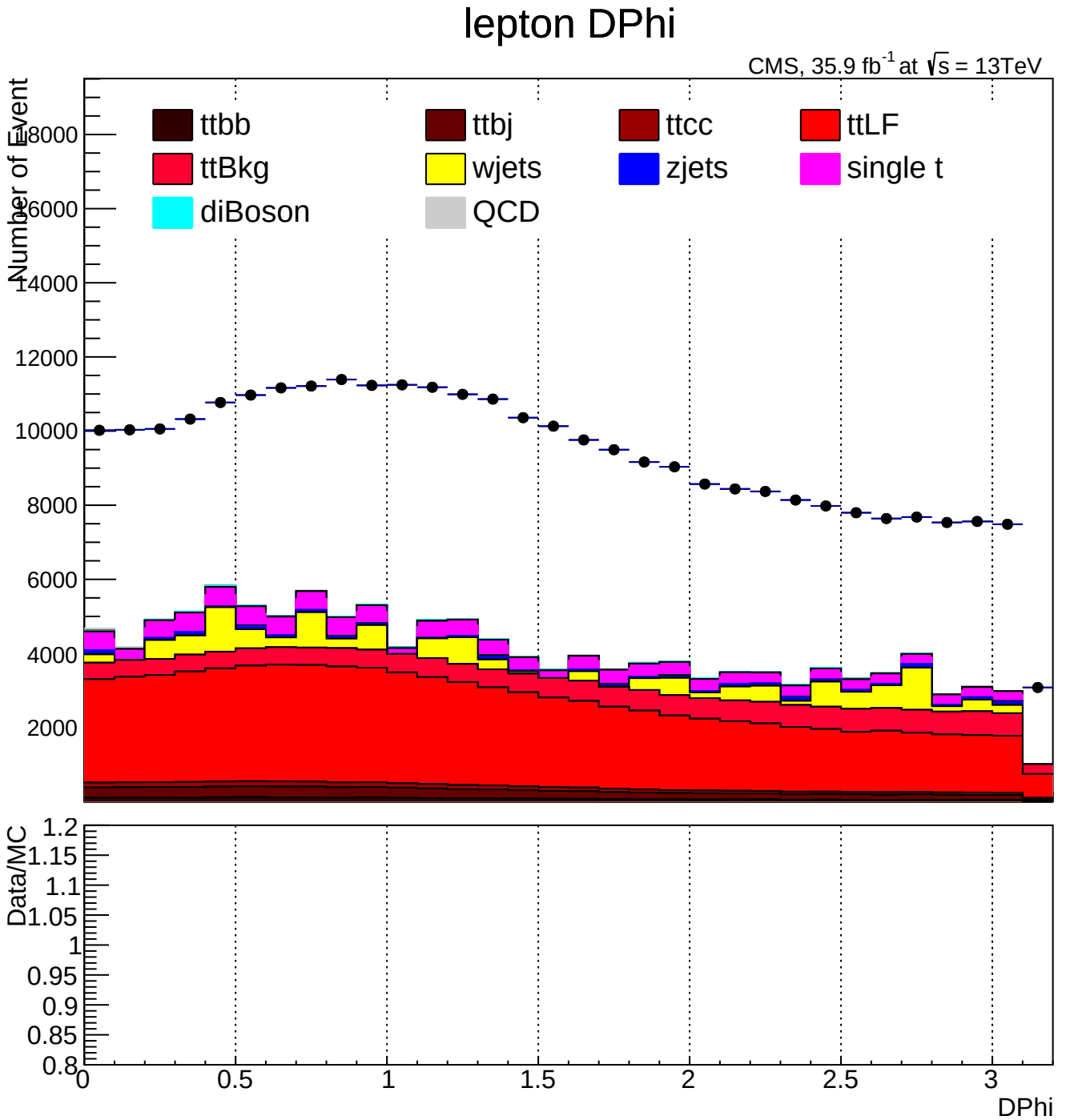

MET
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
MET (GeV)

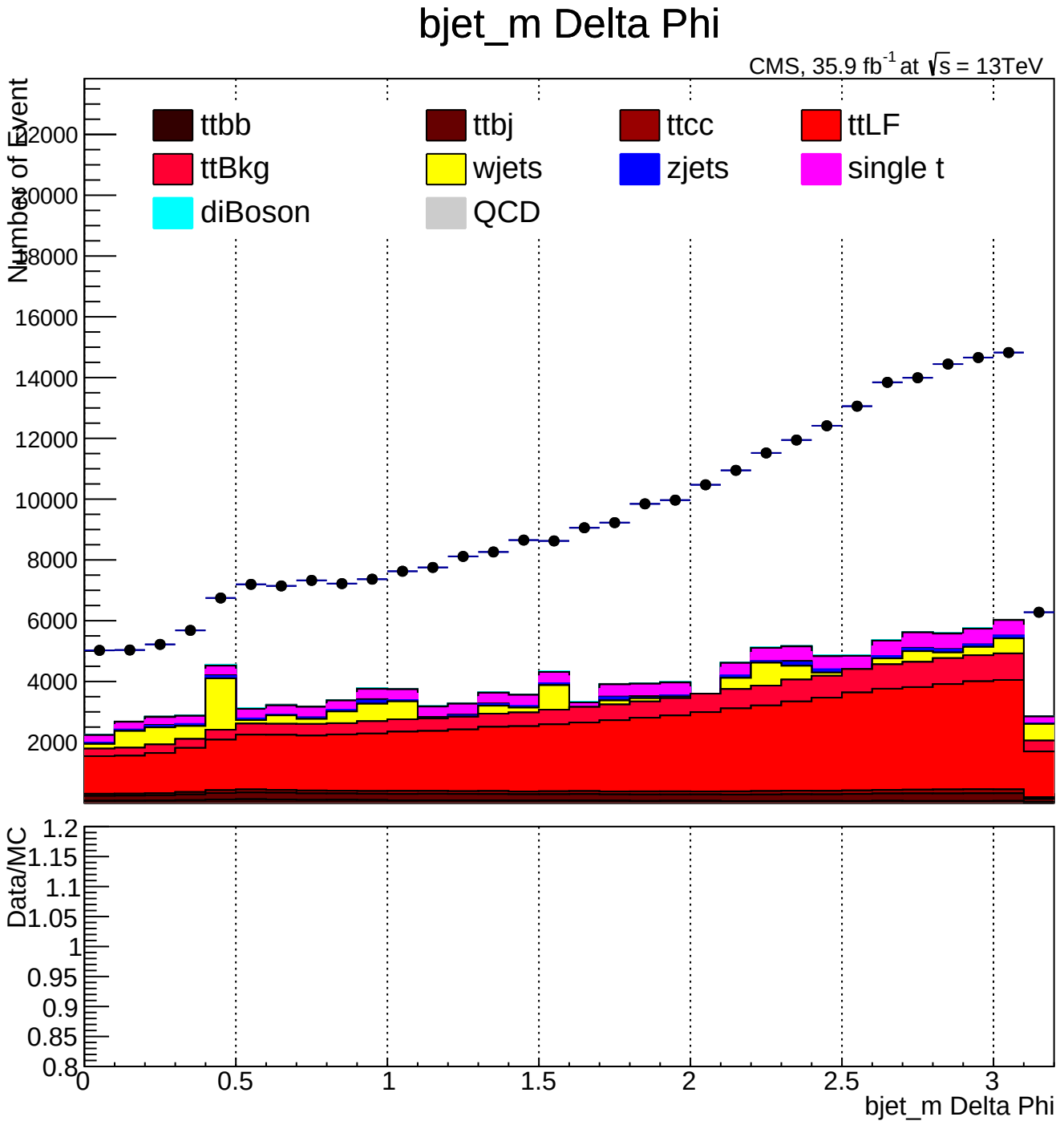

W Mass
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
$\times 10^3$
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Transverse Mass (GeV)

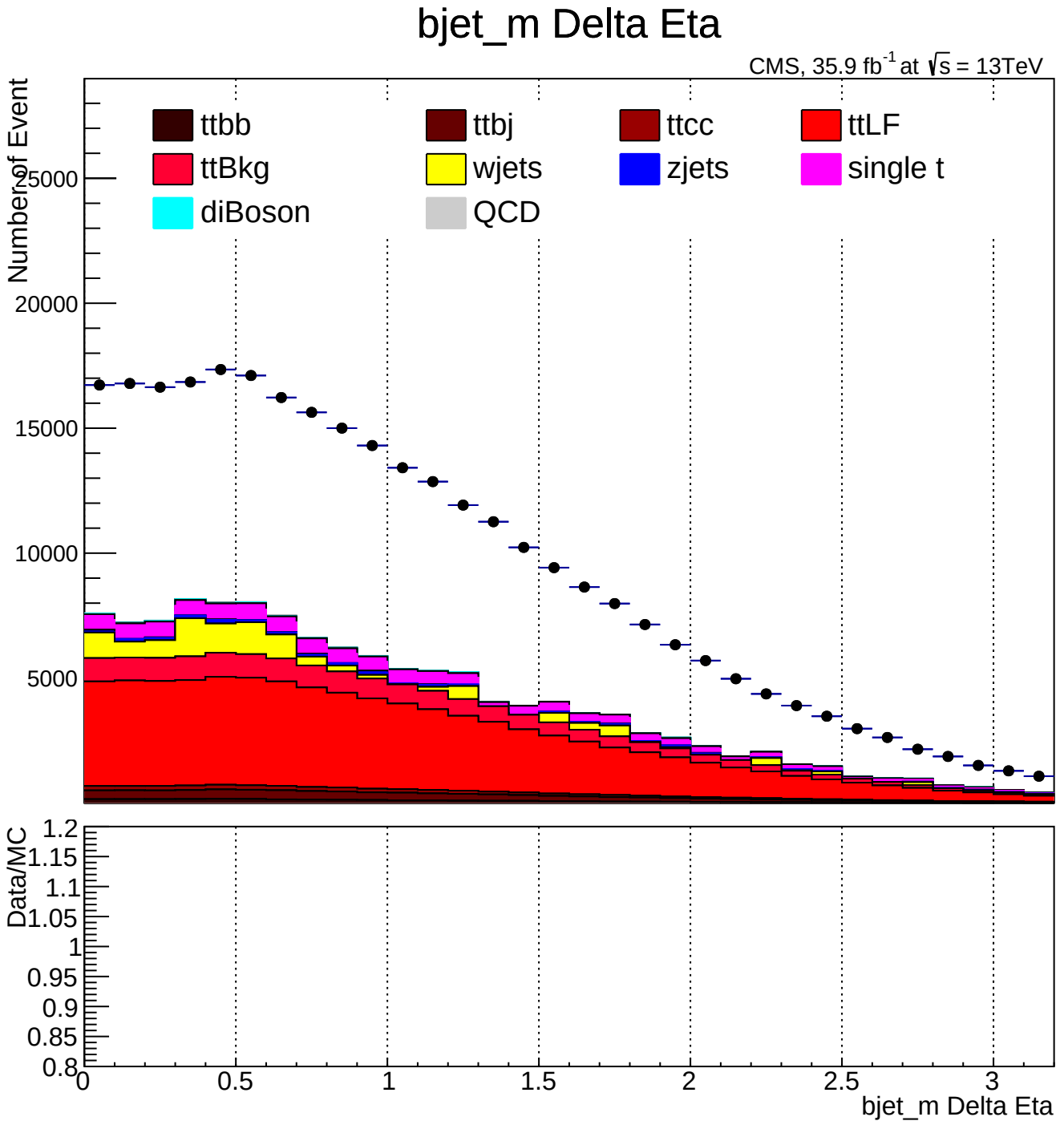

Di-bjet Mass (medium) wrt min DR
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
50000
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
50
100
150
200
250
300
Di-bjet (medium) Mass (GeV)

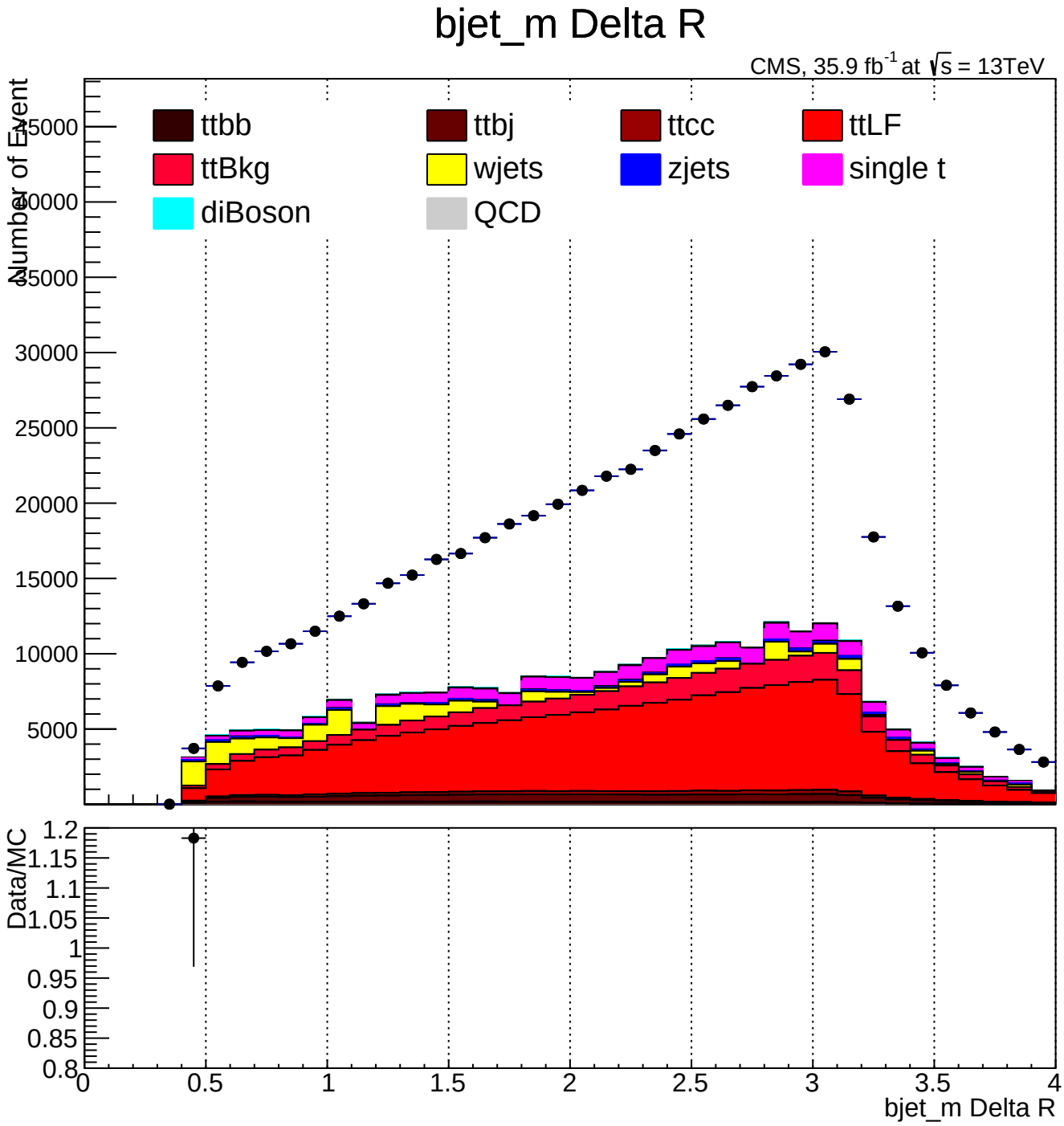

Leading b jet (medium) pT from di-bjets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b Jet (medium) pT from di-bjets (GeV)

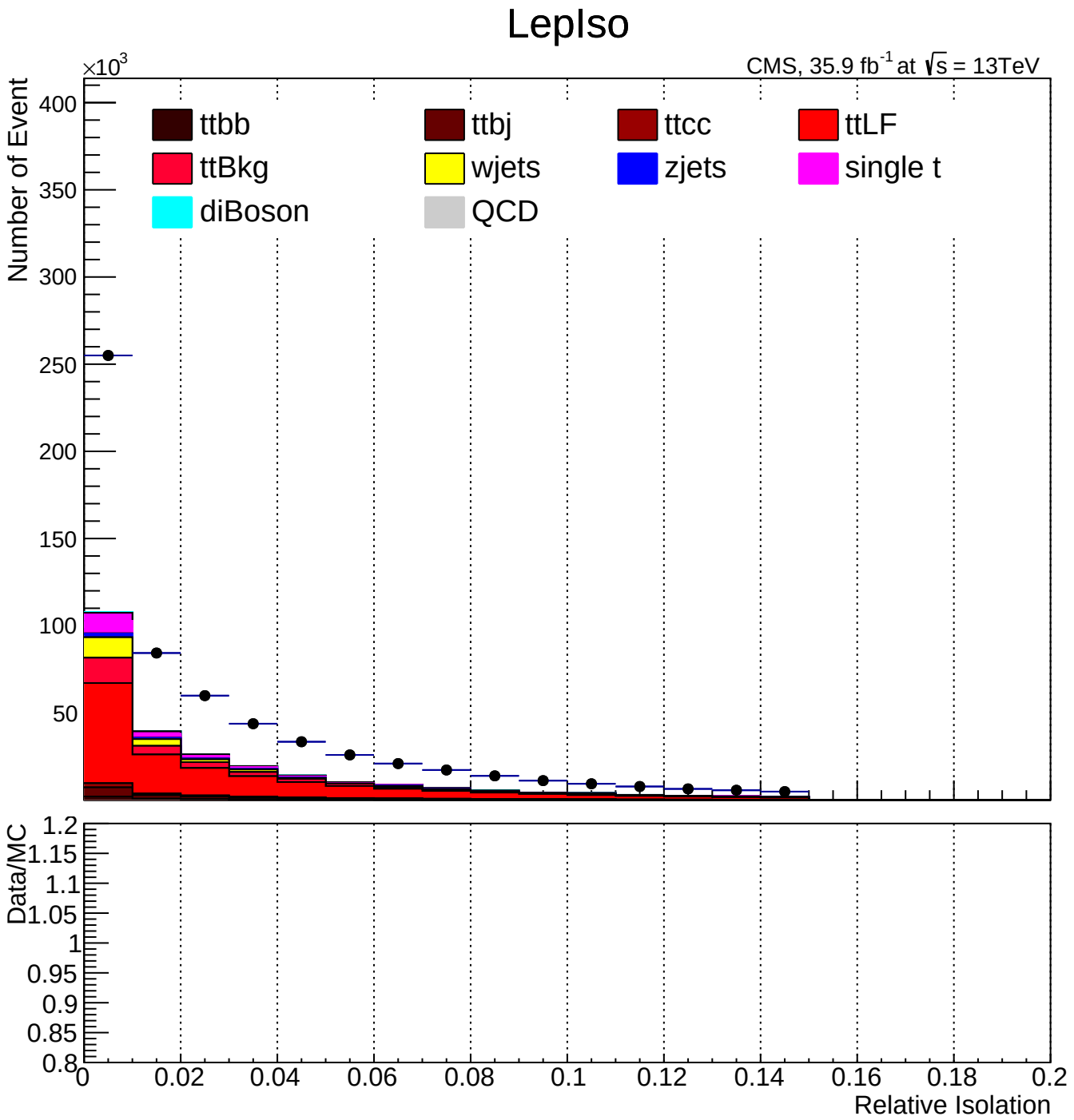

leading c jet (medium) pT
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
60000
50000
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
leading c Jet (medium) pT (GeV)

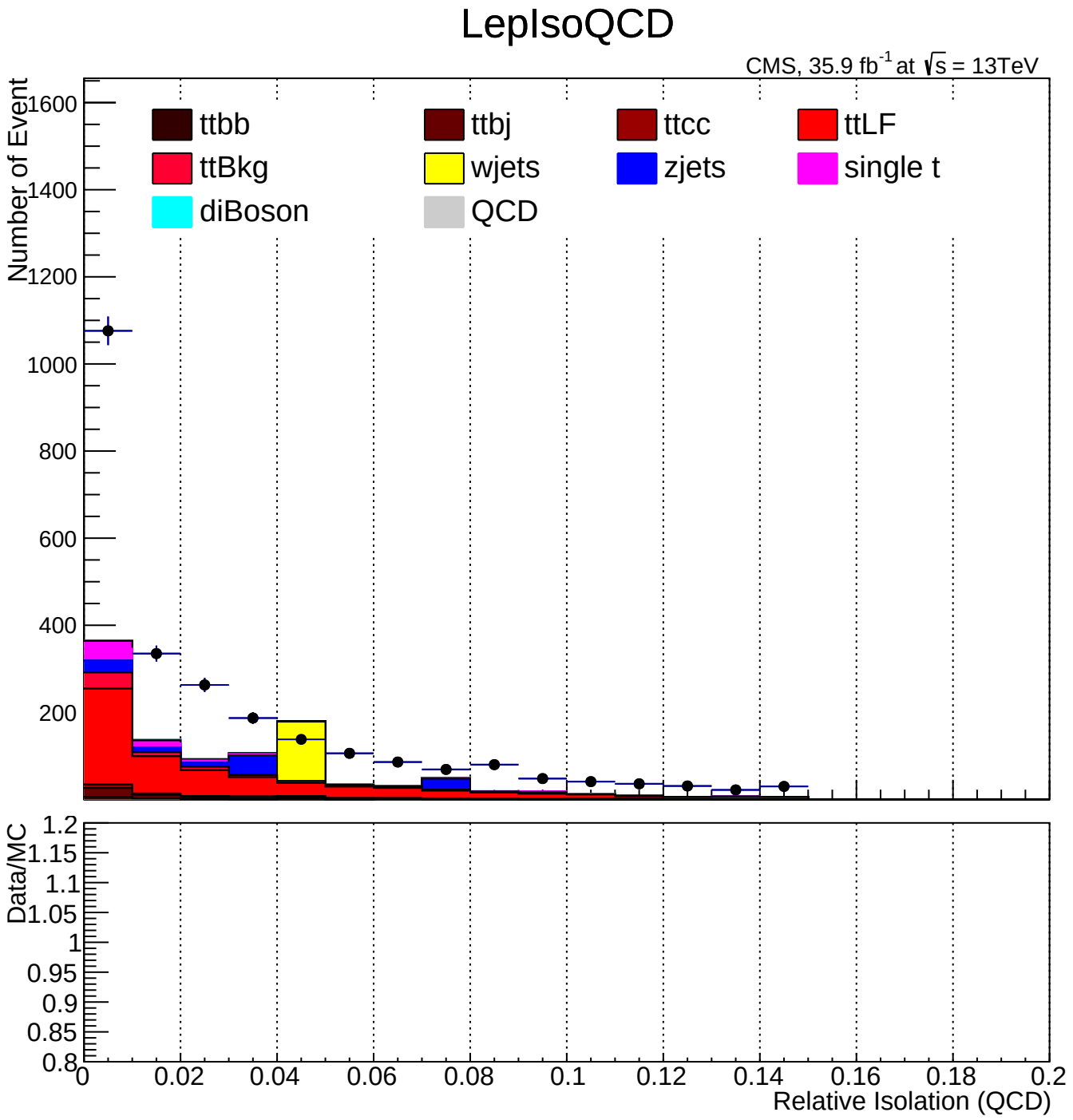

lepton DPhi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
DPhi

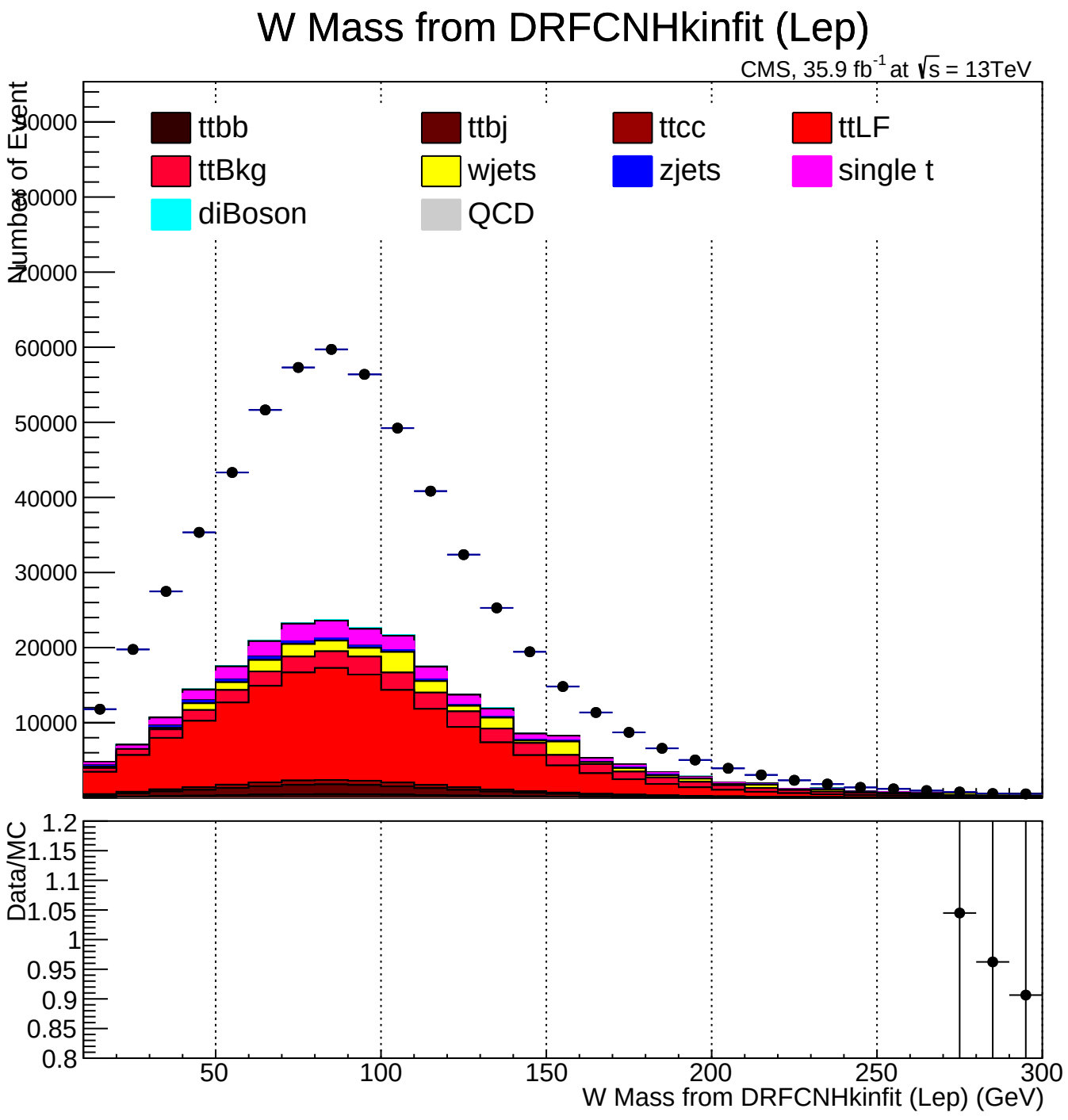

bjet_m Delta Phi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta Phi

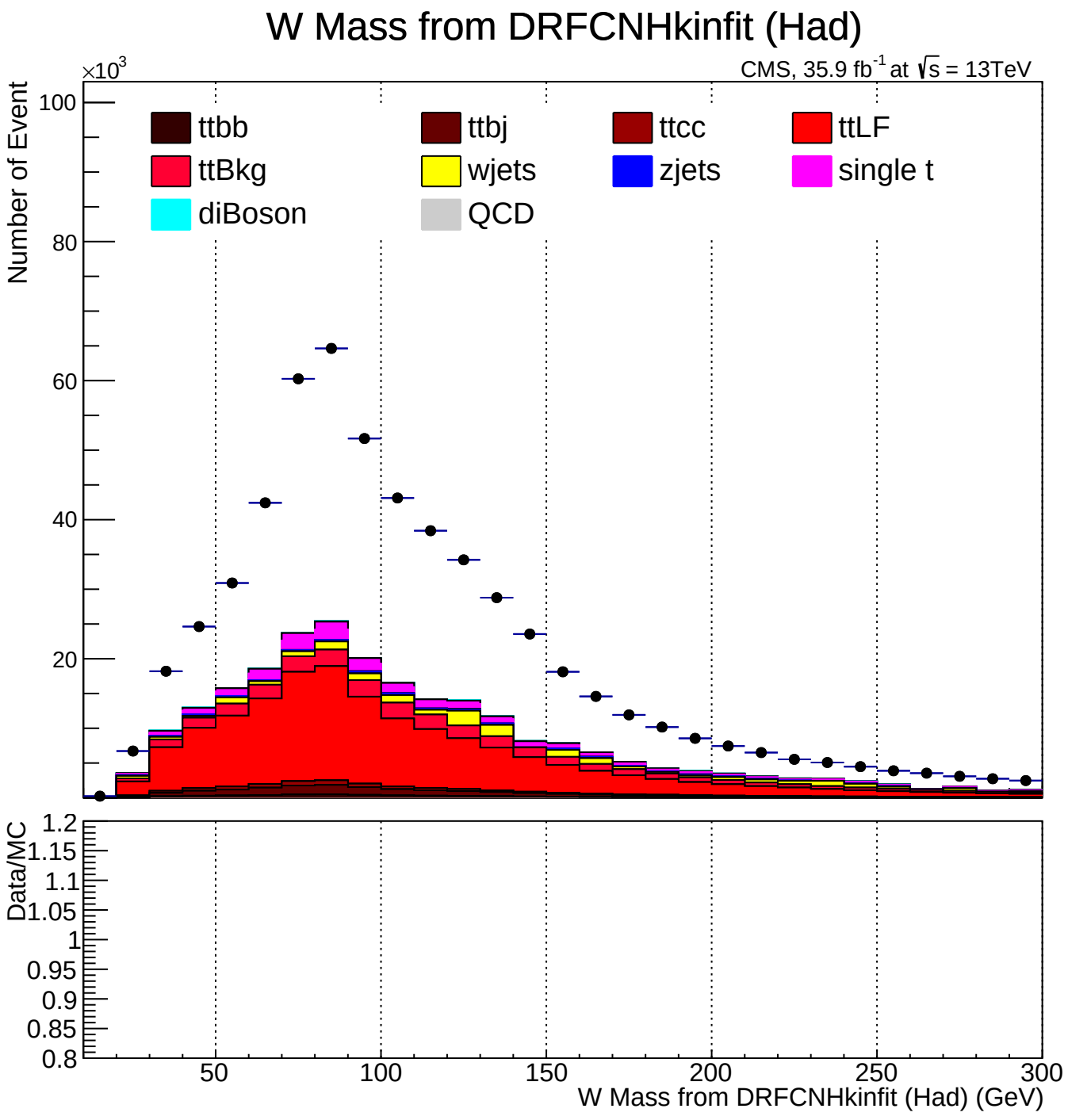

bjet_m Delta Eta
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
25000
20000
15000
10000
5000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Eta

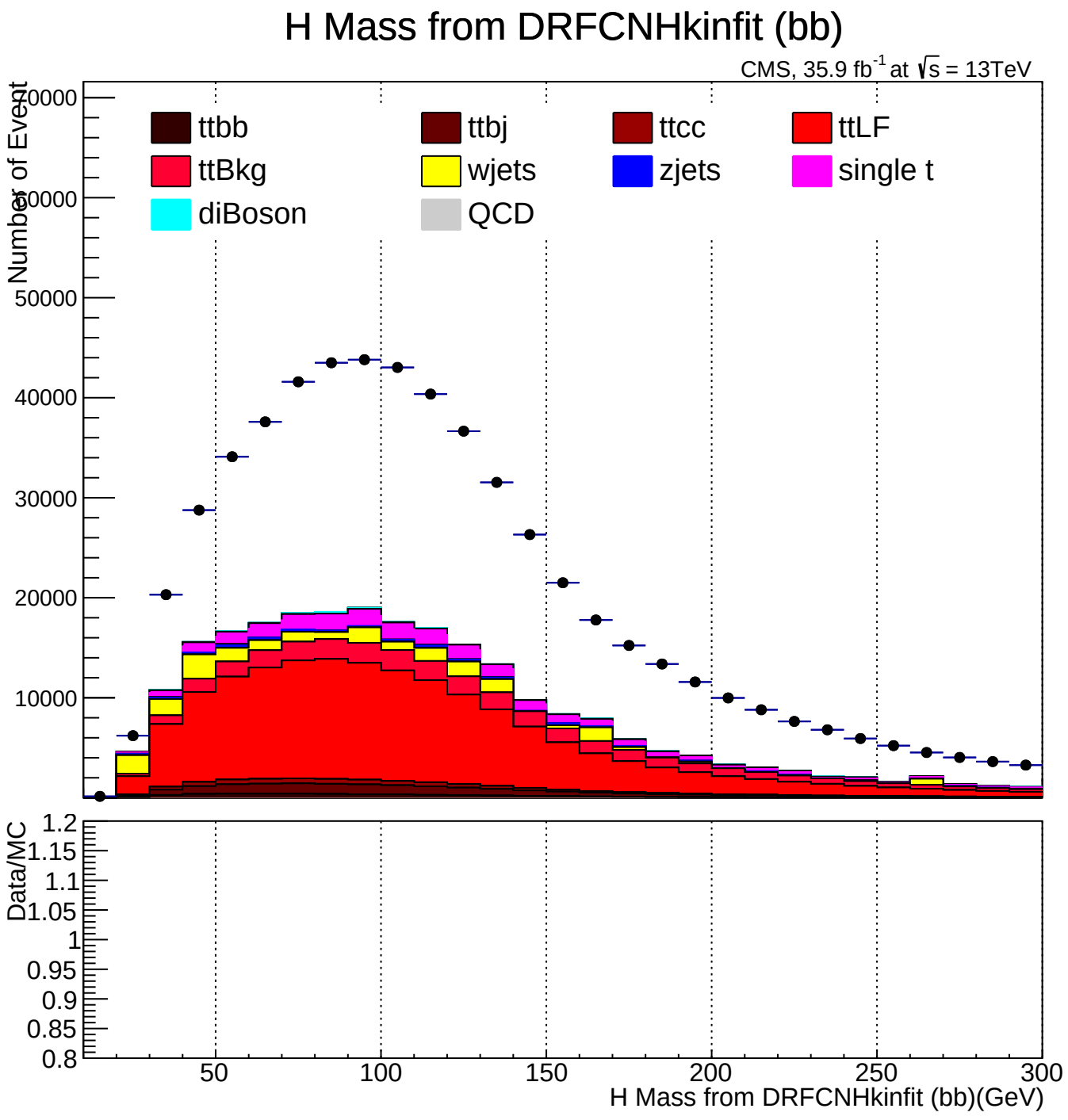

bjet_m Delta R
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
bjet_m Delta R

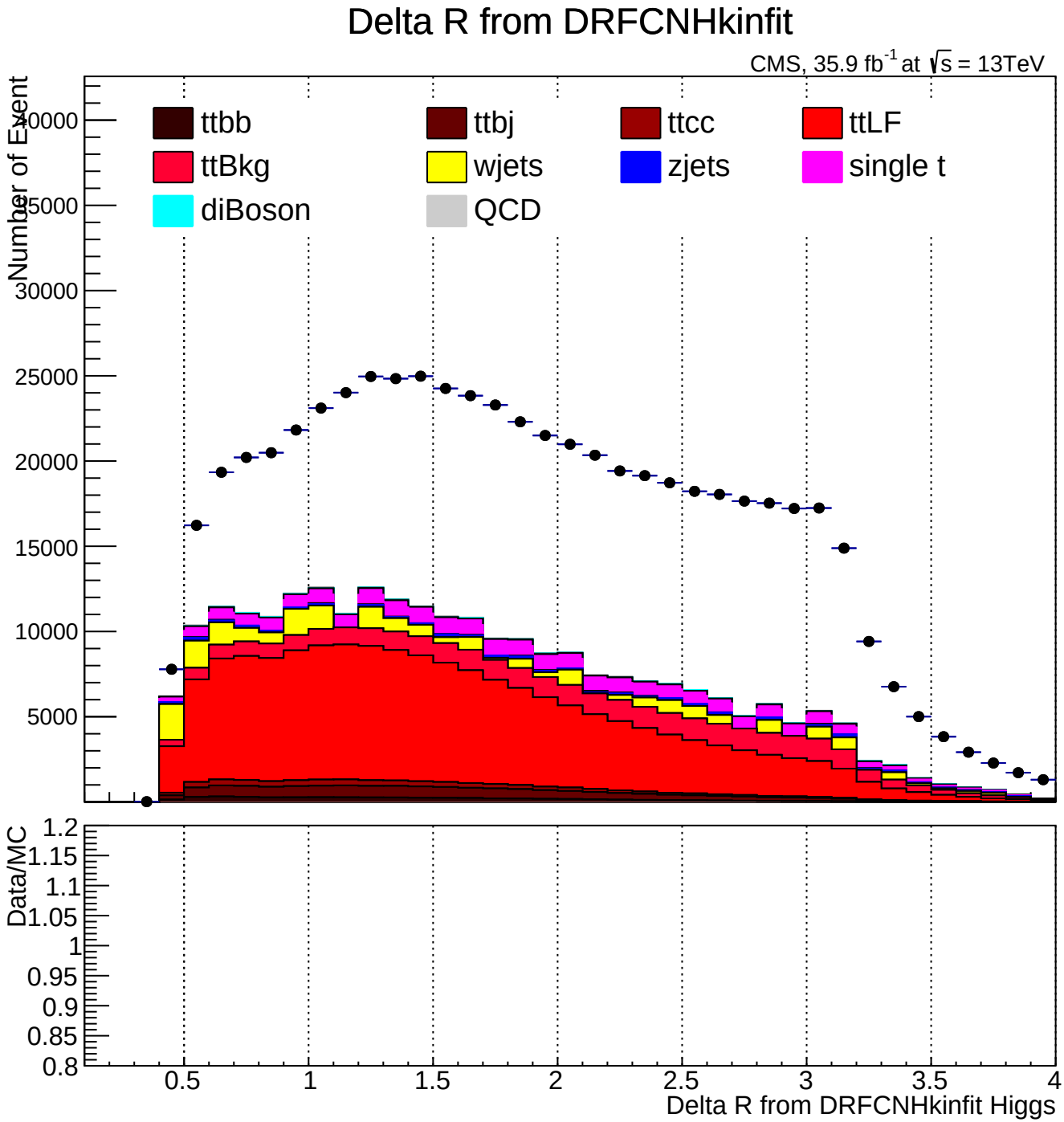

LepIso
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation

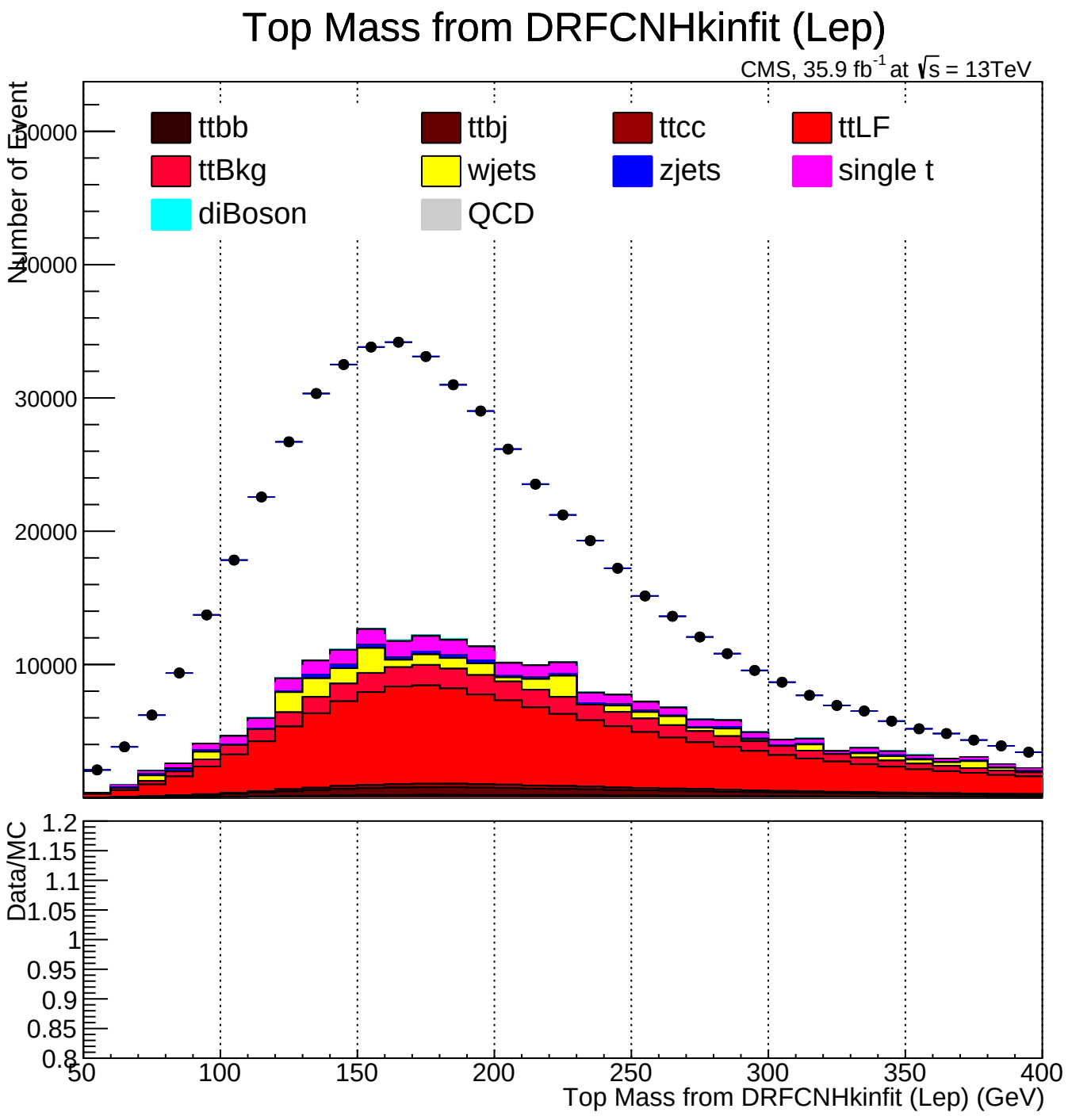

LepIsoQCD
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation (QCD)

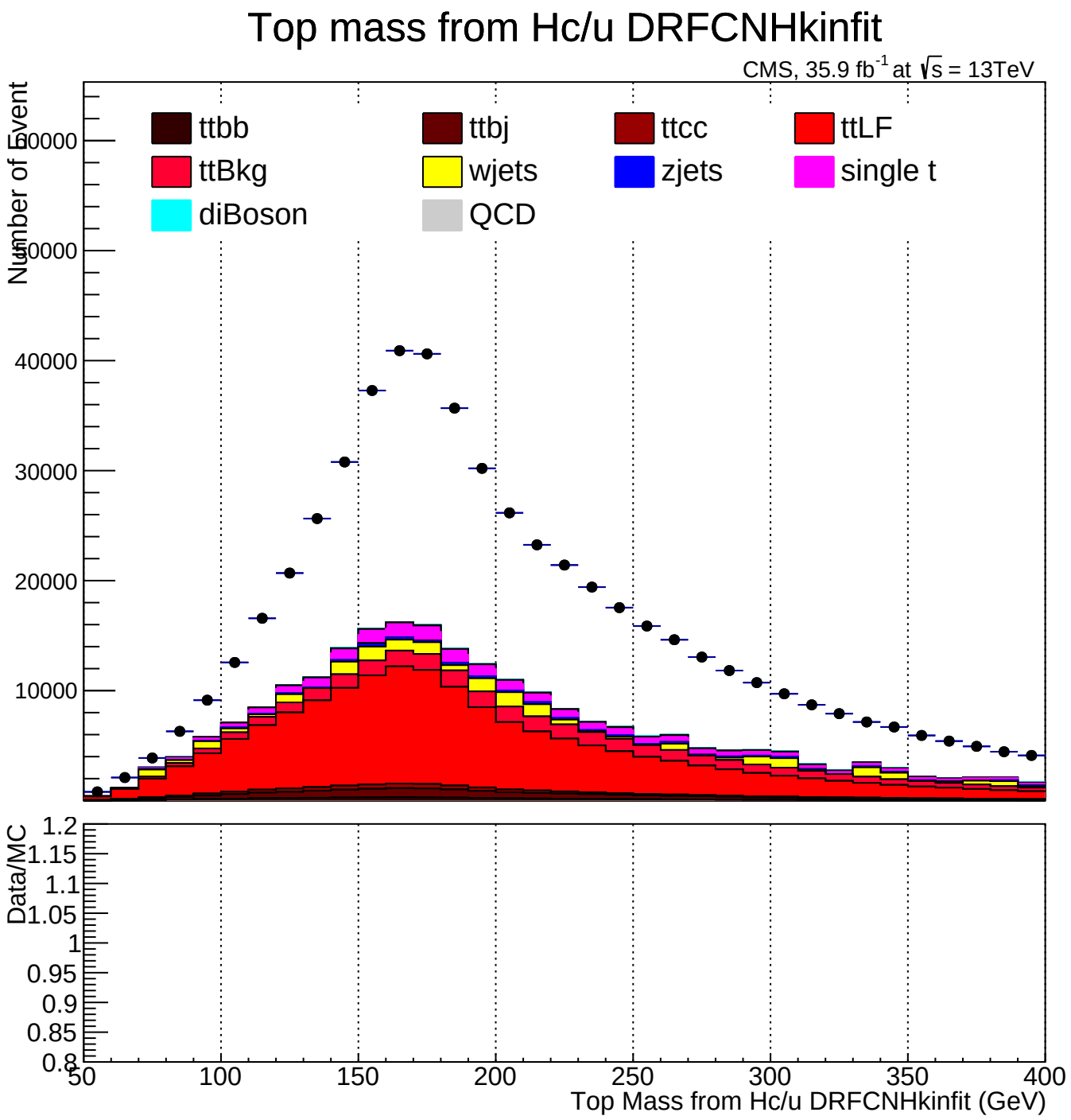

W Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
W Mass from DRFCNHkinfit (Lep) (GeV)

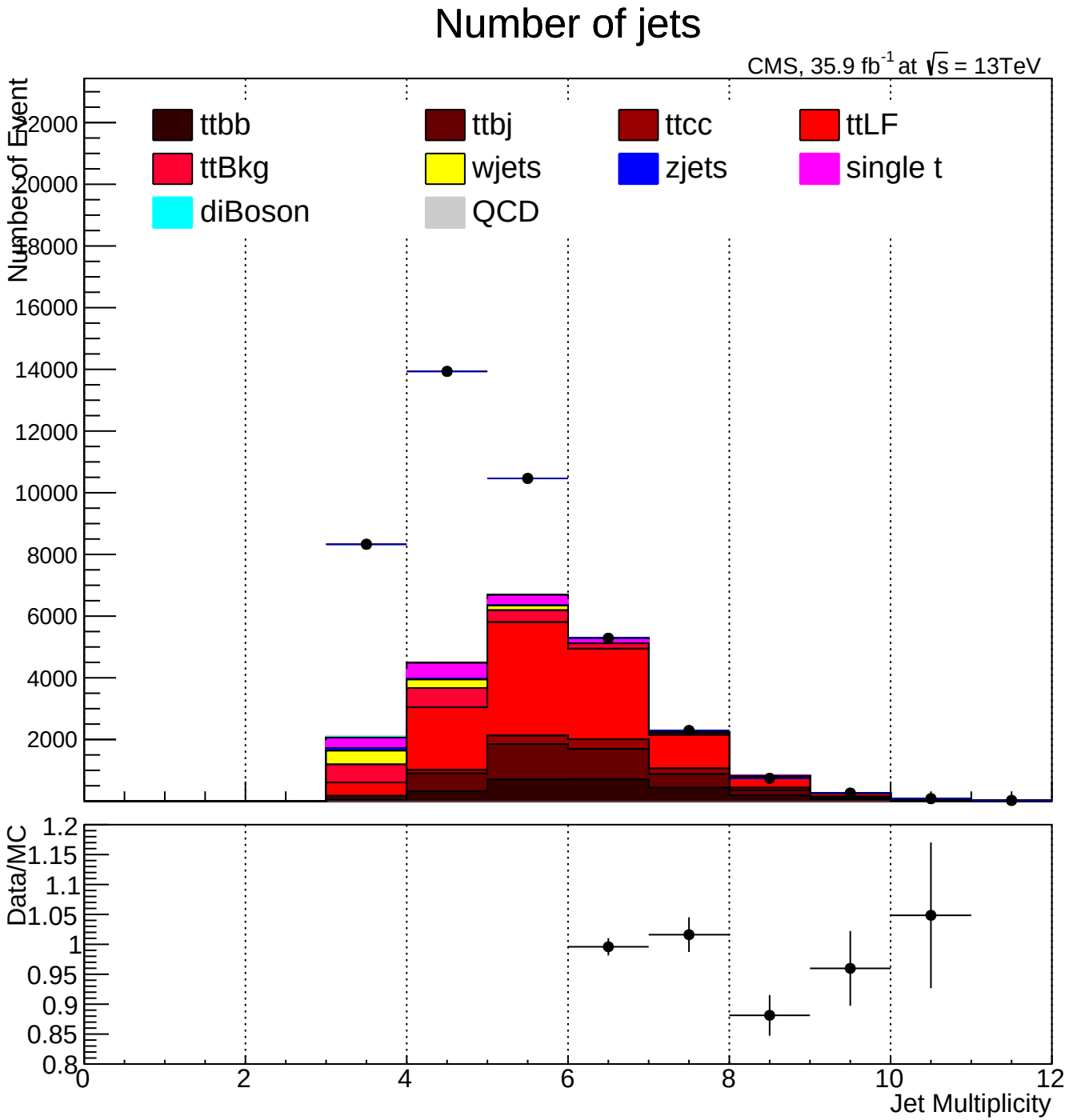

W Mass from DRFCNHkinfit (Had)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
W Mass from DRFCNHkinfit (Had) (GeV)

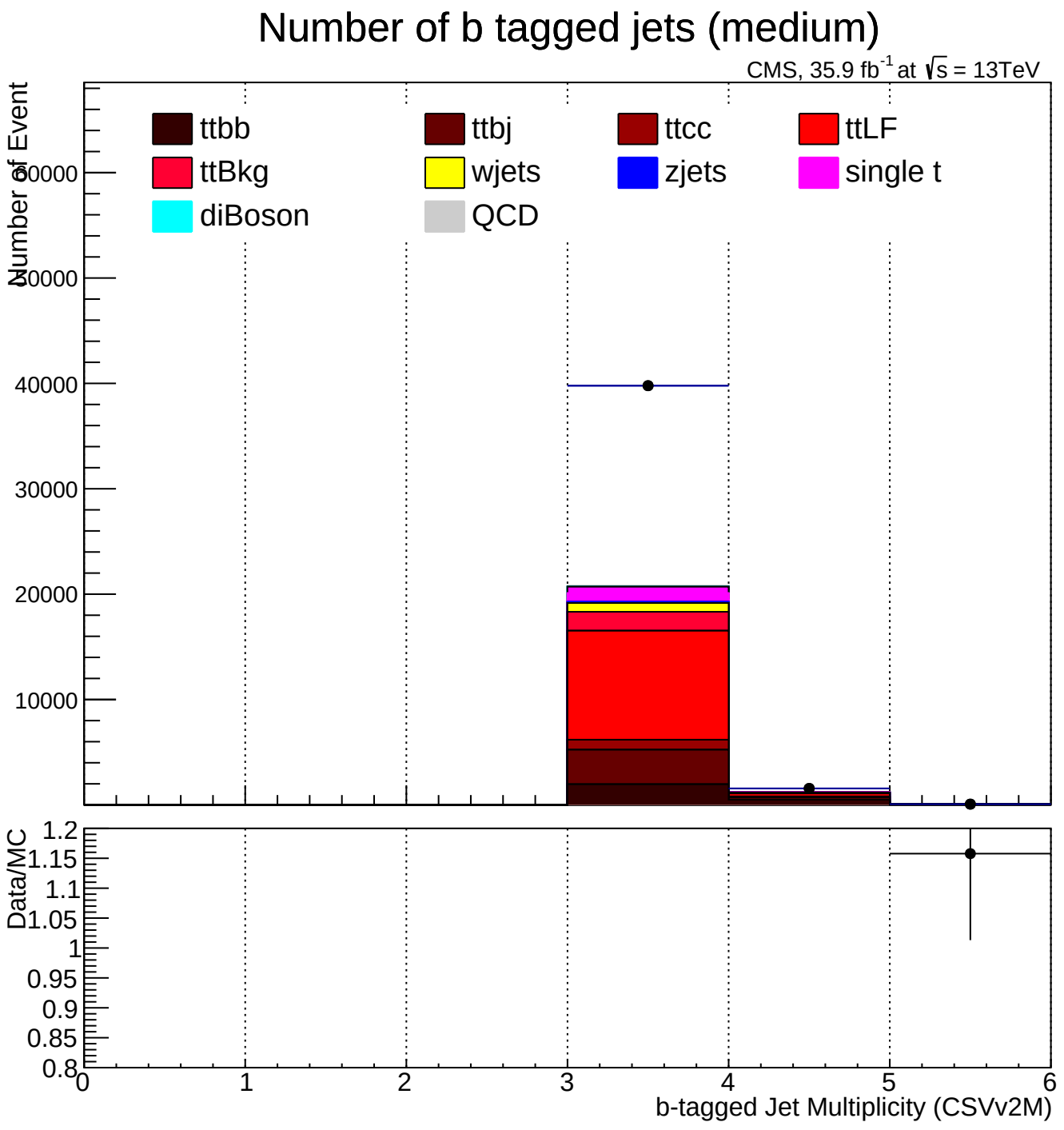

H Mass from DRFCNHkinfit (bb)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
H Mass from DRFCNHkinfit (bb)(GeV)

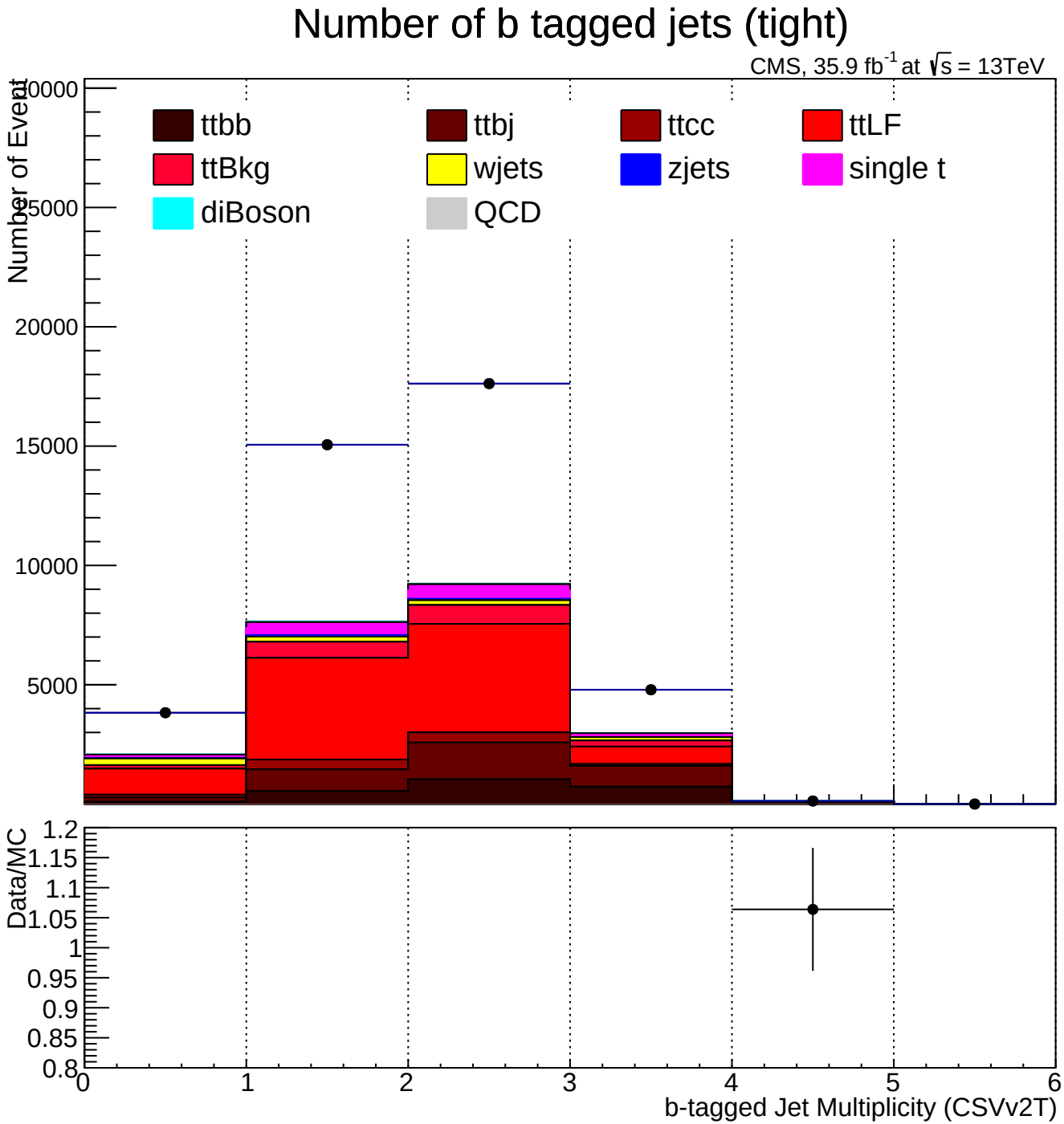

Delta R from DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Delta R from DRFCNHkinfit Higgs

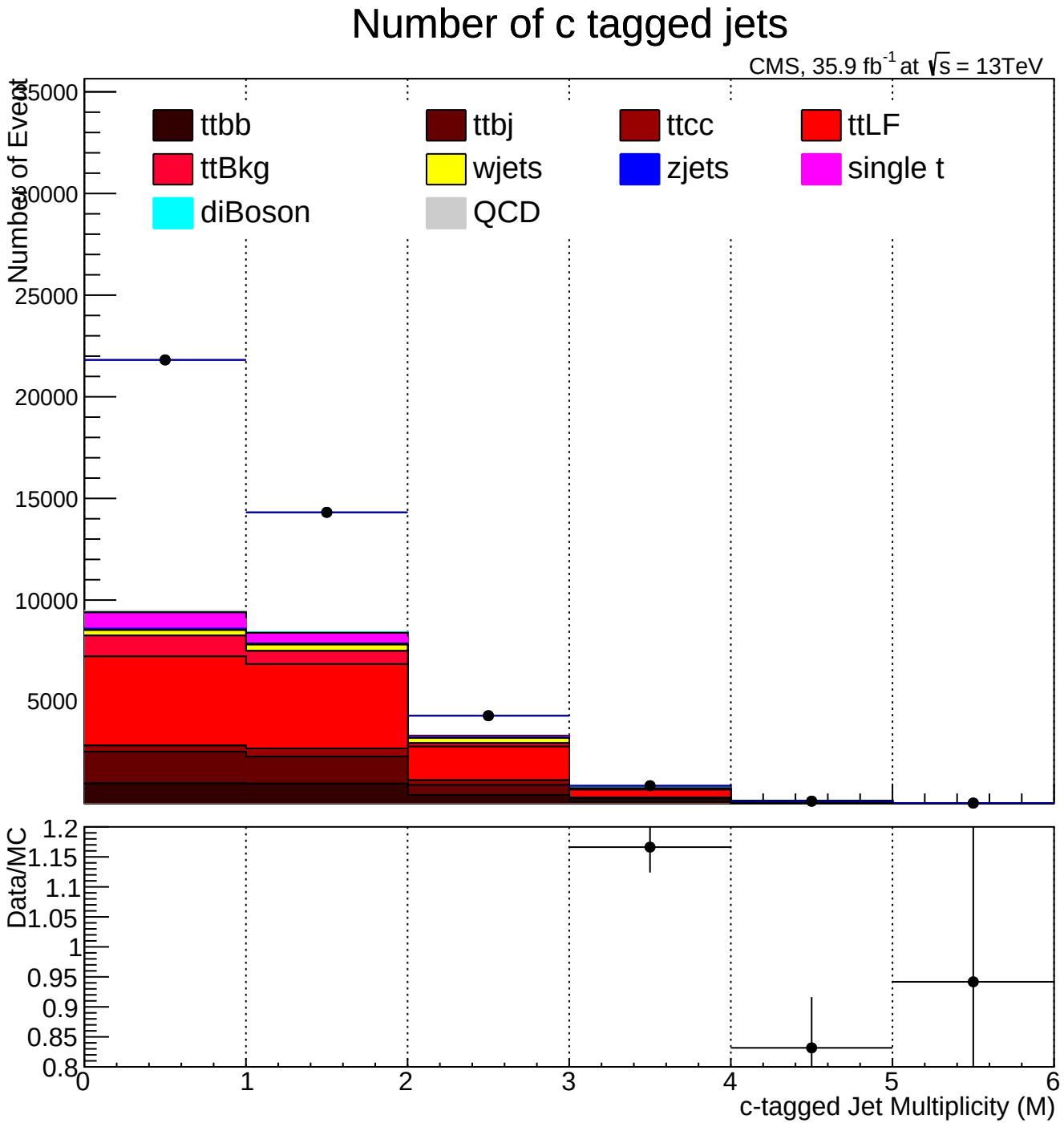

Top Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
350
400
Top Mass from DRFCNHkinfit (Lep) (GeV)

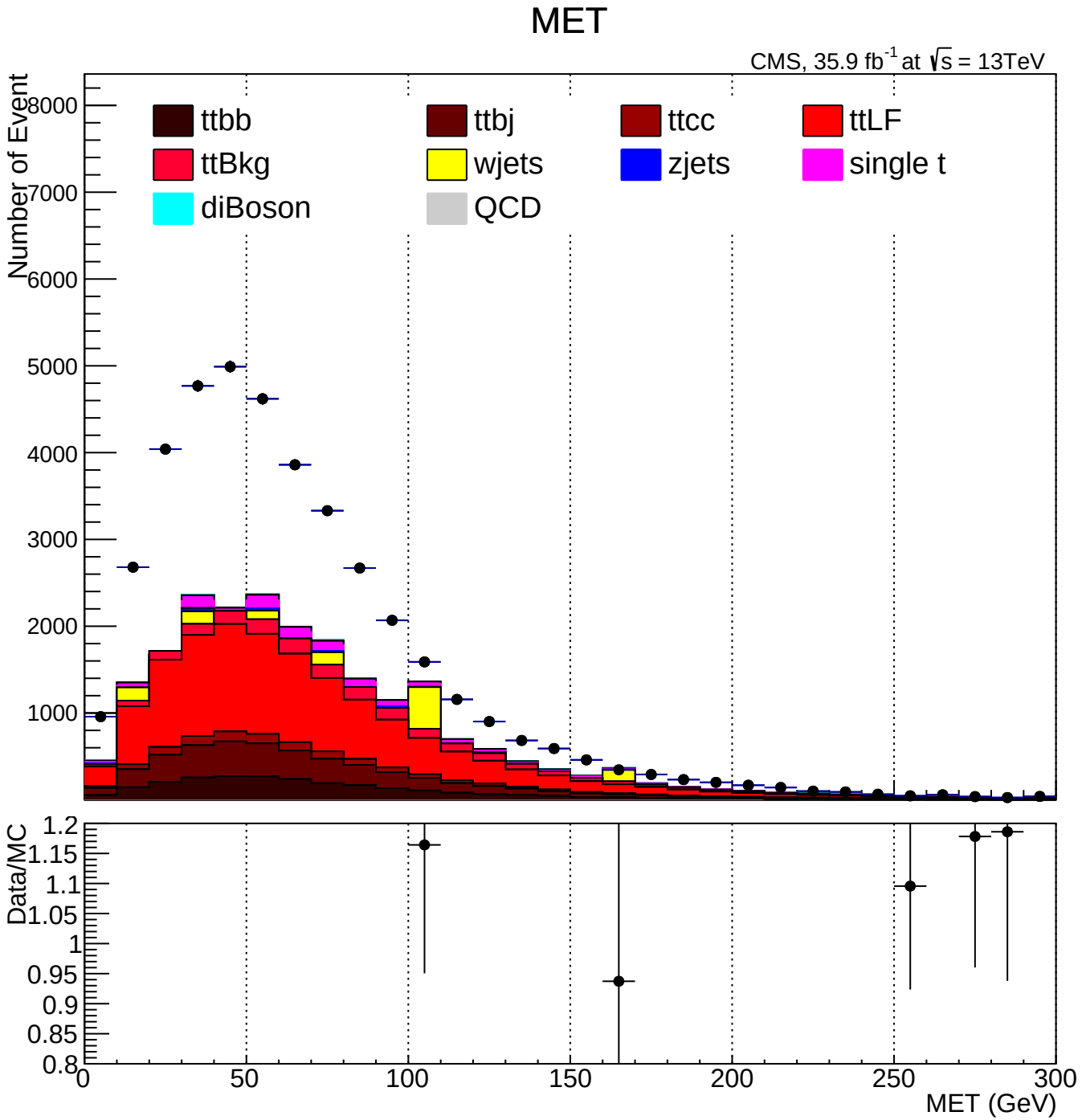

Top mass from Hc/u DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
50000
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
350
400
Top Mass from Hc/u DRFCNHkinfit (GeV)

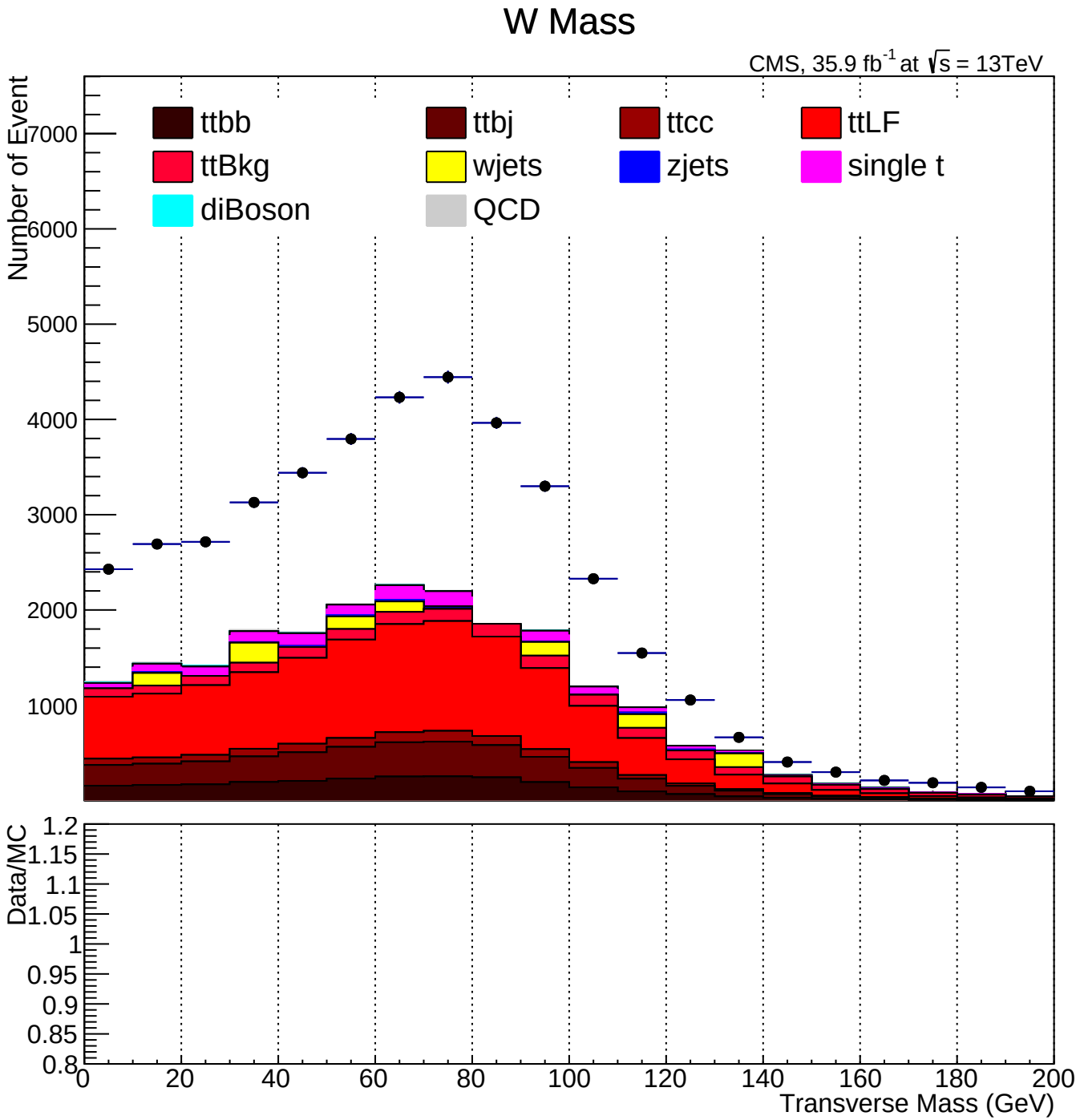

Number of jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Jet Multiplicity

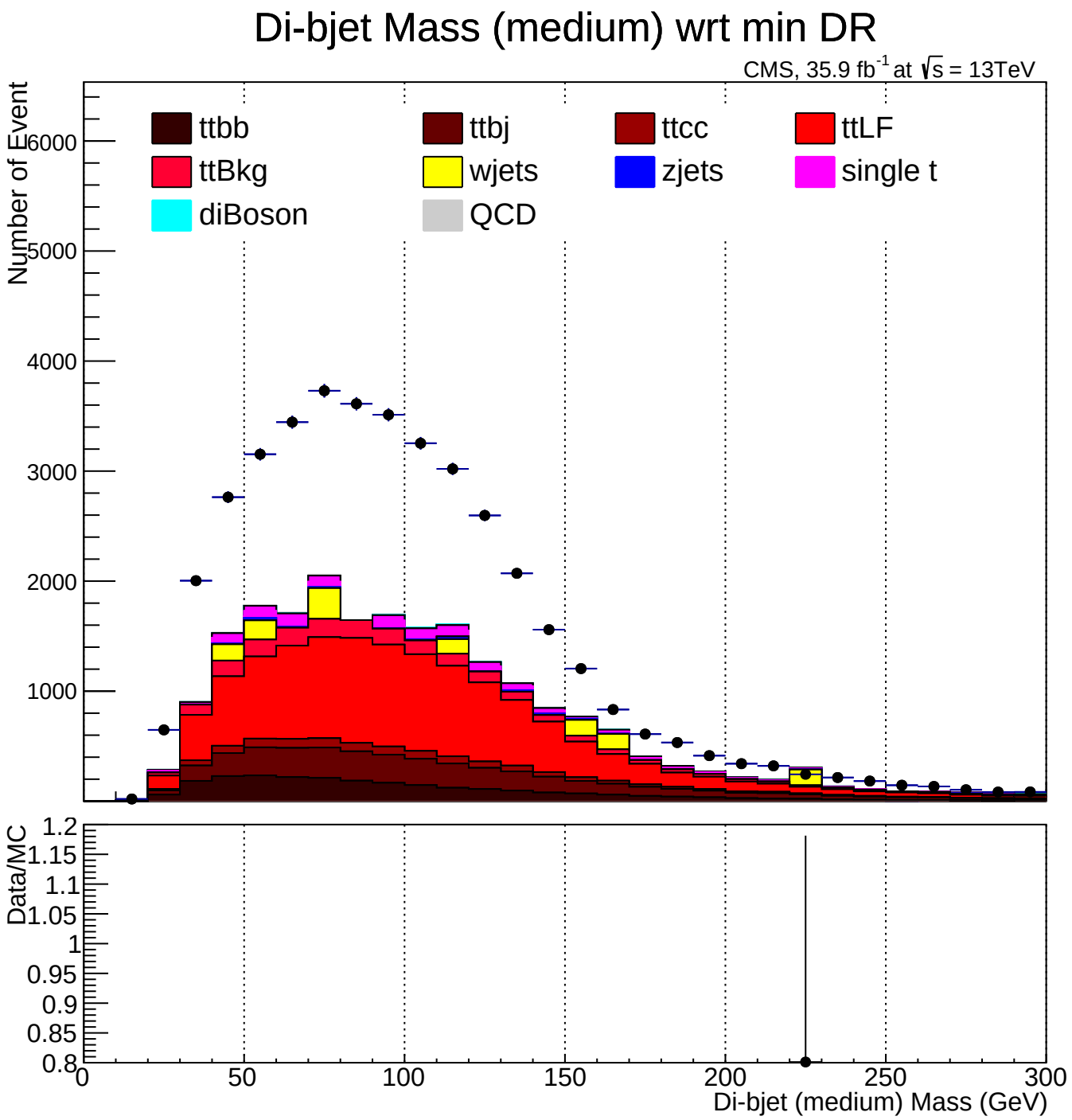

Number of b tagged jets (medium)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
50000
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2M)

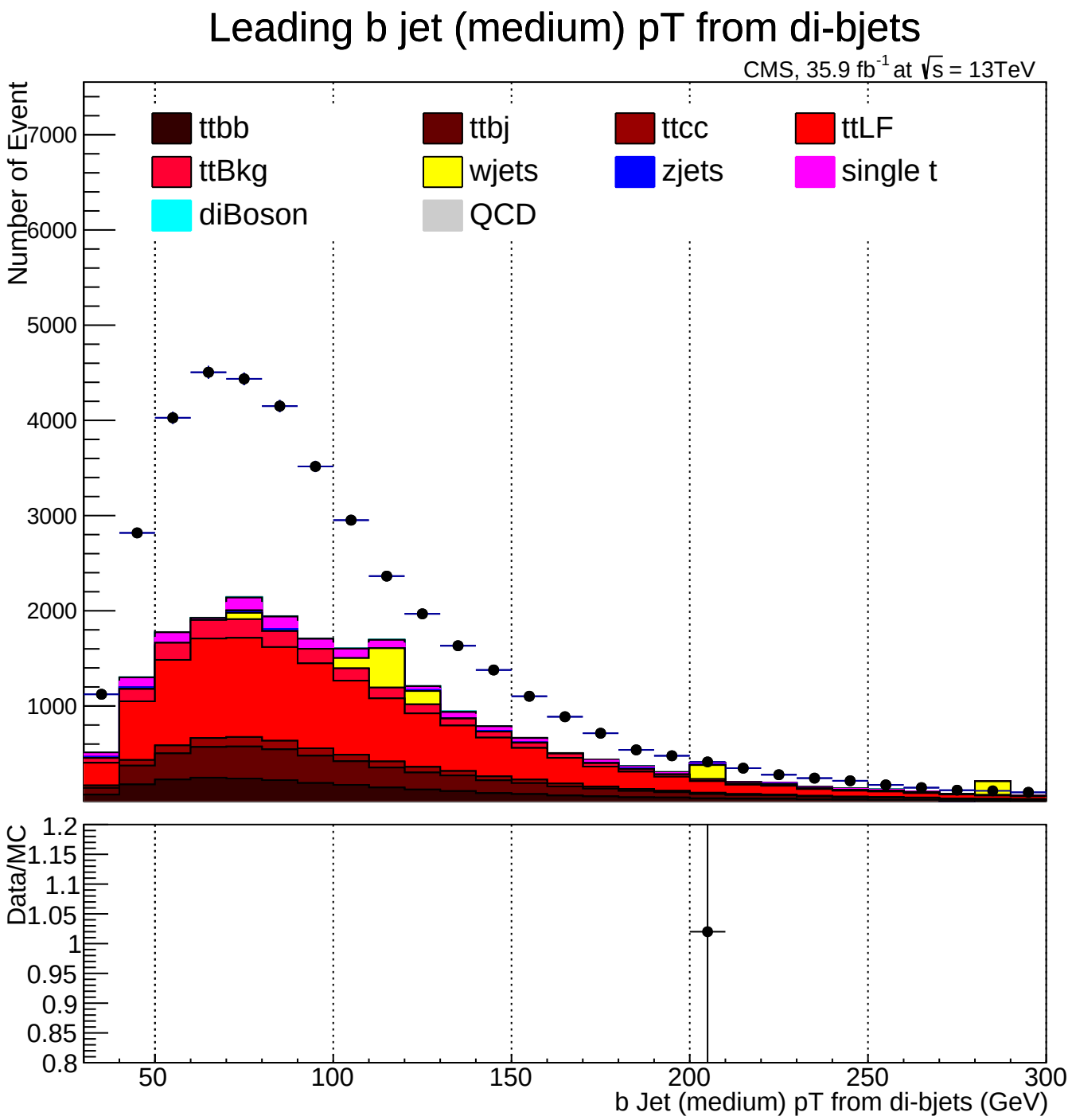

Number of b tagged jets (tight)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b-tagged Jet Multiplicity (CSVv2T)

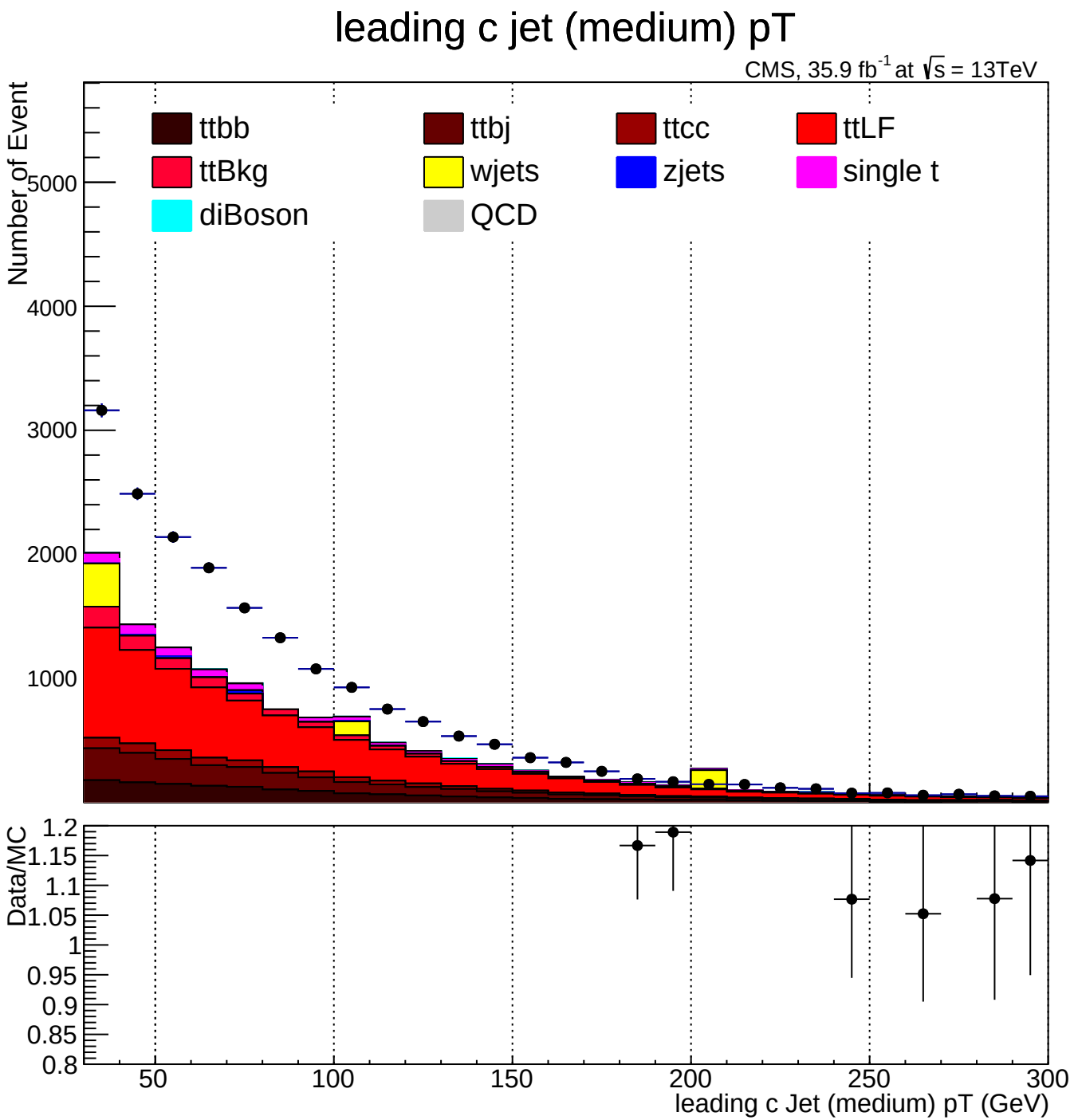

Number of c tagged jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
35000
30000
25000
20000
15000
10000
5000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
c-tagged Jet Multiplicity (M)

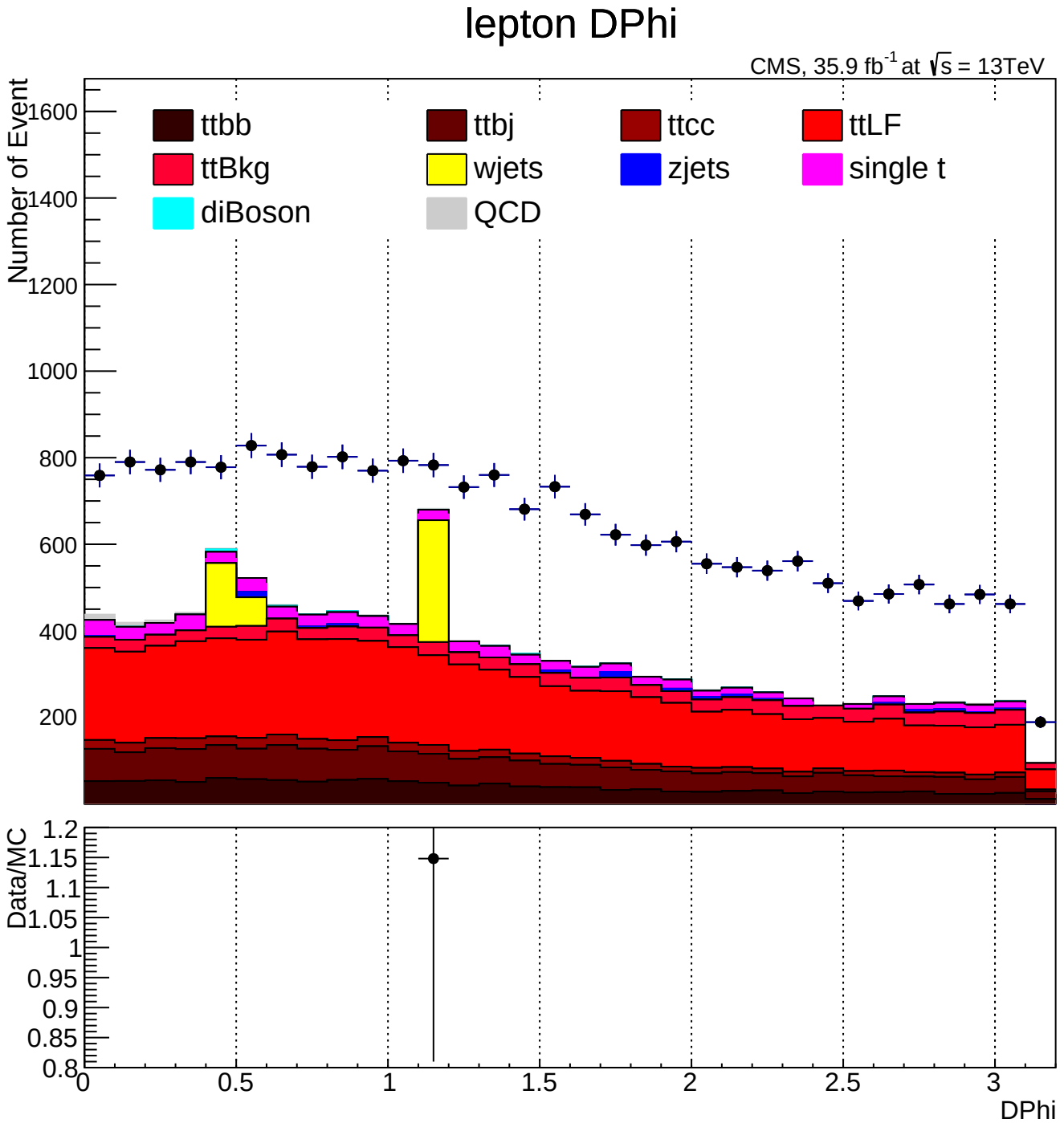

MET
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
8000
7000
6000
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
50
100
150
200
250
300
MET (GeV)

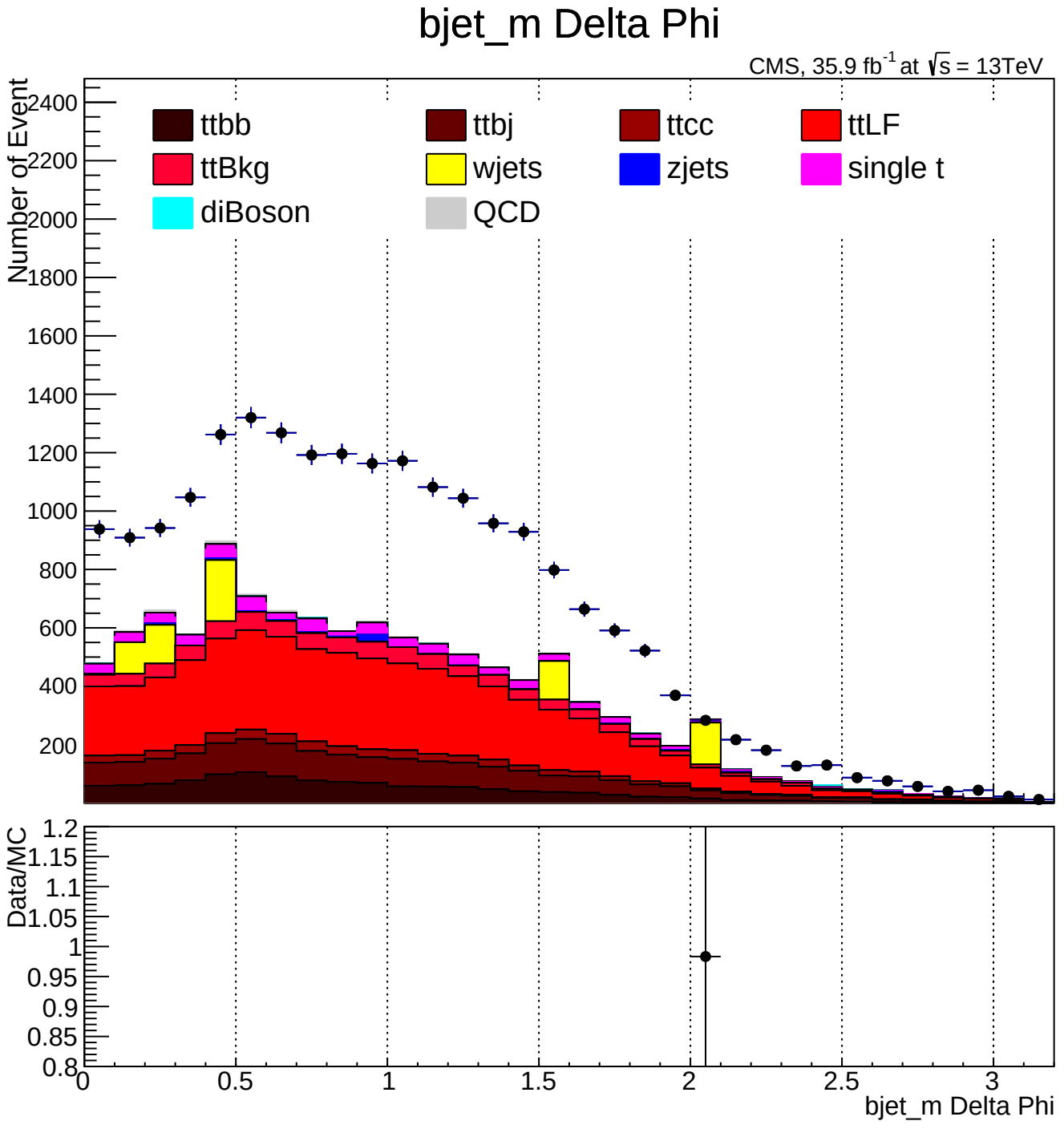

W Mass
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
7000
6000
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
20
40
60
80
100
120
140
160
180
200
Transverse Mass (GeV)

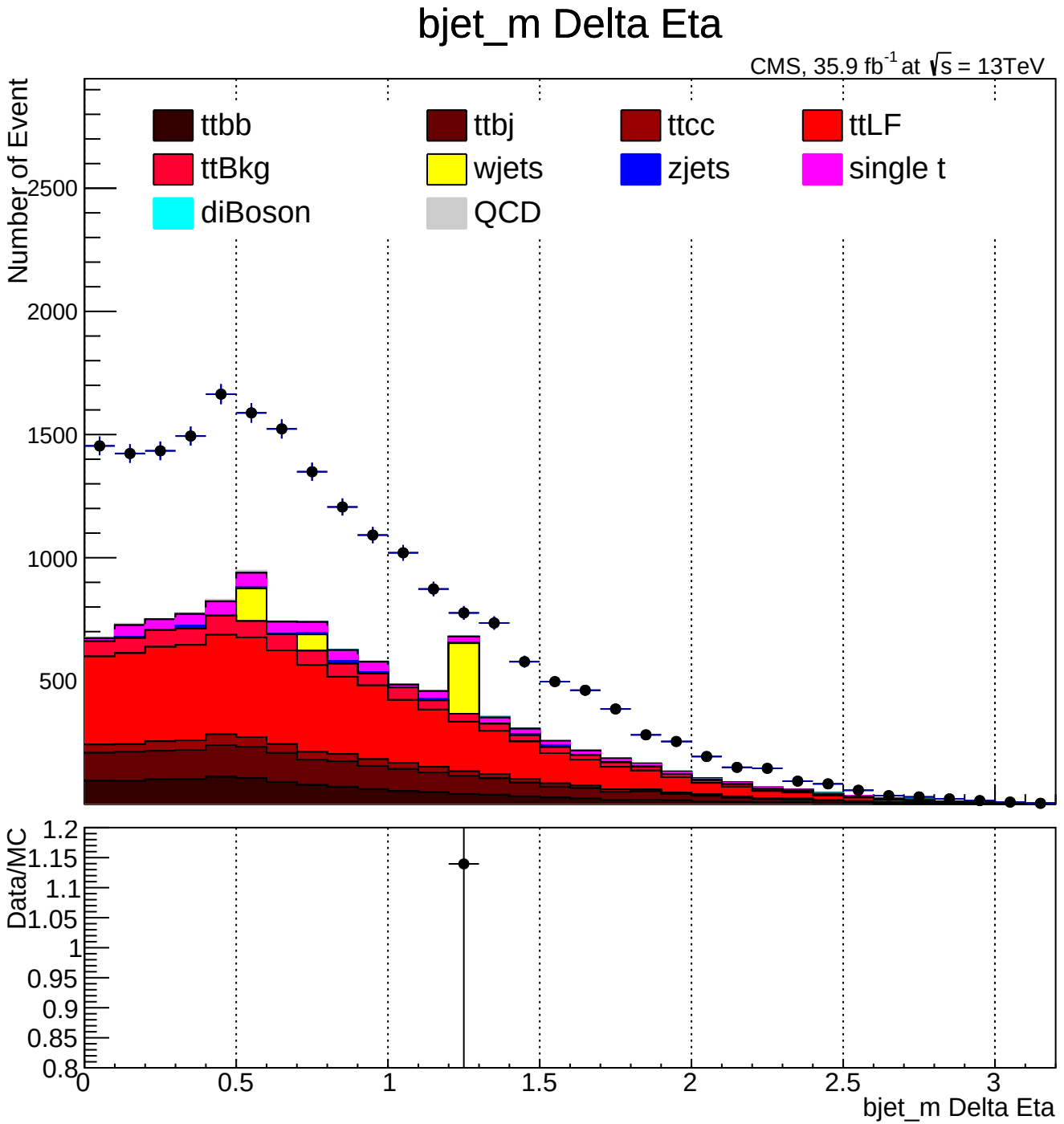

Di-bjet Mass (medium) wrt min DR
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Di-bjet (medium) Mass (GeV)

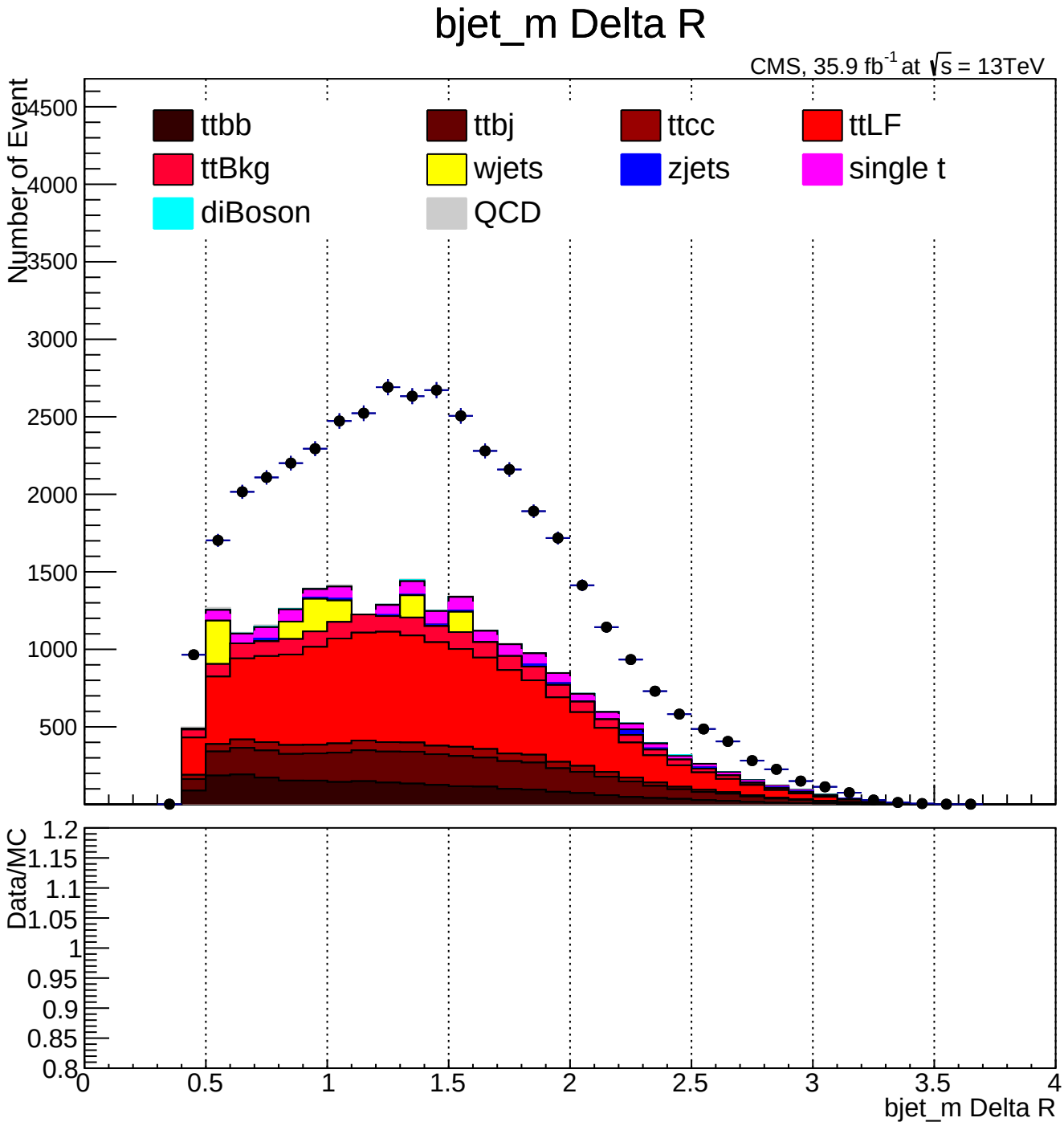

Leading b jet (medium) pT from di-bjets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
7000
6000
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
b Jet (medium) pT from di-bjets (GeV)

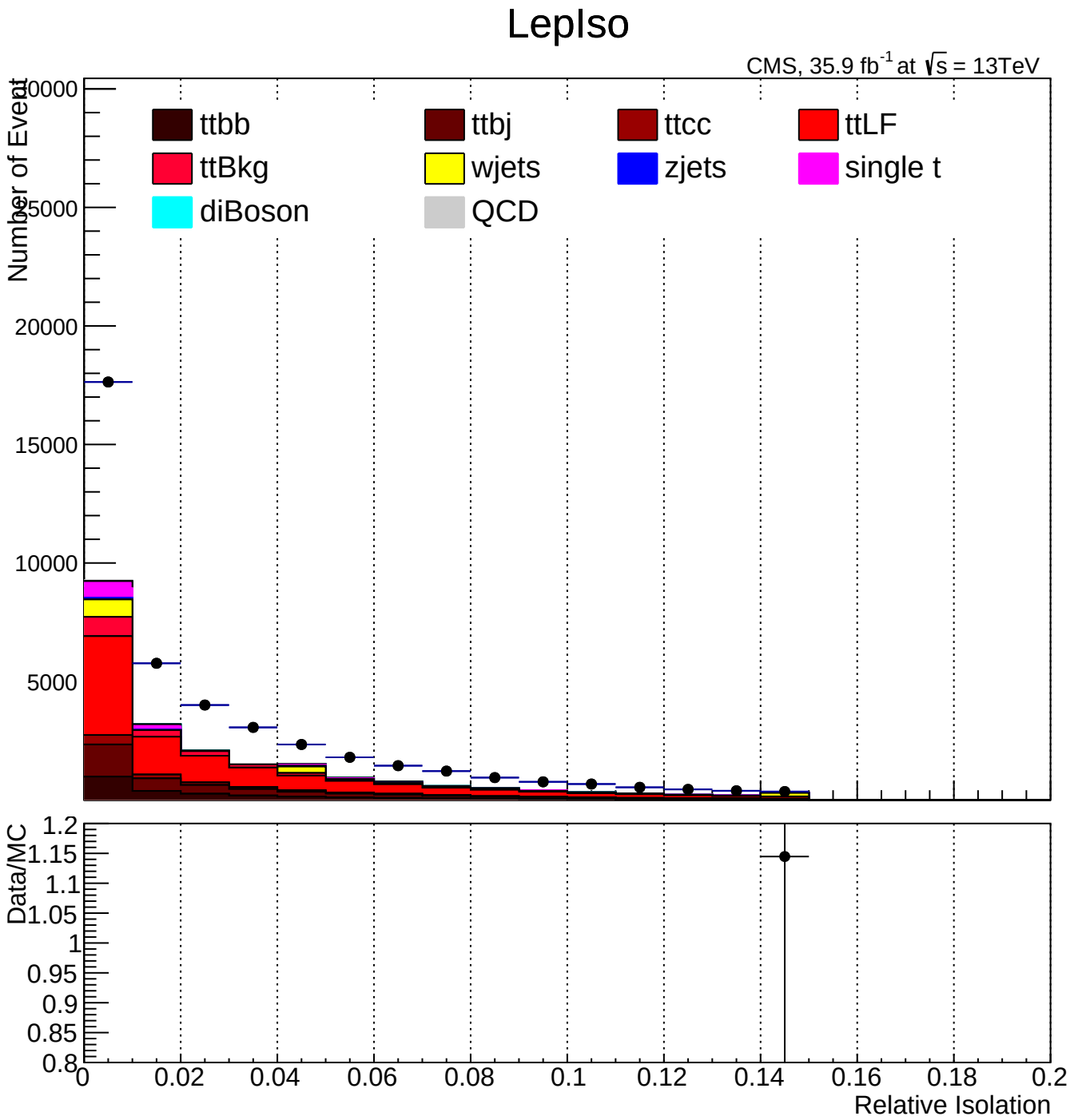

leading c jet (medium) pT
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
leading c Jet (medium) pT (GeV)

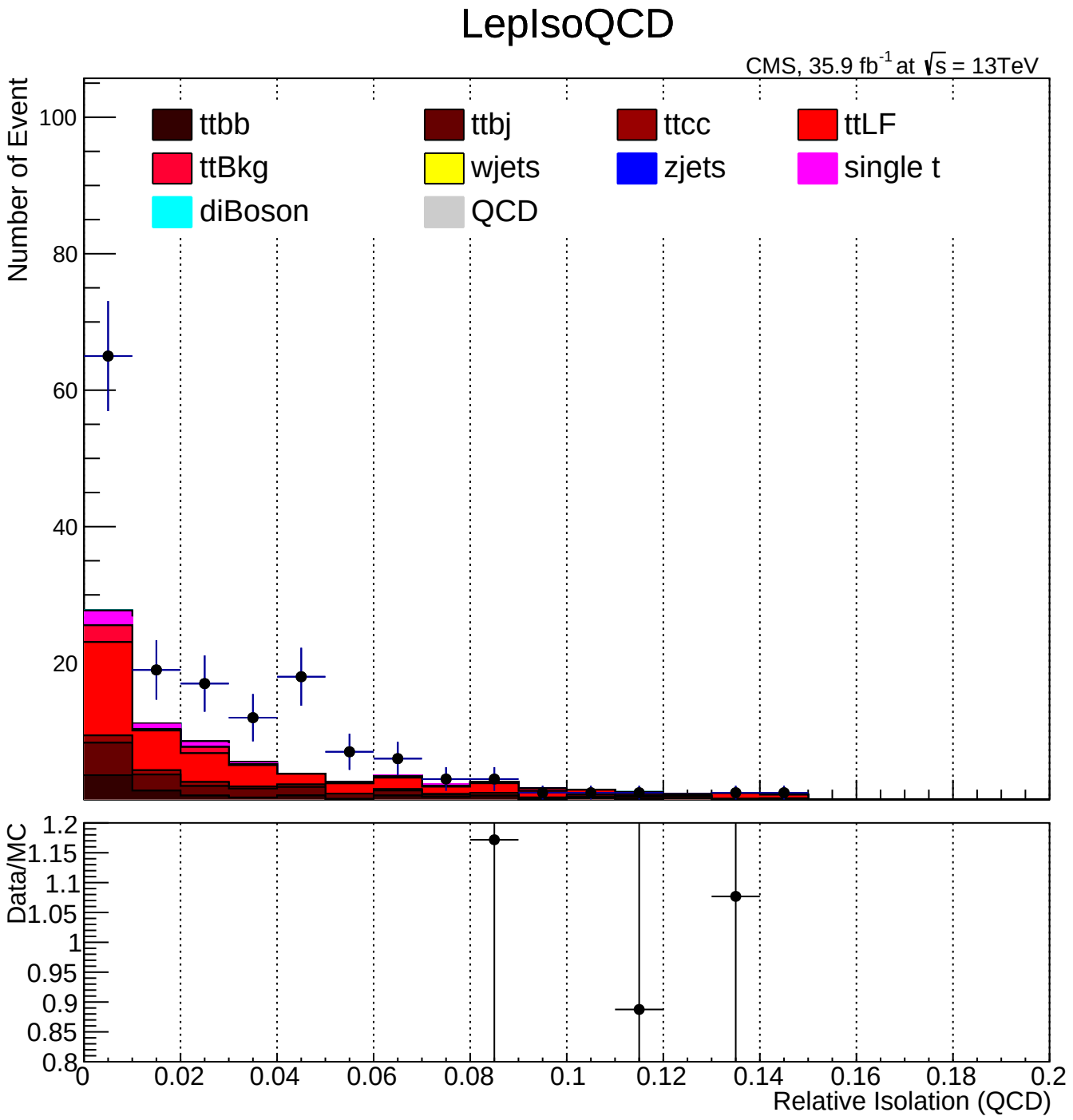

lepton DPhi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
DPhi

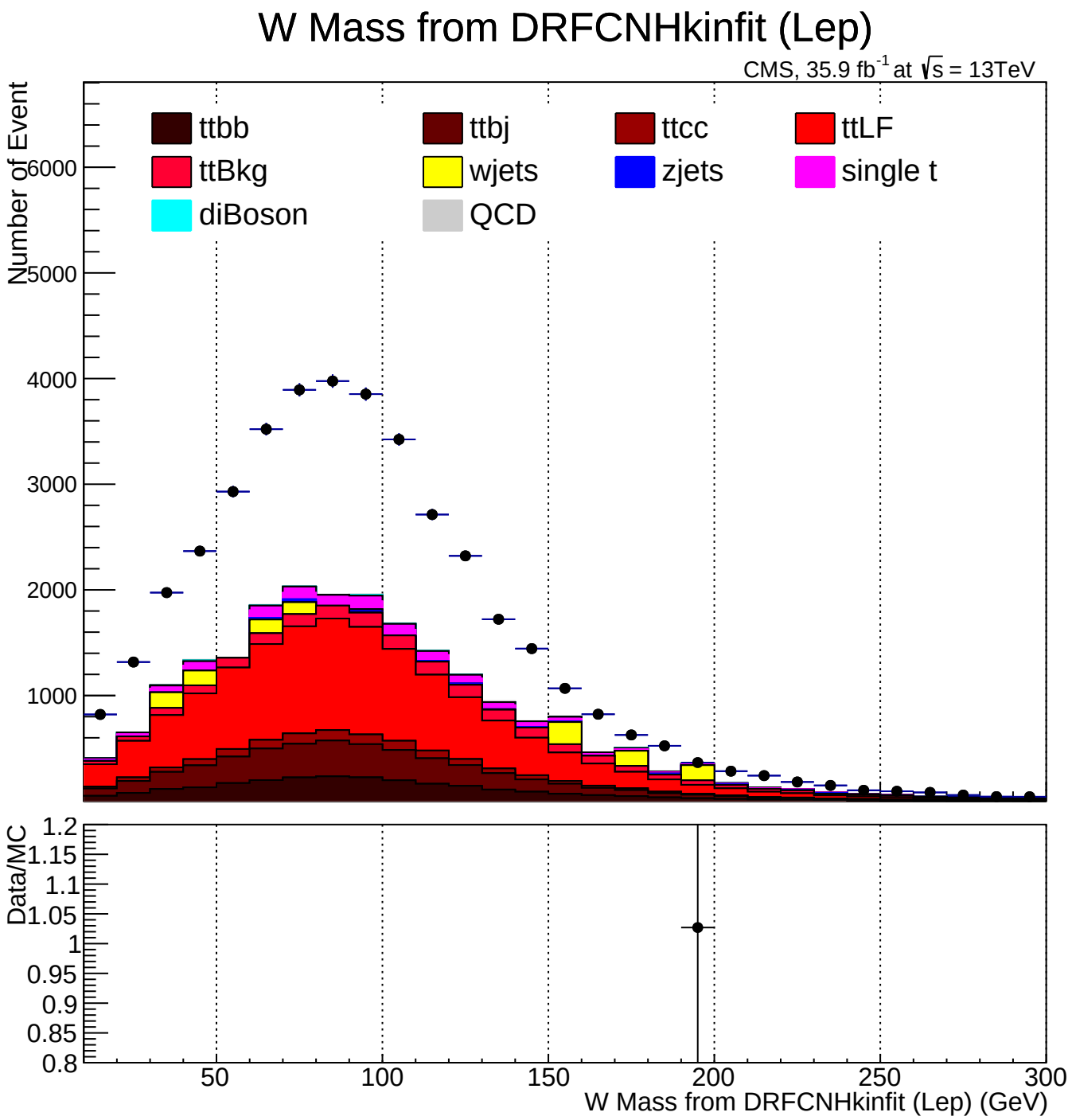

bjet_m Delta Phi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta Phi

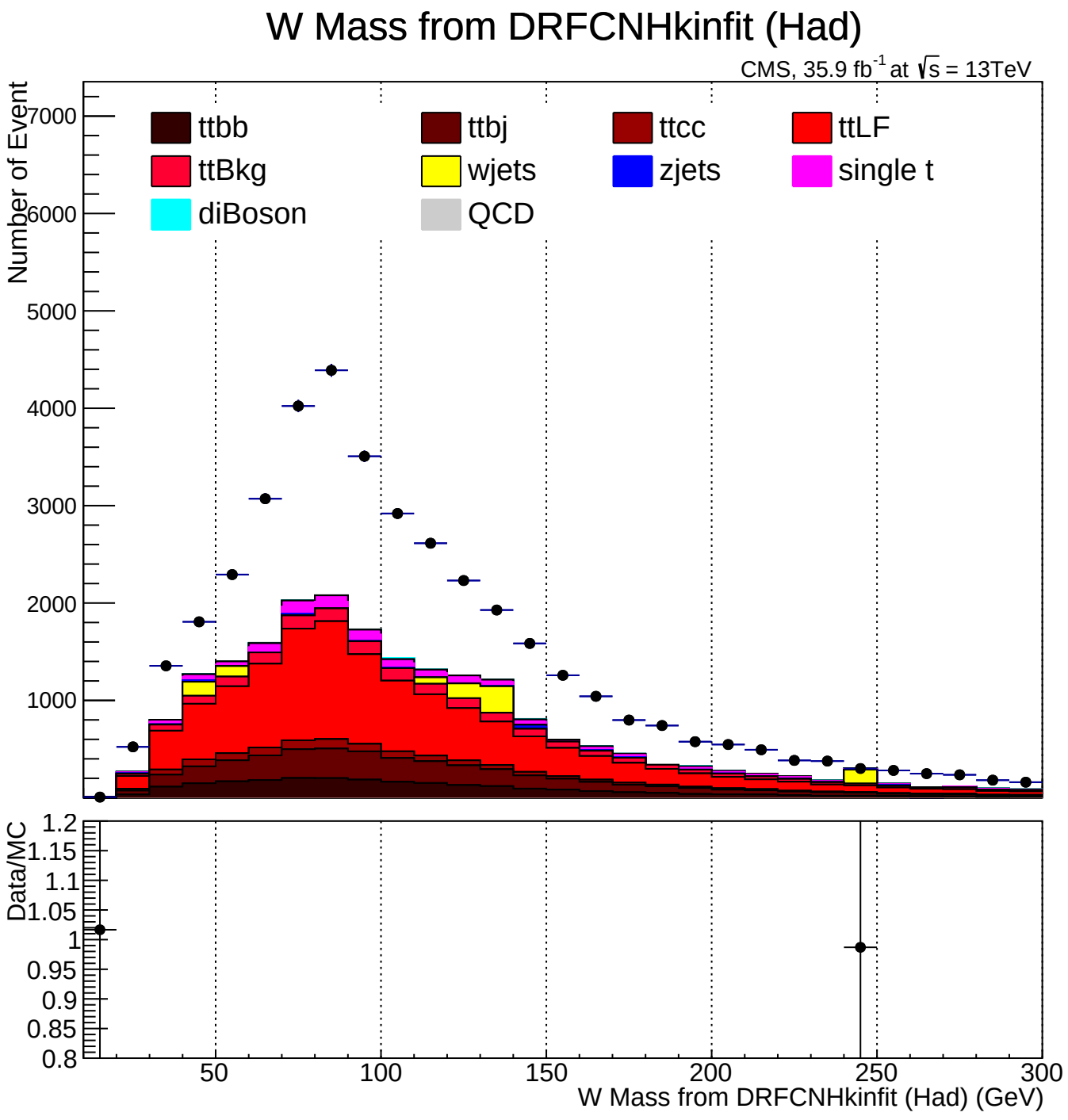

bjet_m Delta Eta
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
2500
2000
1500
1000
500
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Eta

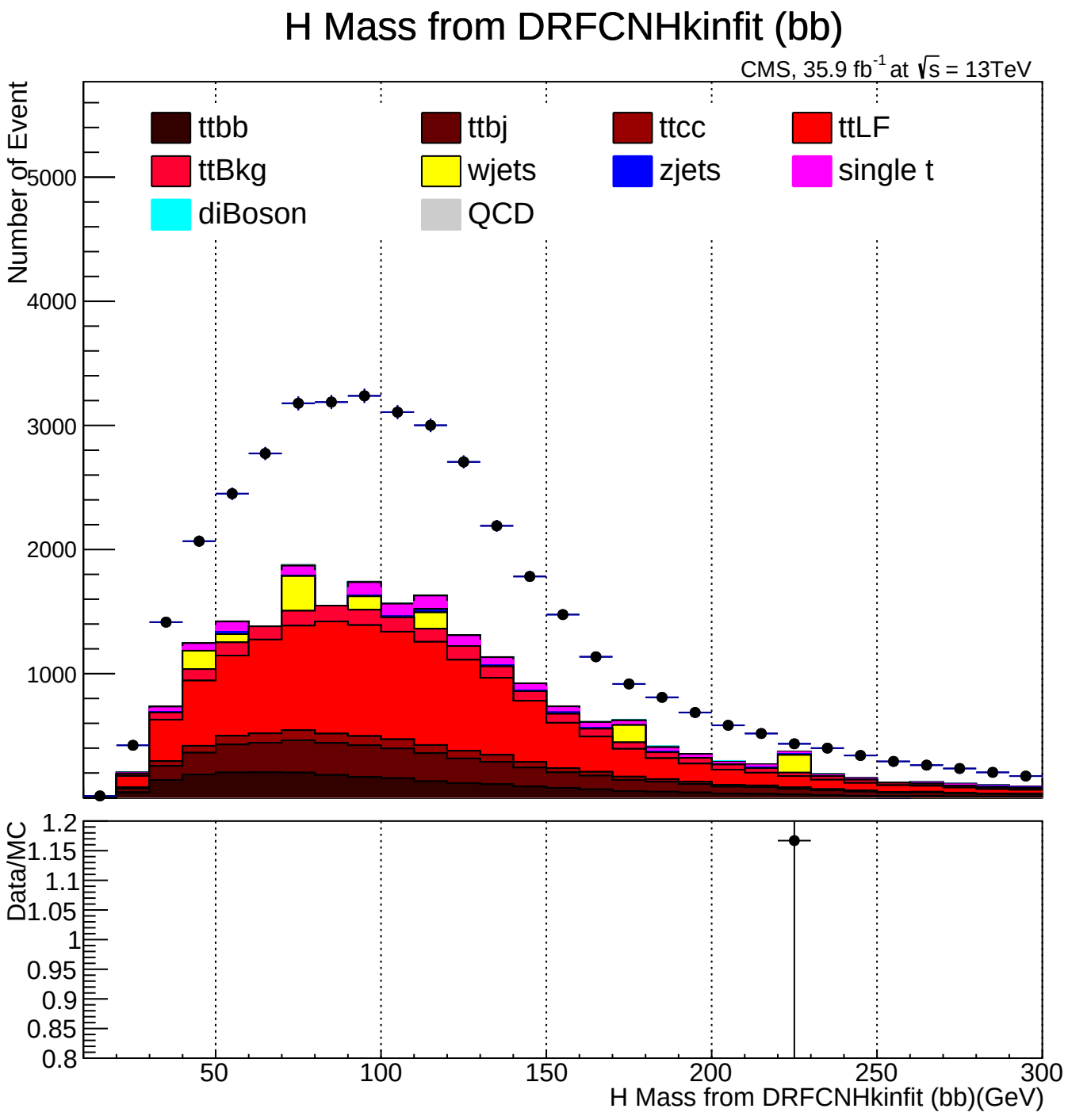

bjet_m Delta R
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta R

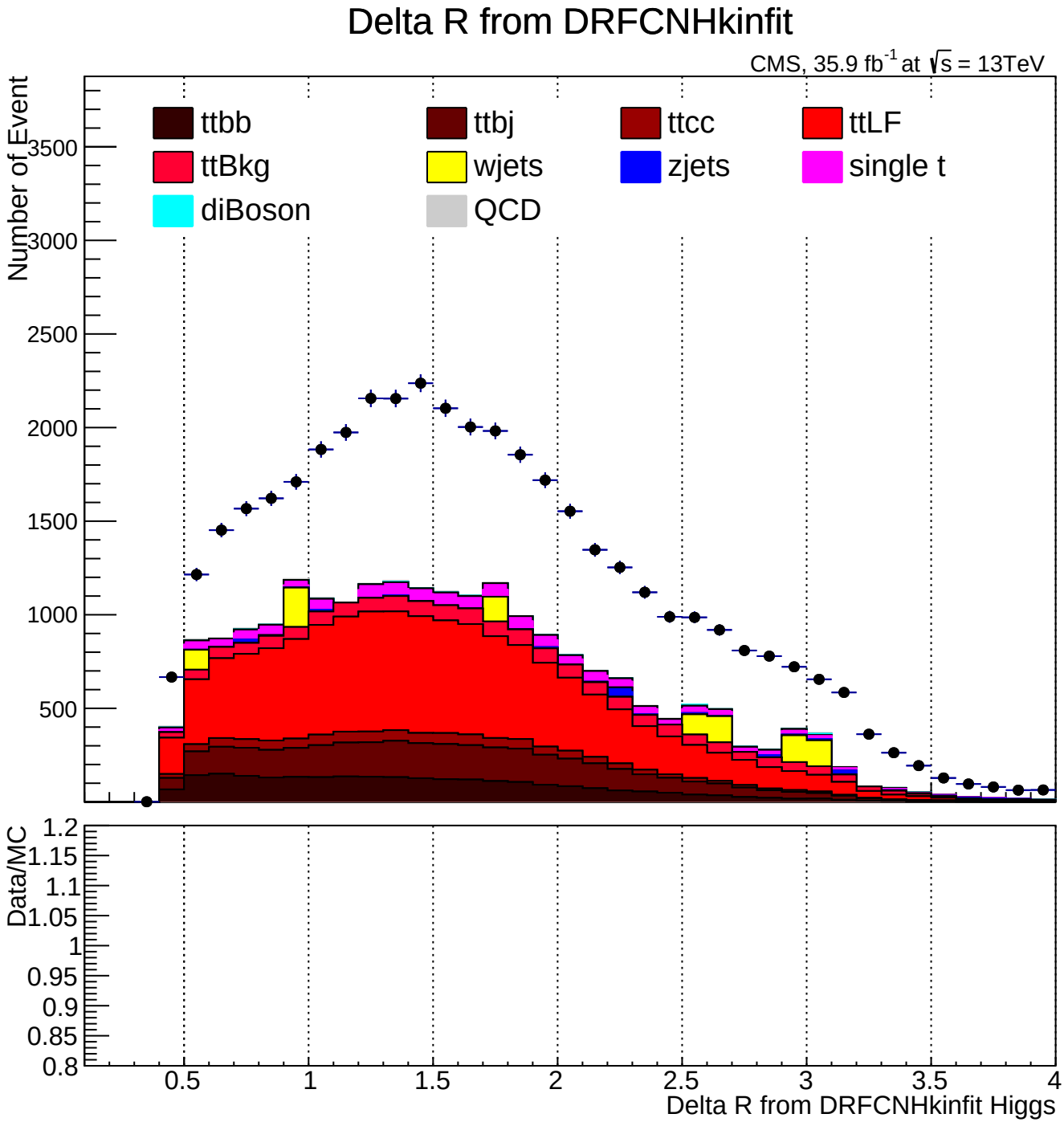

LepIso
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
30000
25000
20000
15000
10000
5000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation

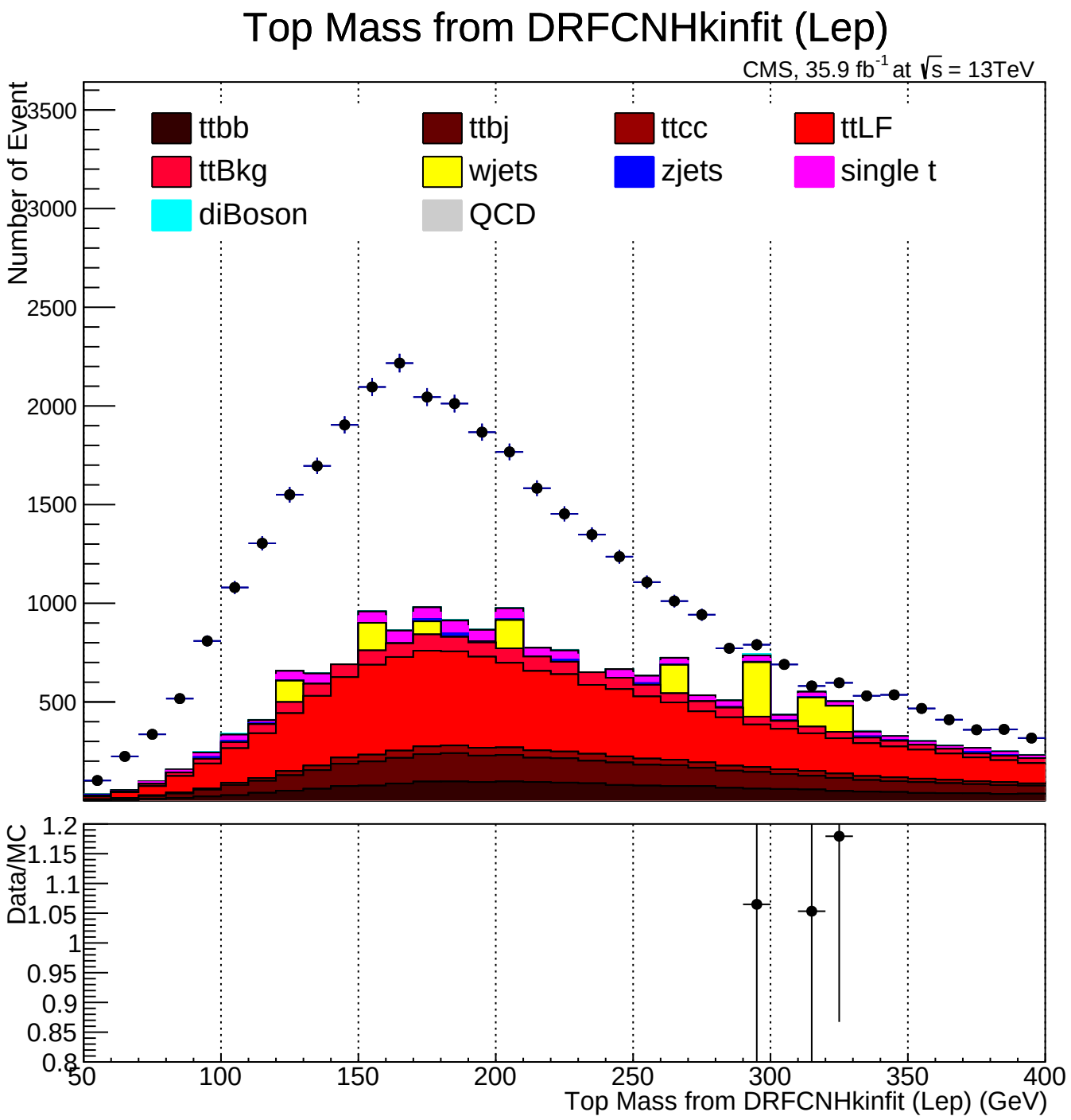

LepIsoQCD
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation (QCD)

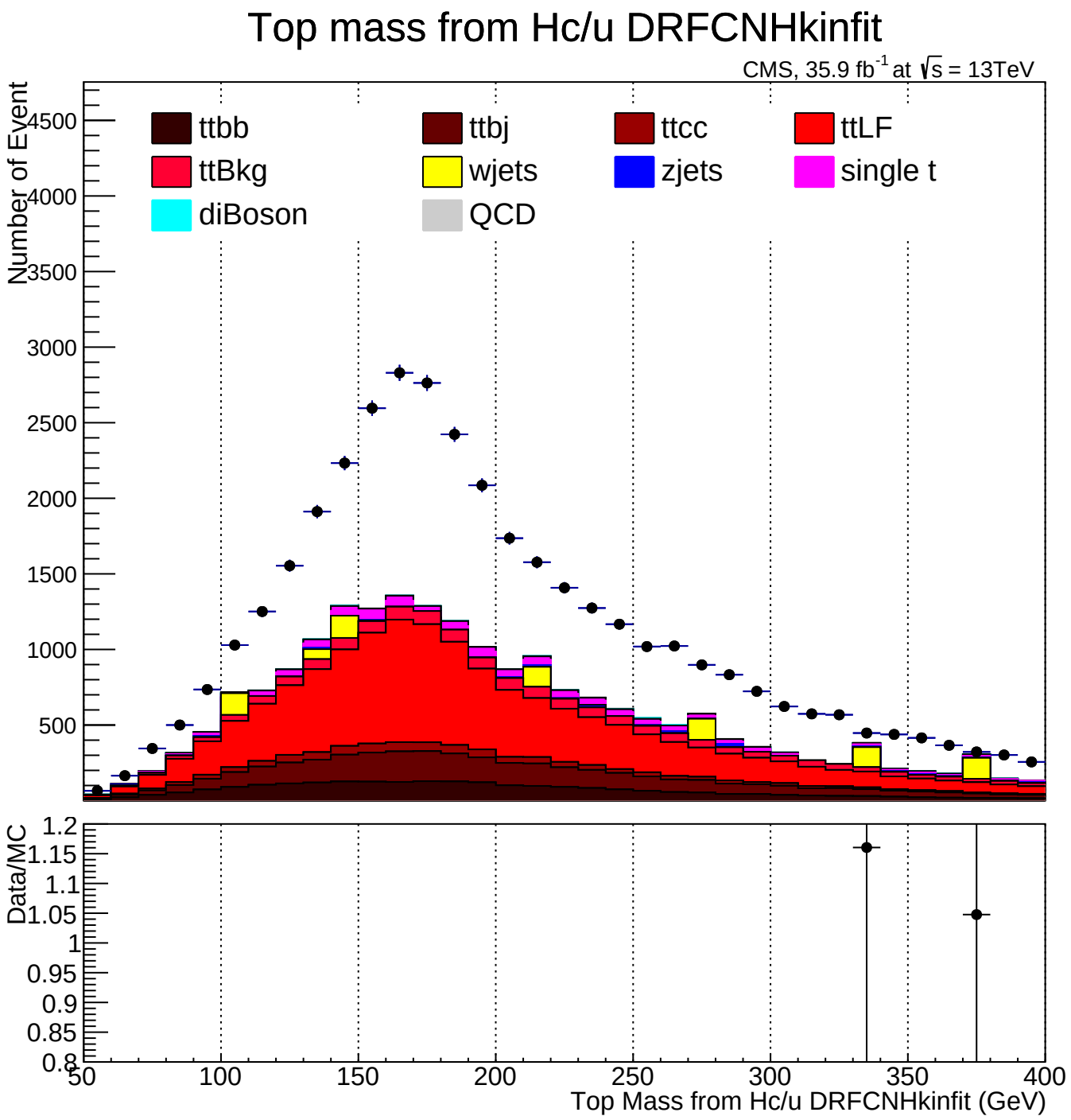

W Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb-1 at √s = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
6000
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
W Mass from DRFCNHkinfit (Lep) (GeV)

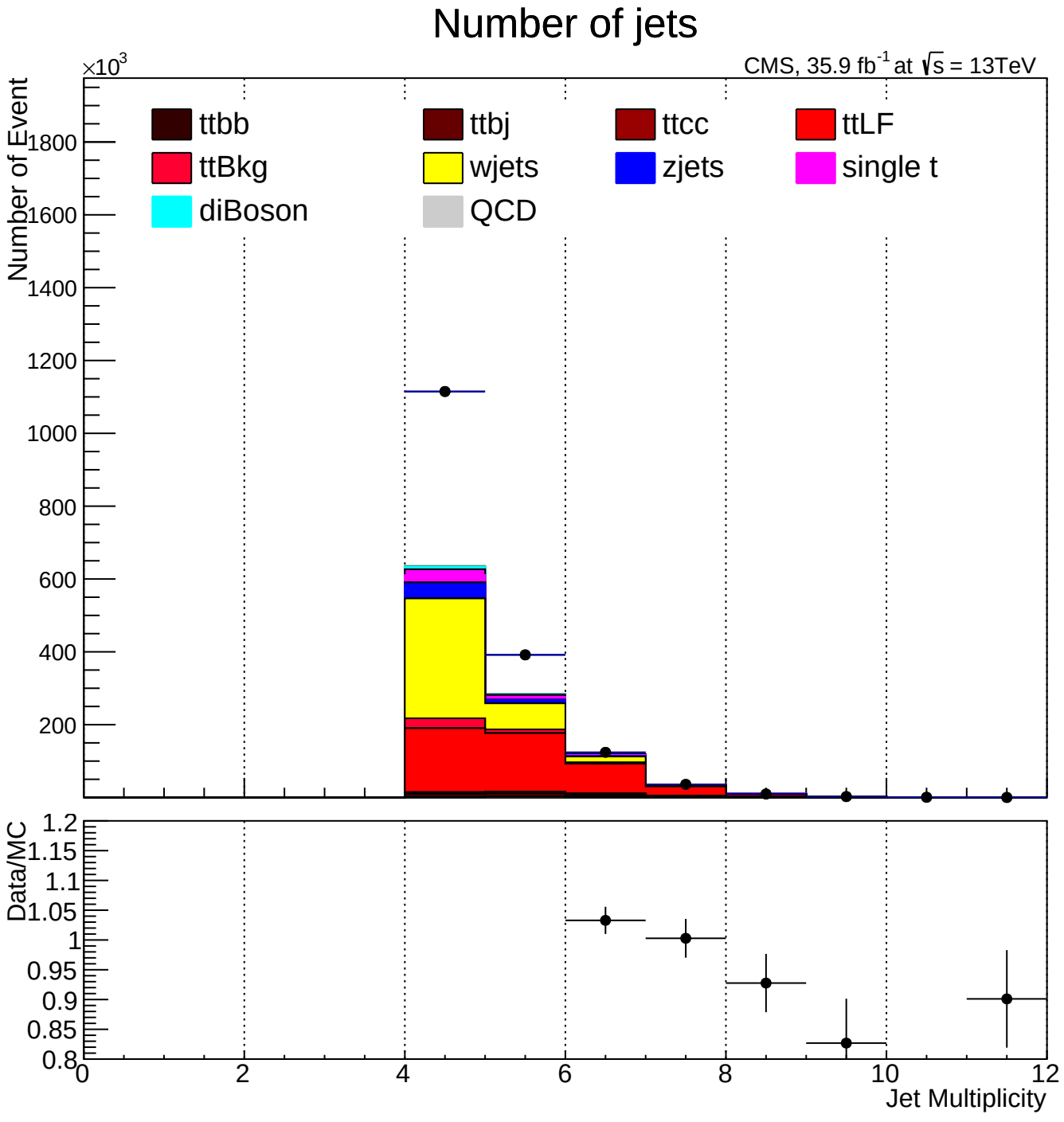

W Mass from DRFCNHkinfit (Had)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
W Mass from DRFCNHkinfit (Had) (GeV)

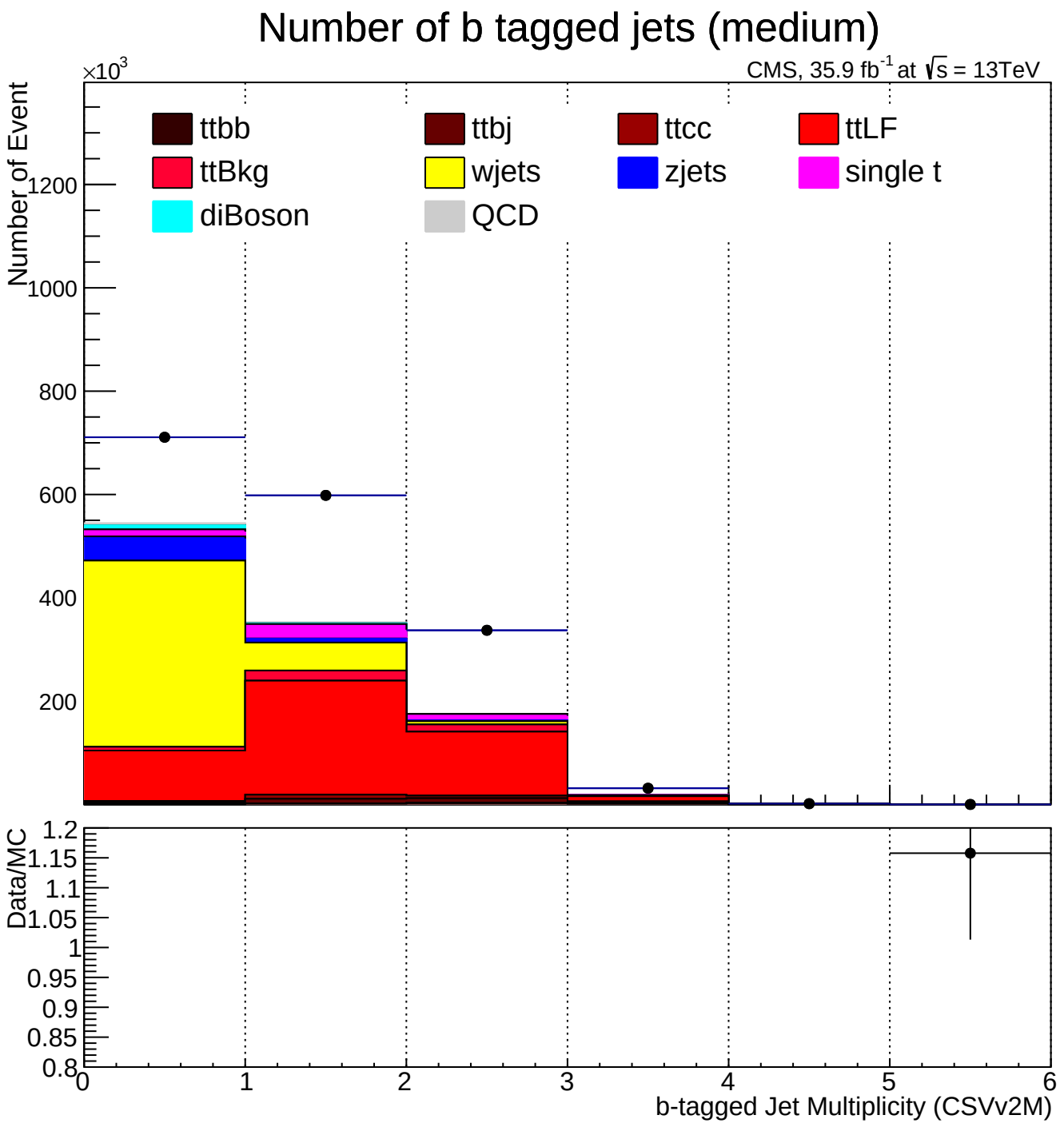

H Mass from DRFCNHkinfit (bb)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
H Mass from DRFCNHkinfit (bb)(GeV)

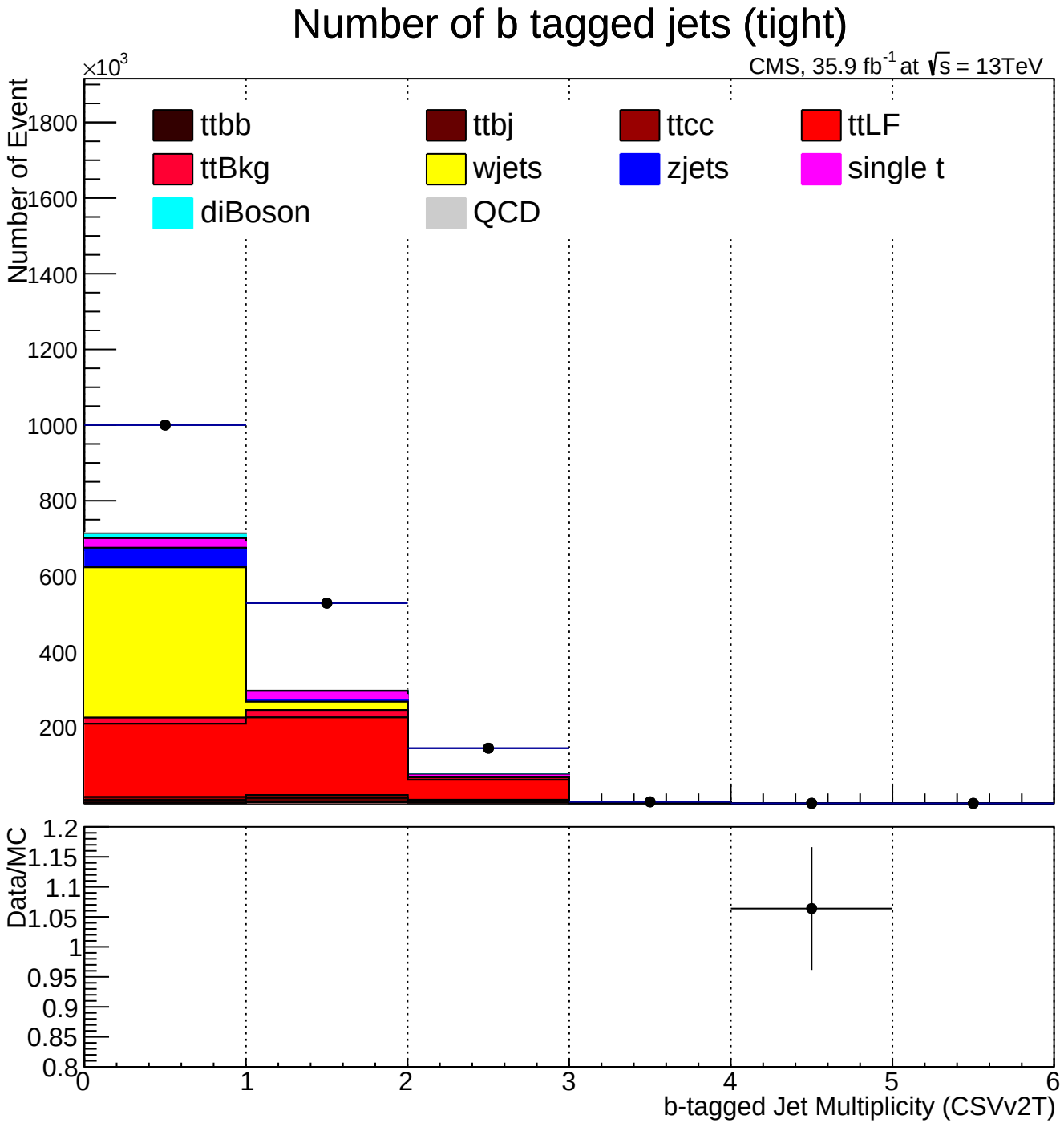

Delta R from DRFCNHkinfit
CMS, 35.9 fb-1 at √s = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Delta R from DRFCNHkinfit Higgs

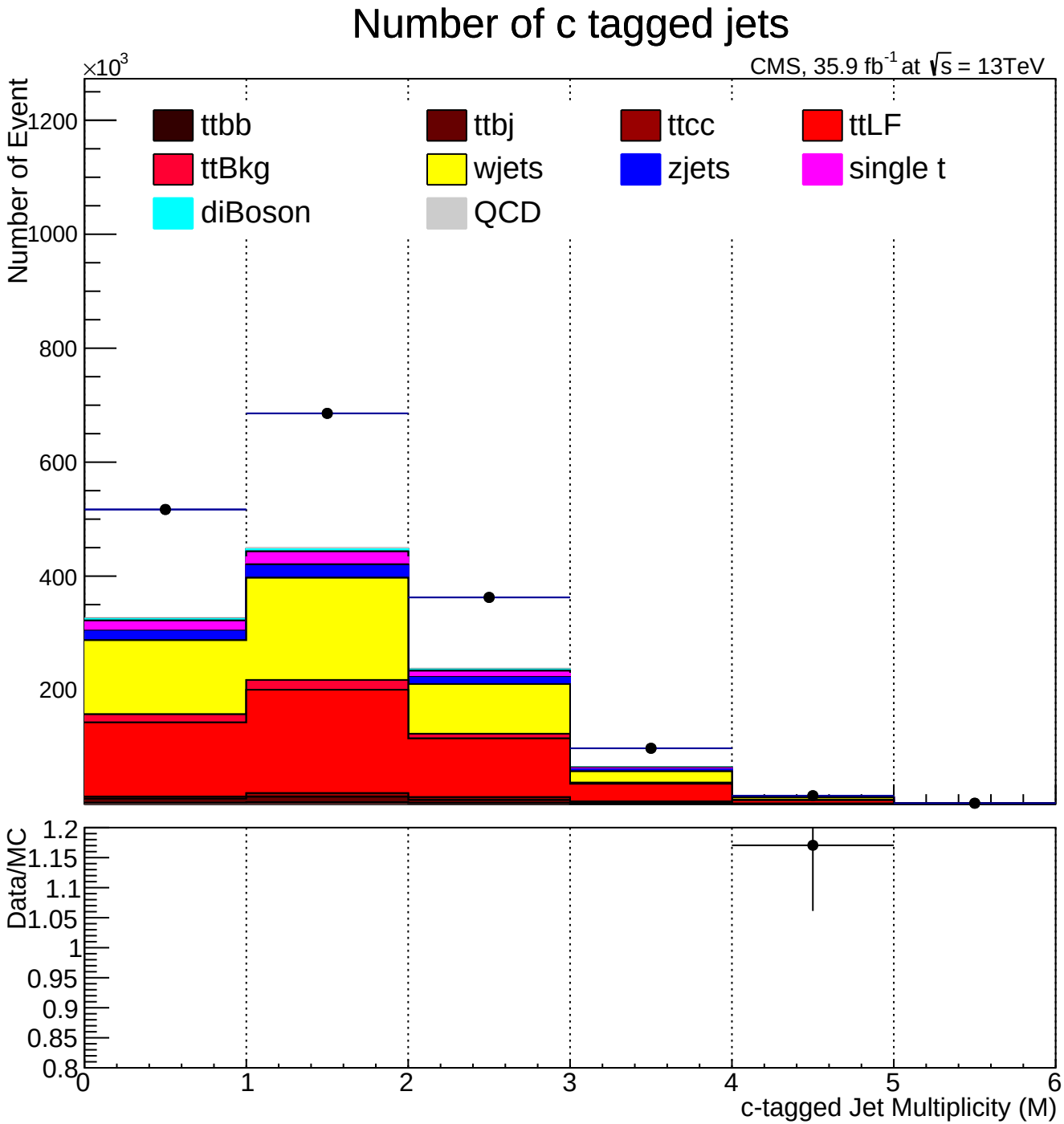

Top Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Top Mass from DRFCNHkinfit (Lep) (GeV)

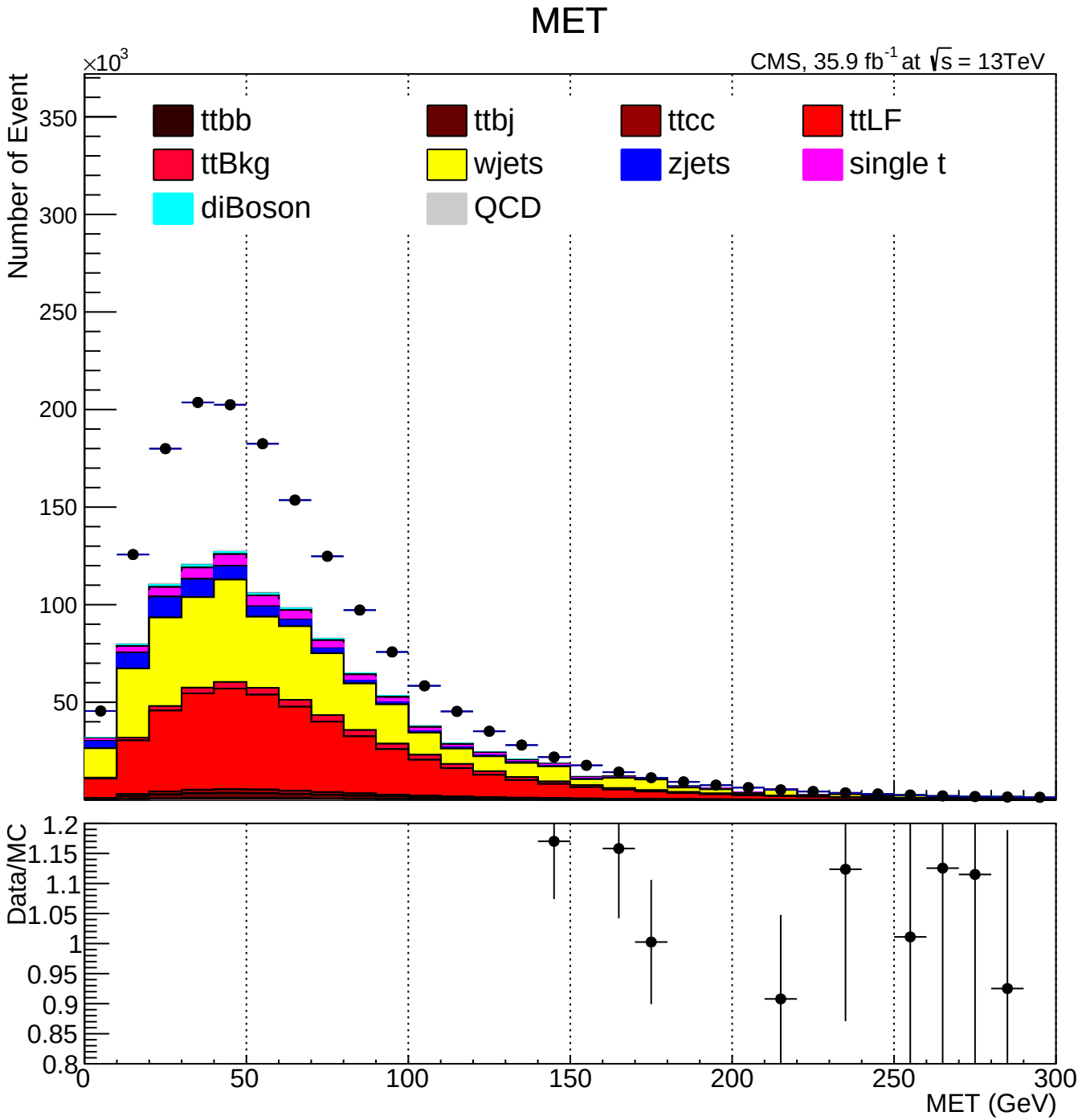

Top mass from Hc/u DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Top Mass from Hc/u DRFCNHkinfit (GeV)

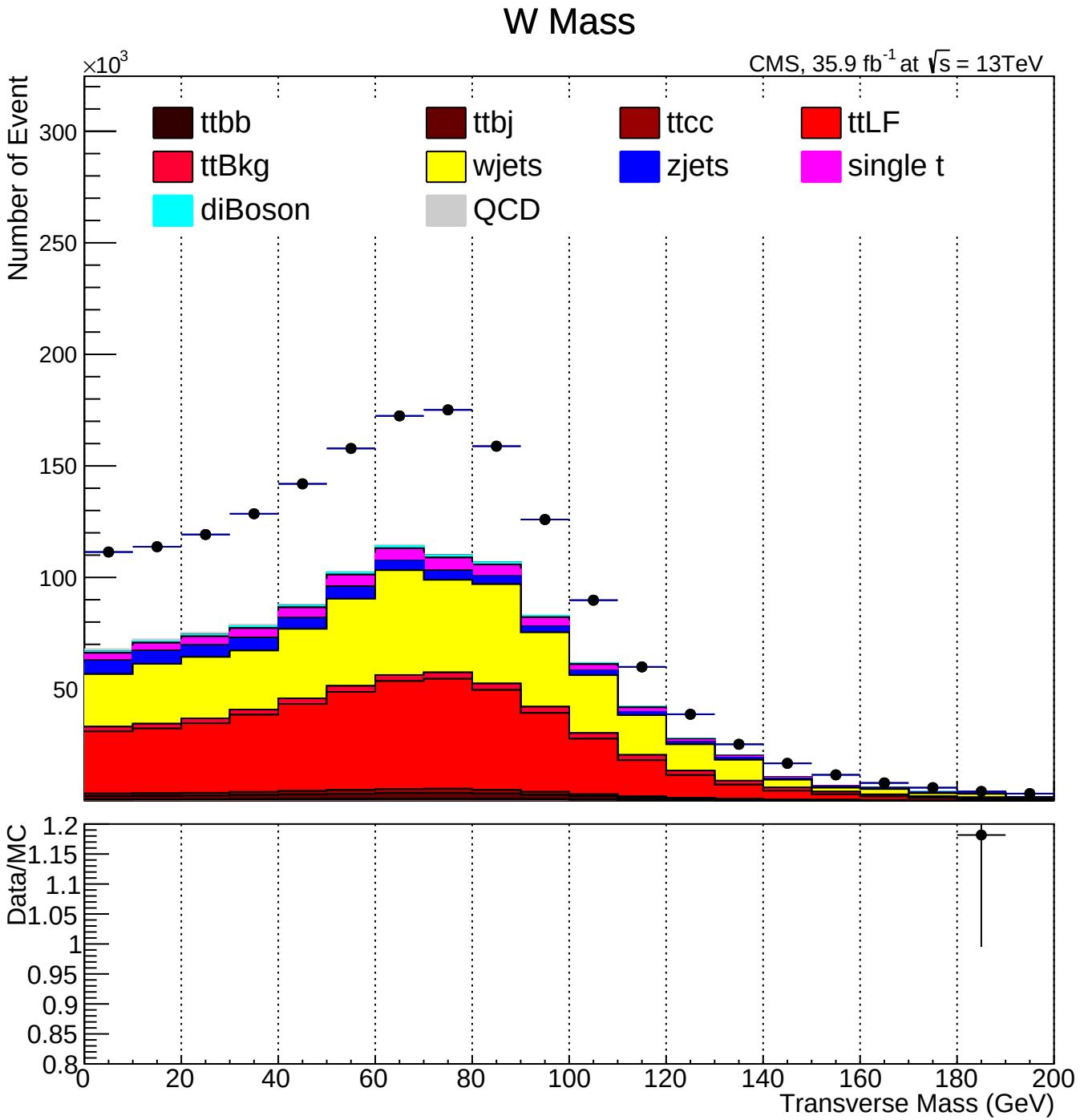

Number of jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Jet Multiplicity

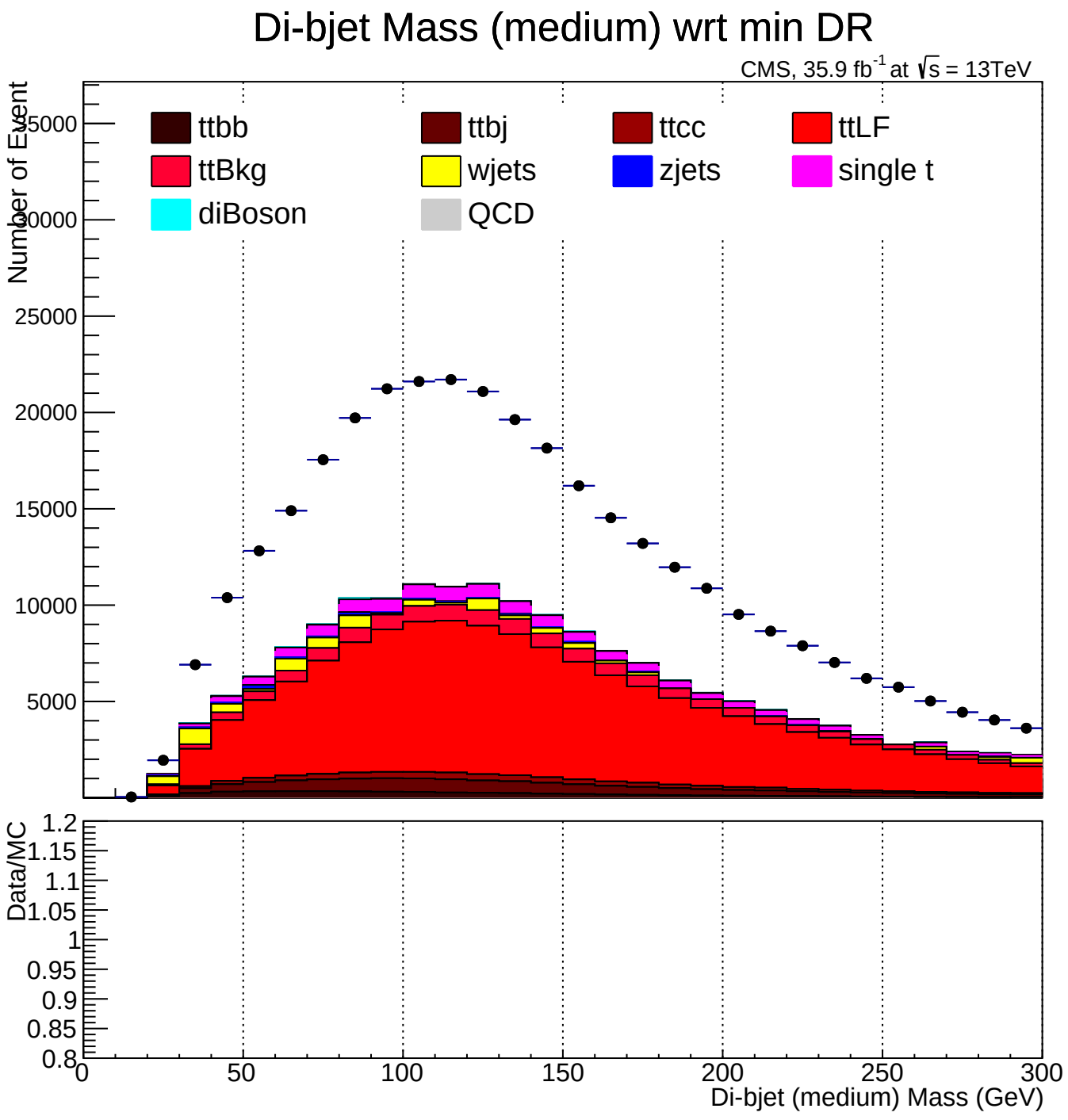

Number of b tagged jets (medium)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b-tagged Jet Multiplicity (CSVv2M)

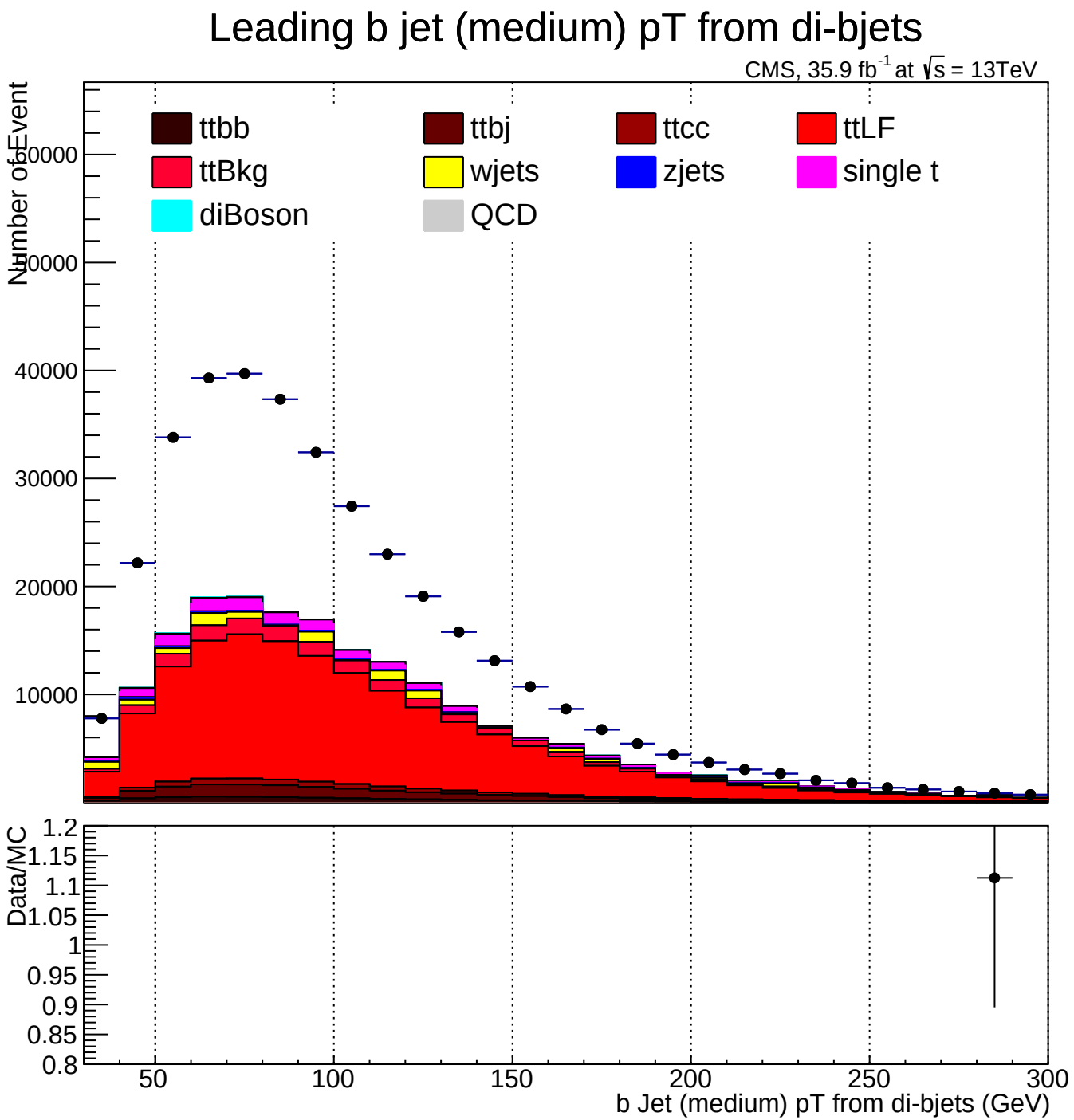

Number of b tagged jets (tight)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
1800
1600
1400
1200
1000
800
600
400
200
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2T)

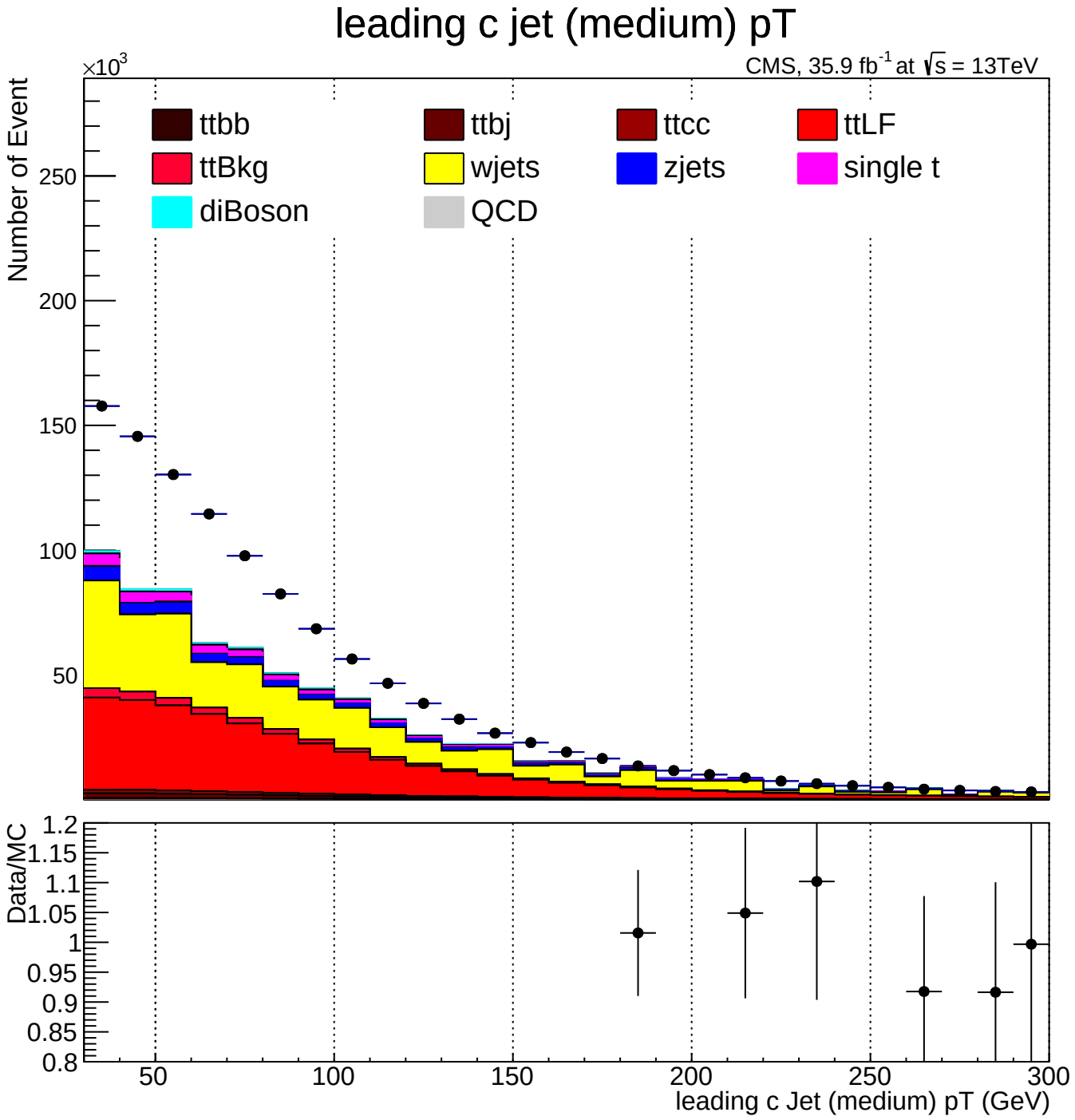

Number of c tagged jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
c-tagged Jet Multiplicity (M)

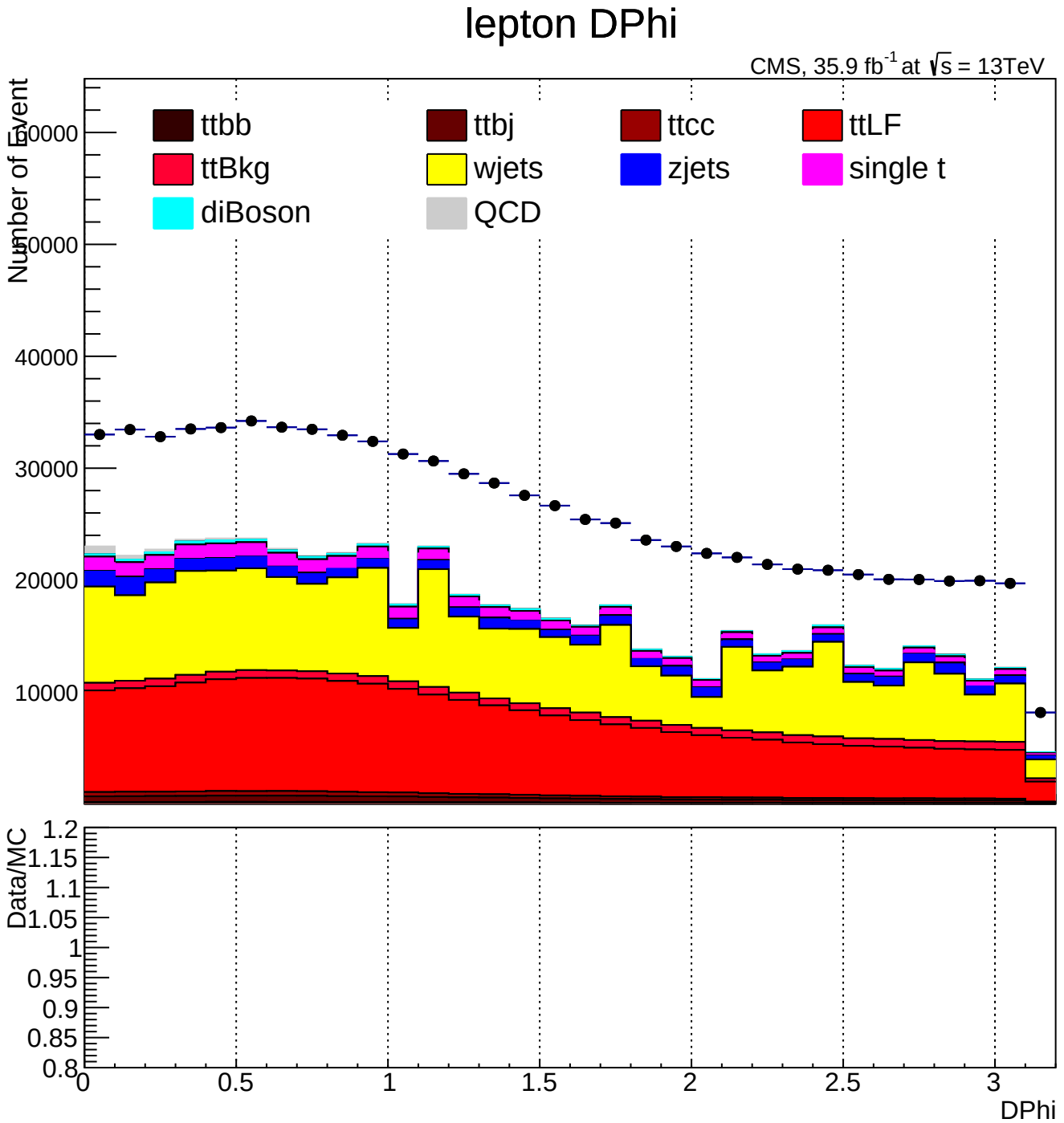

MET
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
MET (GeV)

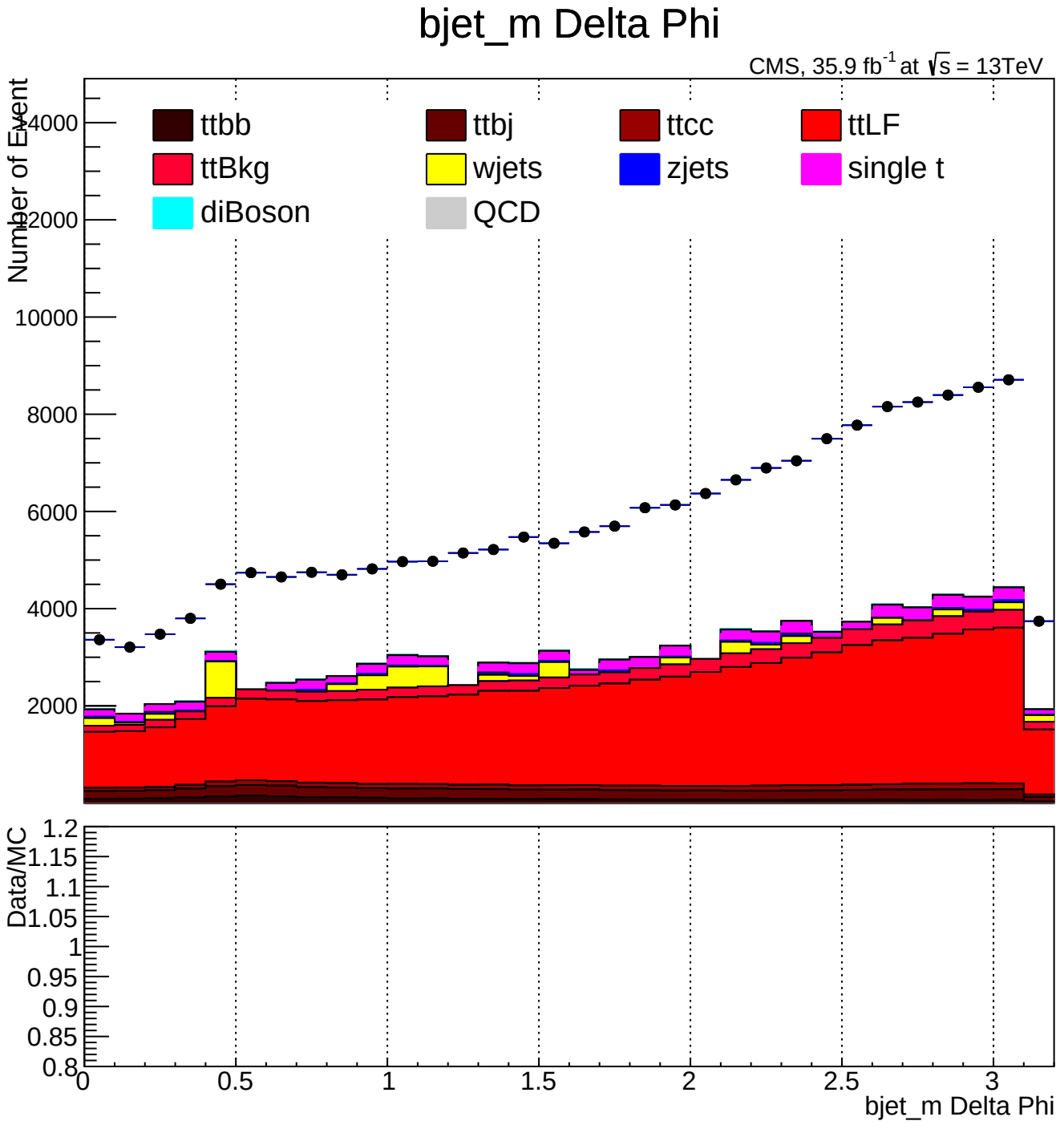

W Mass
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
300
250
200
150
100
50
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
20
40
60
80
100
120
140
160
180
200
Transverse Mass (GeV)

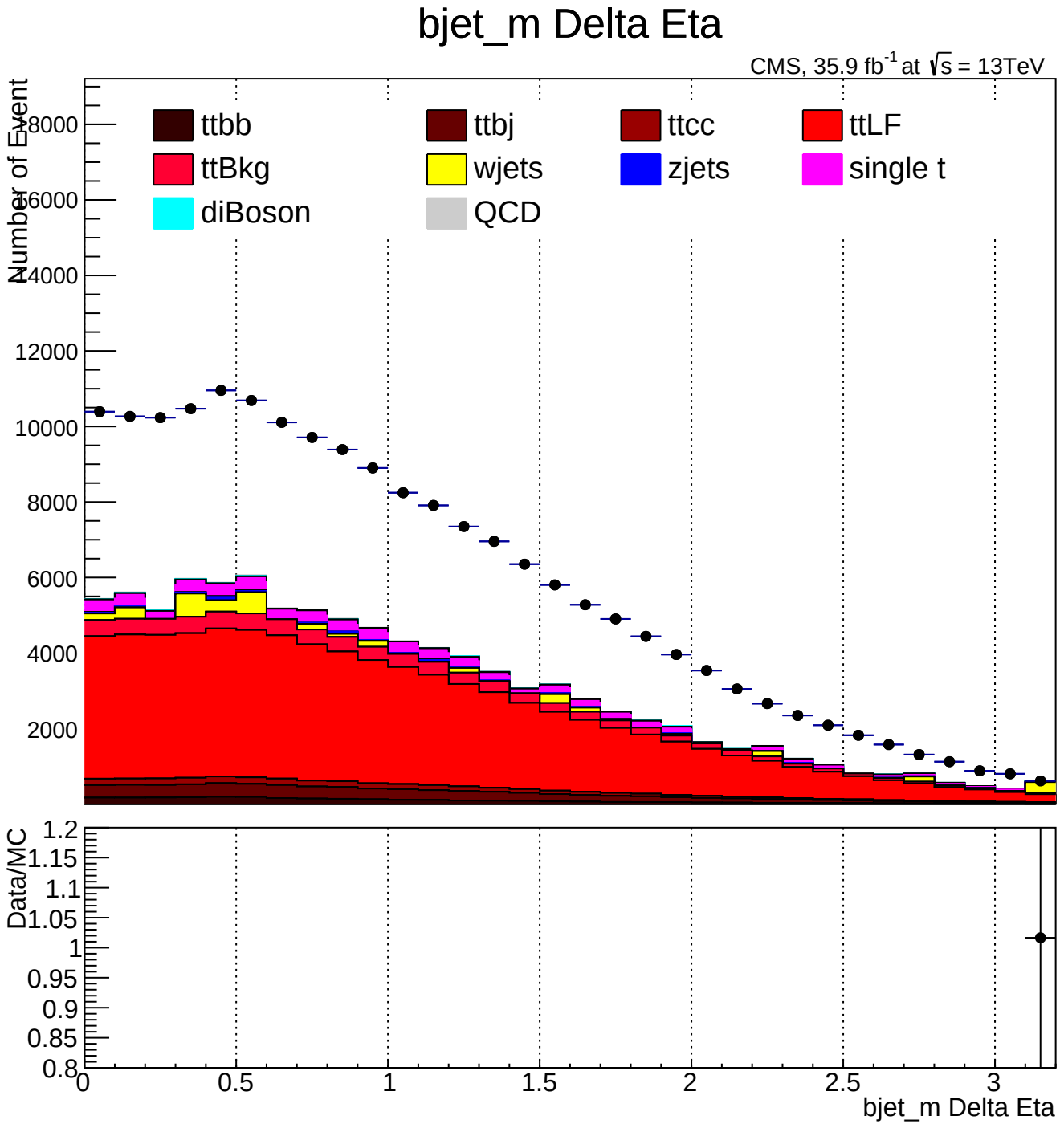

Di-bjet Mass (medium) wrt min DR
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Di-bjet (medium) Mass (GeV)

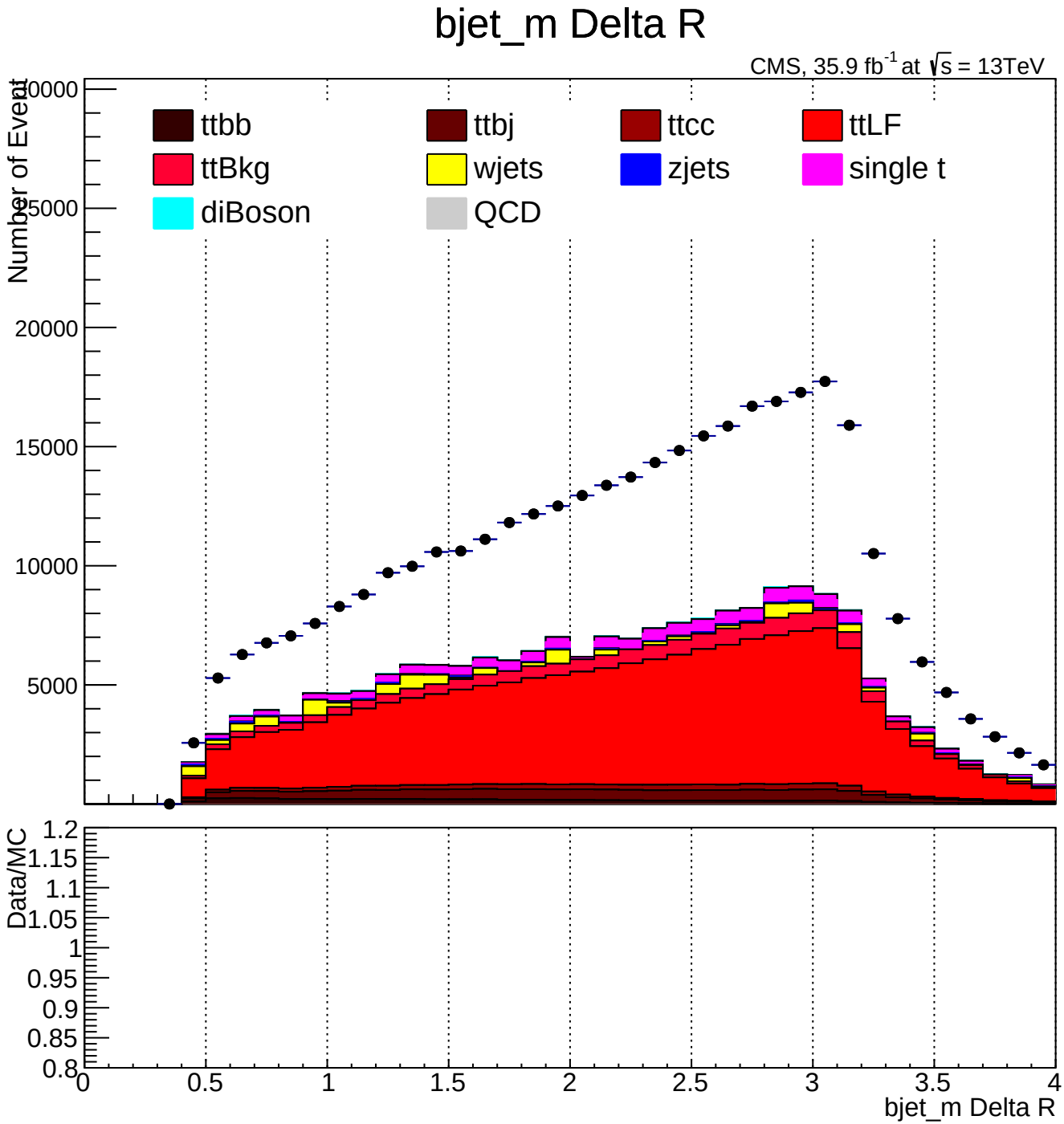

Leading b jet (medium) pT from di-bjets
CMS, 35.9 fb-1 at √s = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
50000
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
b Jet (medium) pT from di-bjets (GeV)

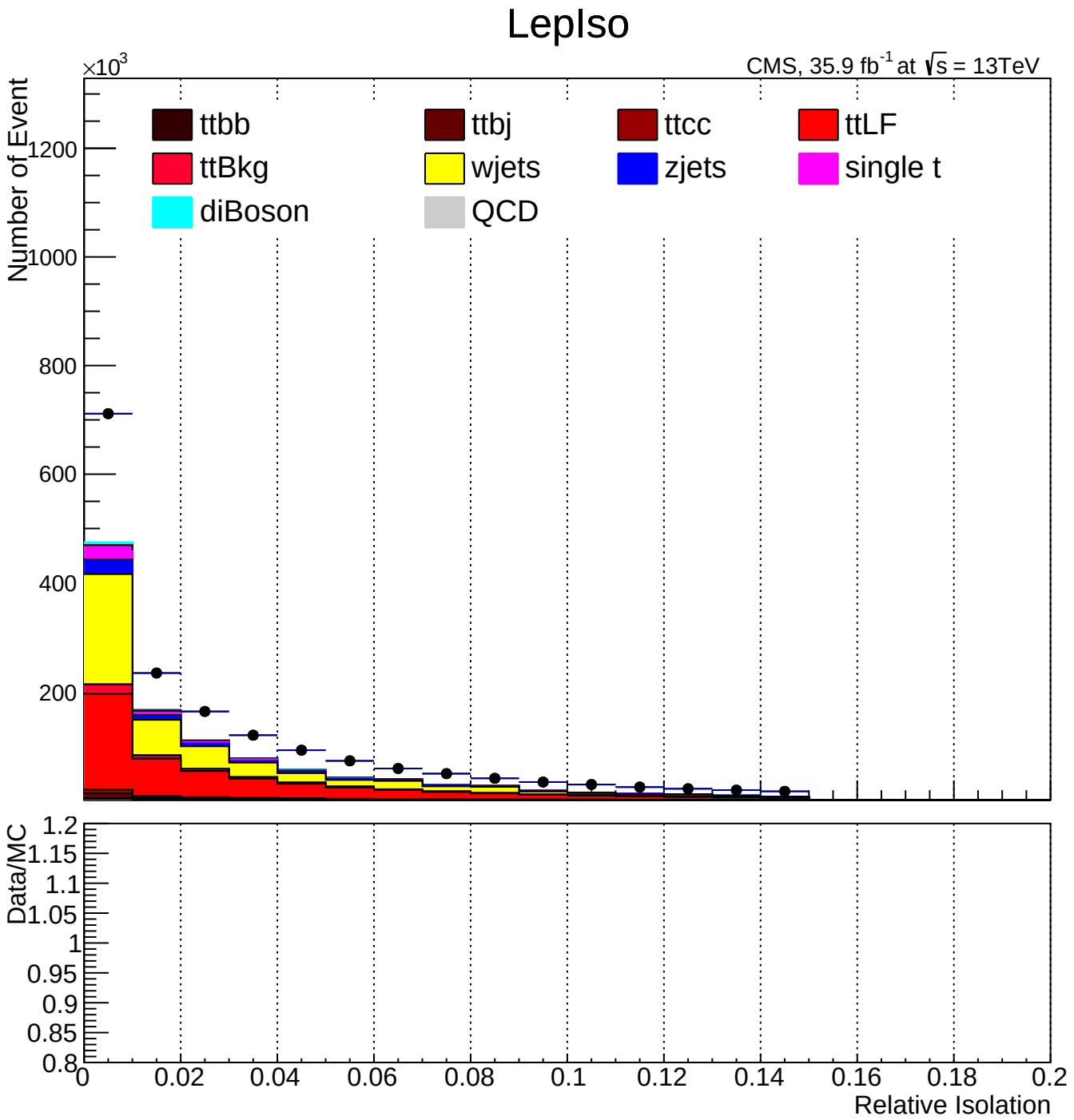

leading c jet (medium) pT
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
leading c Jet (medium) pT (GeV)

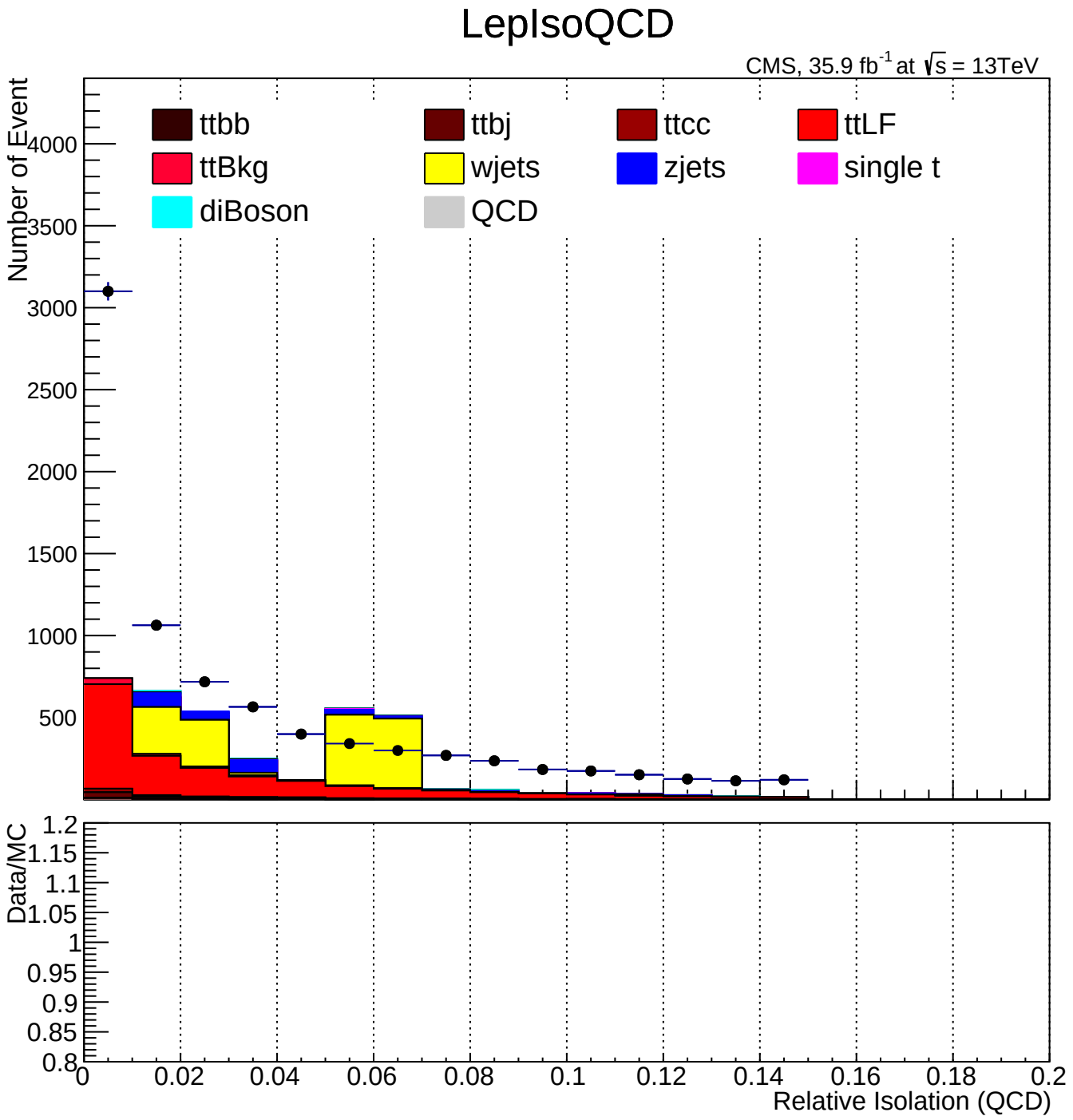

lepton DPhi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
50000
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
DPhi

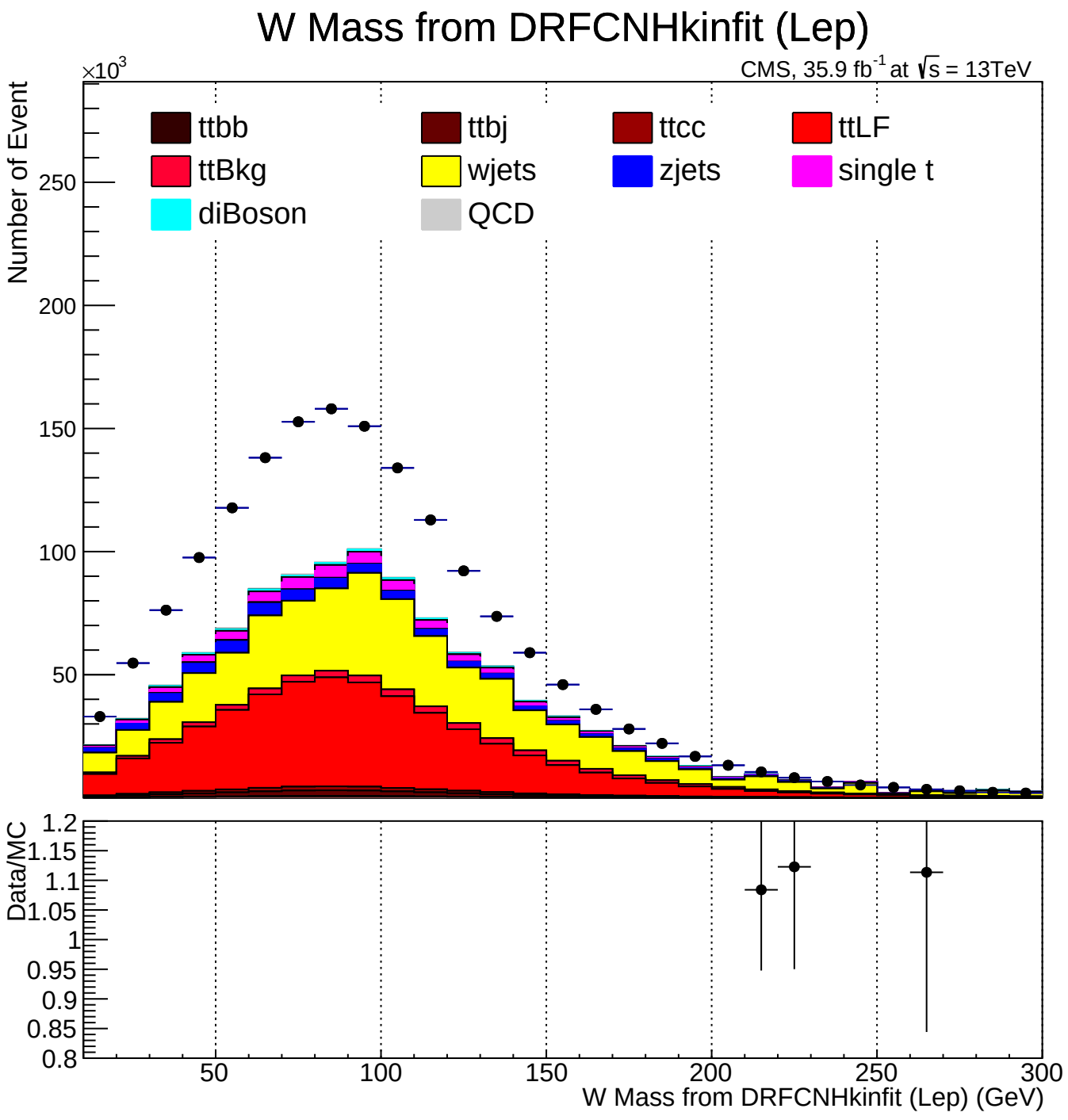

bjet_m Delta Phi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
14000
12000
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Phi

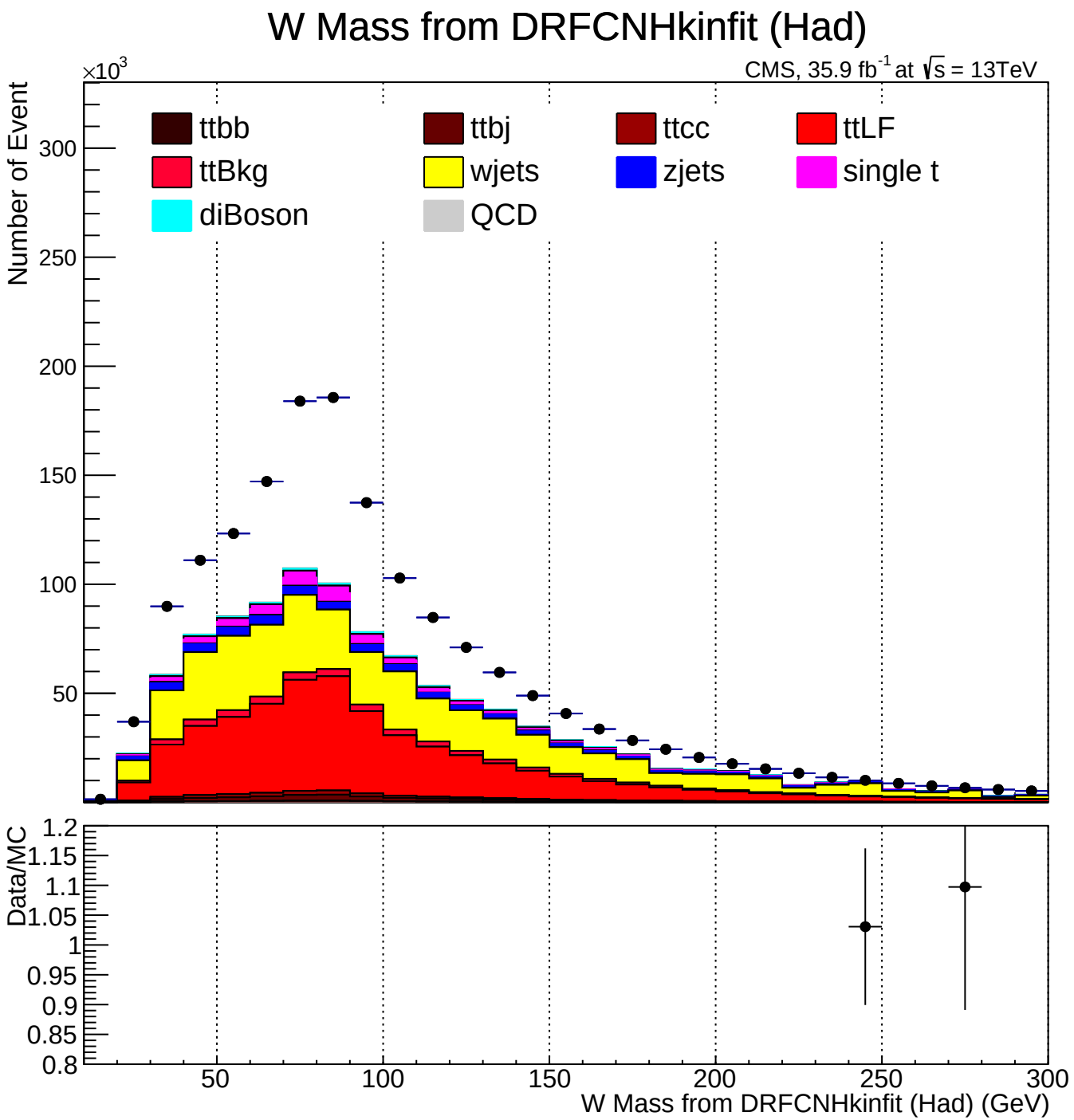

bjet_m Delta Eta
CMS, 35.9 fb-1 at √s = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta Eta

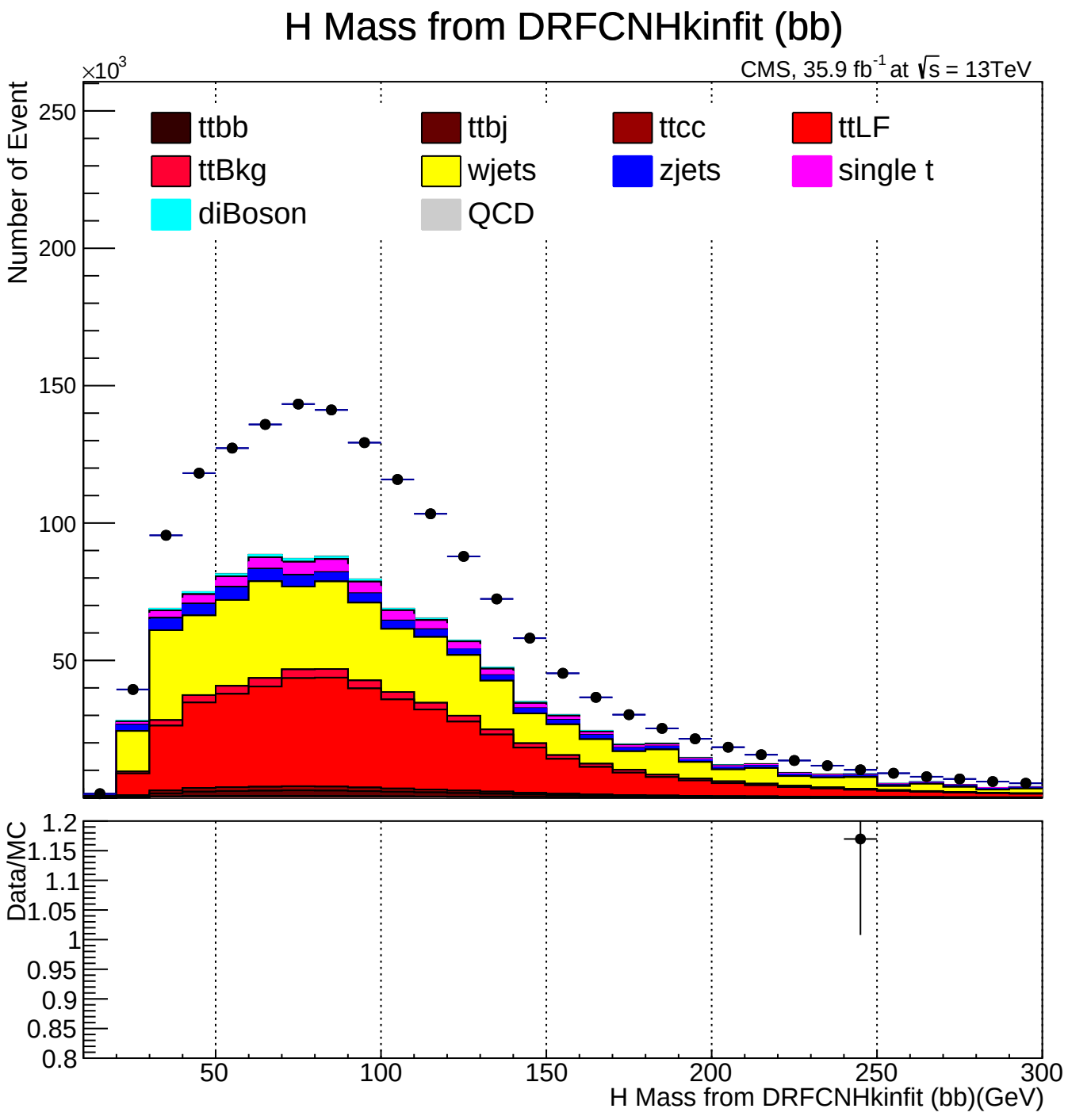

bjet_m Delta R
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta R

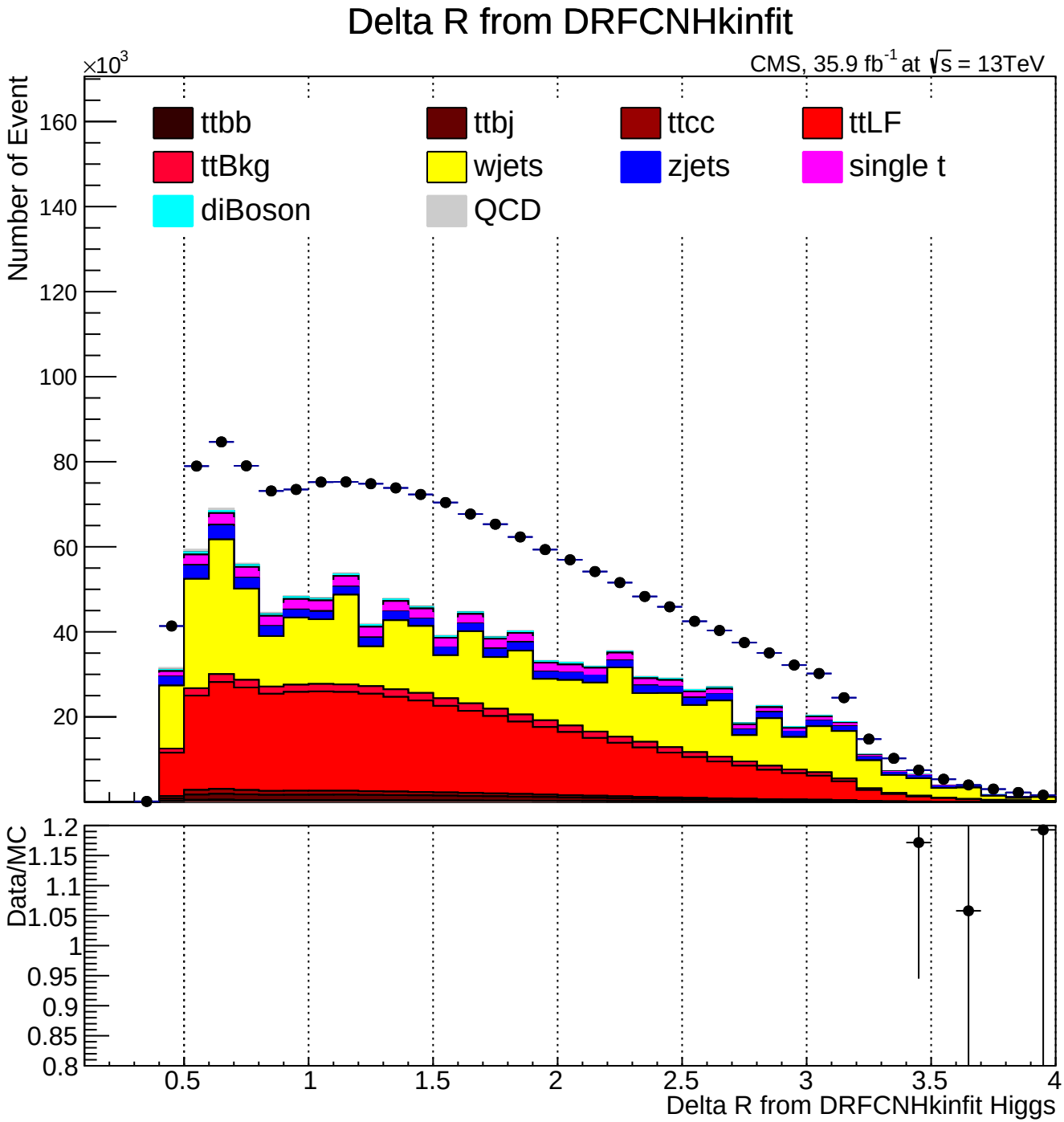

LepIso
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
$\times 10^3$
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
1200
1000
800
600
400
200
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation

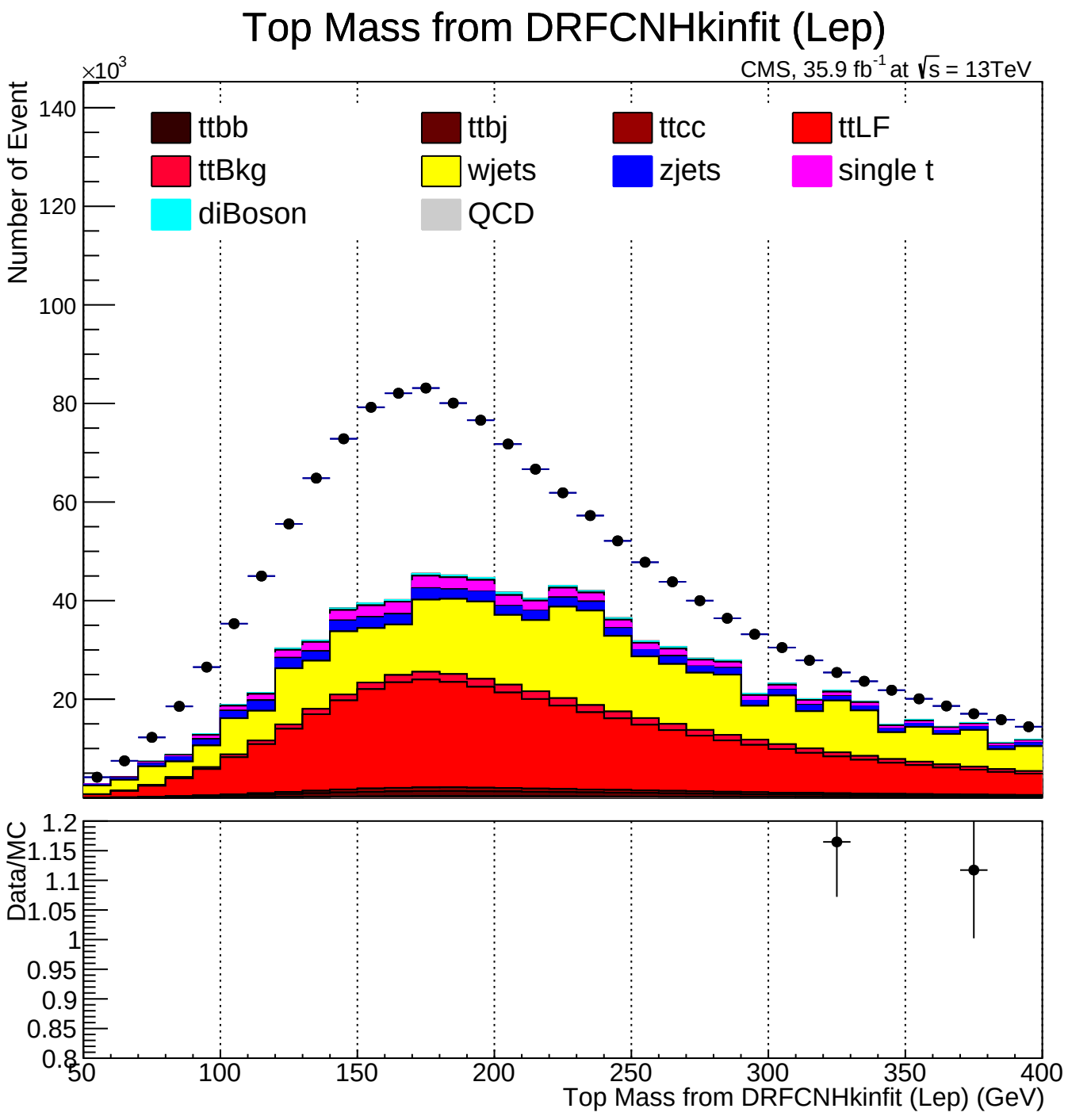

LepIsoQCD
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
4000
3500
3000
2500
2000
1500
1000
500
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation (QCD)

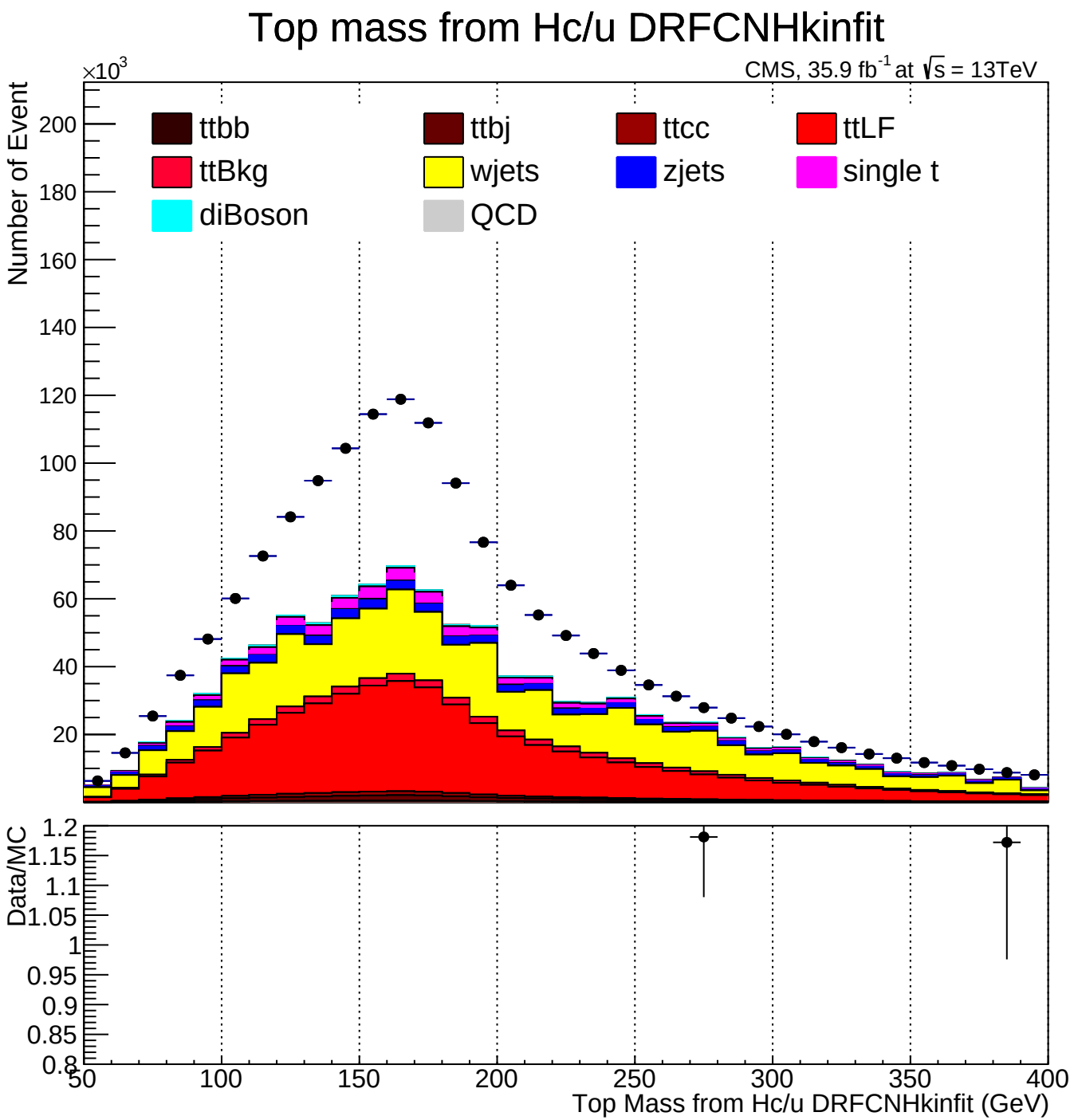

W Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
W Mass from DRFCNHkinfit (Lep) (GeV)

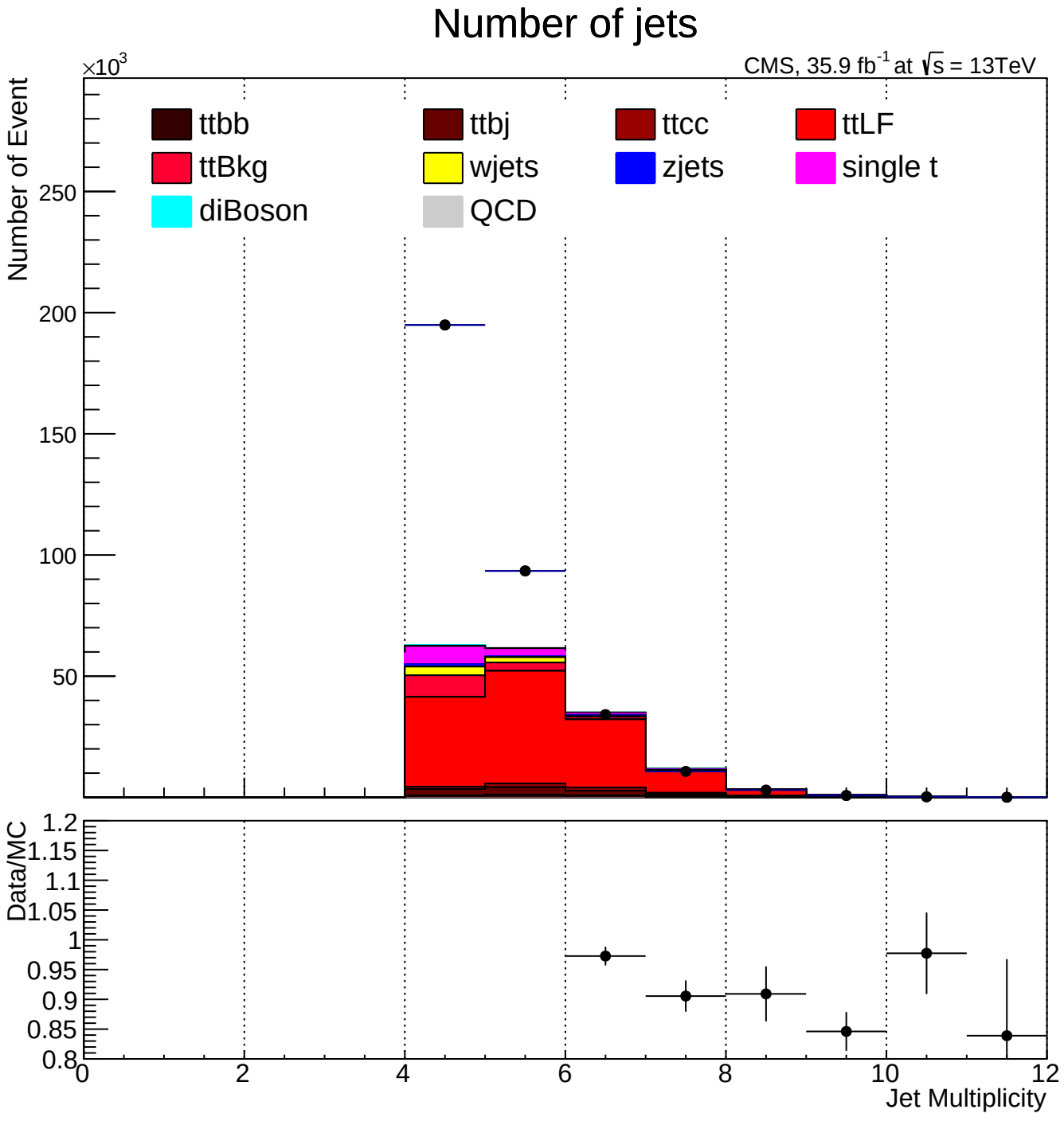

W Mass from DRFCNHkinfit (Had)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
W Mass from DRFCNHkinfit (Had) (GeV)


H Mass from DRFCNHkinfit (bb)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
H Mass from DRFCNHkinfit (bb)(GeV)

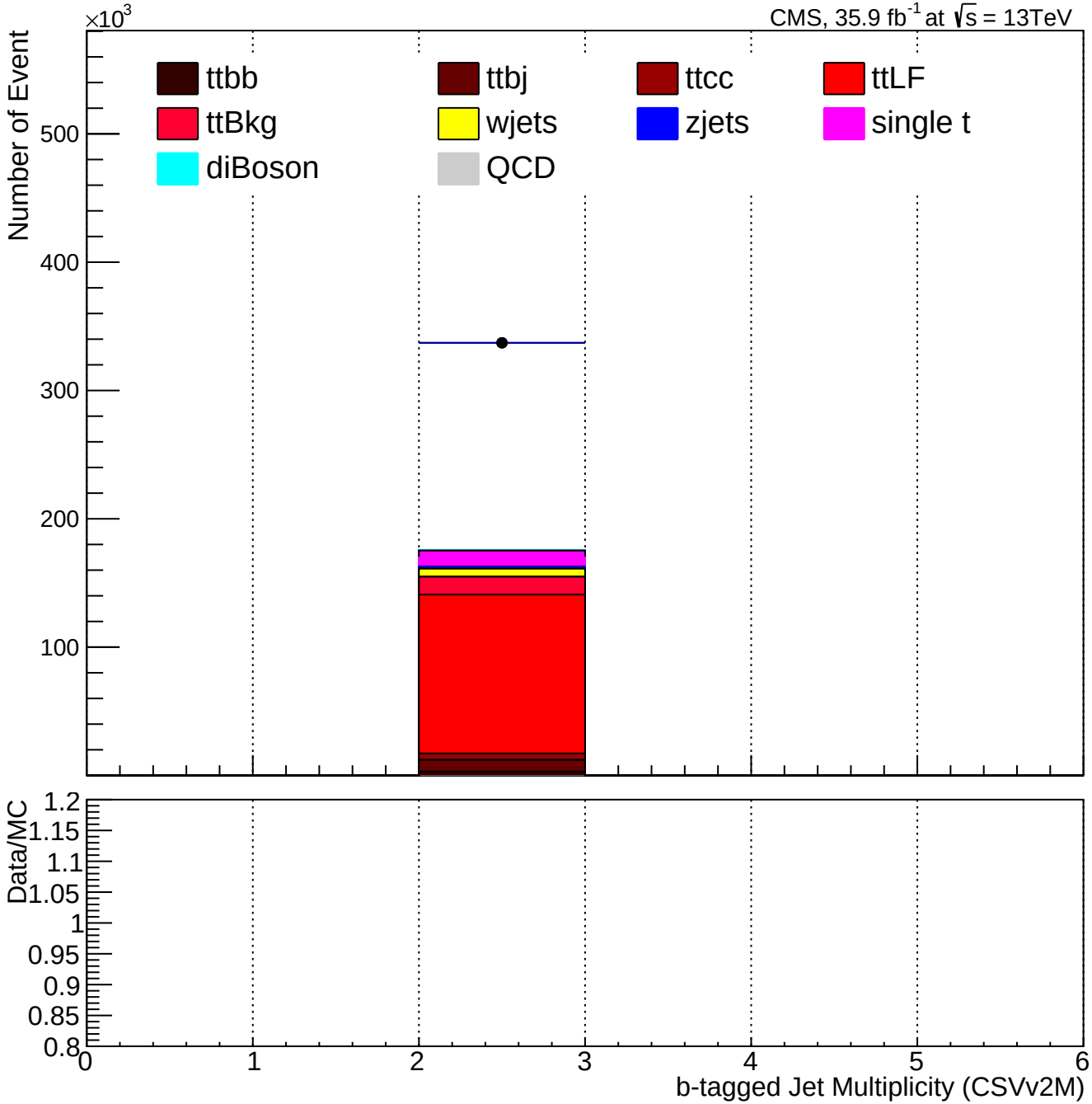

Delta R from DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Delta R from DRFCNHkinfit Higgs

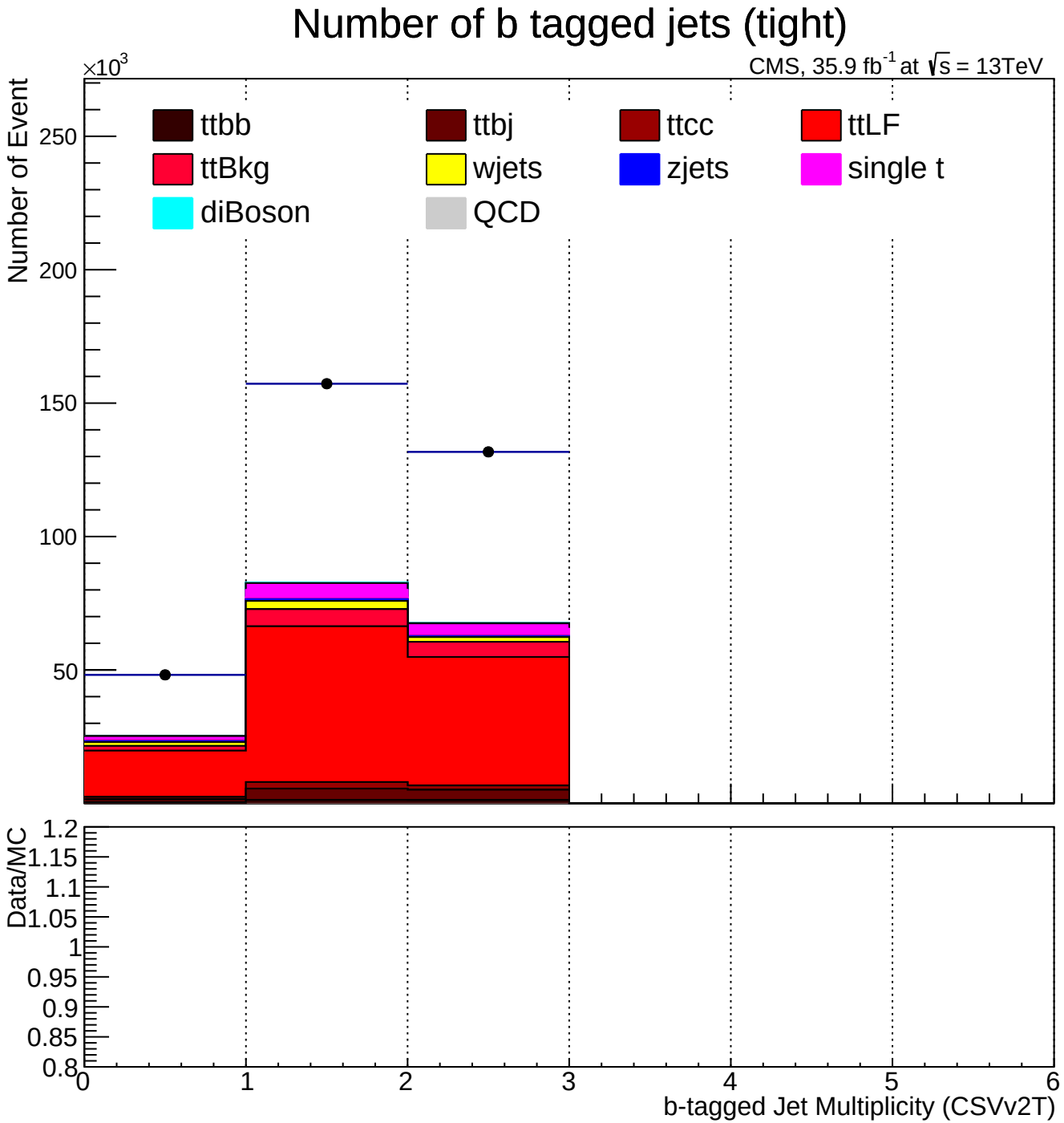

Top Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Top Mass from DRFCNHkinfit (Lep) (GeV)

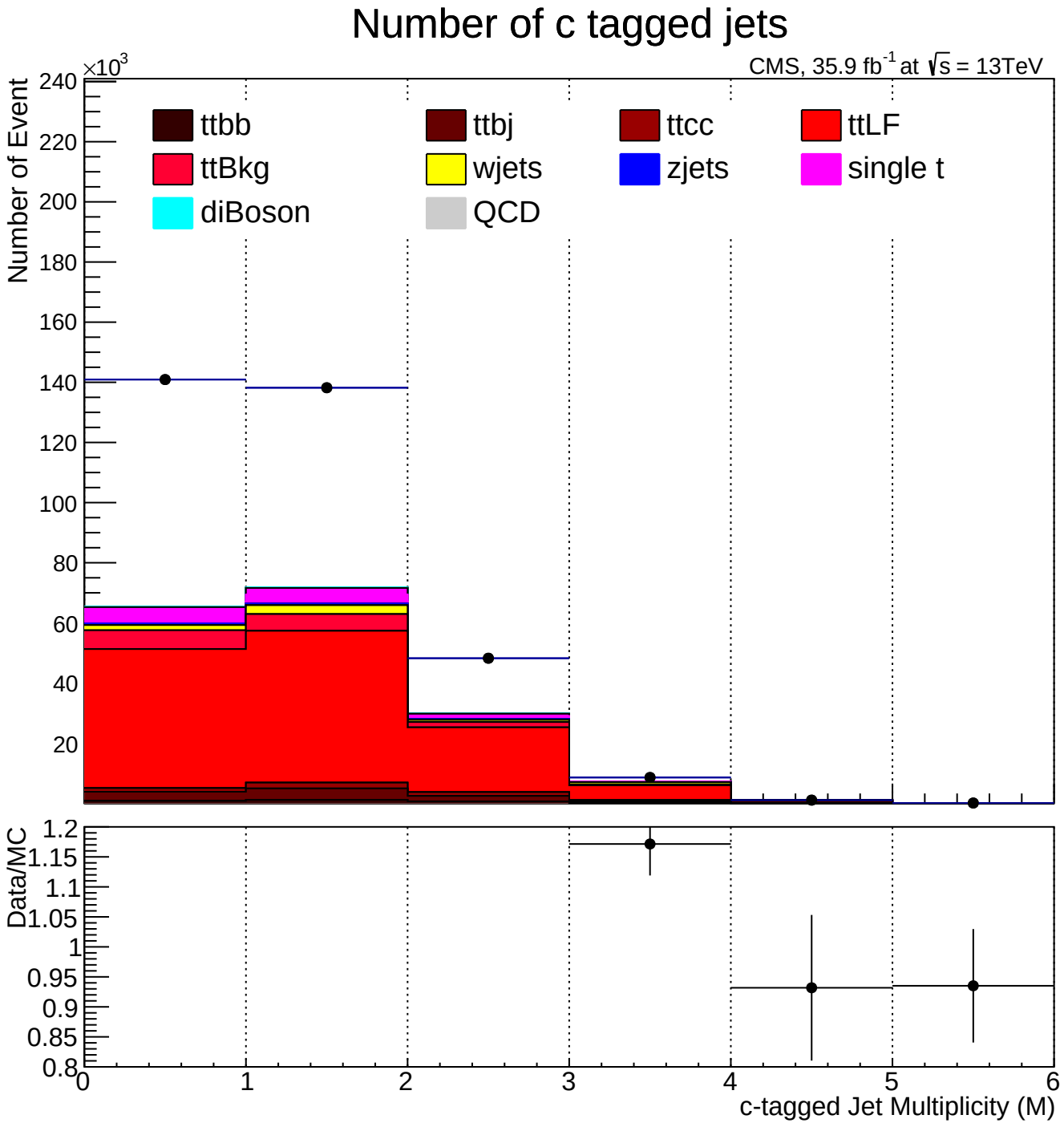

Top mass from Hc/u DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Top Mass from Hc/u DRFCNHkinfit (GeV)

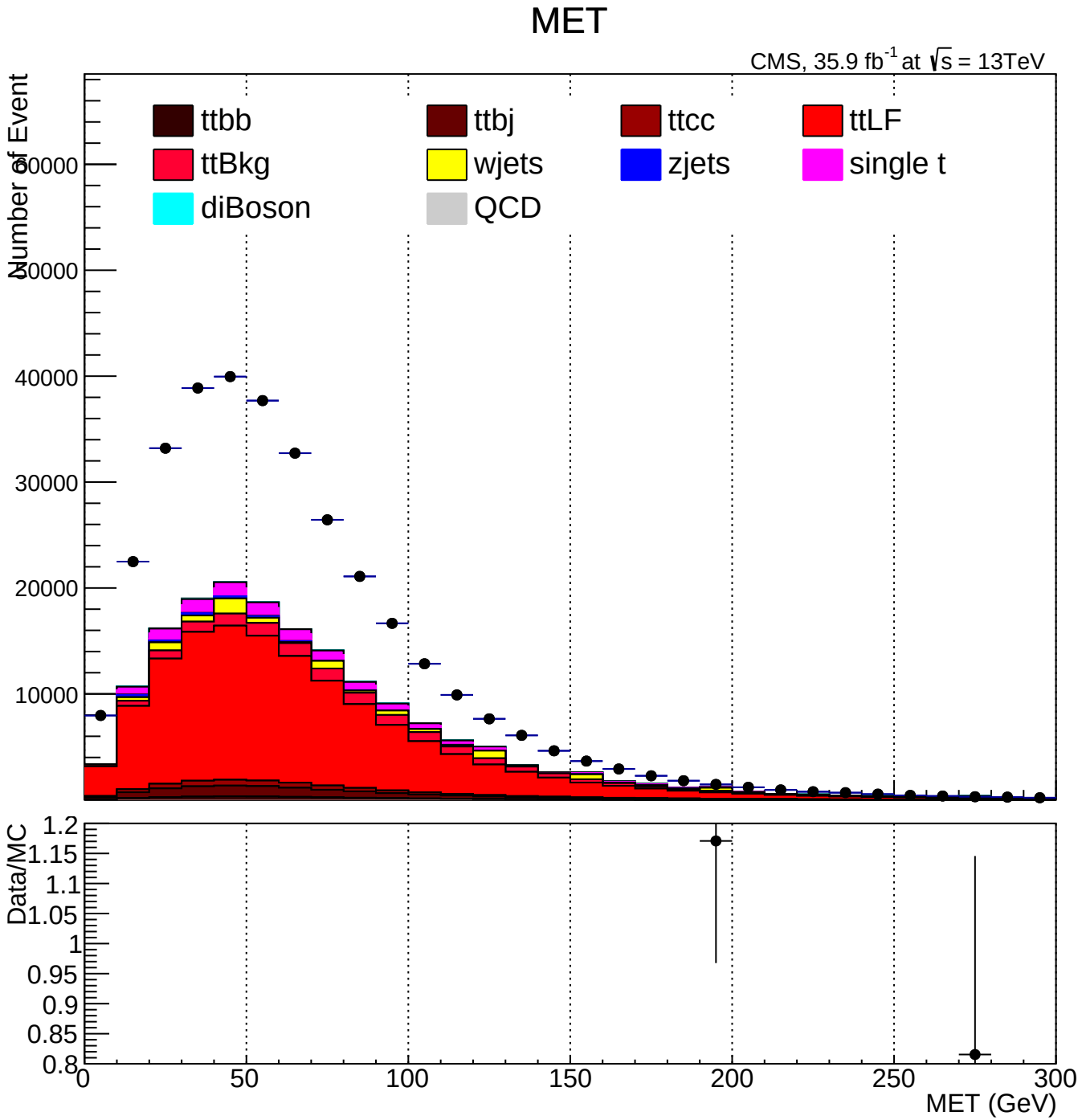

Number of jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
$\times 10^3$
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Jet Multiplicity

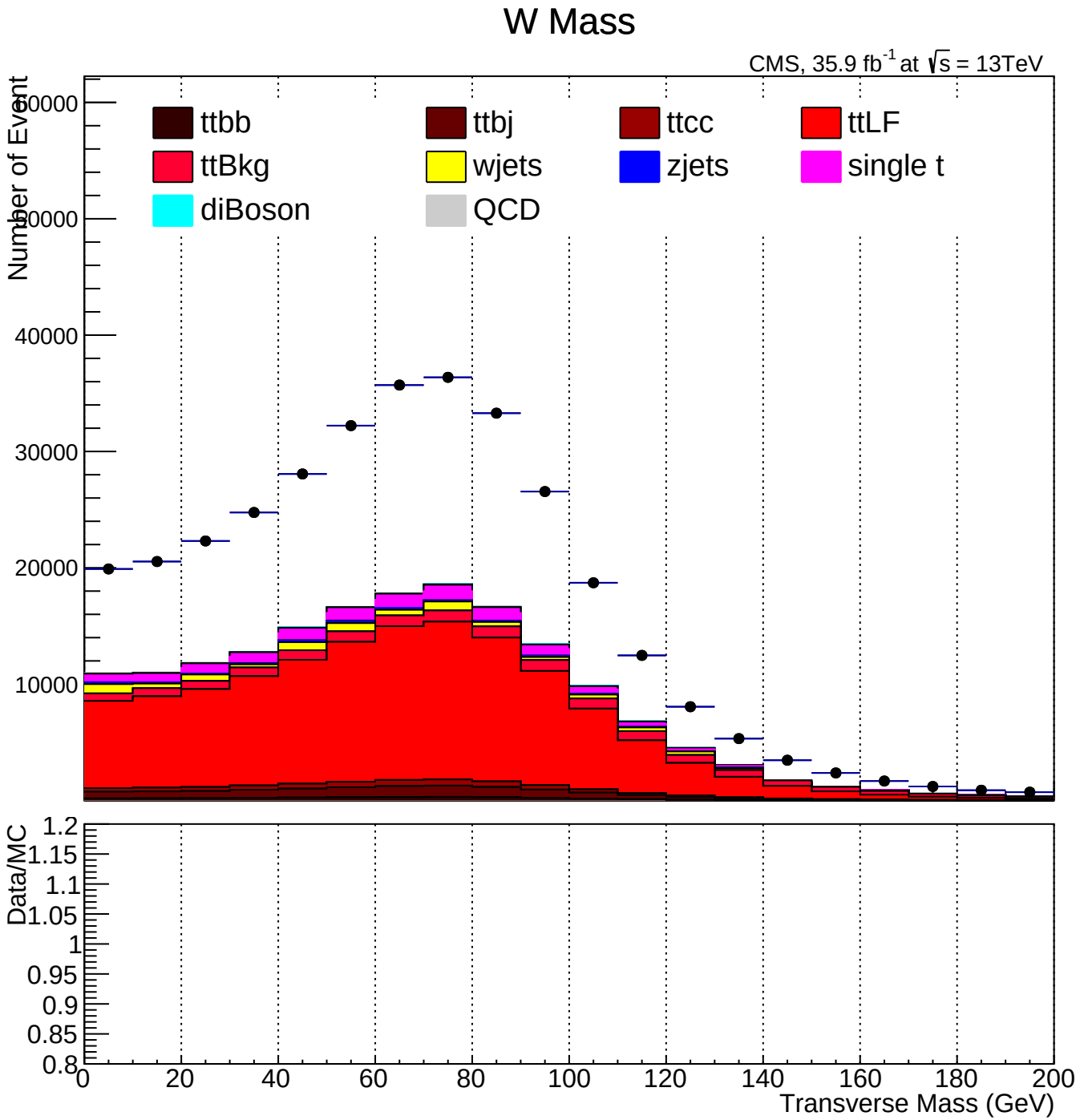
Number of b tagged jets (medium)

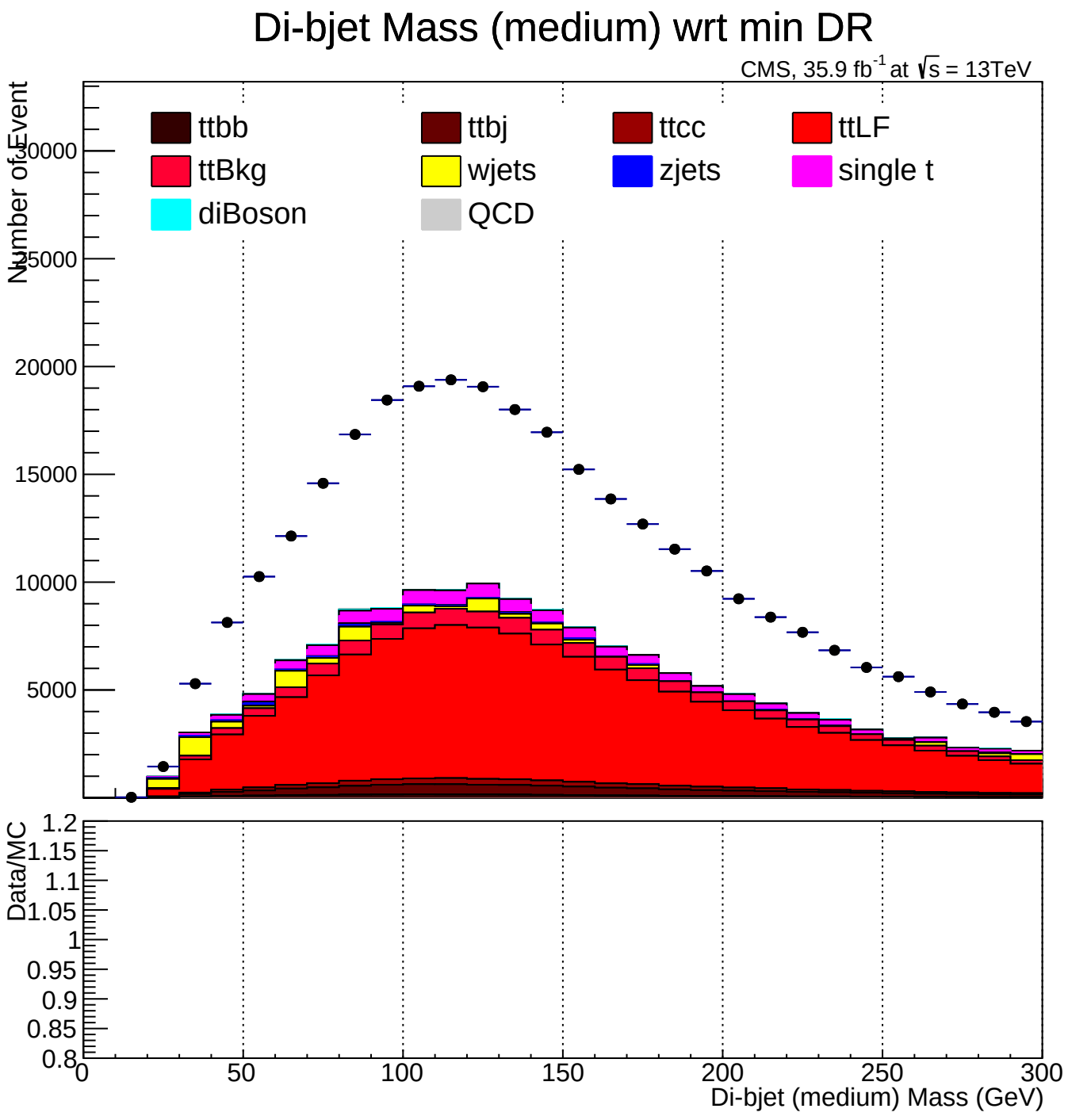


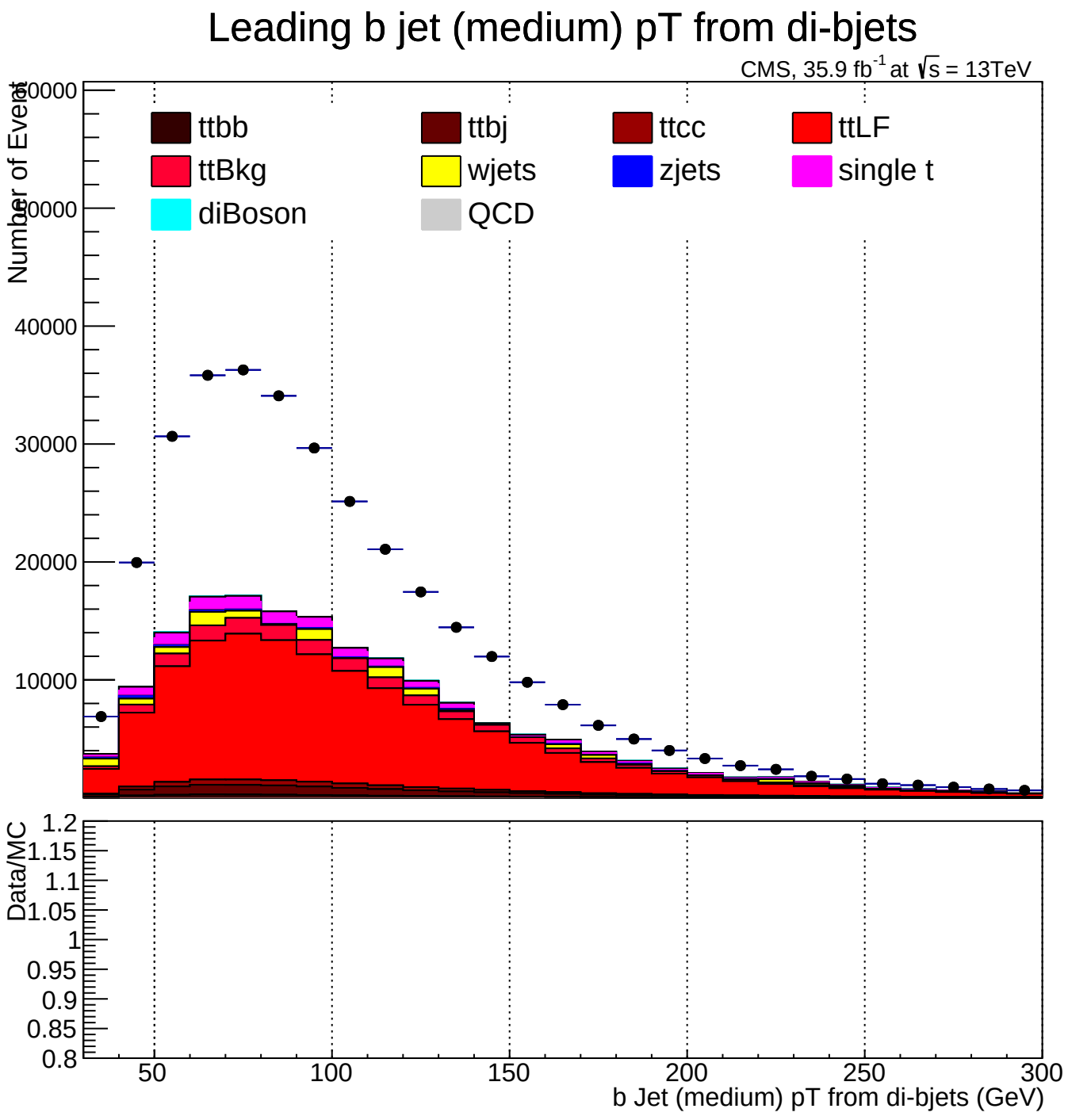

Number of b tagged jets (tight)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
250
200
150
100
50
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2T)

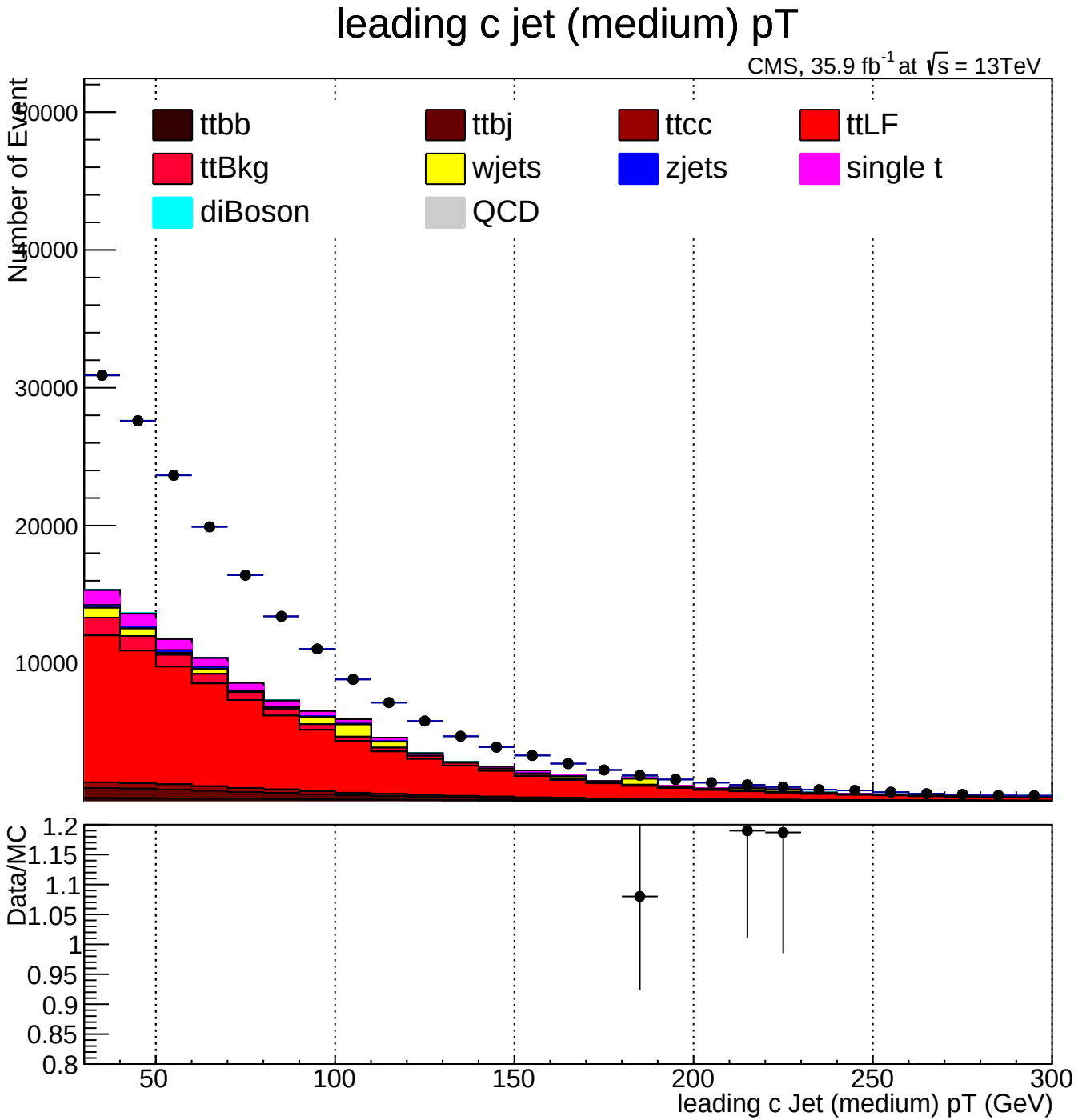

Number of c tagged jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
c-tagged Jet Multiplicity (M)

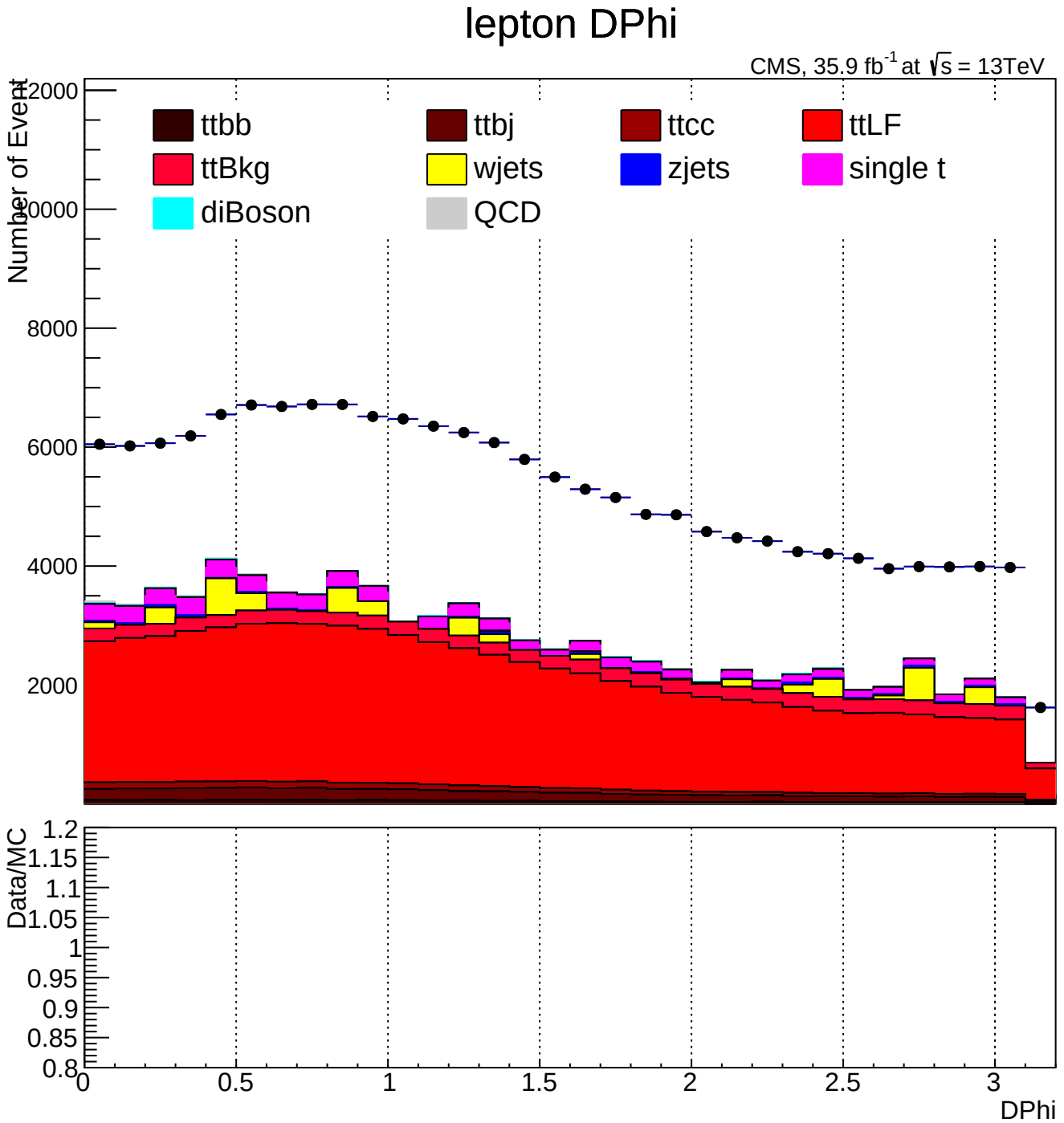

MET
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
50000
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
50
100
150
200
250
300
MET (GeV)

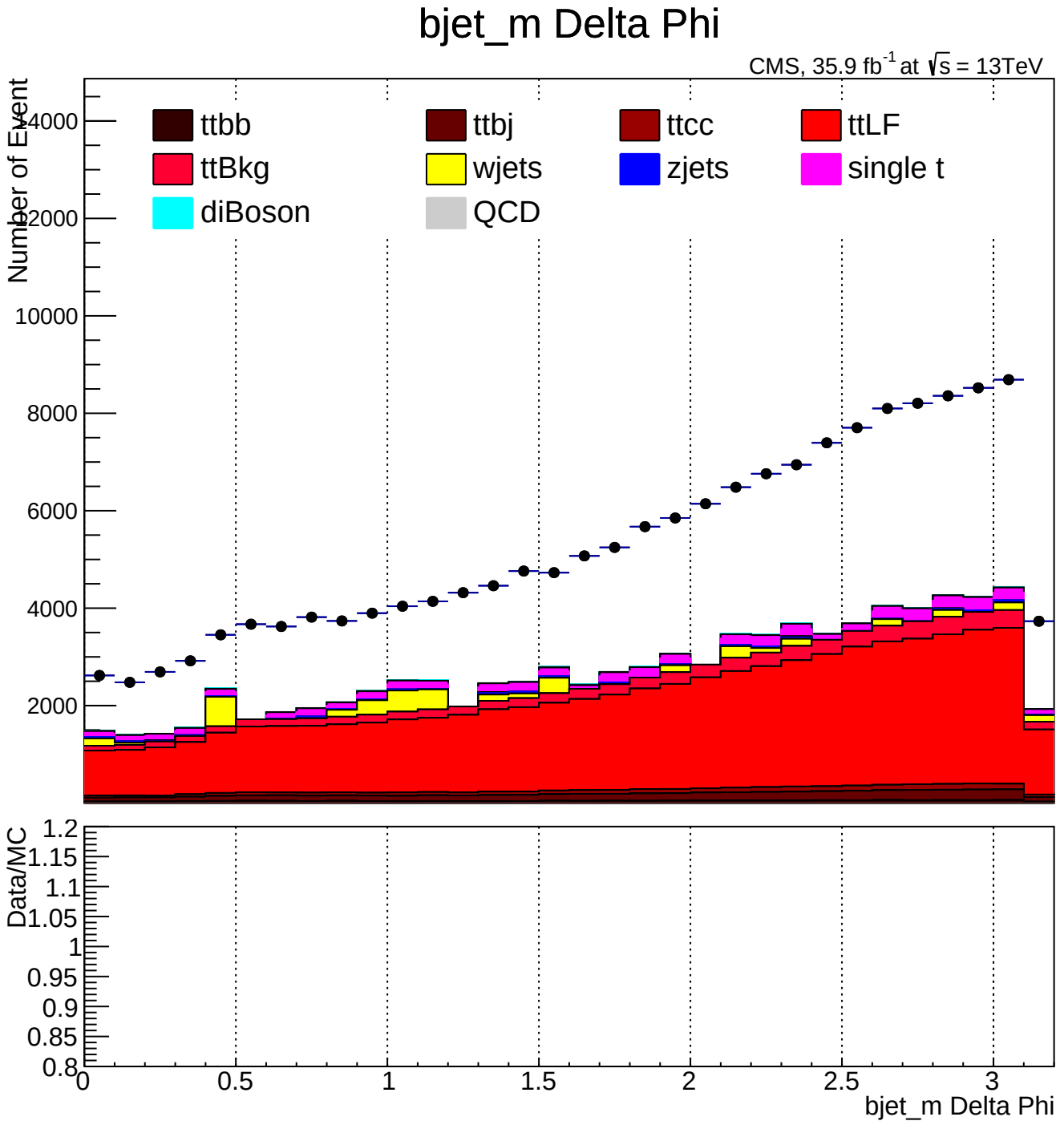

W Mass
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Transverse Mass (GeV)

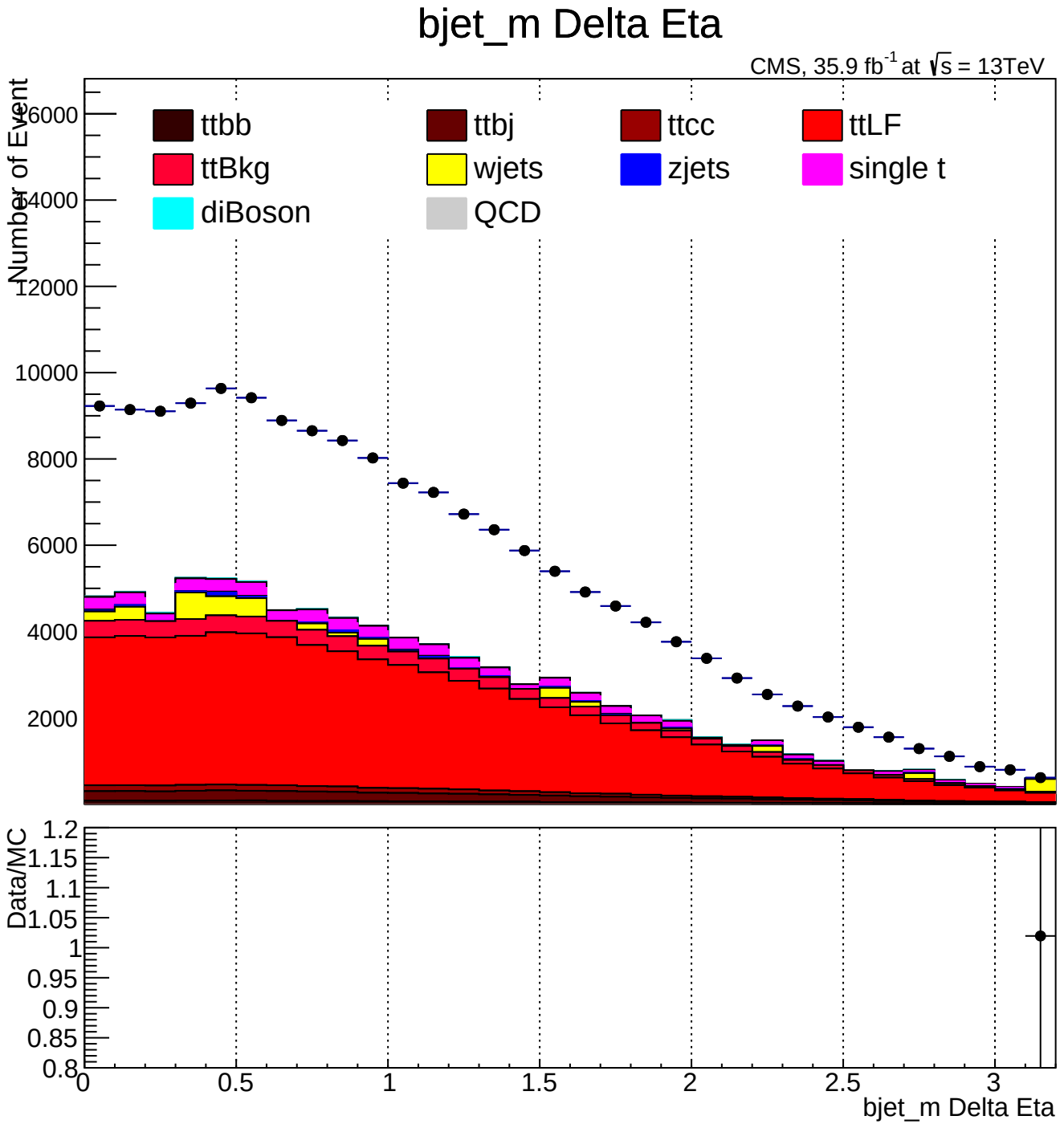

Di-bjet Mass (medium) wrt min DR
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
30000
25000
20000
15000
10000
5000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
50
100
150
200
250
300
Di-bjet (medium) Mass (GeV)

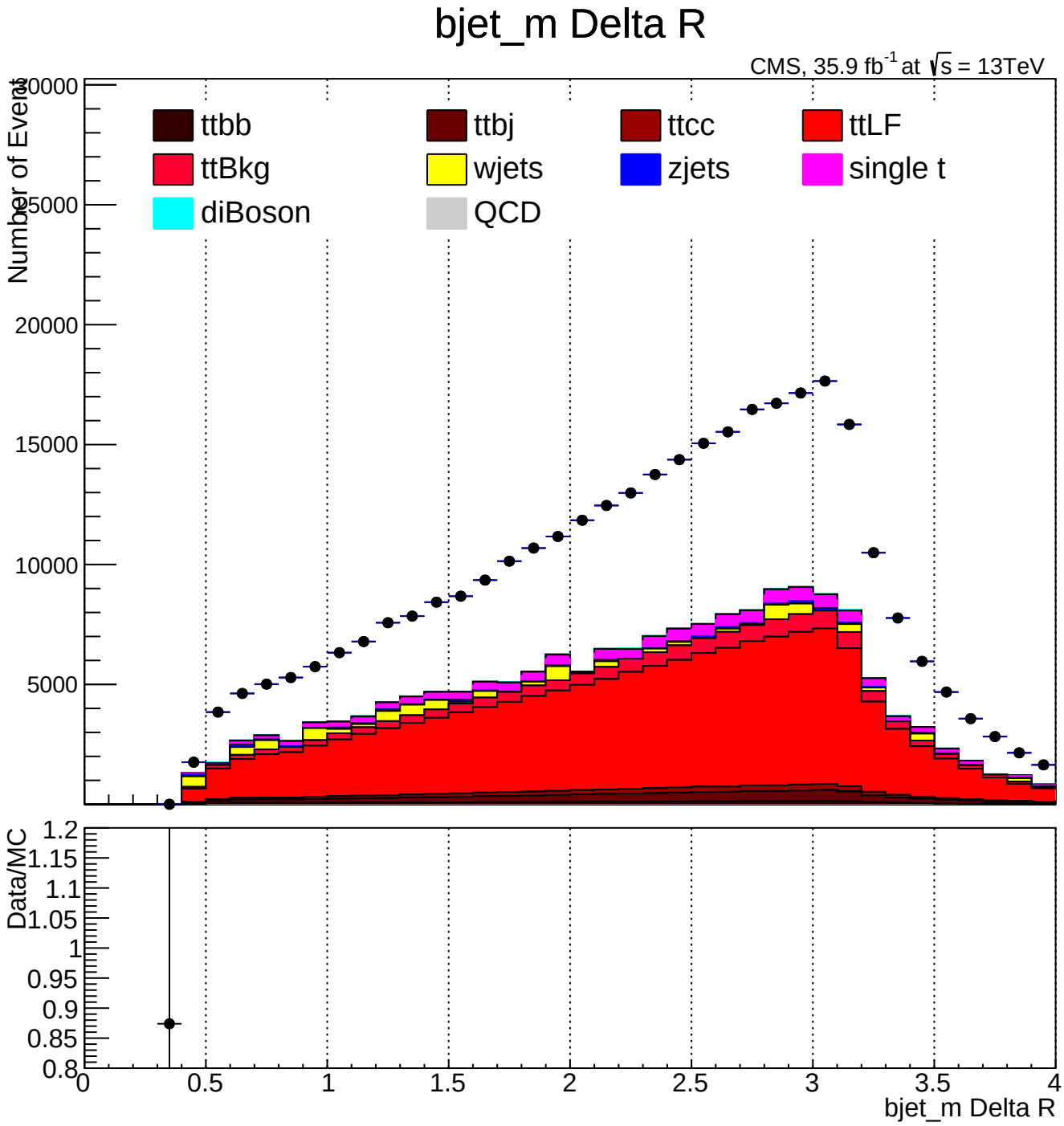

Leading b jet (medium) pT from di-bjets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b Jet (medium) pT from di-bjets (GeV)

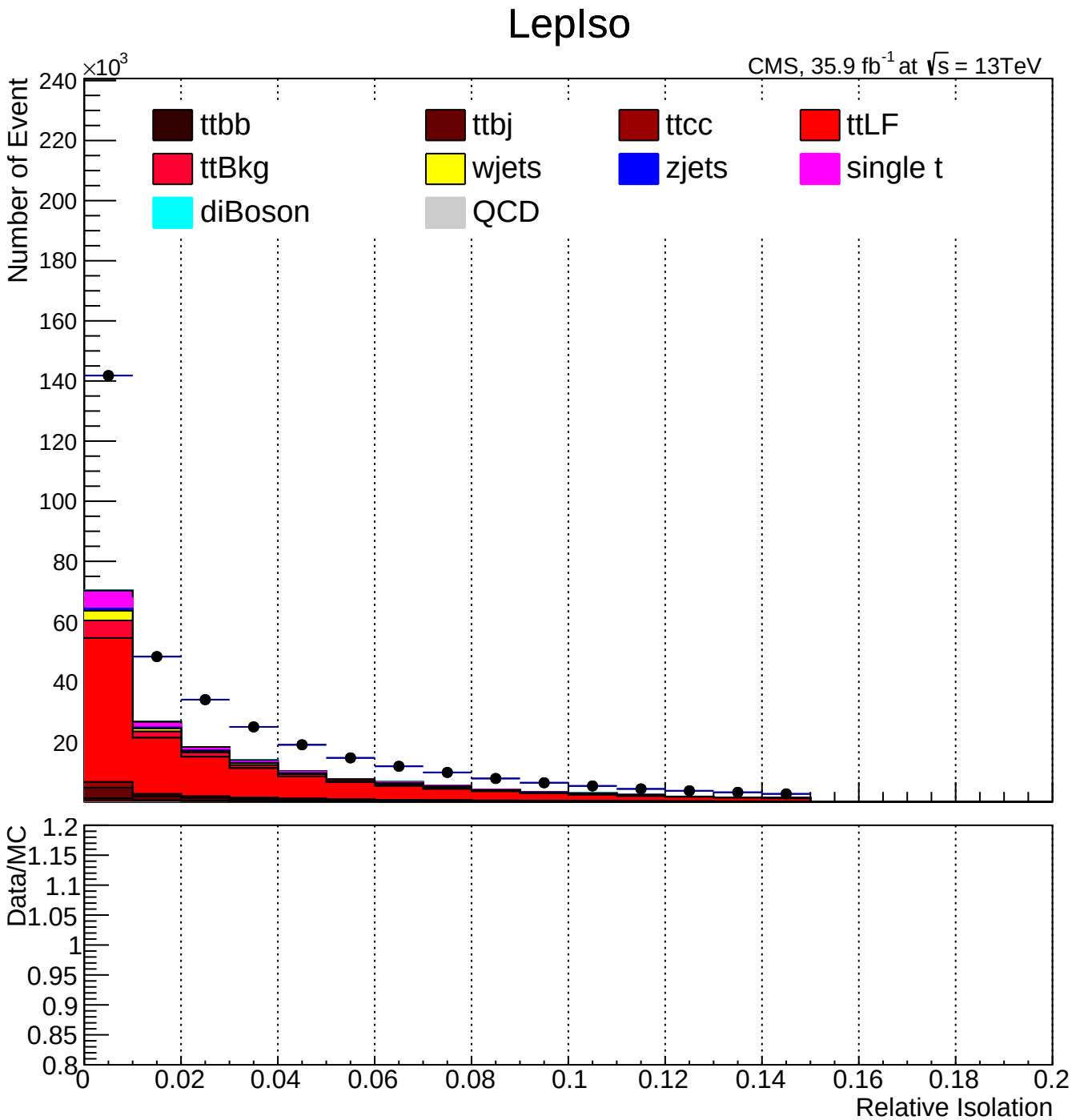

leading c jet (medium) pT
CMS, 35.9 fb-1 at √s = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
leading c Jet (medium) pT (GeV)

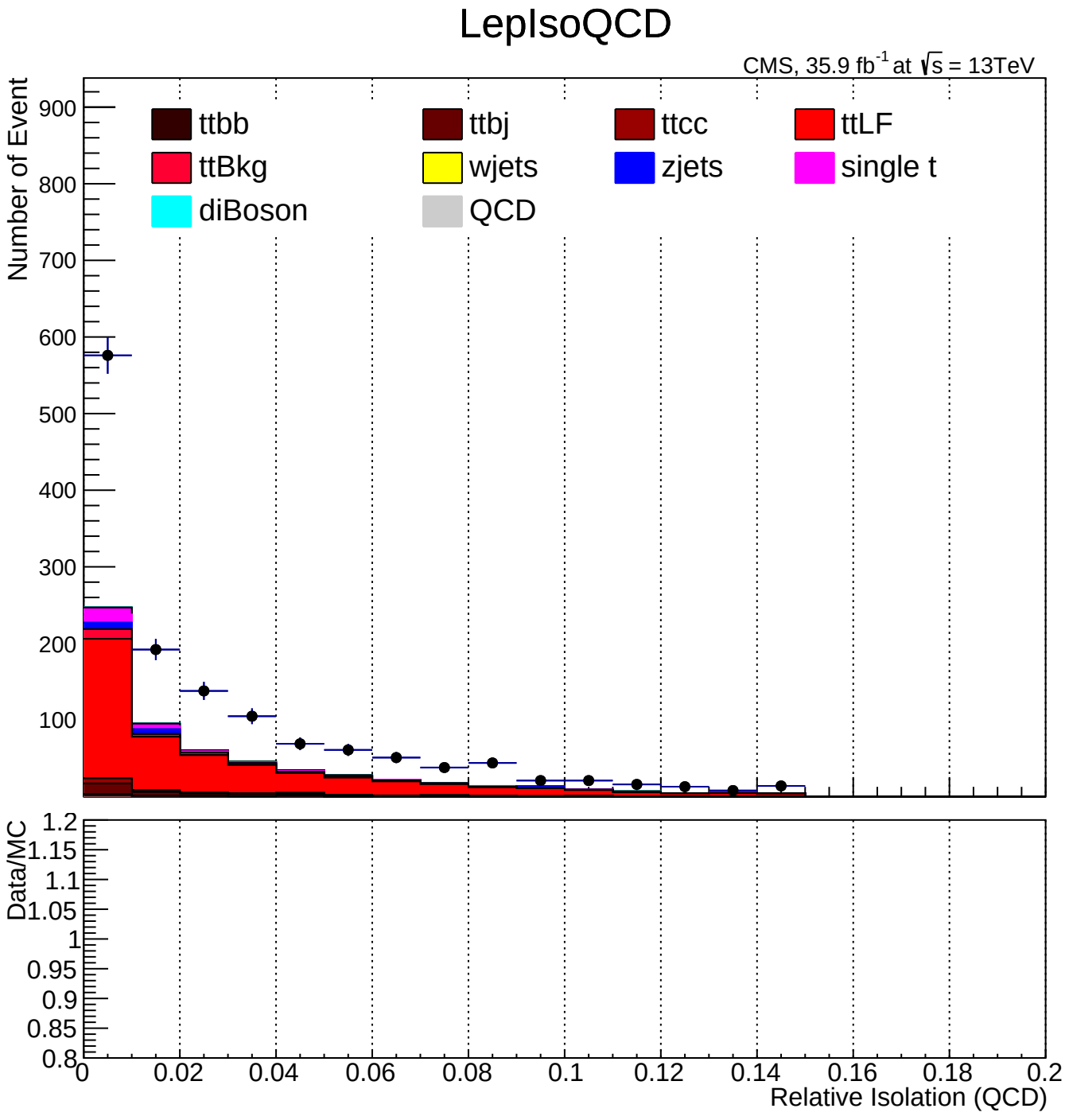

lepton DPhi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
DPhi

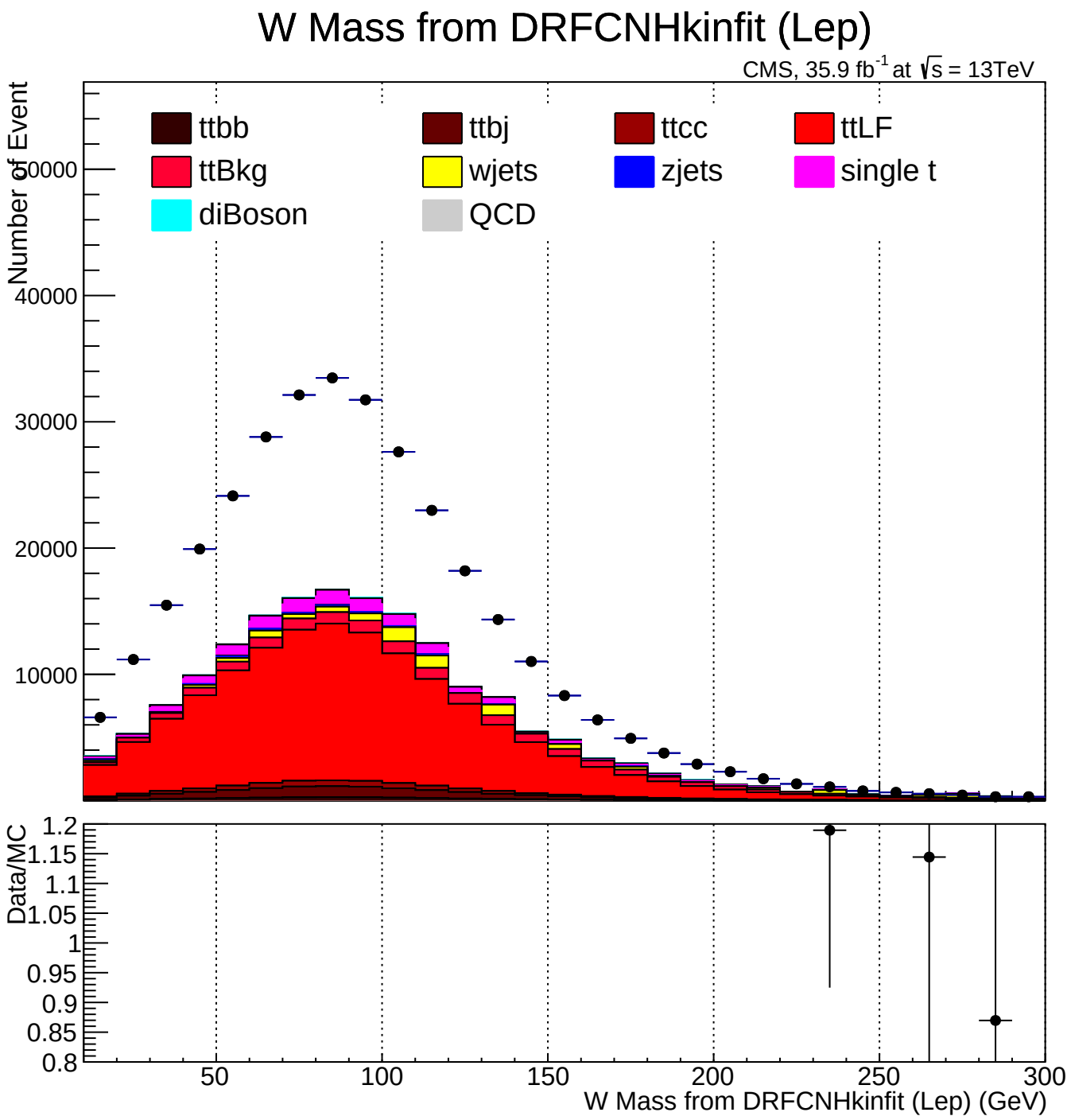

bjet_m Delta Phi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta Phi

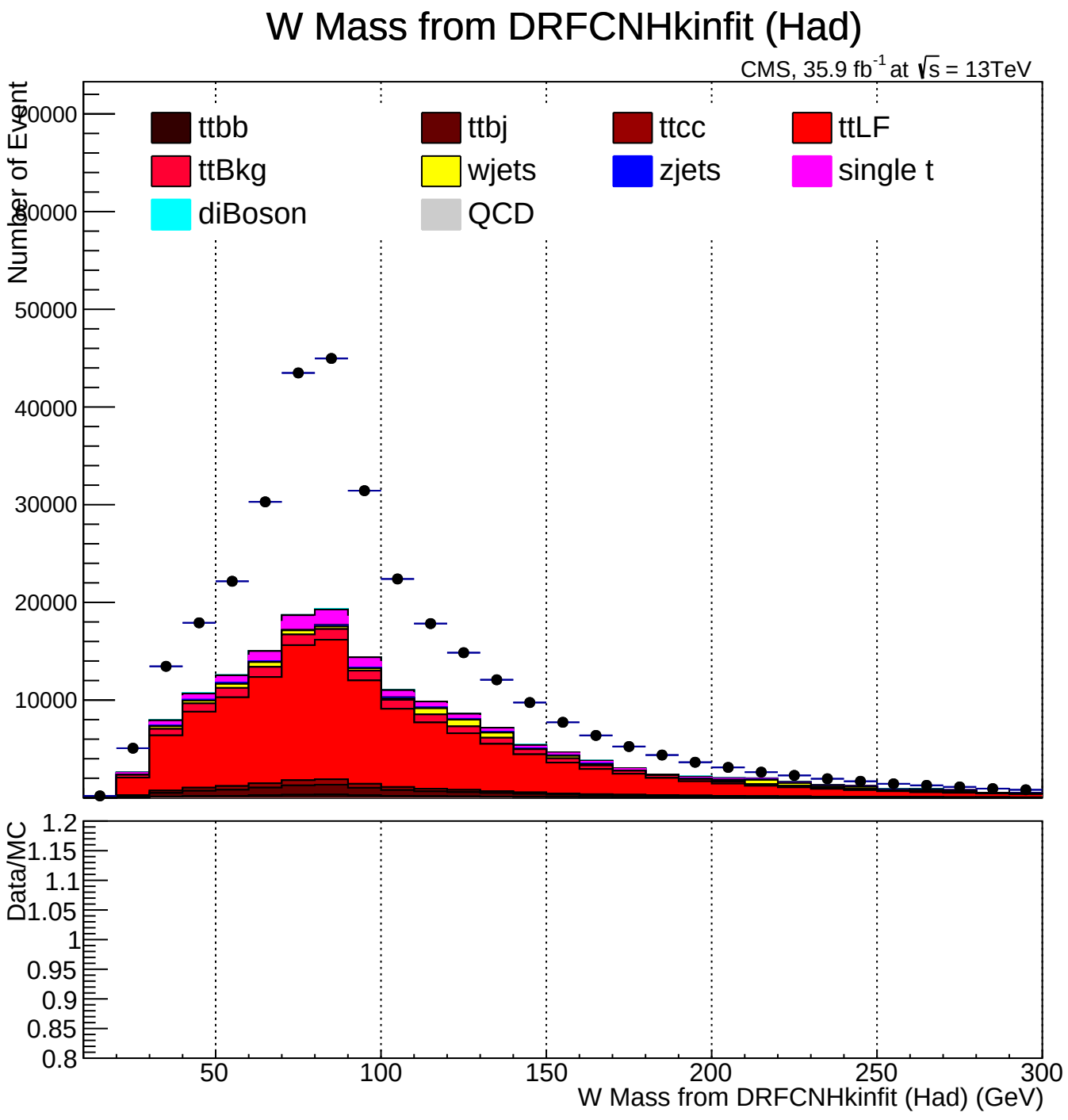

bjet_m Delta Eta
CMS, 35.9 fb-1 at √s = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
16000
14000
12000
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Eta

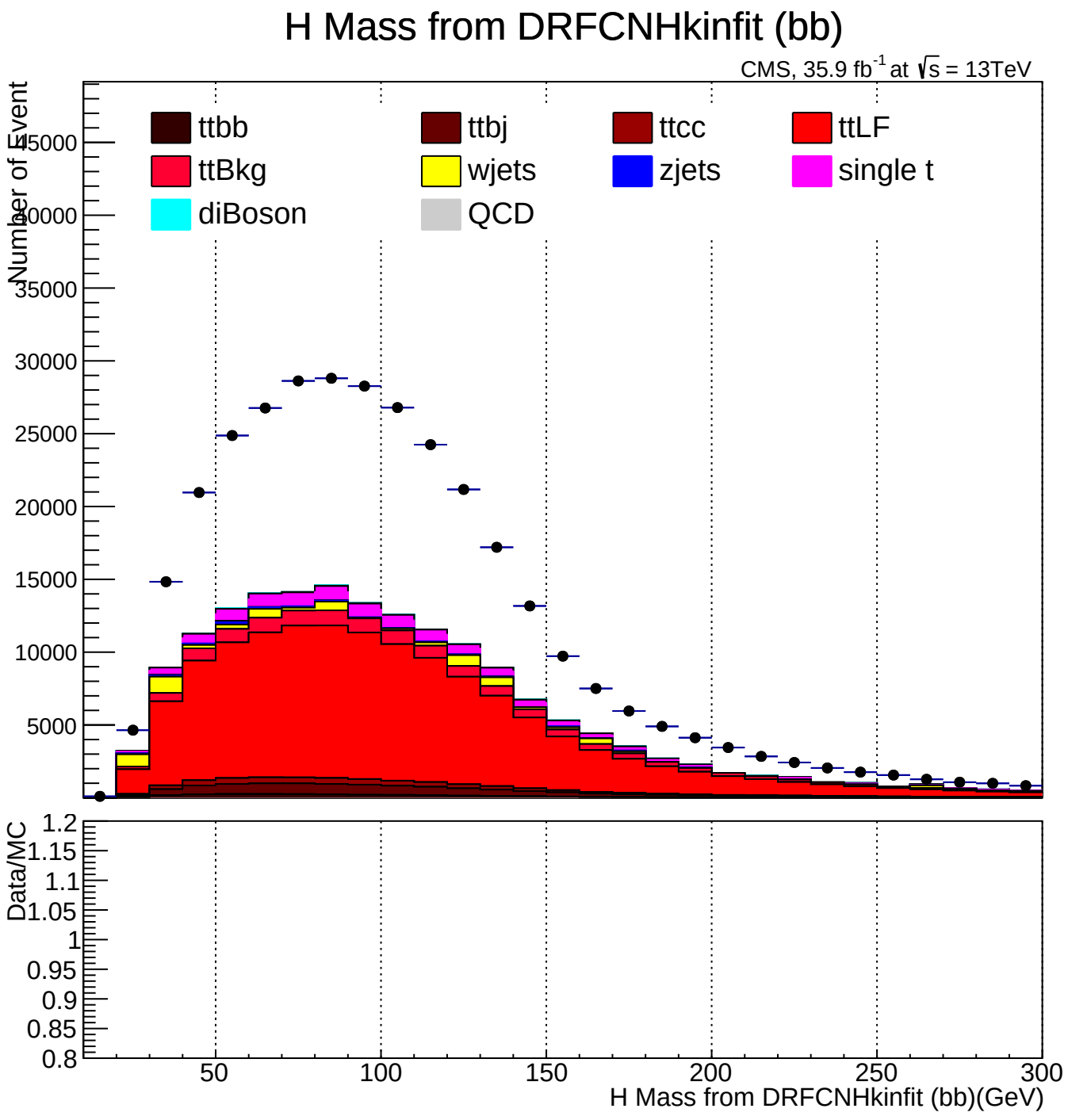

bjet_m Delta R
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Events
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
30000
25000
20000
15000
10000
5000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
3.5
4
bjet_m Delta R

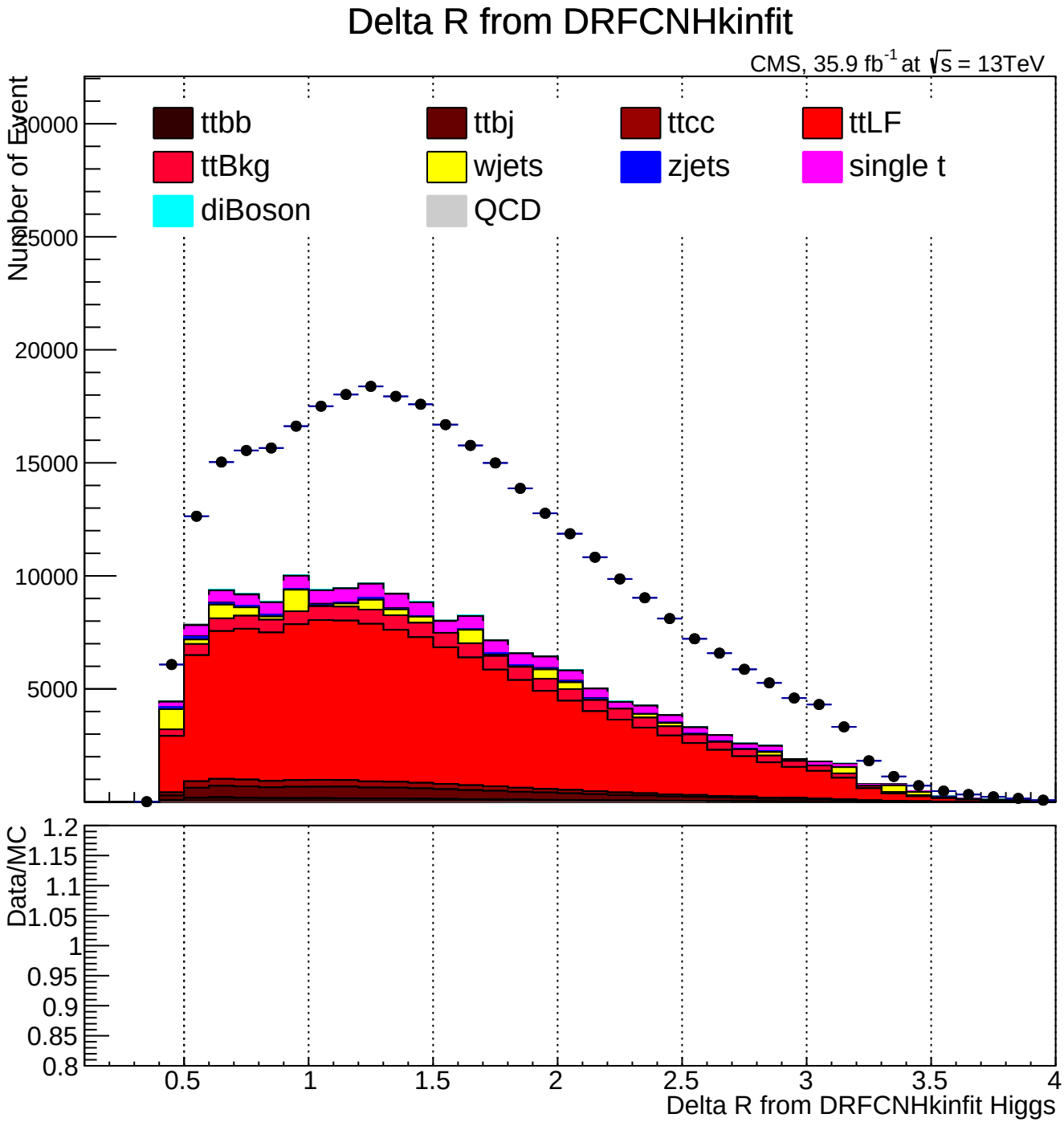

LepIso
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation

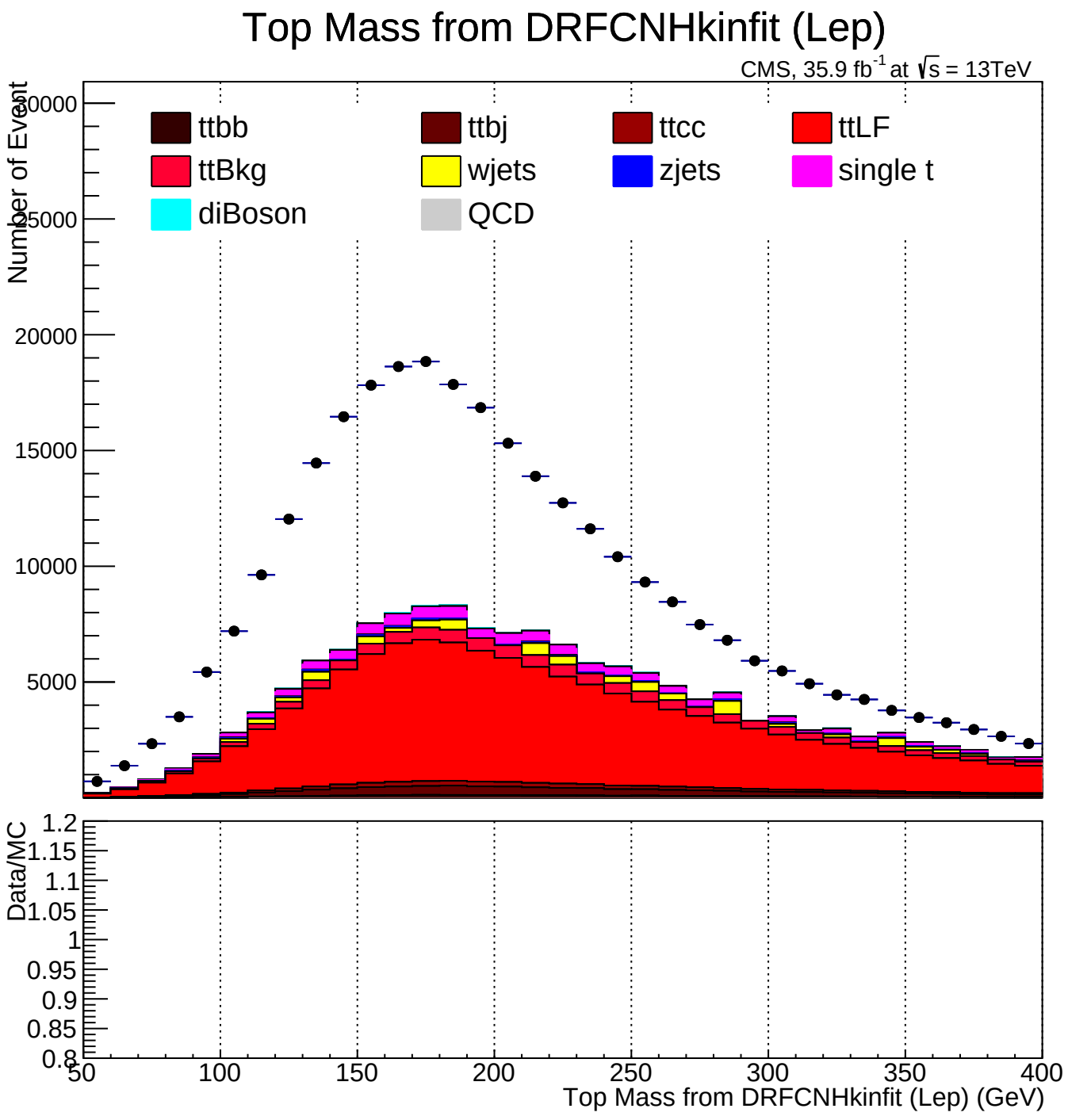

LepIsoQCD
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation (QCD)

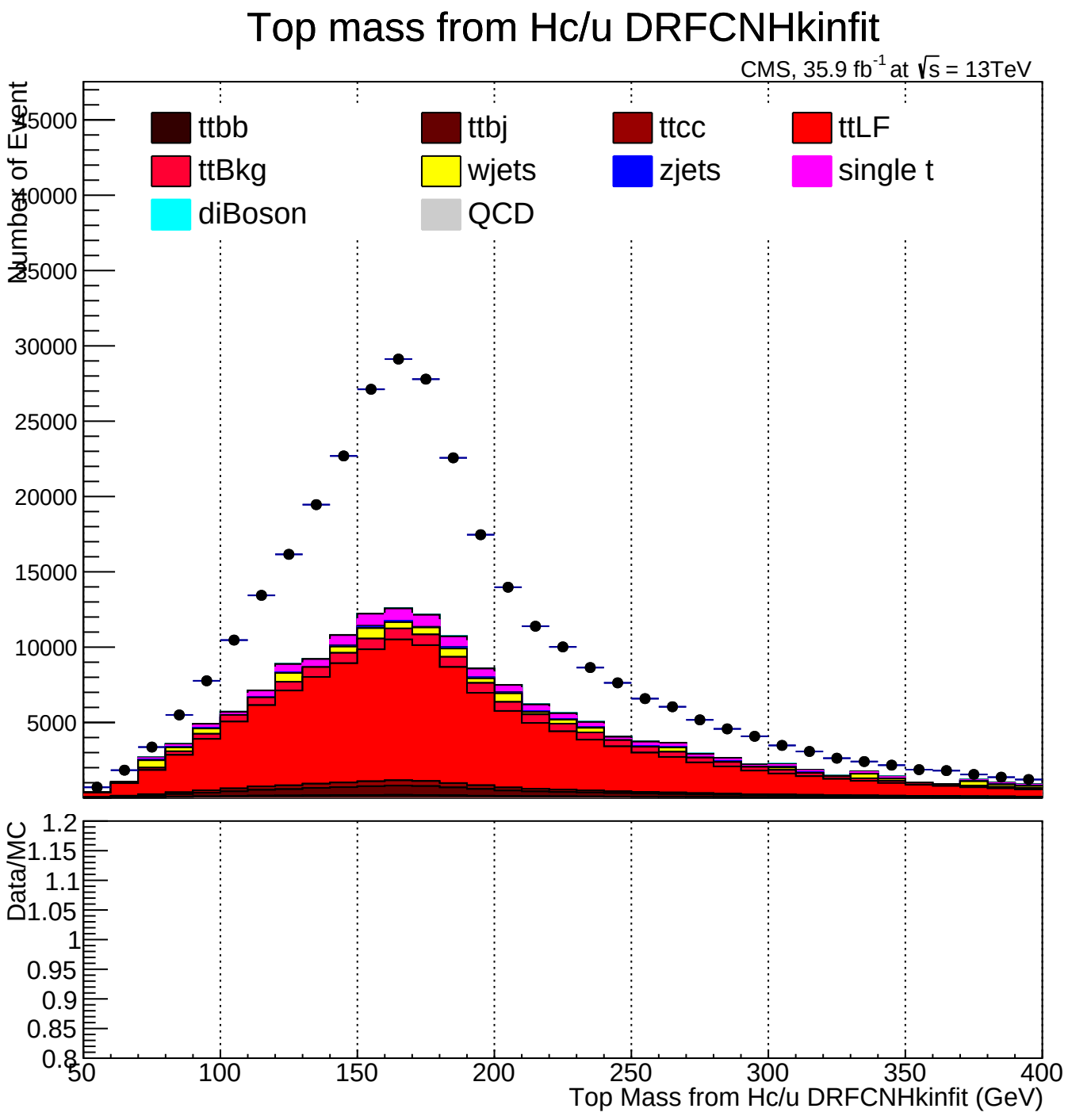

W Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
50000
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
W Mass from DRFCNHkinfit (Lep) (GeV)

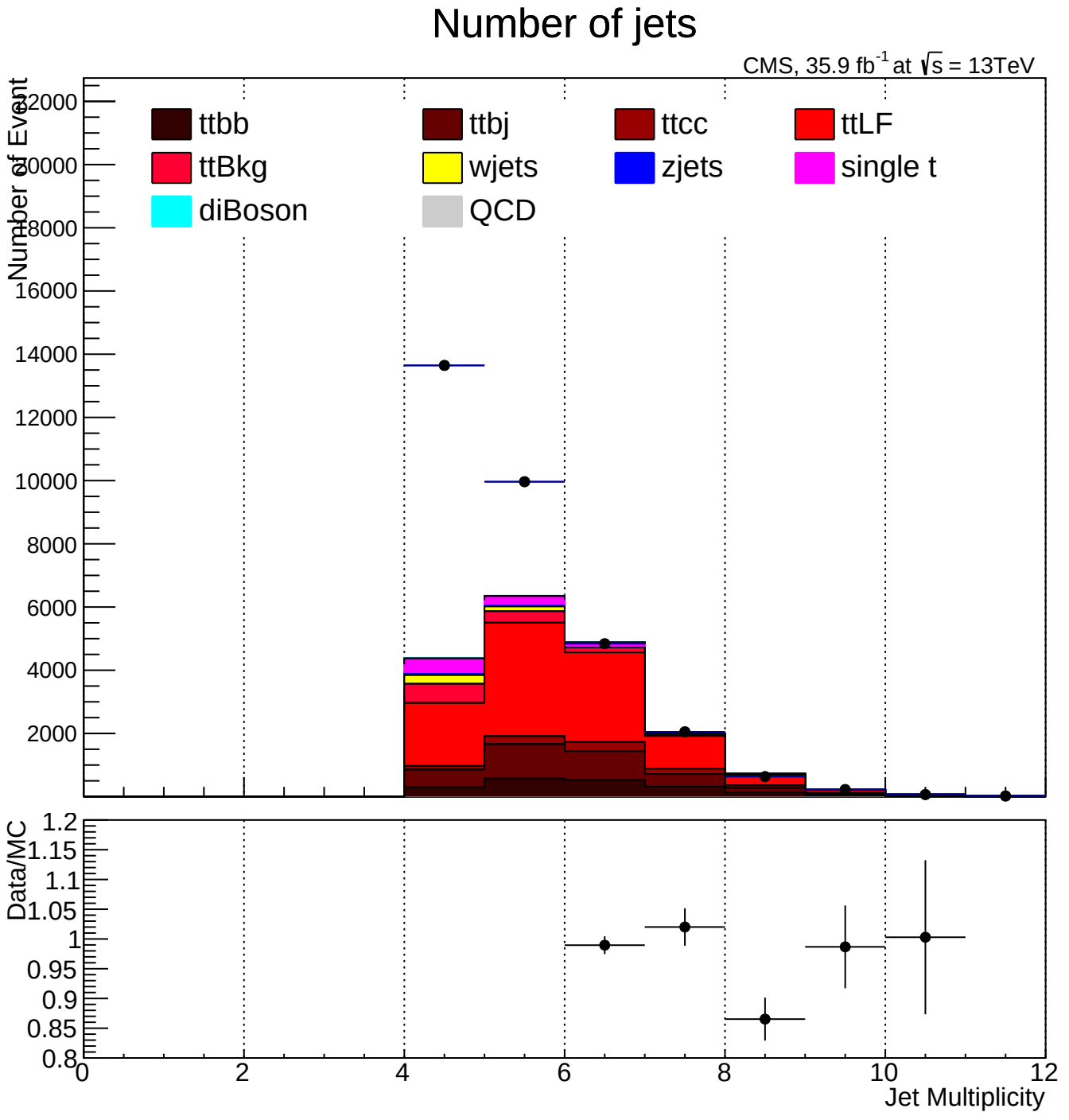

W Mass from DRFCNHkinfit (Had)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
W Mass from DRFCNHkinfit (Had) (GeV)

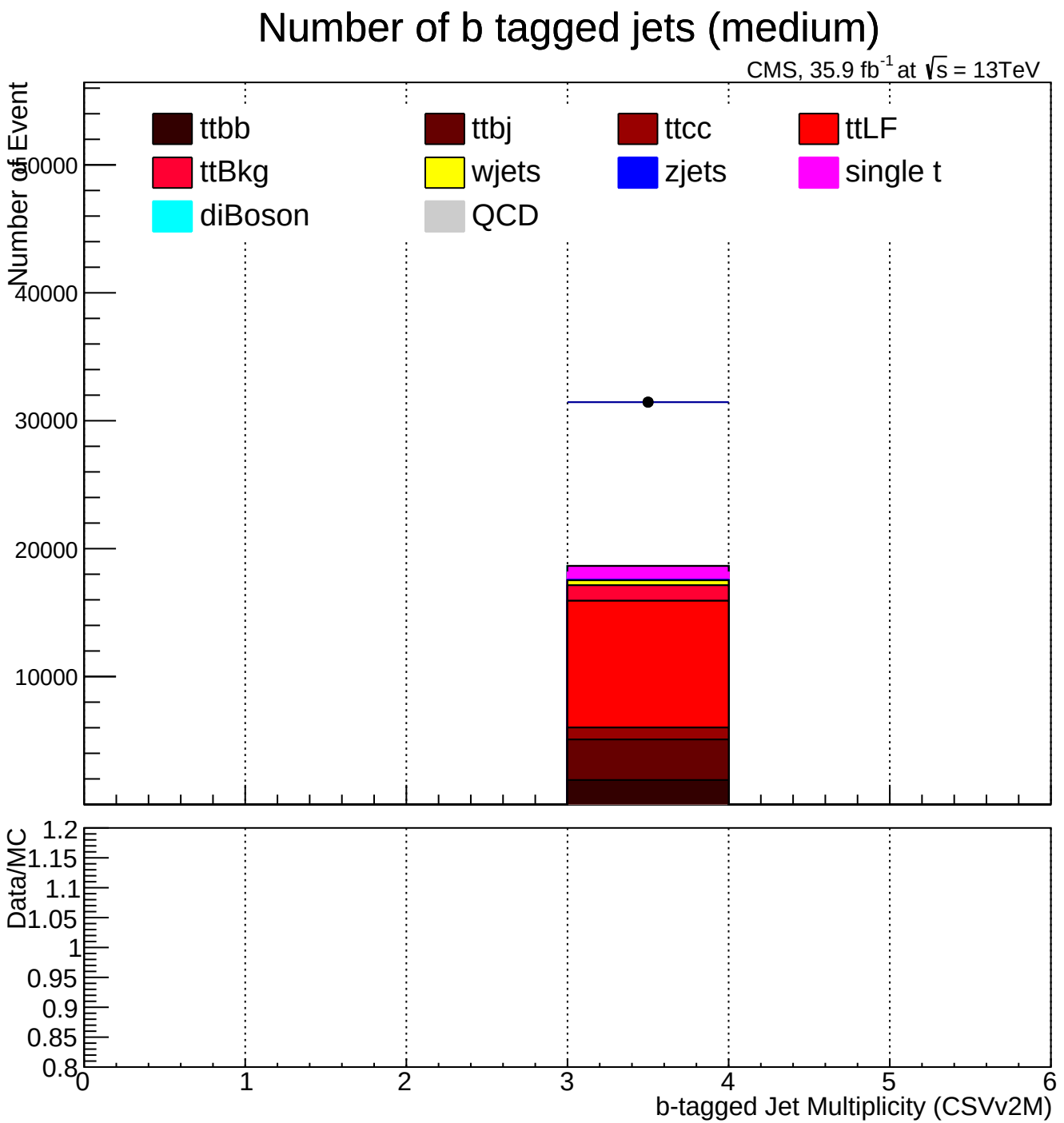

H Mass from DRFCNHkinfit (bb)
CMS, 35.9 fb-1 at √s = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
H Mass from DRFCNHkinfit (bb)(GeV)

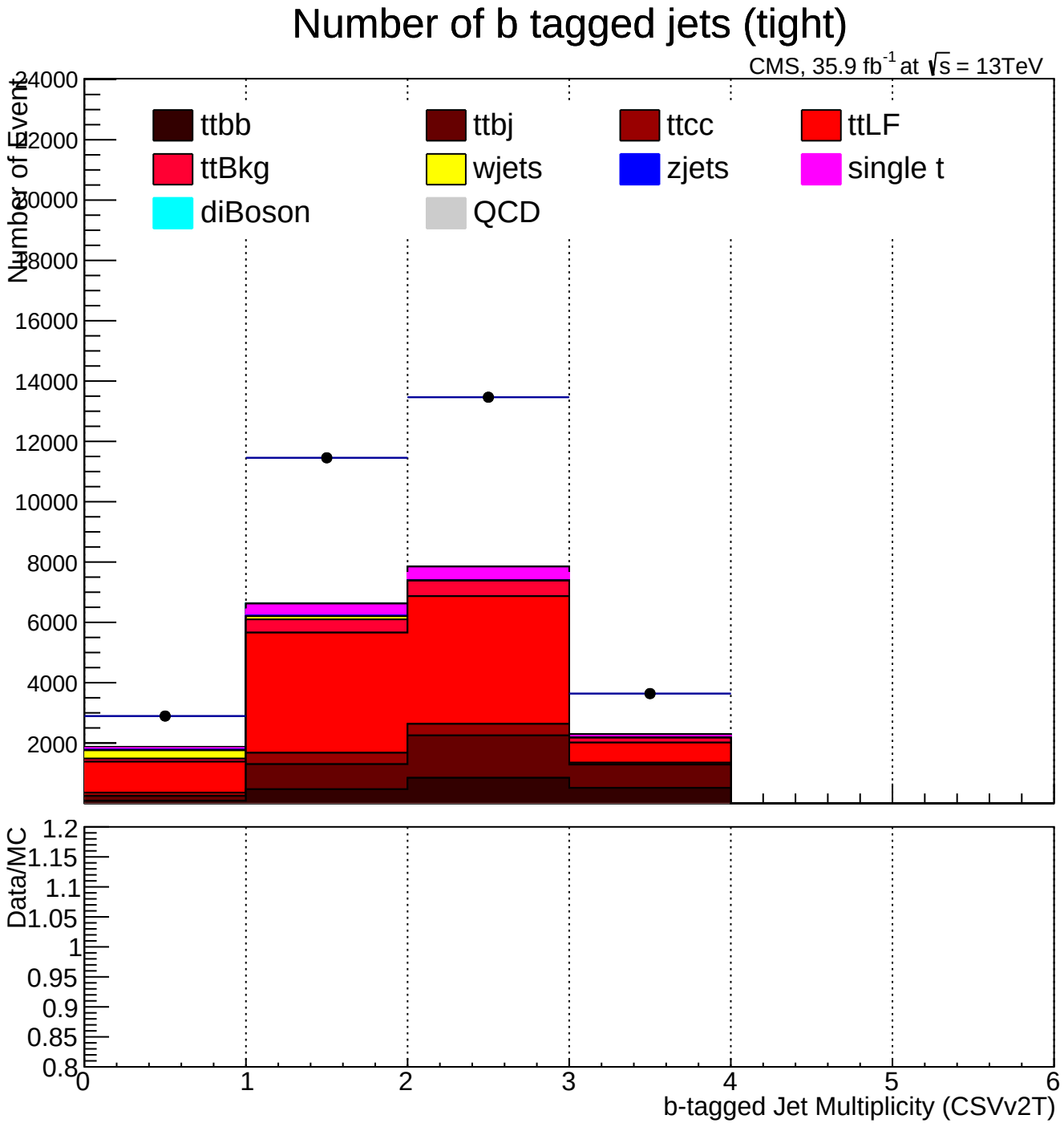

Delta R from DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Delta R from DRFCNHkinfit Higgs

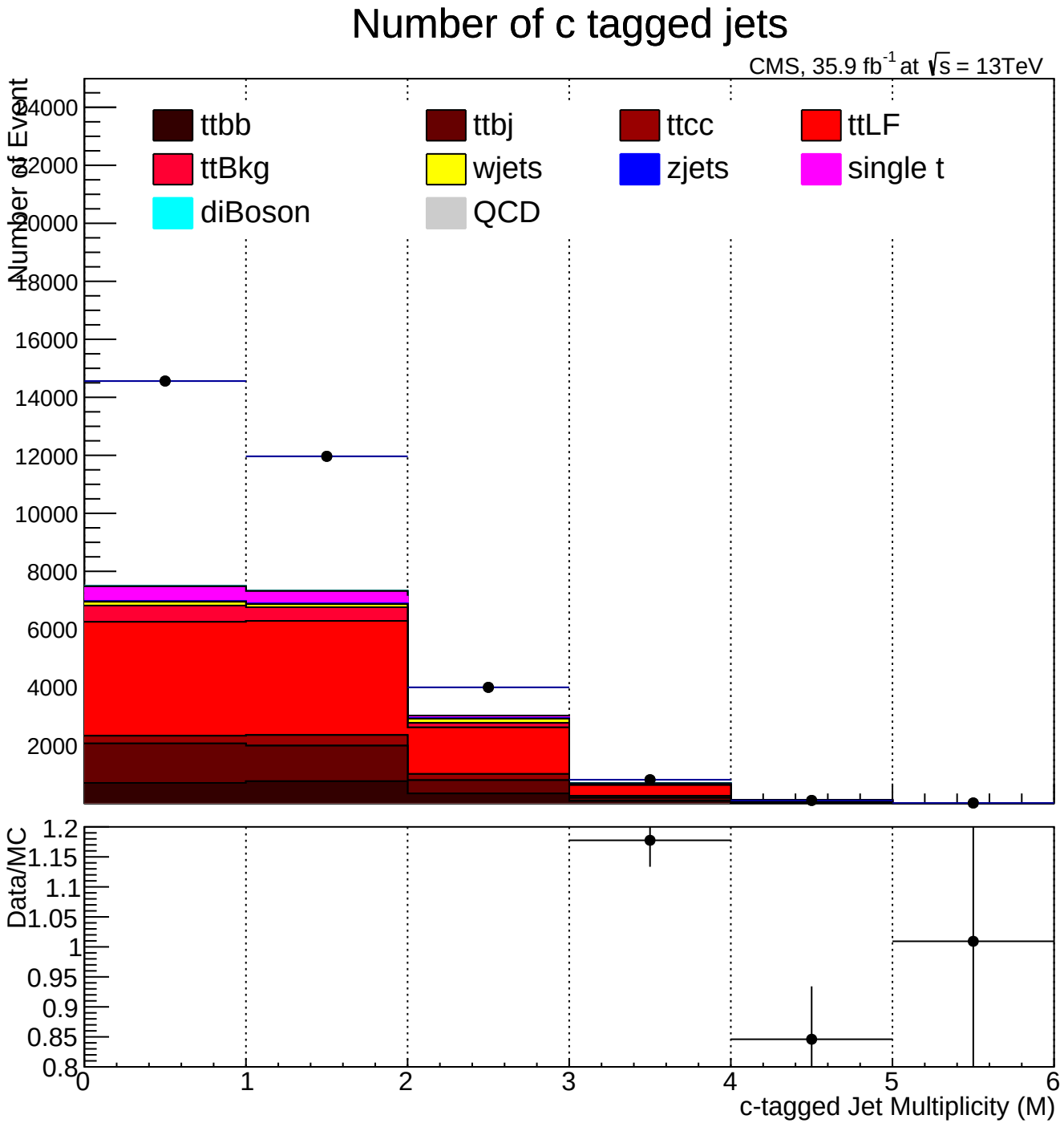

Top Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Top Mass from DRFCNHkinfit (Lep) (GeV)

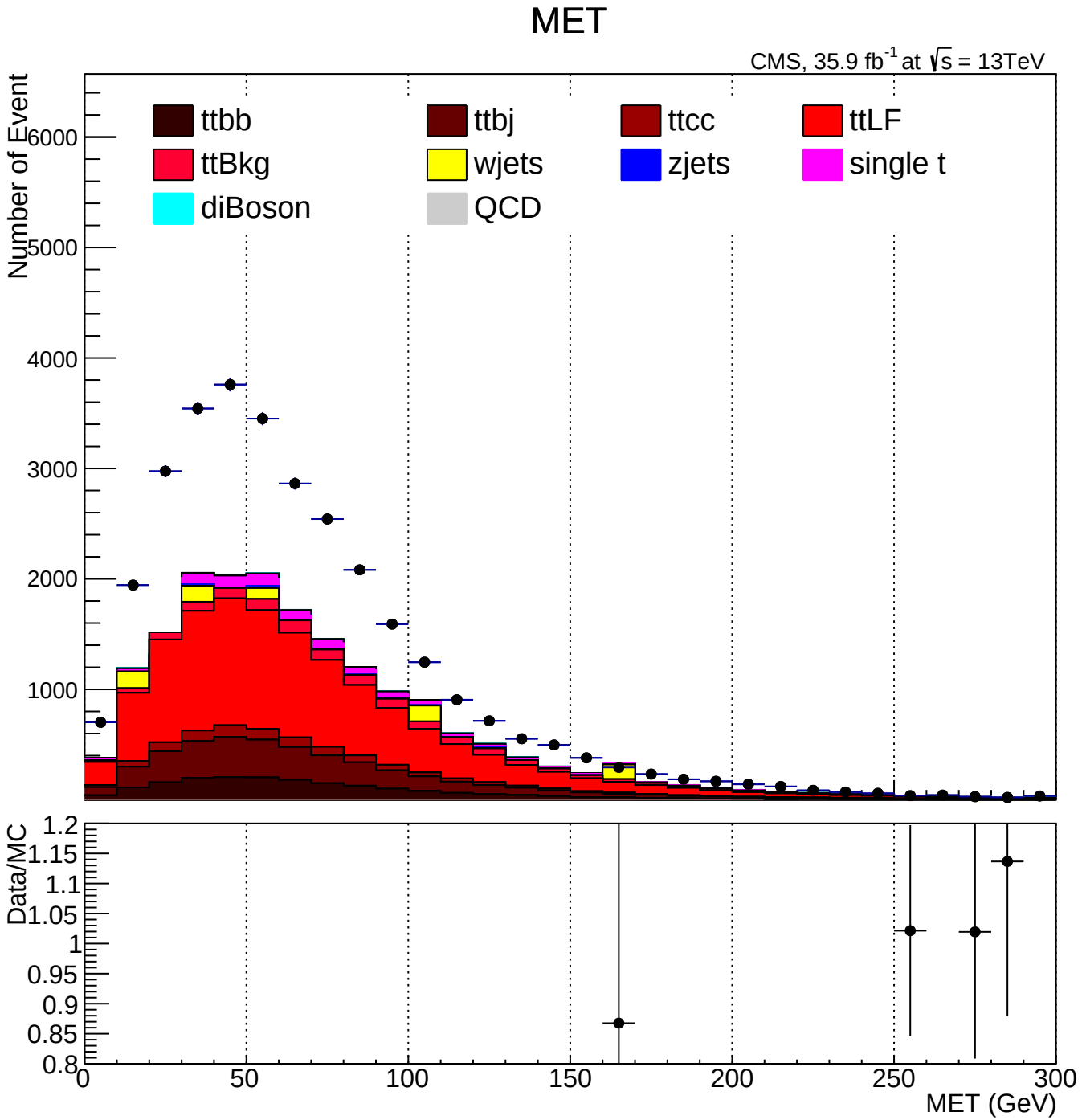

Top mass from Hc/u DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Top Mass from Hc/u DRFCNHkinfit (GeV)

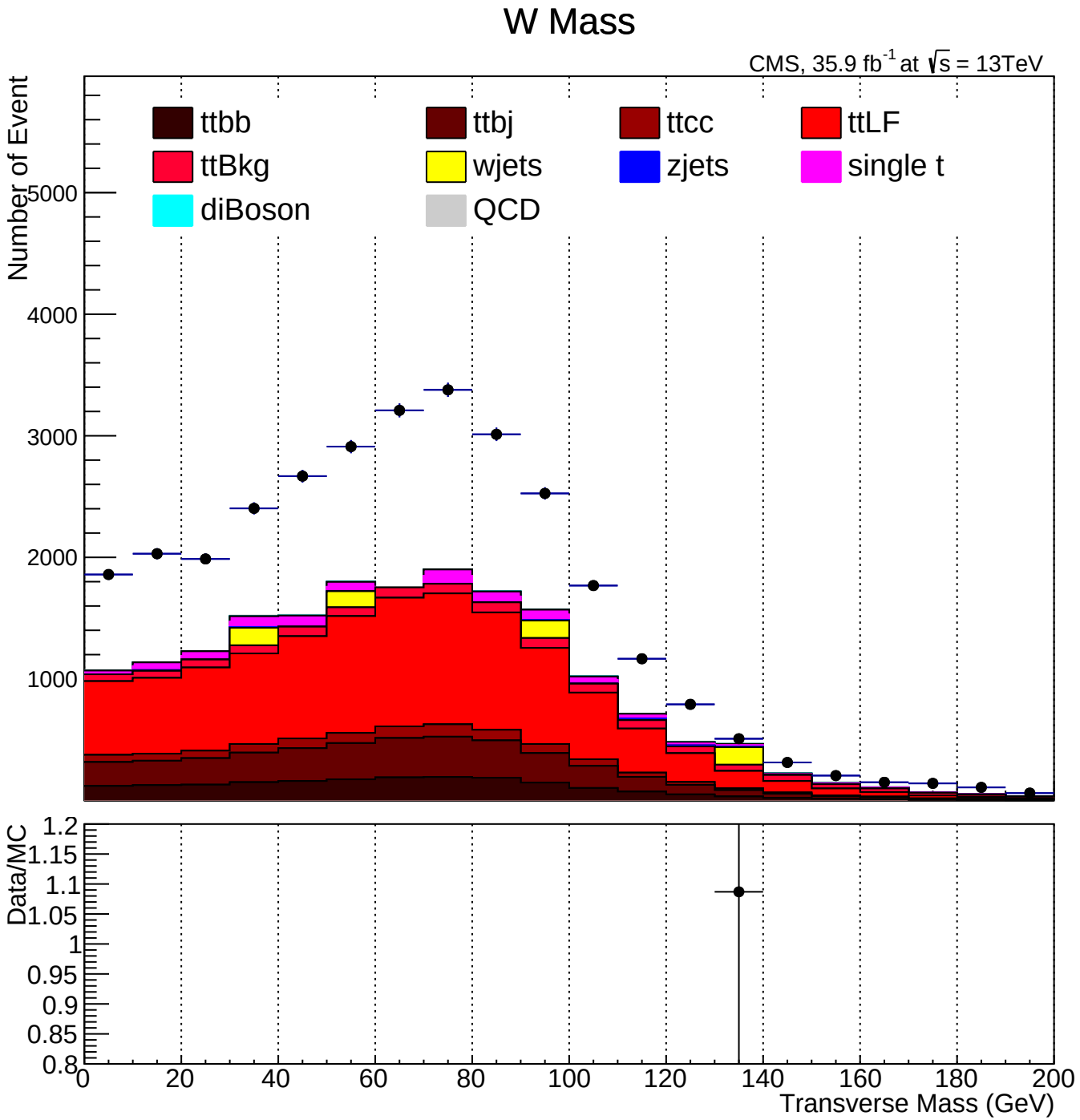

Number of jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Jet Multiplicity

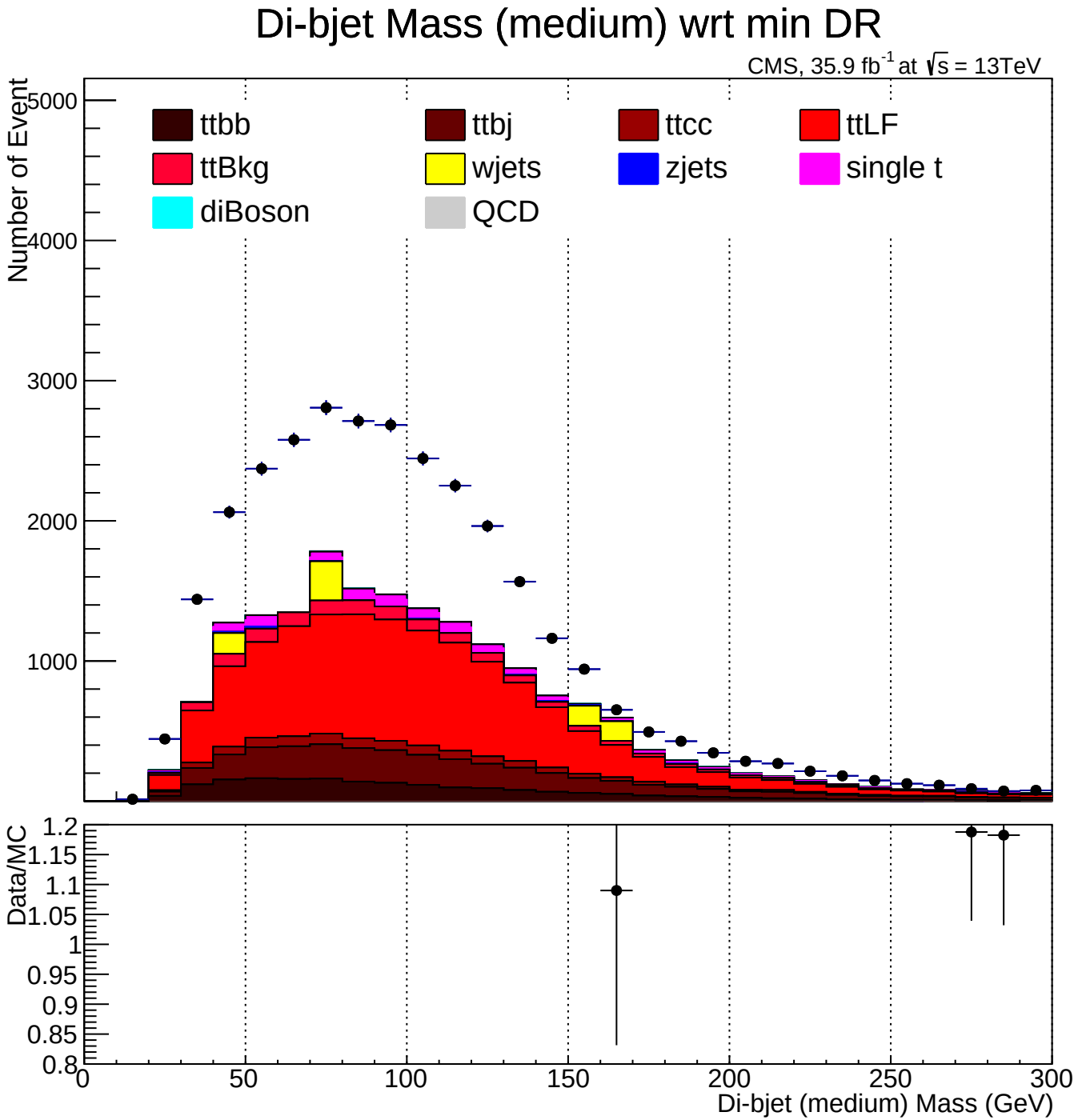

Number of b tagged jets (medium)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
50000
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2M)

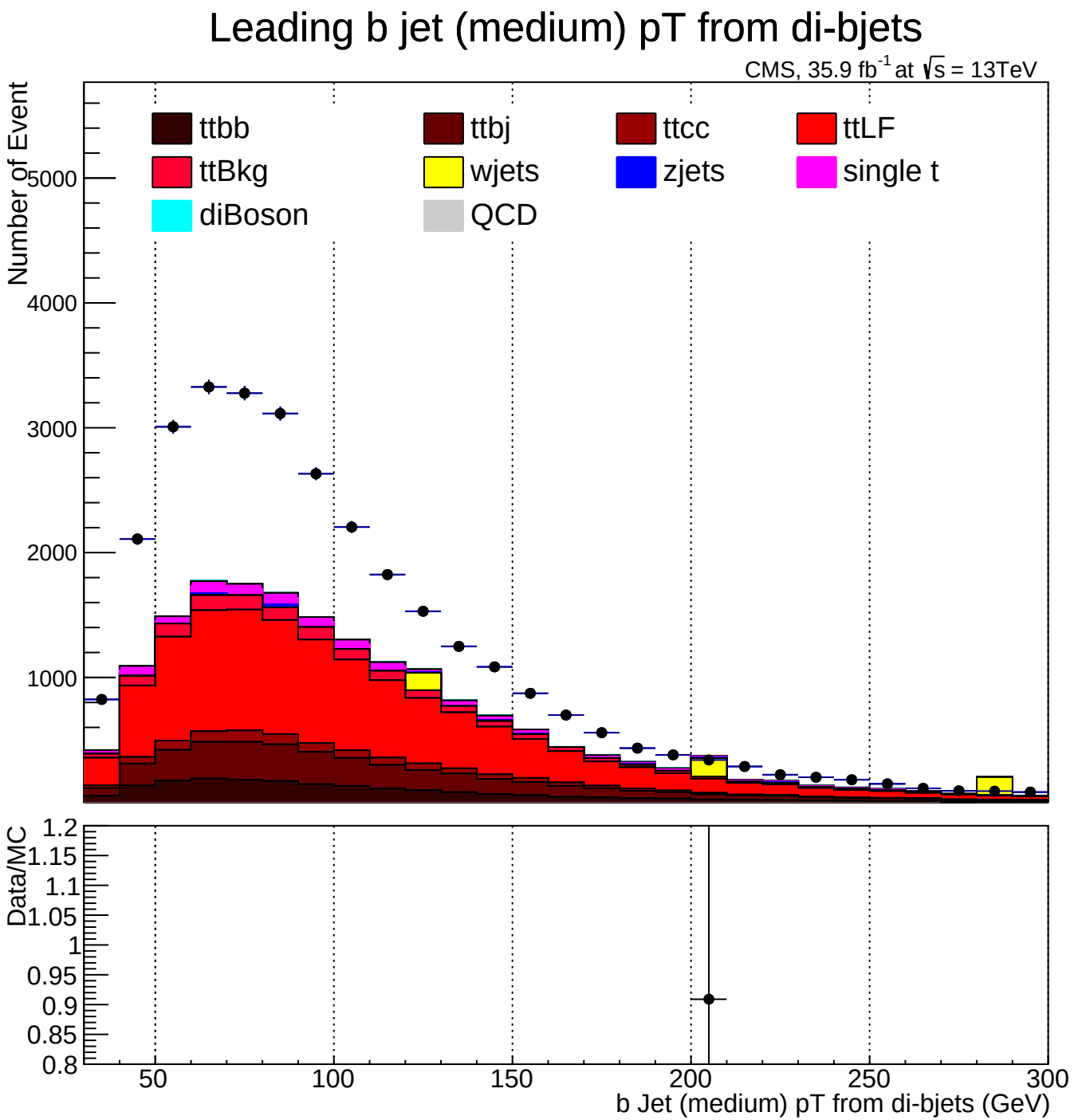

Number of b tagged jets (tight)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
24000
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2T)

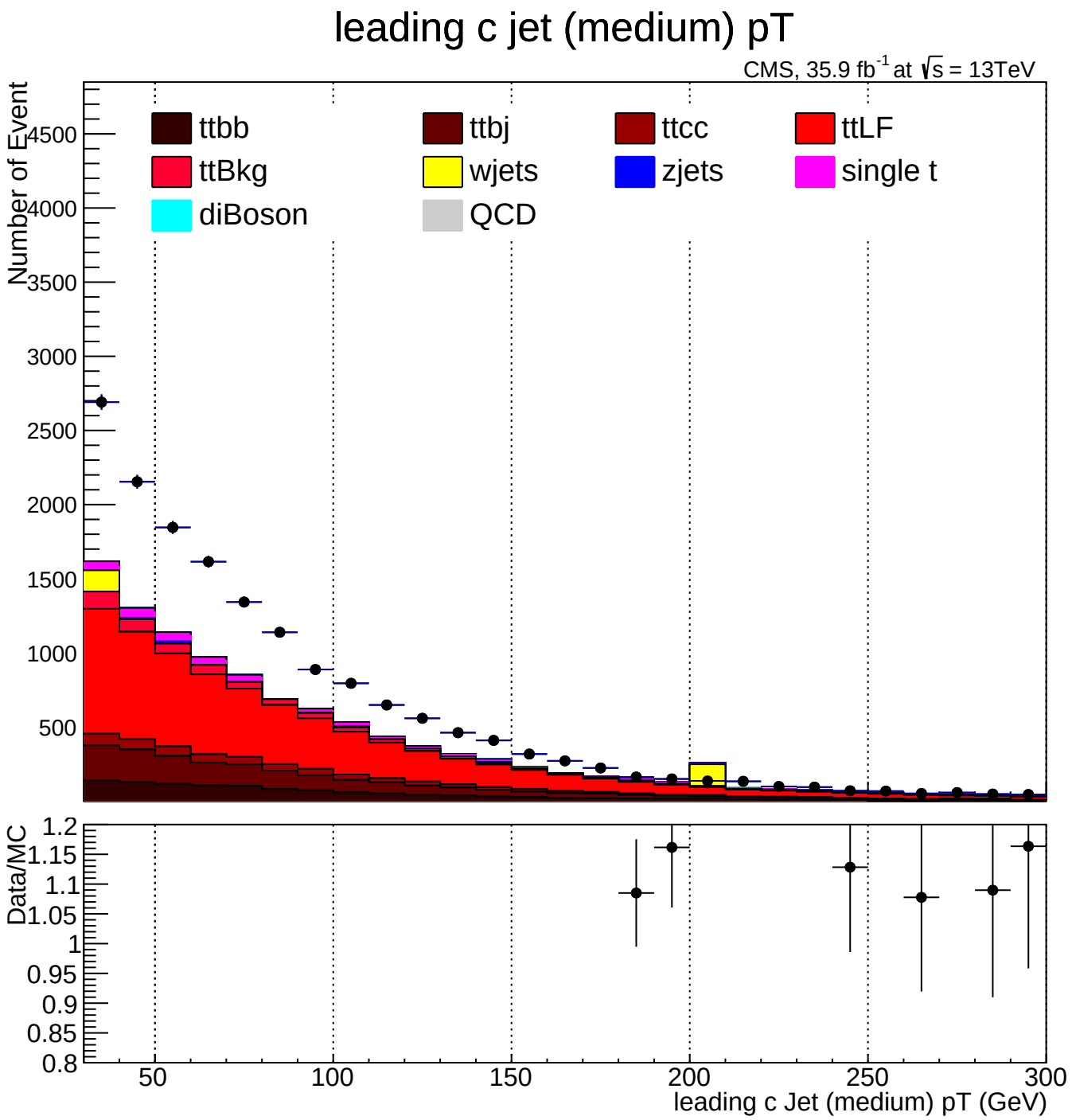

Number of c tagged jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
c-tagged Jet Multiplicity (M)

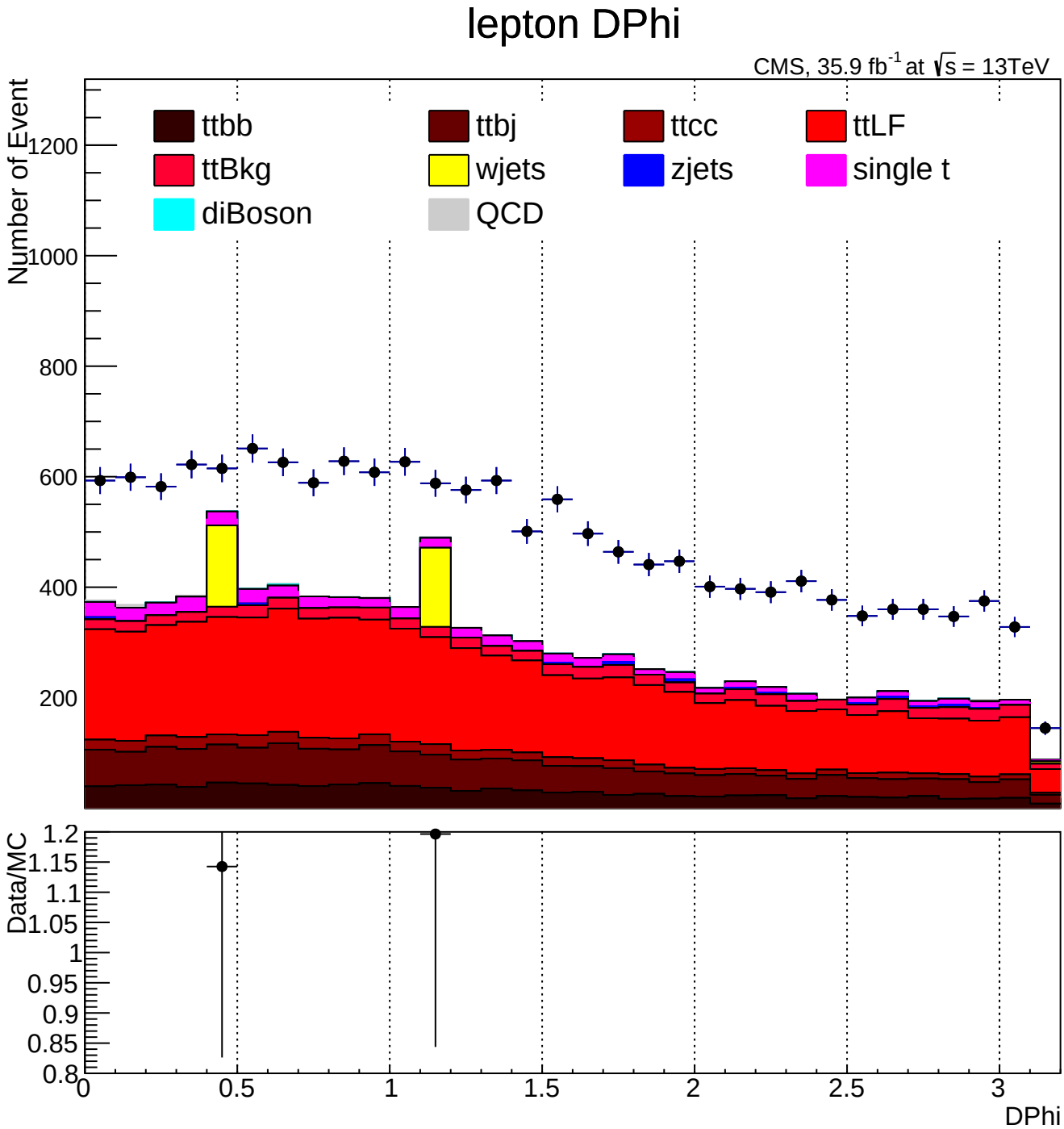

MET
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
6000
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
50
100
150
200
250
300
MET (GeV)

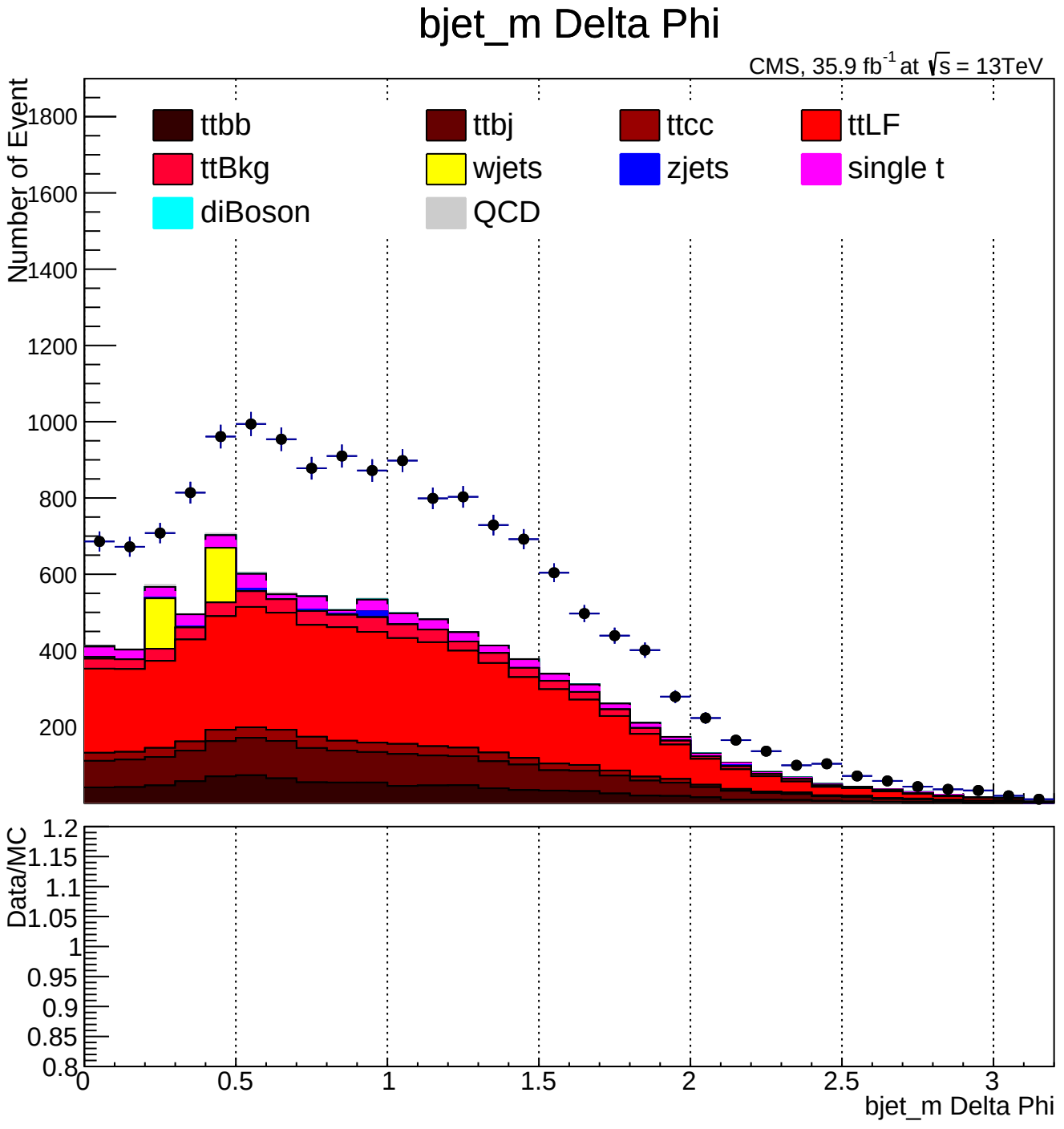

W Mass
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
20
40
60
80
100
120
140
160
180
200
Transverse Mass (GeV)

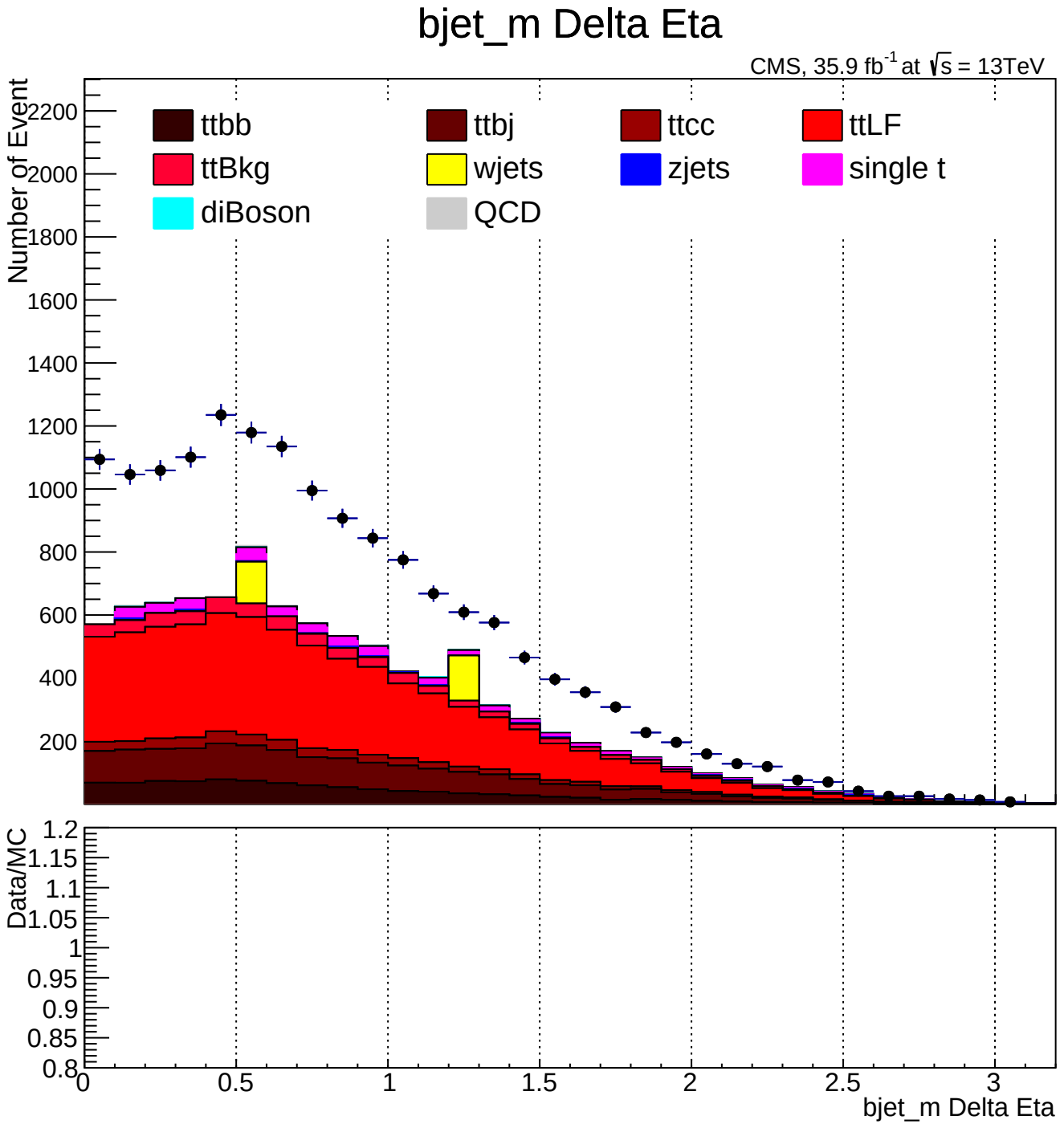

Di-bjet Mass (medium) wrt min DR
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Di-bjet (medium) Mass (GeV)

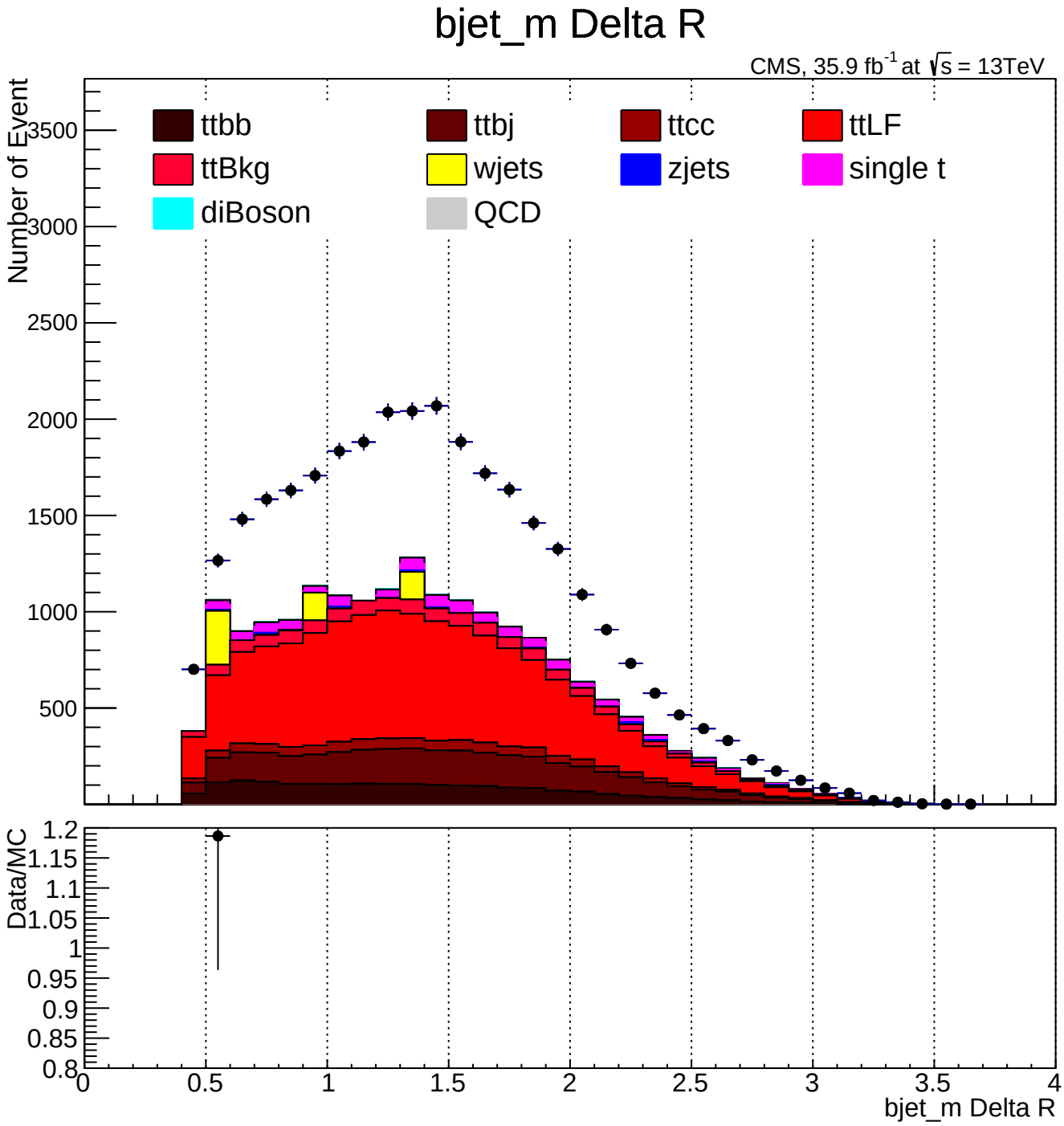

Leading b jet (medium) pT from di-bjets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
b Jet (medium) pT from di-bjets (GeV)

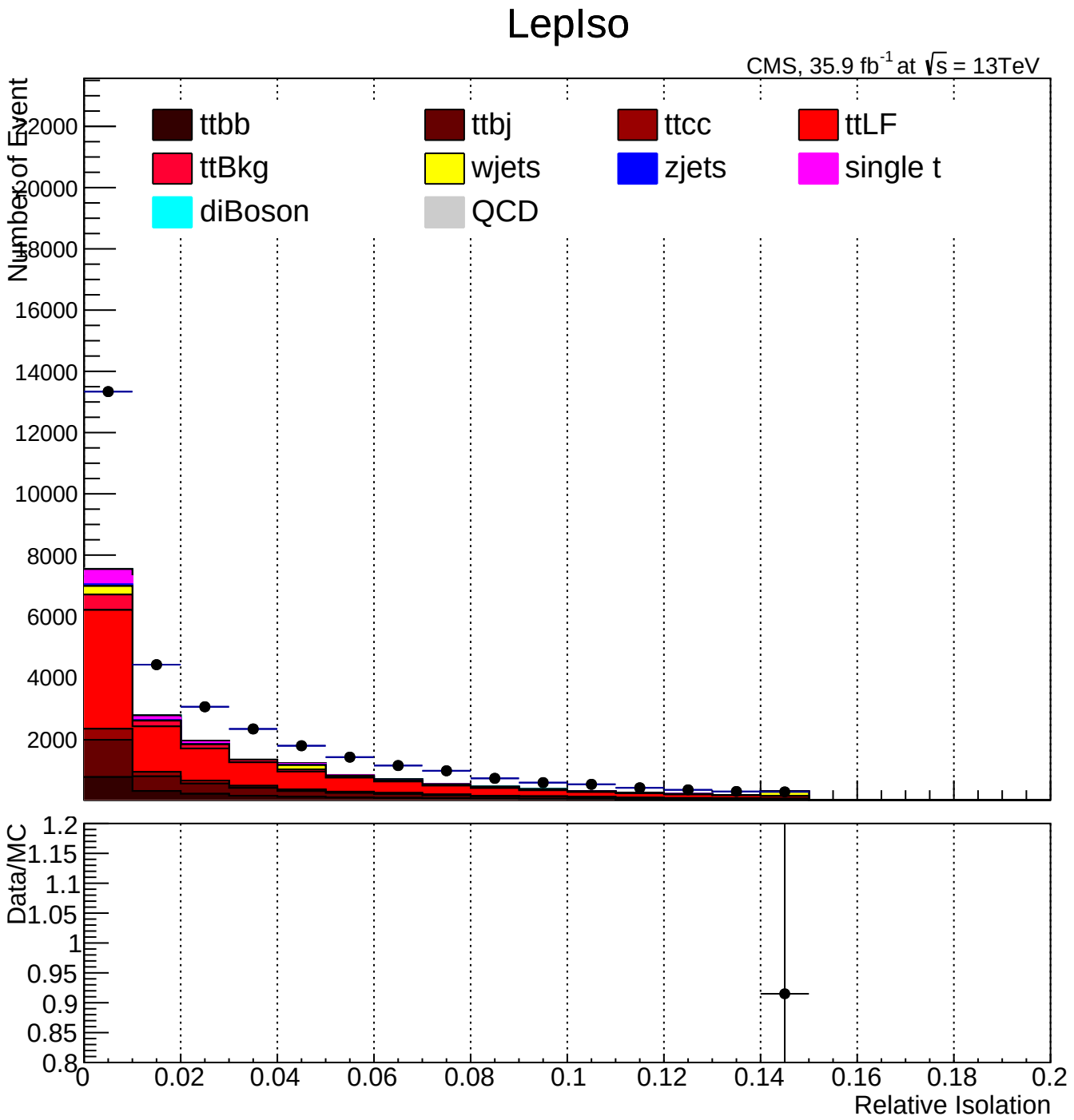

leading c jet (medium) pT
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
leading c Jet (medium) pT (GeV)

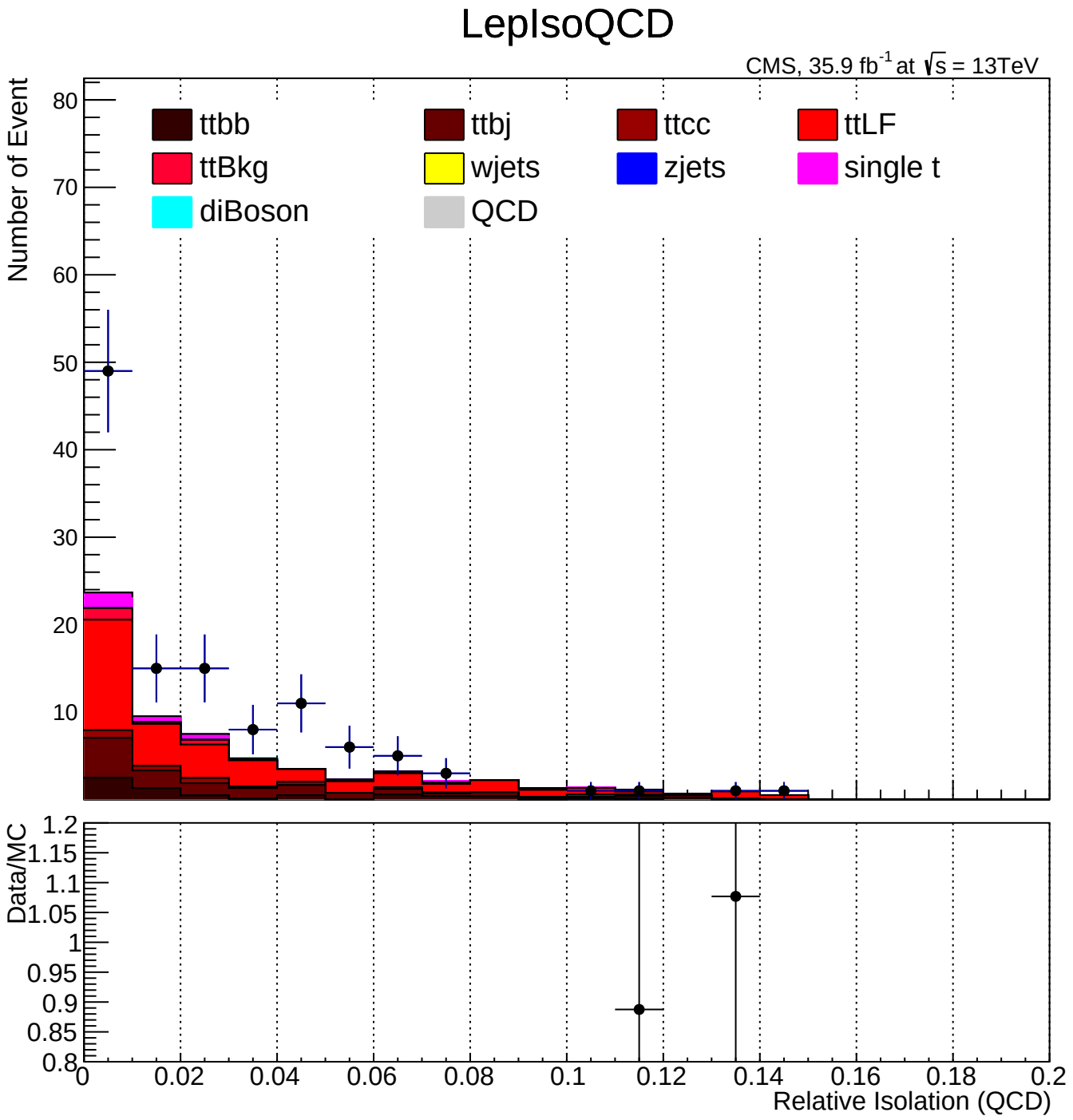

lepton DPhi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
1200
1000
800
600
400
200
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
DPhi

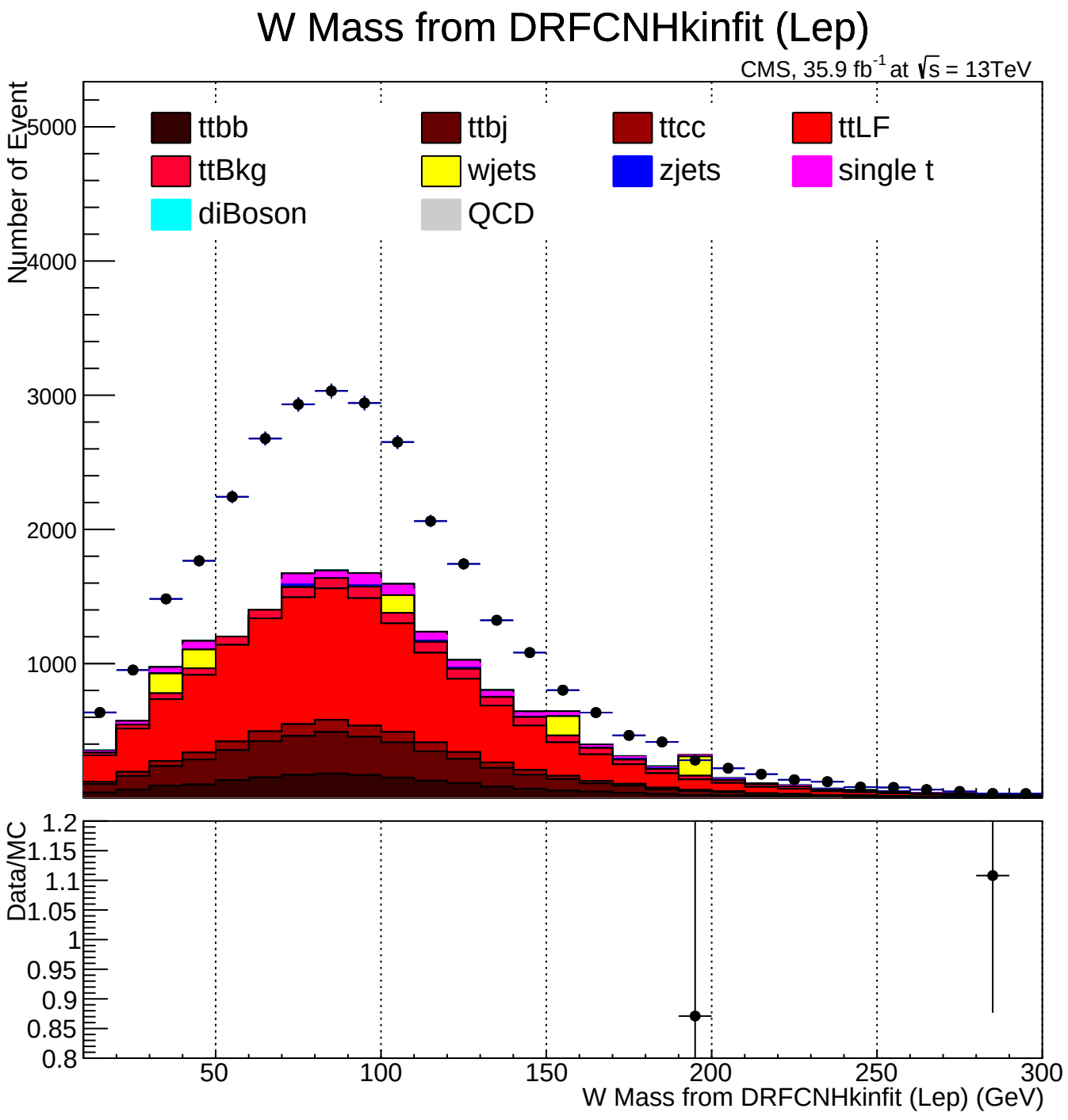

bjet_m Delta Phi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta Phi

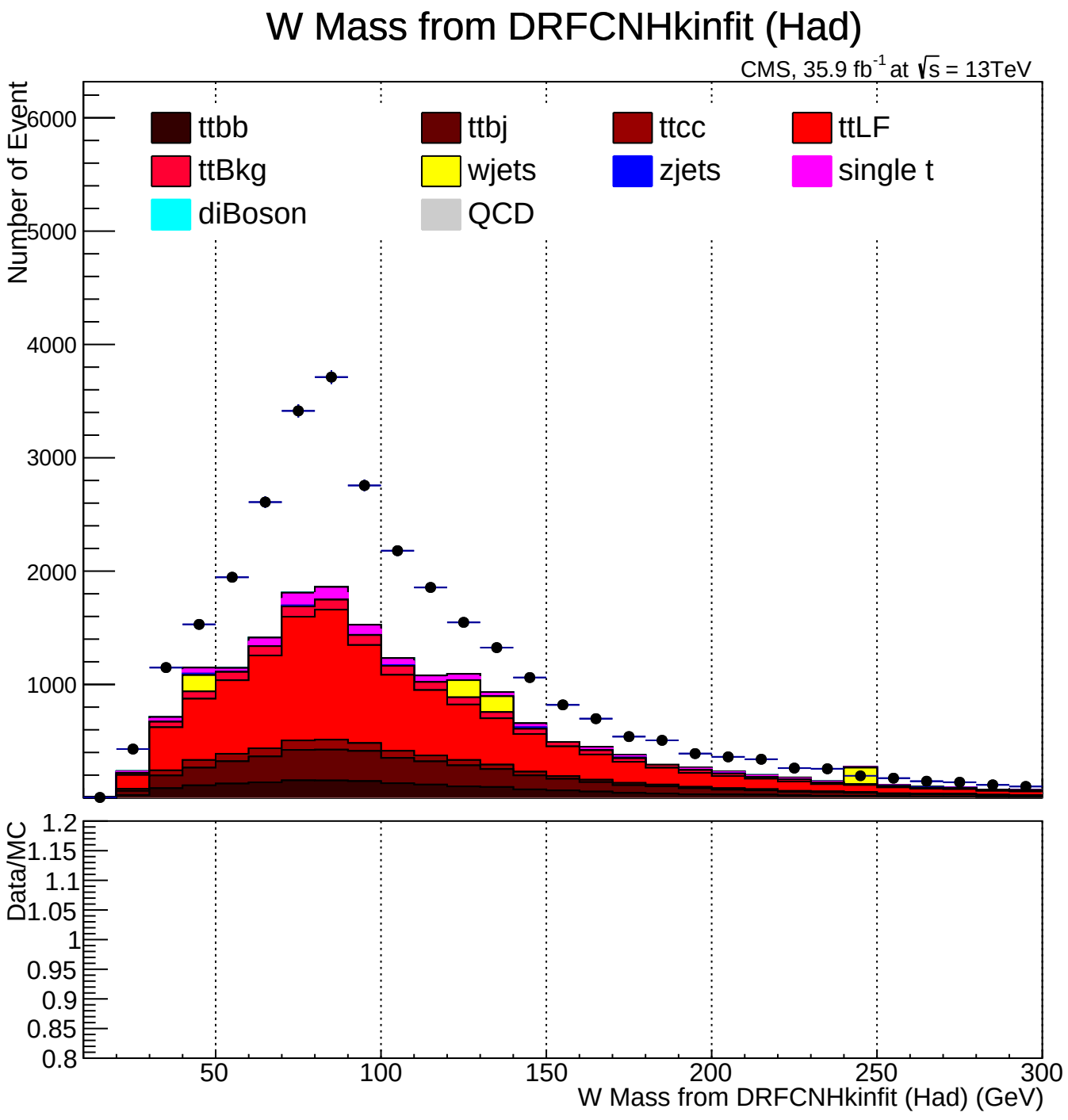

bjet_m Delta Eta
CMS, 35.9 fb-1 at √s = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta Eta

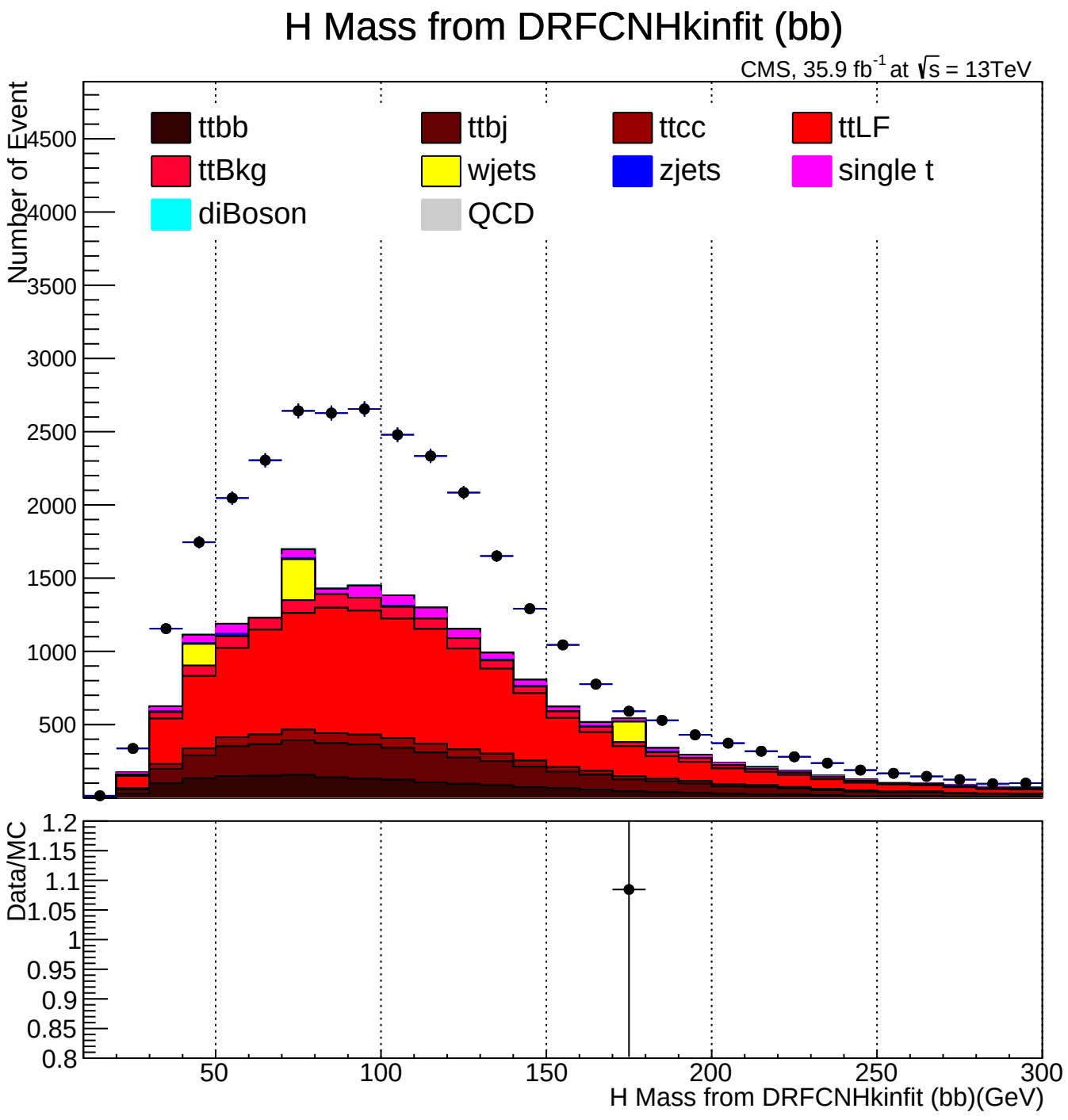

bjet_m Delta R
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta R

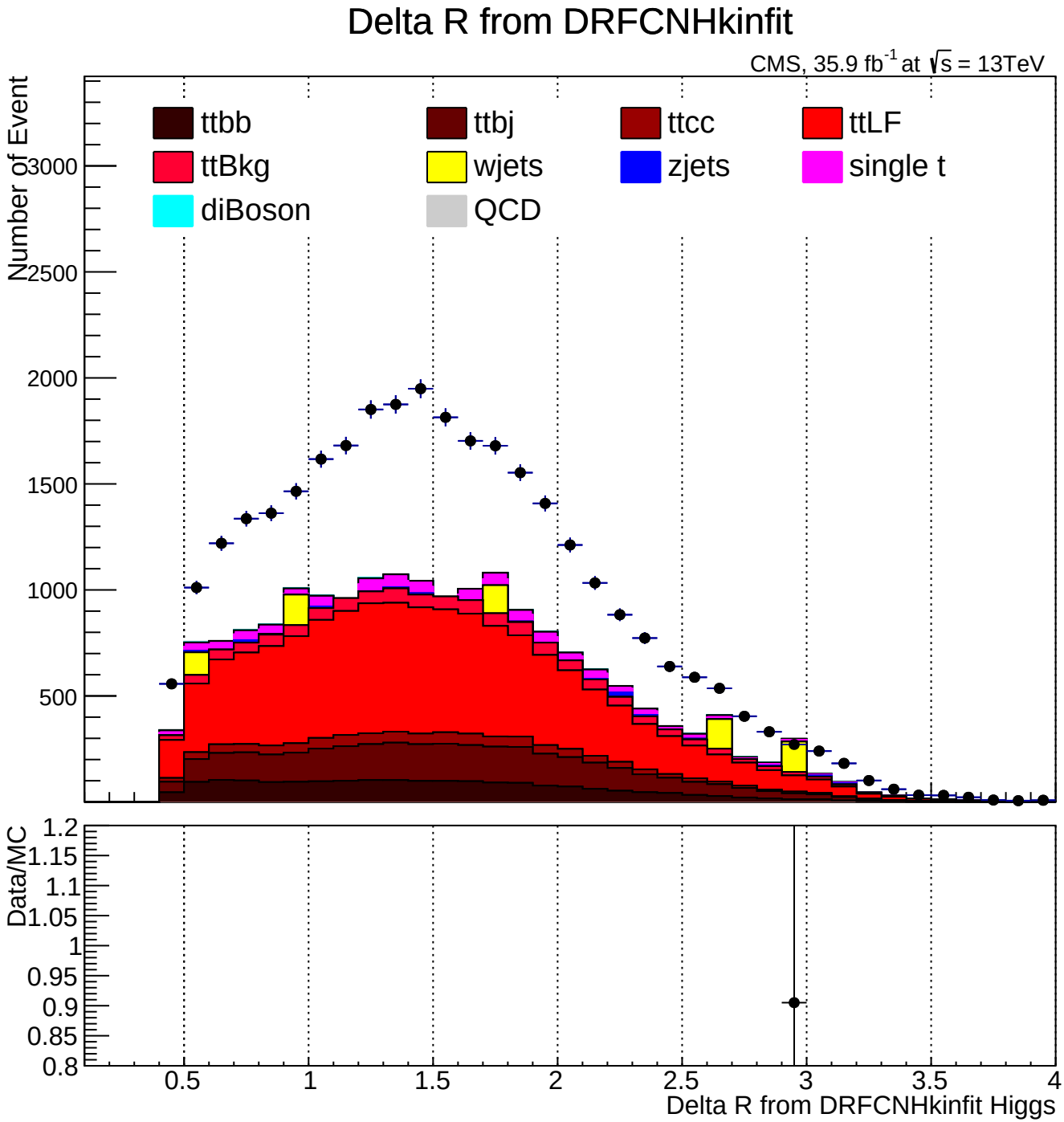

LepIso
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation

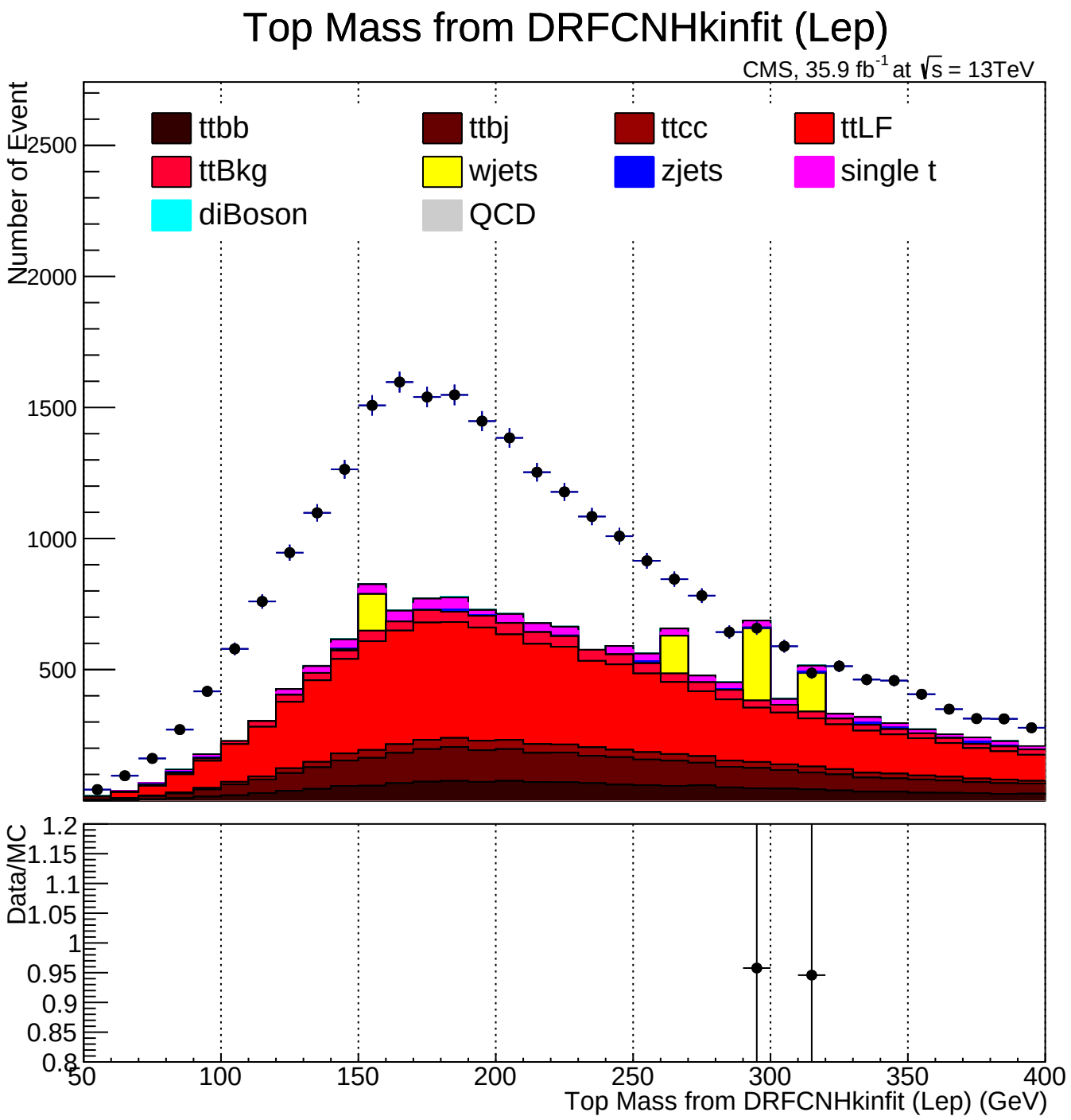

LepIsoQCD
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation (QCD)

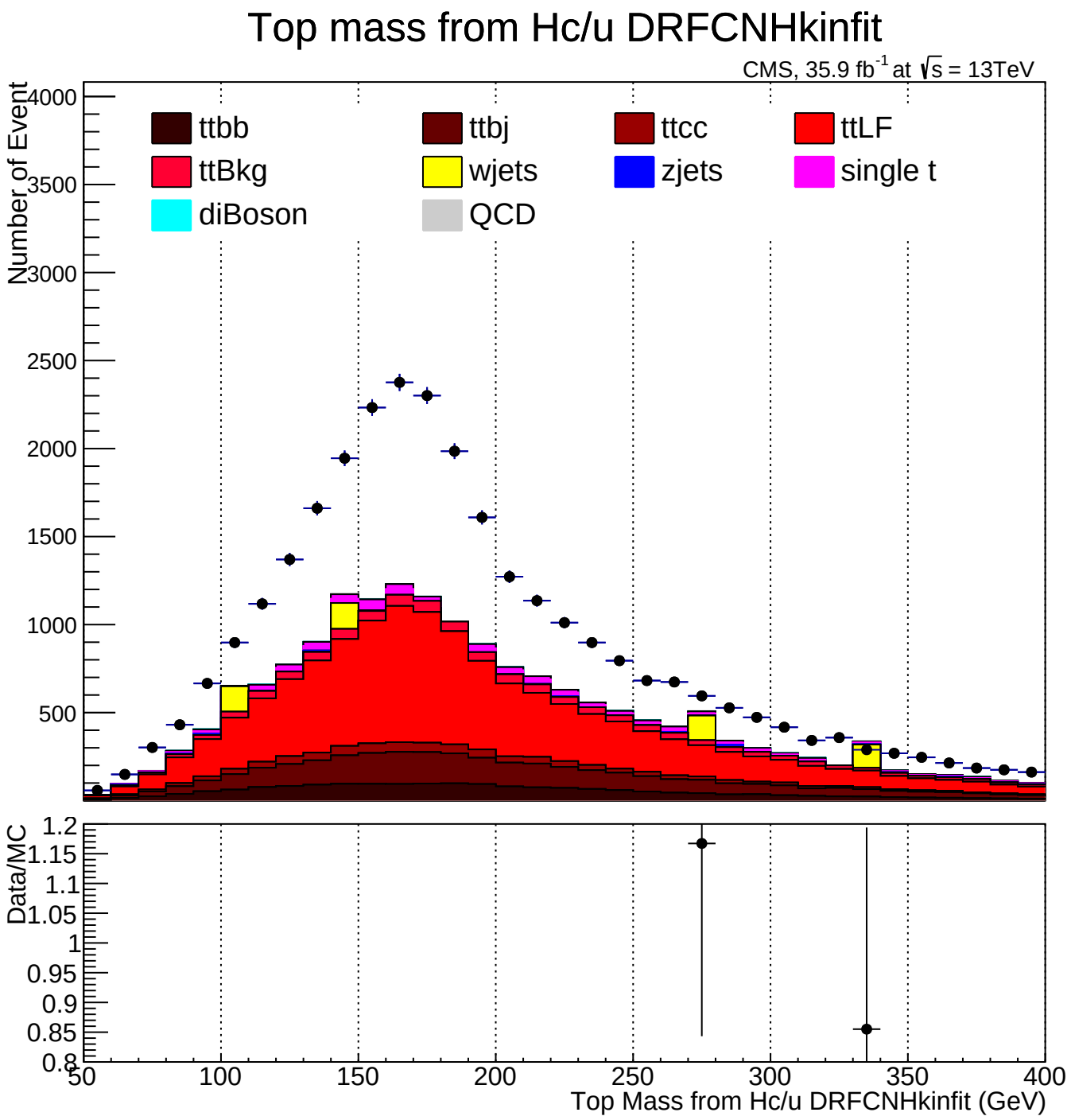

W Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb-1 at √s = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
W Mass from DRFCNHkinfit (Lep) (GeV)

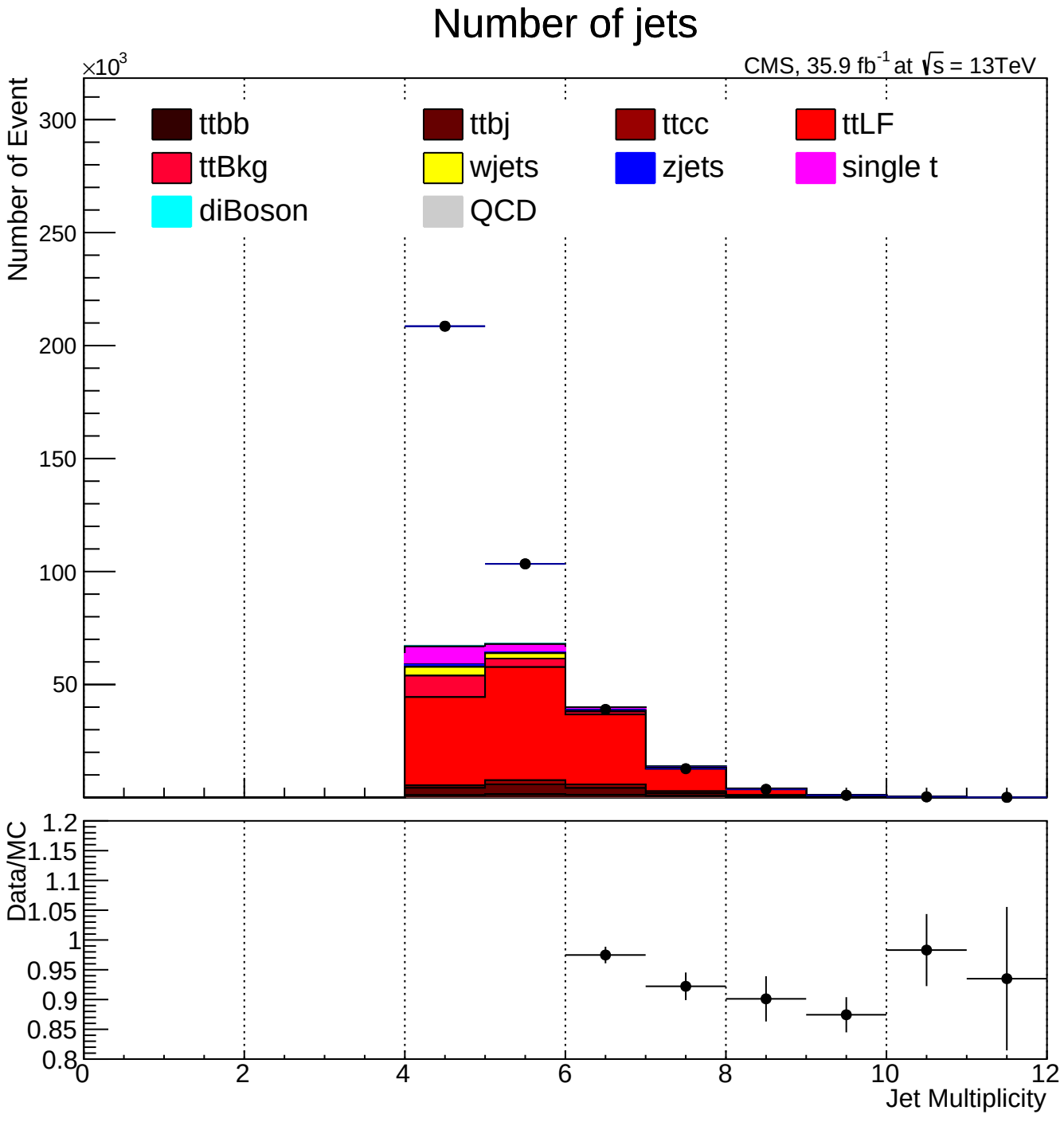

W Mass from DRFCNHkinfit (Had)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
W Mass from DRFCNHkinfit (Had) (GeV)

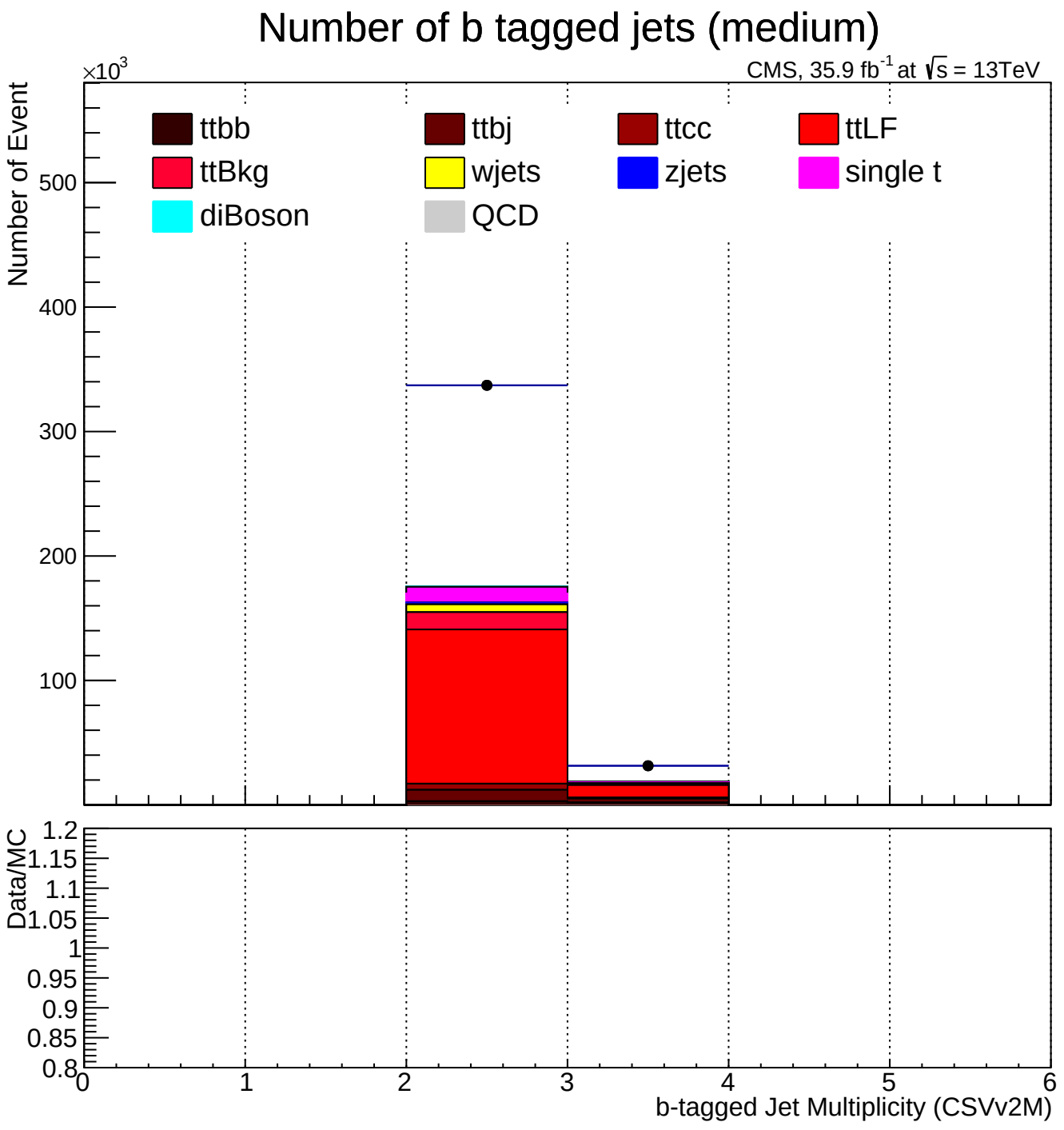

H Mass from DRFCNHkinfit (bb)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
H Mass from DRFCNHkinfit (bb)(GeV)

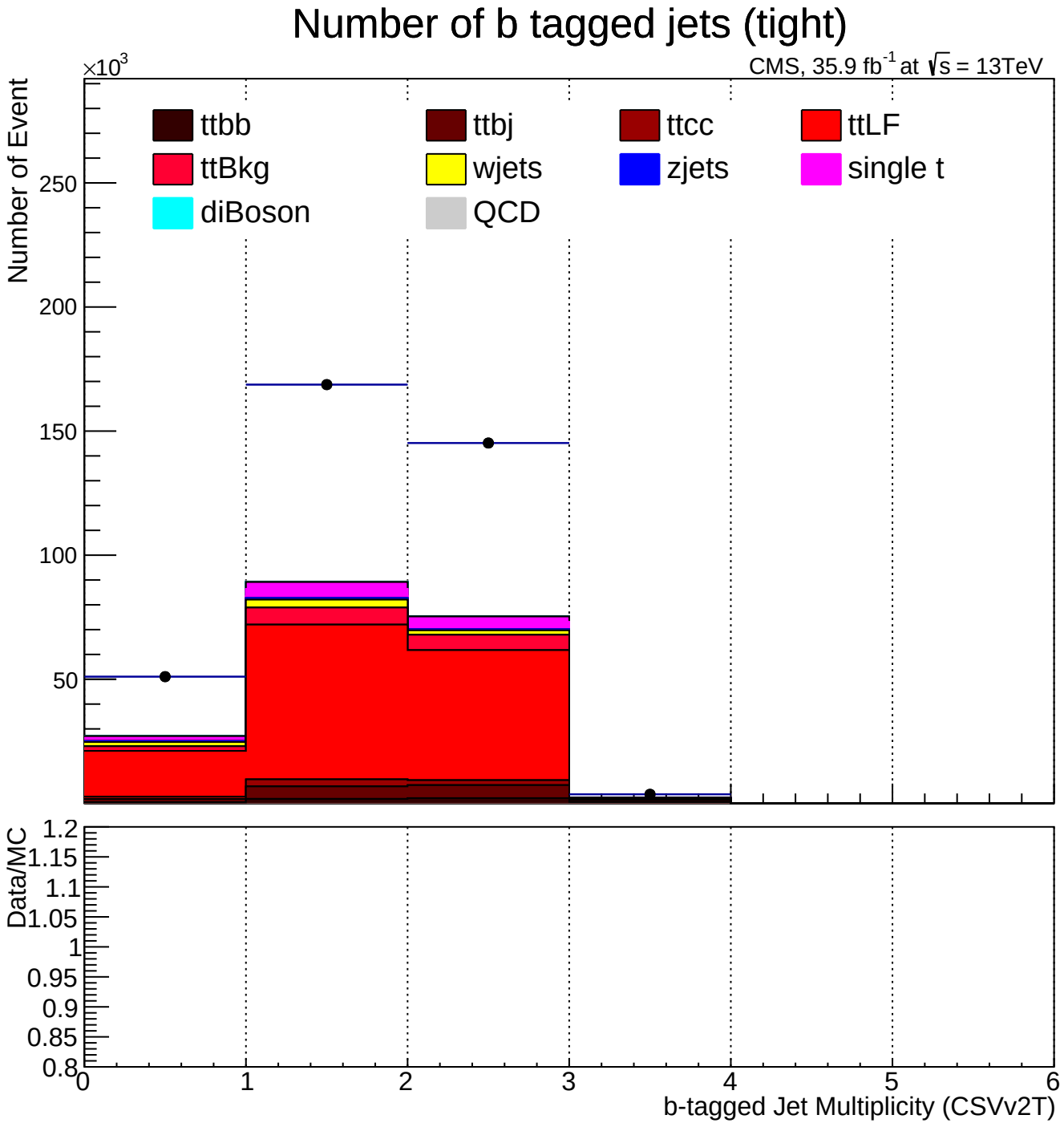

Delta R from DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
3000
2500
2000
1500
1000
500
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0.5
1
1.5
2
2.5
3
3.5
4
Delta R from DRFCNHkinfit Higgs

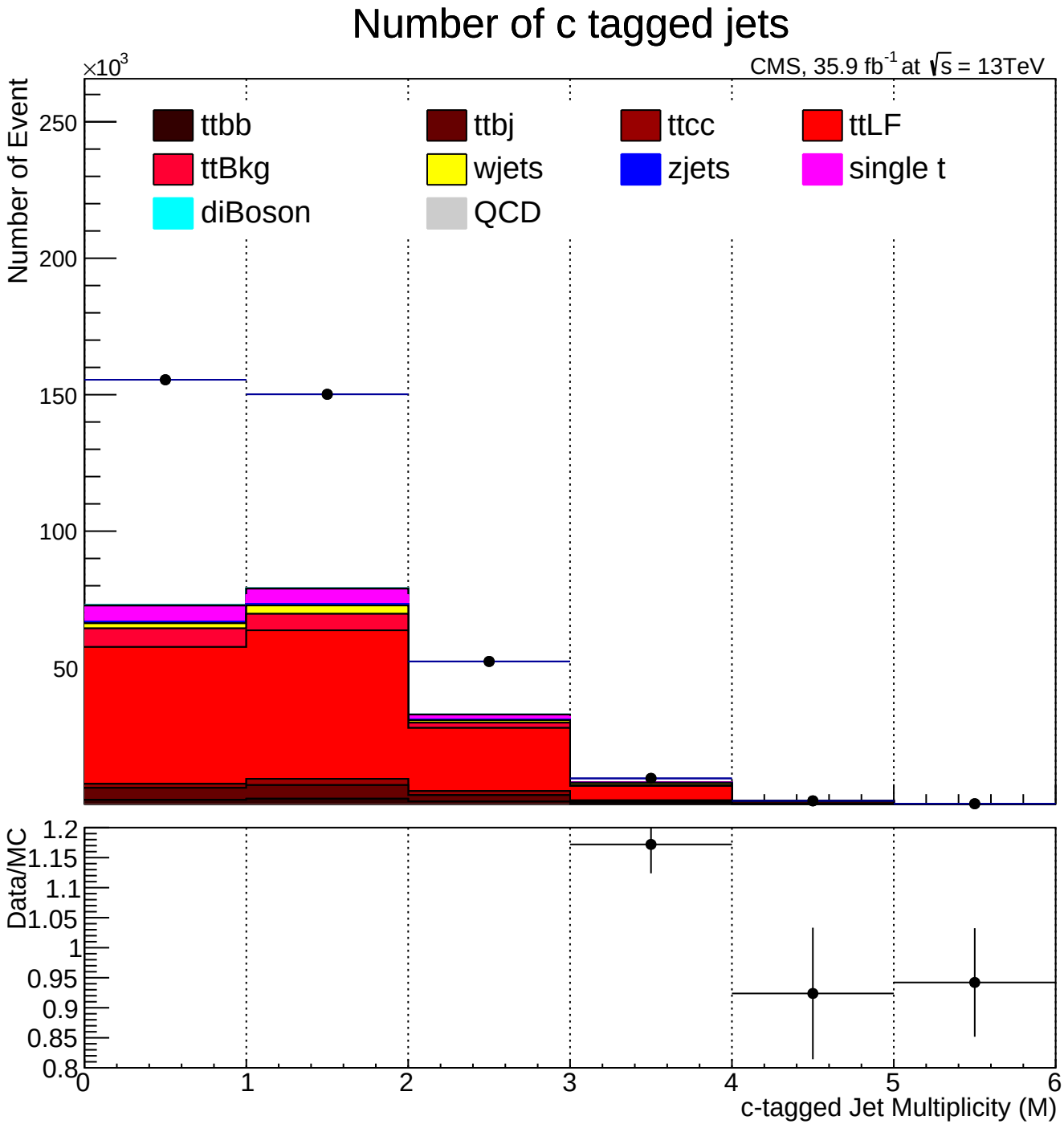

Top Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
2500
2000
1500
1000
500
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
350
400
Top Mass from DRFCNHkinfit (Lep) (GeV)

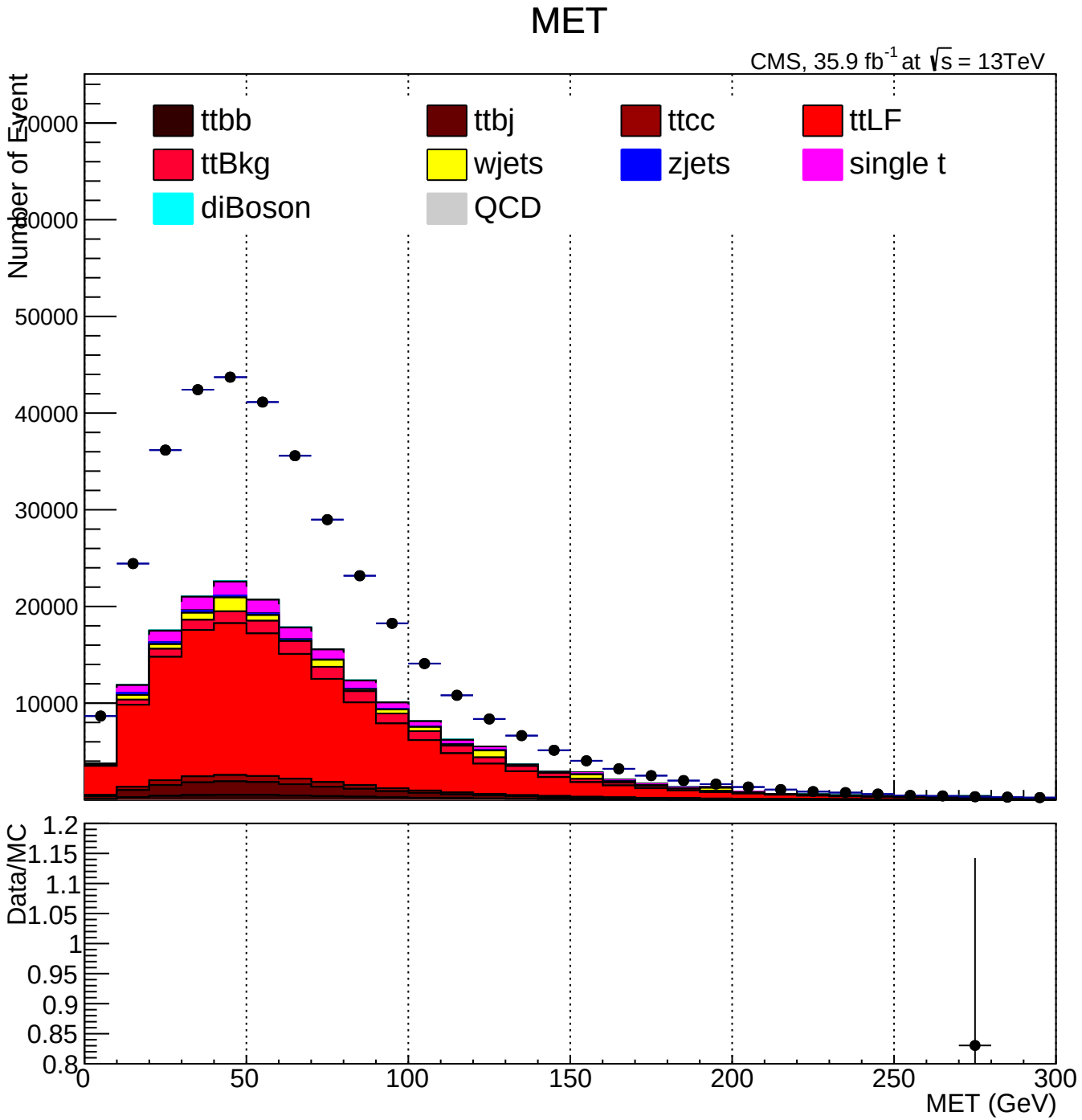

Top mass from Hc/u DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Top Mass from Hc/u DRFCNHkinfit (GeV)

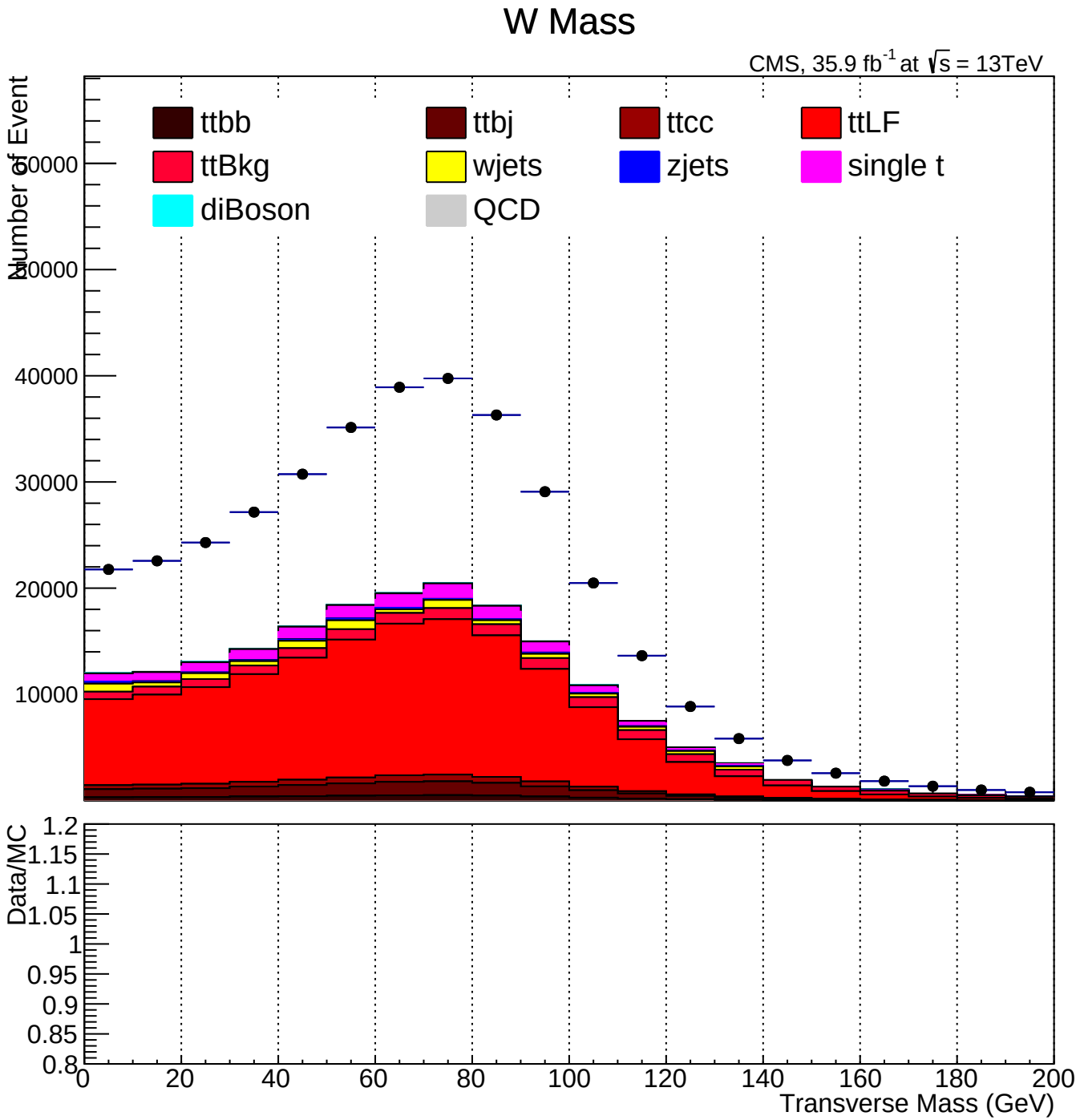

Number of jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Jet Multiplicity

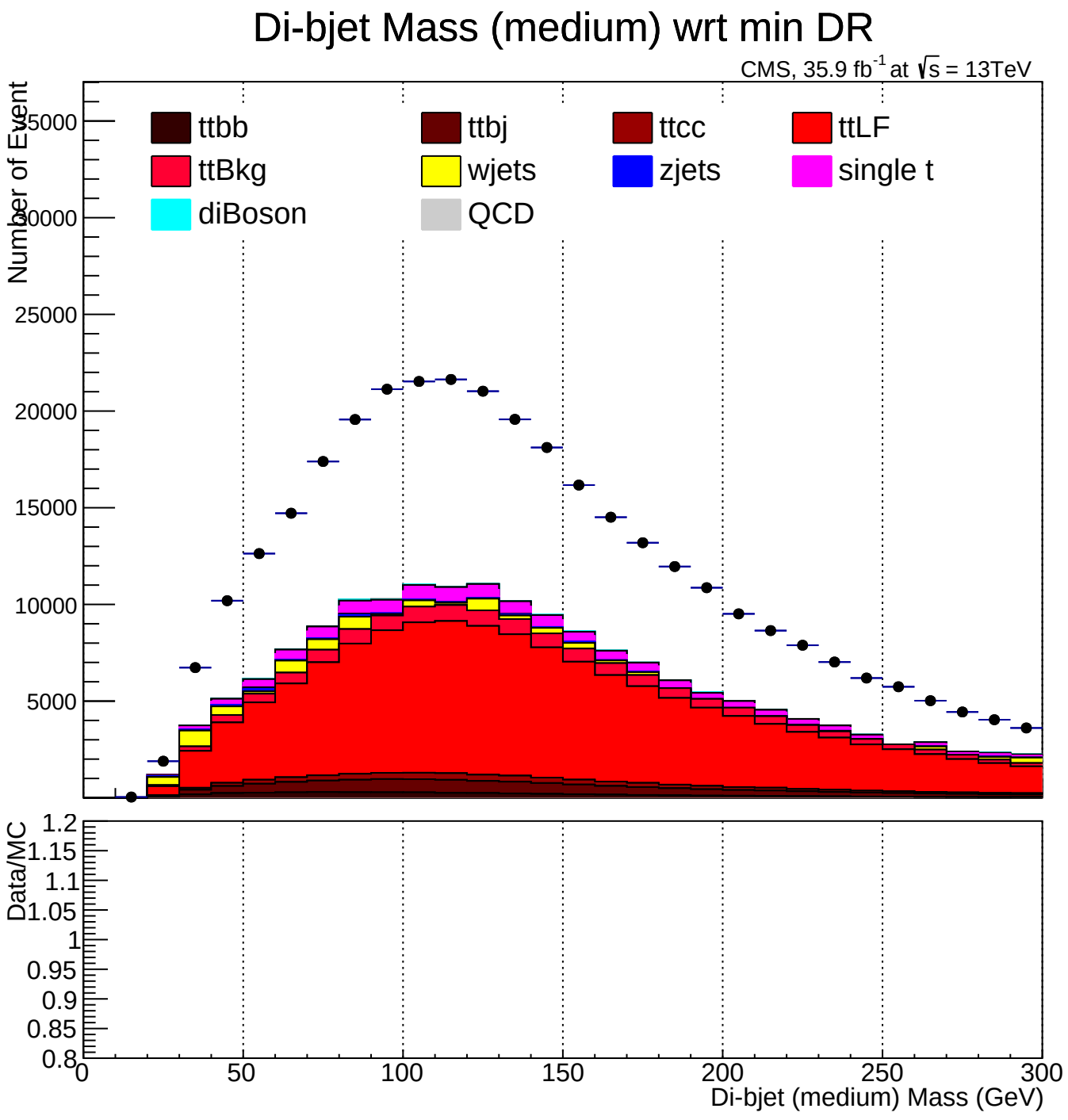

Number of b tagged jets (medium)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
$\times 10^3$
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
500
400
300
200
100
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2M)

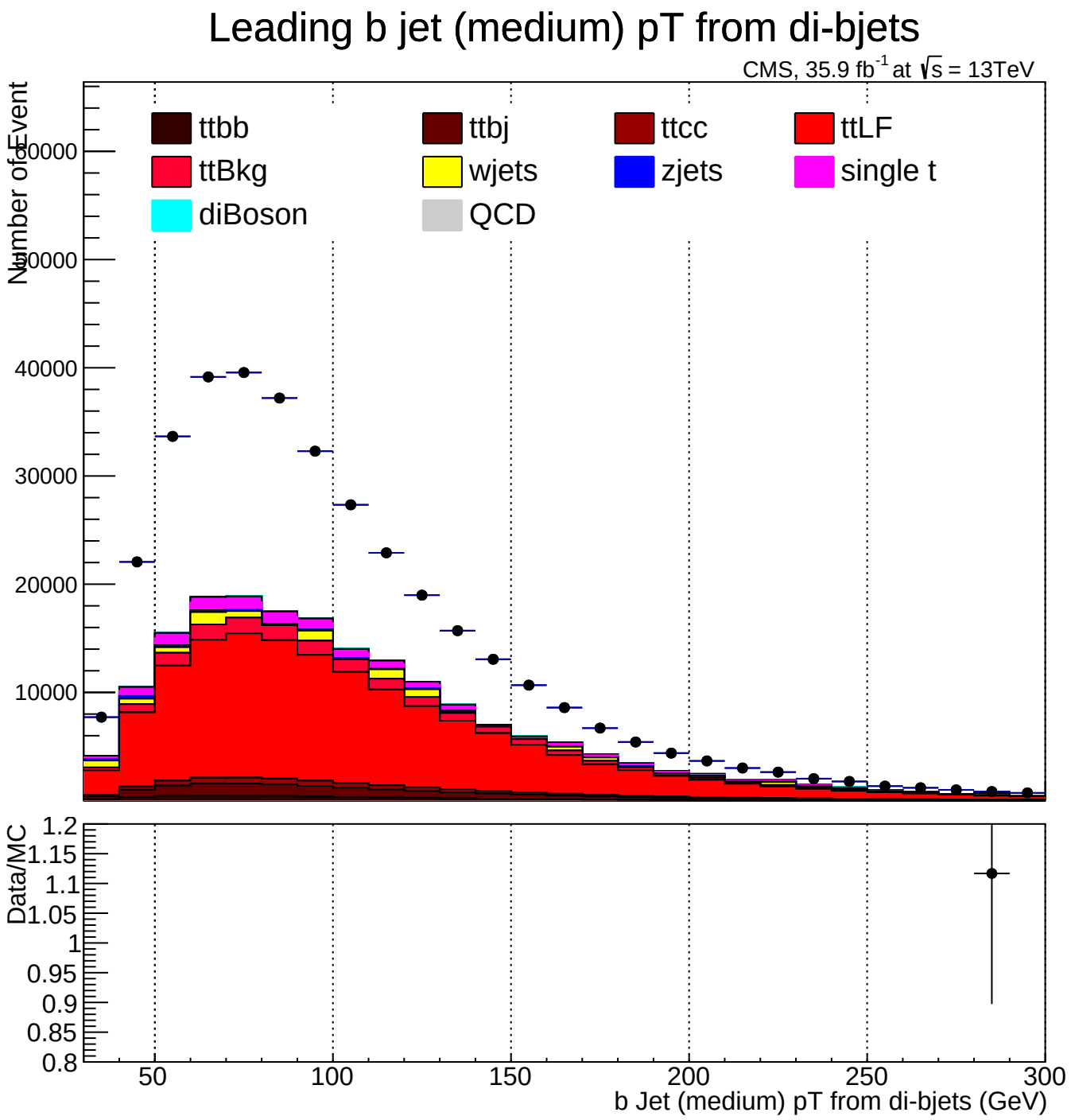

Number of b tagged jets (tight)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
250
200
150
100
50
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2T)

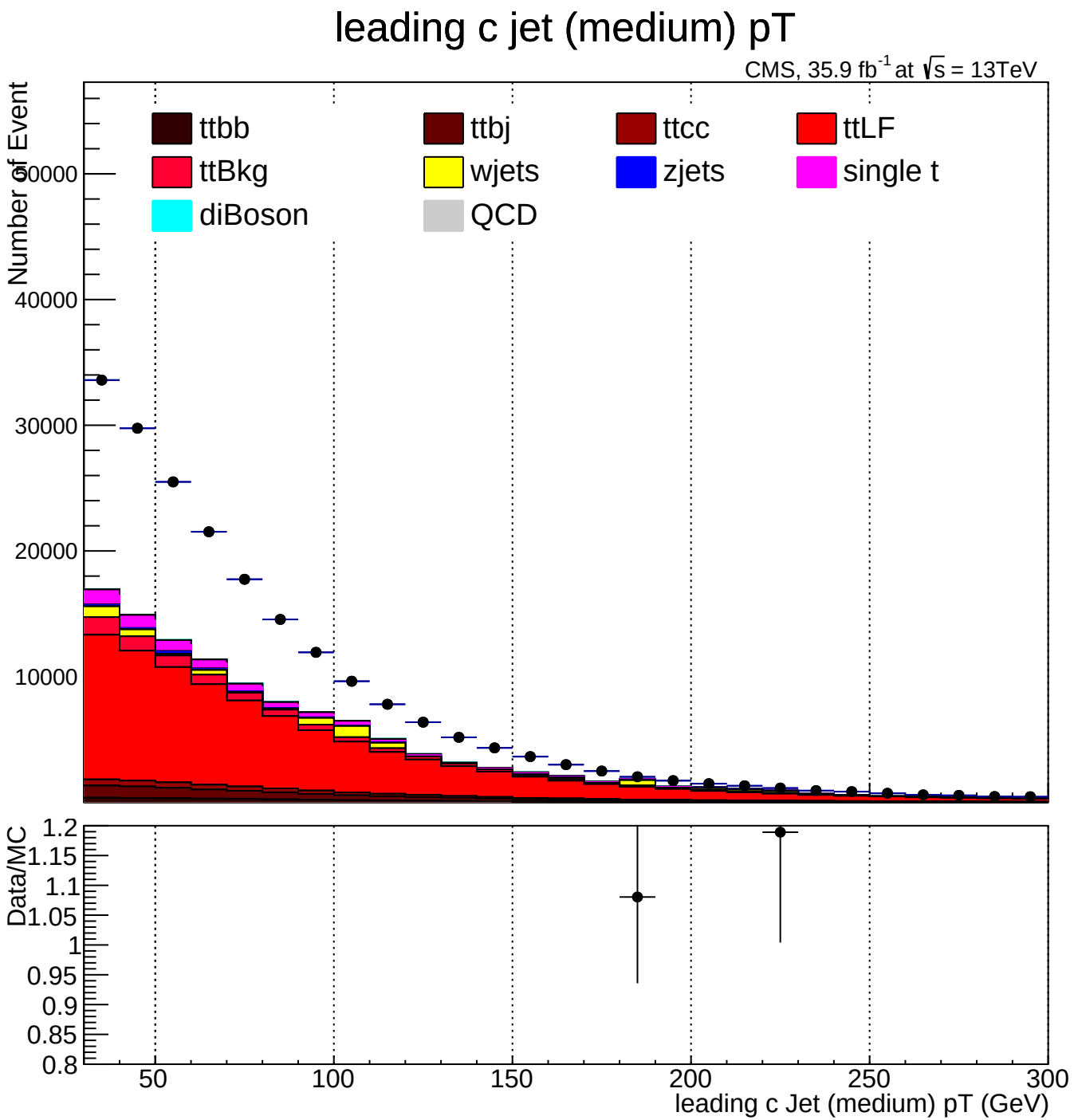

Number of c tagged jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
$\times 10^3$
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
c-tagged Jet Multiplicity (M)

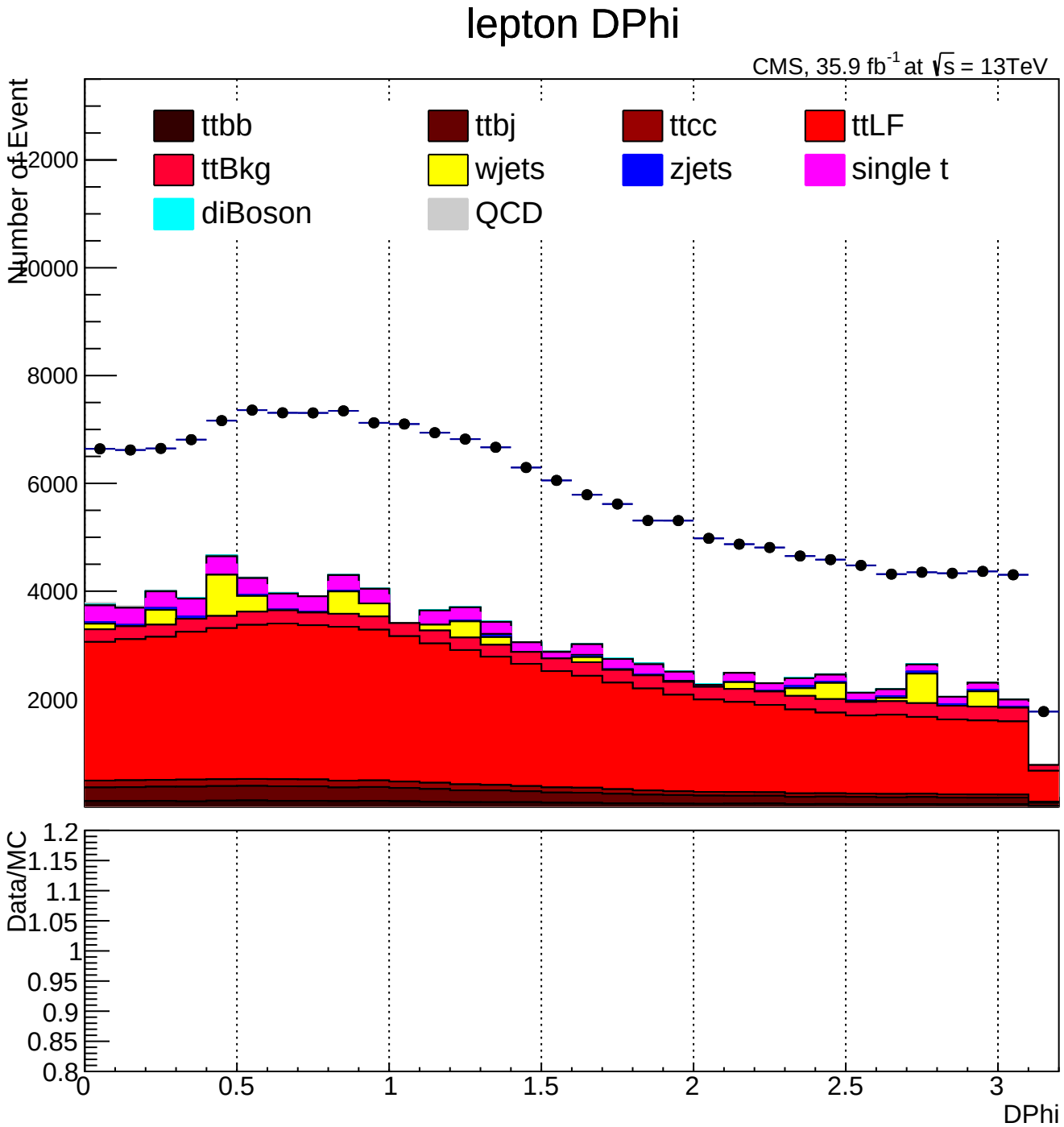

MET
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
MET (GeV)

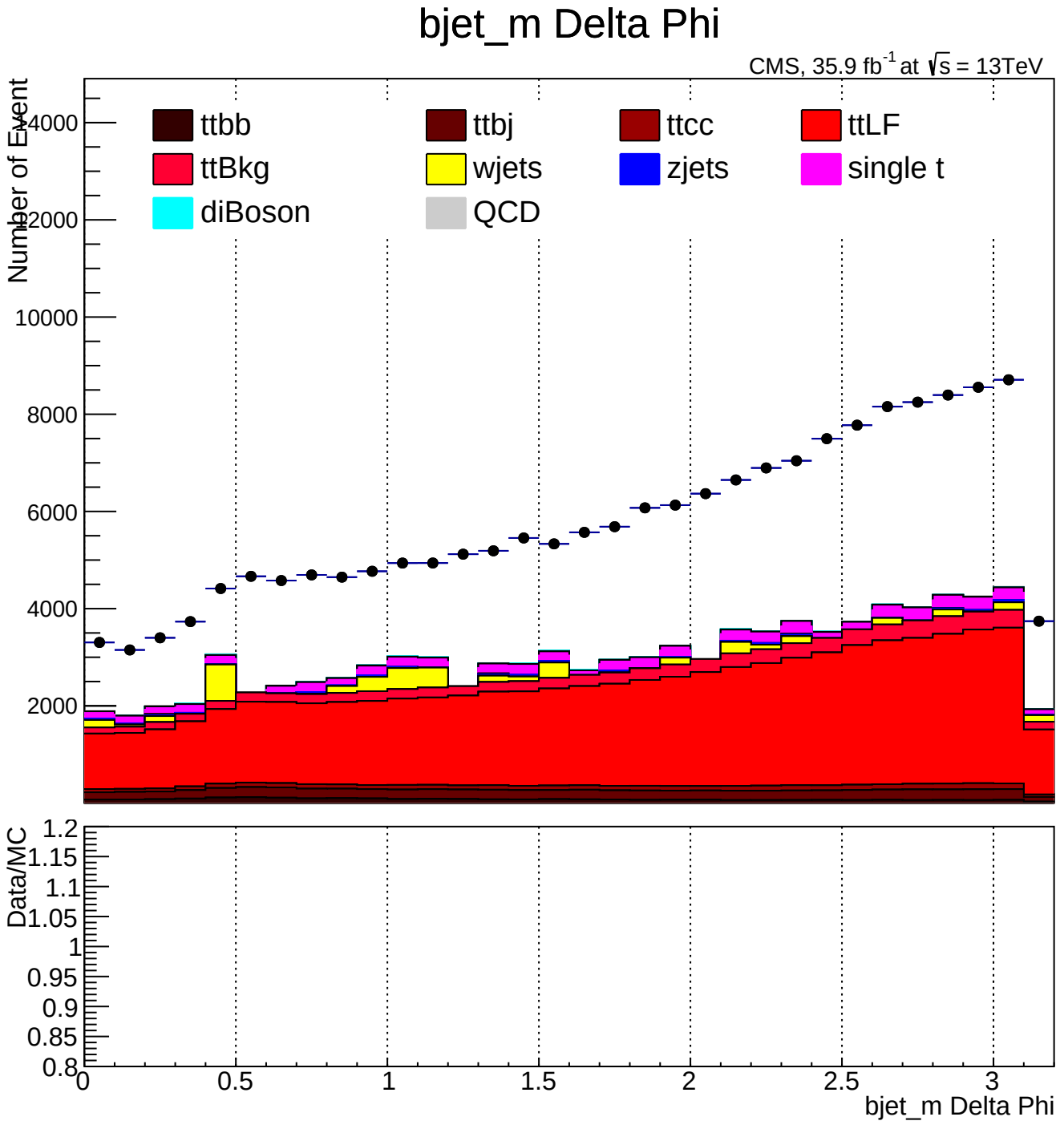

W Mass
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
50000
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
20
40
60
80
100
120
140
160
180
200
Transverse Mass (GeV)

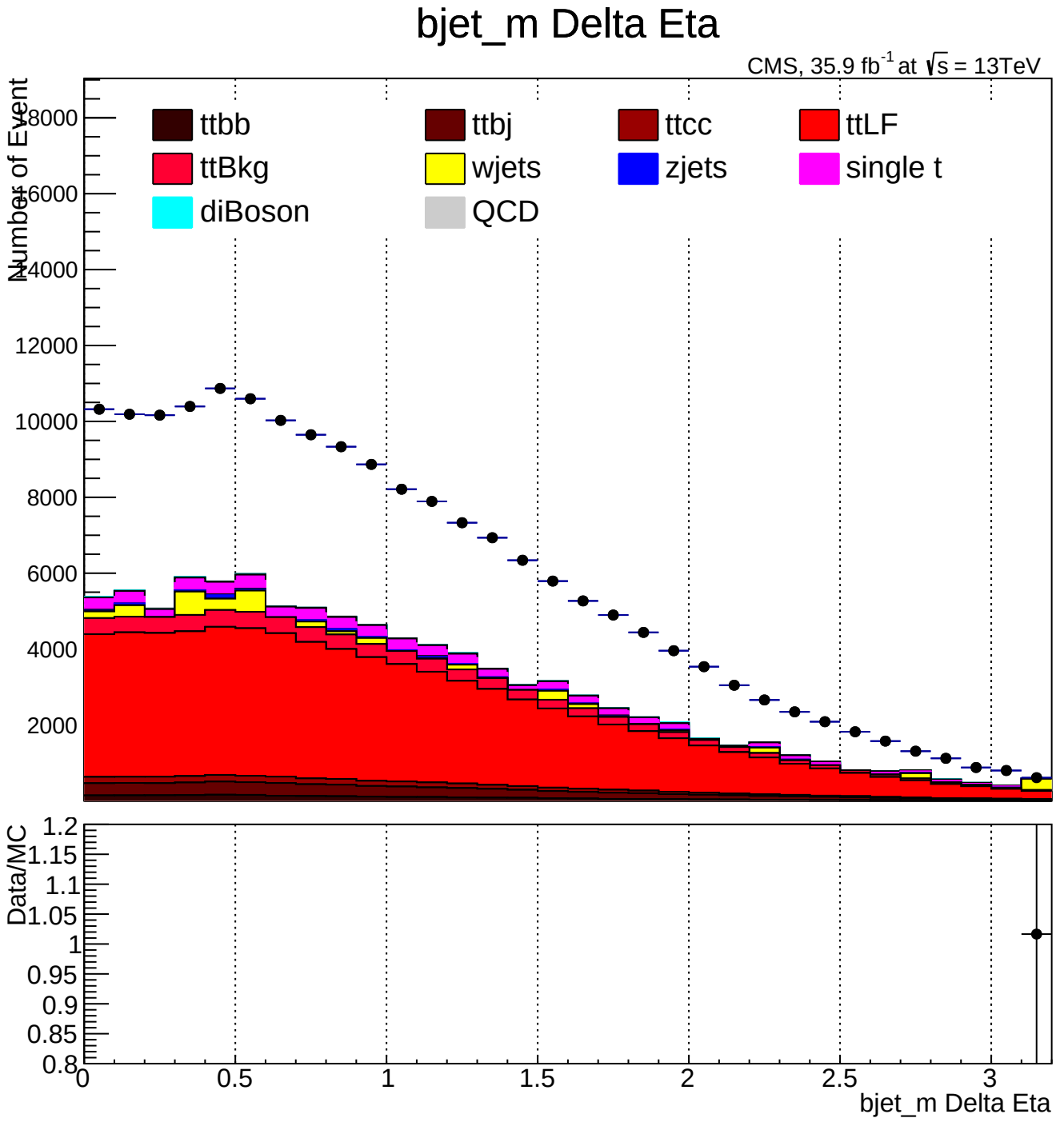

Di-bjet Mass (medium) wrt min DR
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
35000
30000
25000
20000
15000
10000
5000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
50
100
150
200
250
300
Di-bjet (medium) Mass (GeV)

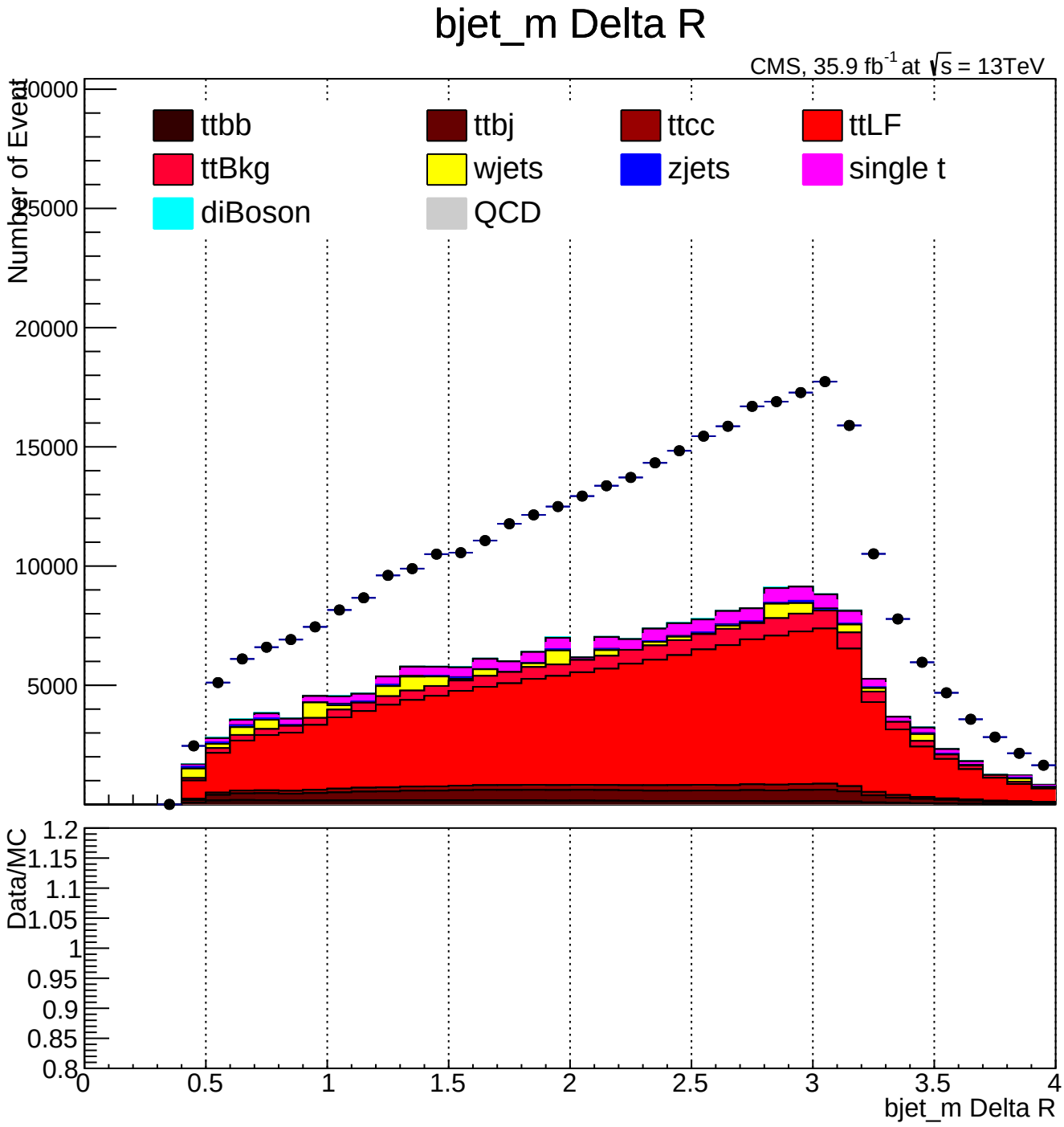

Leading b jet (medium) pT from di-bjets
CMS, 35.9 fb-1 at √s = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
50000
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
b Jet (medium) pT from di-bjets (GeV)

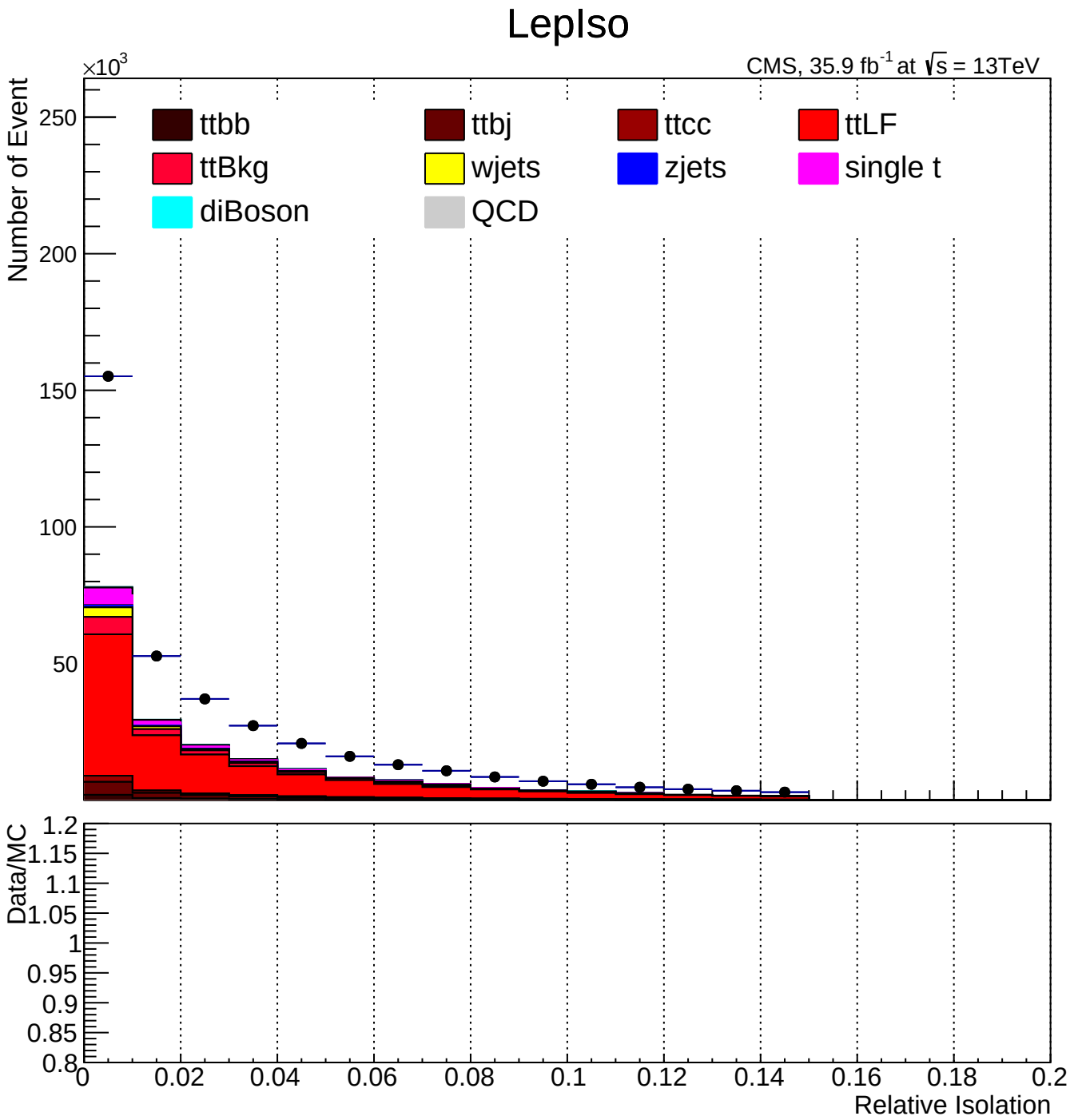

leading c jet (medium) pT
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
50000
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
leading c Jet (medium) pT (GeV)

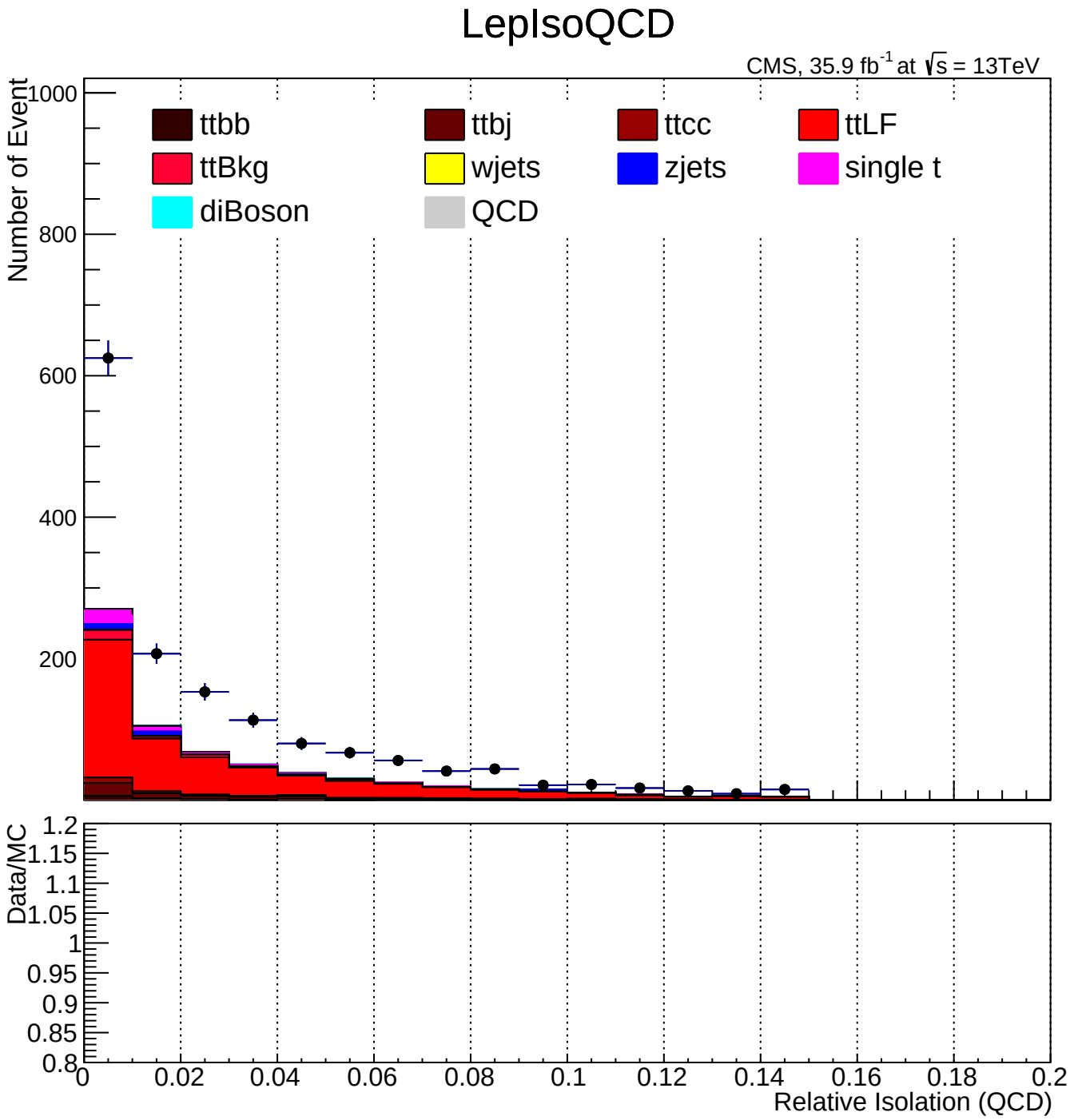

lepton DPhi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
2000
4000
6000
8000
10000
12000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
DPhi

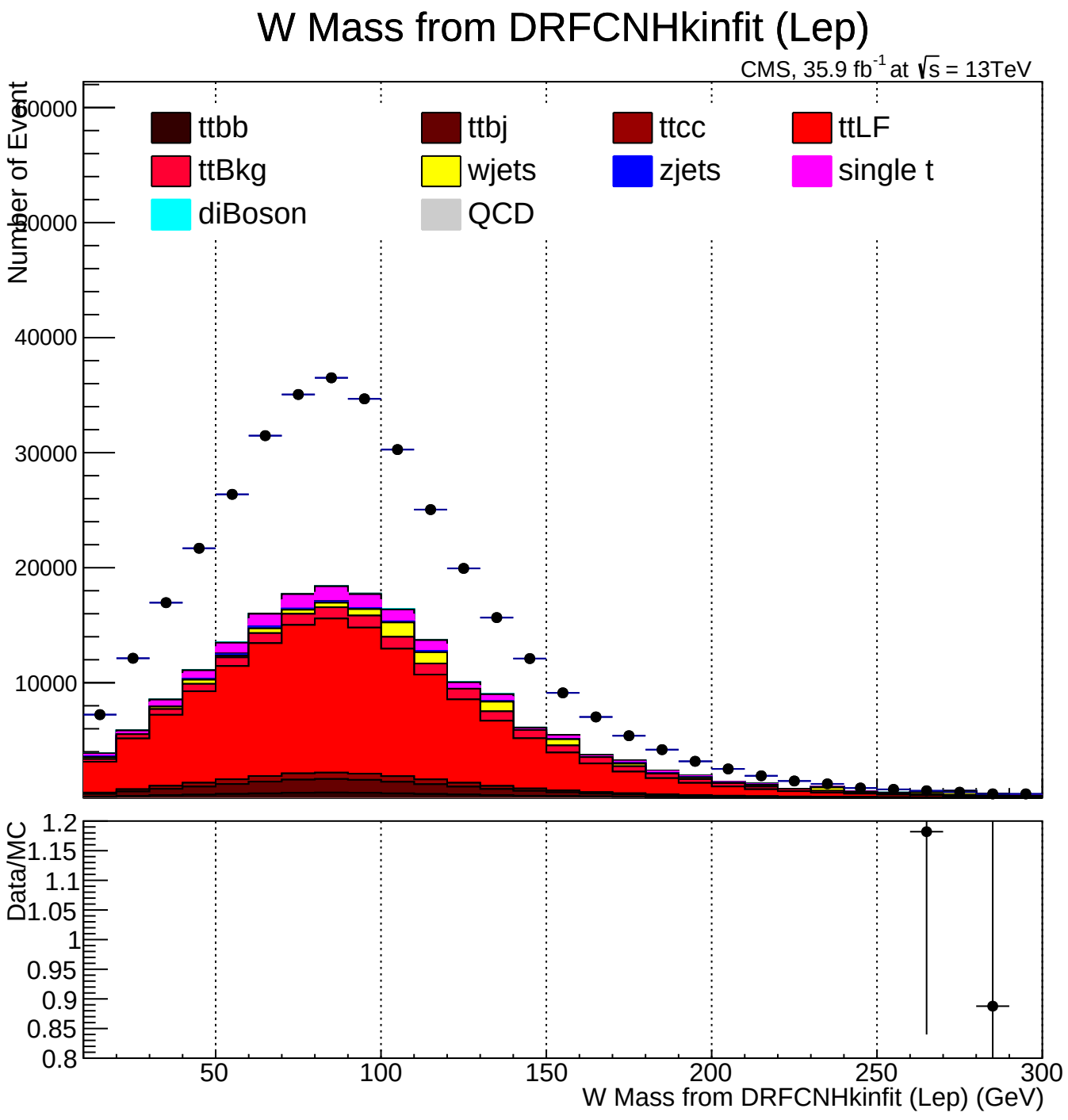

bjet_m Delta Phi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta Phi

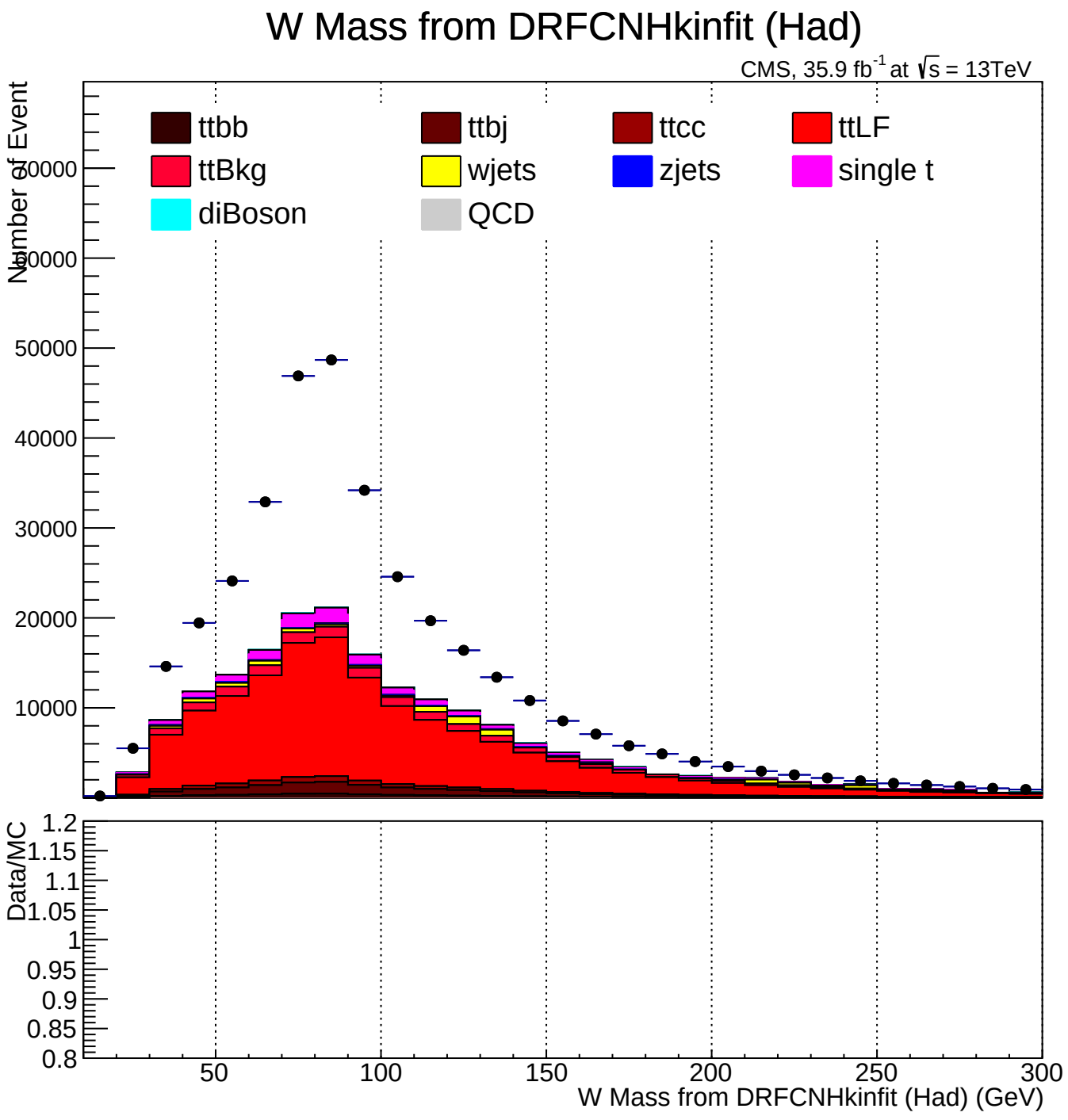

bjet_m Delta Eta
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta Eta

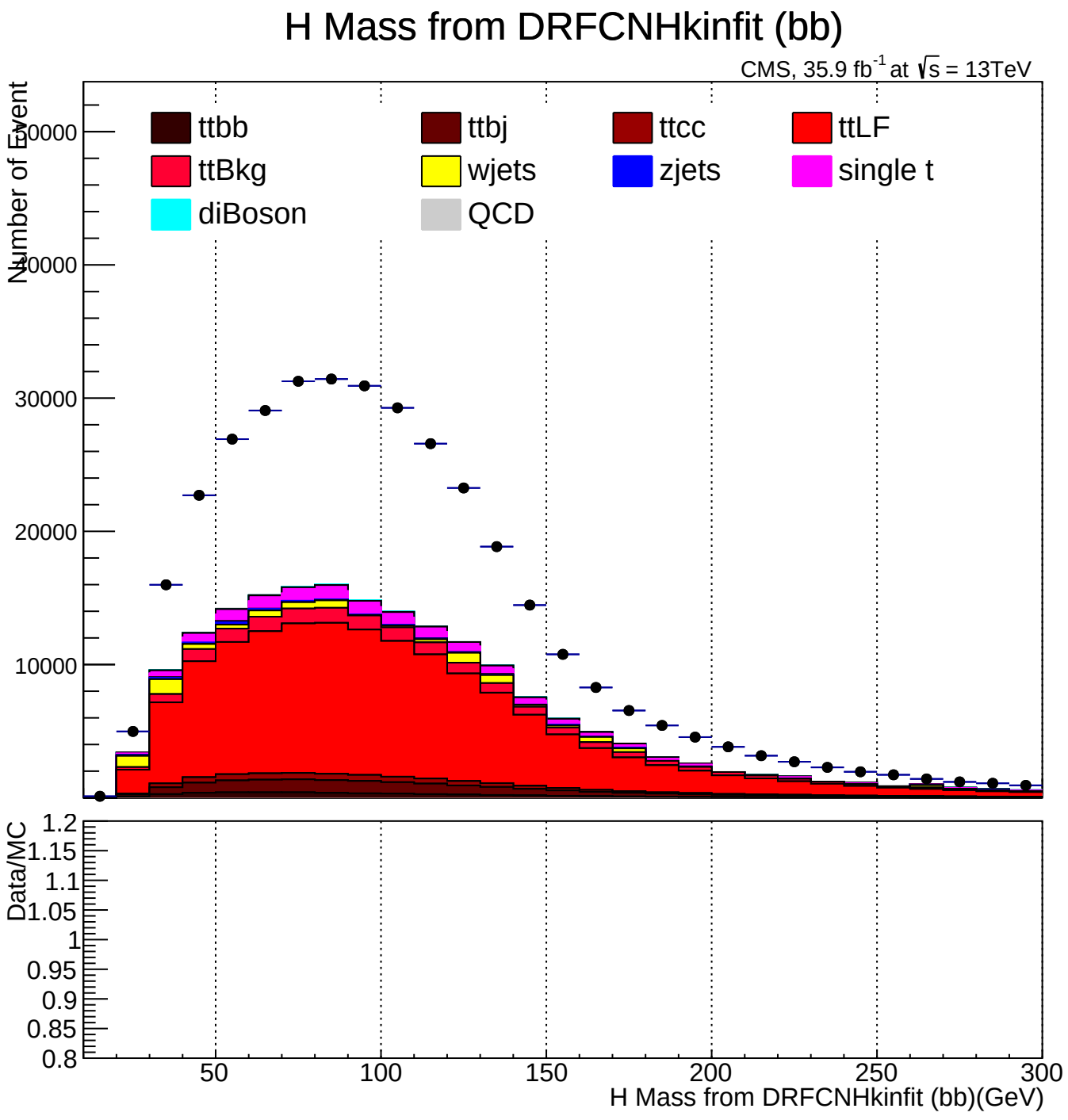

bjet_m Delta R
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta R

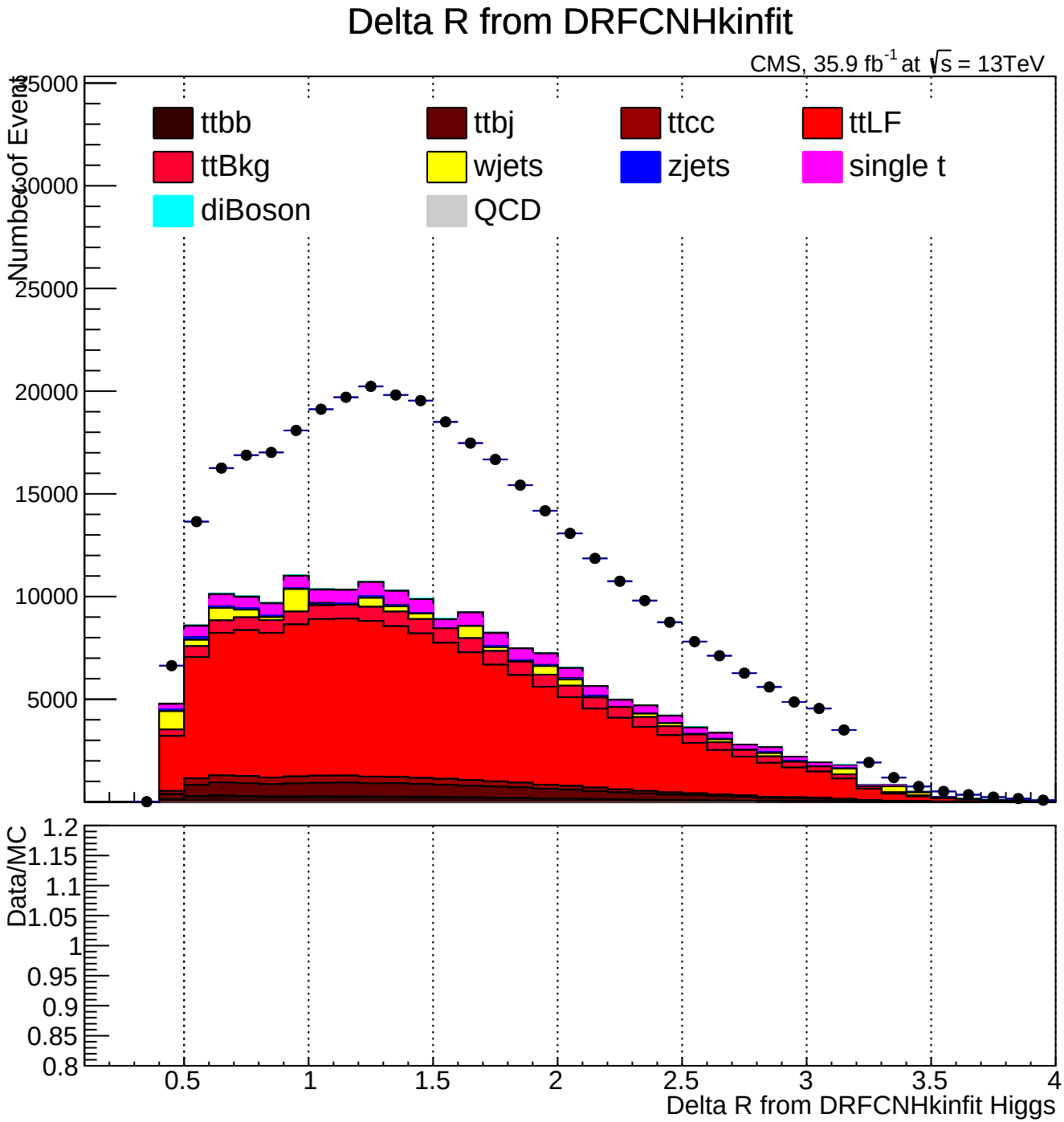

LepIso
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation

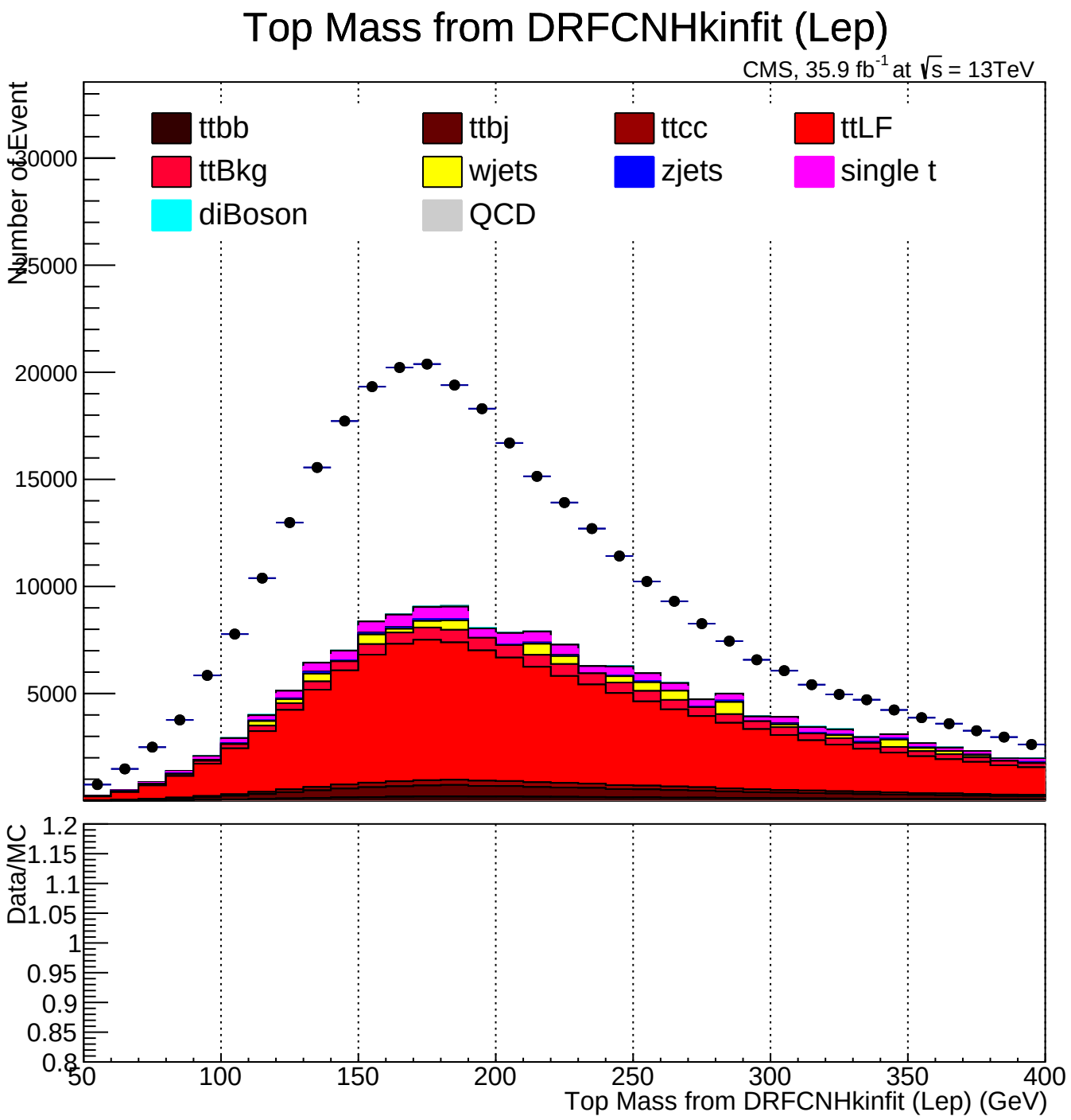

LepIsoQCD
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation (QCD)

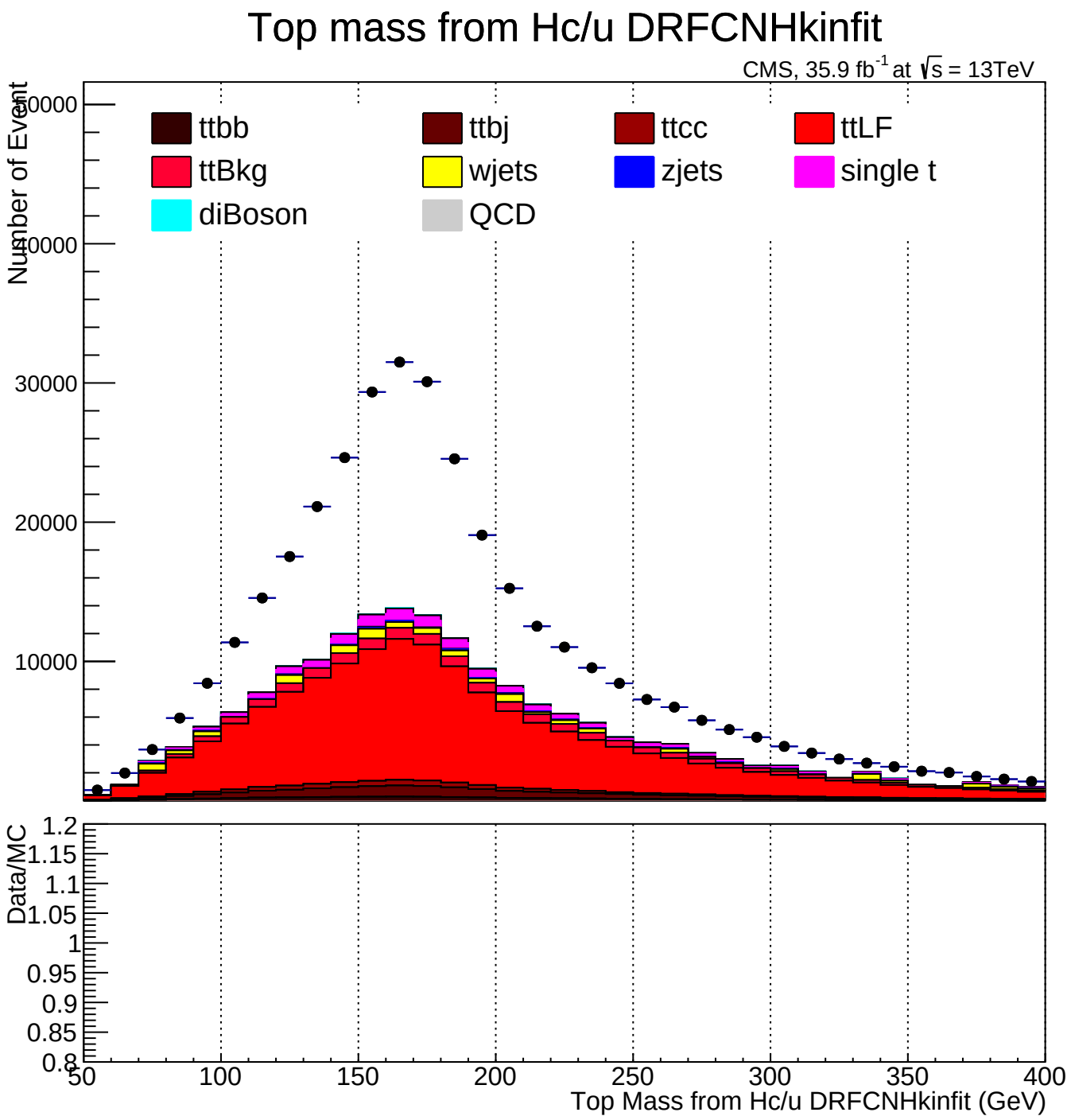

W Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
W Mass from DRFCNHkinfit (Lep) (GeV)

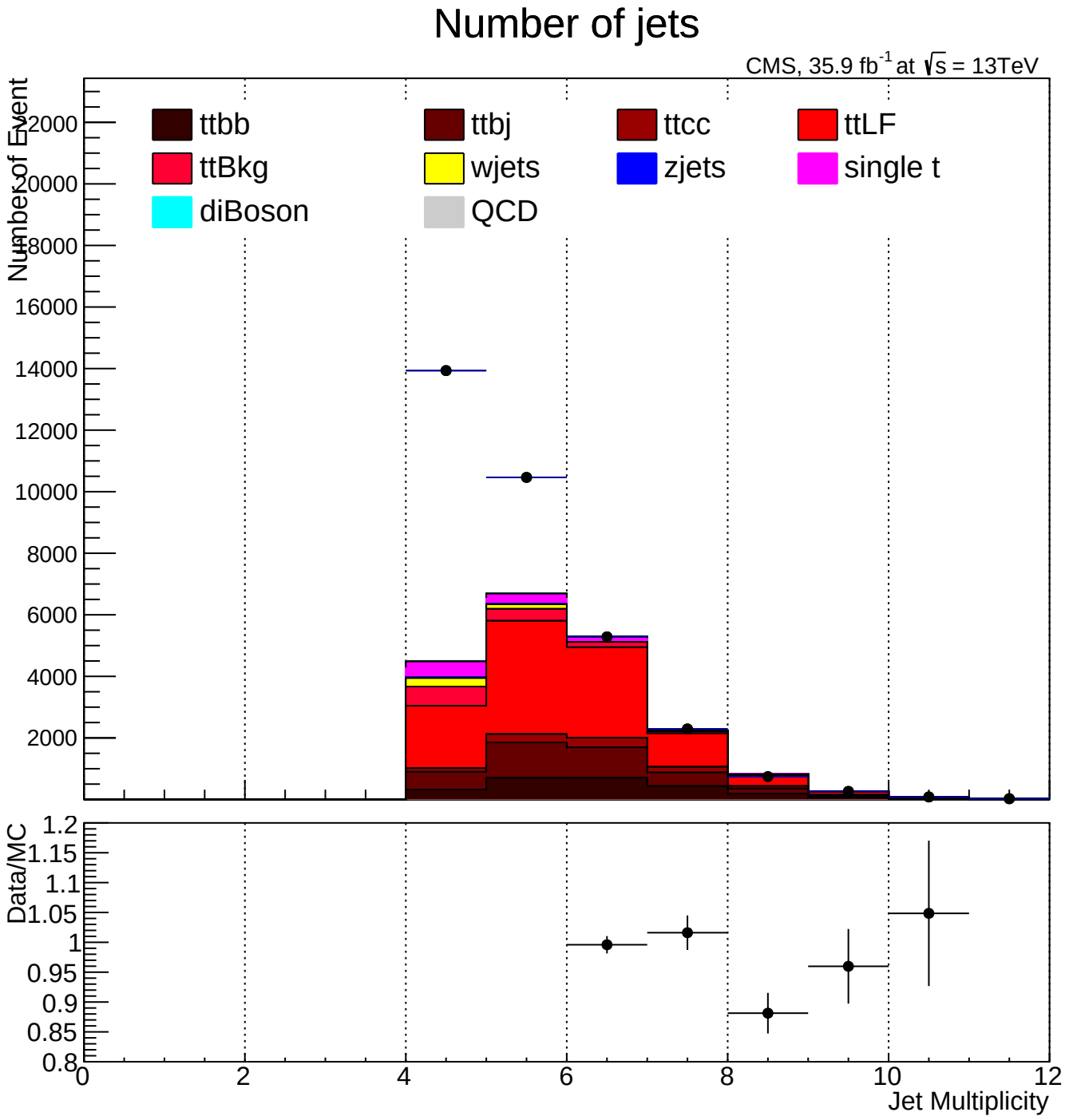

W Mass from DRFCNHkinfit (Had)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
60000
50000
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
W Mass from DRFCNHkinfit (Had) (GeV)

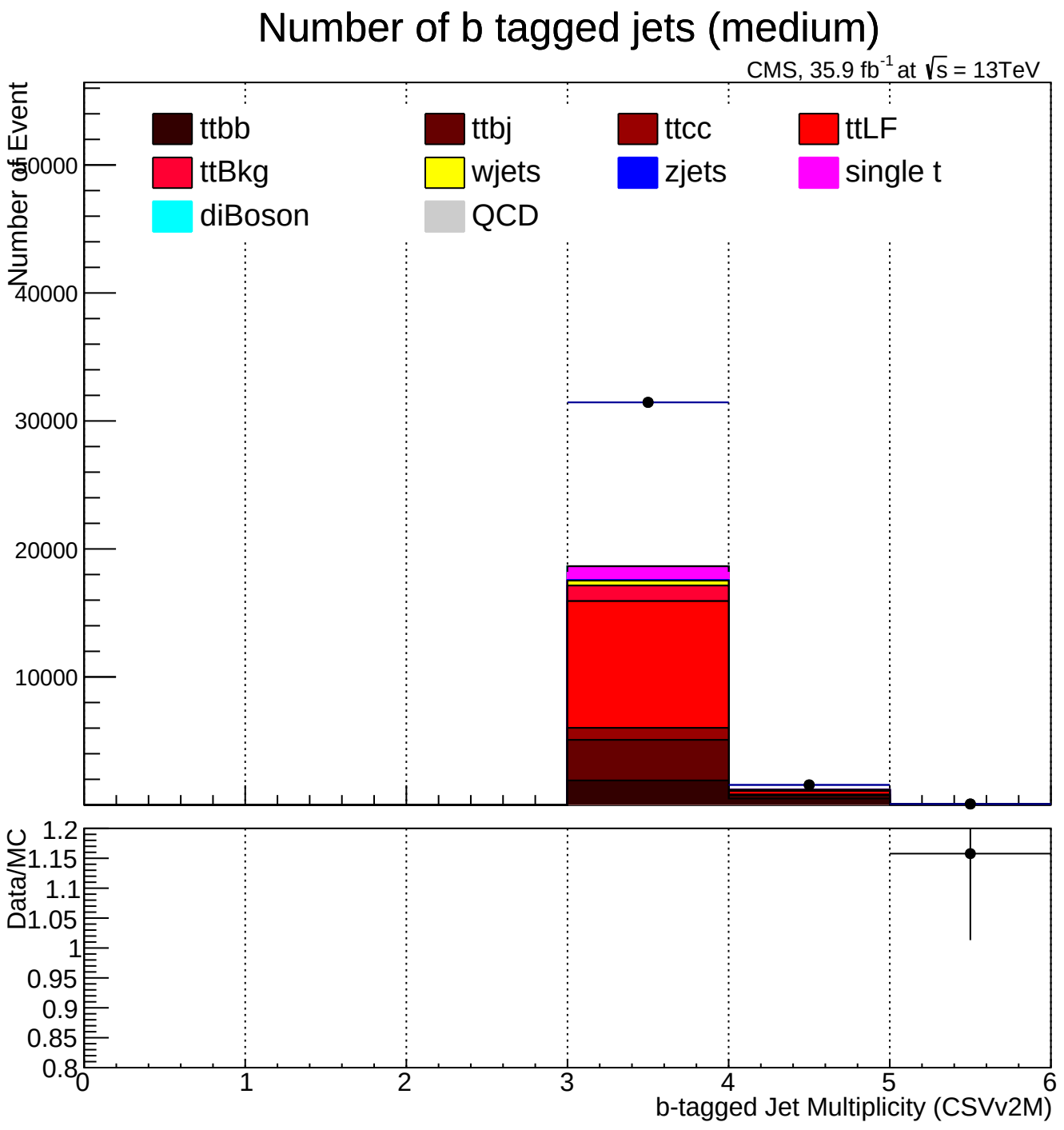

H Mass from DRFCNHkinfit (bb)
CMS, 35.9 fb-1 at √s = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
H Mass from DRFCNHkinfit (bb)(GeV)

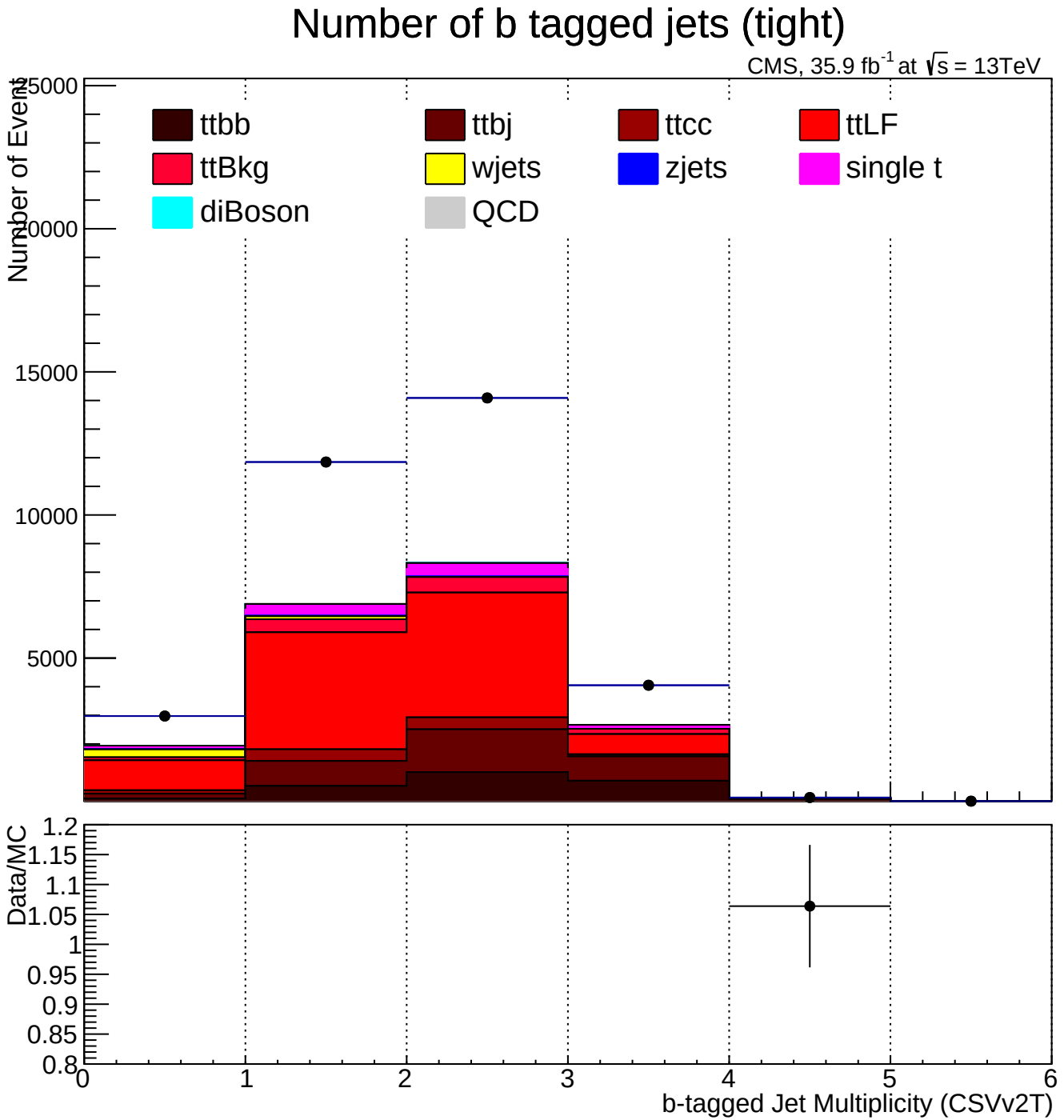

Delta R from DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Events
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Delta R from DRFCNHkinfit Higgs

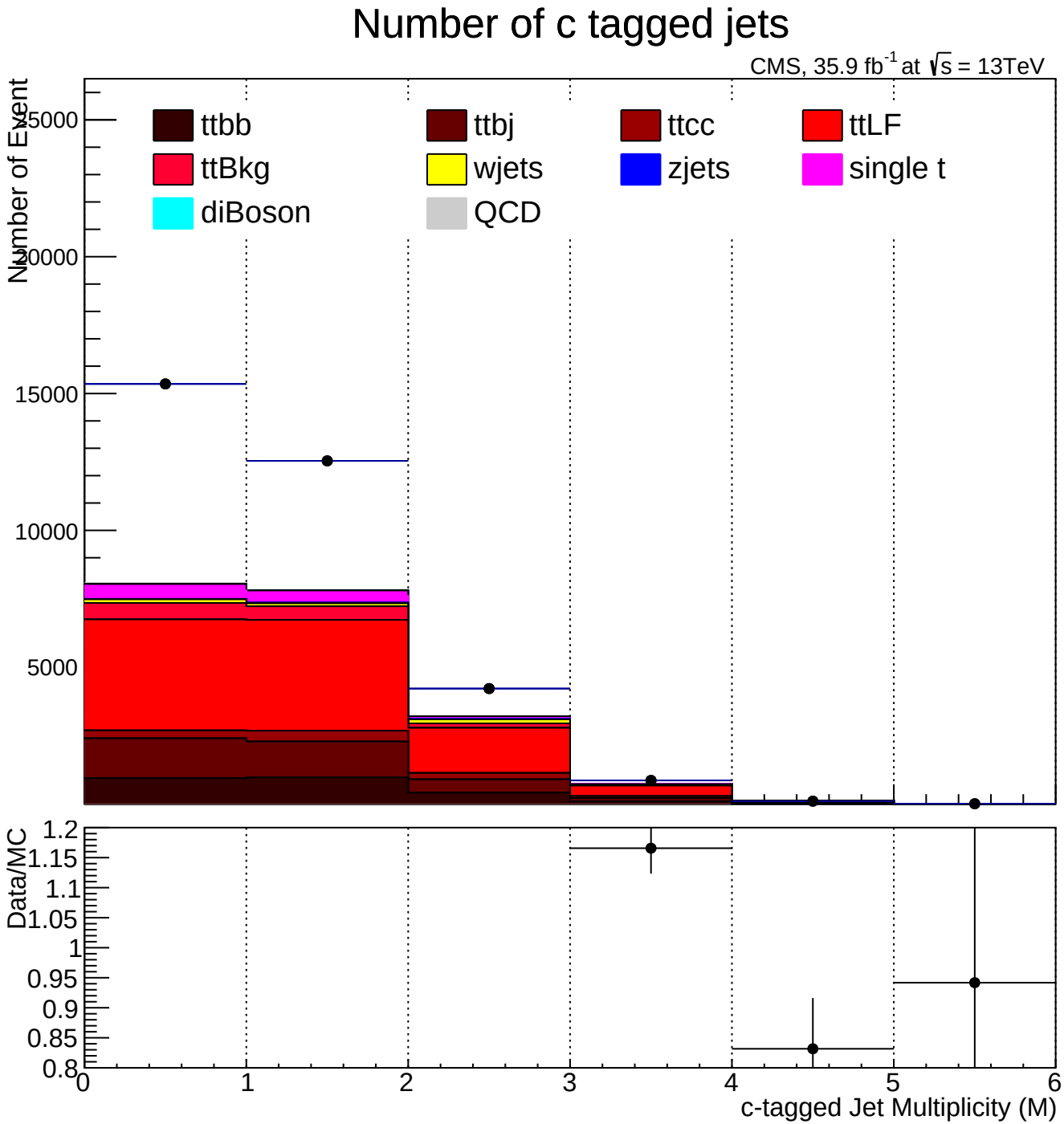

Top Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb-1 at √s = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
Top Mass from DRFCNHkinfit (Lep) (GeV)

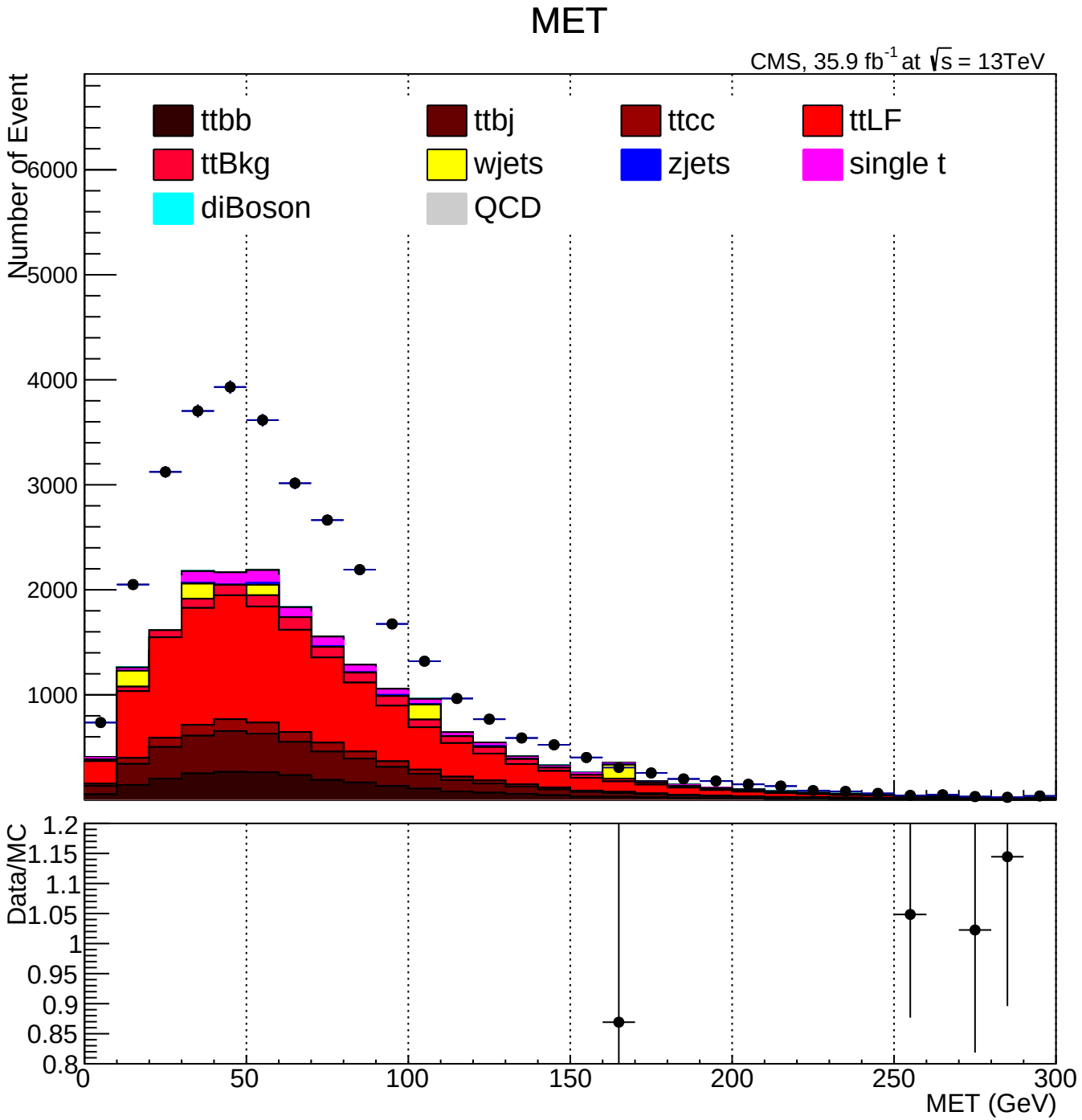

Top mass from Hc/u DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
350
400
Top Mass from Hc/u DRFCNHkinfit (GeV)

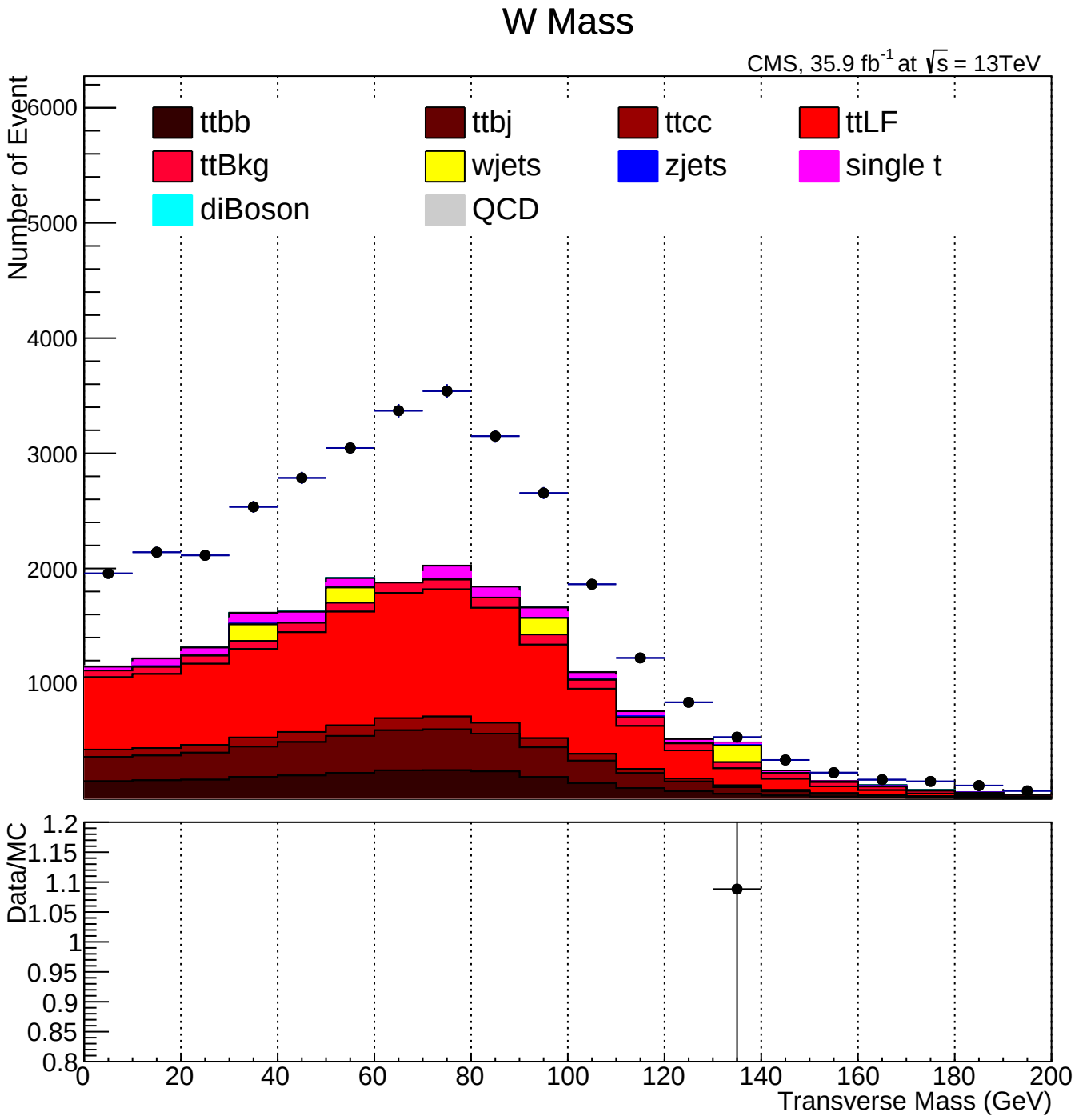

Number of jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Jet Multiplicity

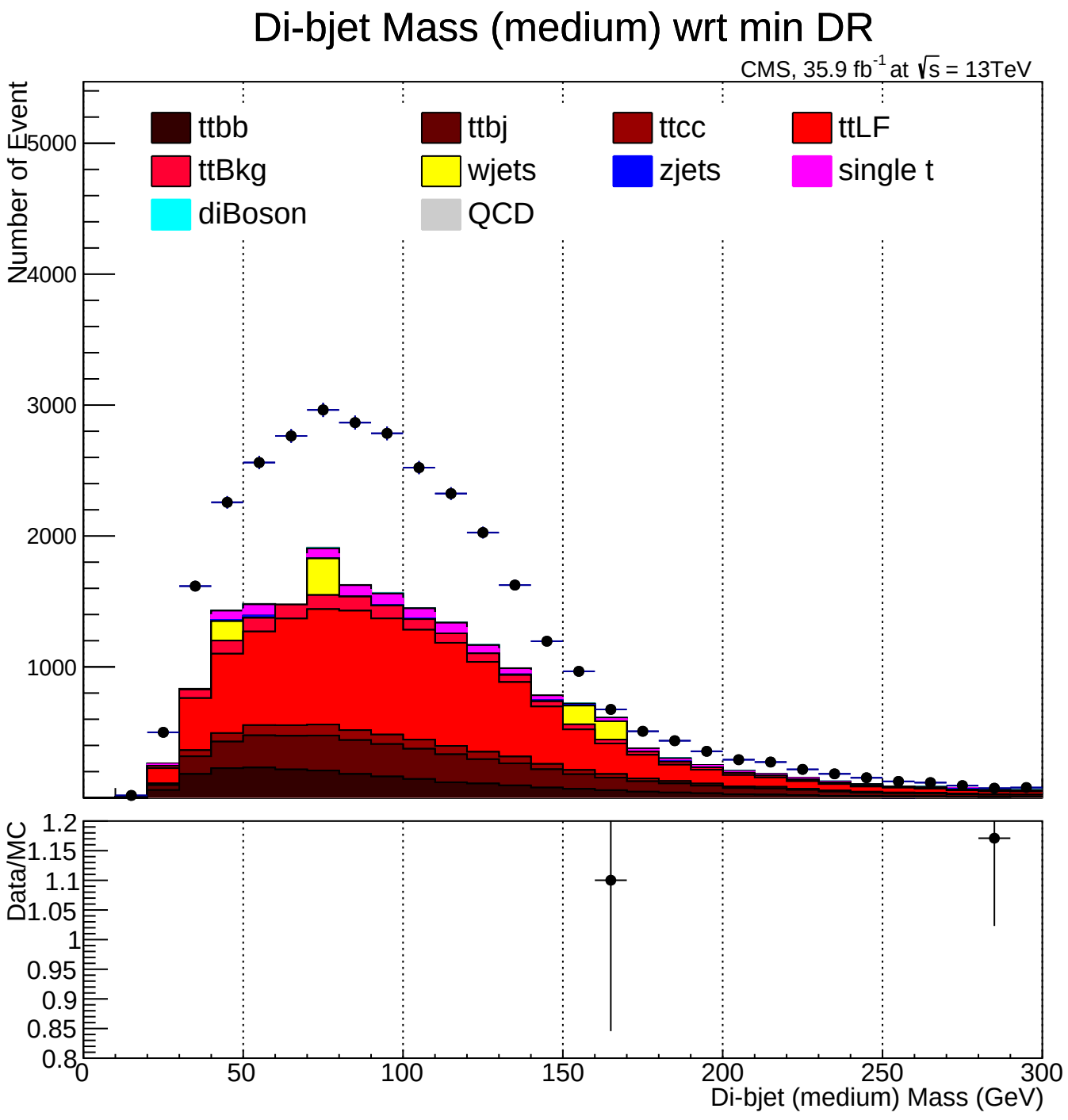

Number of b tagged jets (medium)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
50000
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2M)

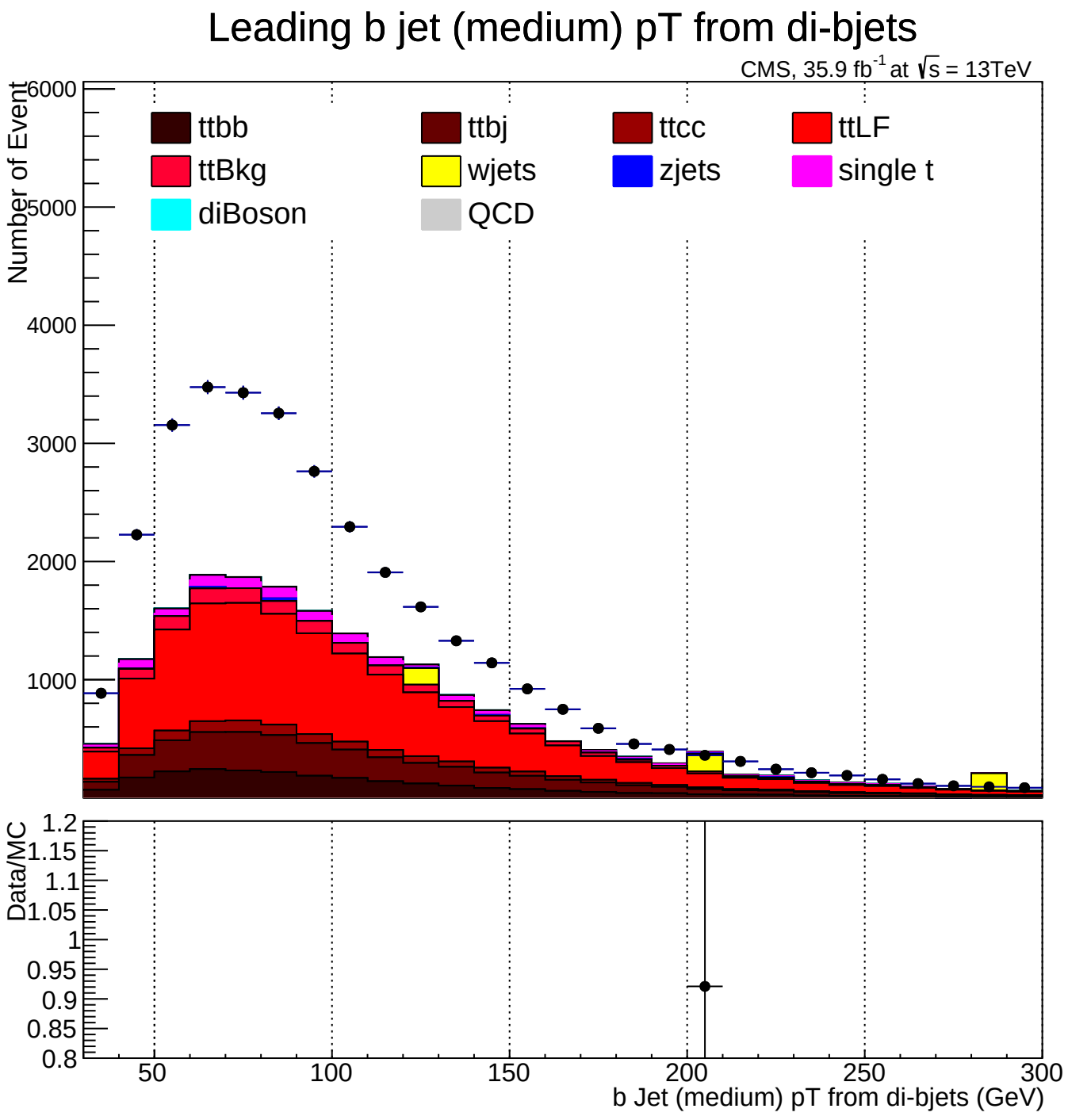

Number of b tagged jets (tight)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b-tagged Jet Multiplicity (CSVv2T)

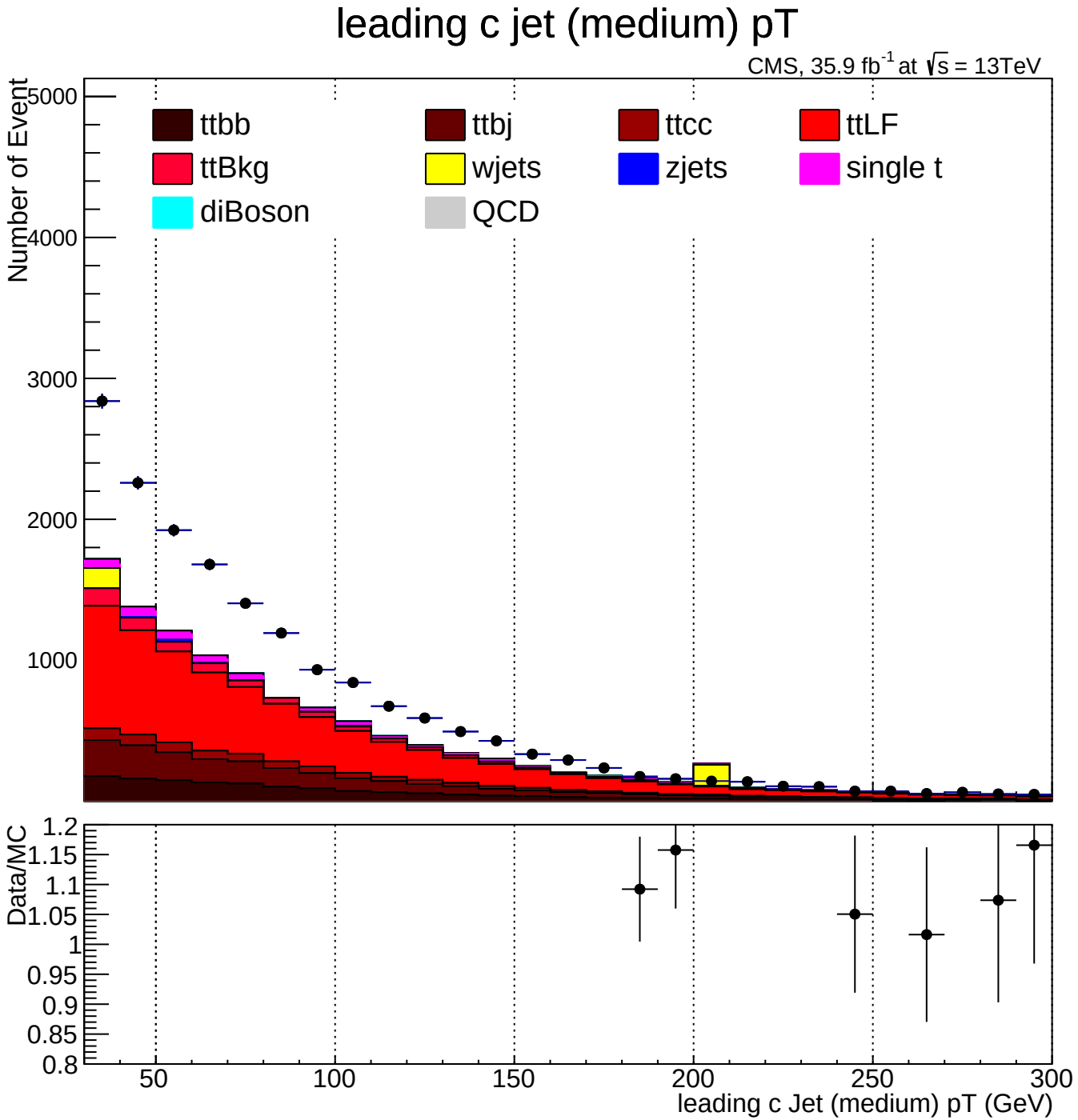

Number of c tagged jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
25000
20000
15000
10000
5000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
c-tagged Jet Multiplicity (M)

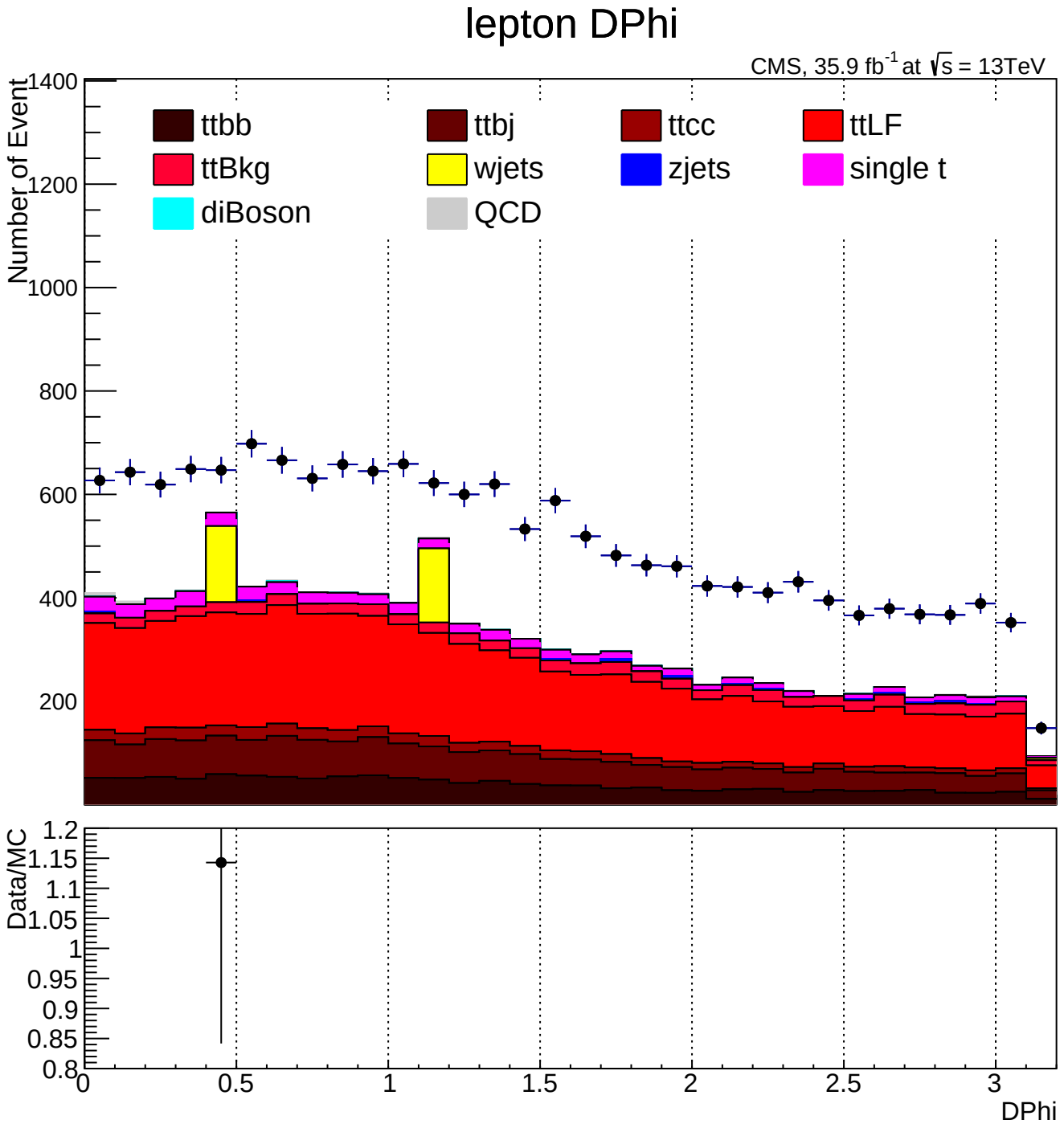

MET
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
6000
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
50
100
150
200
250
300
MET (GeV)

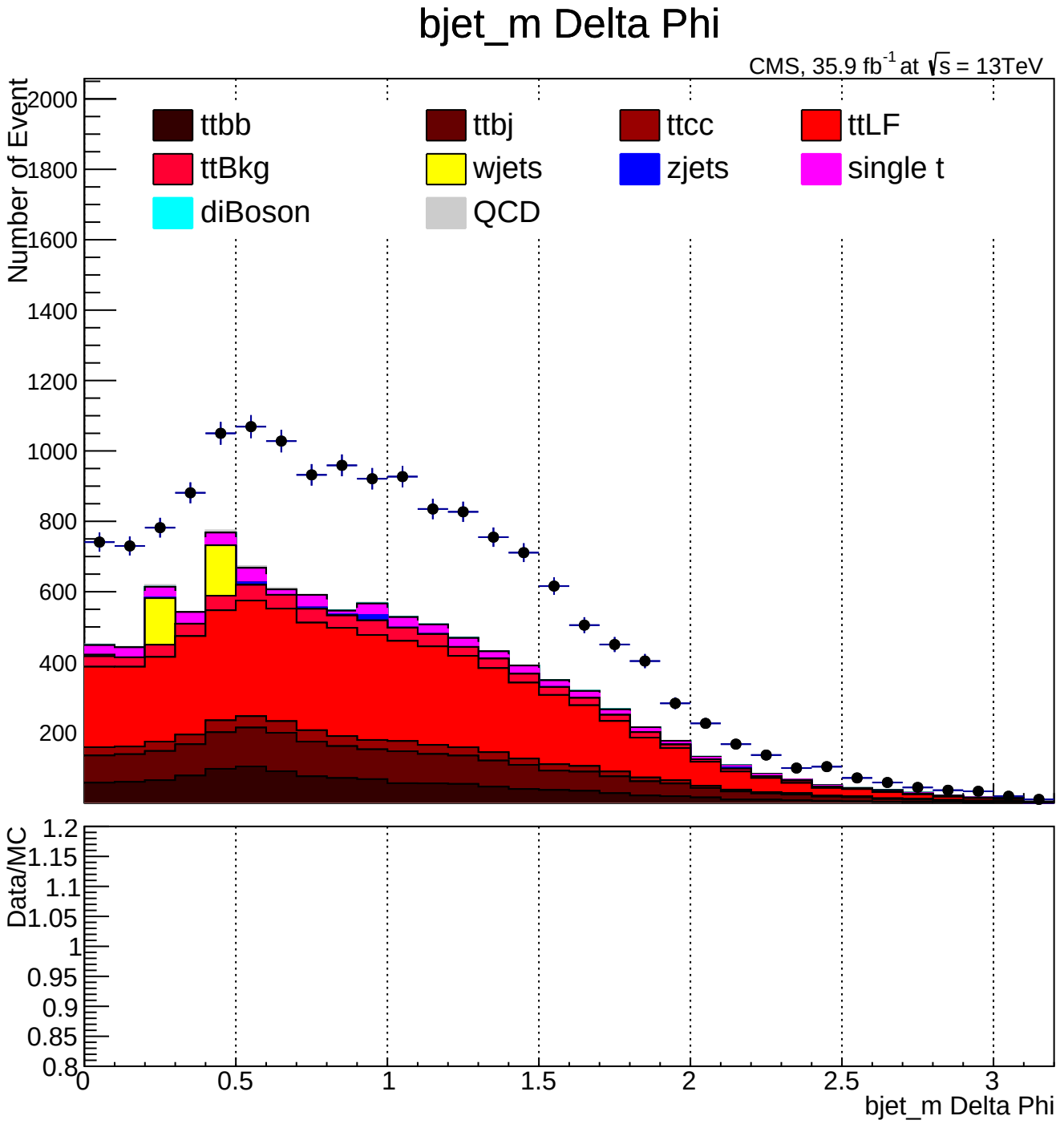

W Mass
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Transverse Mass (GeV)

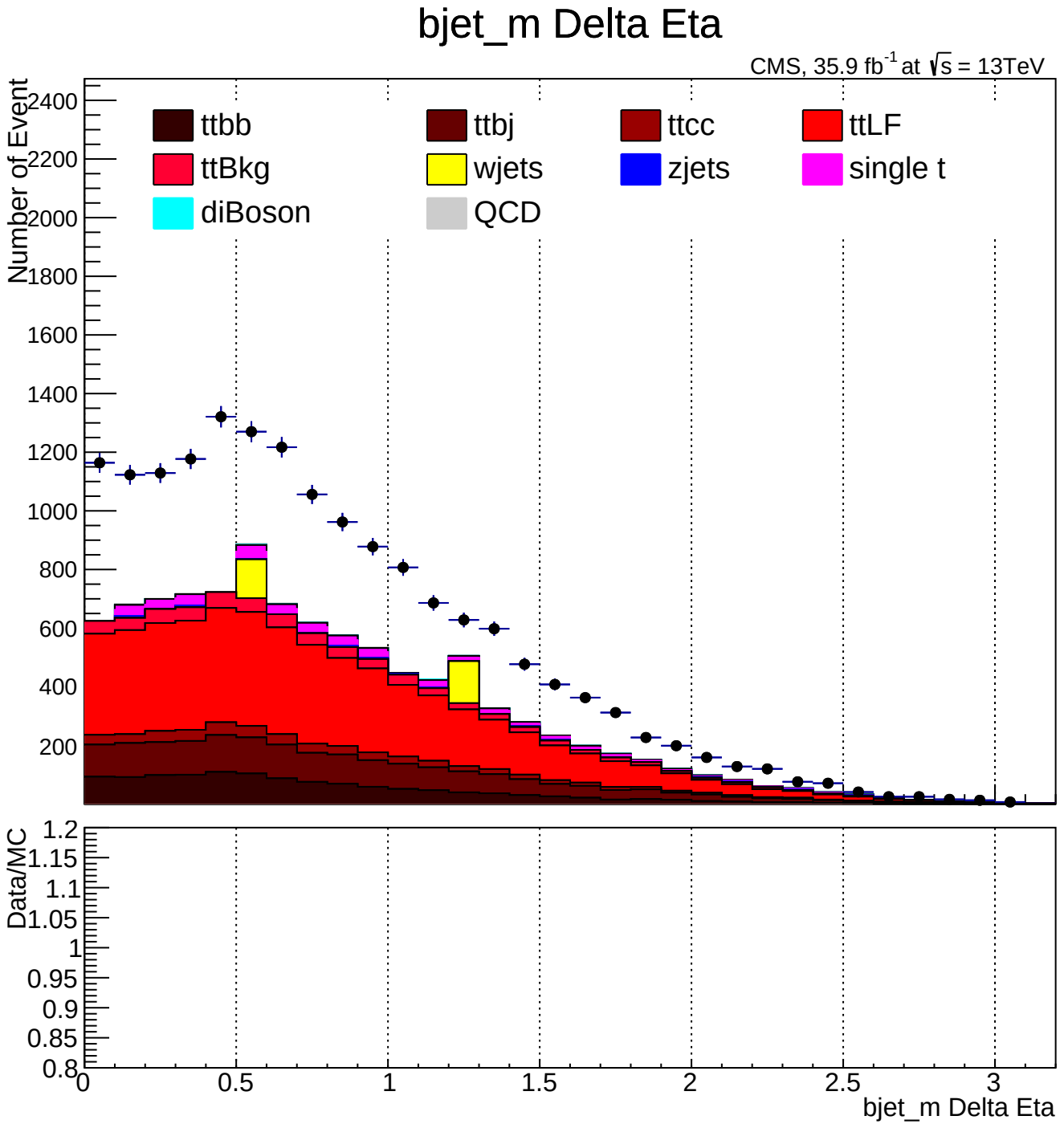

Di-bjet Mass (medium) wrt min DR
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Di-bjet (medium) Mass (GeV)

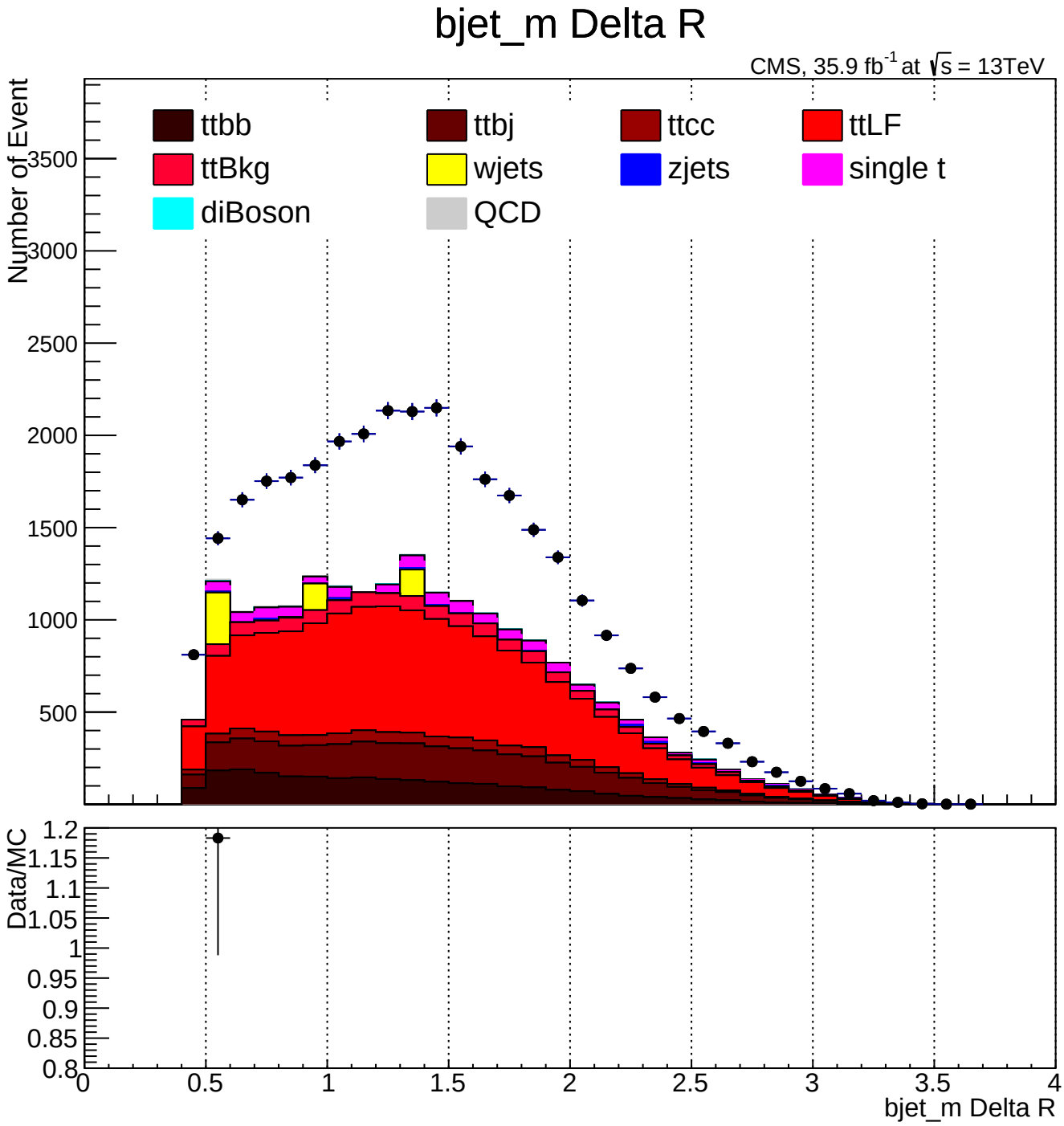

Leading b jet (medium) pT from di-bjets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b Jet (medium) pT from di-bjets (GeV)

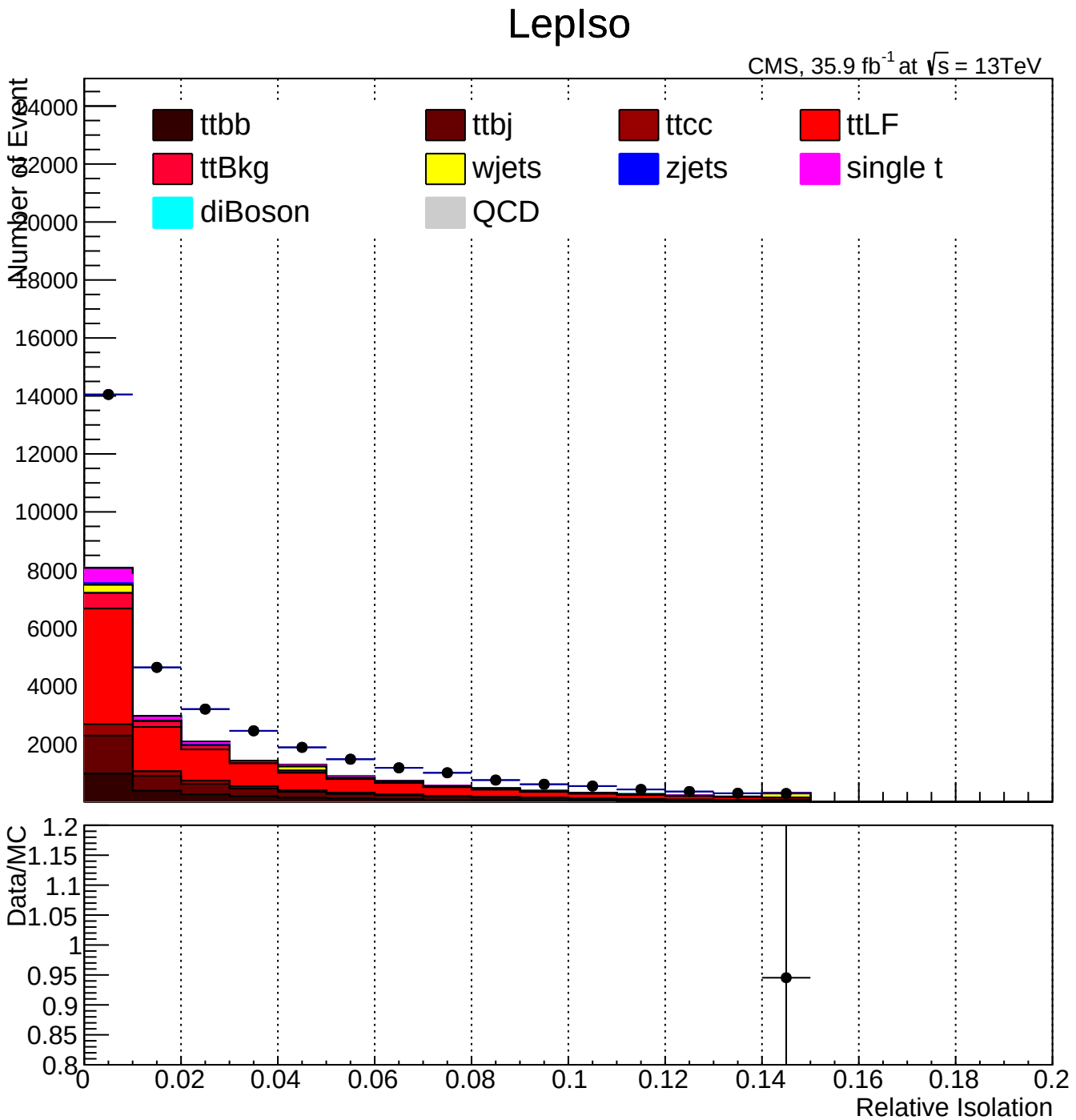

leading c jet (medium) pT
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
leading c Jet (medium) pT (GeV)

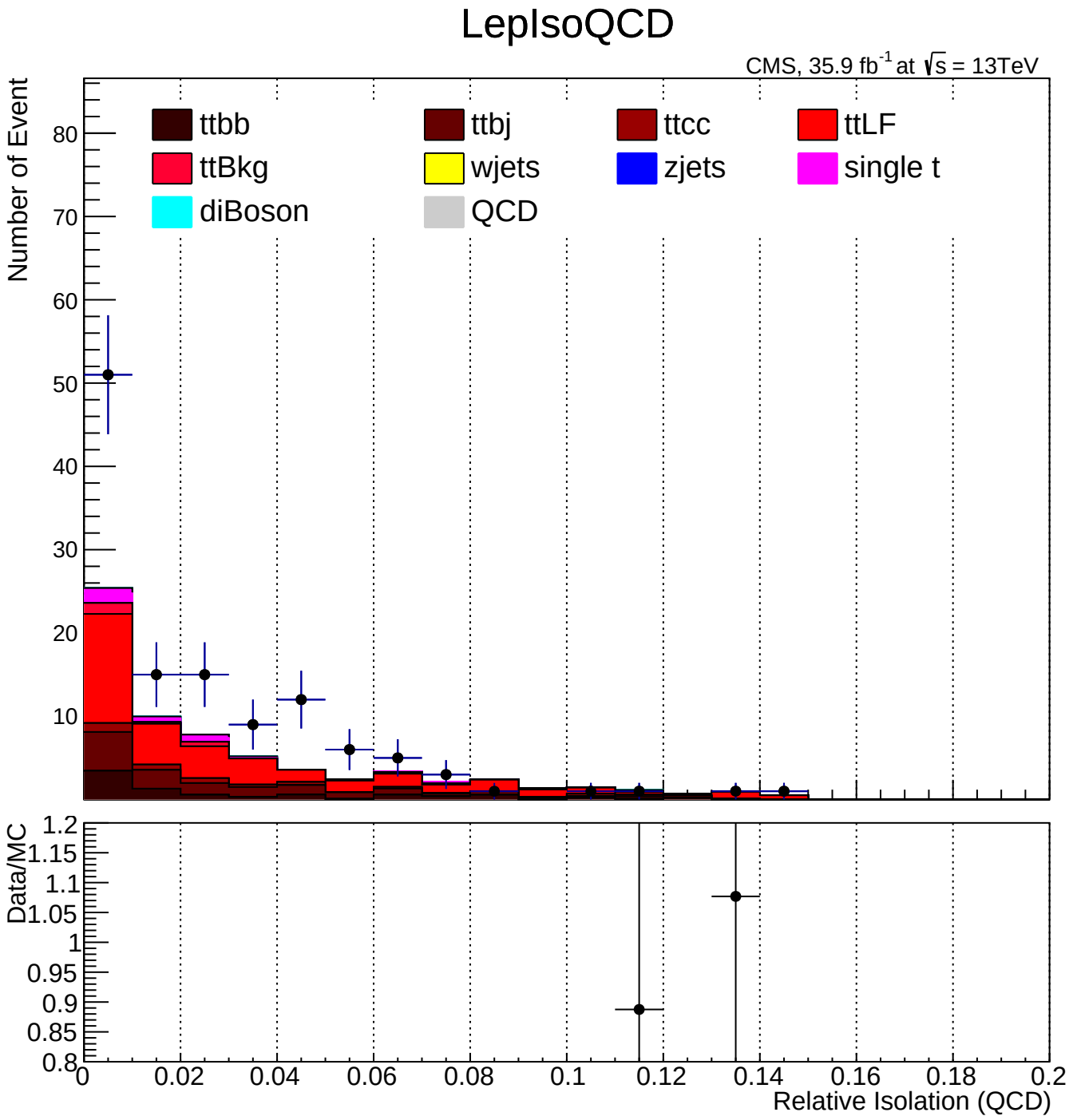

lepton DPhi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
DPhi

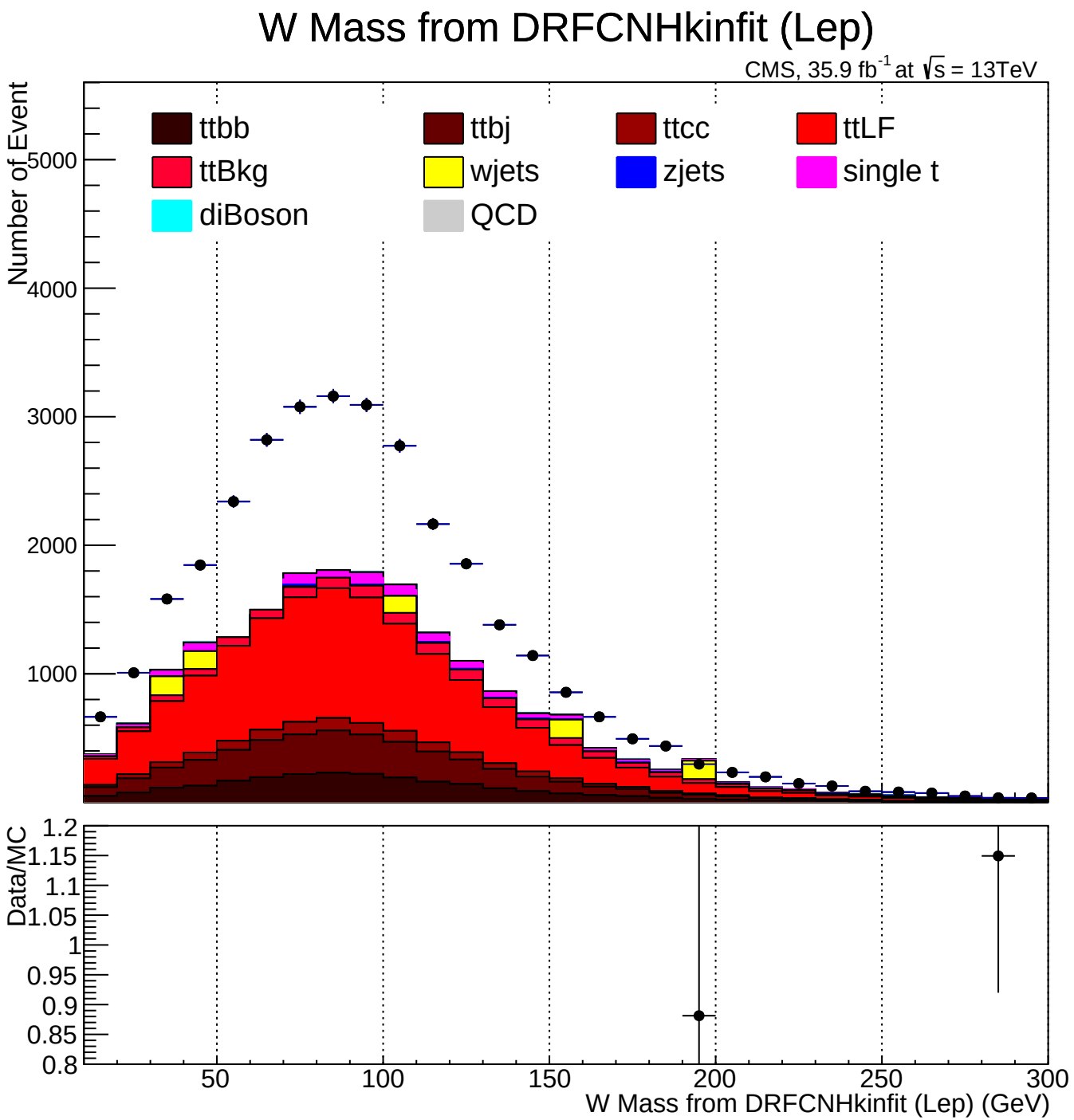

bjet_m Delta Phi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta Phi

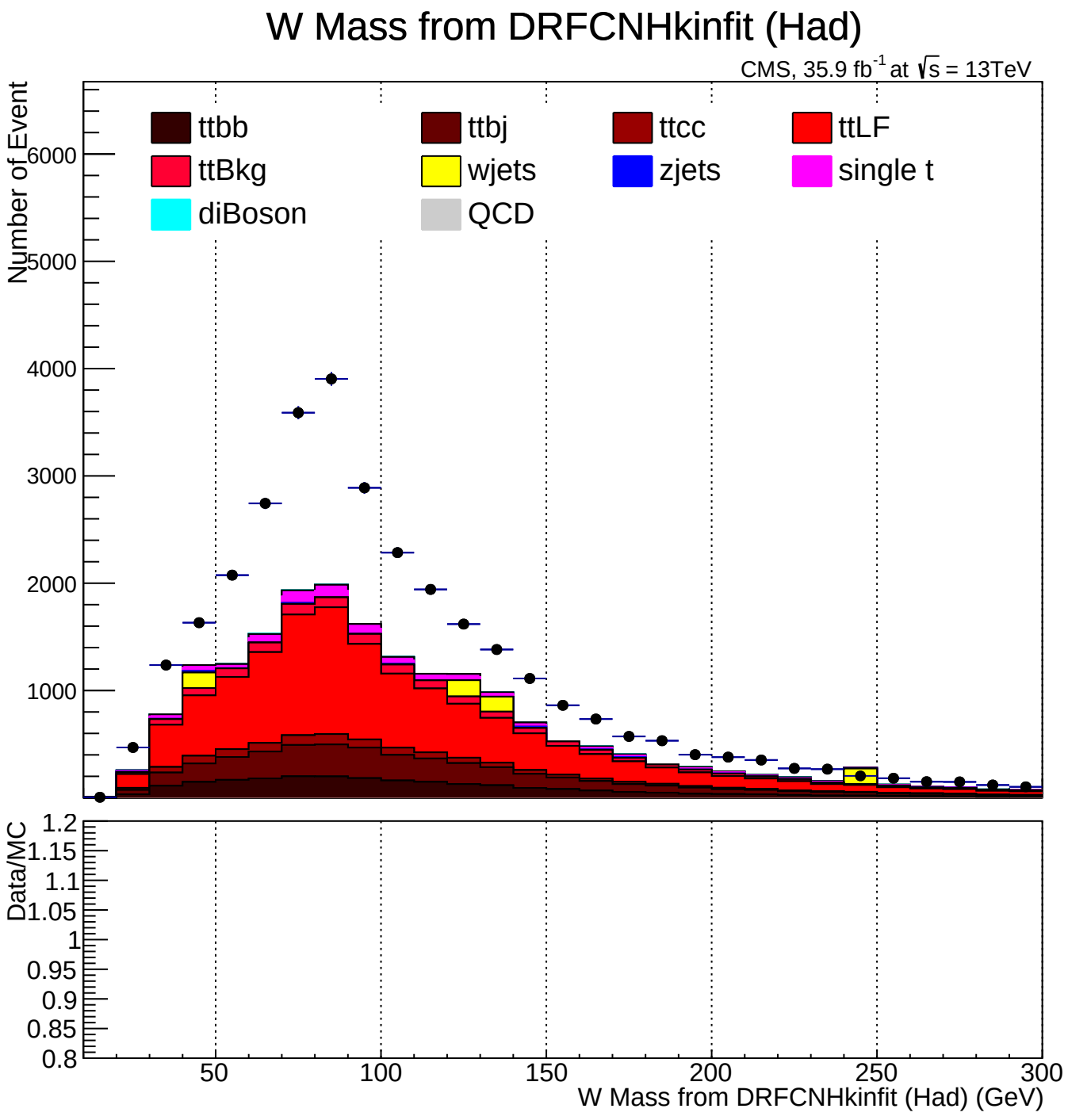

bjet_m Delta Eta
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta Eta

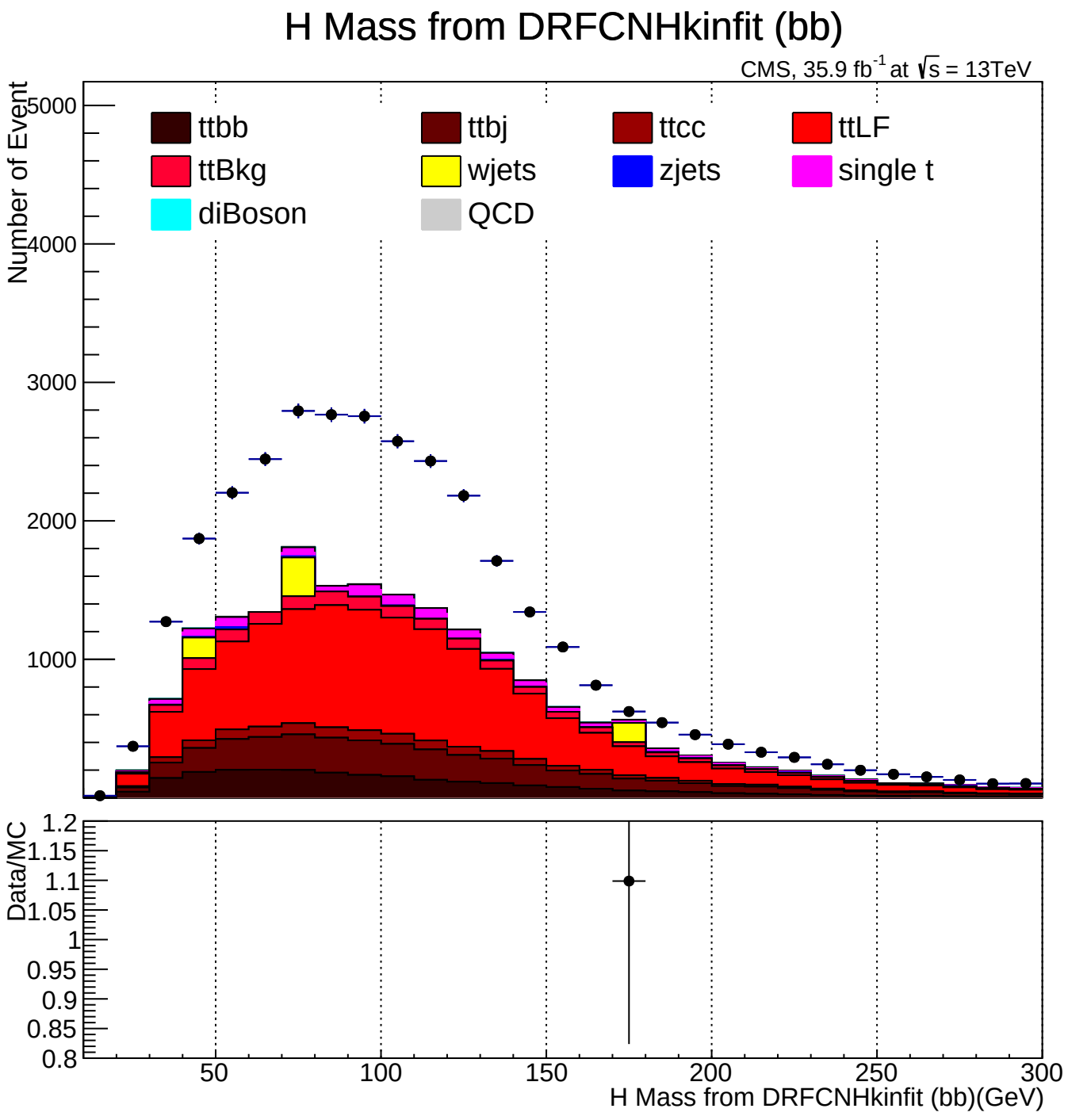

bjet_m Delta R
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
3500
3000
2500
2000
1500
1000
500
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
3.5
4
bjet_m Delta R

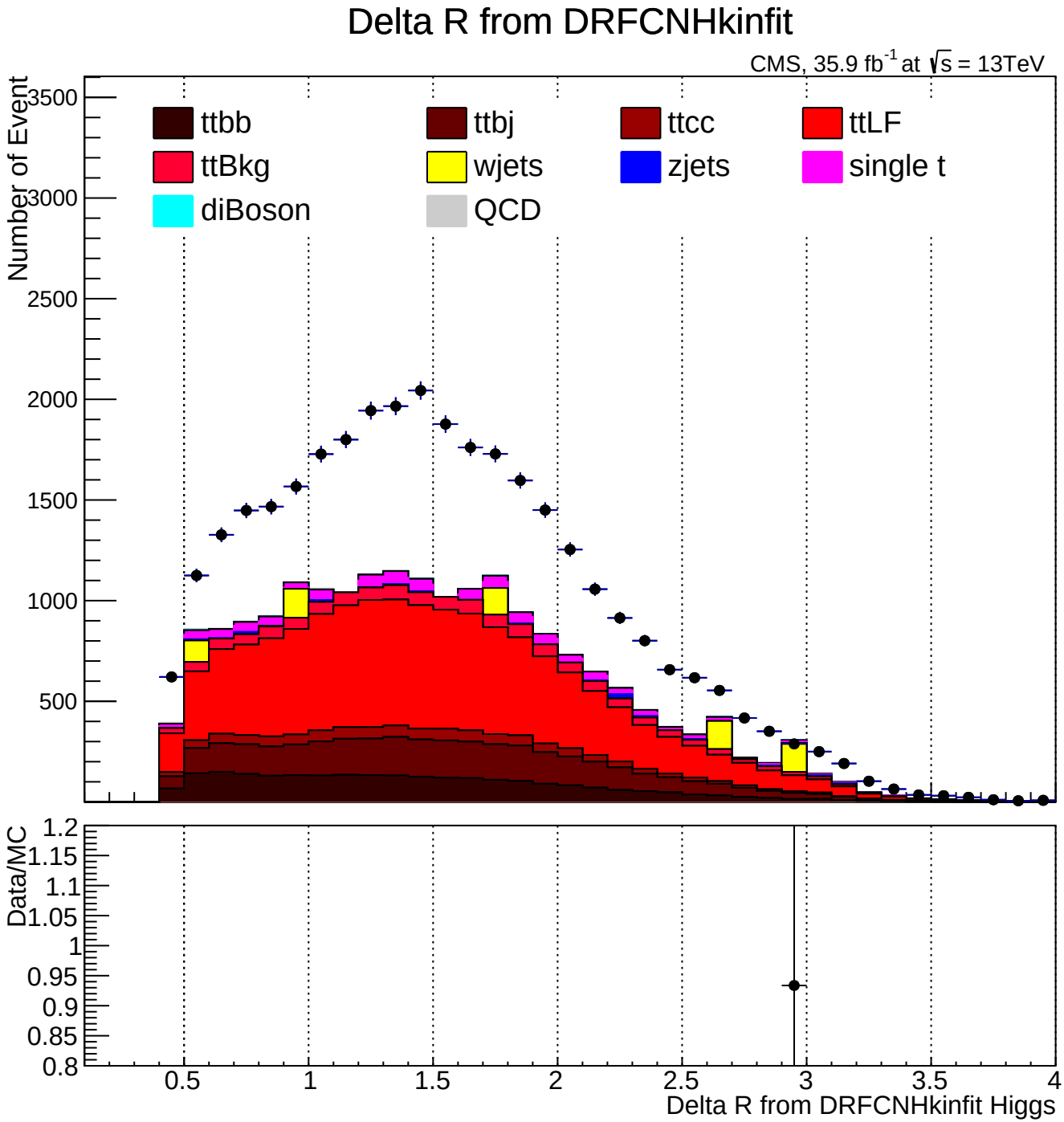

LepIso
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
24000
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation

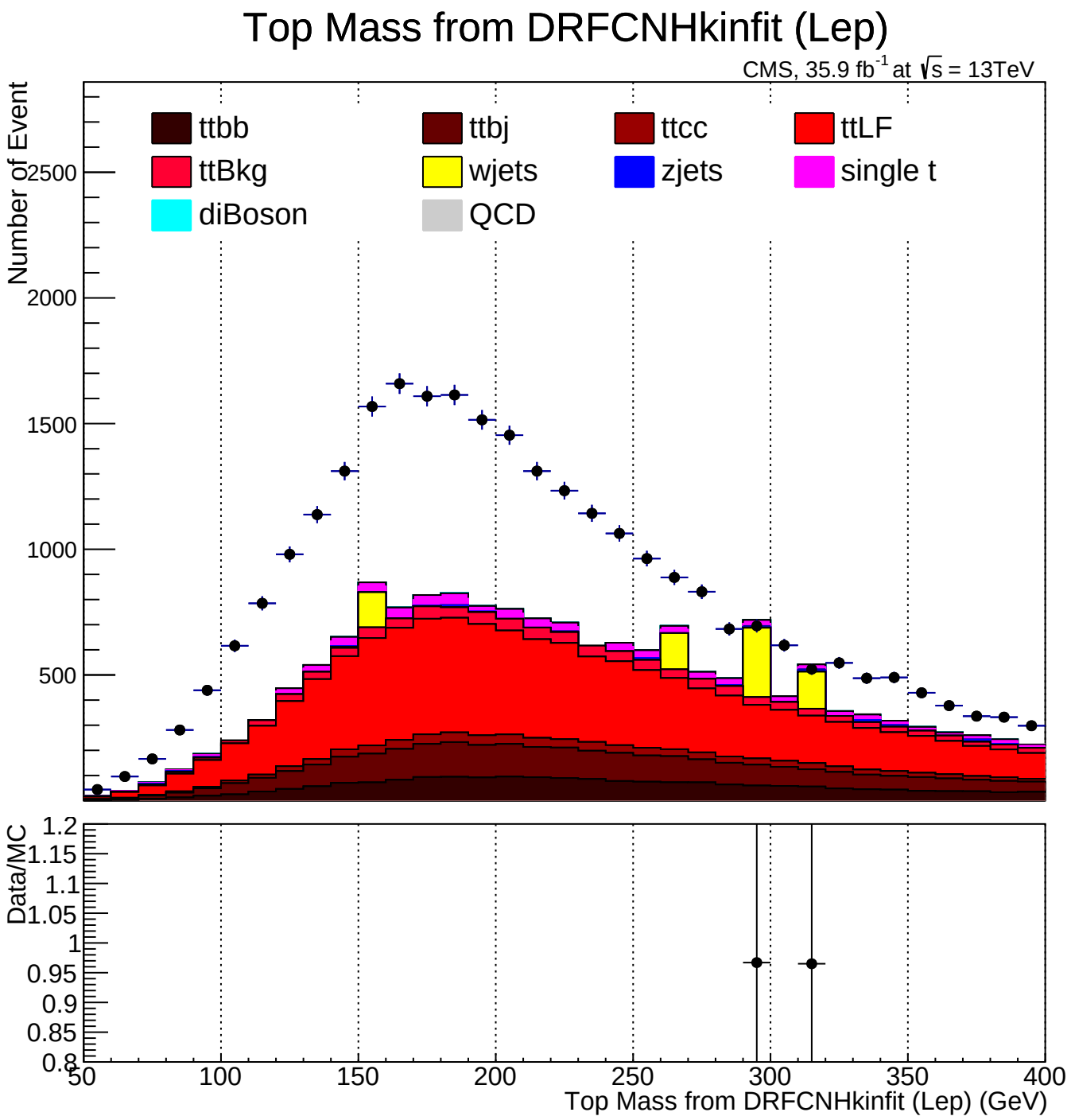

LepIsoQCD
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation (QCD)

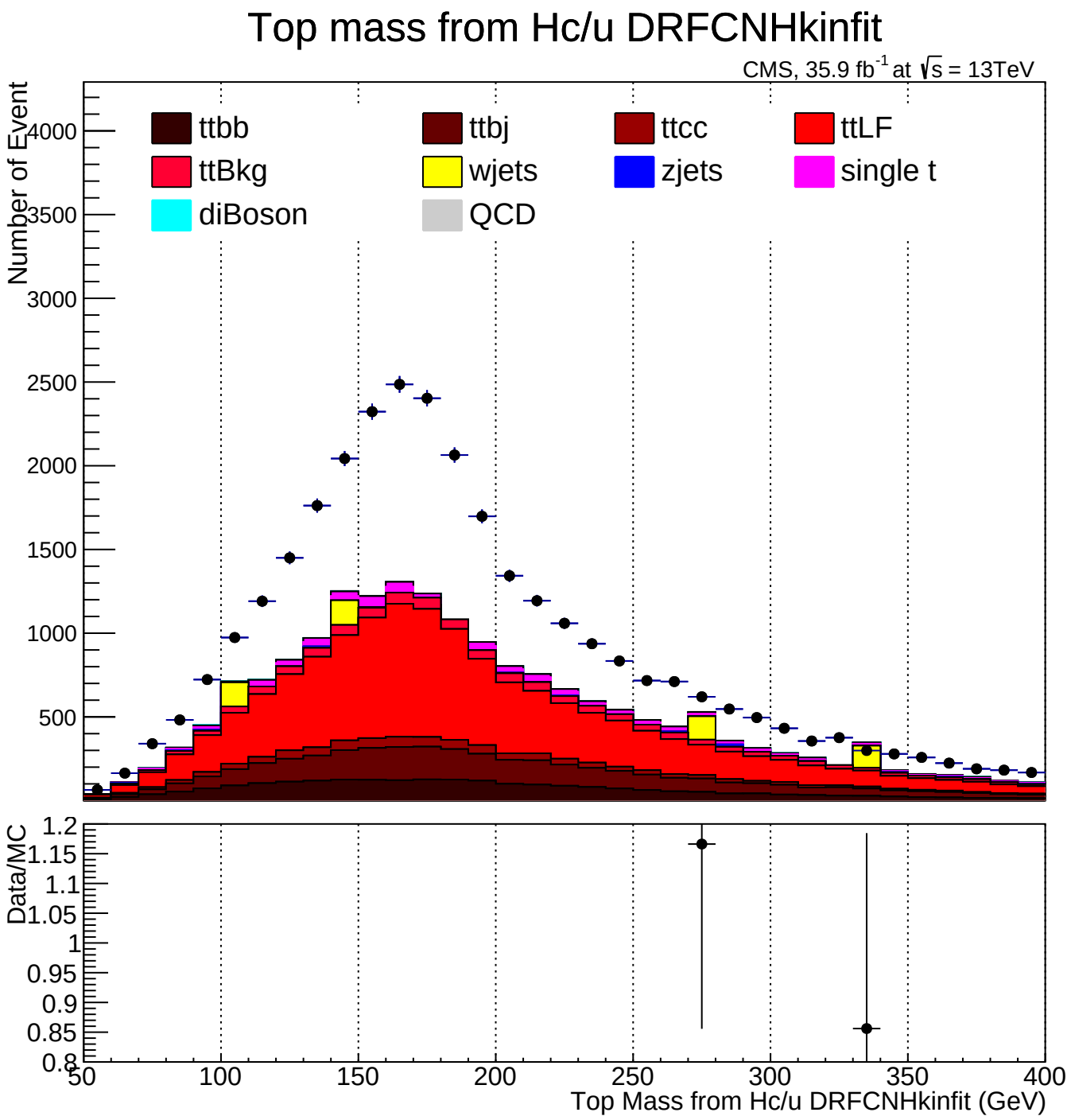

W Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
W Mass from DRFCNHkinfit (Lep) (GeV)

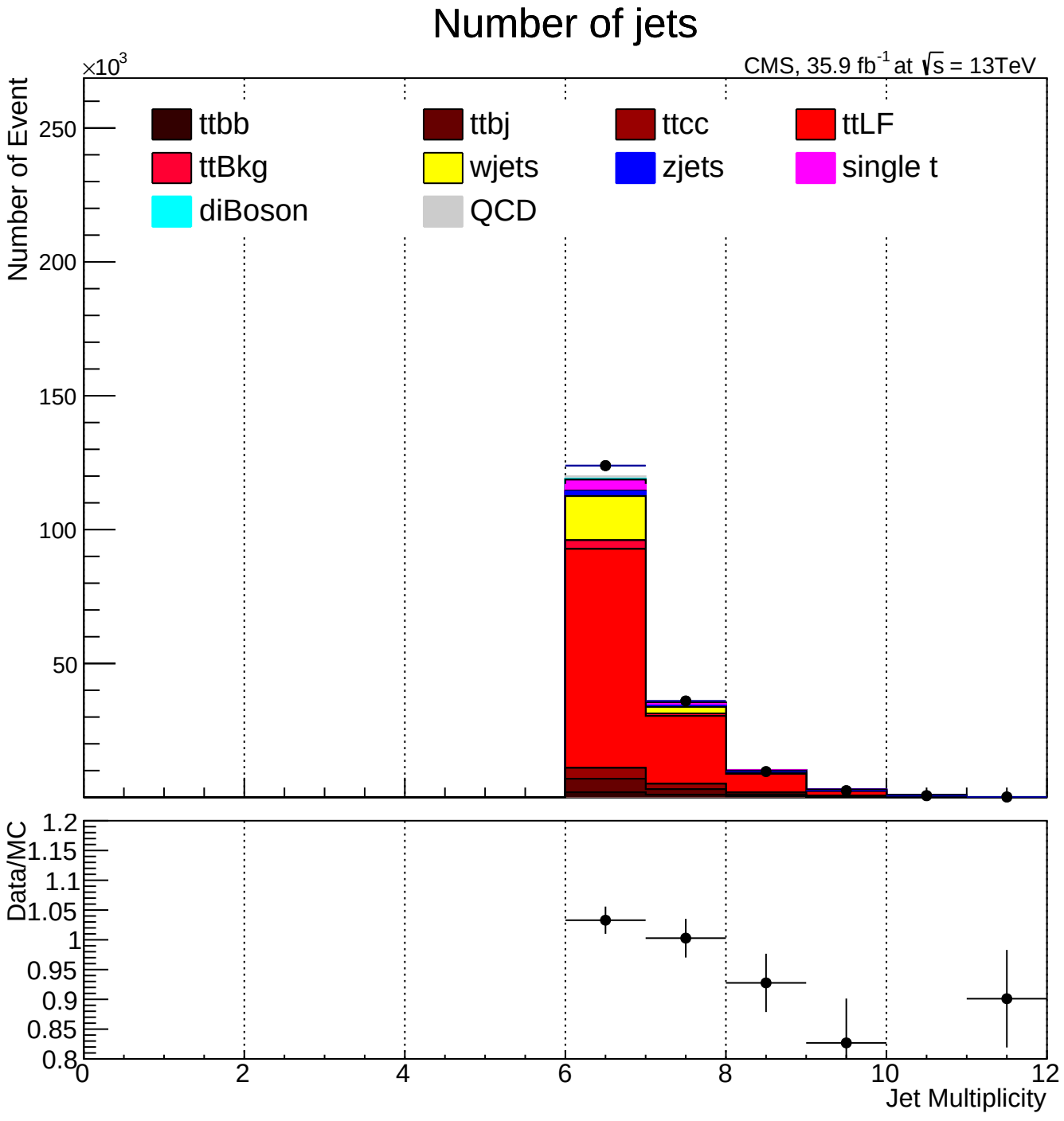

W Mass from DRFCNHkinfit (Had)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
6000
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
W Mass from DRFCNHkinfit (Had) (GeV)

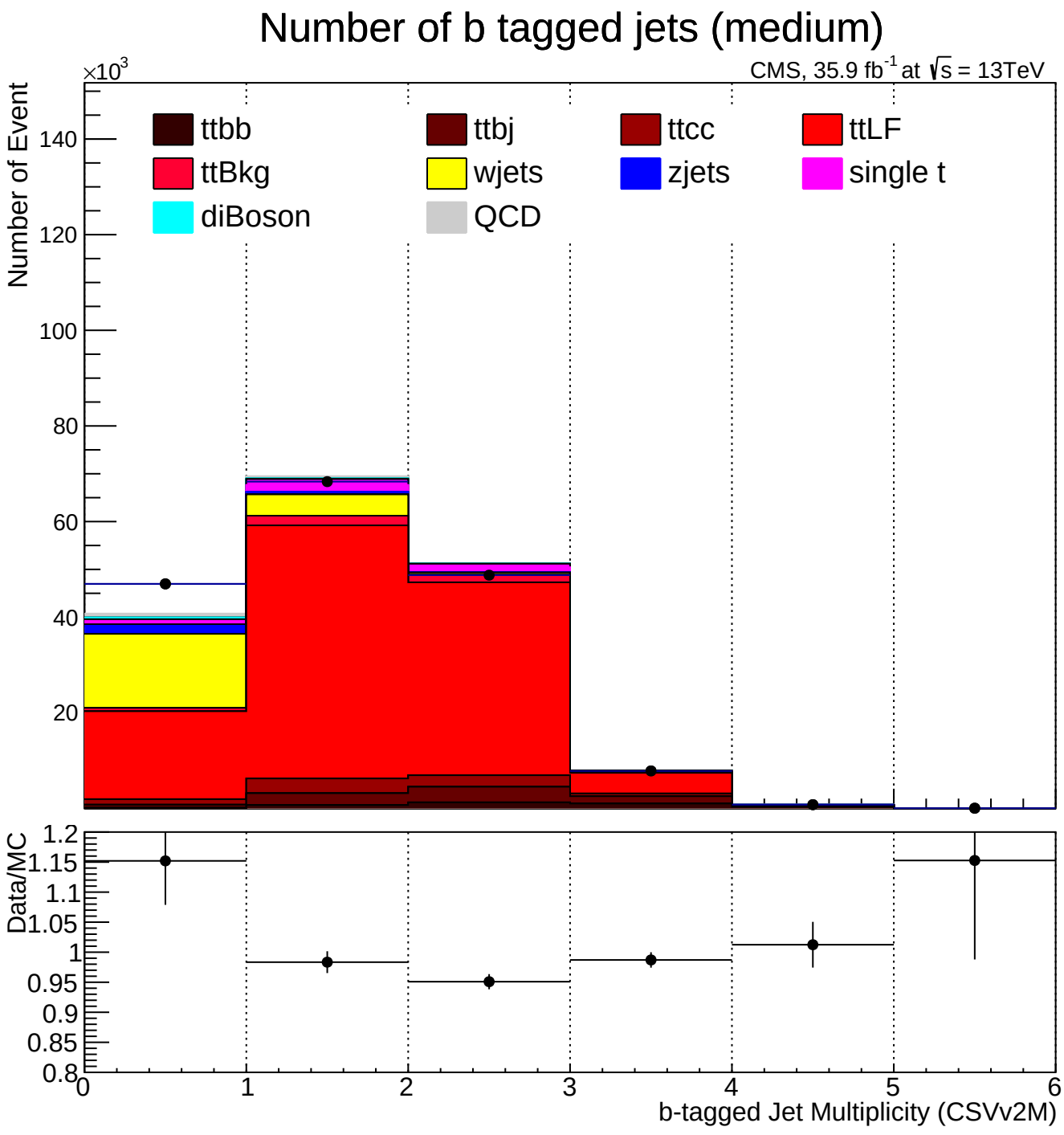

H Mass from DRFCNHkinfit (bb)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
H Mass from DRFCNHkinfit (bb)(GeV)

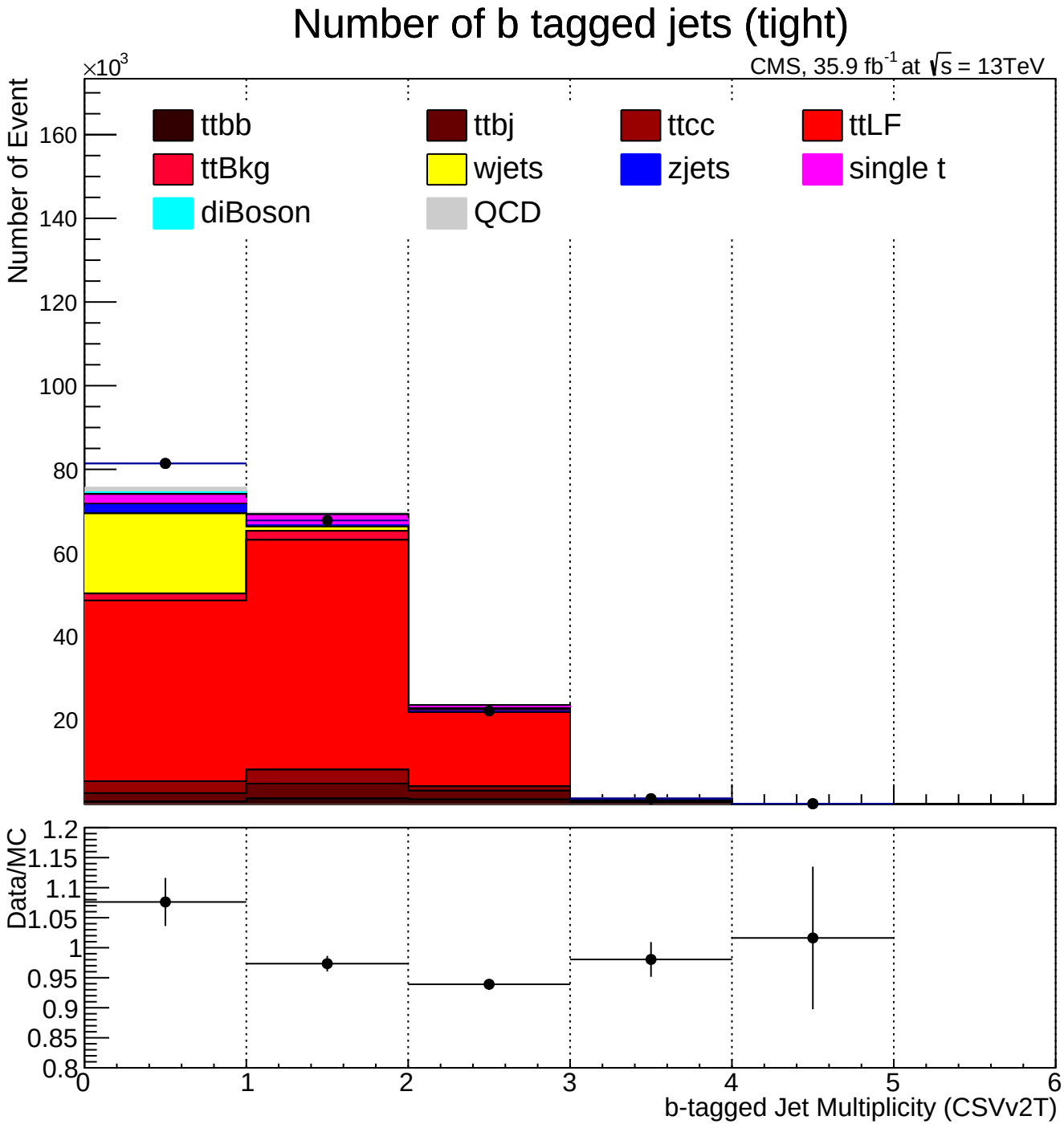

Delta R from DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Delta R from DRFCNHkinfit Higgs

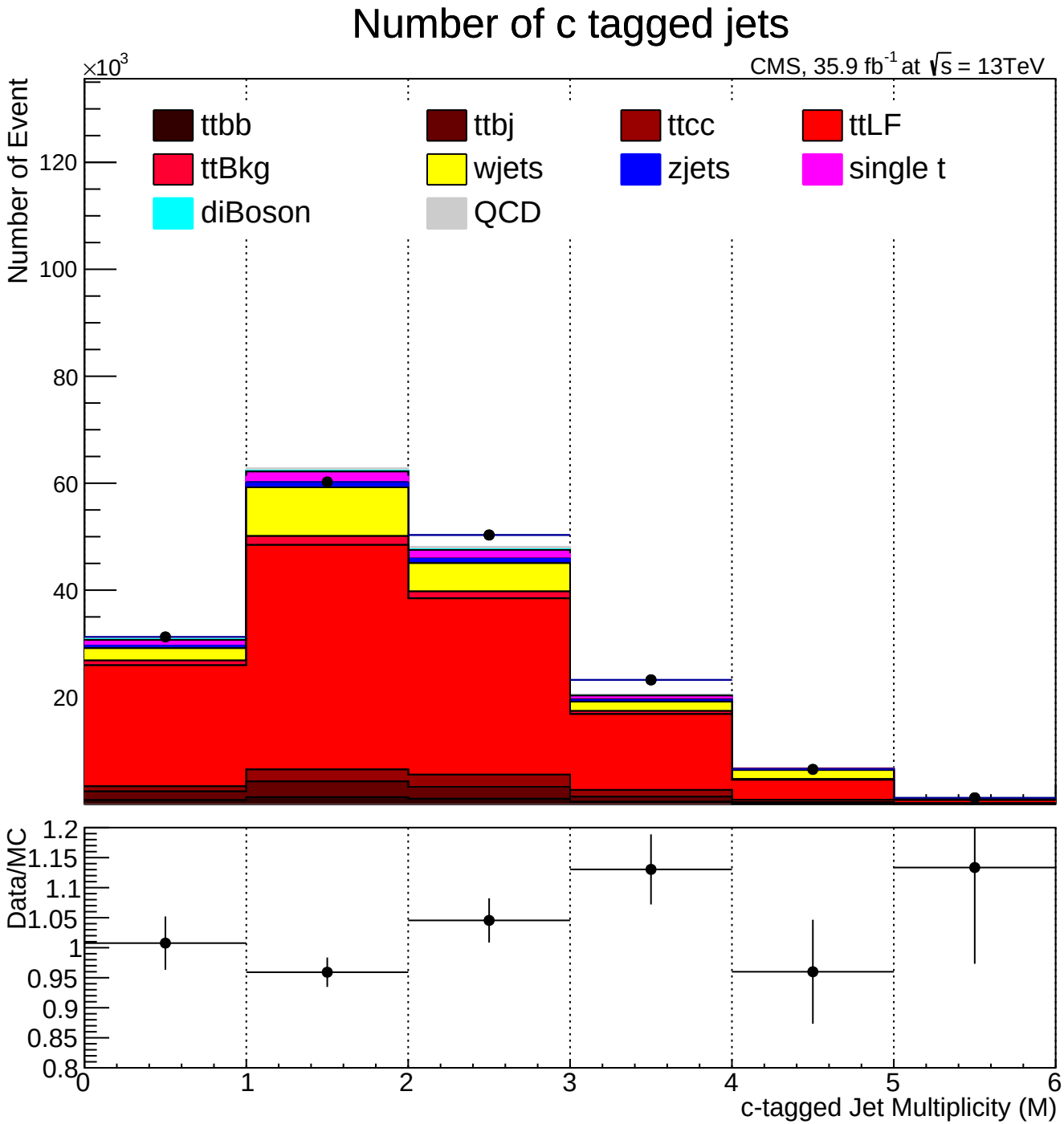

Top Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
2500
2000
1500
1000
500
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
350
400
Top Mass from DRFCNHkinfit (Lep) (GeV)

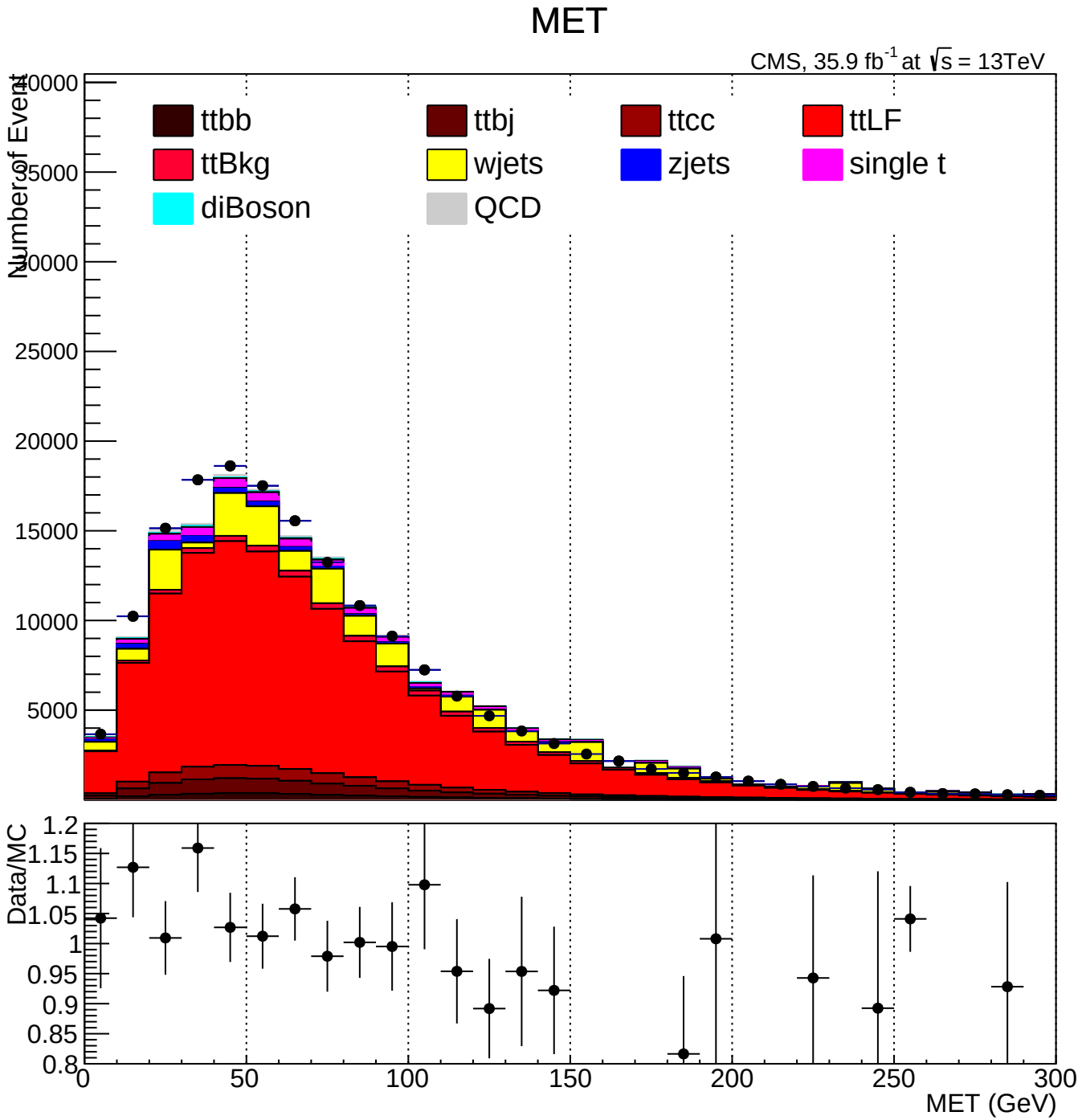

Top mass from Hc/u DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Top Mass from Hc/u DRFCNHkinfit (GeV)

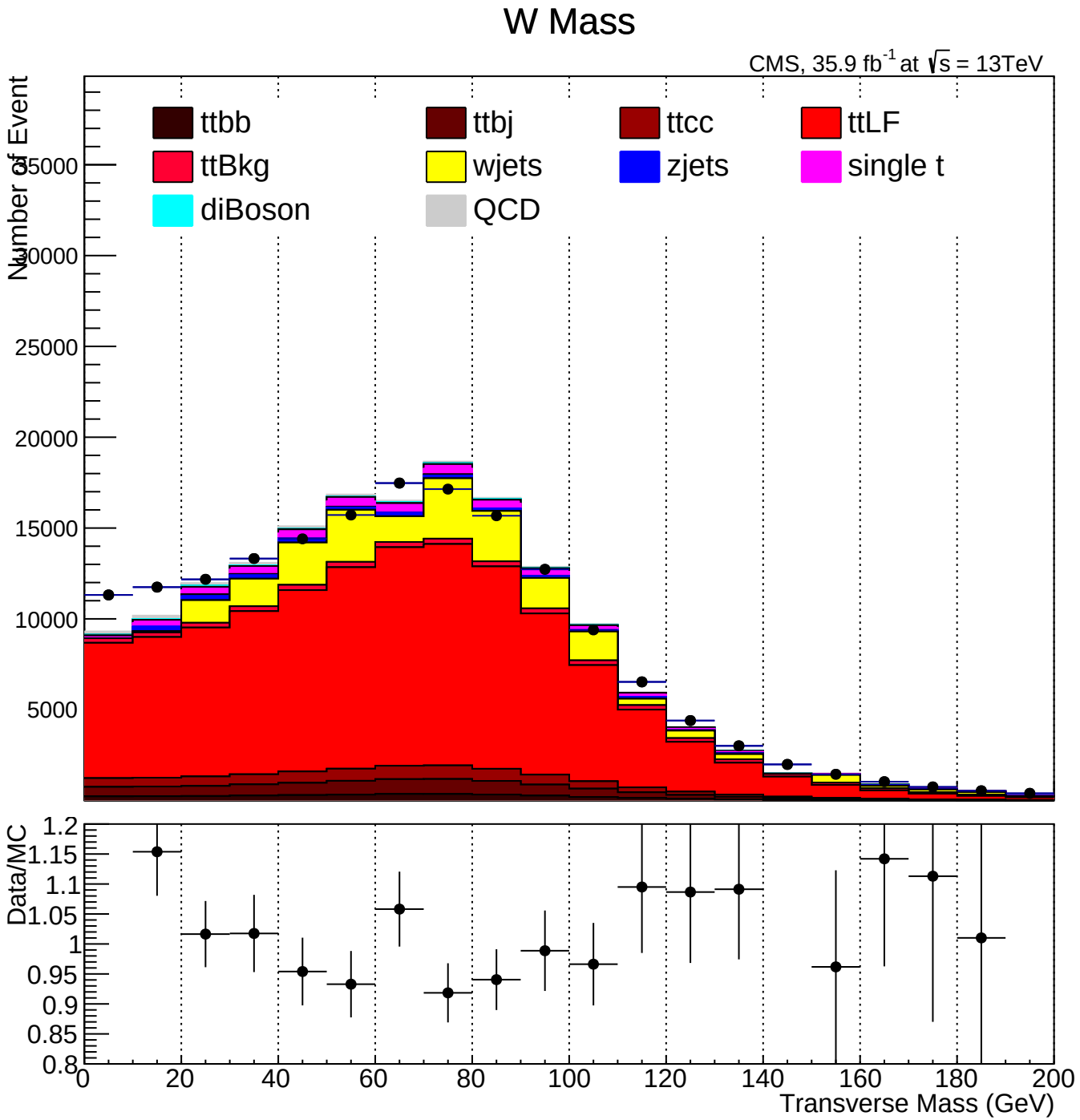

Number of jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Jet Multiplicity


Number of b tagged jets (medium)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b-tagged Jet Multiplicity (CSVv2M)

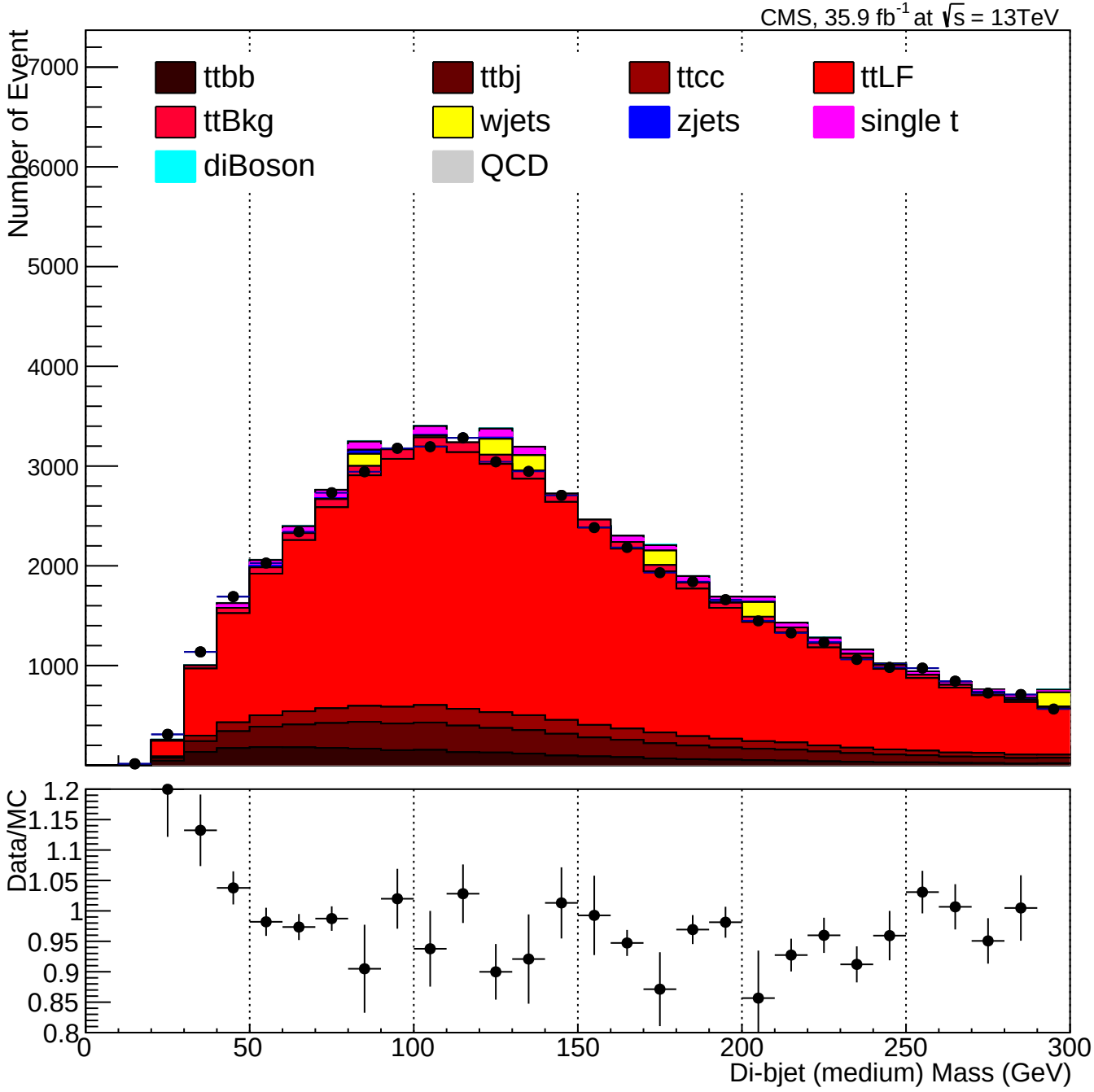

Number of b tagged jets (tight)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
$\times 10^3$
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b-tagged Jet Multiplicity (CSVv2T)

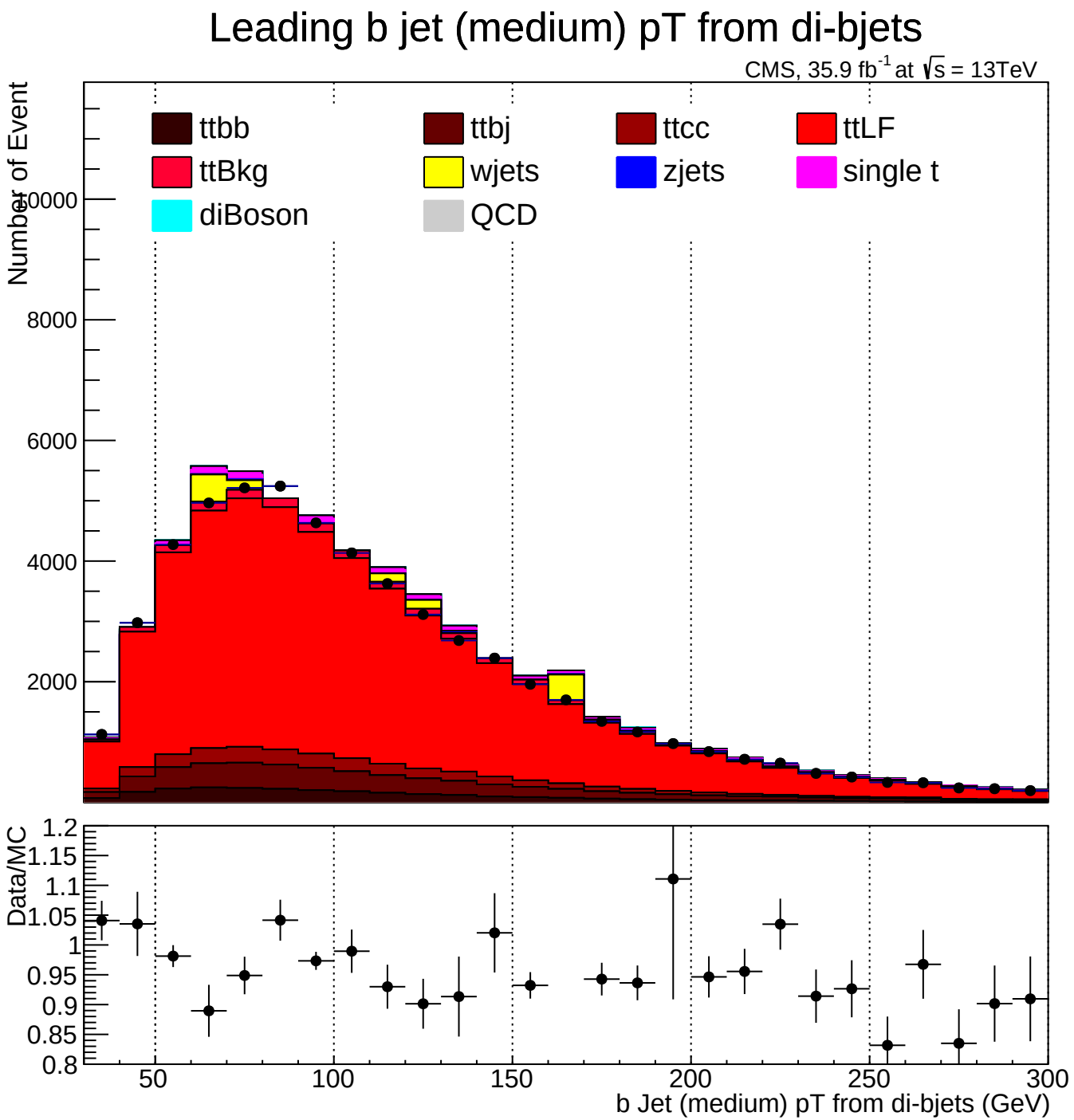

Number of c tagged jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
c-tagged Jet Multiplicity (M)

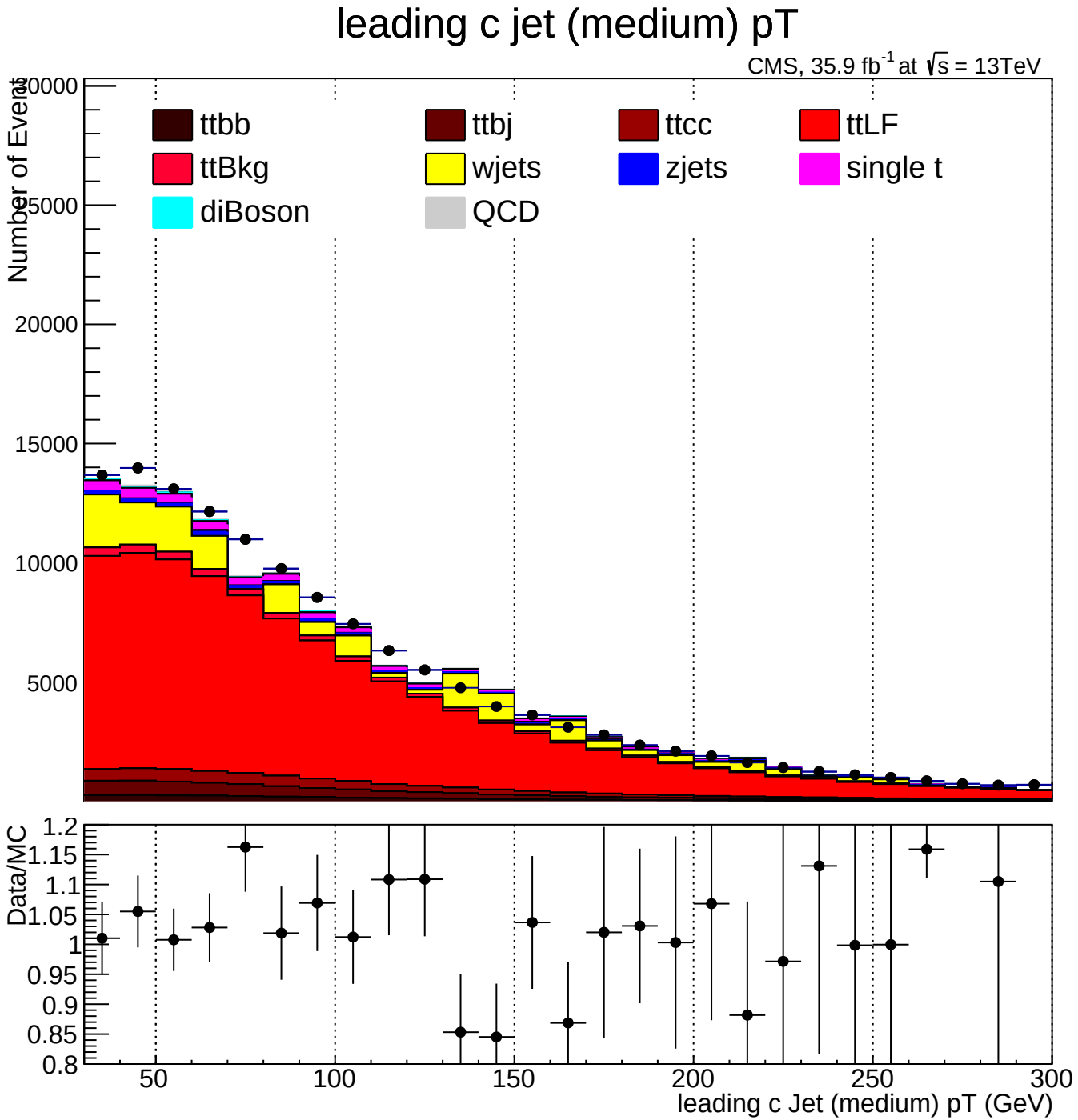

MET
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
MET (GeV)

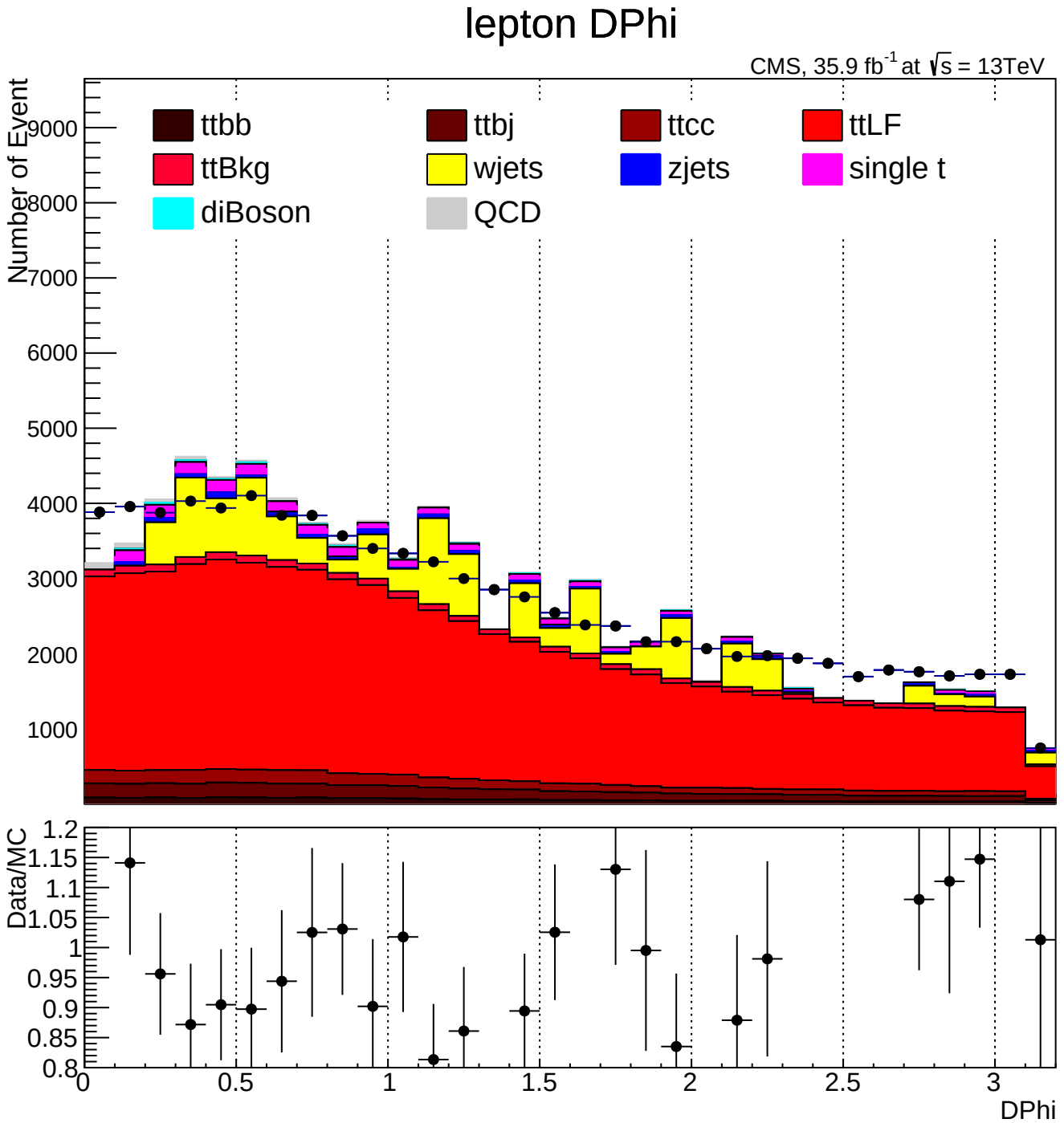

W Mass
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
35000
30000
25000
20000
15000
10000
5000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
20
40
60
80
100
120
140
160
180
200
Transverse Mass (GeV)

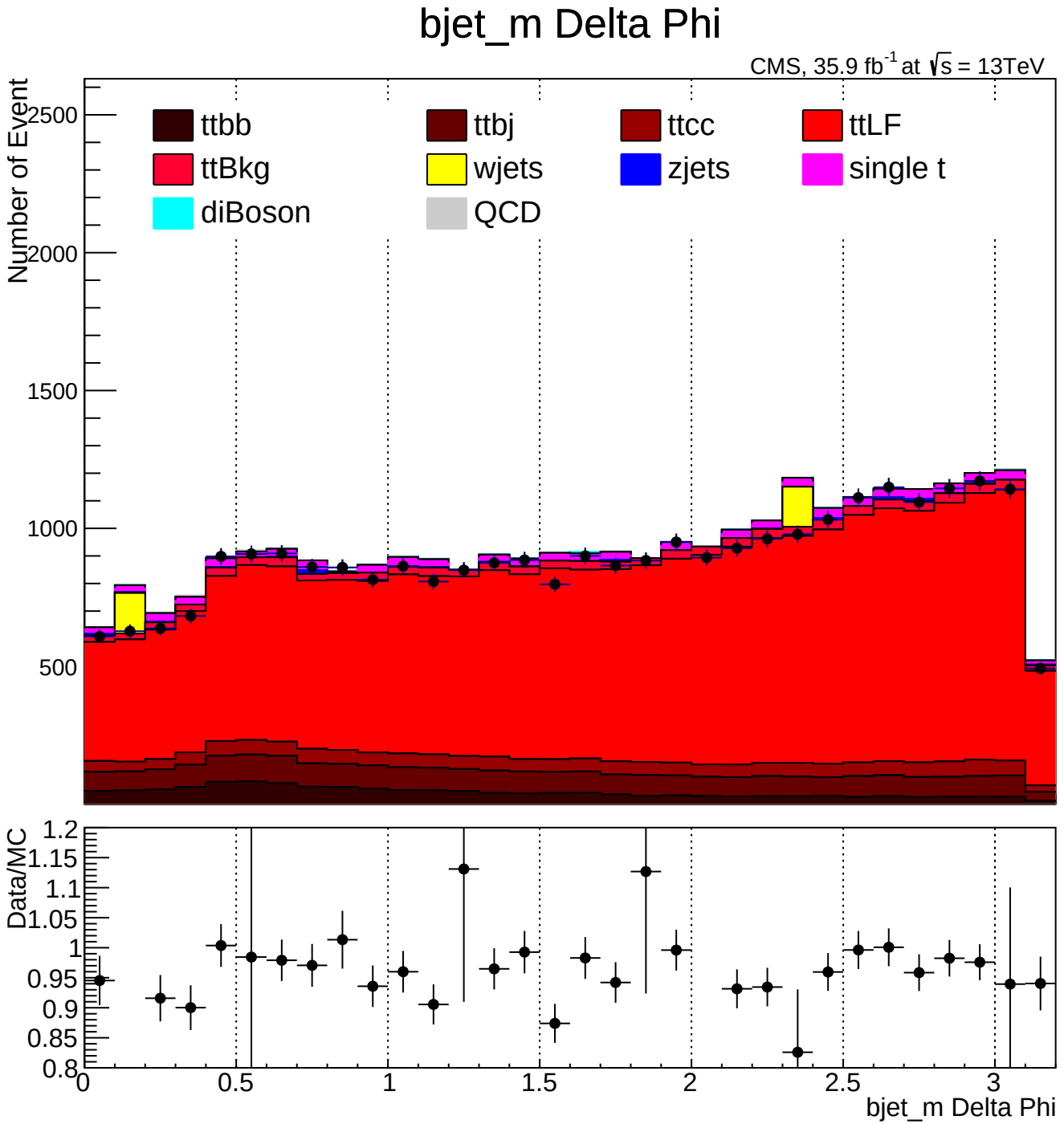
Di-bjet Mass (medium) wrt min DR

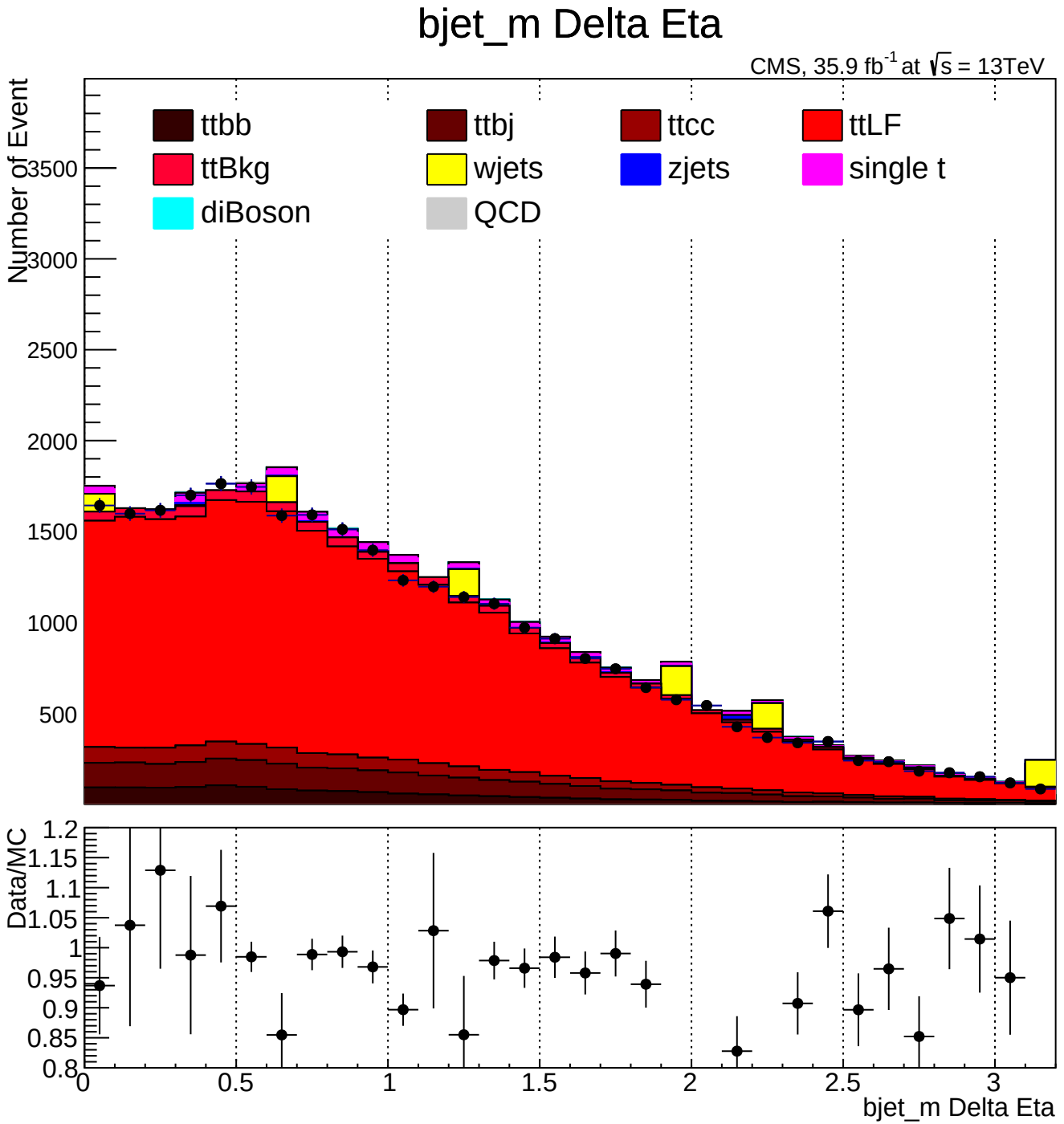


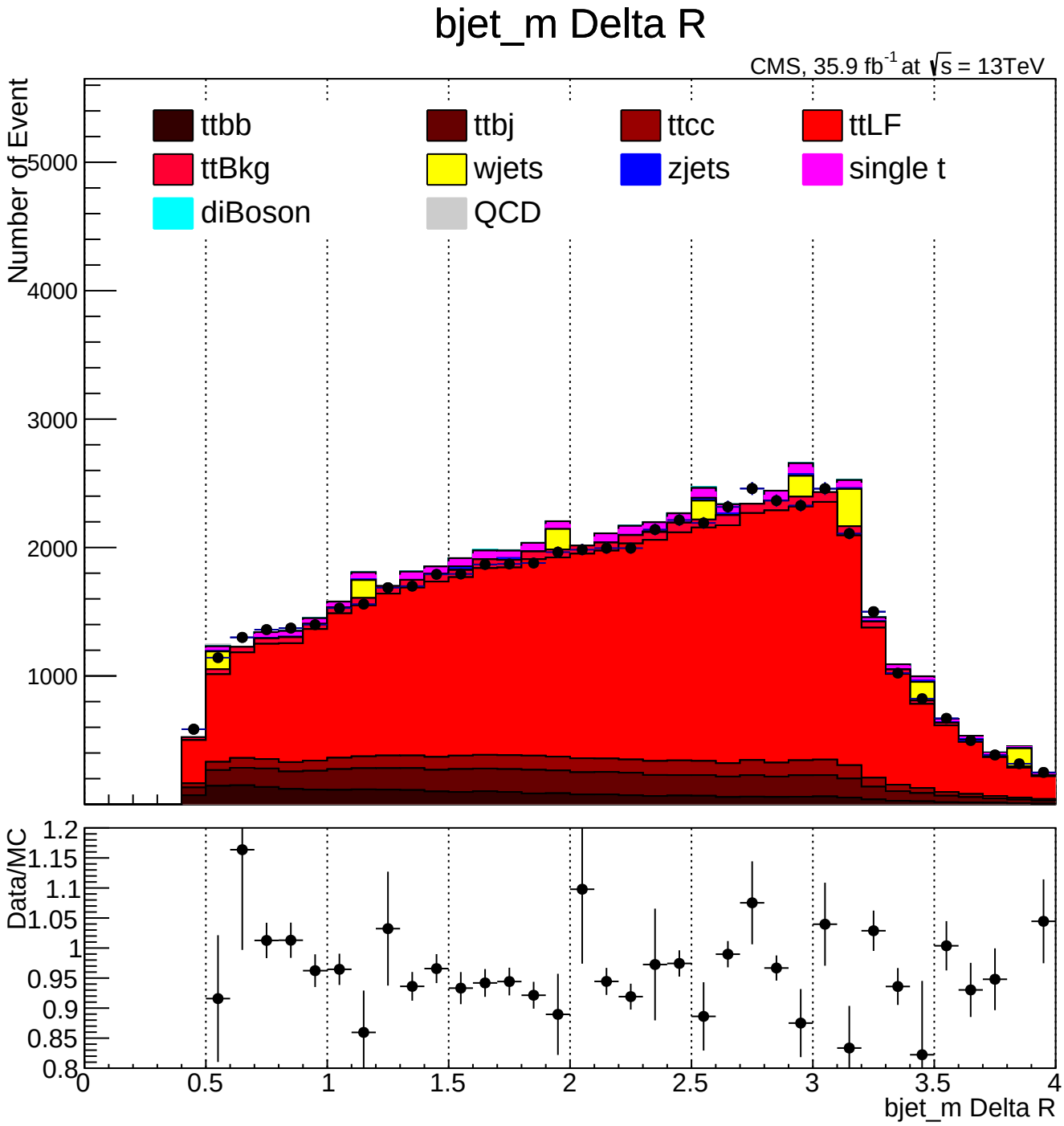

Leading b jet (medium) pT from di-bjets
CMS, 35.9 fb-1 at √s = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
b Jet (medium) pT from di-bjets (GeV)

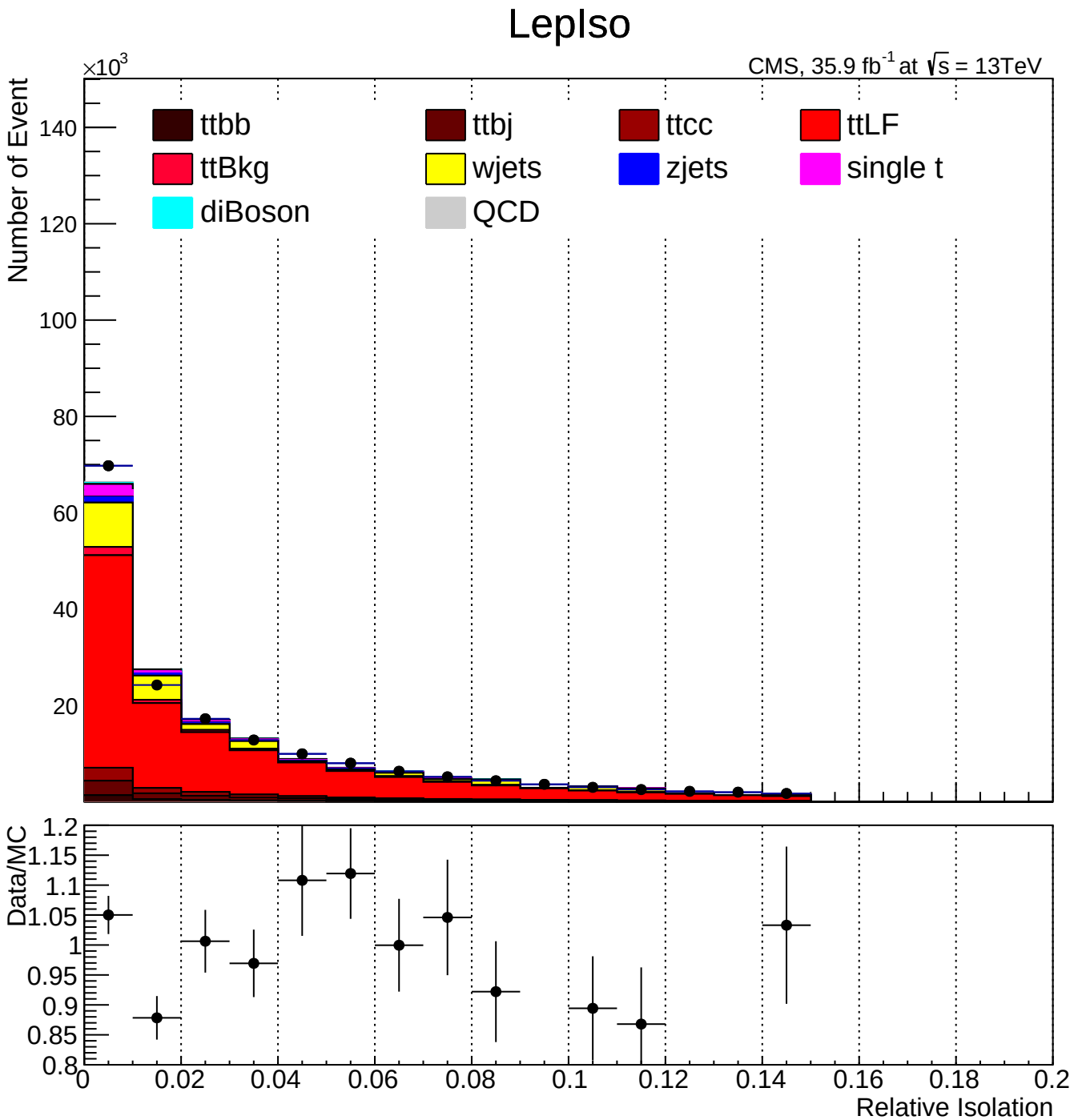

leading c jet (medium) pT
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Events
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
30000
25000
20000
15000
10000
5000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
leading c Jet (medium) pT (GeV)

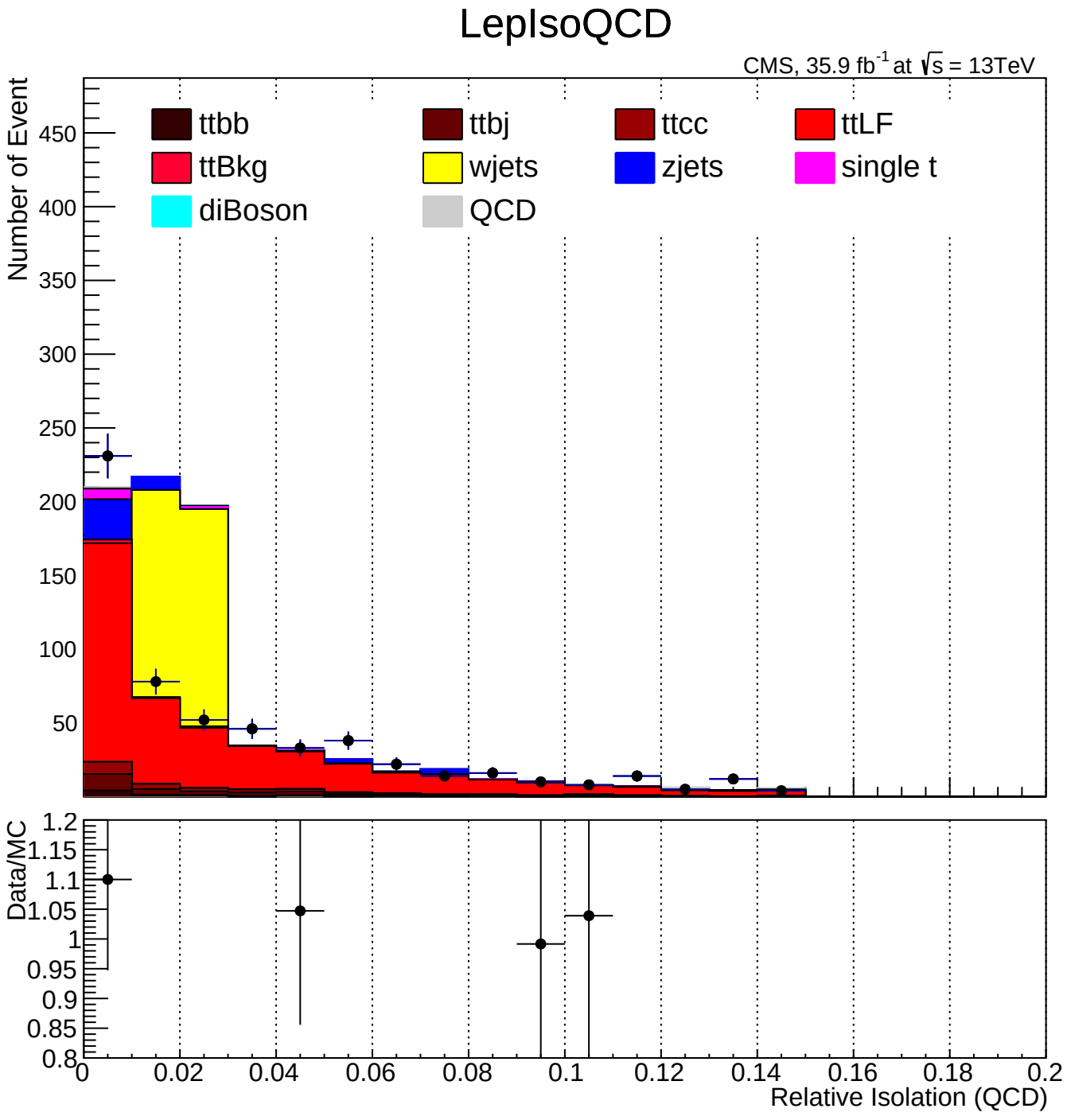

lepton DPhi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
9000
8000
7000
6000
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
DPhi

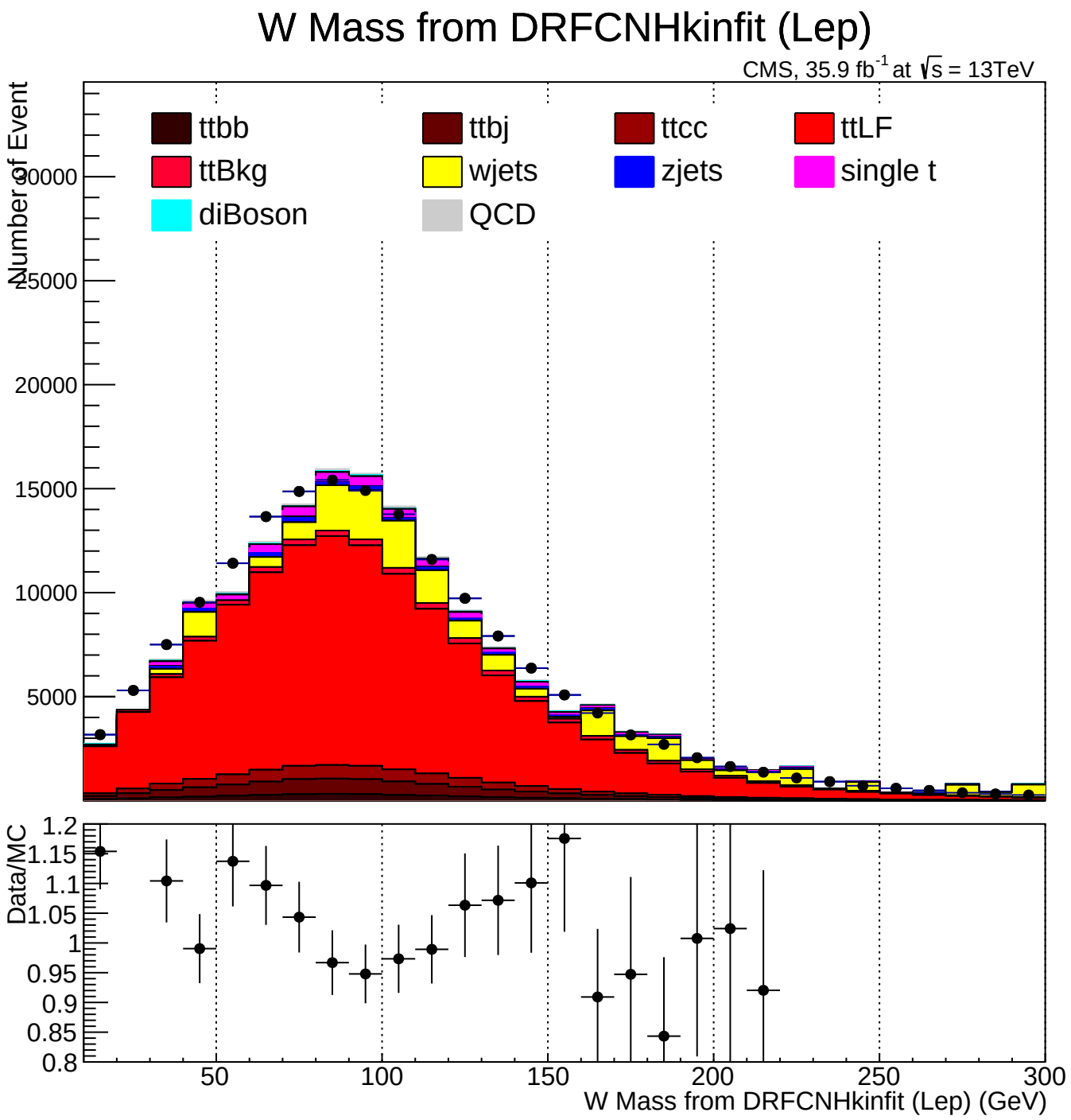

bjet_m Delta Phi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
2500
2000
1500
1000
500
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Phi

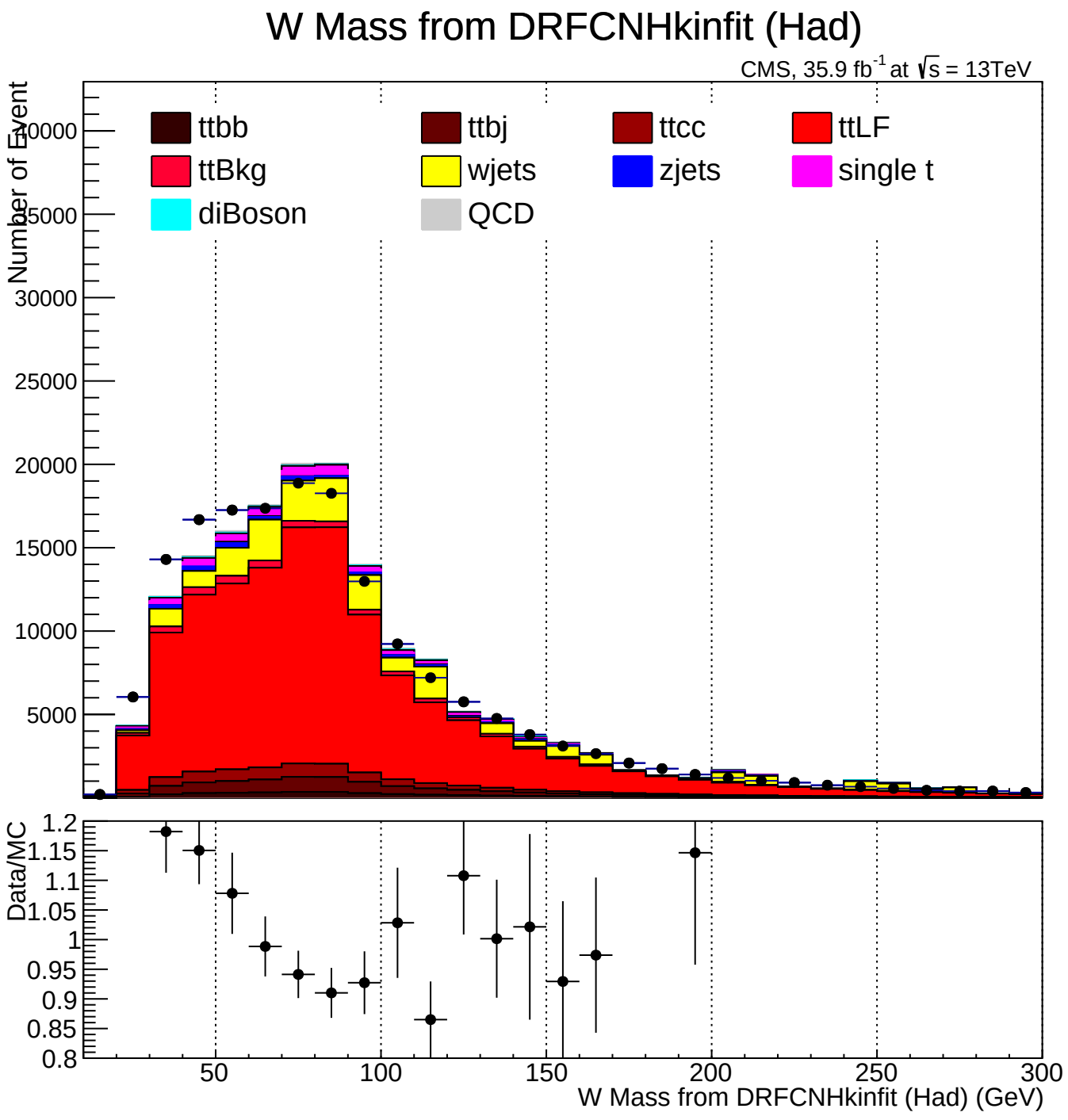

bjet_m Delta Eta
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
3500
3000
2500
2000
1500
1000
500
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Eta

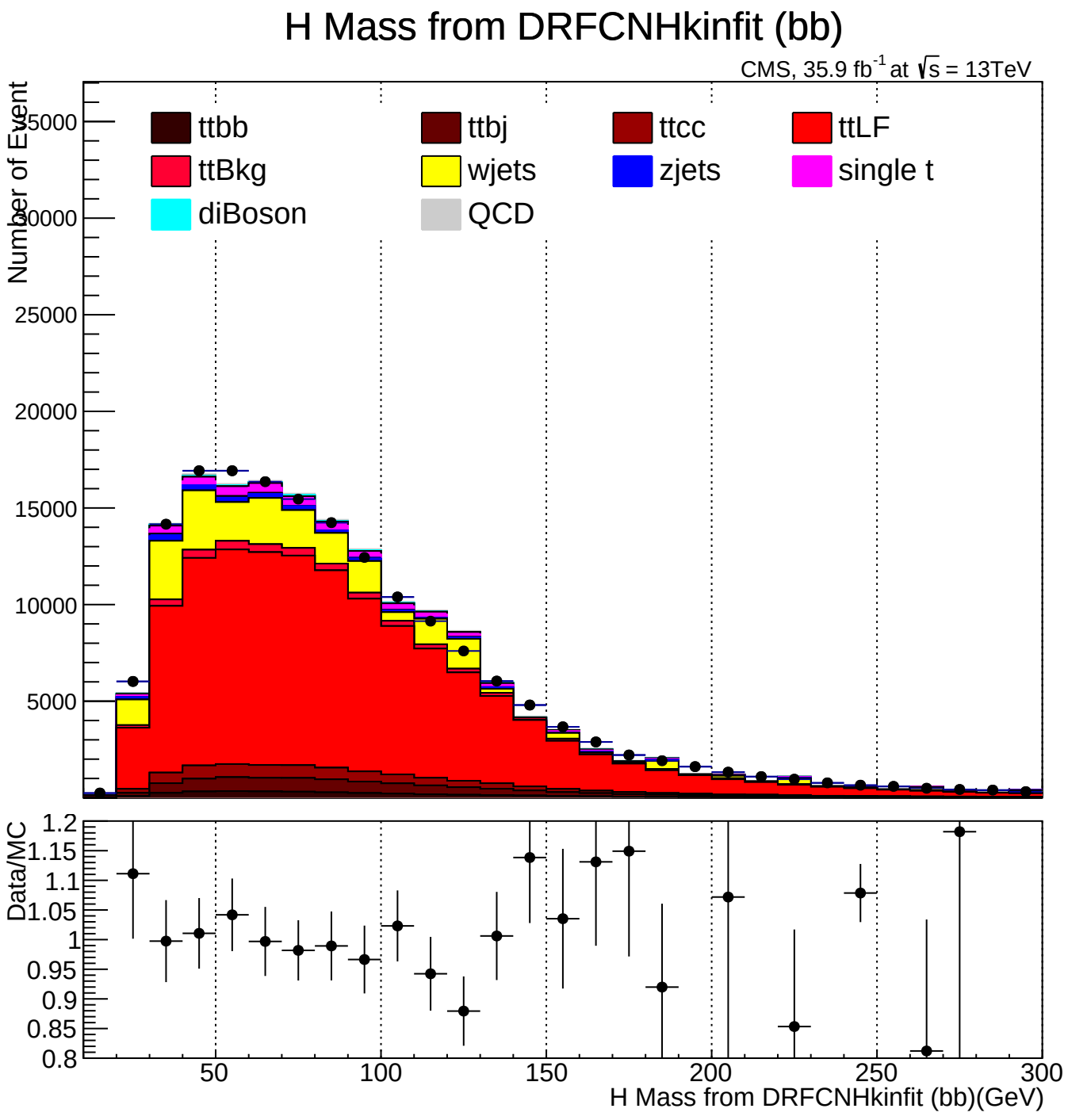

bjet_m Delta R
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
3.5
4
bjet_m Delta R

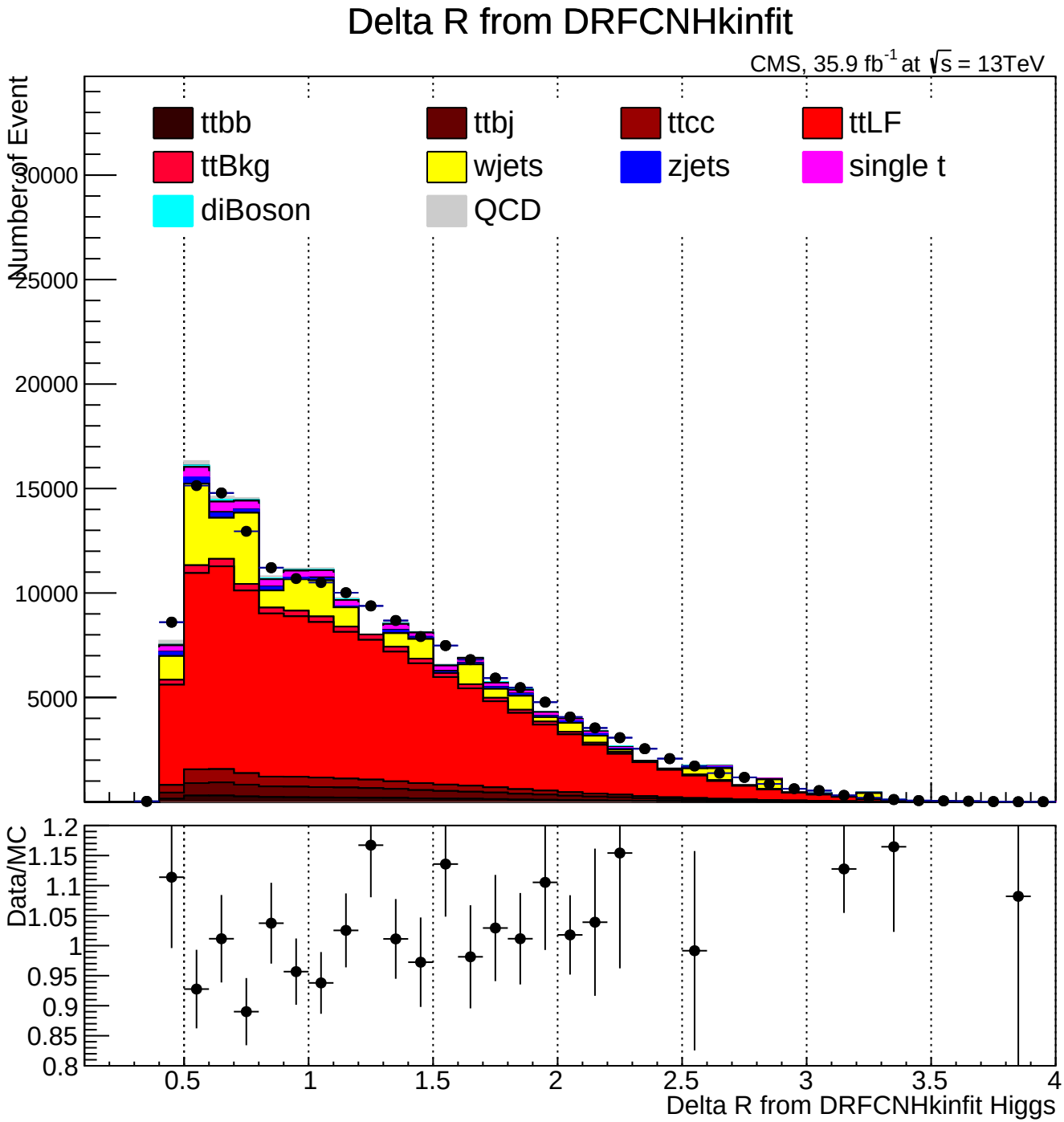

LepIso
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation


LepIsoQCD
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation (QCD)

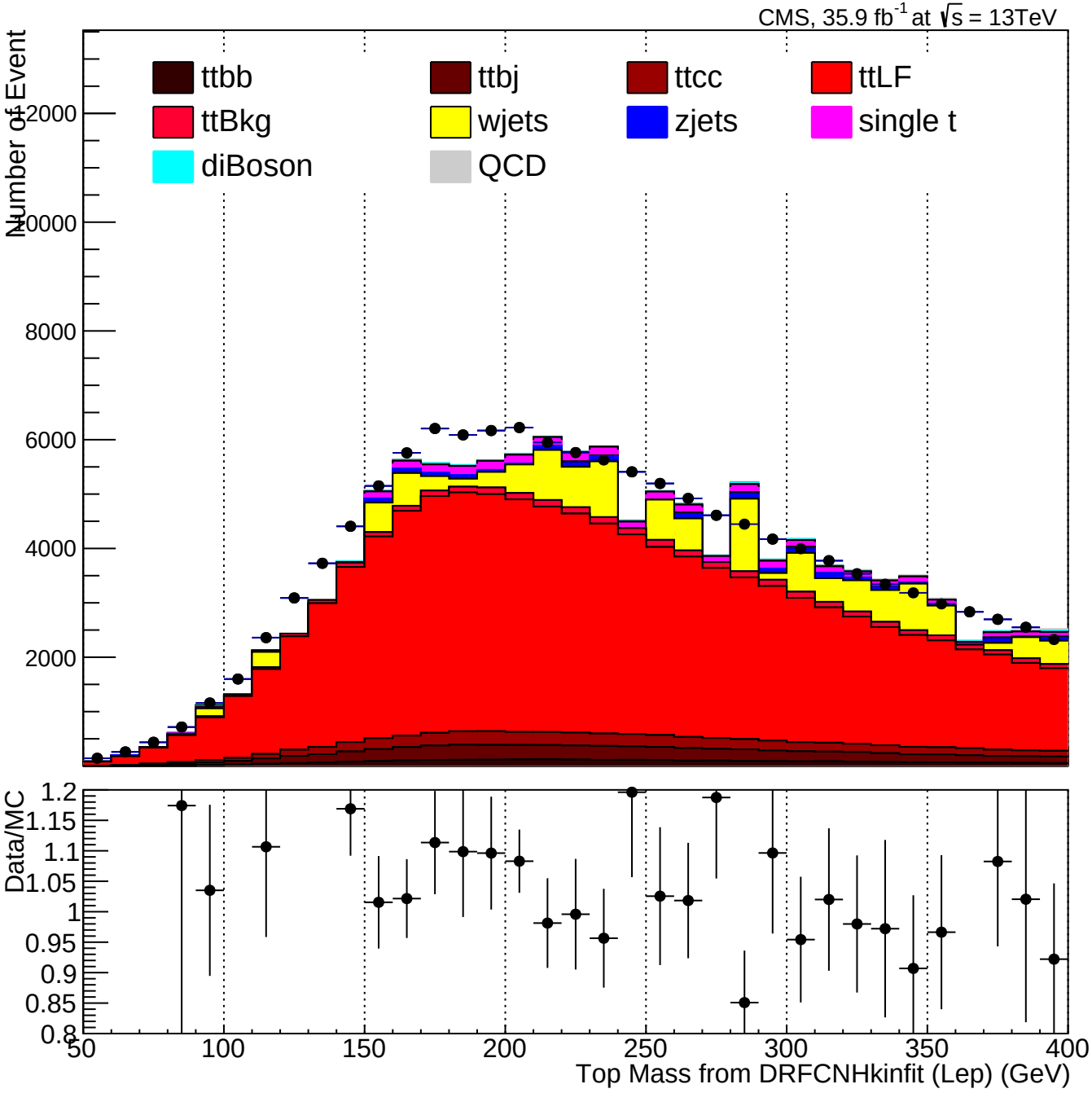

W Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb-1 at √s = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
30000
25000
20000
15000
10000
5000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
W Mass from DRFCNHkinfit (Lep) (GeV)

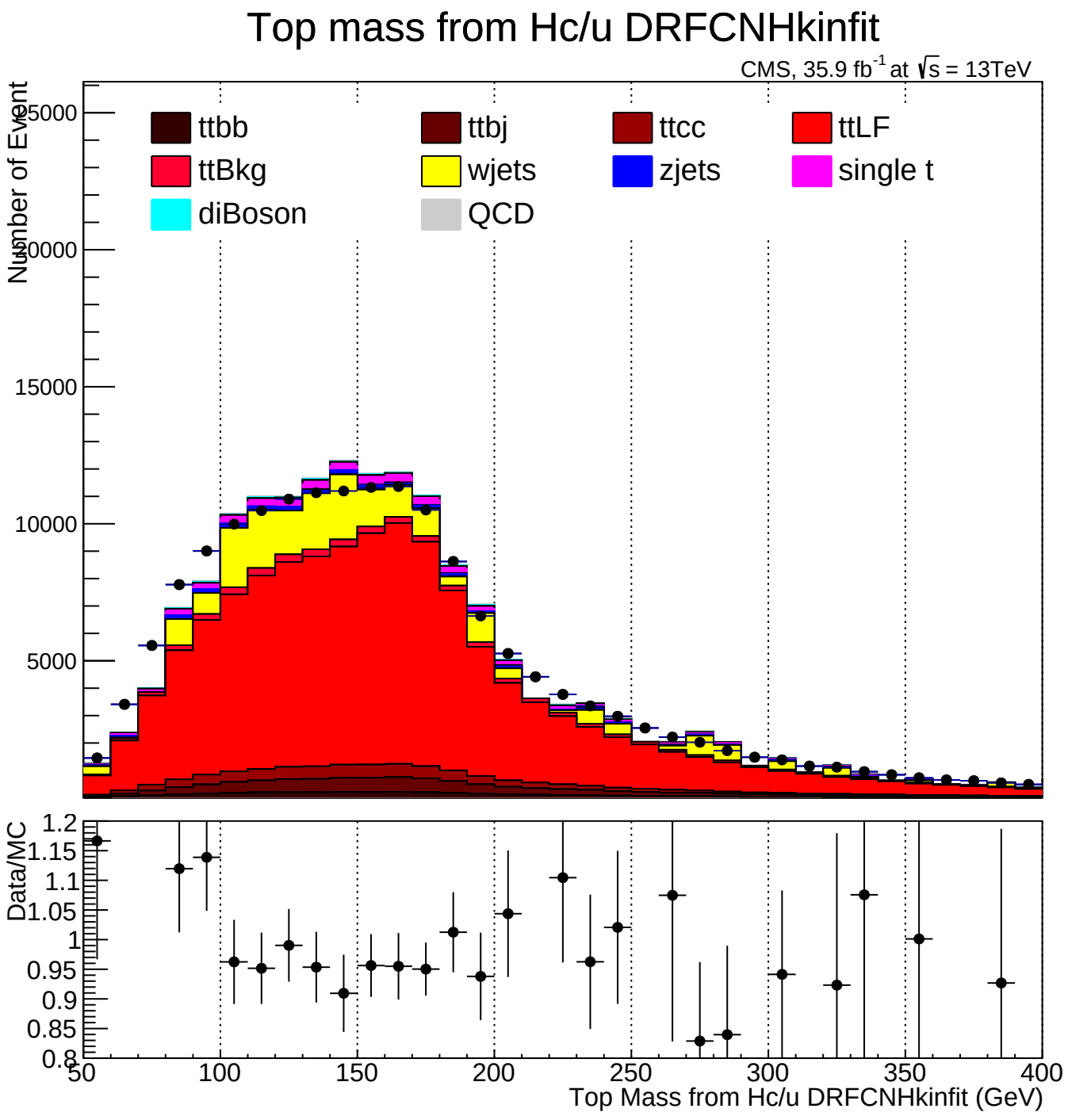

W Mass from DRFCNHkinfit (Had)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
W Mass from DRFCNHkinfit (Had) (GeV)

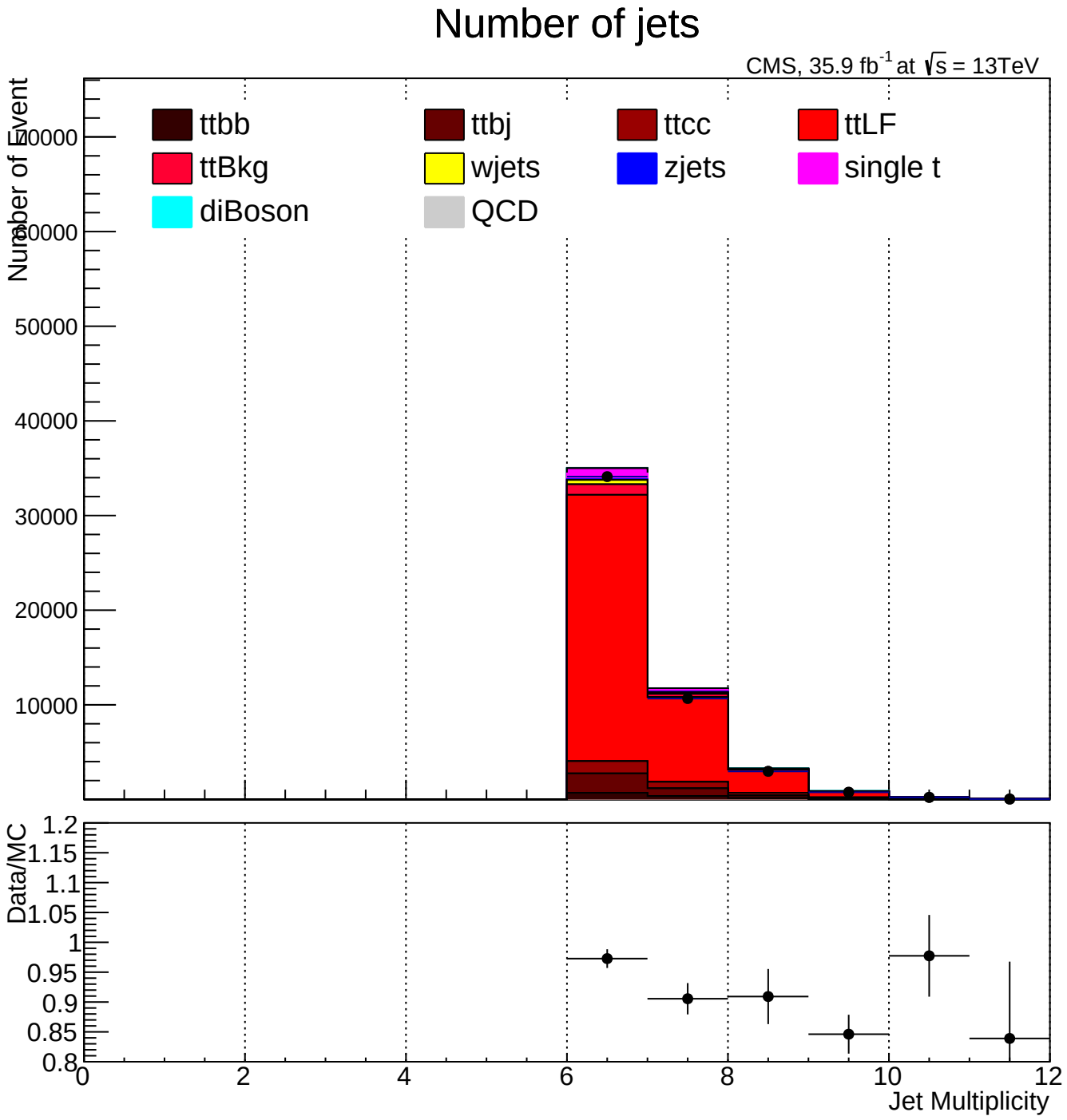

H Mass from DRFCNHkinfit (bb)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
H Mass from DRFCNHkinfit (bb)(GeV)

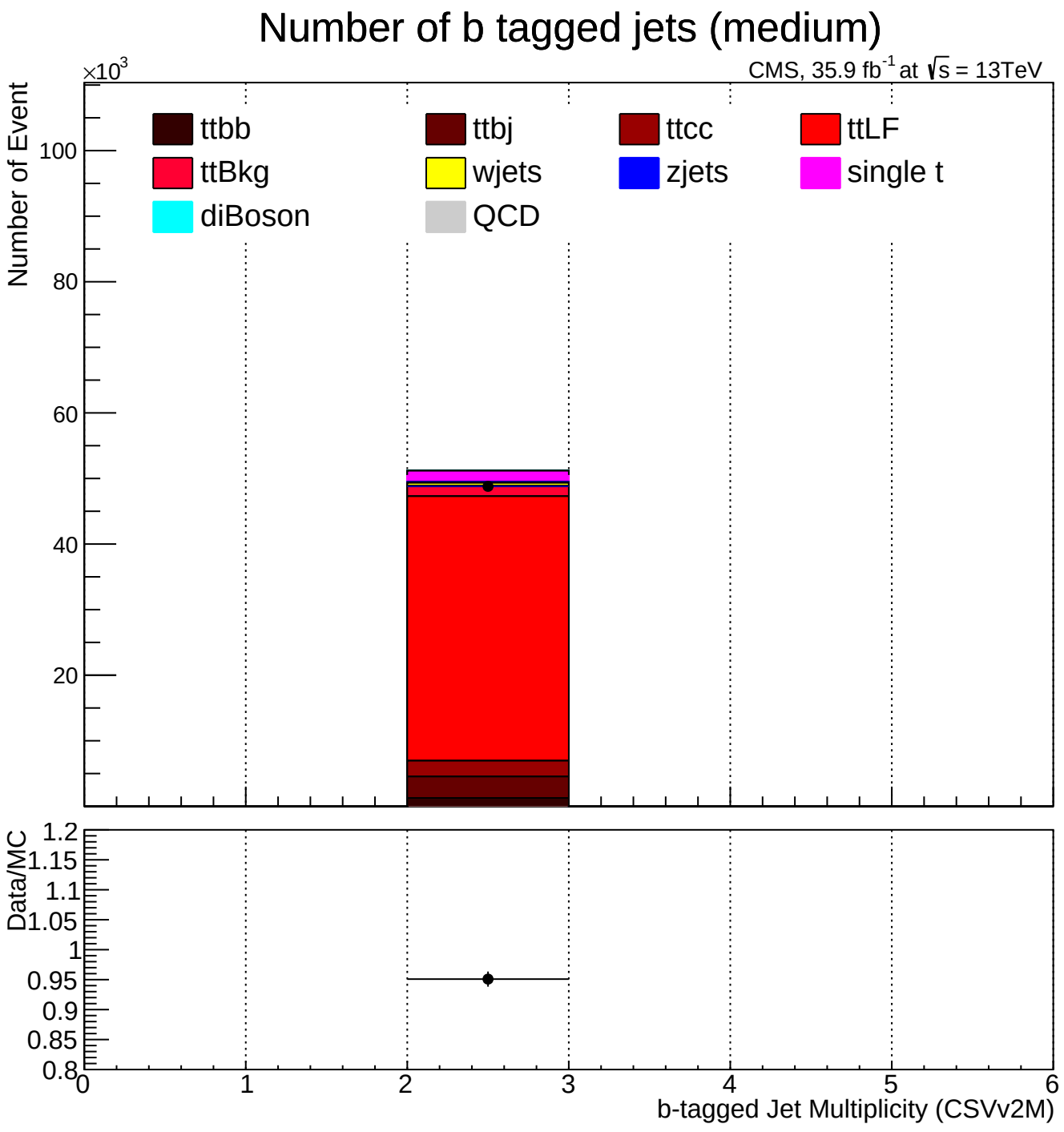

Delta R from DRFCNHkinfit
CMS, 35.9 fb-1 at √s = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
30000
25000
20000
15000
10000
5000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0.5
1
1.5
2
2.5
3
3.5
4
Delta R from DRFCNHkinfit Higgs

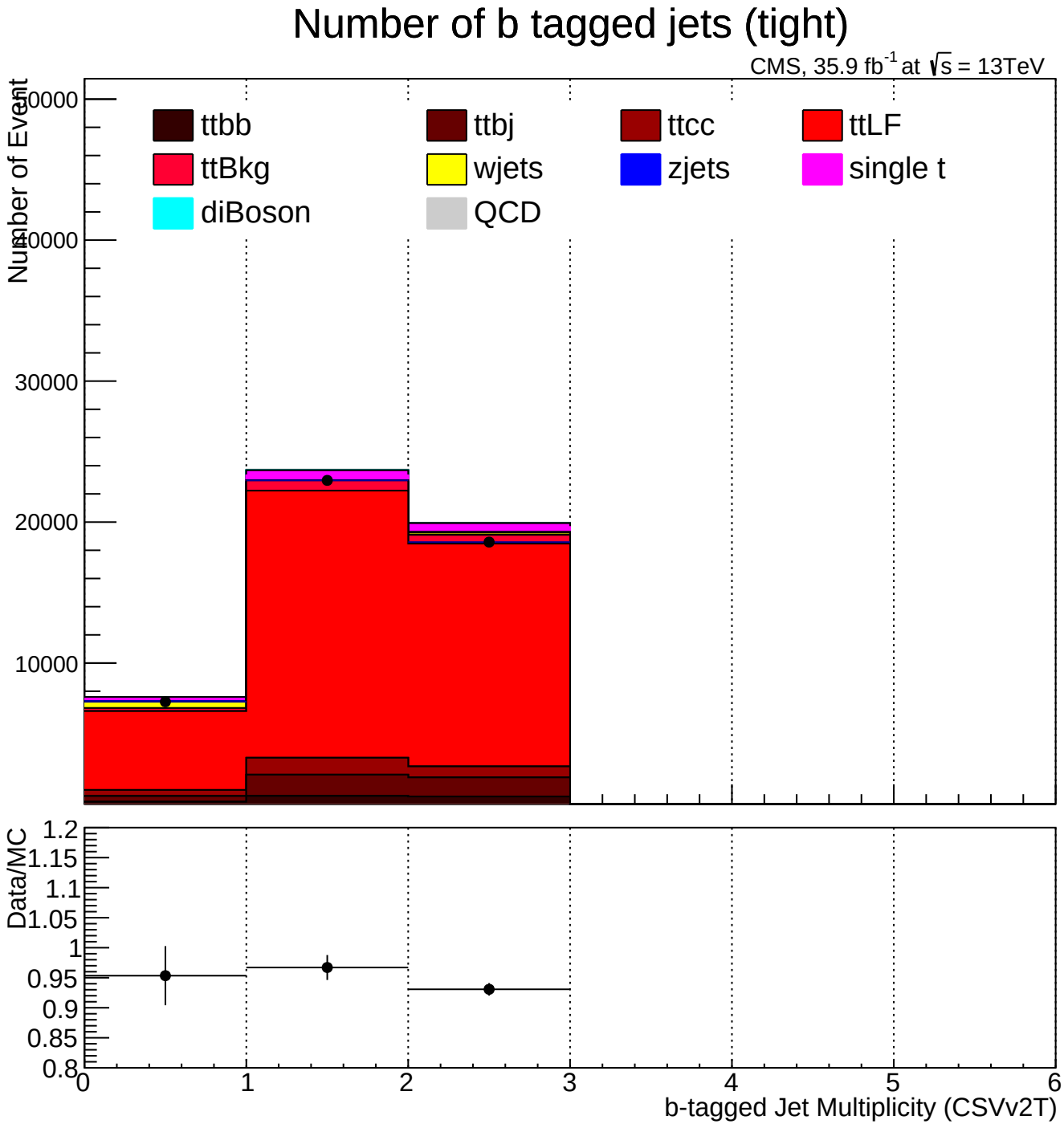
Top Mass from DRFCNHkinfit (Lep)

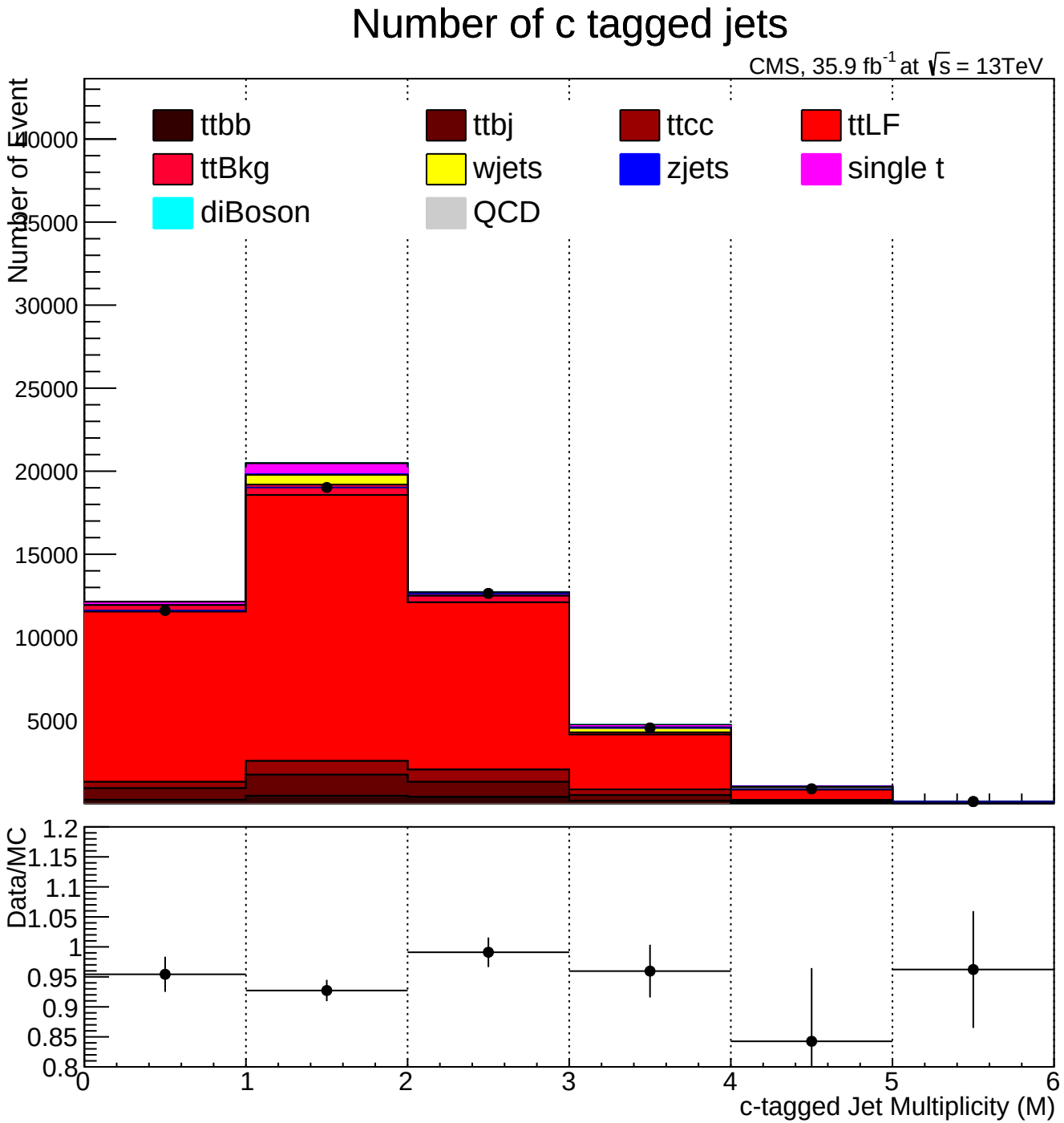


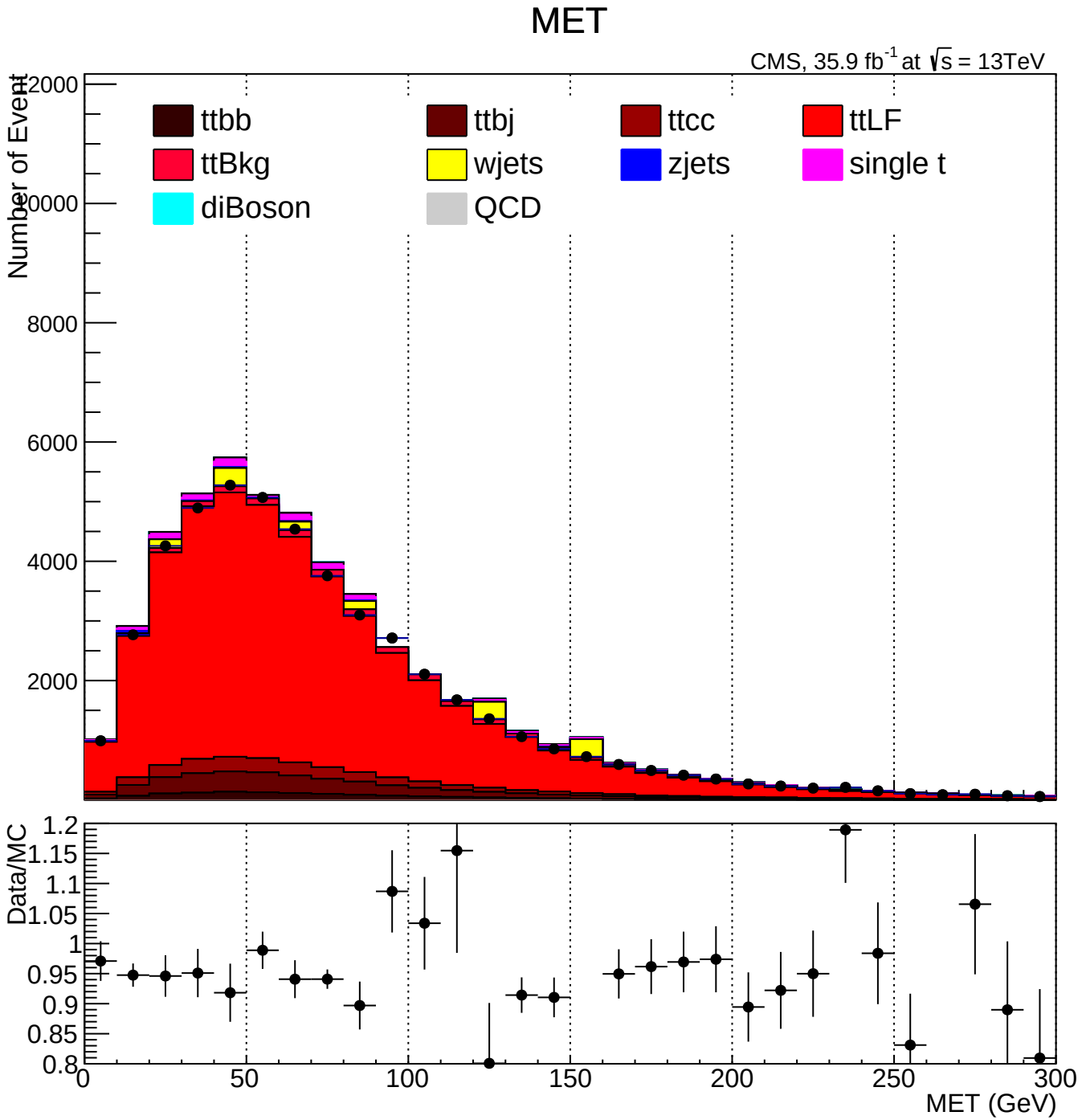

Top mass from Hc/u DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Top Mass from Hc/u DRFCNHkinfit (GeV)

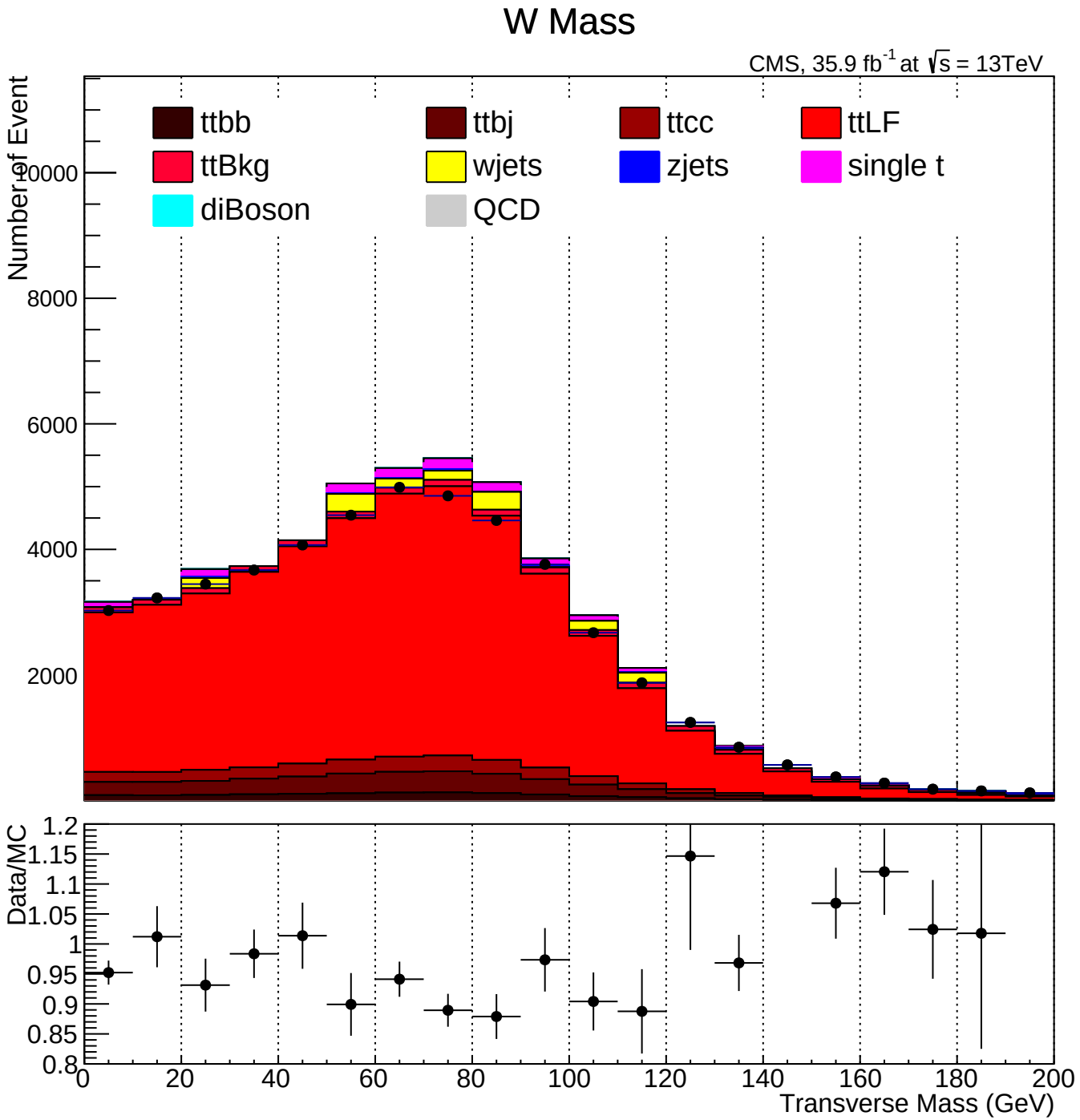

Number of jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
60000
50000
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
2
4
6
8
10
12
Jet Multiplicity


Number of b tagged jets (medium)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
$\times 10^3$
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b-tagged Jet Multiplicity (CSVv2M)

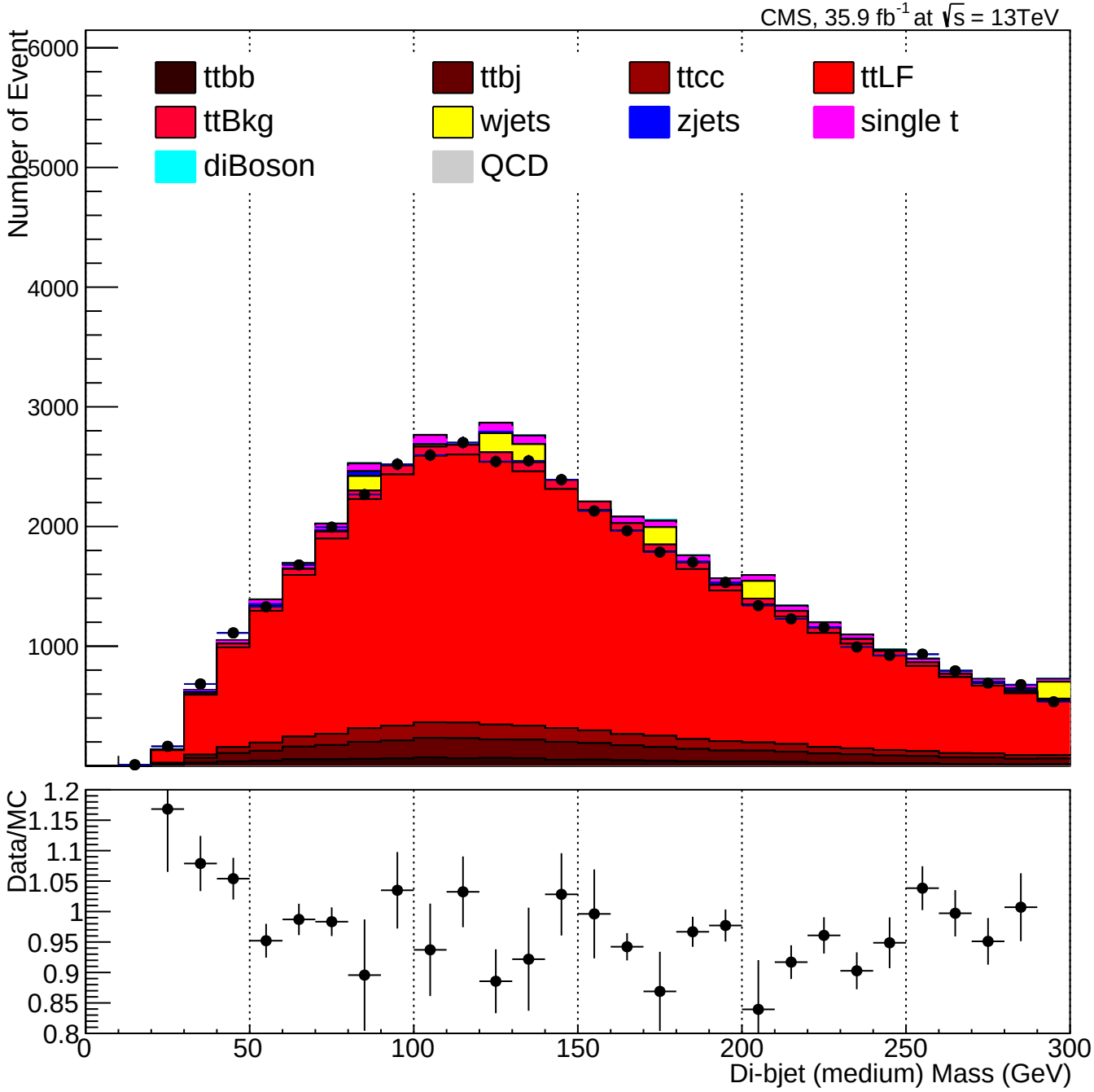

Number of b tagged jets (tight)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2T)

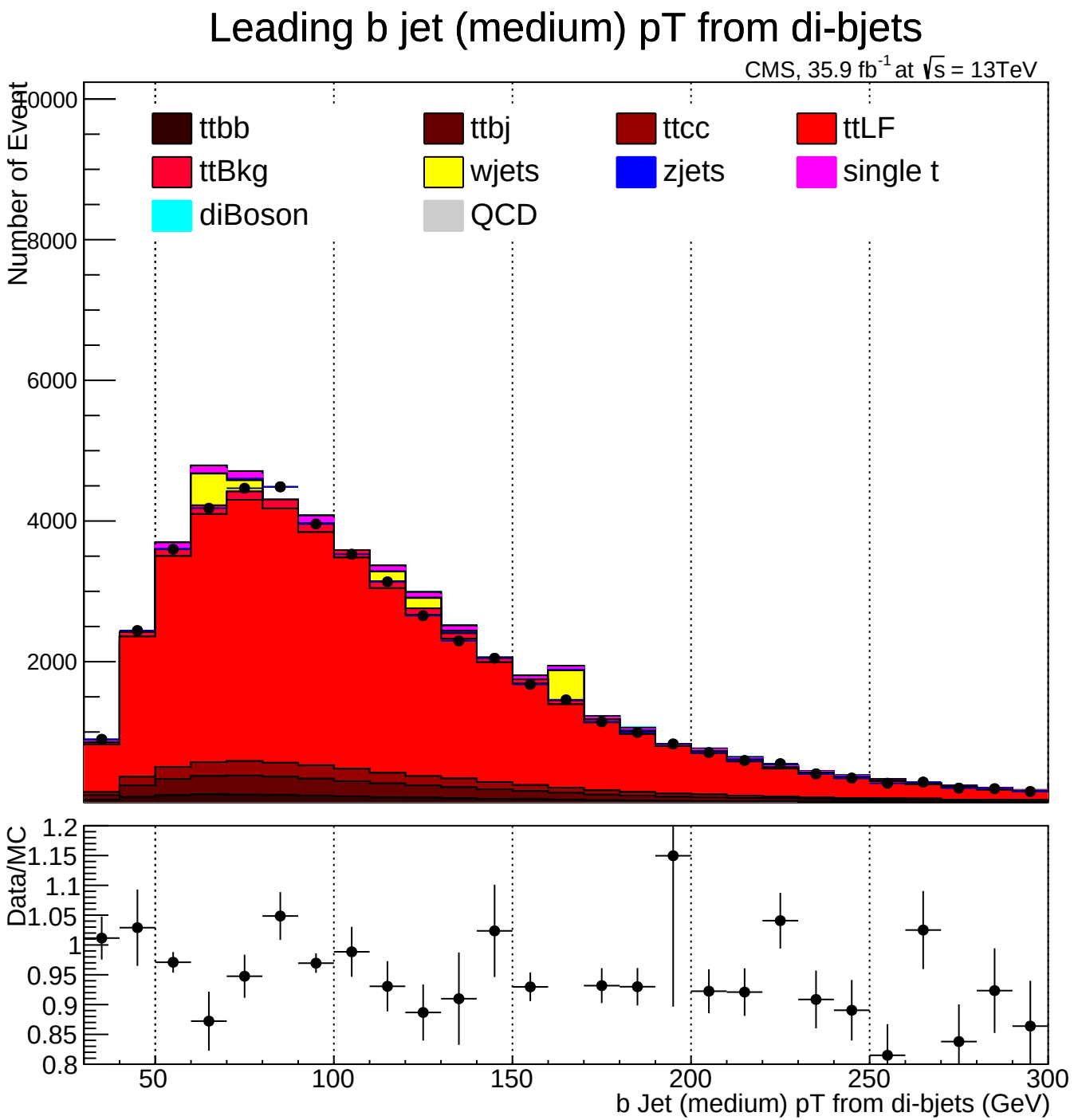

Number of c tagged jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
40000
35000
30000
25000
20000
15000
10000
5000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
c-tagged Jet Multiplicity (M)

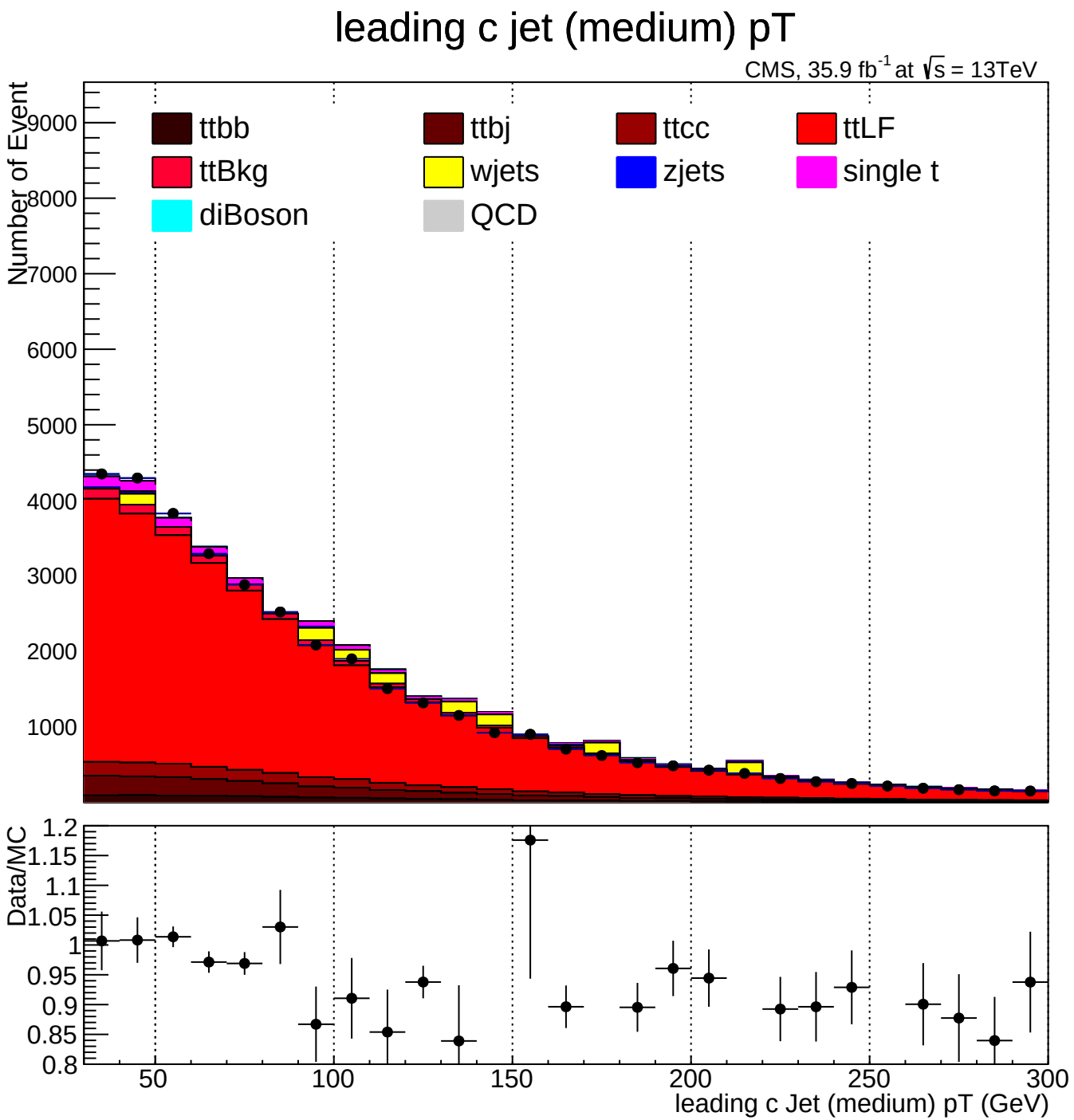

MET
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
MET (GeV)

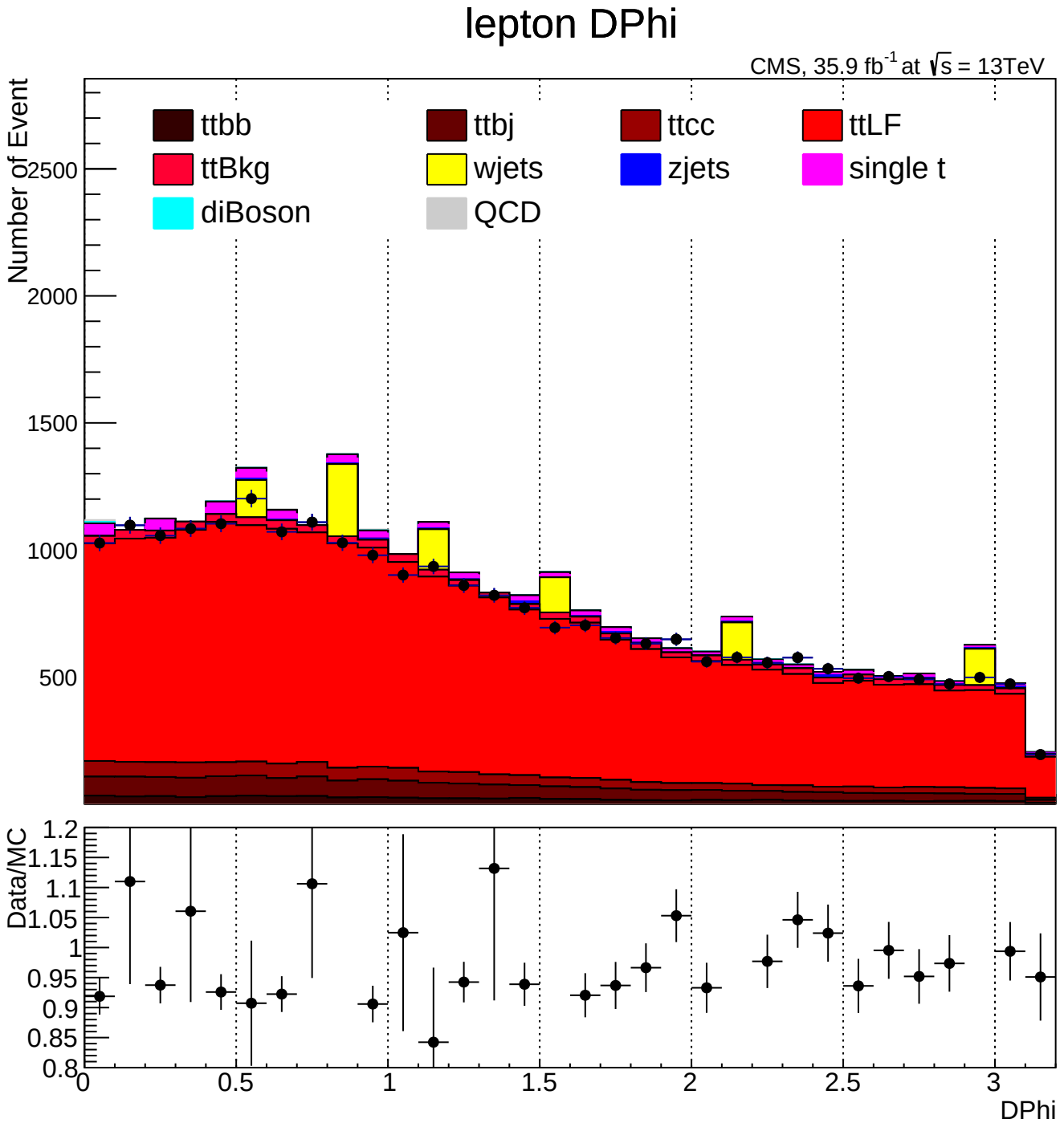

W Mass
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
20
40
60
80
100
120
140
160
180
200
Transverse Mass (GeV)

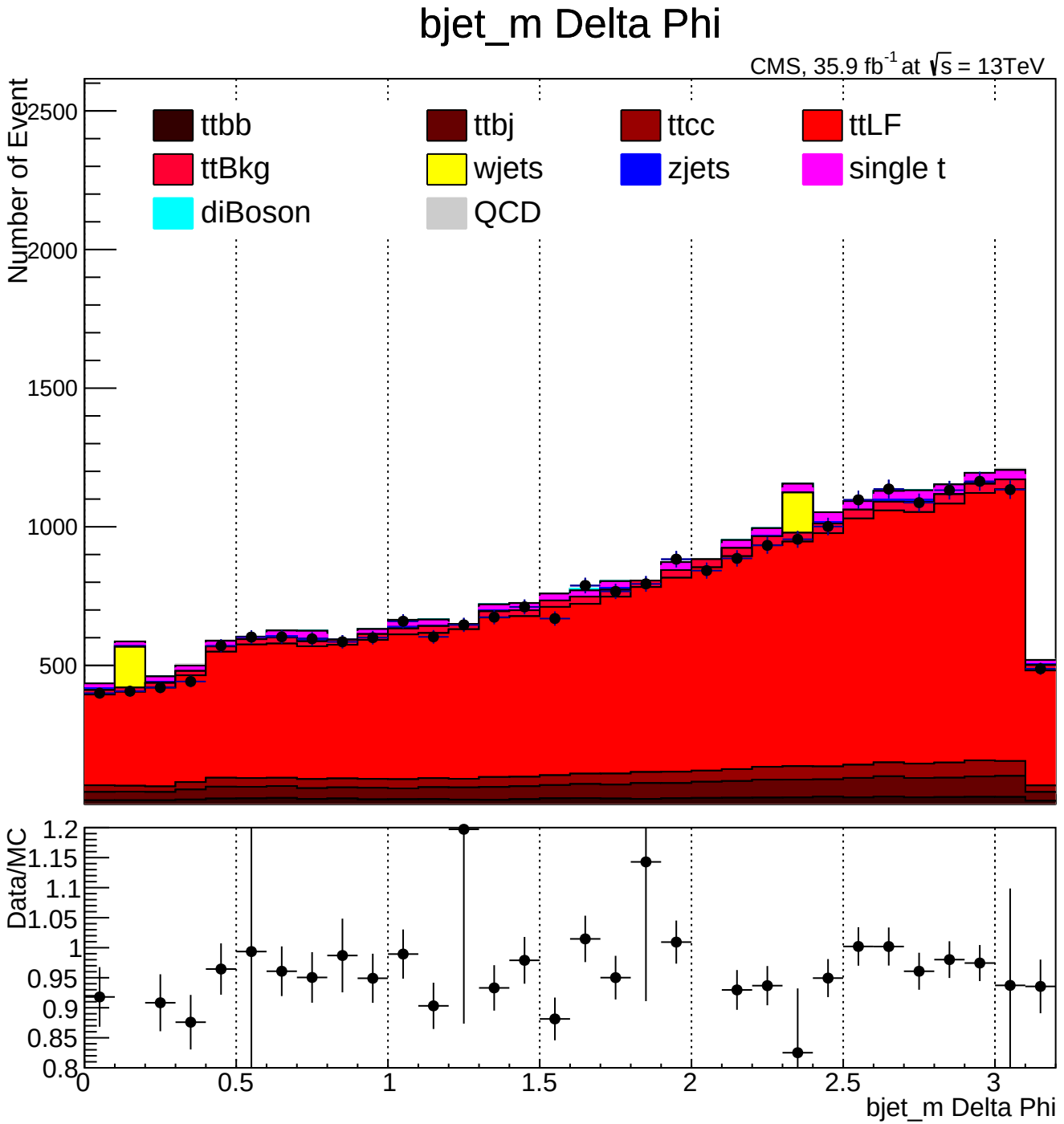
Di-bjet Mass (medium) wrt min DR

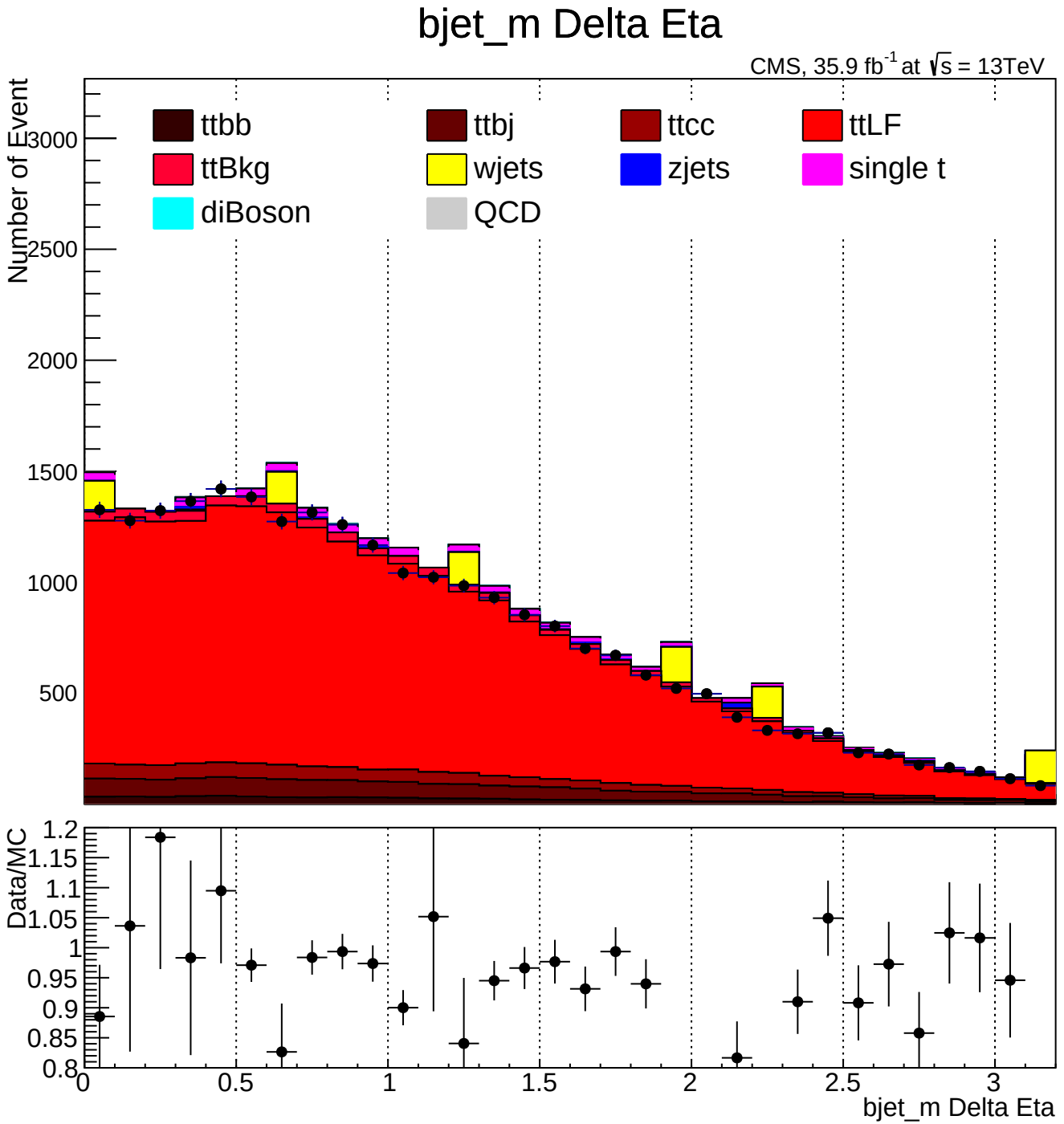


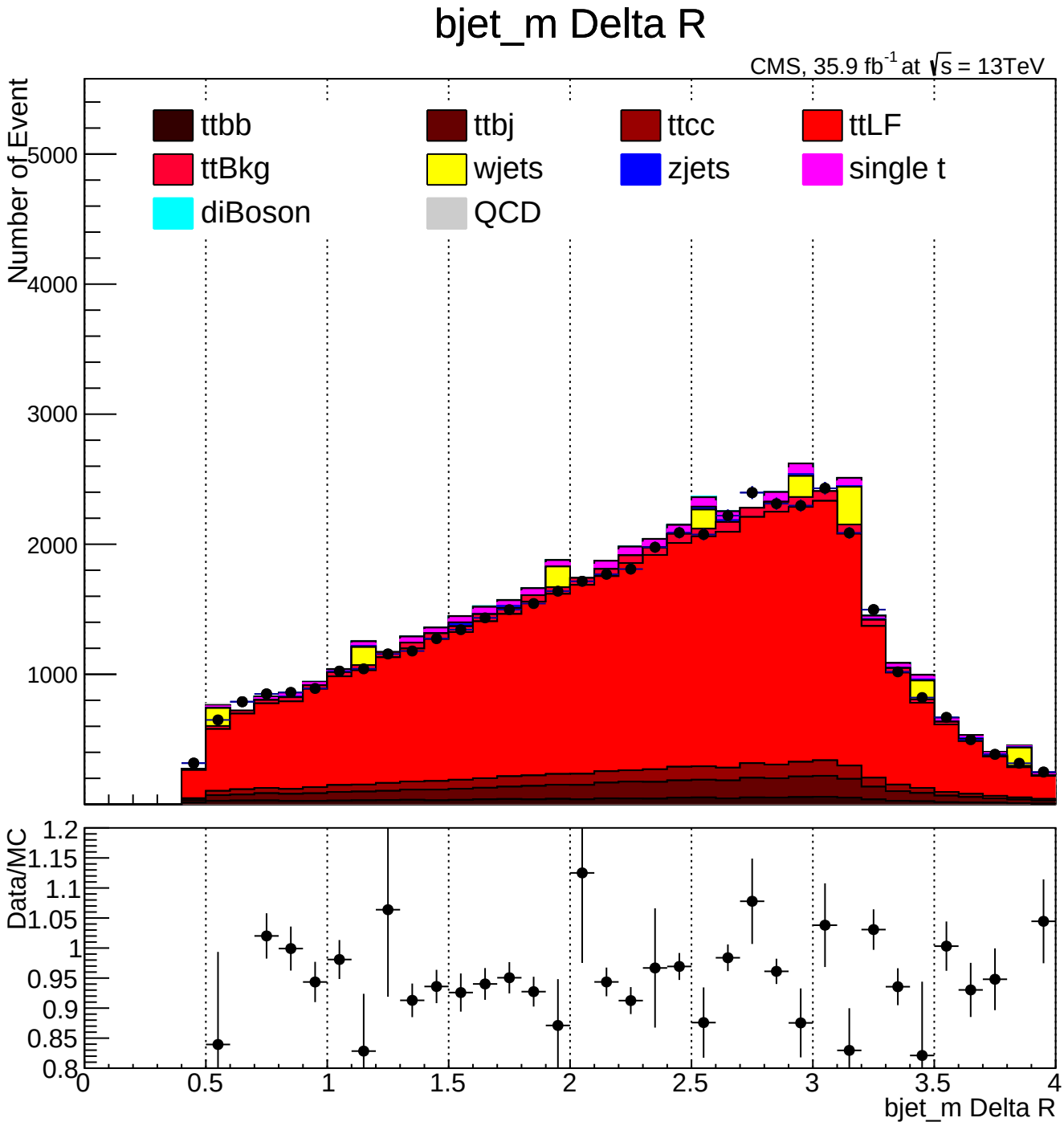

Leading b jet (medium) pT from di-bjets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
b Jet (medium) pT from di-bjets (GeV)

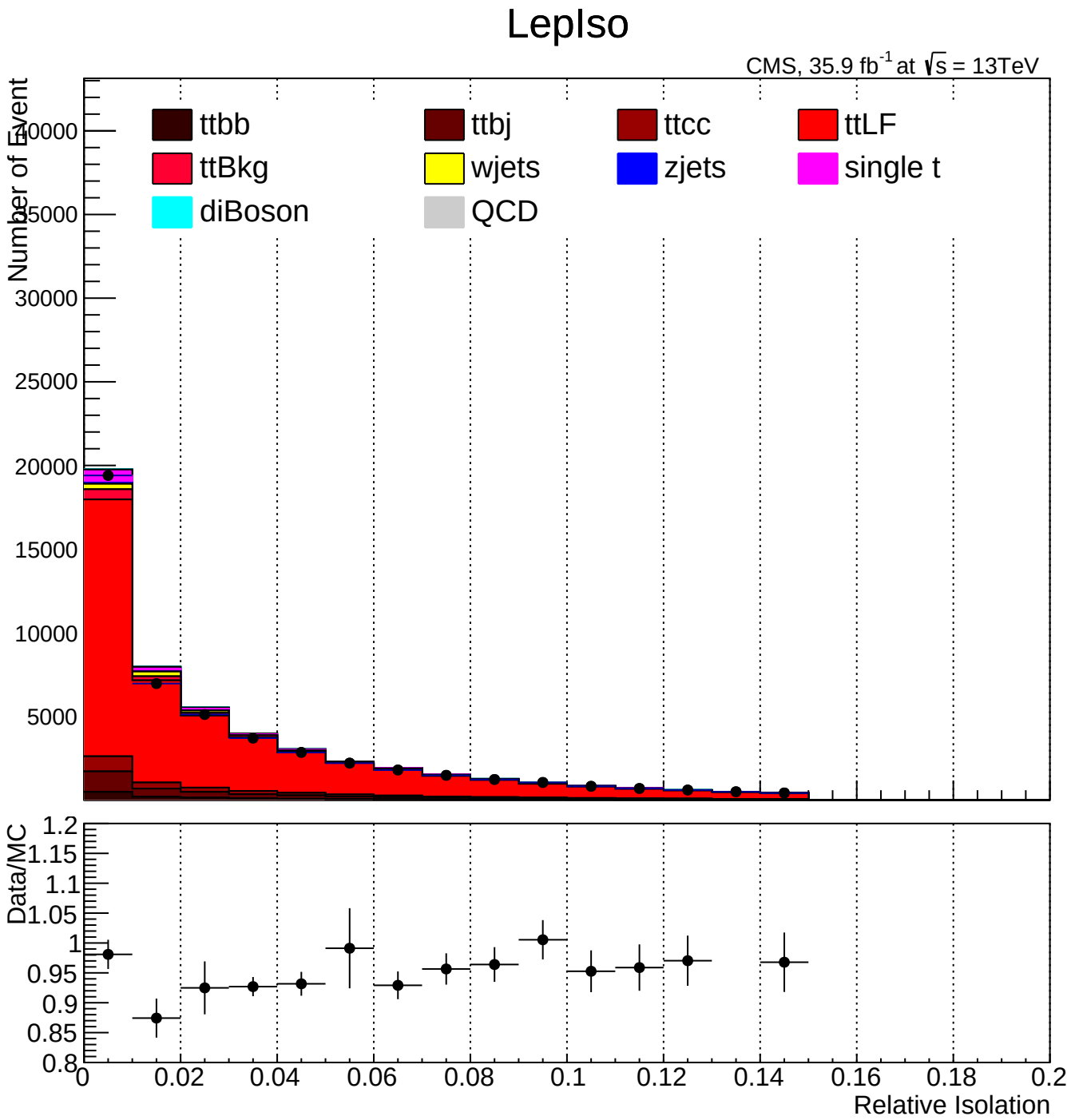

leading c jet (medium) pT
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
leading c Jet (medium) pT (GeV)

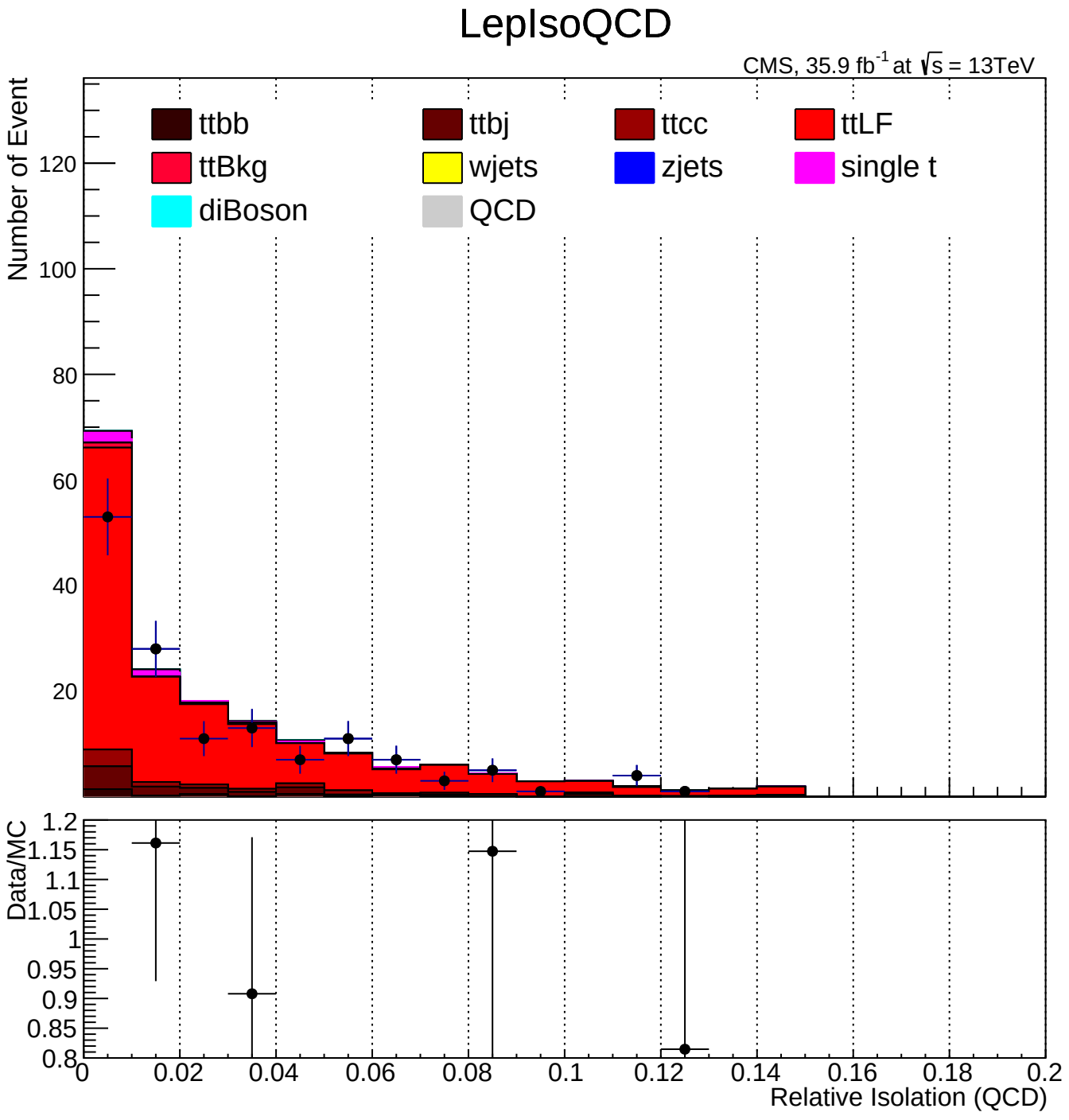

lepton DPhi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
2500
2000
1500
1000
500
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
DPhi

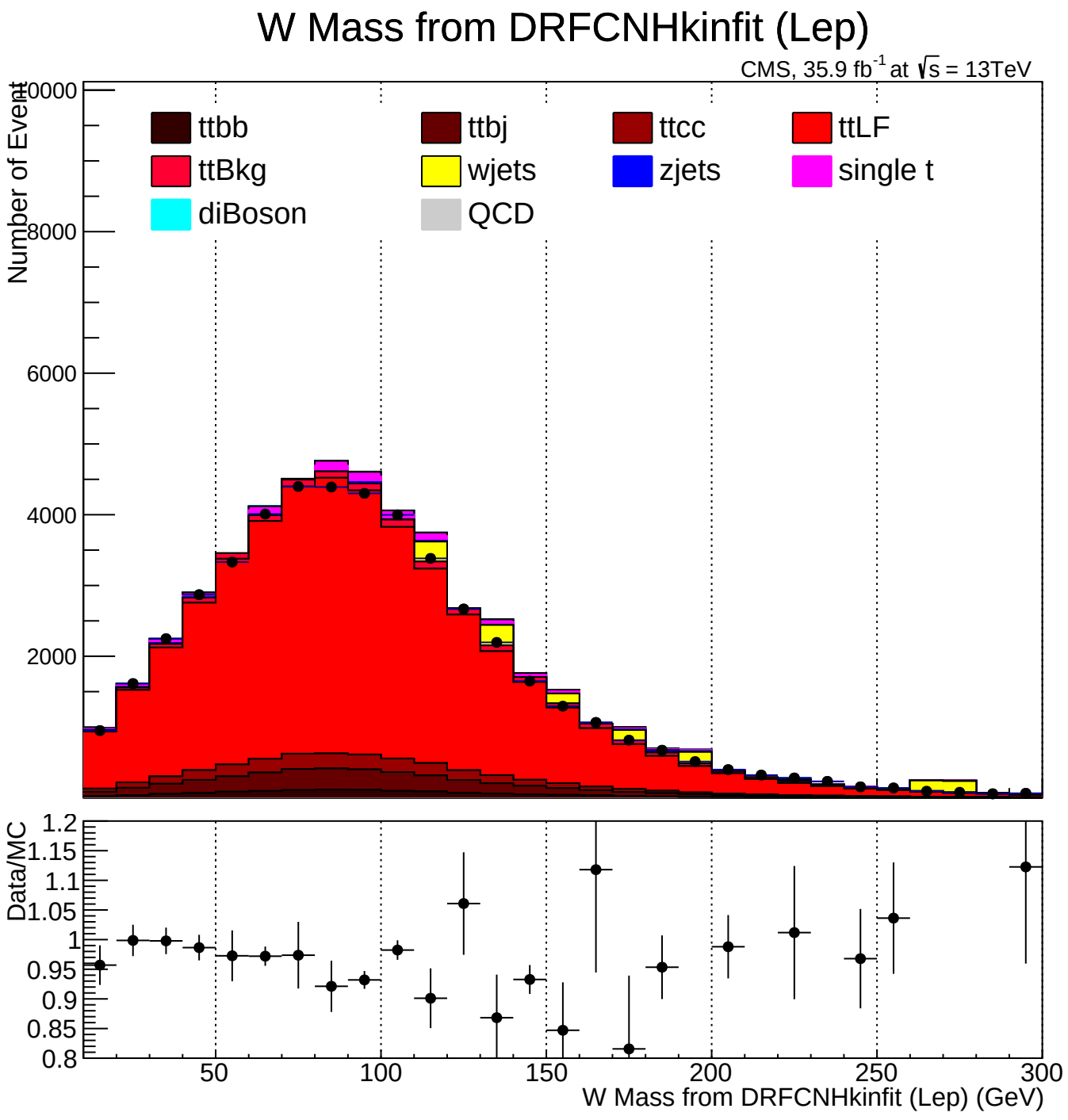

bjet_m Delta Phi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
2500
2000
1500
1000
500
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Phi

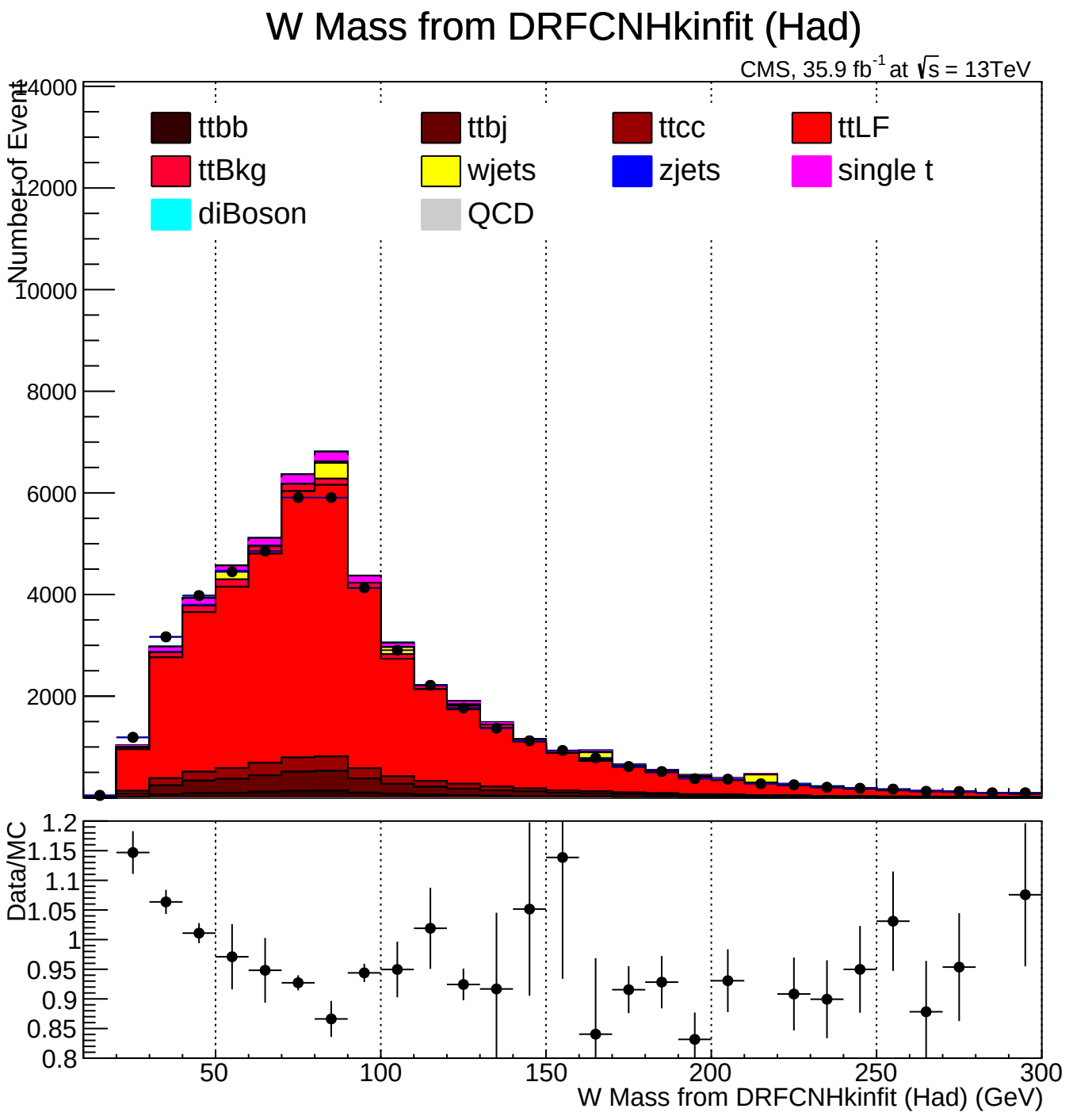

bjet_m Delta Eta
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
3000
2500
2000
1500
1000
500
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Eta

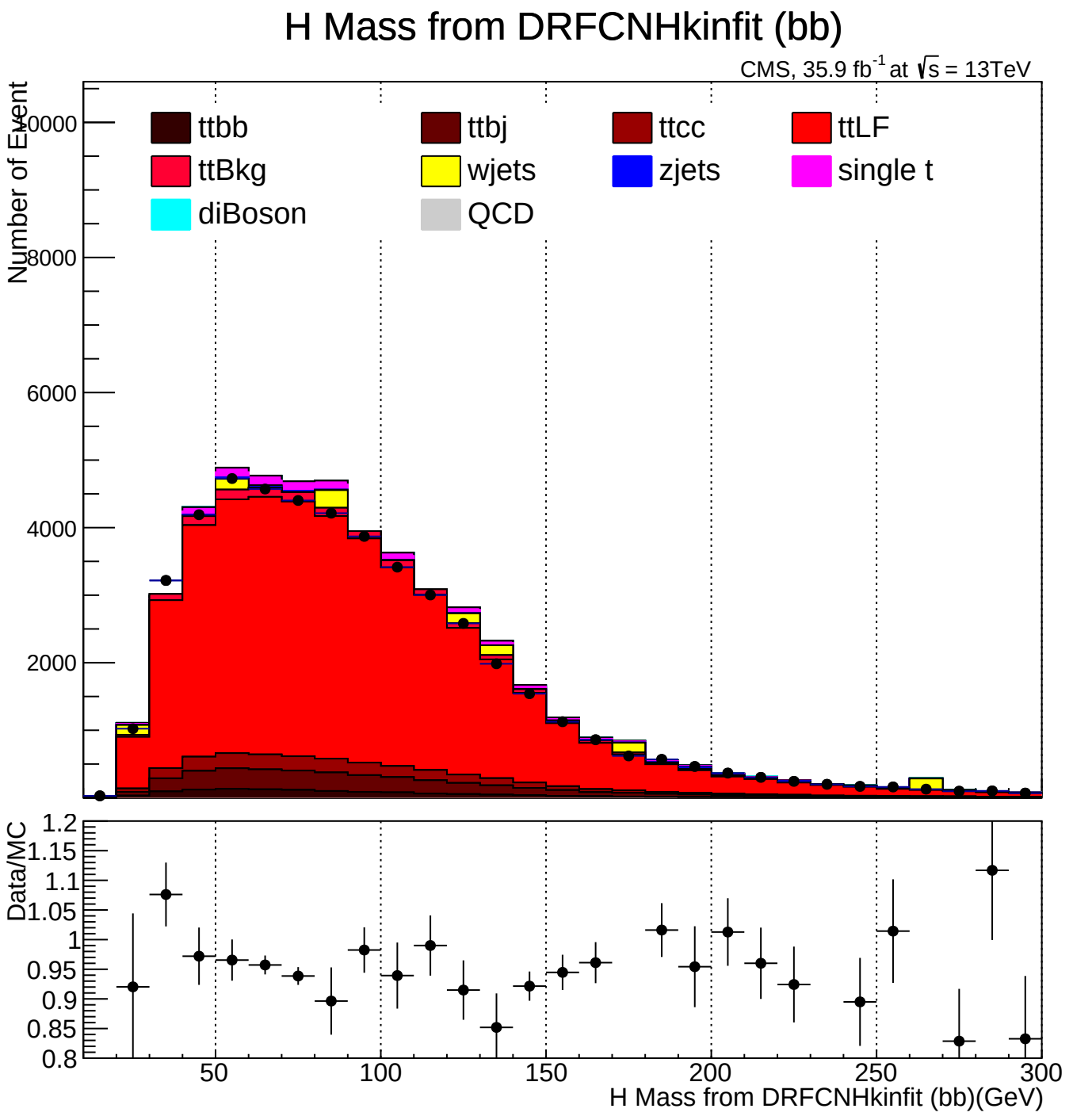

bjet_m Delta R
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
3.5
4
bjet_m Delta R

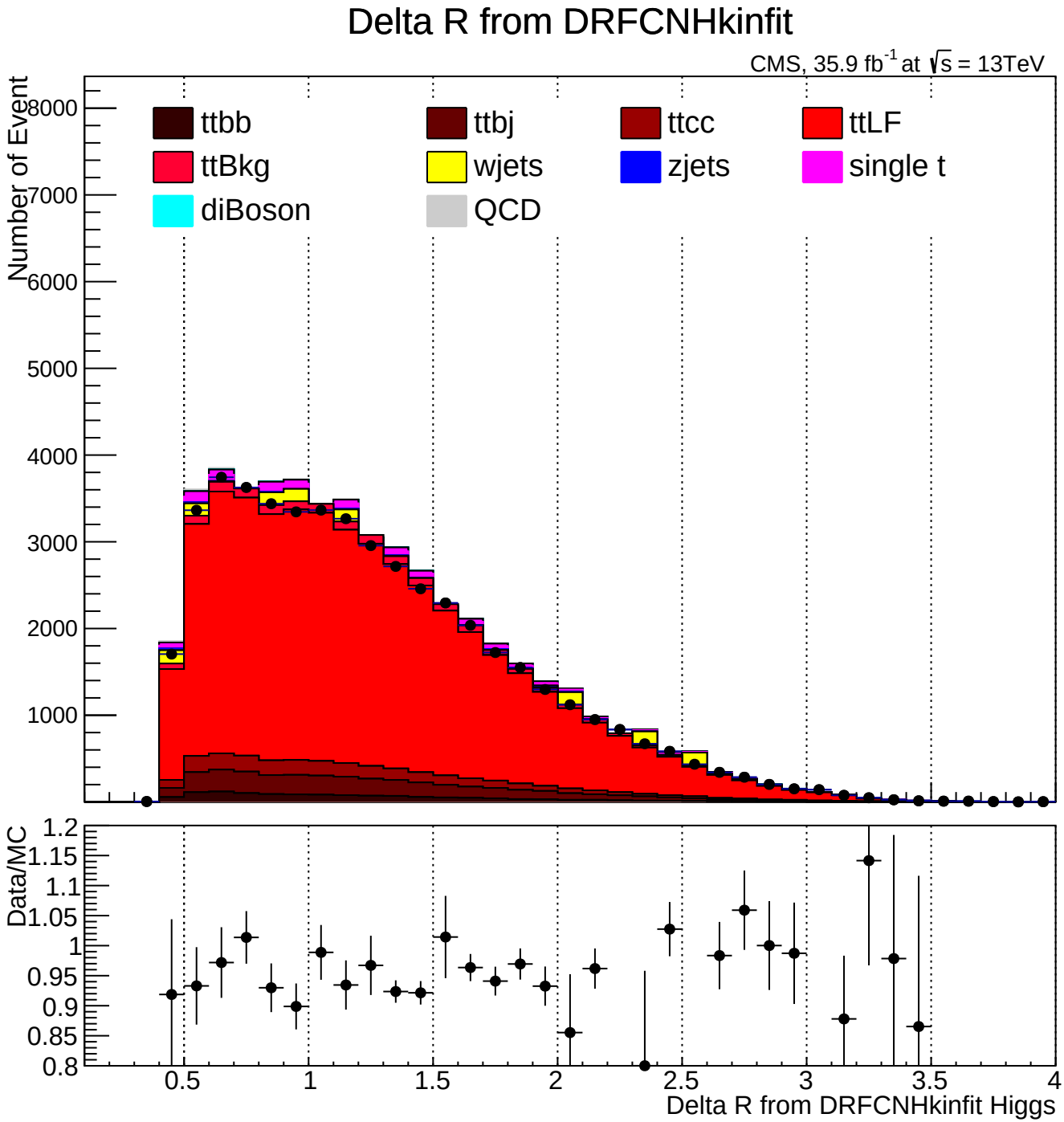

LepIso
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
40000
35000
30000
25000
20000
15000
10000
5000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation

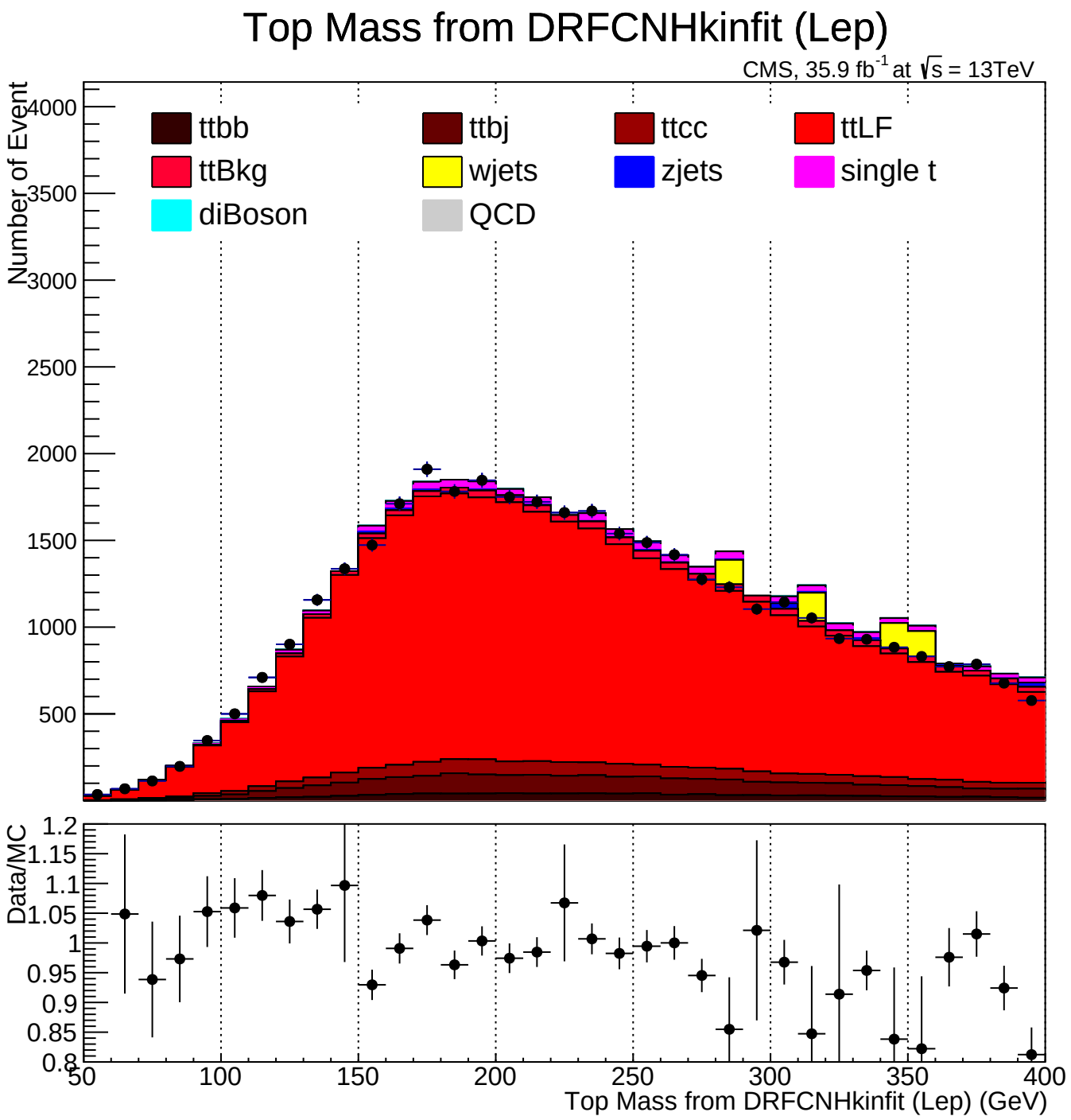

LepIsoQCD
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation (QCD)

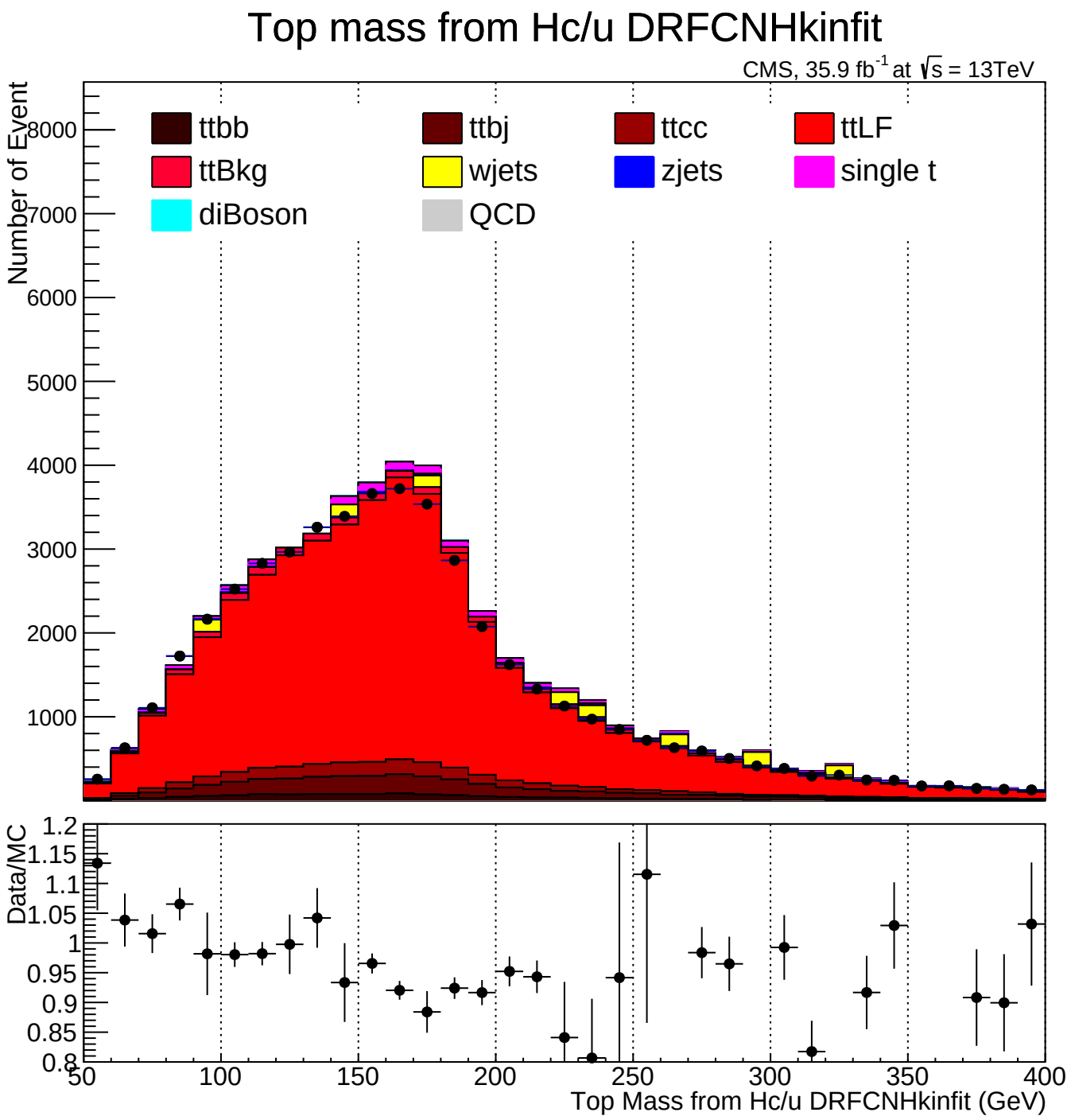

W Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
W Mass from DRFCNHkinfit (Lep) (GeV)

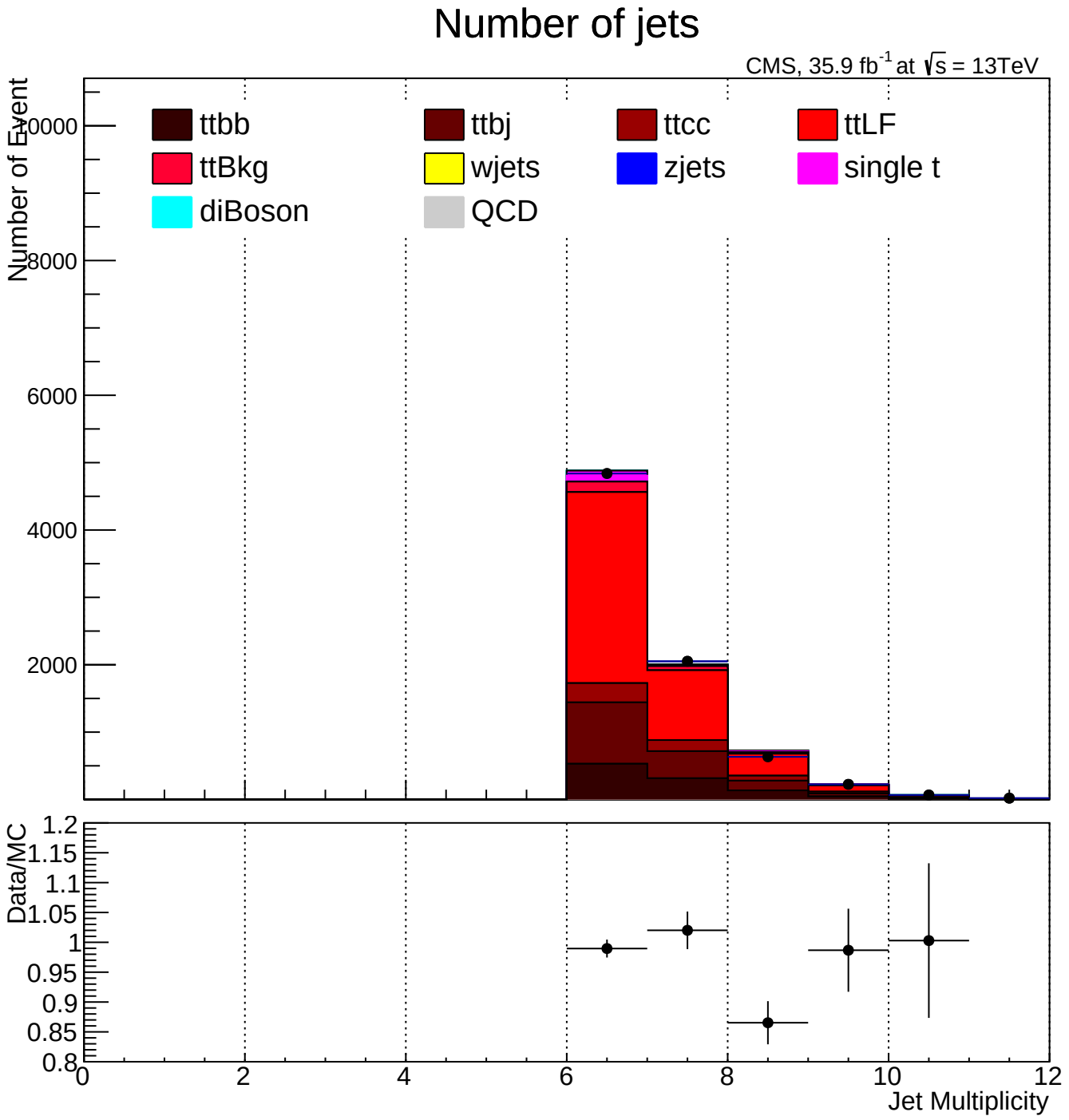

W Mass from DRFCNHkinfit (Had)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
W Mass from DRFCNHkinfit (Had) (GeV)


H Mass from DRFCNHkinfit (bb)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
H Mass from DRFCNHkinfit (bb)(GeV)

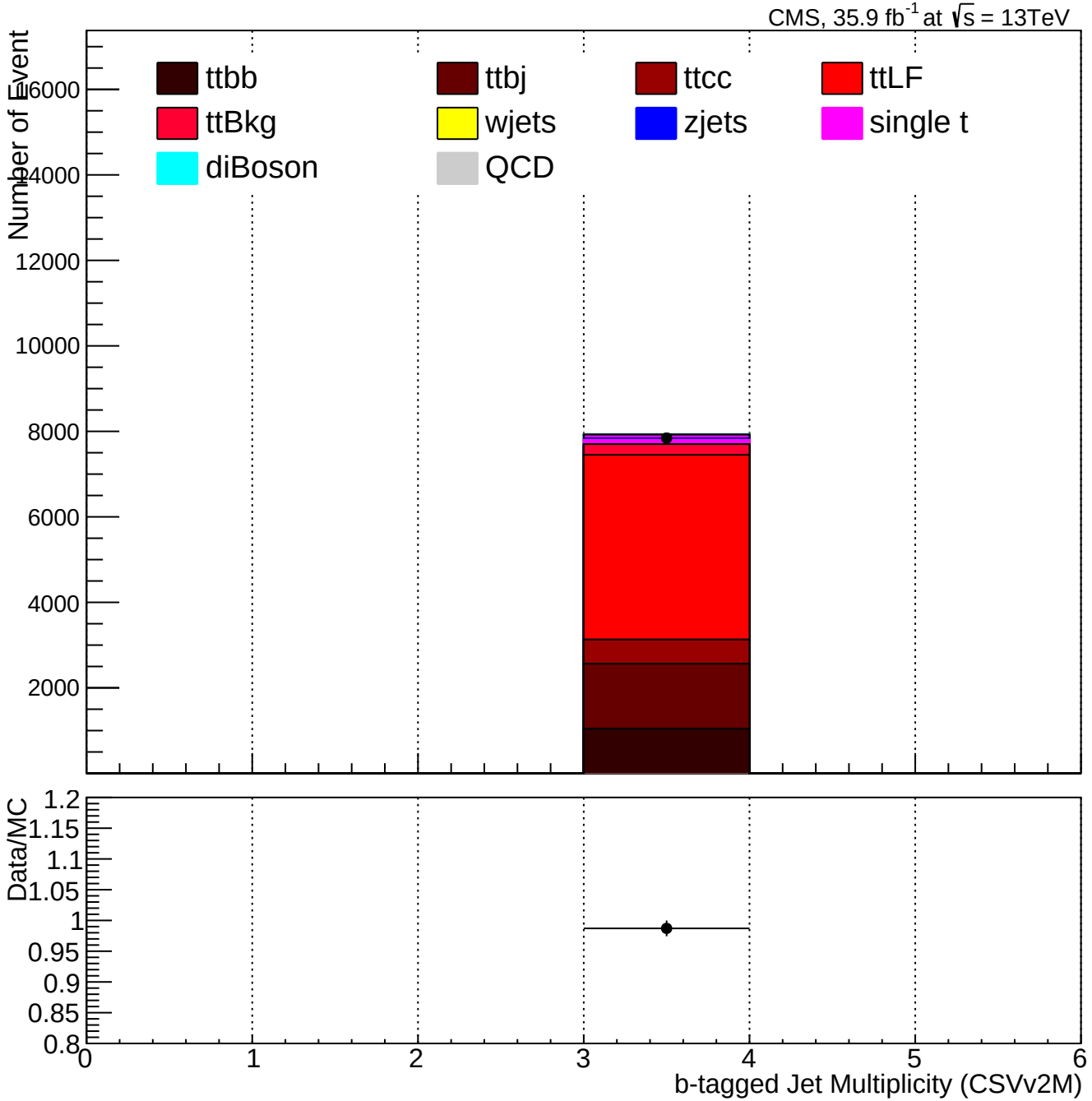

Delta R from DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Delta R from DRFCNHkinfit Higgs

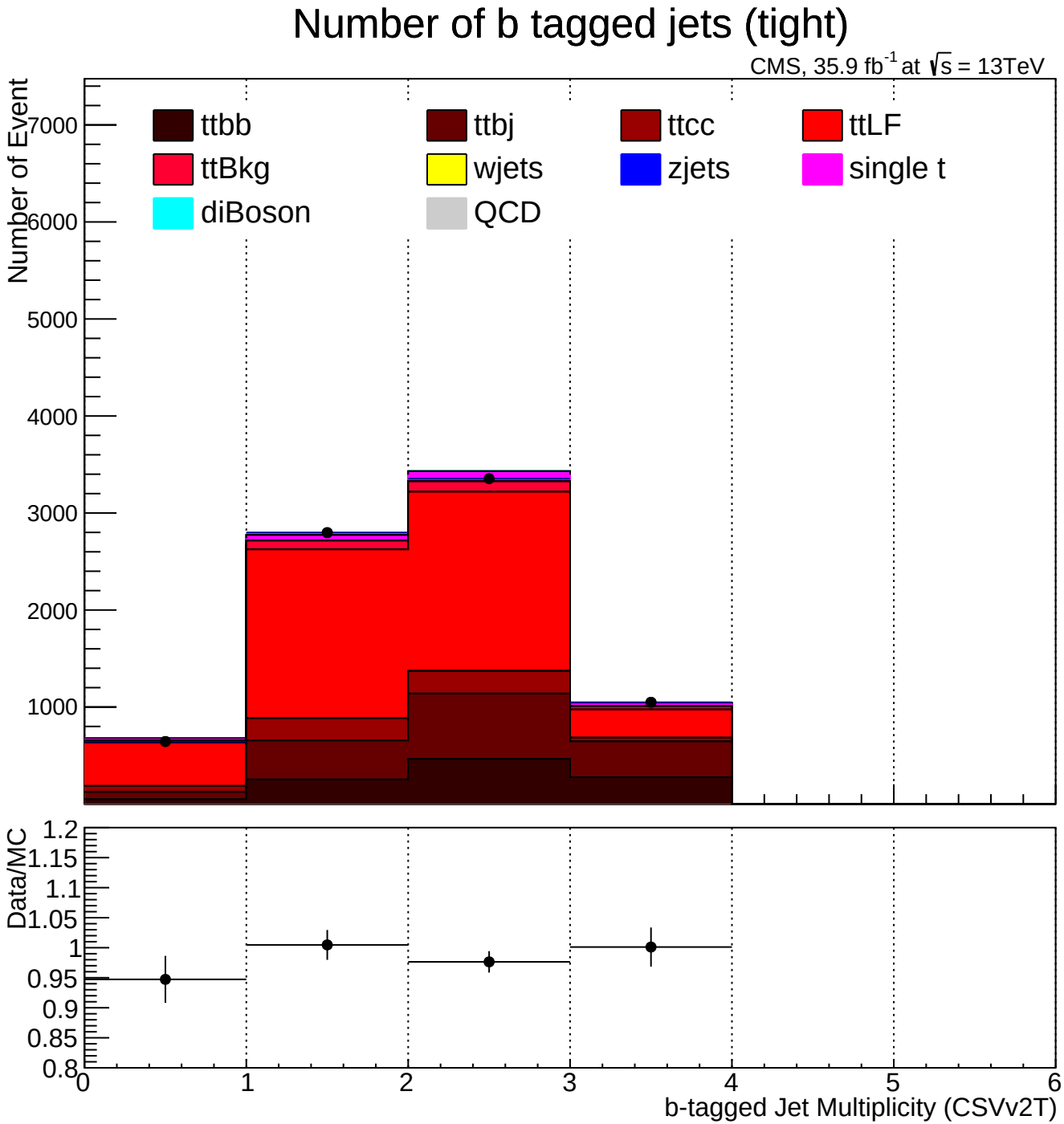

Top Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Top Mass from DRFCNHkinfit (Lep) (GeV)

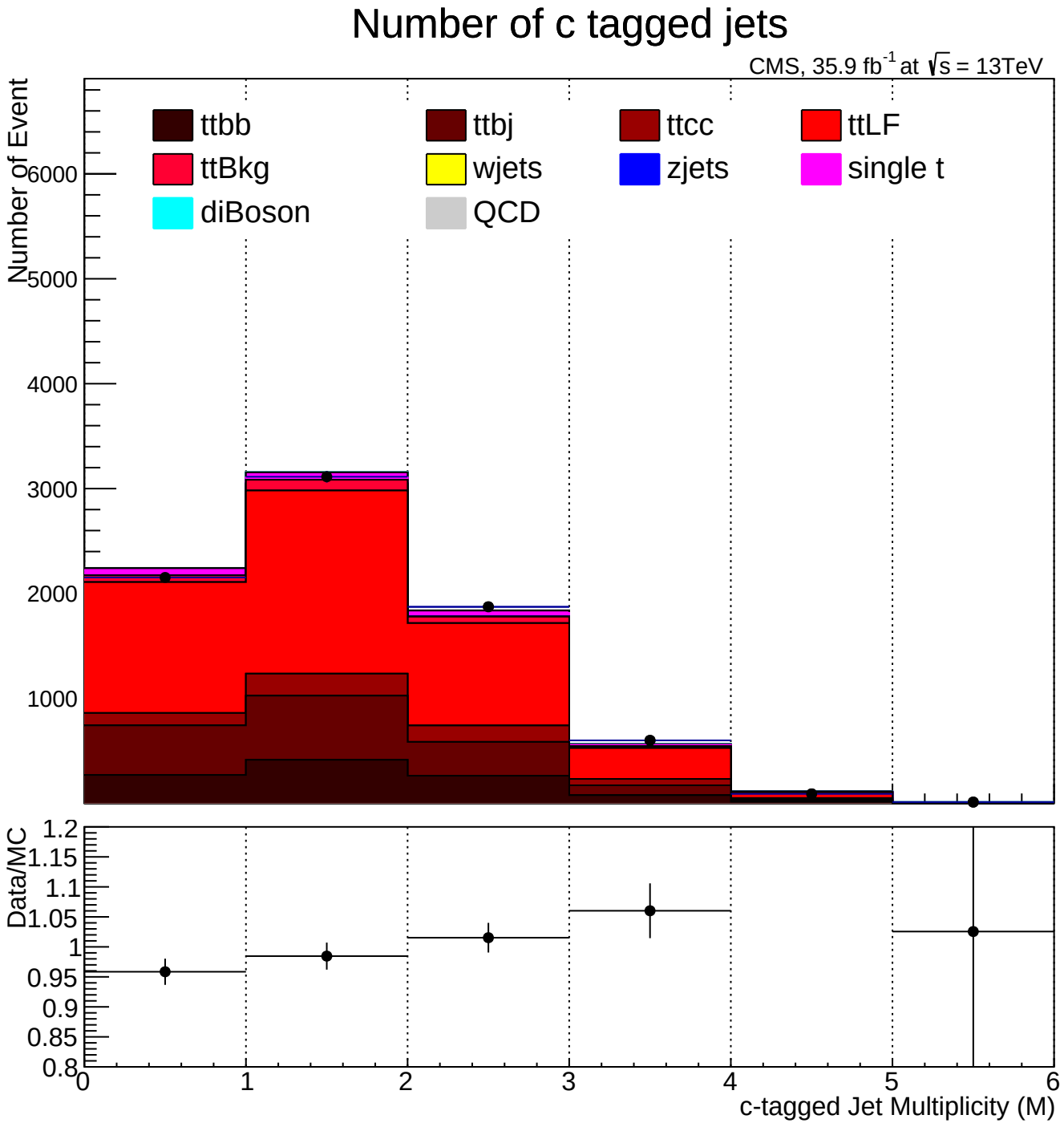

Top mass from Hc/u DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Top Mass from Hc/u DRFCNHkinfit (GeV)

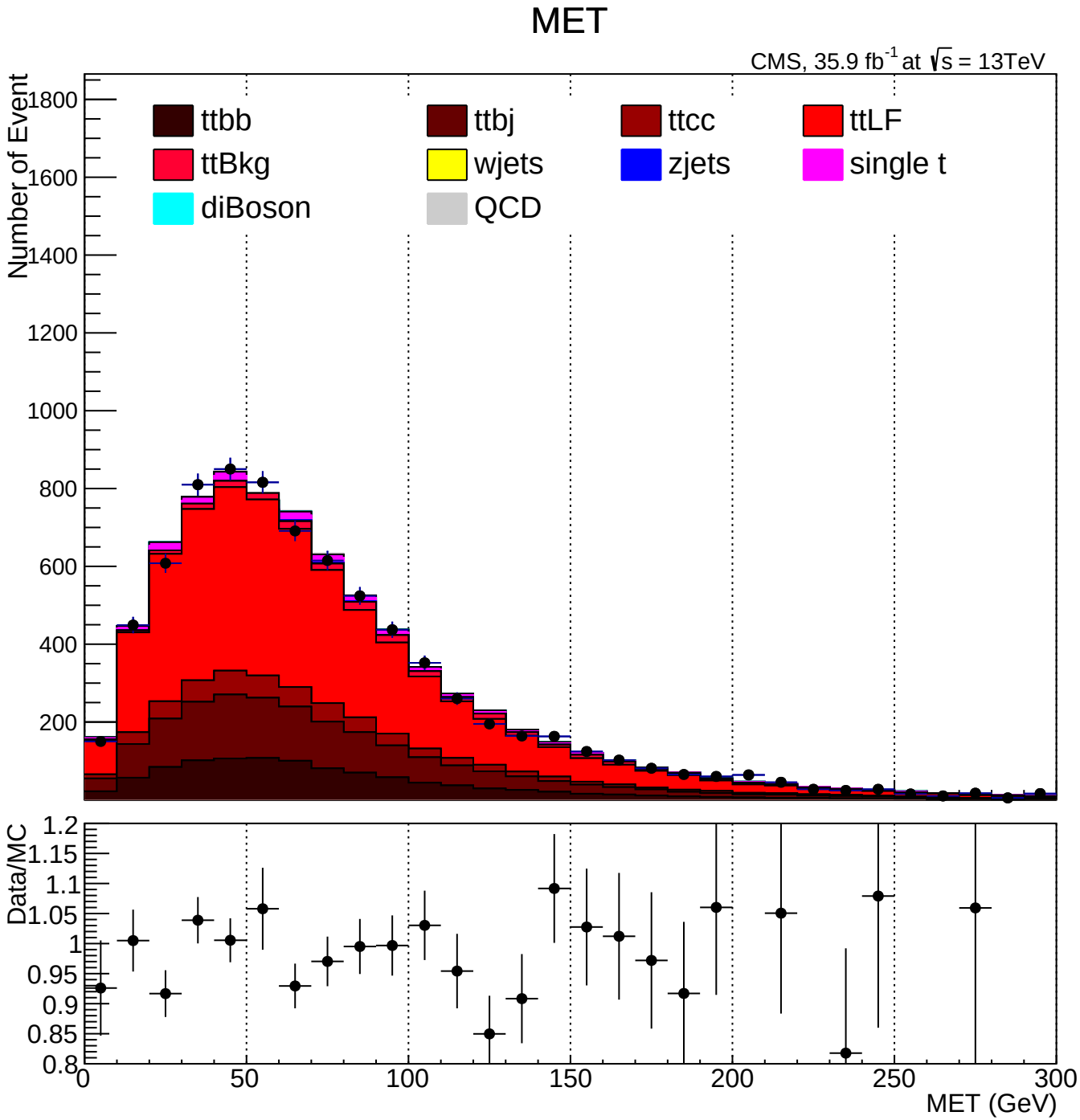

Number of jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
2
4
6
8
10
12
Jet Multiplicity

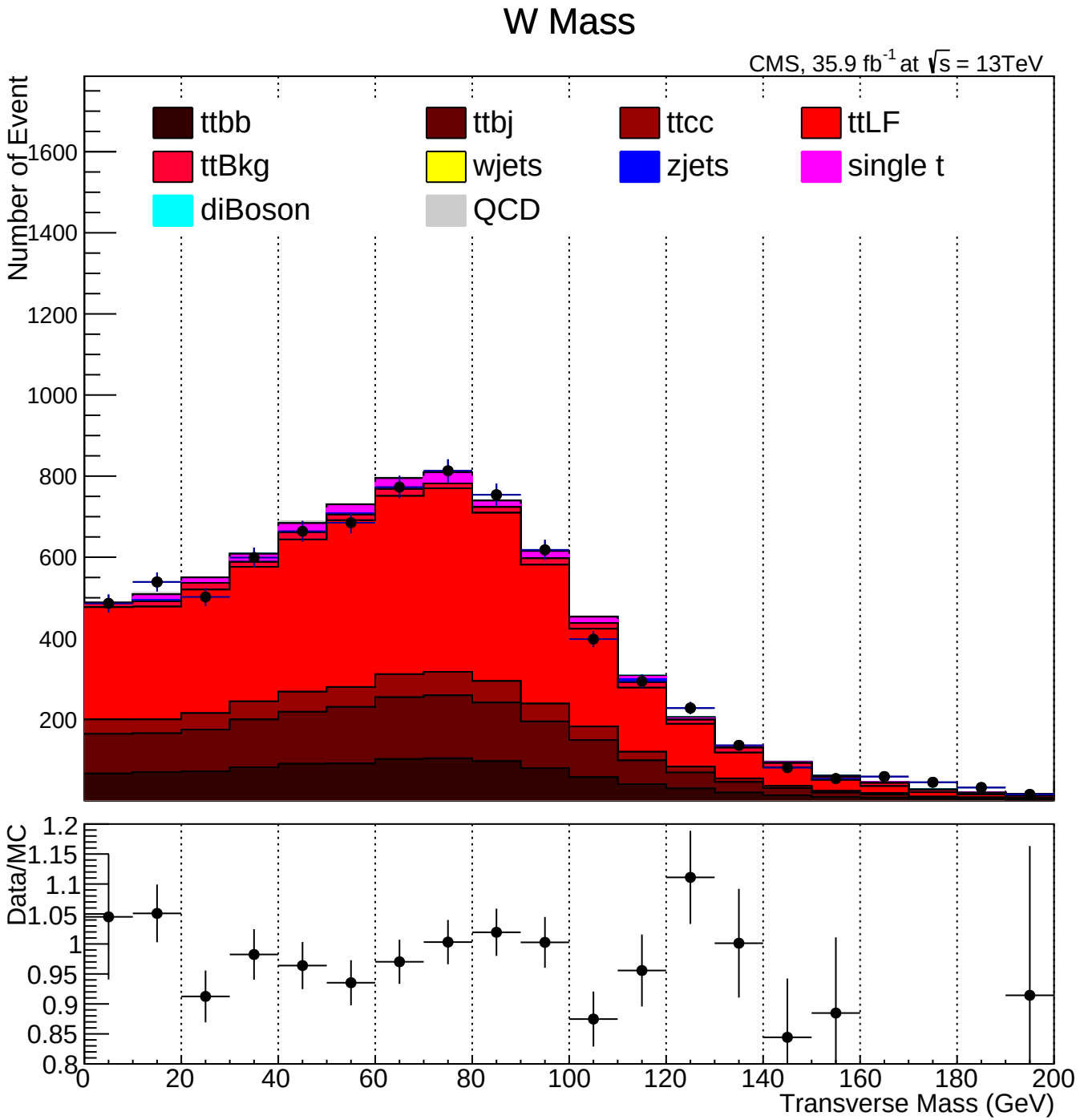
Number of b tagged jets (medium)



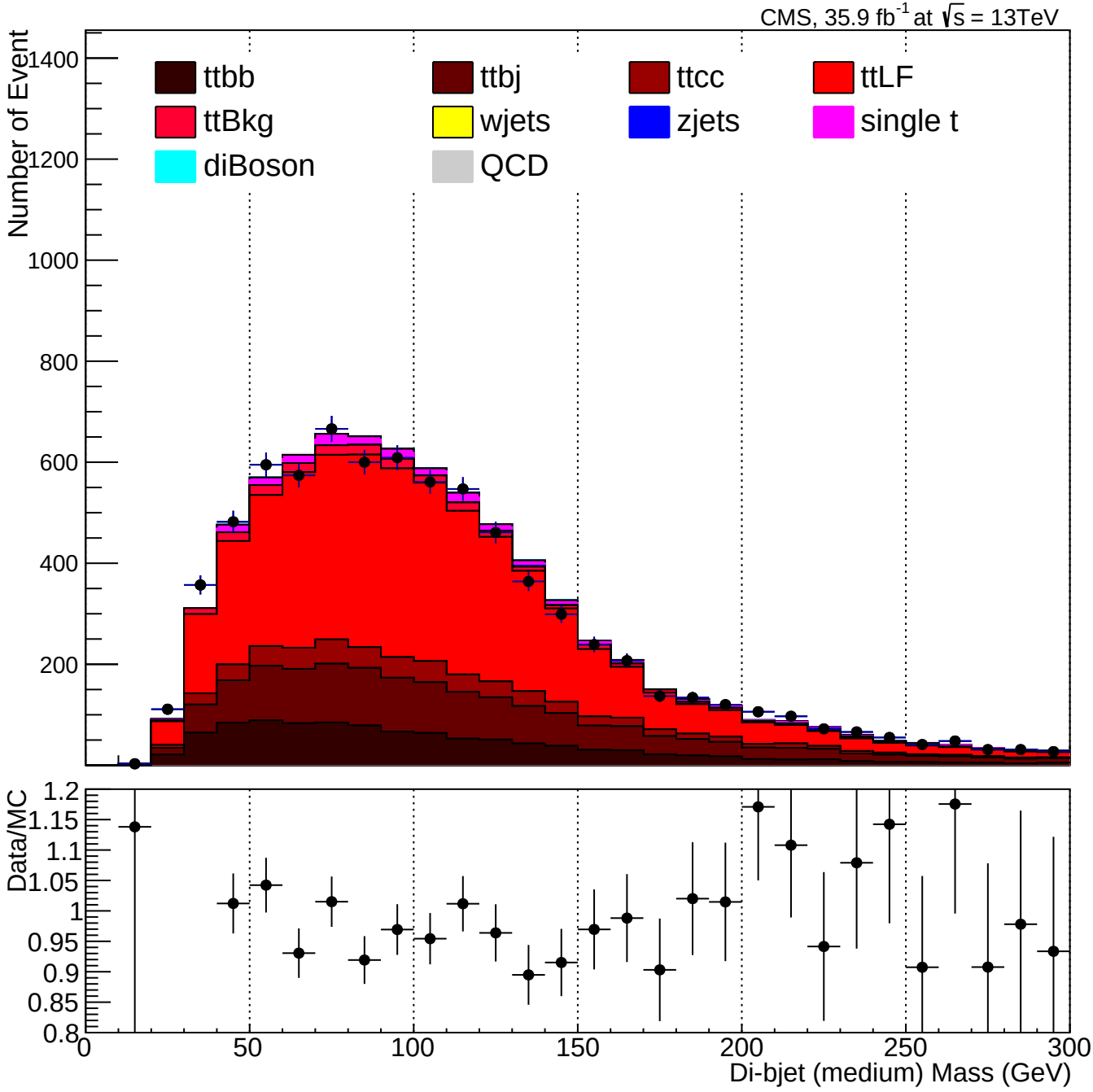

Number of b tagged jets (tight)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
7000
6000
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2T)

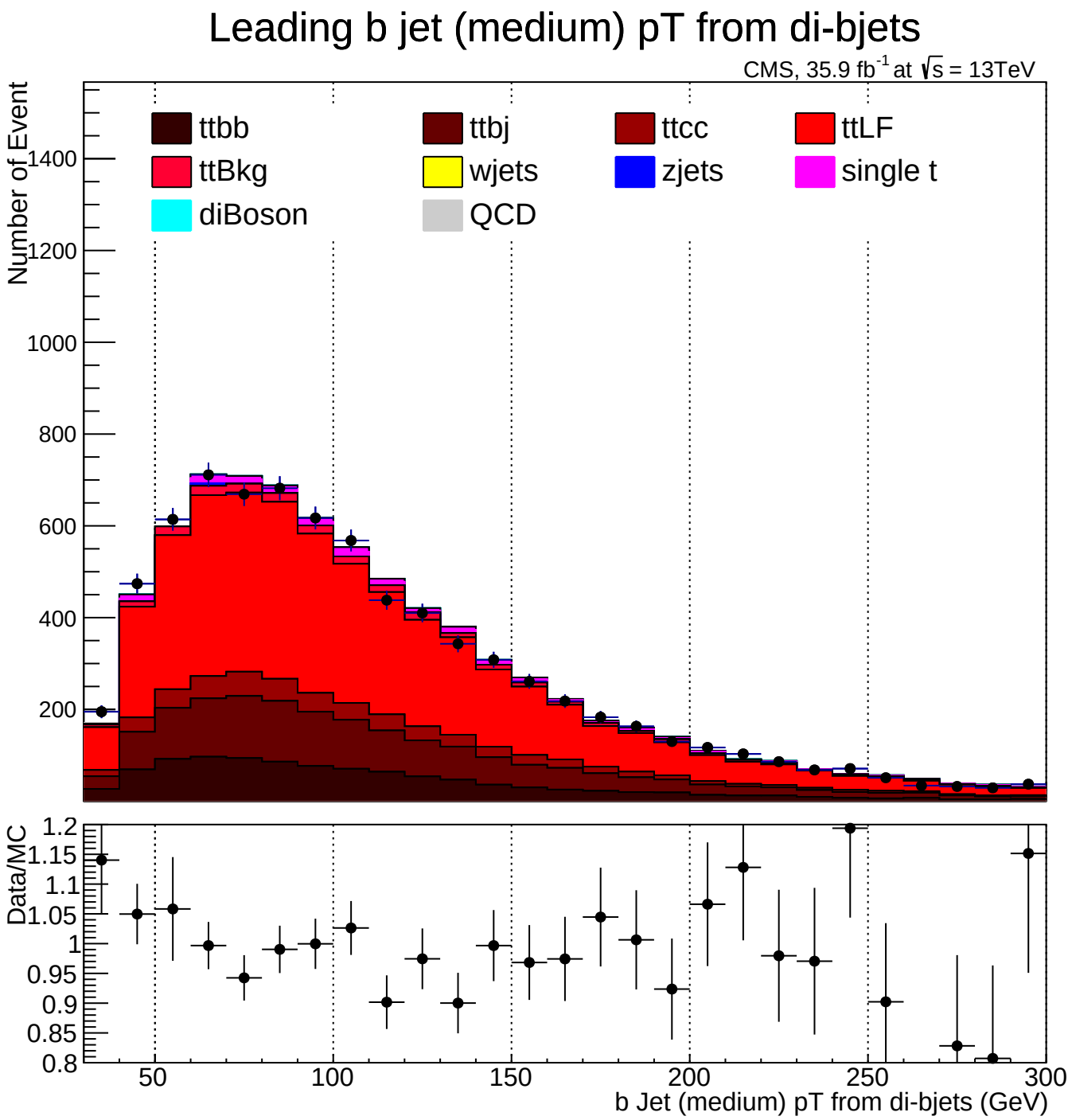

Number of c tagged jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
6000
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
c-tagged Jet Multiplicity (M)

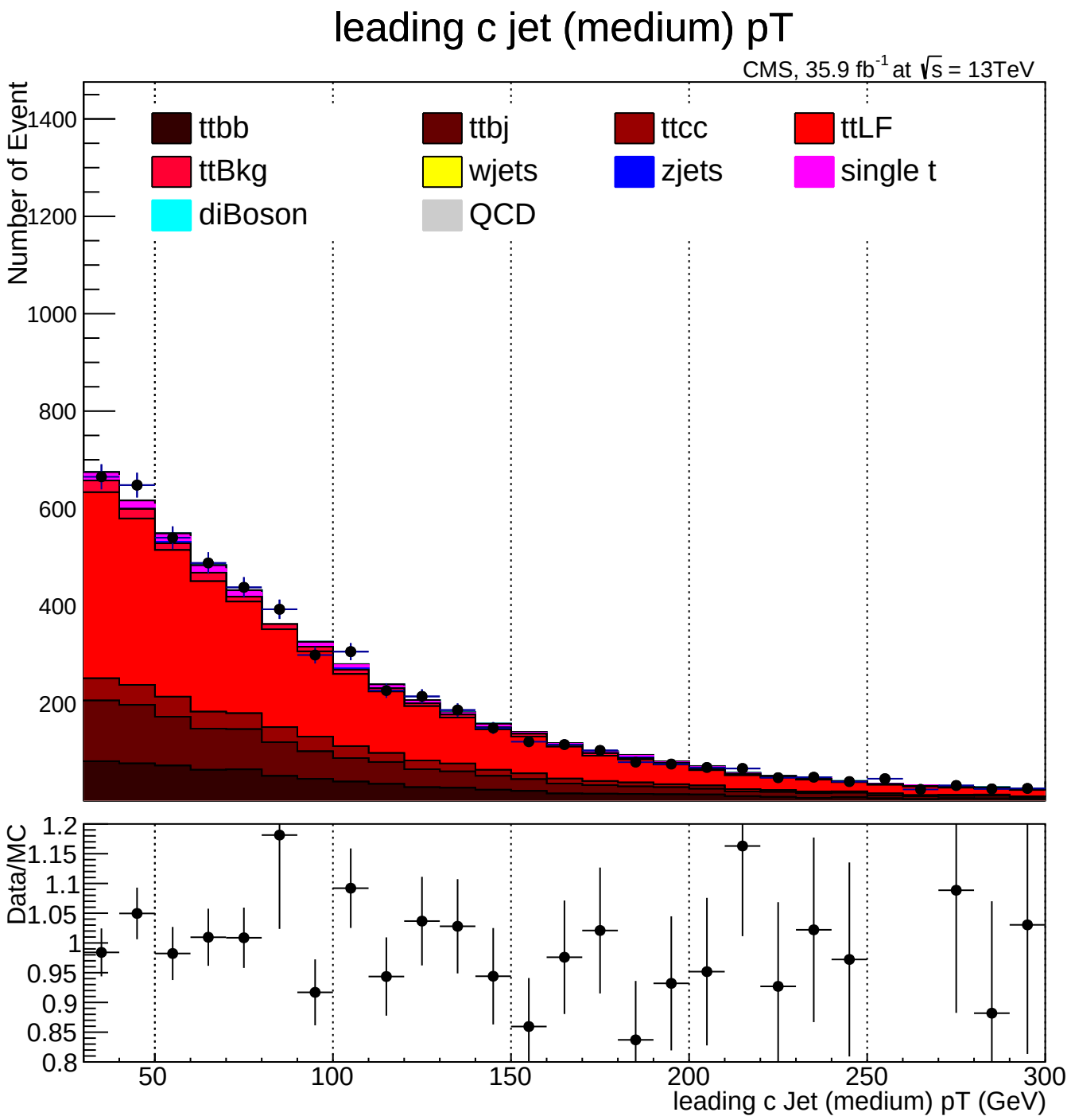

MET
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
MET (GeV)

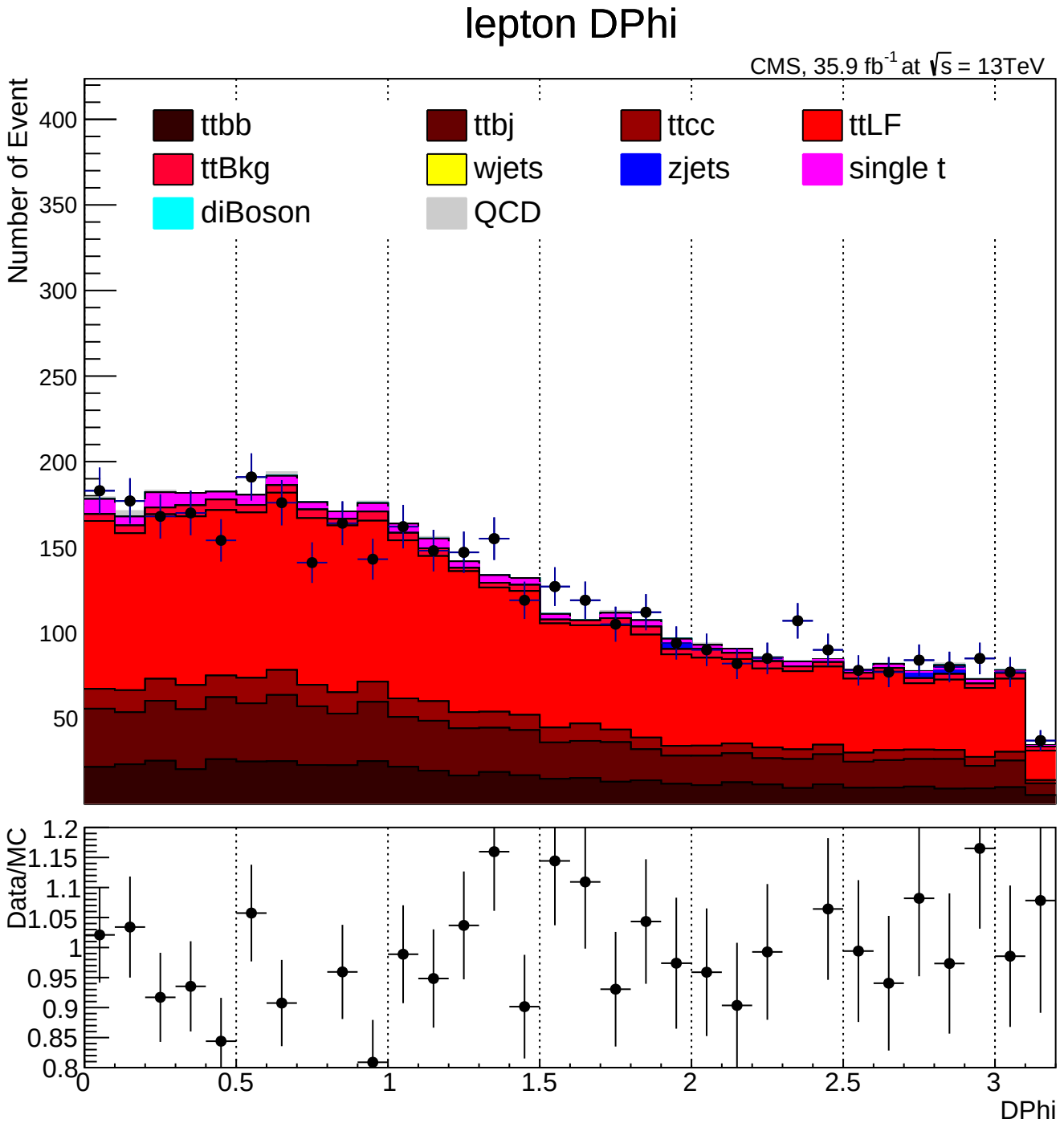

W Mass
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Transverse Mass (GeV)

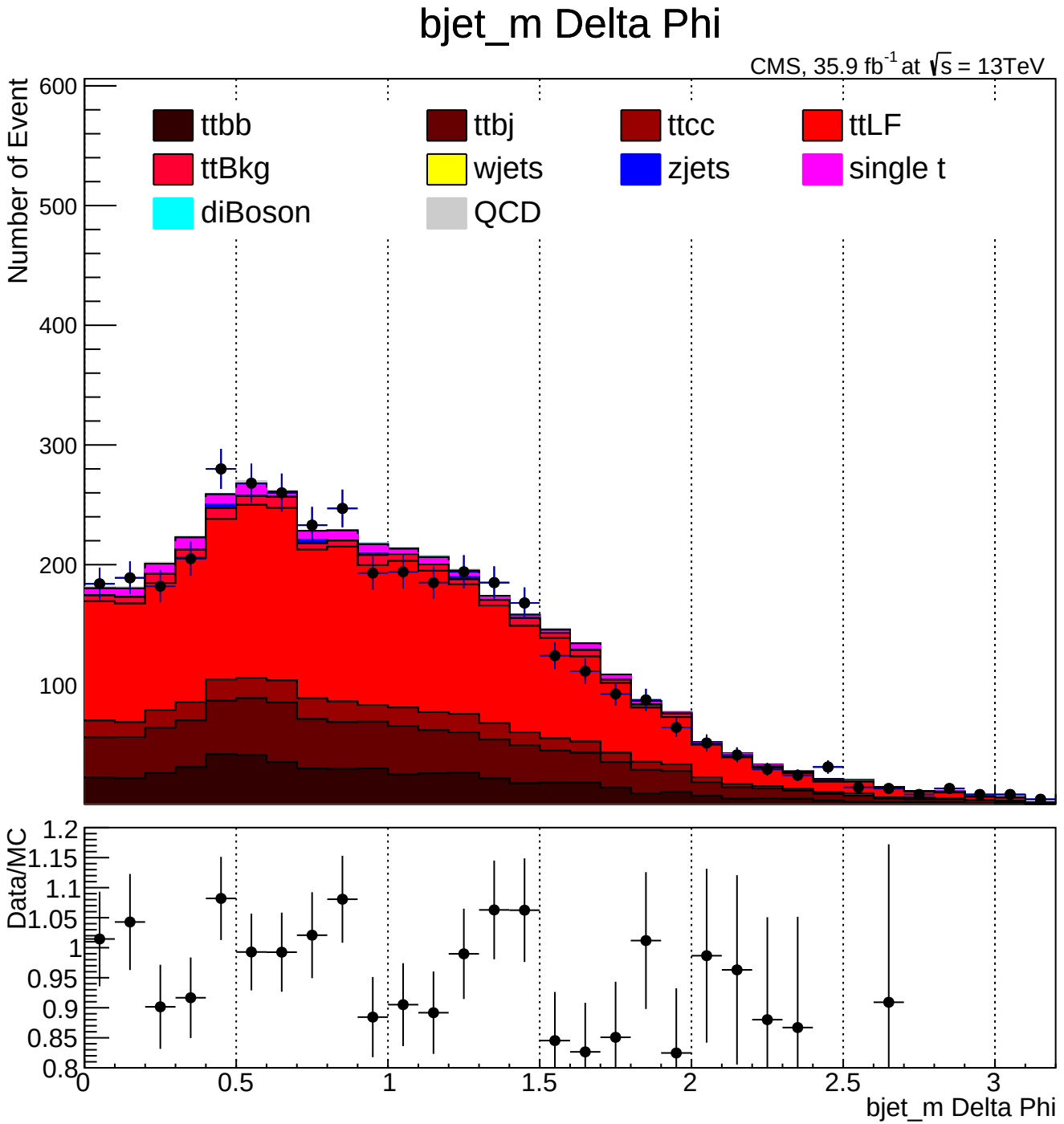
Di-bjet Mass (medium) wrt min DR

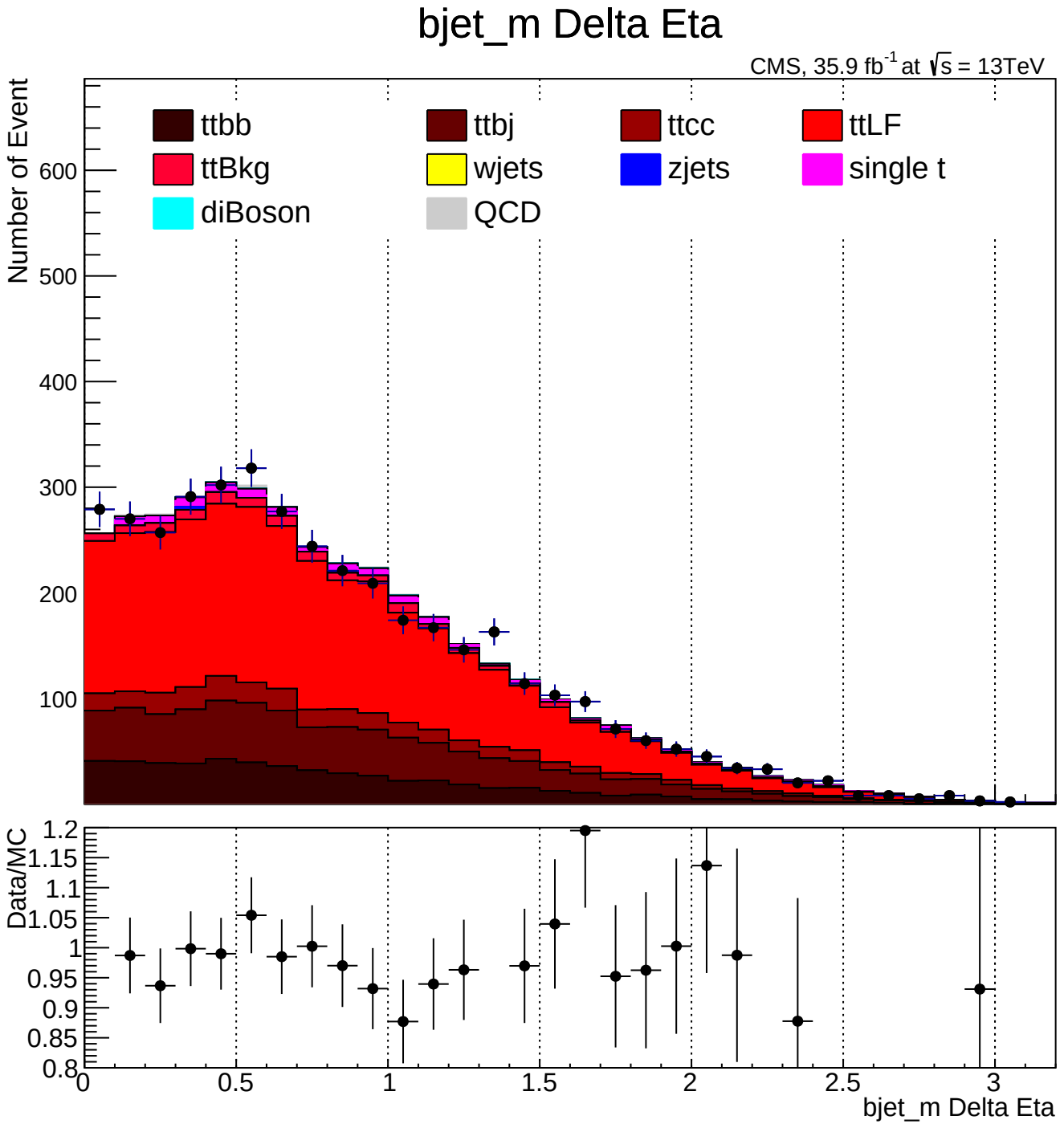


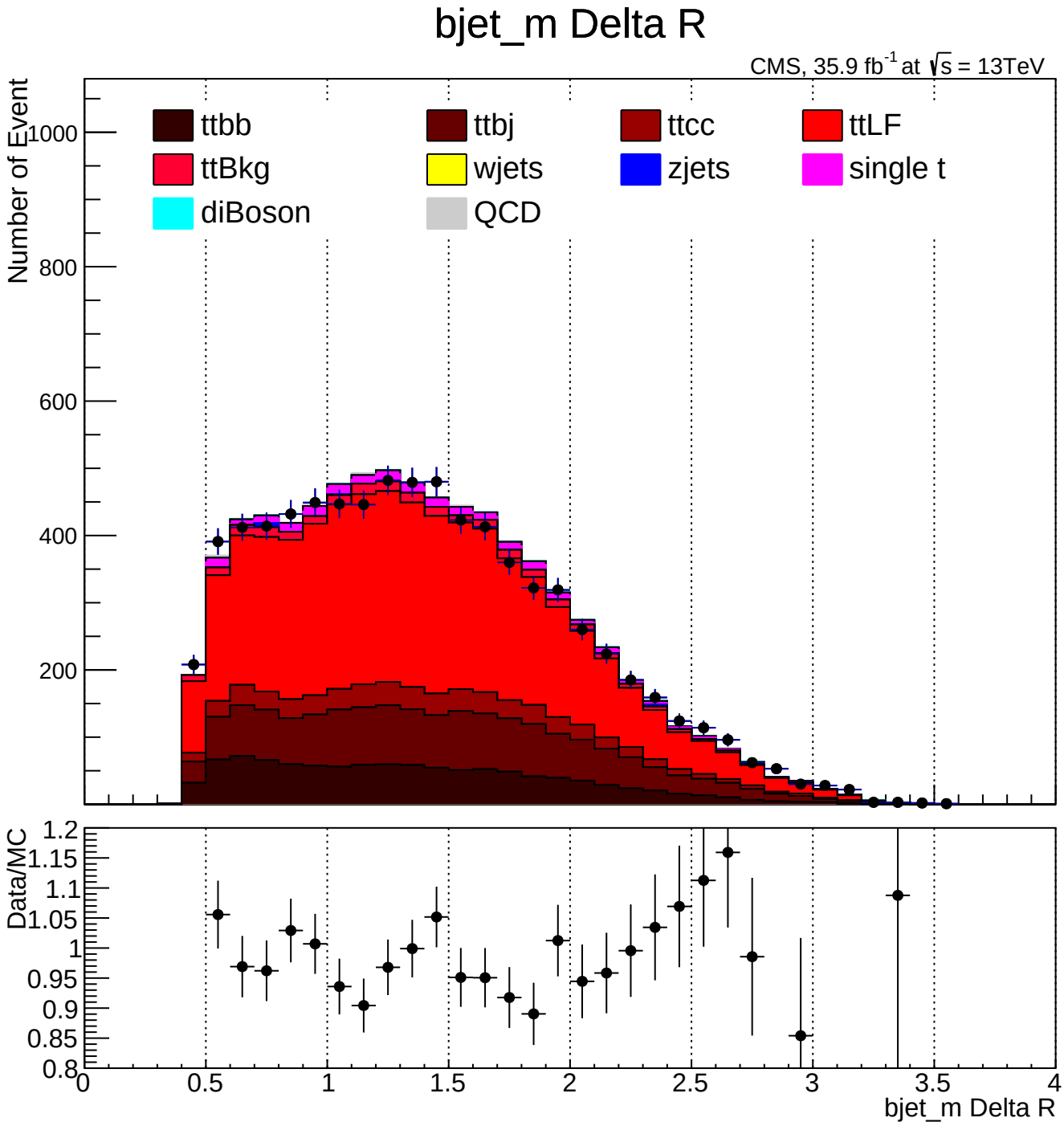

Leading b jet (medium) pT from di-bjets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
1400
1200
1000
800
600
400
200
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
b Jet (medium) pT from di-bjets (GeV)

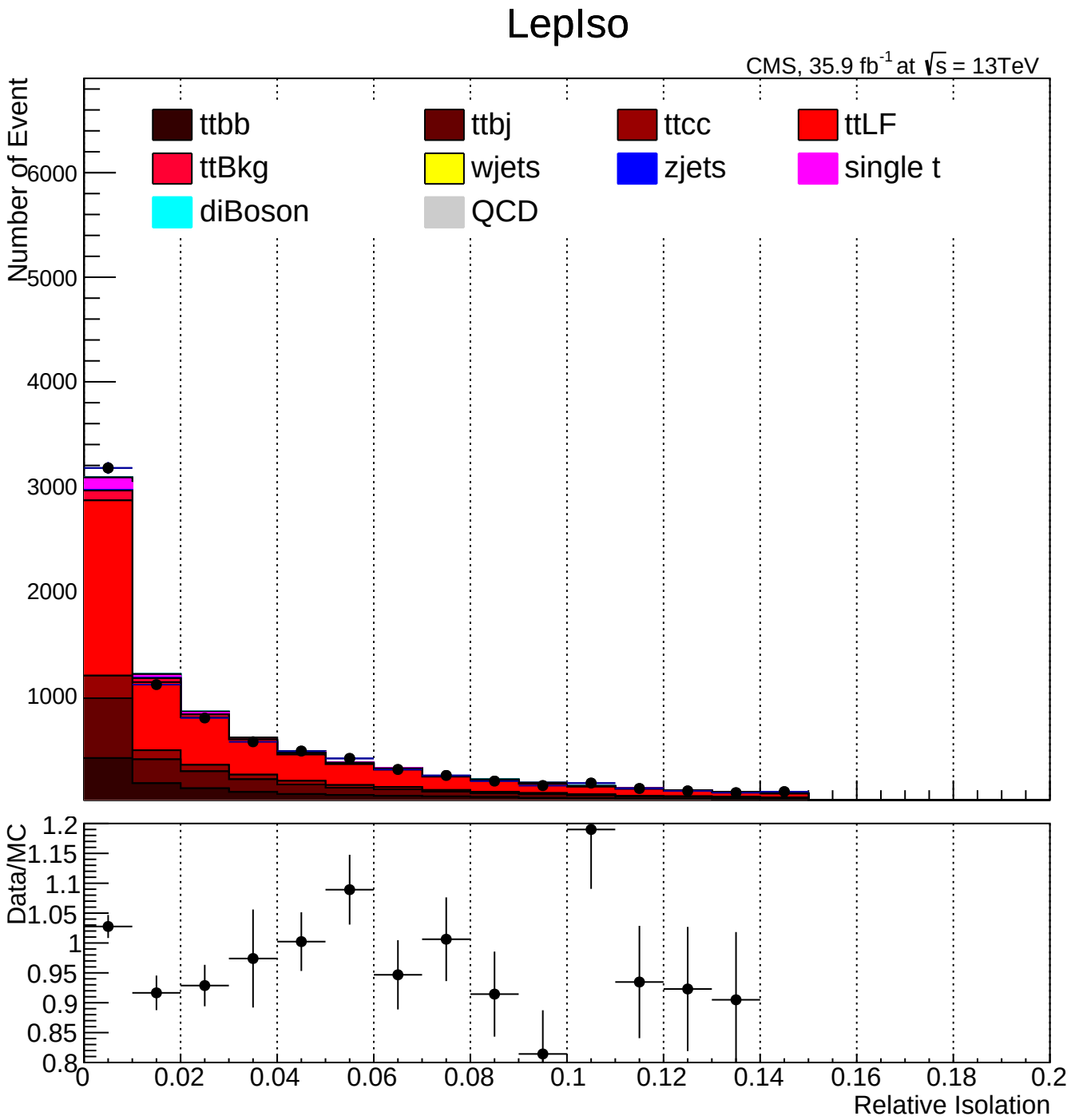

leading c jet (medium) pT
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
leading c Jet (medium) pT (GeV)

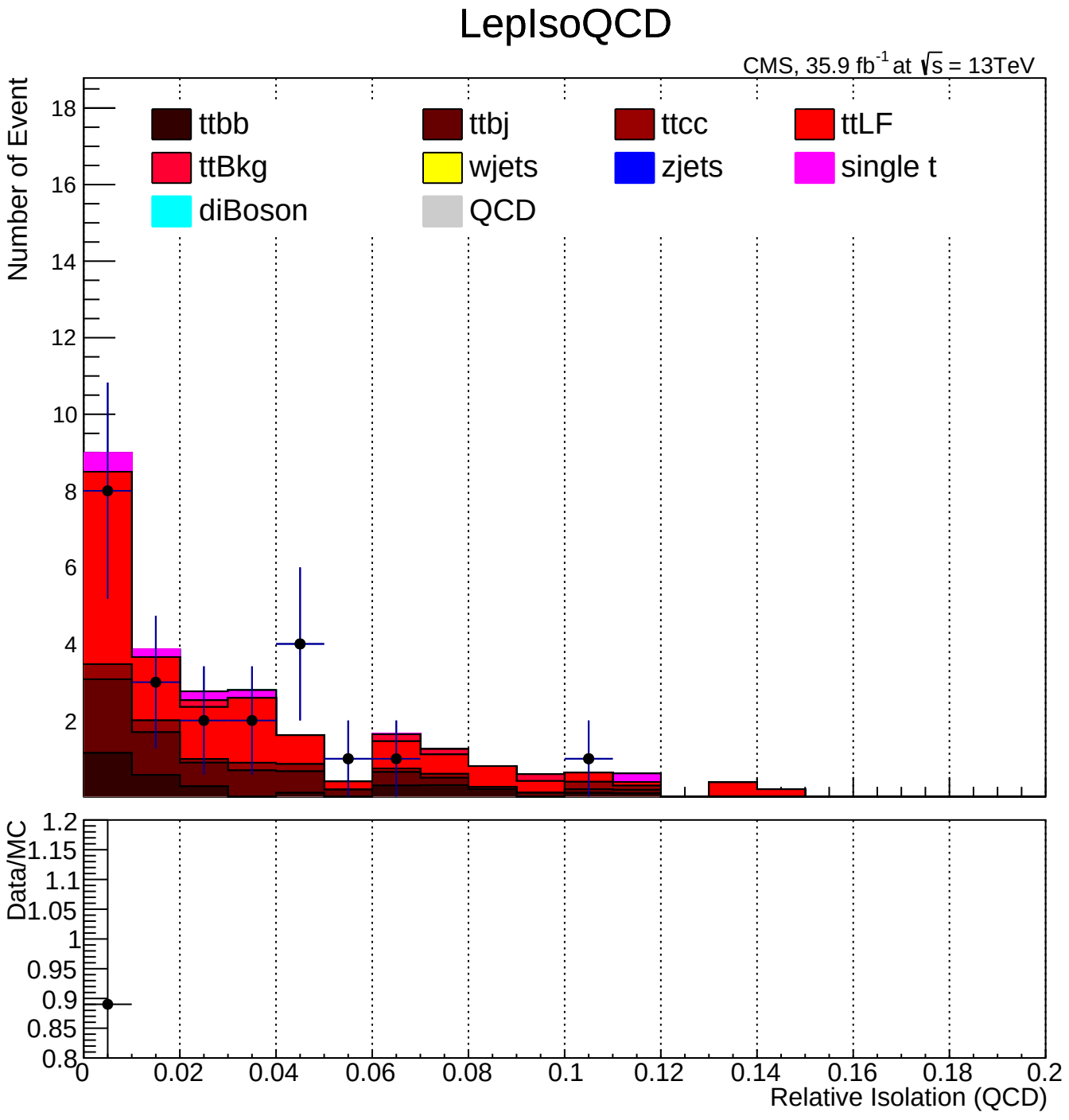

lepton DPhi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
DPhi

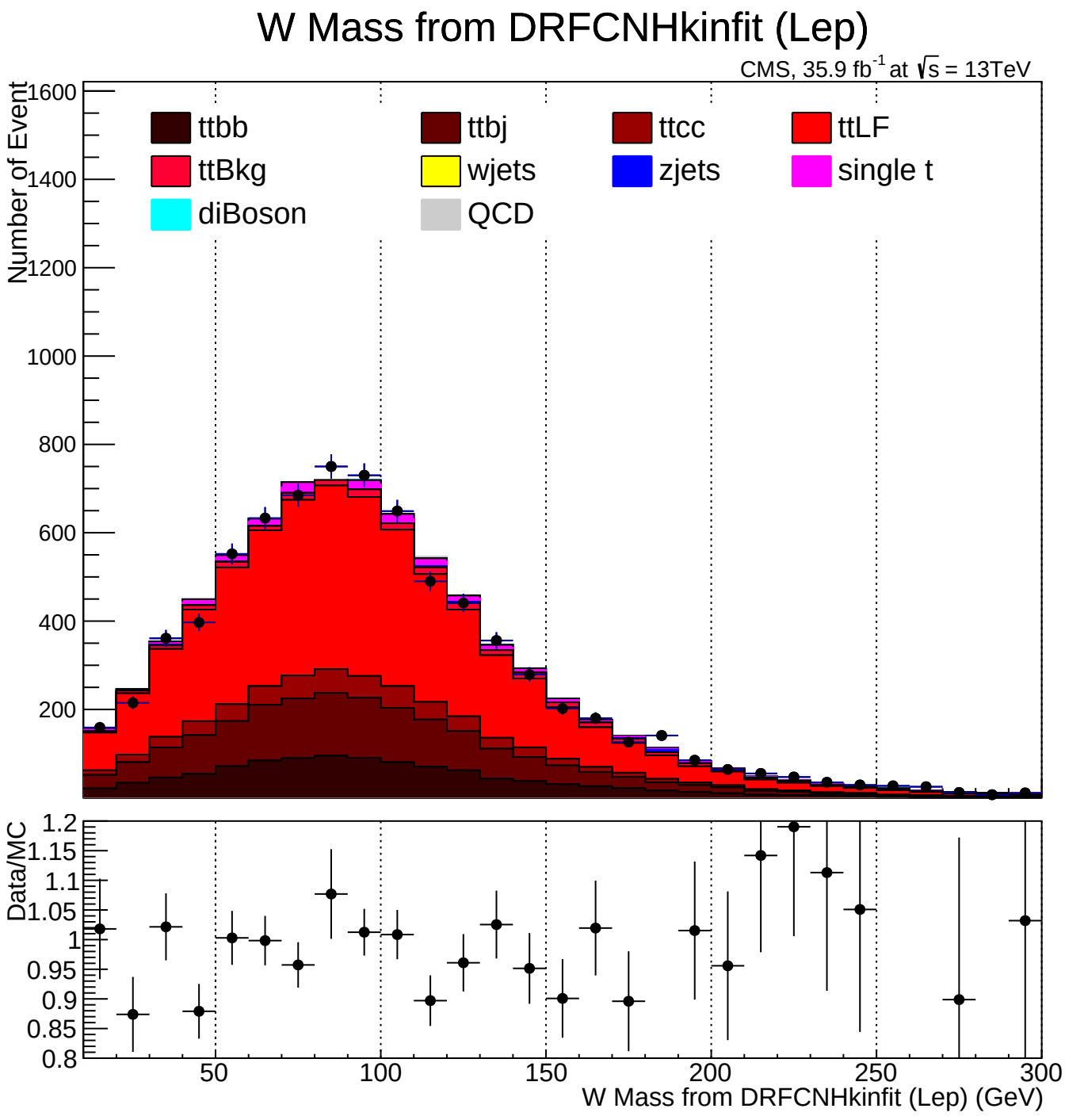

bjet_m Delta Phi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta Phi

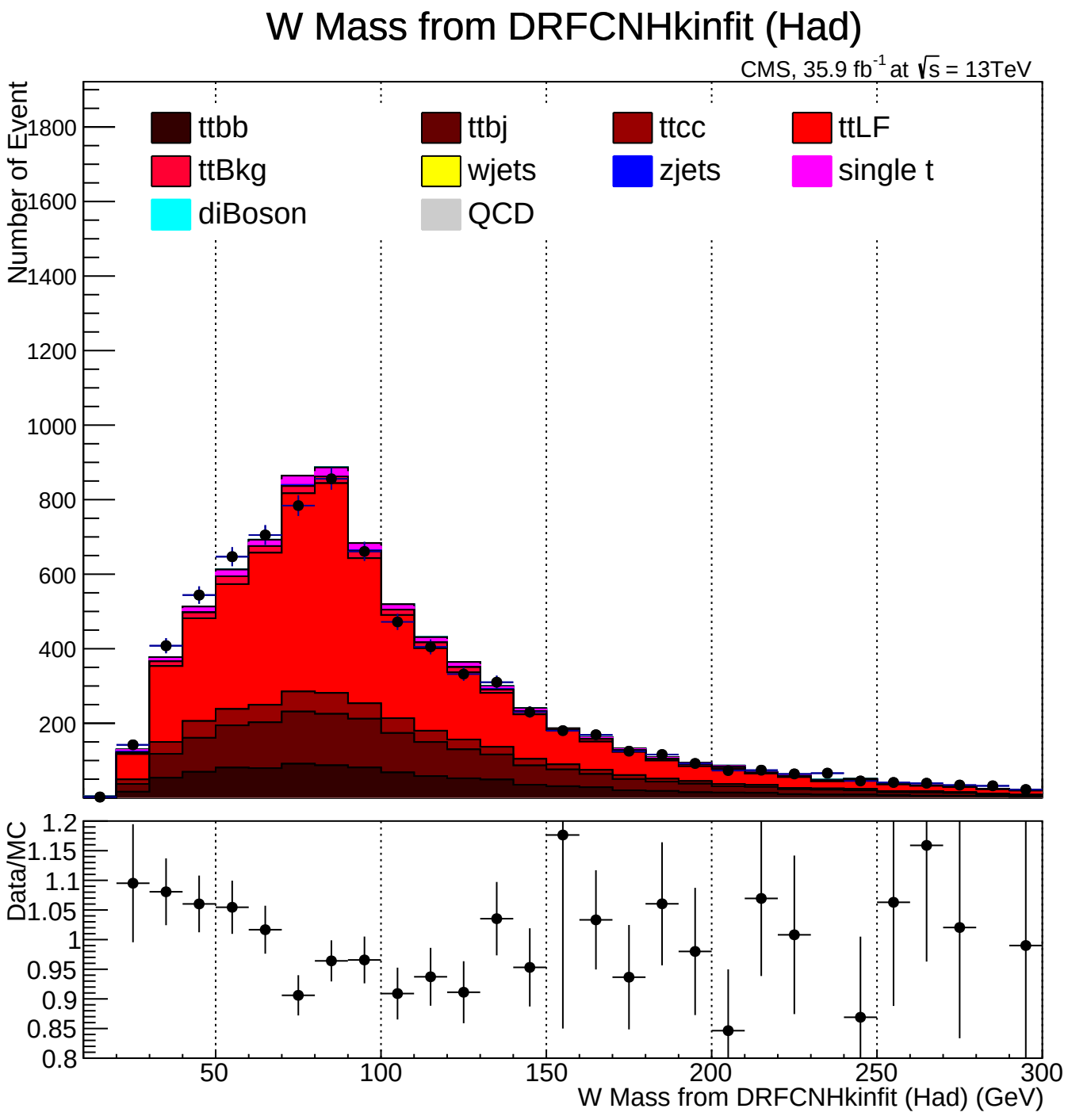

bjet_m Delta Eta
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
600
500
400
300
200
100
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Eta

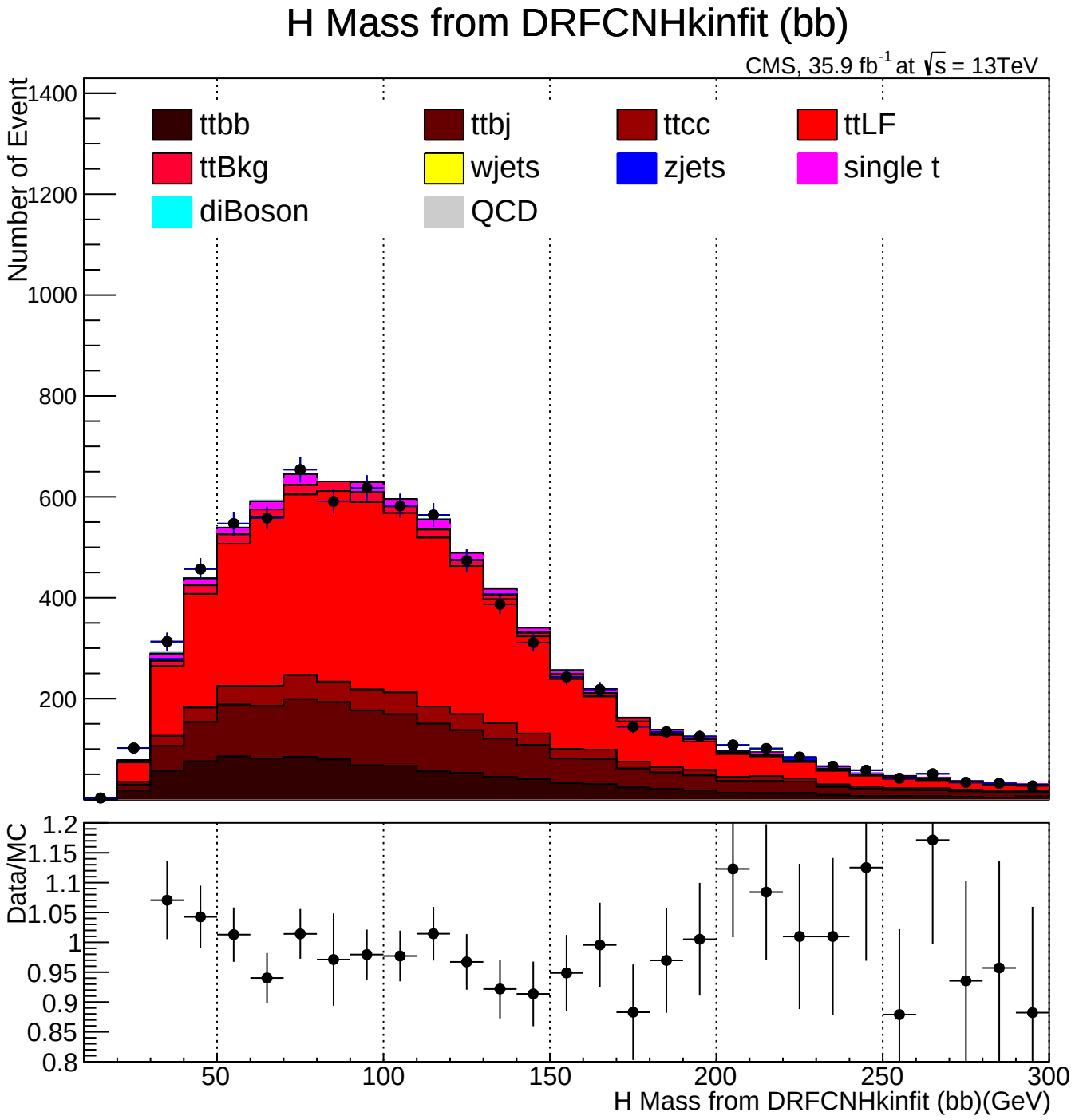

bjet_m Delta R
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
1000
800
600
400
200
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
3.5
4
bjet_m Delta R

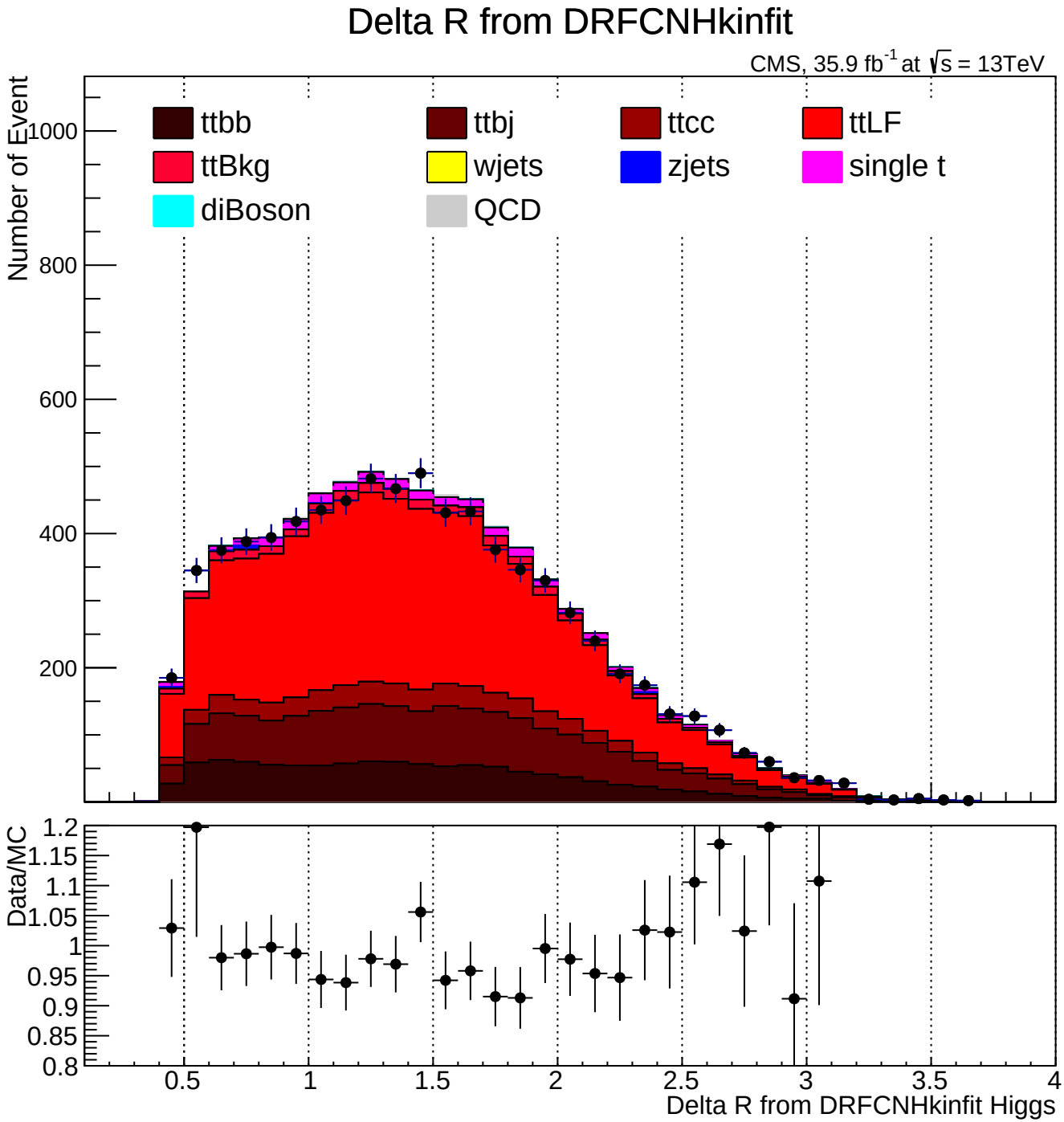

LepIso
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
6000
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation

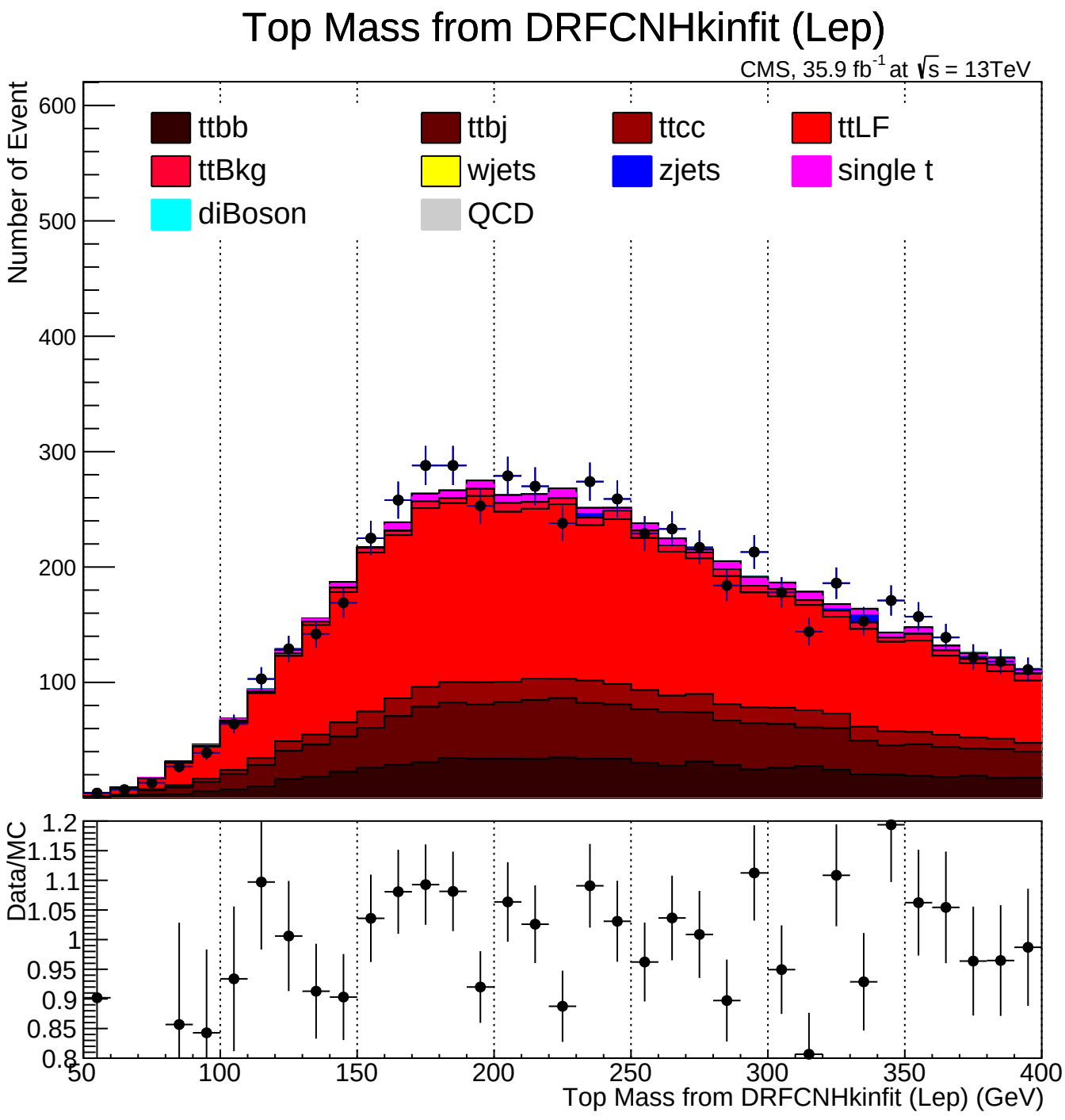

LepIsoQCD
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation (QCD)


W Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
W Mass from DRFCNHkinfit (Lep) (GeV)

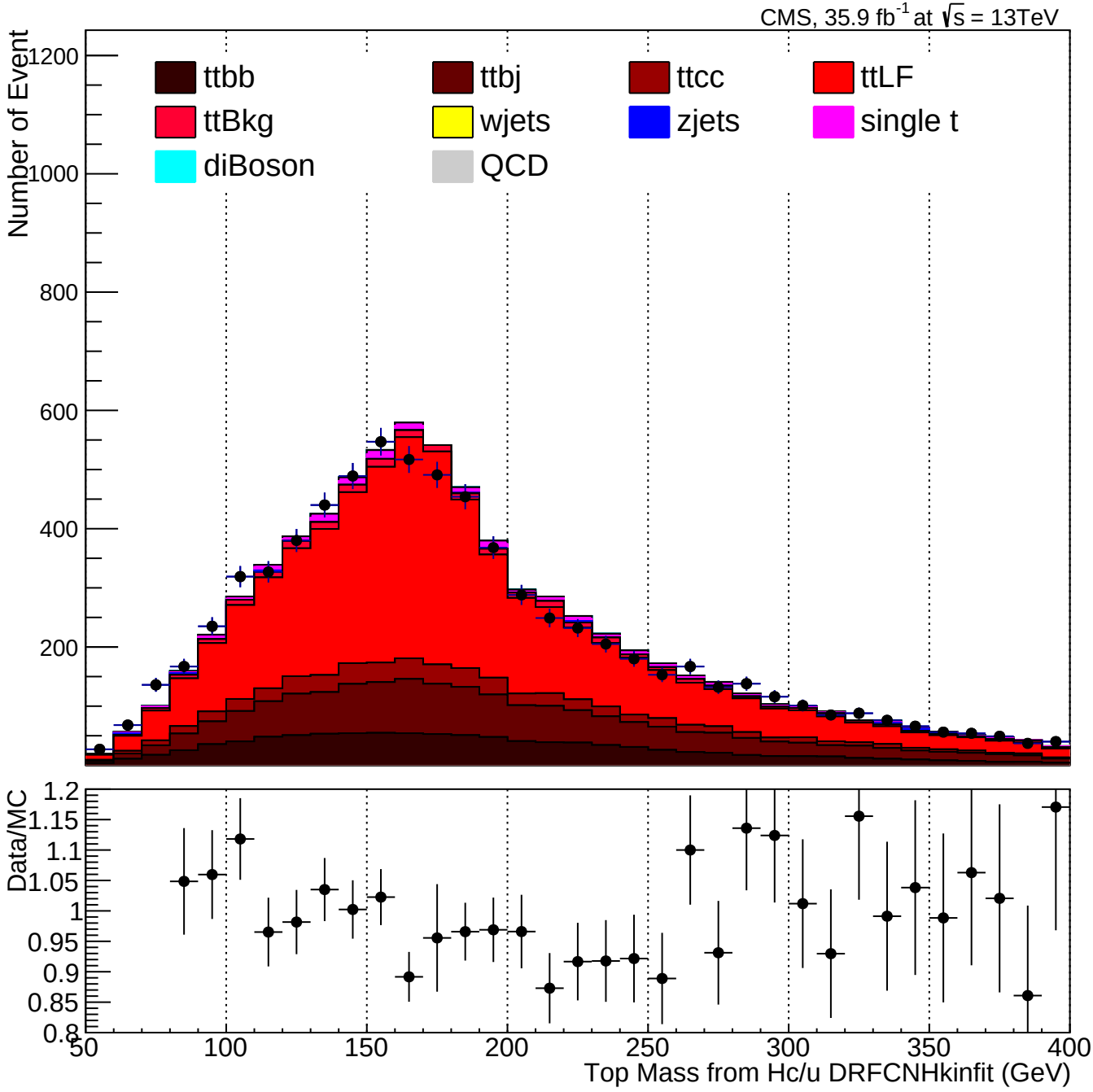

W Mass from DRFCNHkinfit (Had)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
W Mass from DRFCNHkinfit (Had) (GeV)

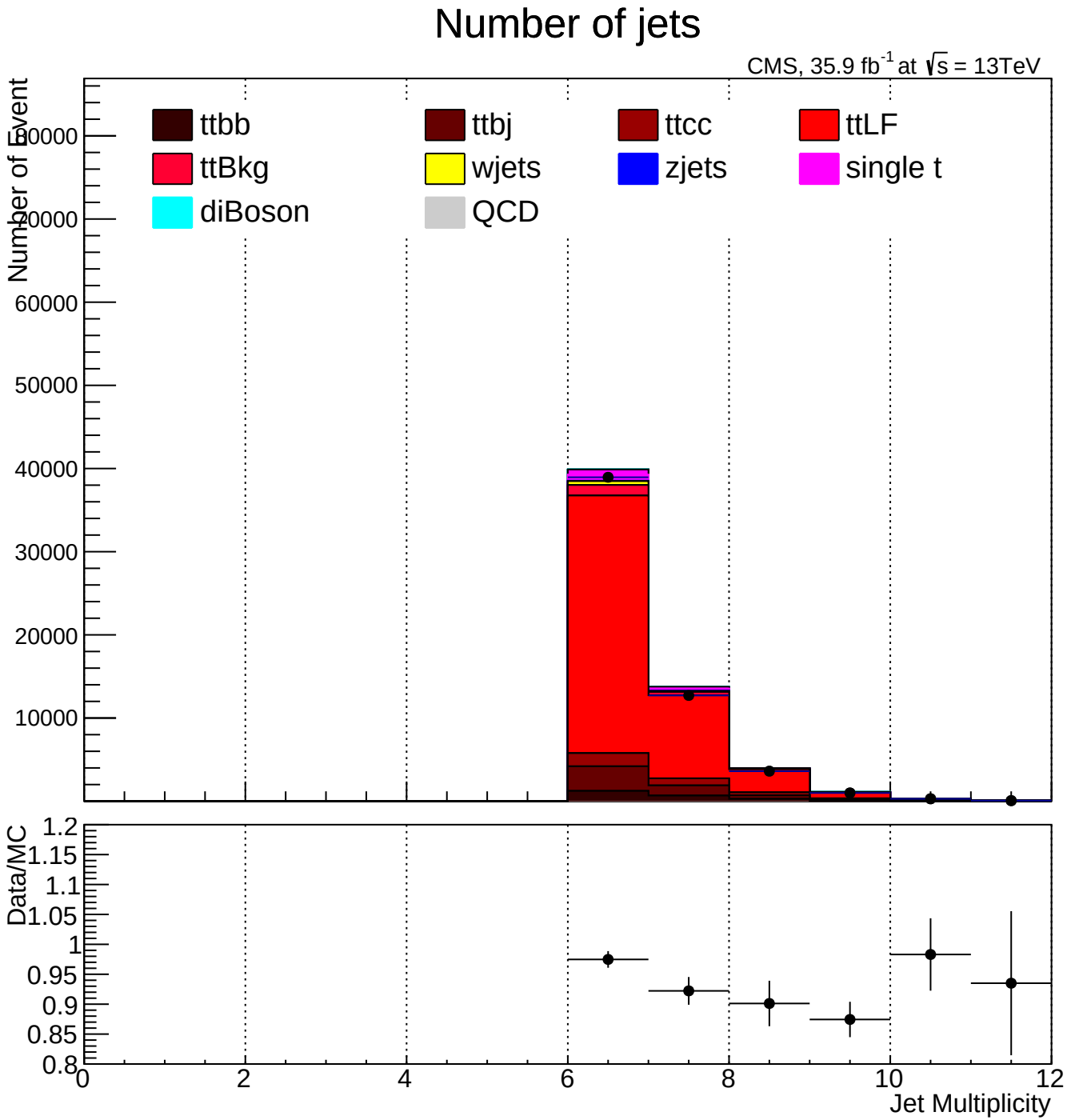

H Mass from DRFCNHkinfit (bb)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
H Mass from DRFCNHkinfit (bb)(GeV)

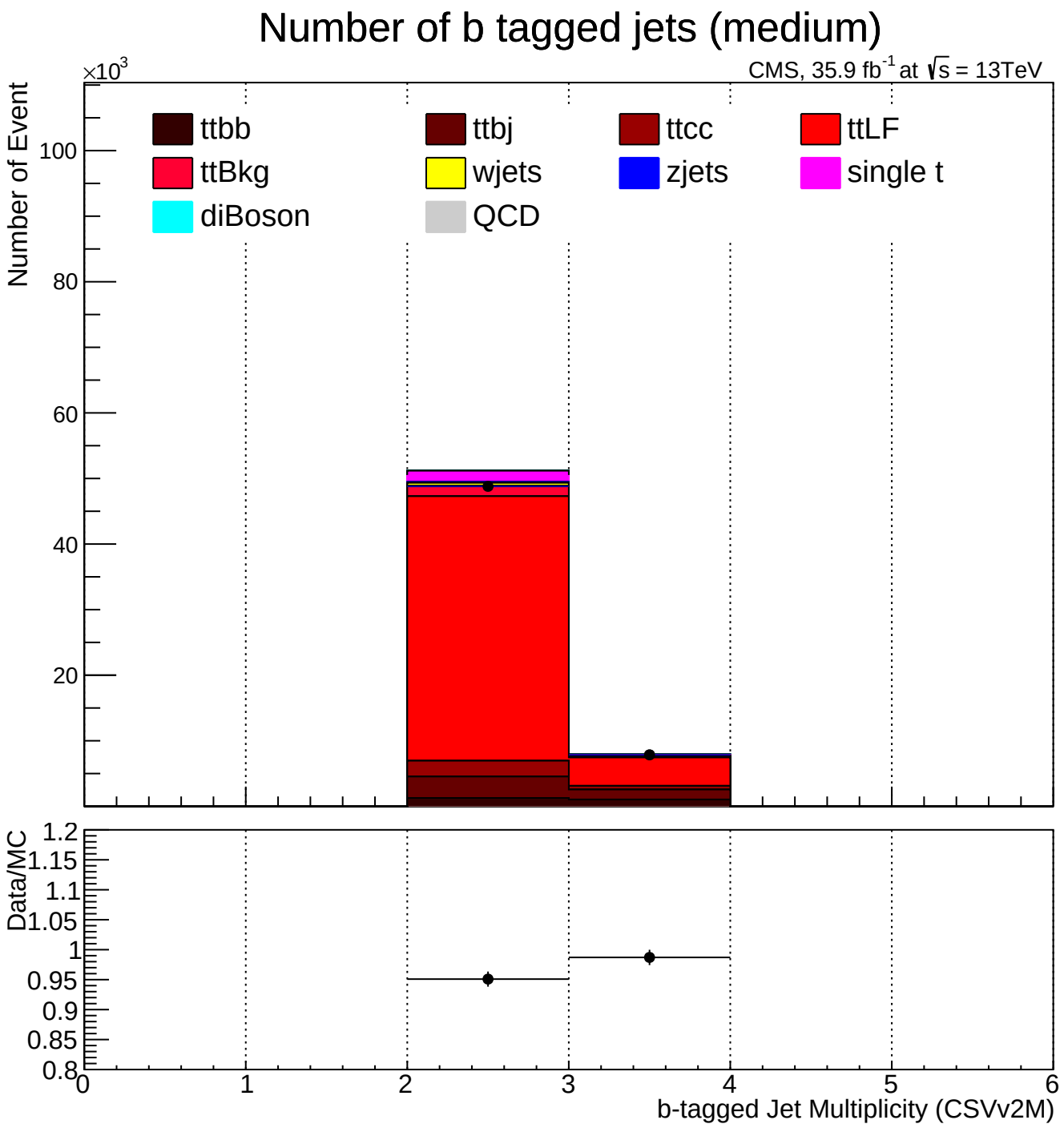

Delta R from DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
1000
800
600
400
200
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0.5
1
1.5
2
2.5
3
3.5
4
Delta R from DRFCNHkinfit Higgs

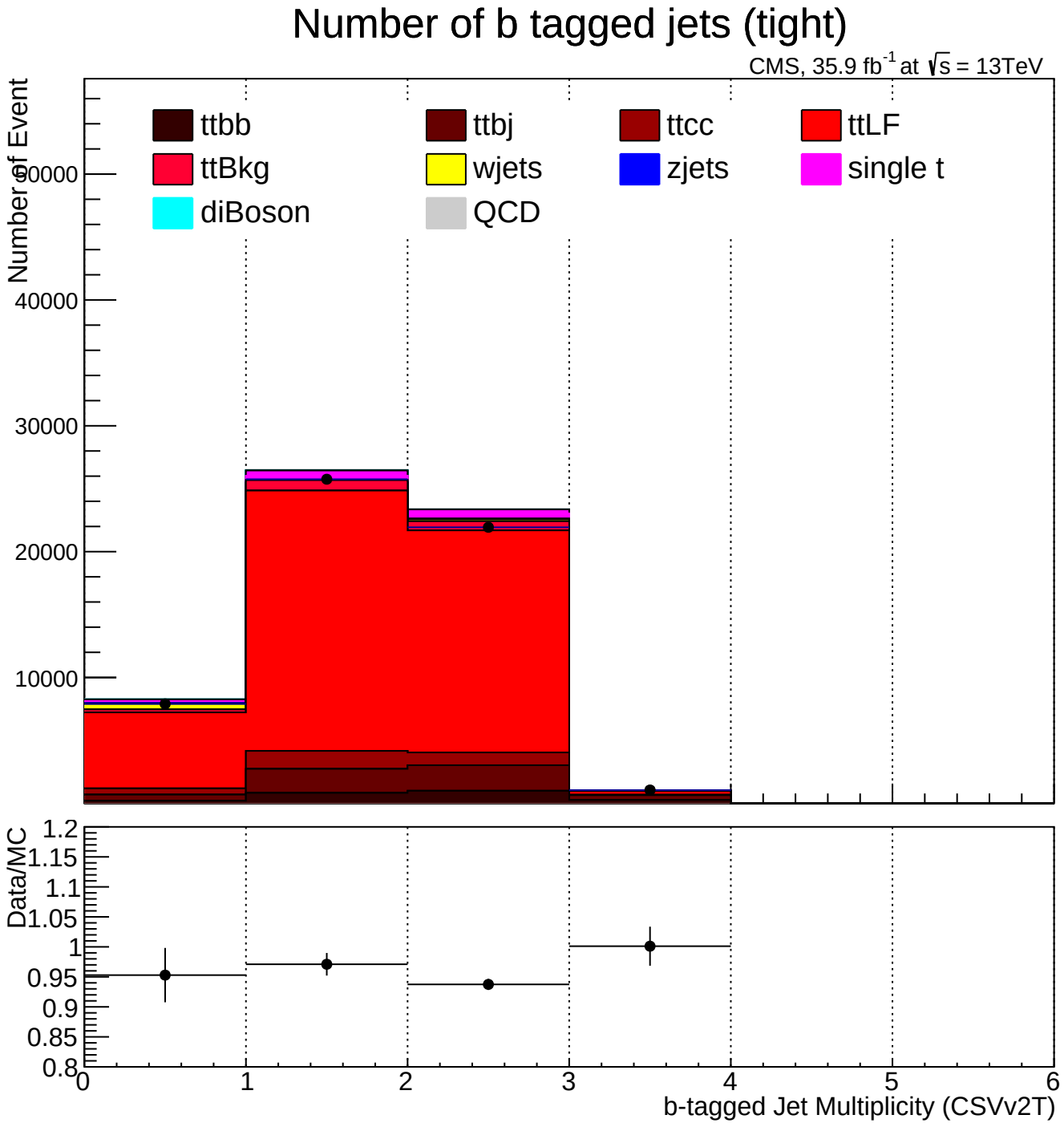

Top Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Top Mass from DRFCNHkinfit (Lep) (GeV)

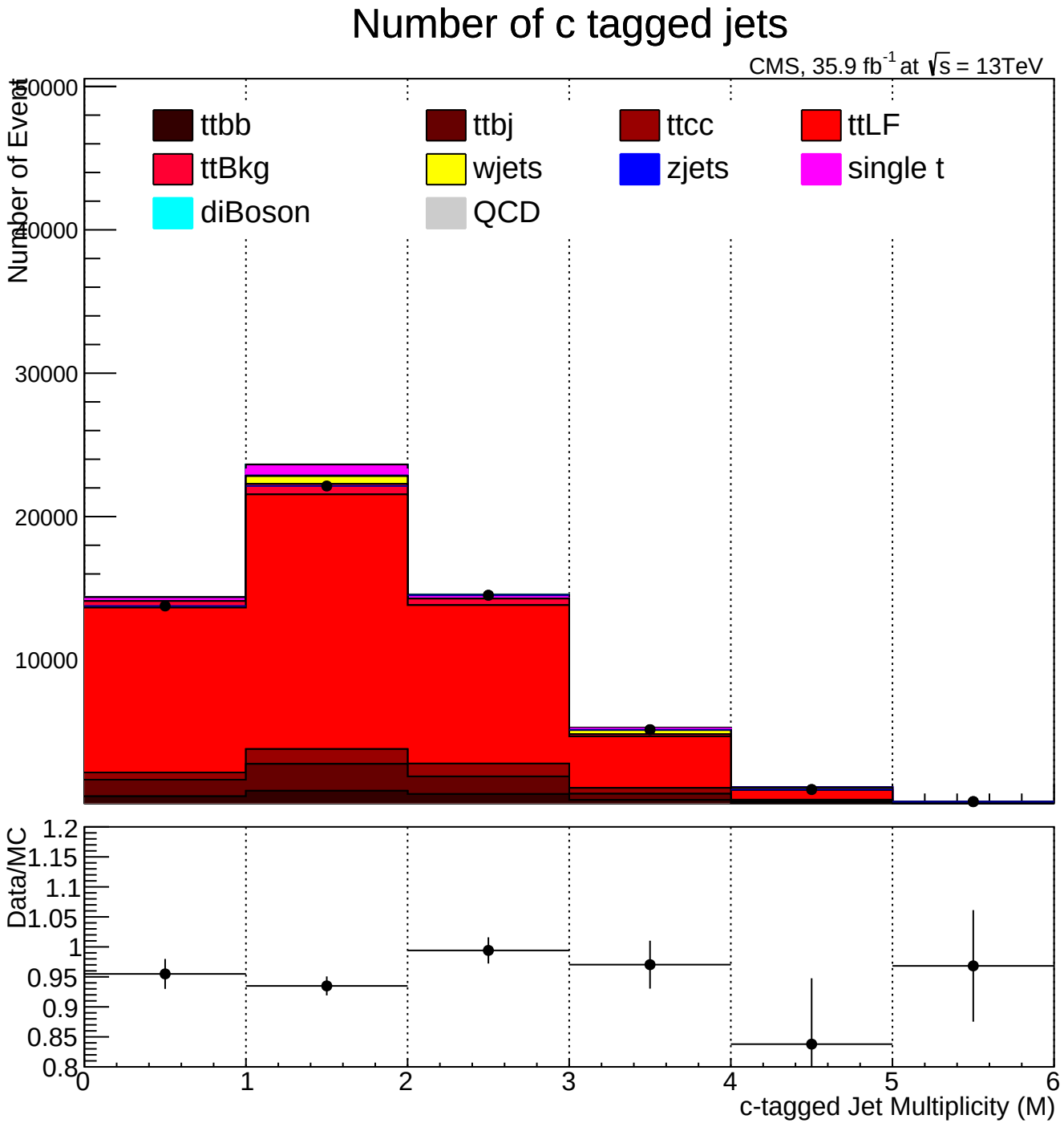
Top mass from Hc/u DRFCNHkinfit

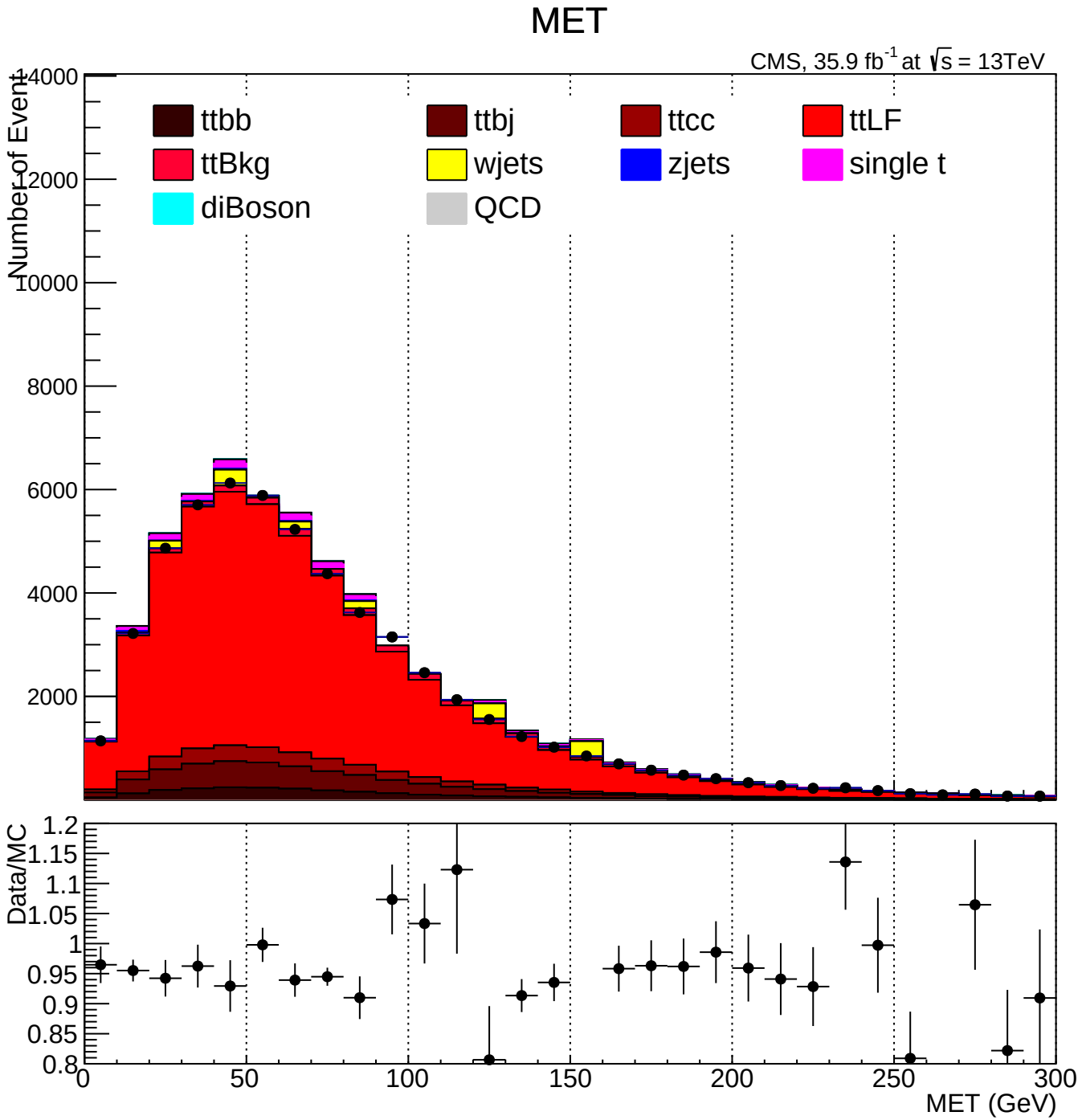


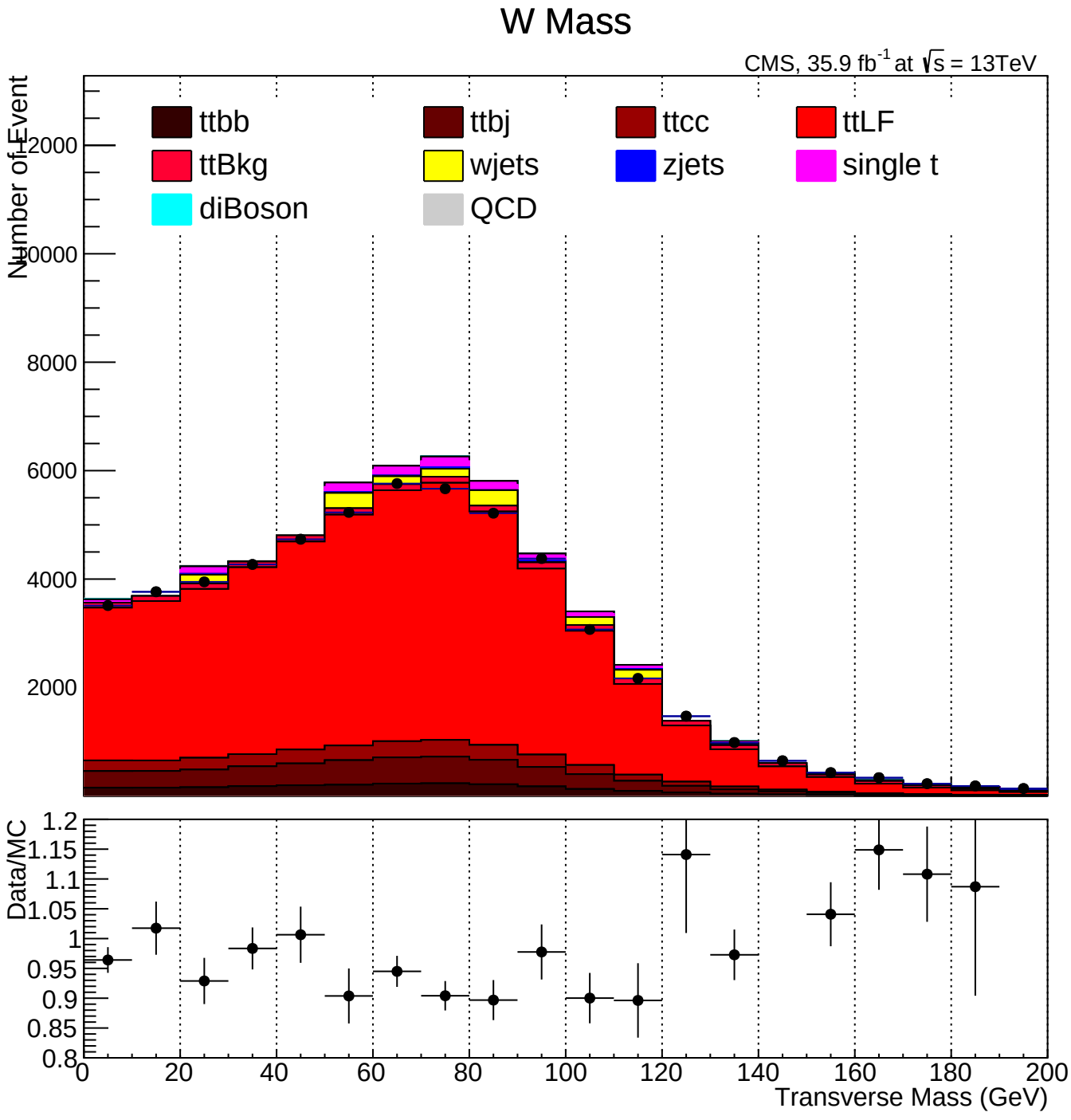

Number of jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
80000
70000
60000
50000
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
2
4
6
8
10
12
Jet Multiplicity


Number of b tagged jets (medium)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
$\times 10^3$
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b-tagged Jet Multiplicity (CSVv2M)

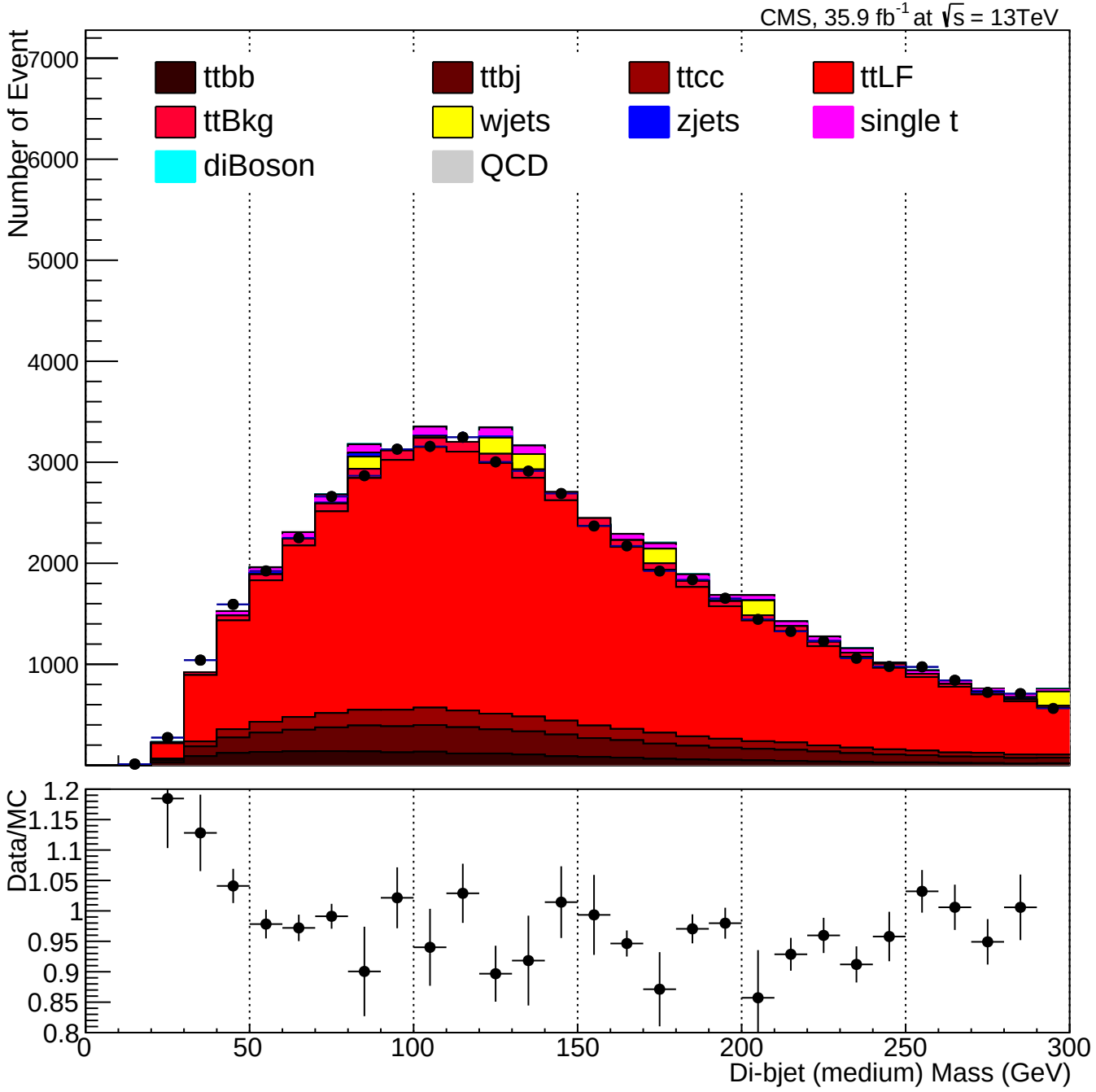

Number of b tagged jets (tight)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
50000
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2T)

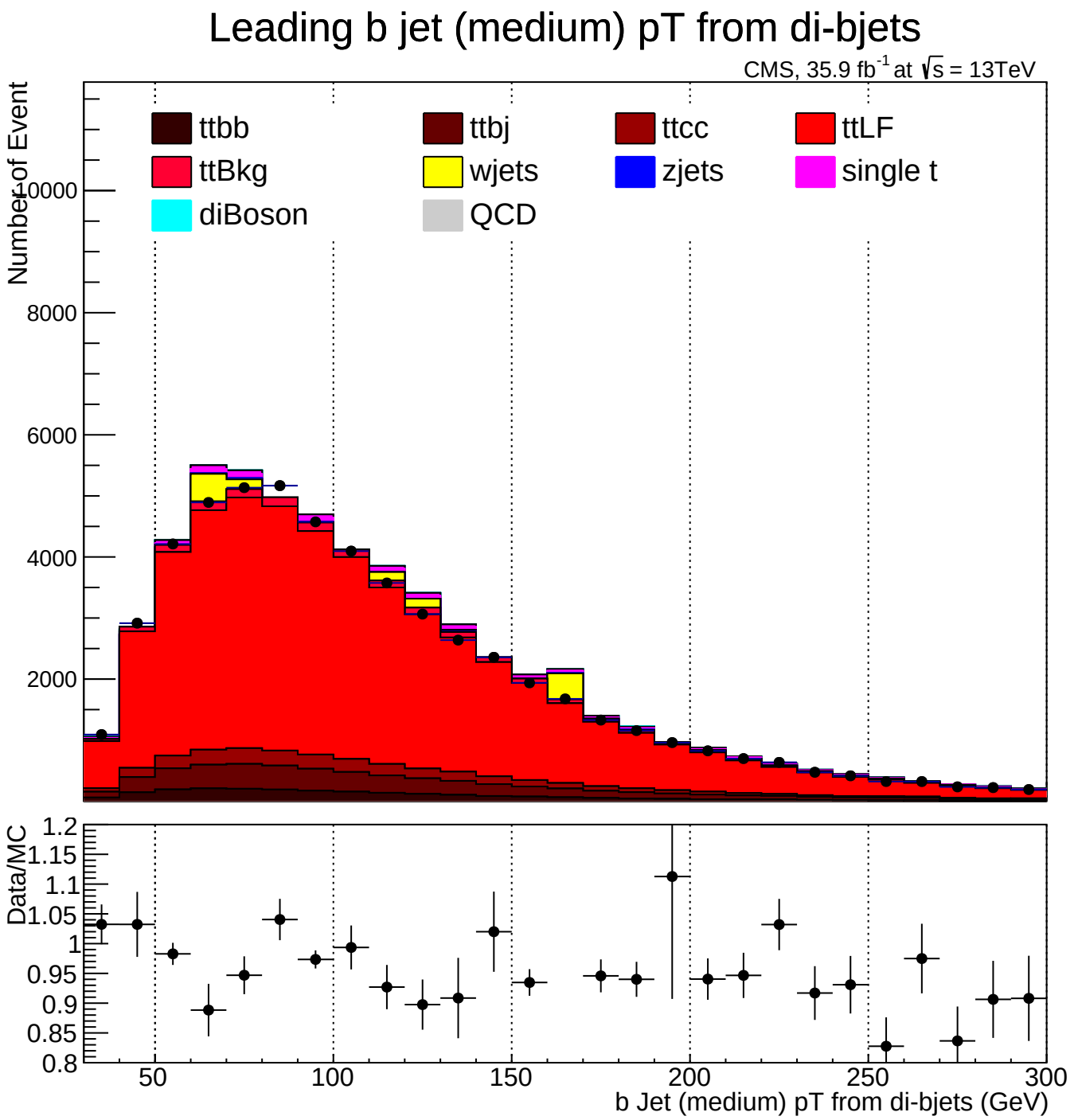

Number of c tagged jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
c-tagged Jet Multiplicity (M)

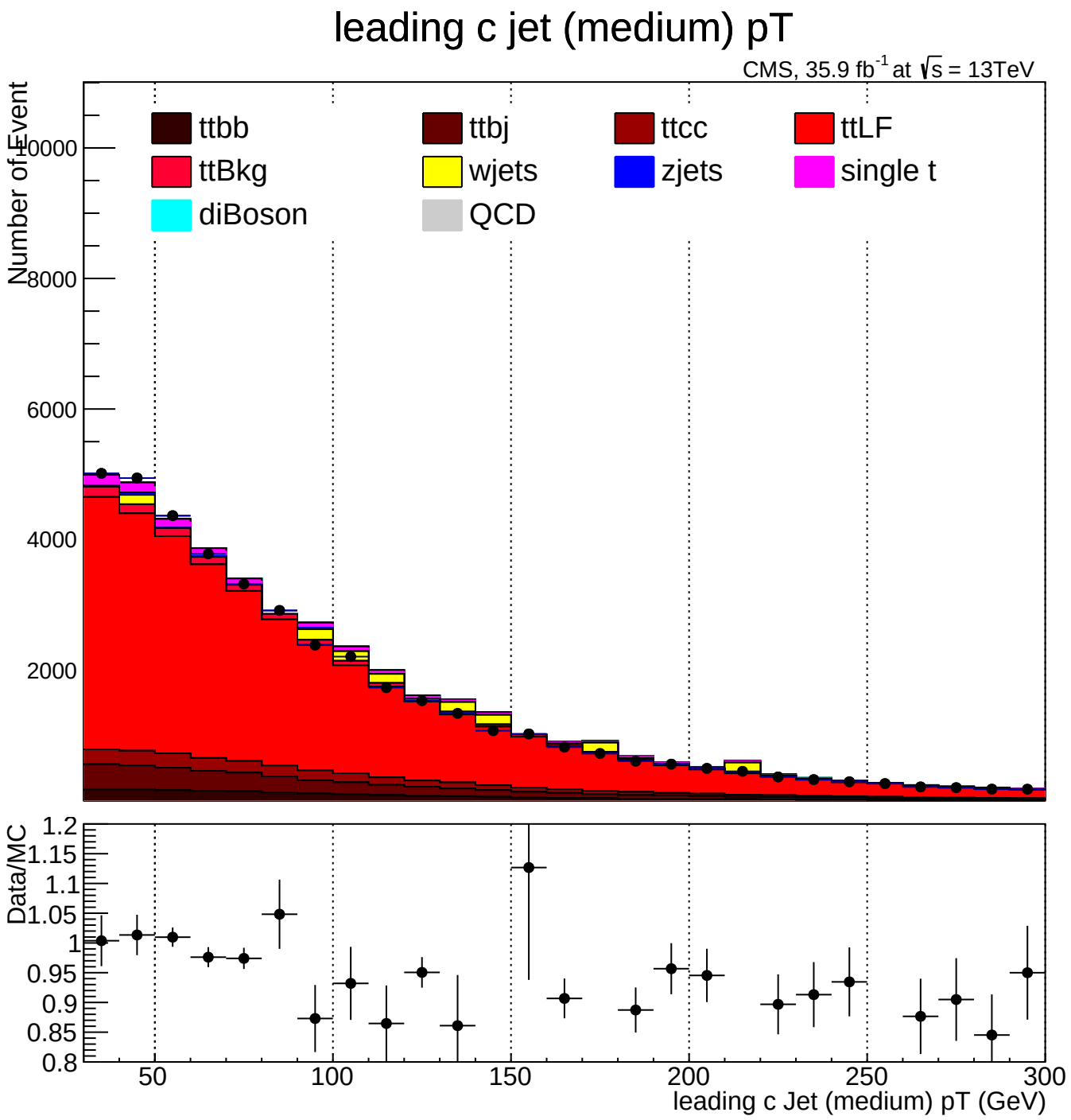

MET
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
MET (GeV)

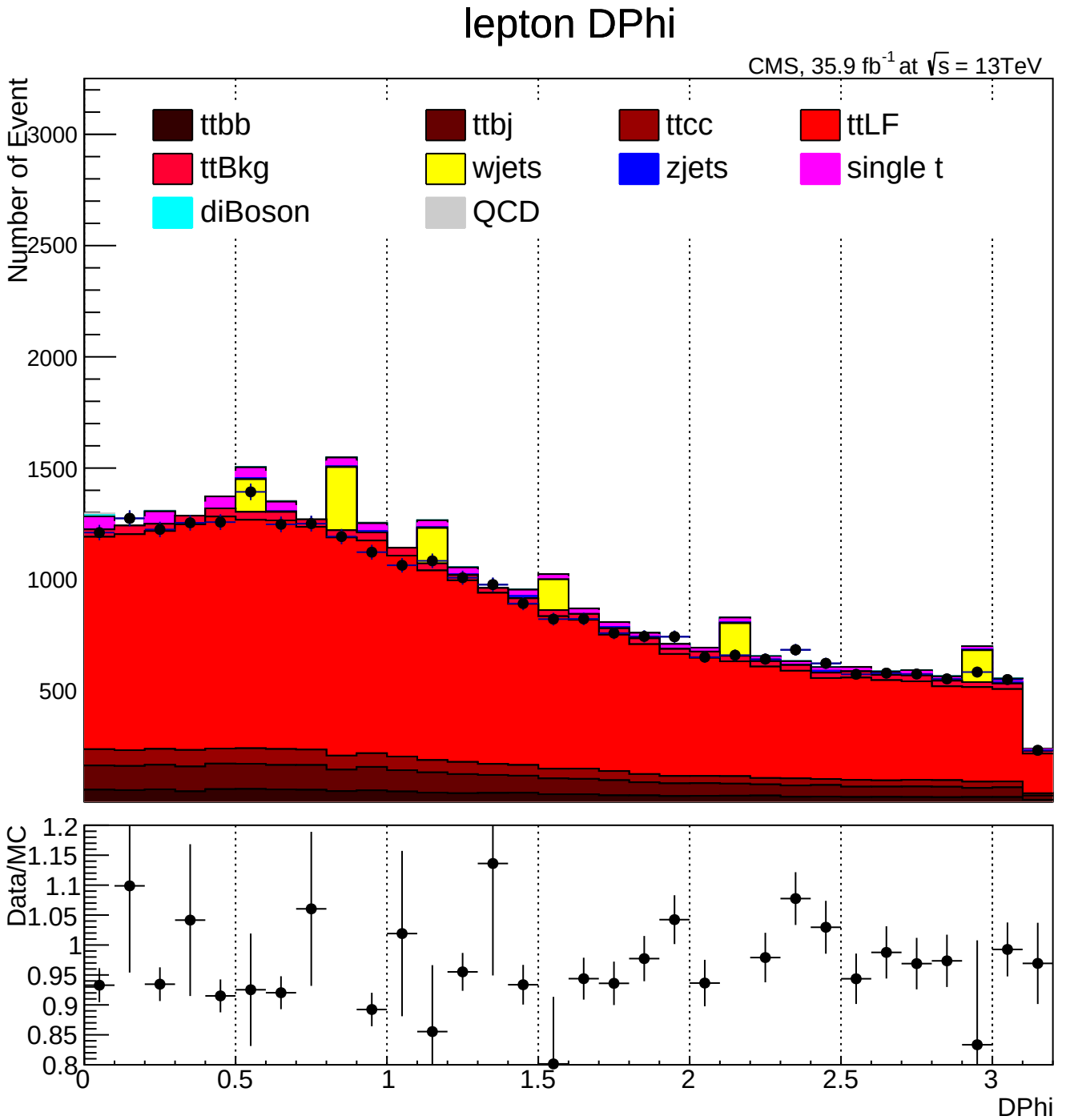

W Mass
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
2000
4000
6000
8000
10000
12000
Data/MC
0.8
0.85
0.9
0.95
1
1.05
1.1
1.15
1.2
0
20
40
60
80
100
120
140
160
180
200
Transverse Mass (GeV)

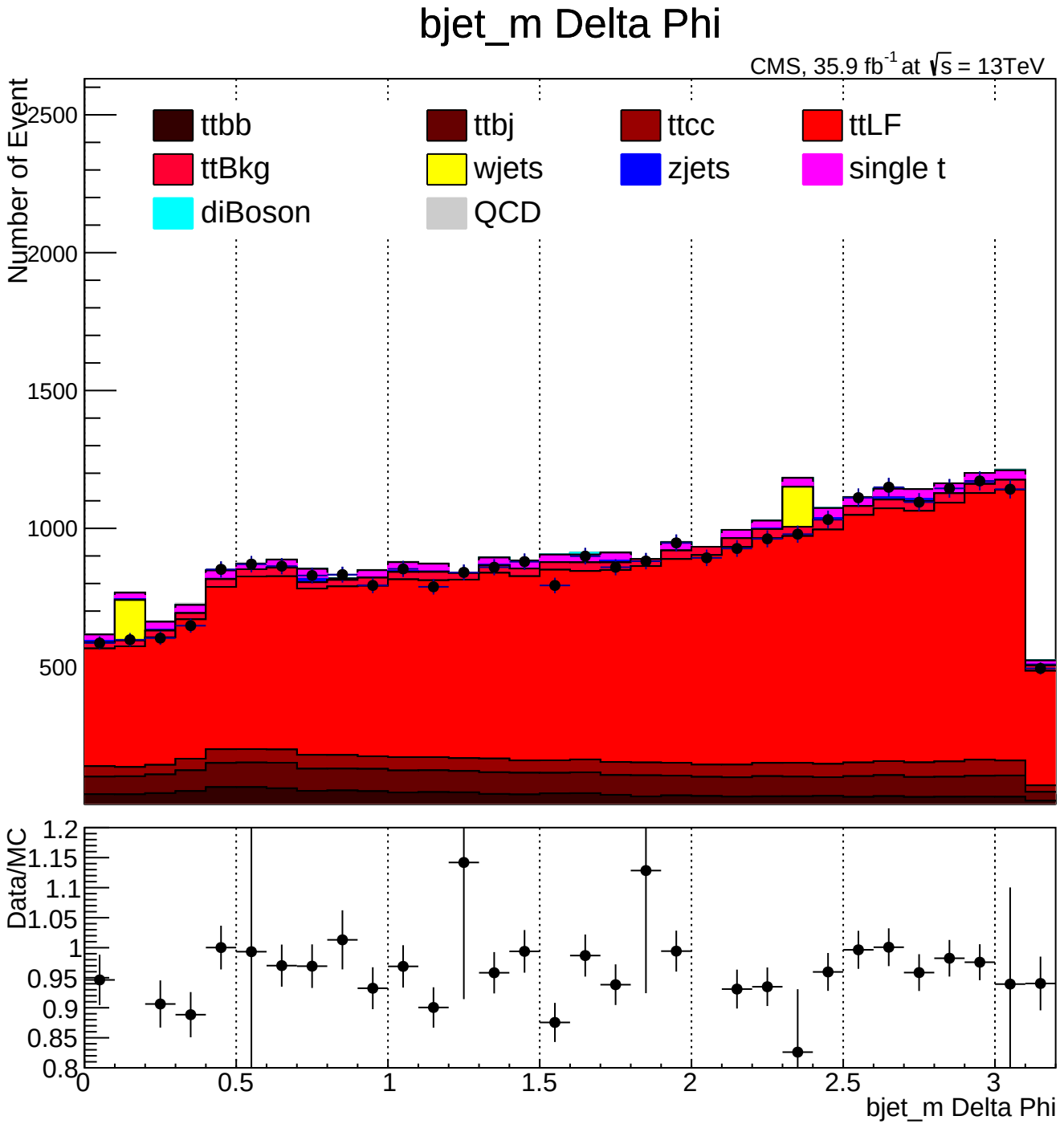
Di-bjet Mass (medium) wrt min DR

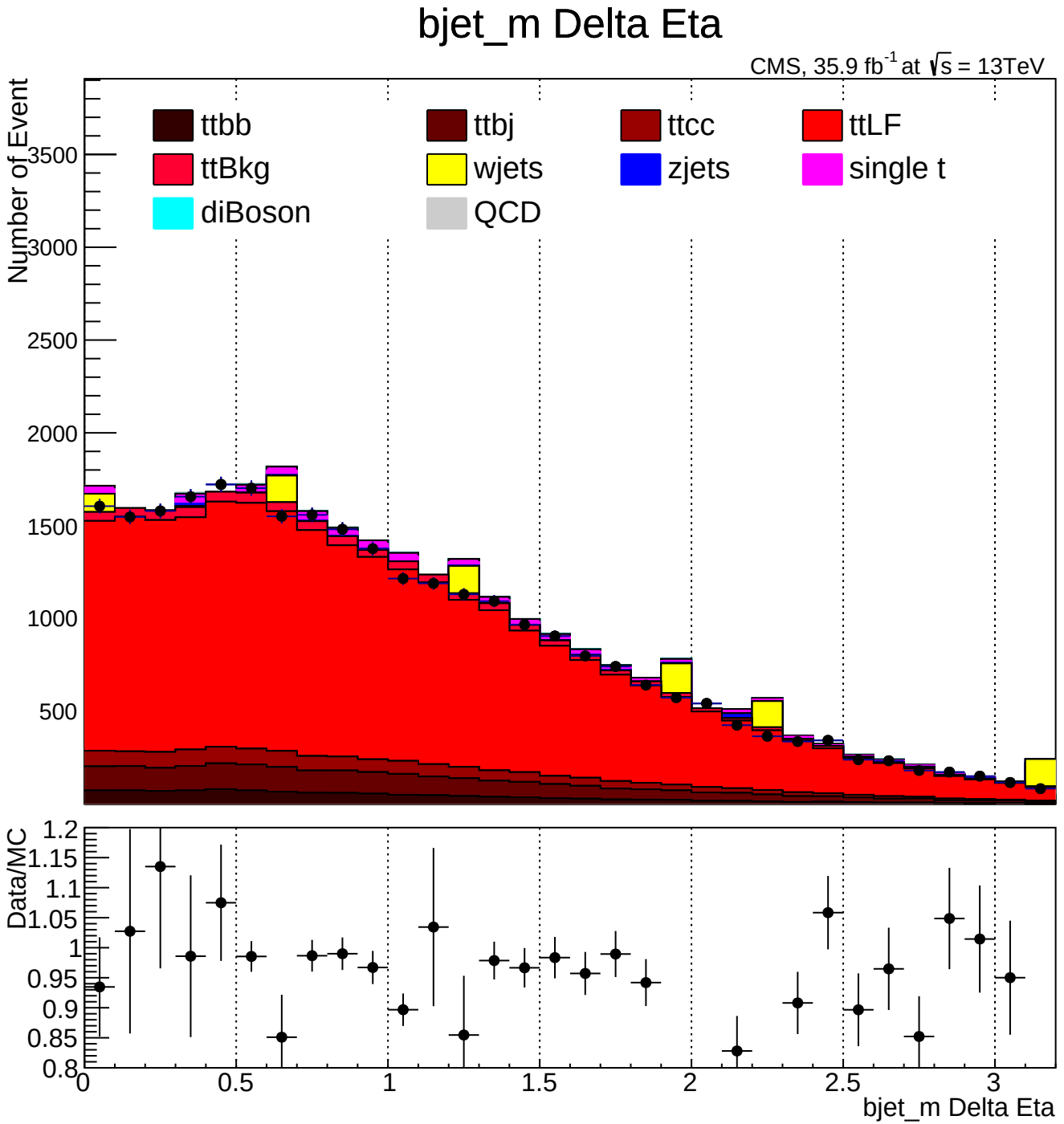


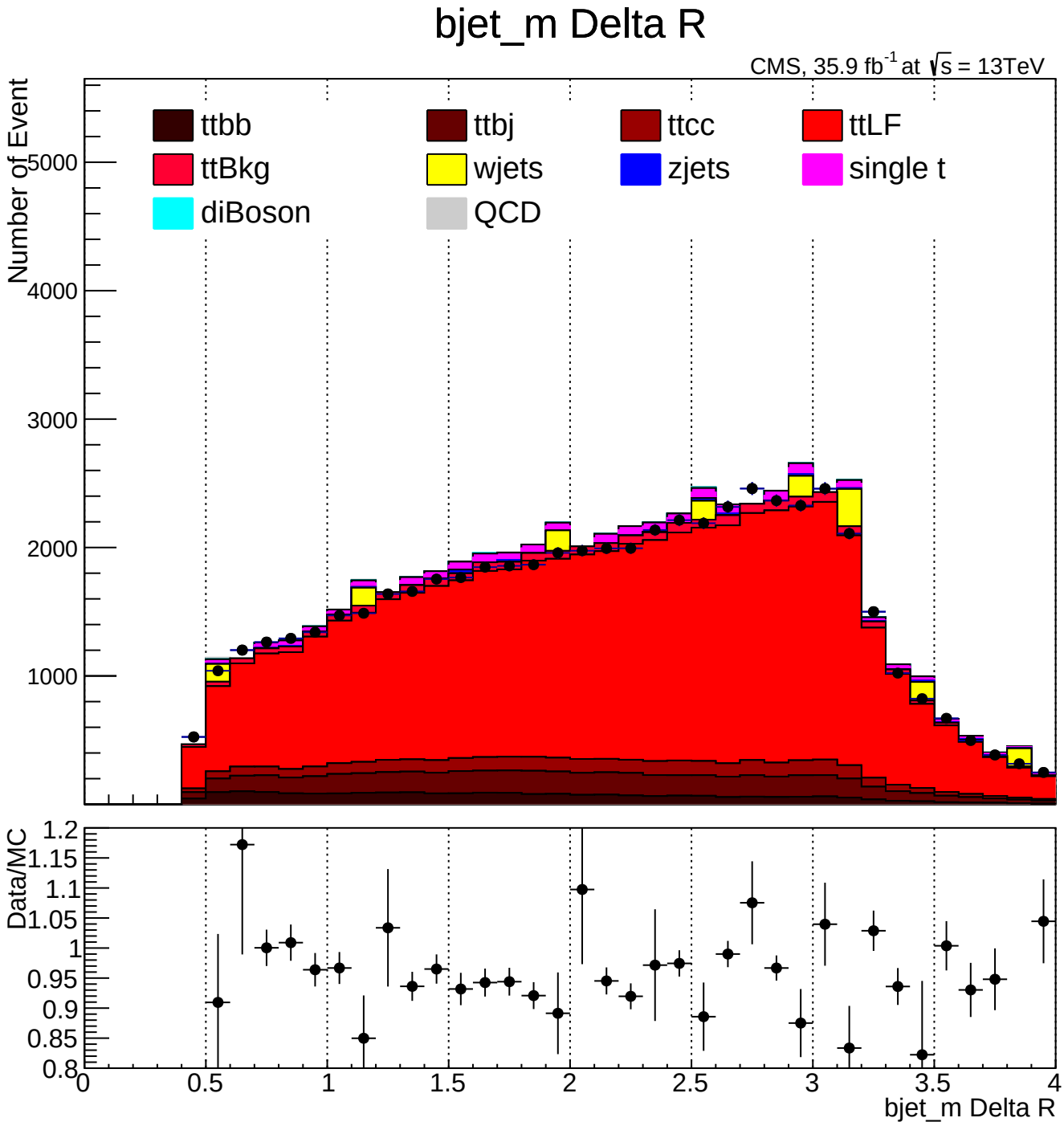

Leading b jet (medium) pT from di-bjets
CMS, 35.9 fb-1 at √s = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
b Jet (medium) pT from di-bjets (GeV)

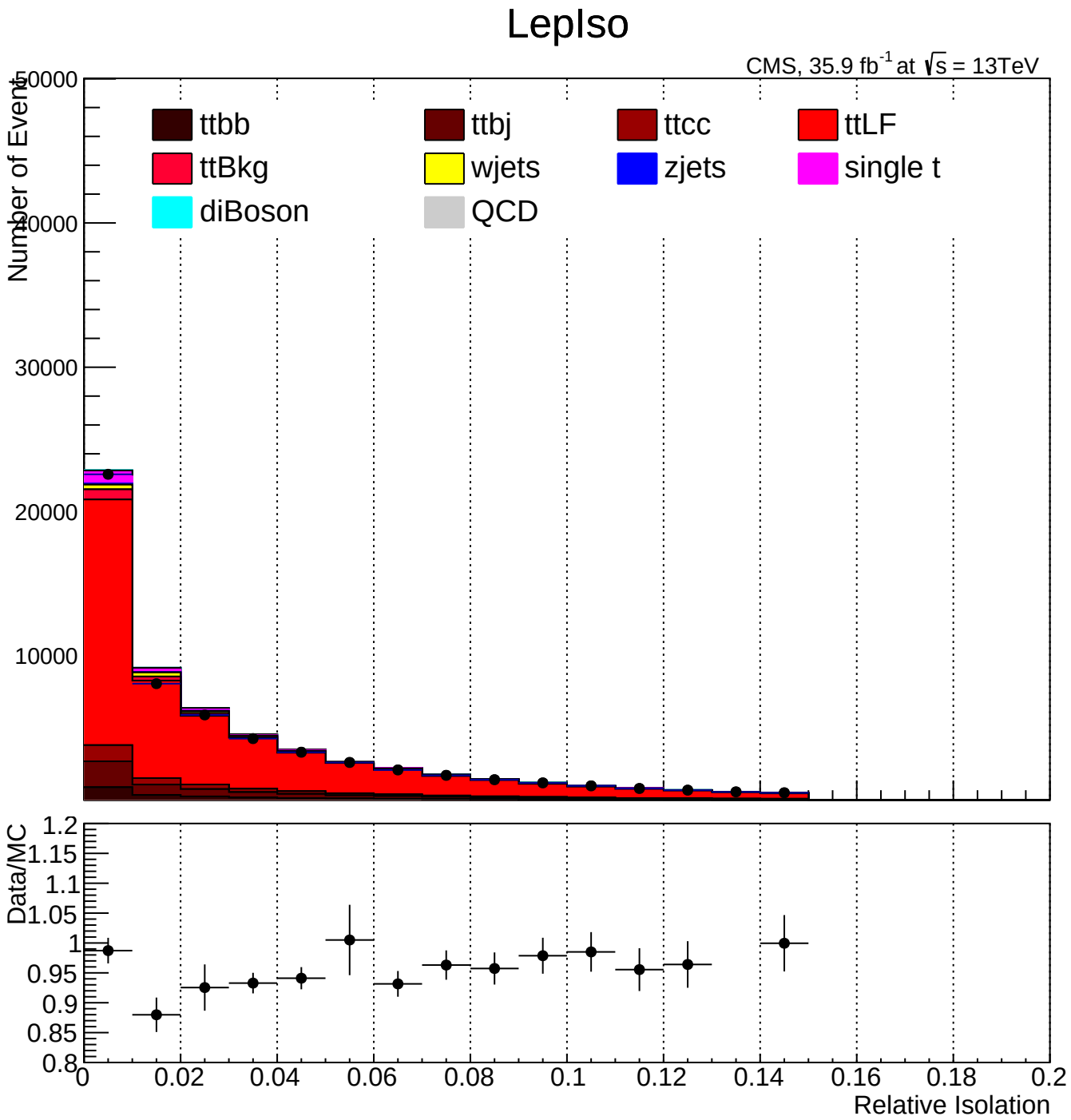

leading c jet (medium) pT
CMS, 35.9 fb-1 at √s = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
leading c Jet (medium) pT (GeV)

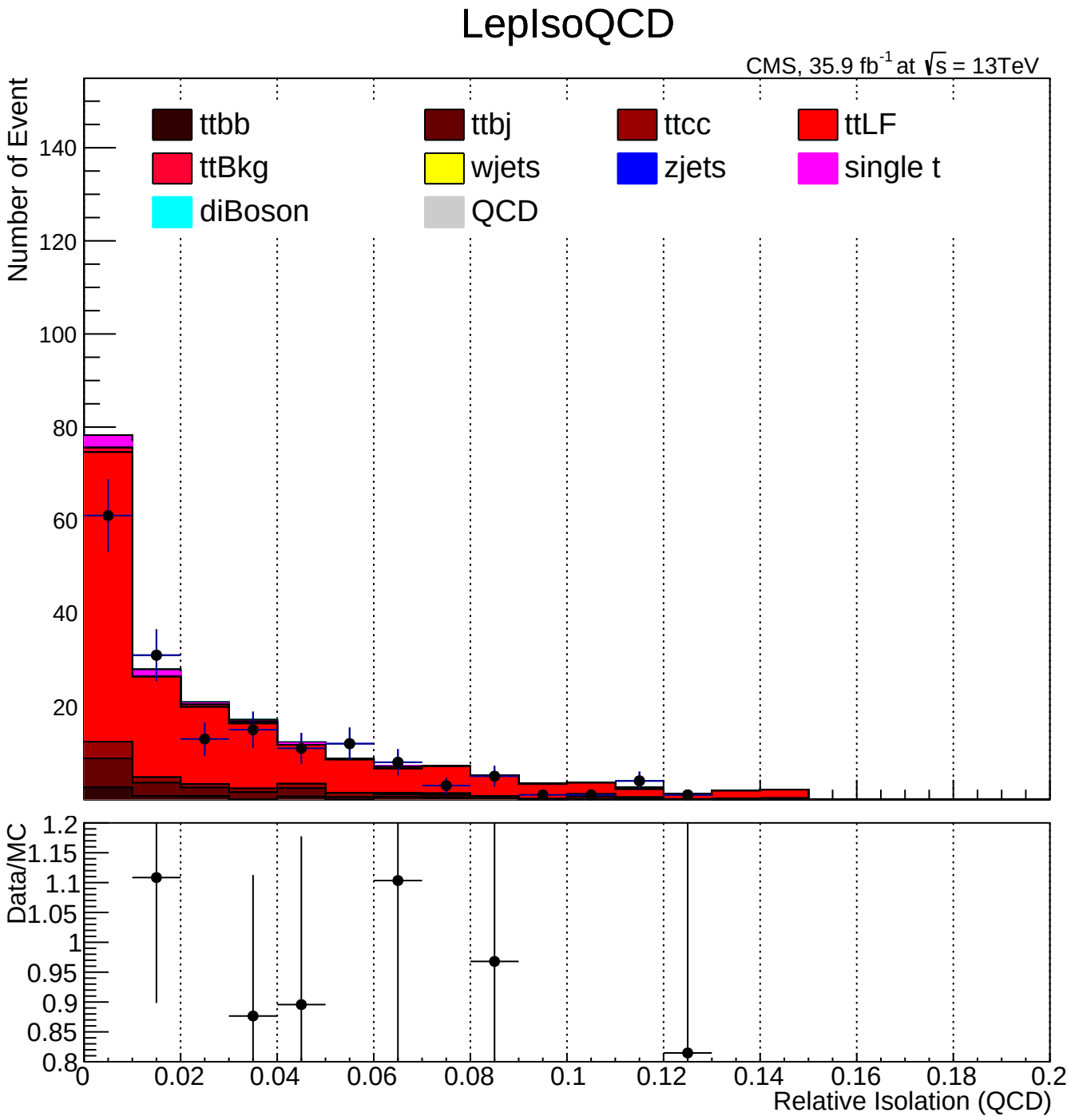

lepton DPhi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
3000
2500
2000
1500
1000
500
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
DPhi

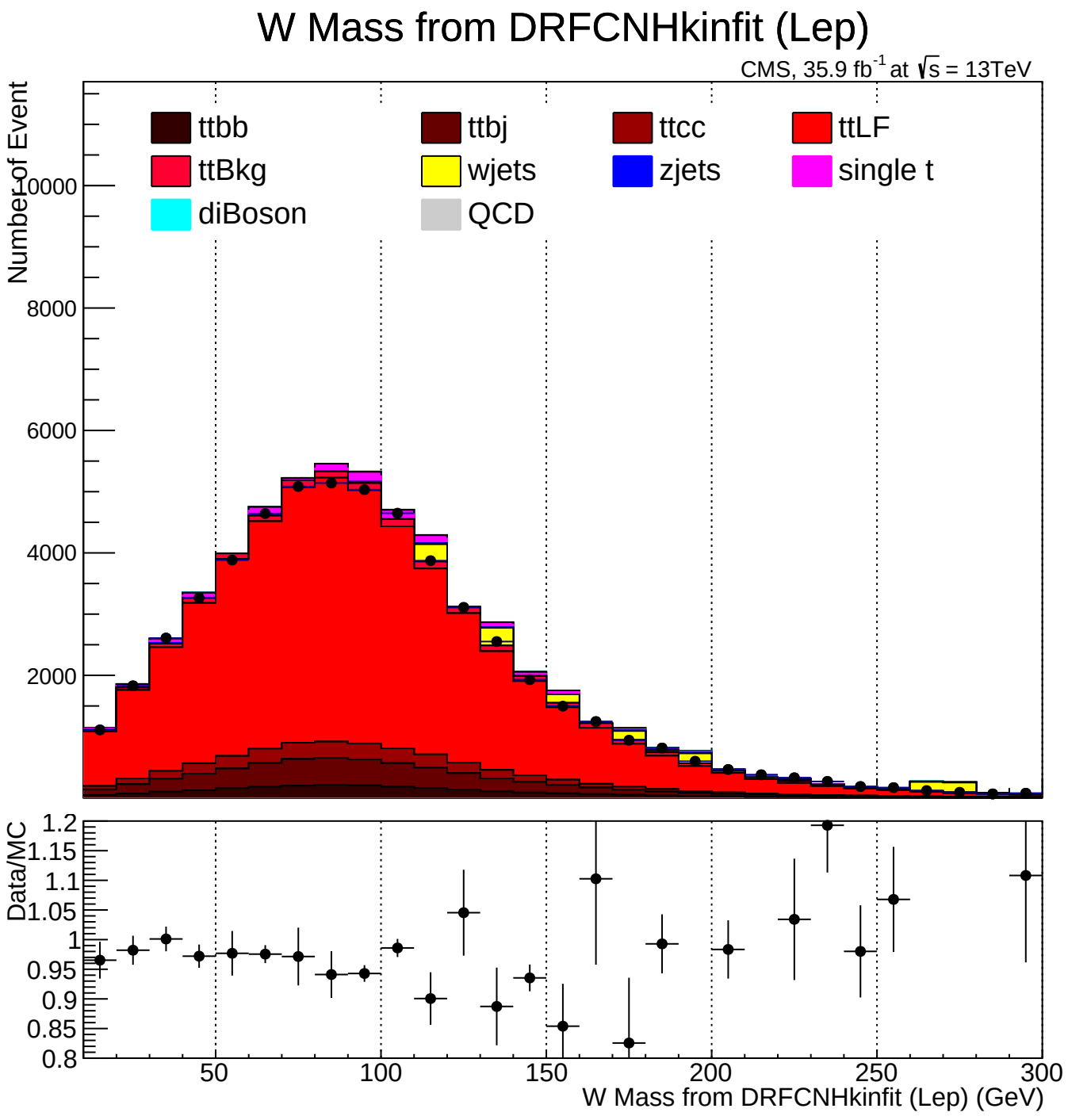

bjet_m Delta Phi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
2500
2000
1500
1000
500
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Phi

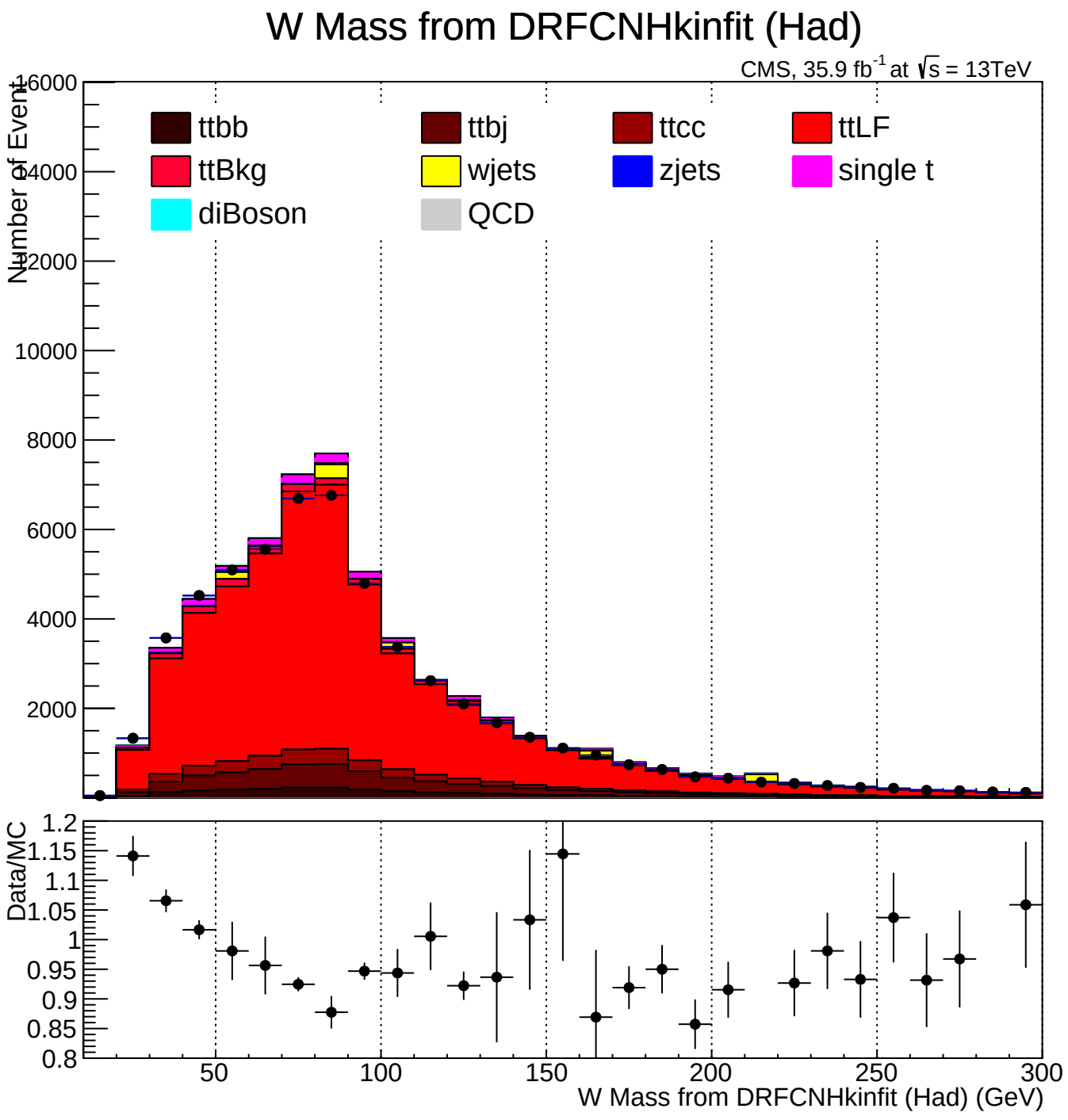

bjet_m Delta Eta
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
3500
3000
2500
2000
1500
1000
500
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Eta

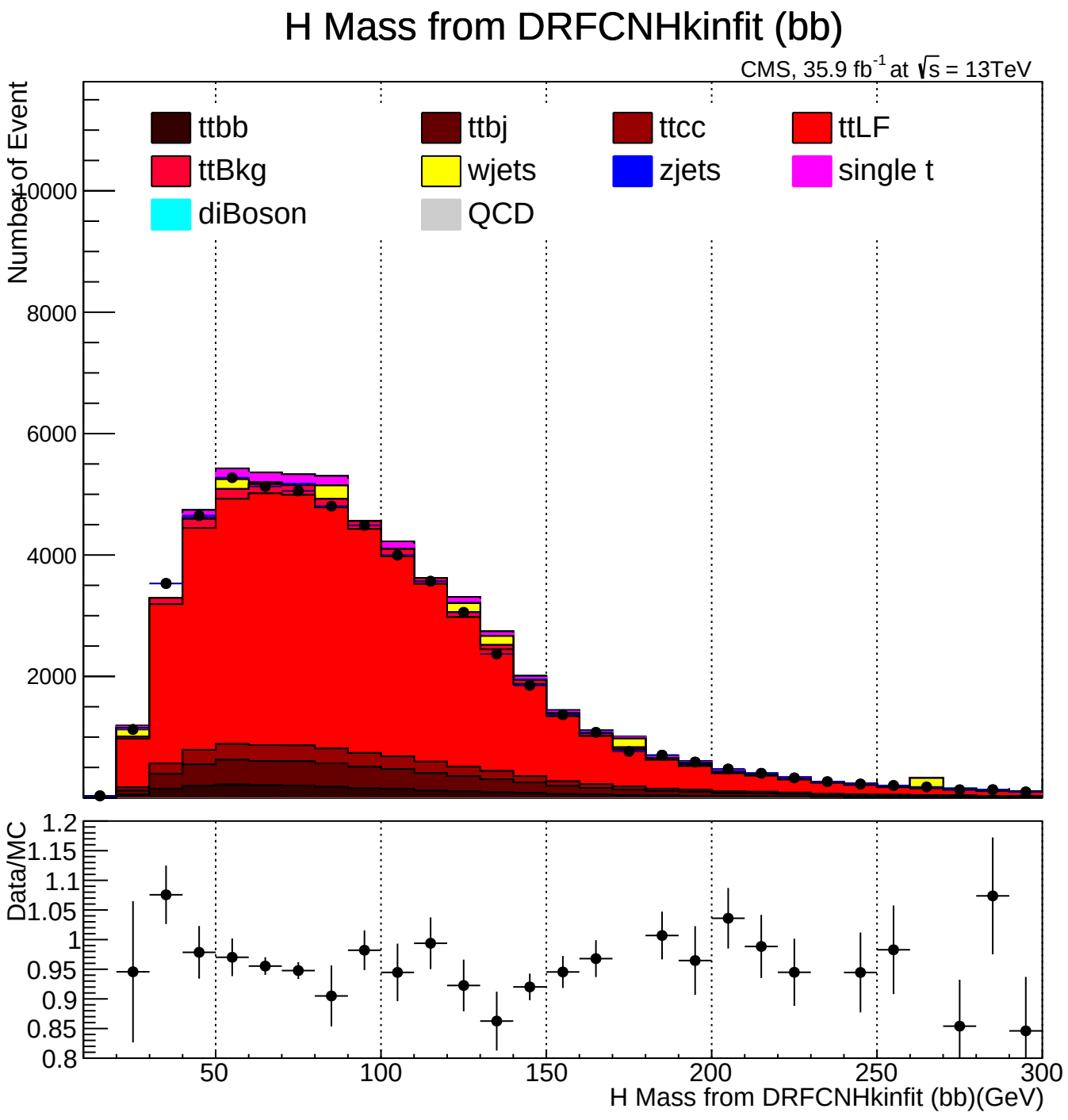

bjet_m Delta R
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
3.5
4
bjet_m Delta R

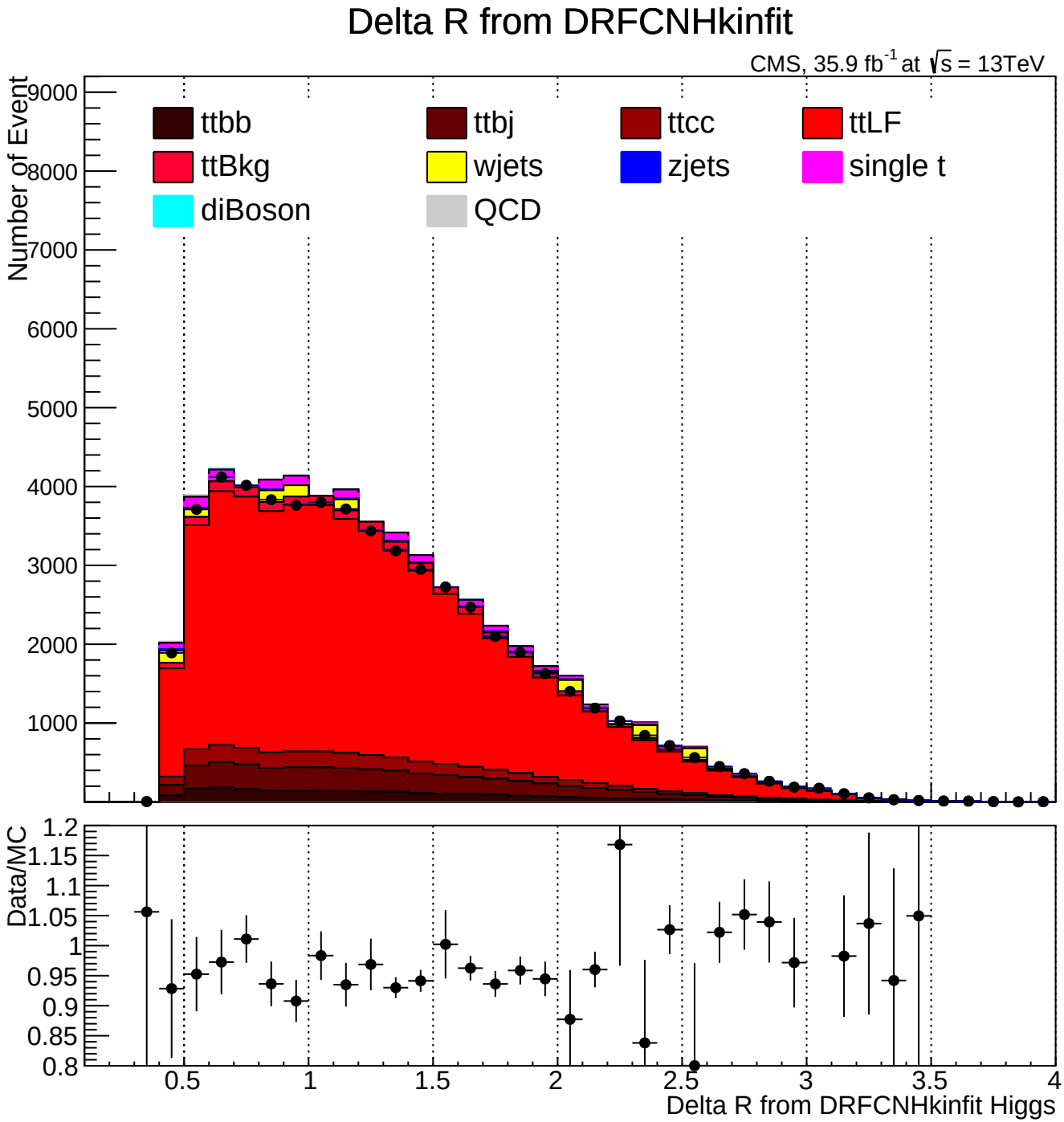

LepIso
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Events
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
50000
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation

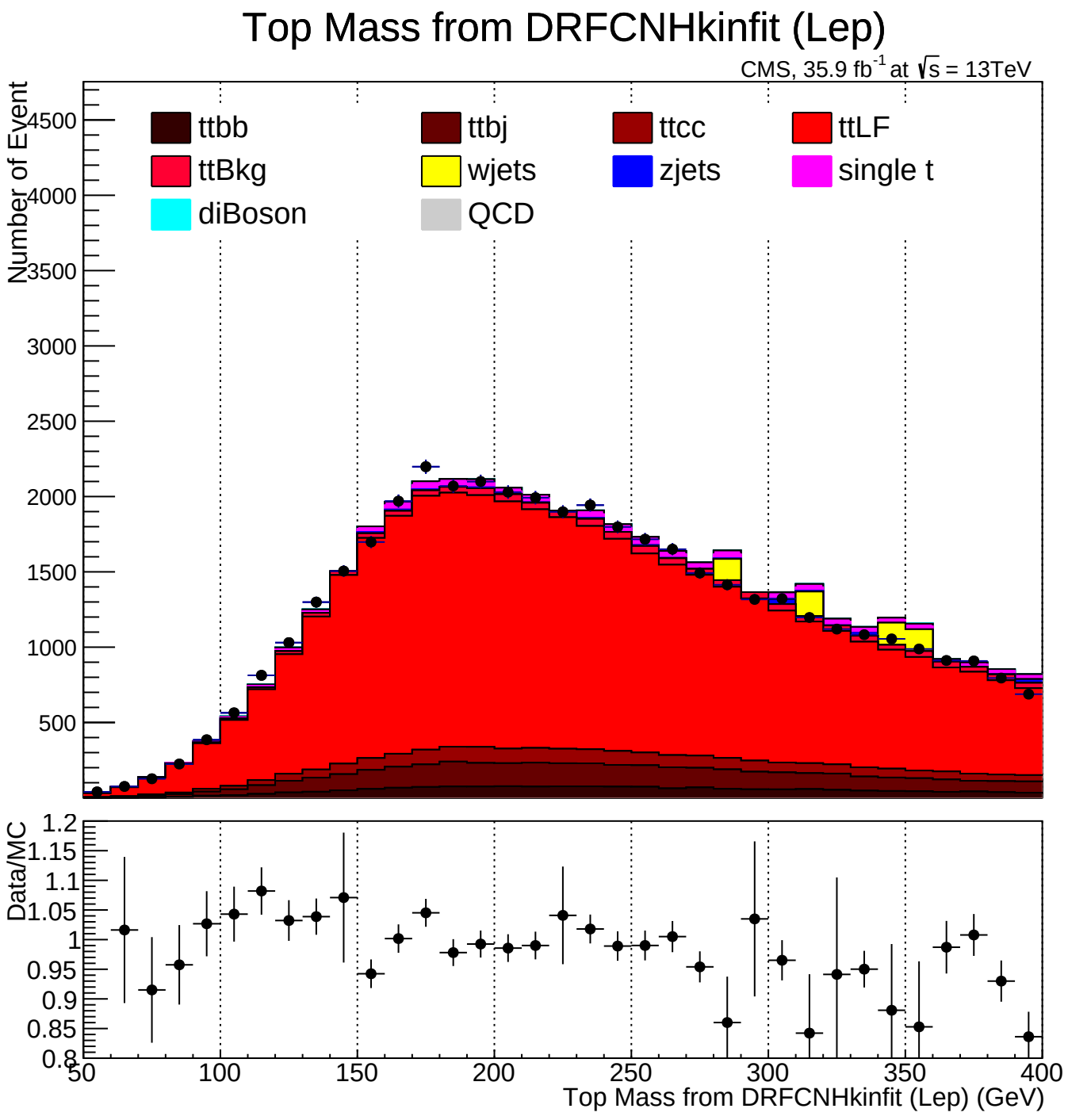

LepIsoQCD
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
Relative Isolation (QCD)

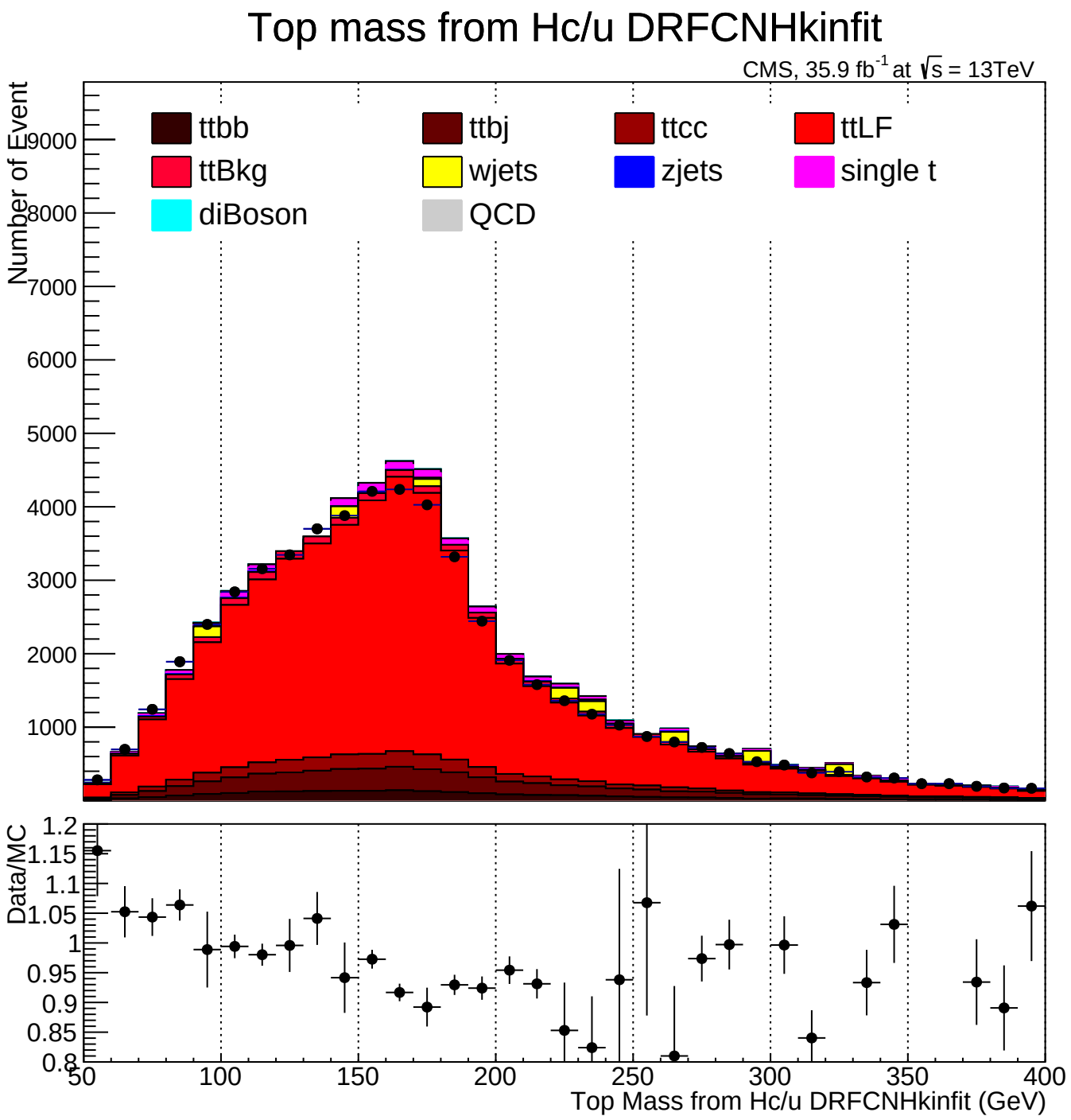

W Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb-1 at √s = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
W Mass from DRFCNHkinfit (Lep) (GeV)

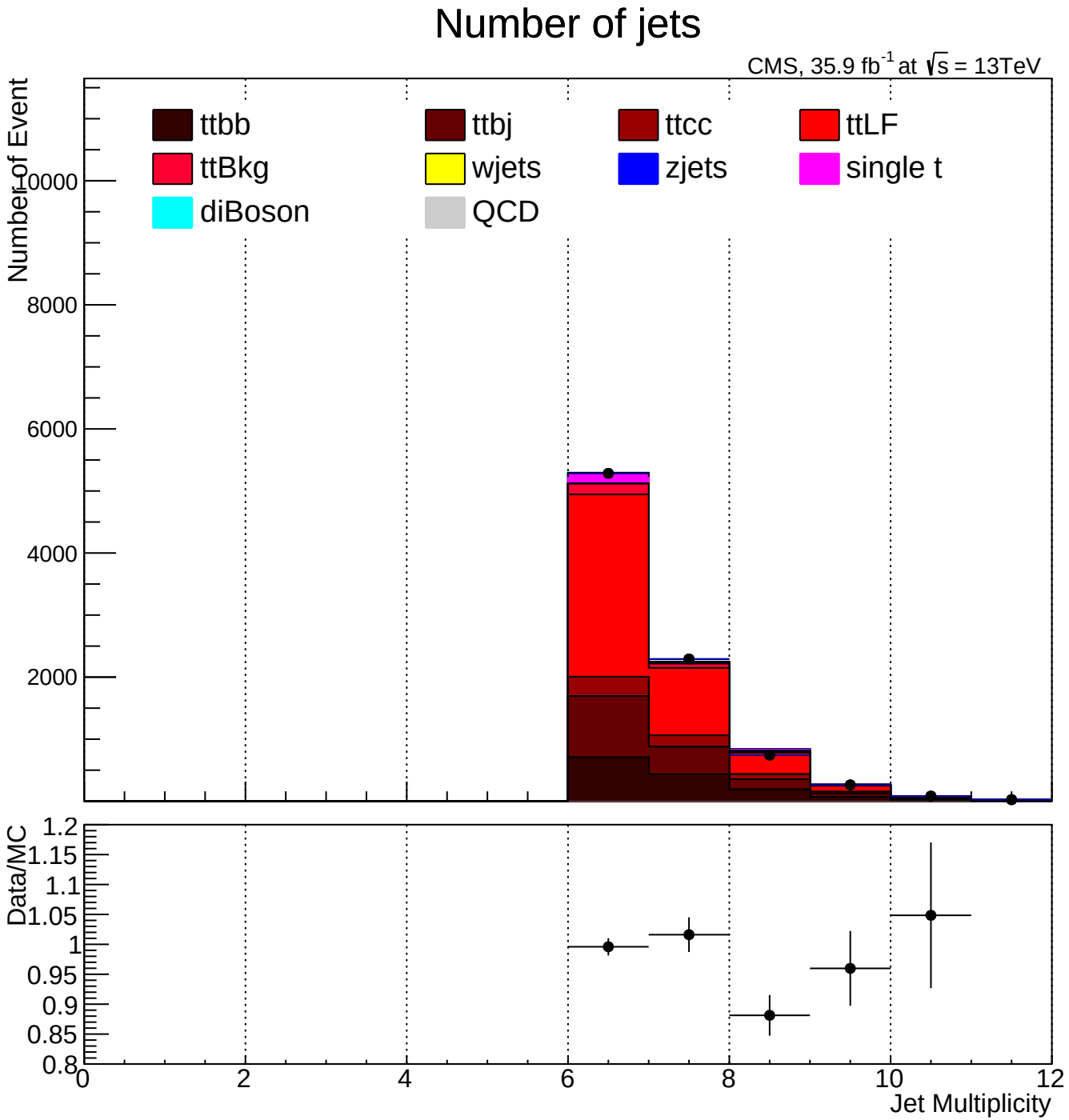

W Mass from DRFCNHkinfit (Had)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
16000
14000
12000
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
W Mass from DRFCNHkinfit (Had) (GeV)

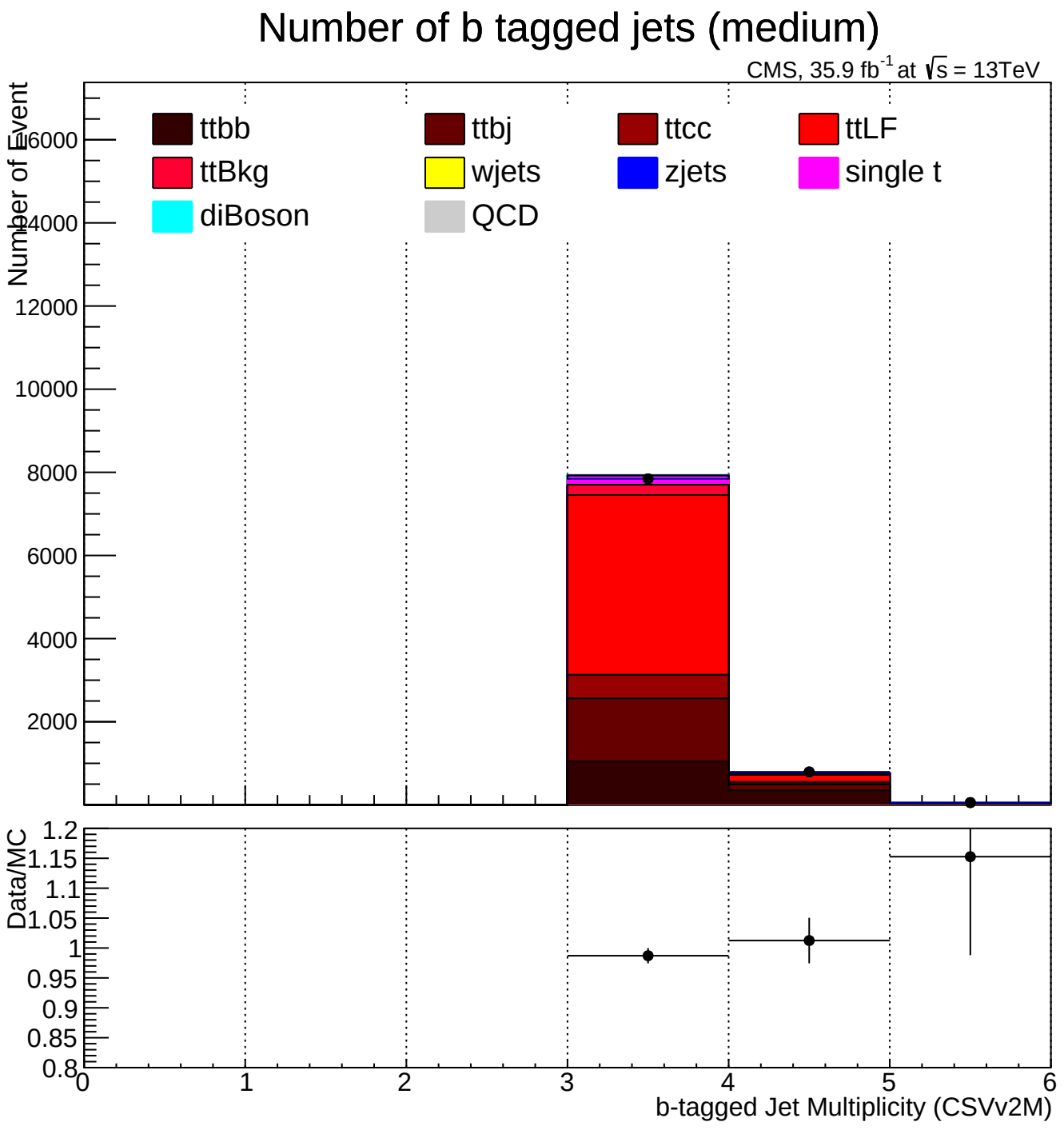

H Mass from DRFCNHkinfit (bb)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
H Mass from DRFCNHkinfit (bb)(GeV)

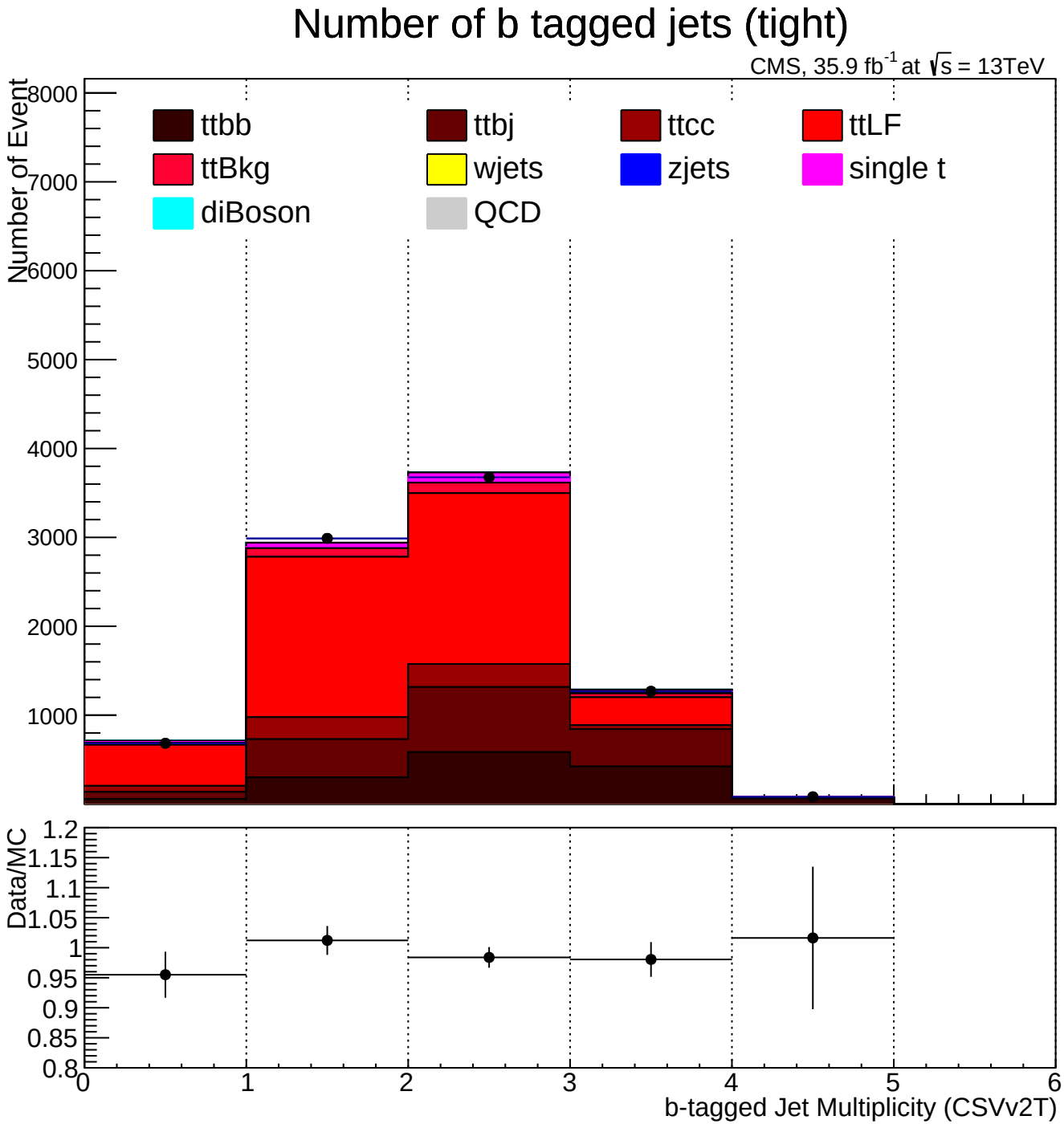

Delta R from DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Delta R from DRFCNHkinfit Higgs

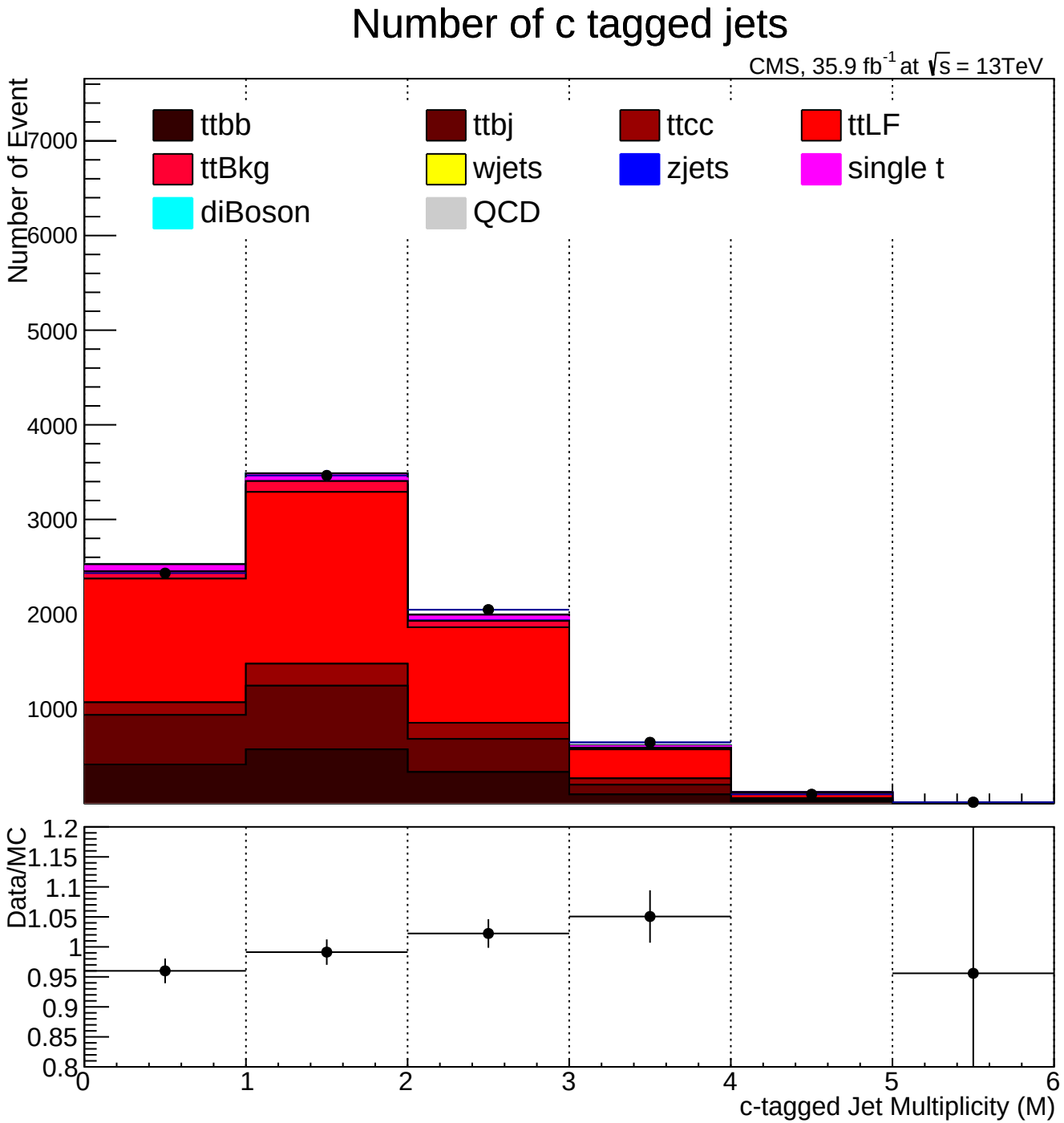

Top Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Top Mass from DRFCNHkinfit (Lep) (GeV)

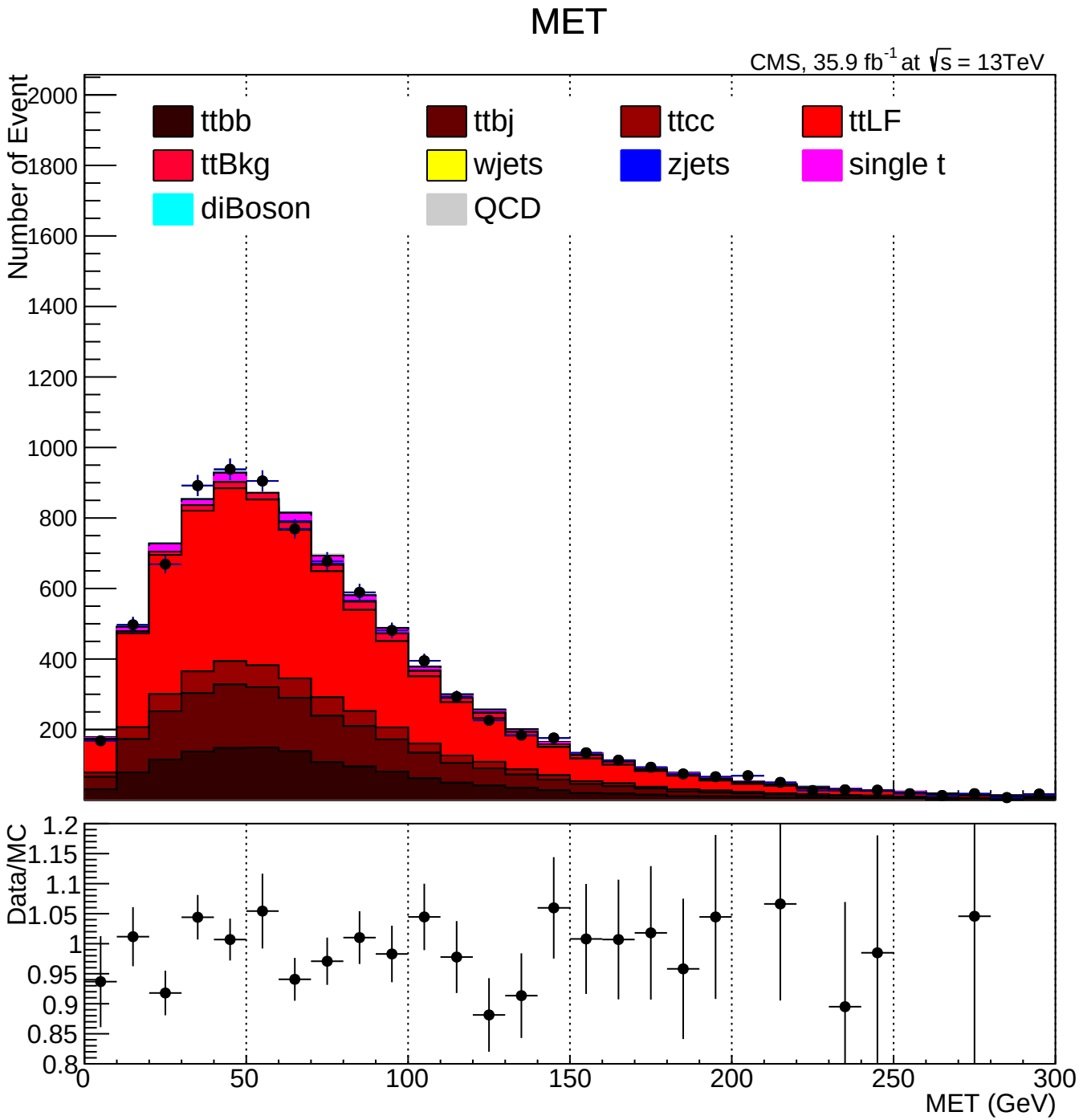

Top mass from Hc/u DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Top Mass from Hc/u DRFCNHkinfit (GeV)

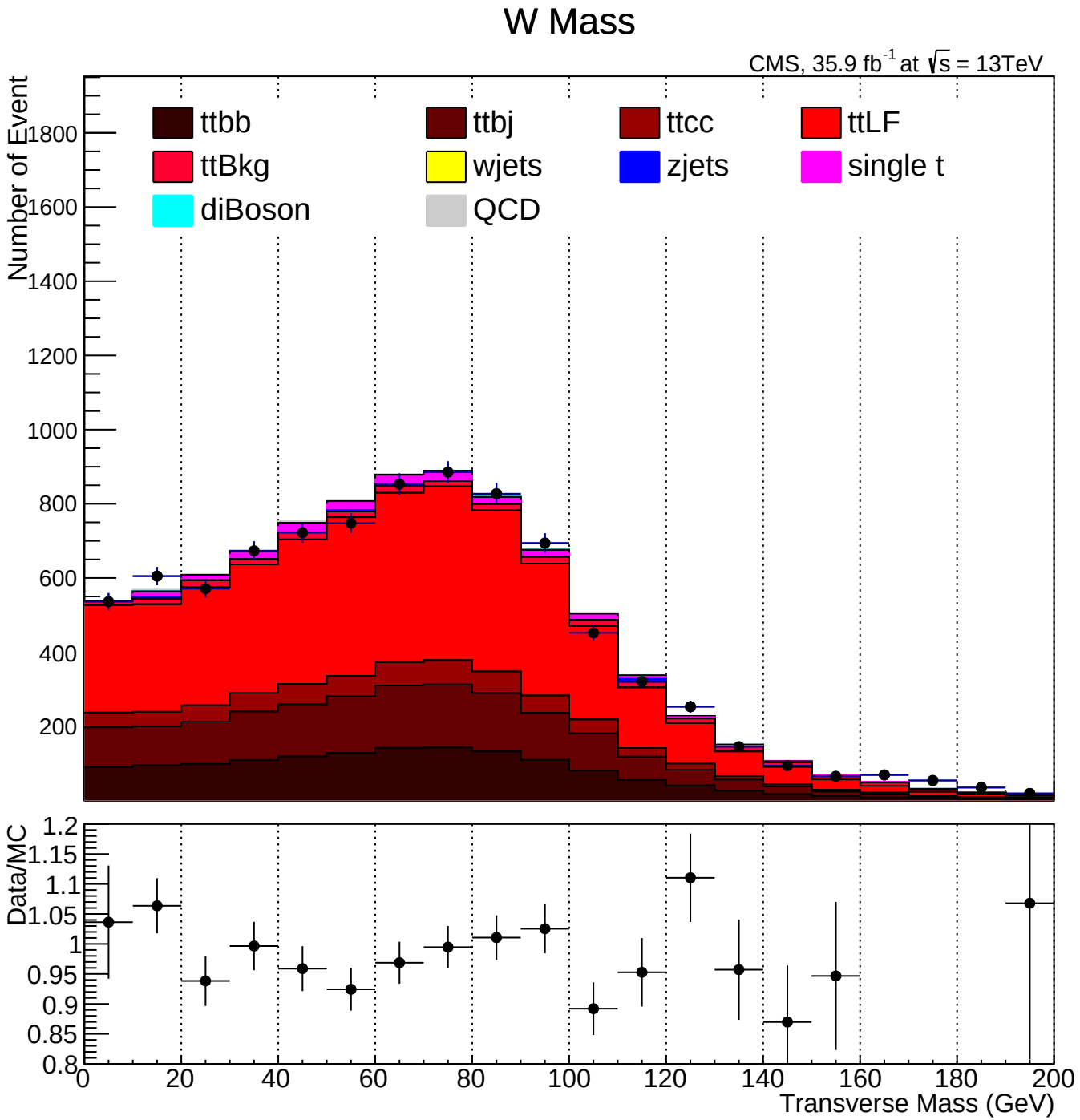

Number of jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
2
4
6
8
10
12
Jet Multiplicity


Number of b tagged jets (medium)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
16000
14000
12000
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2M)

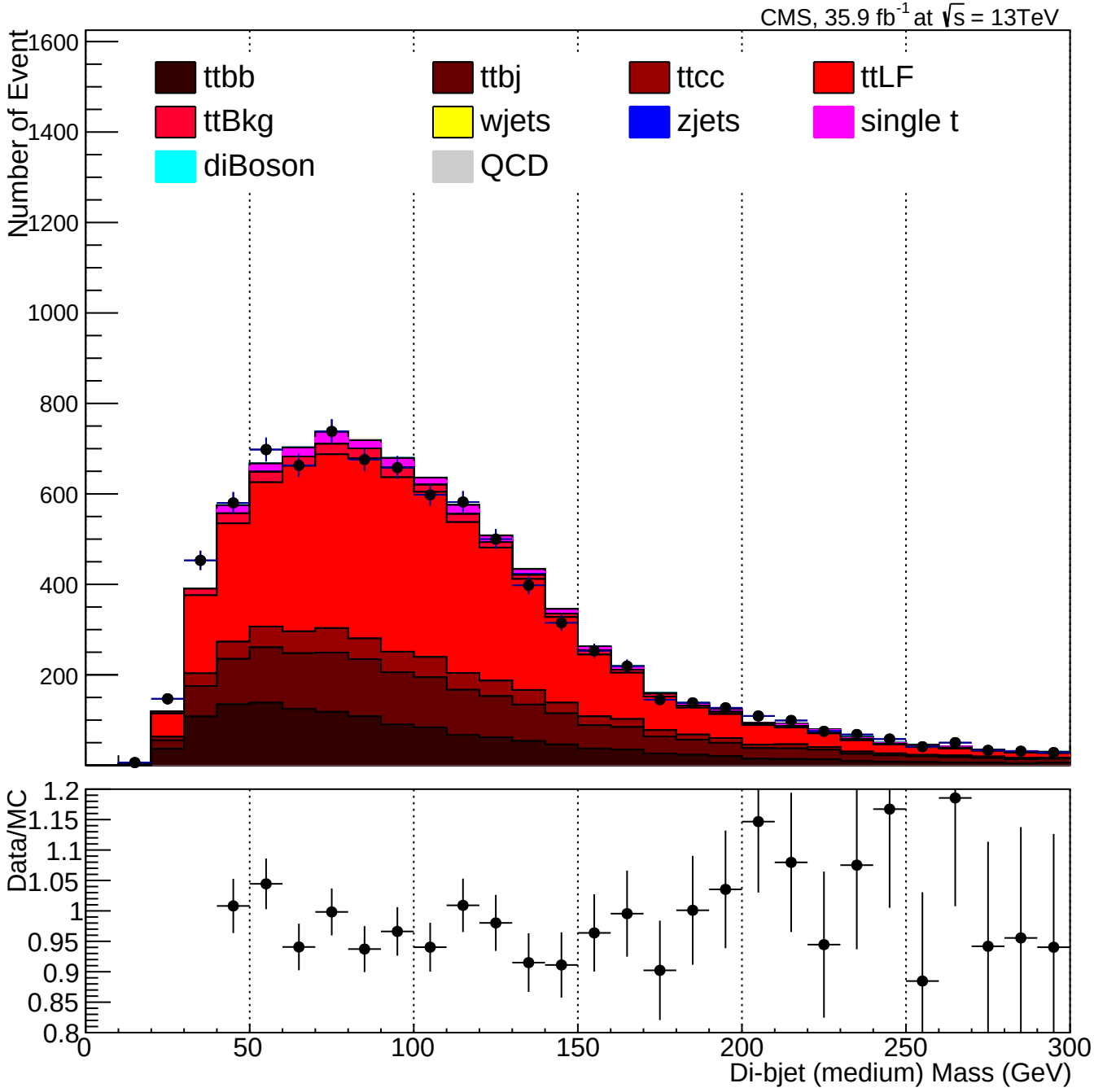

Number of b tagged jets (tight)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b-tagged Jet Multiplicity (CSVv2T)

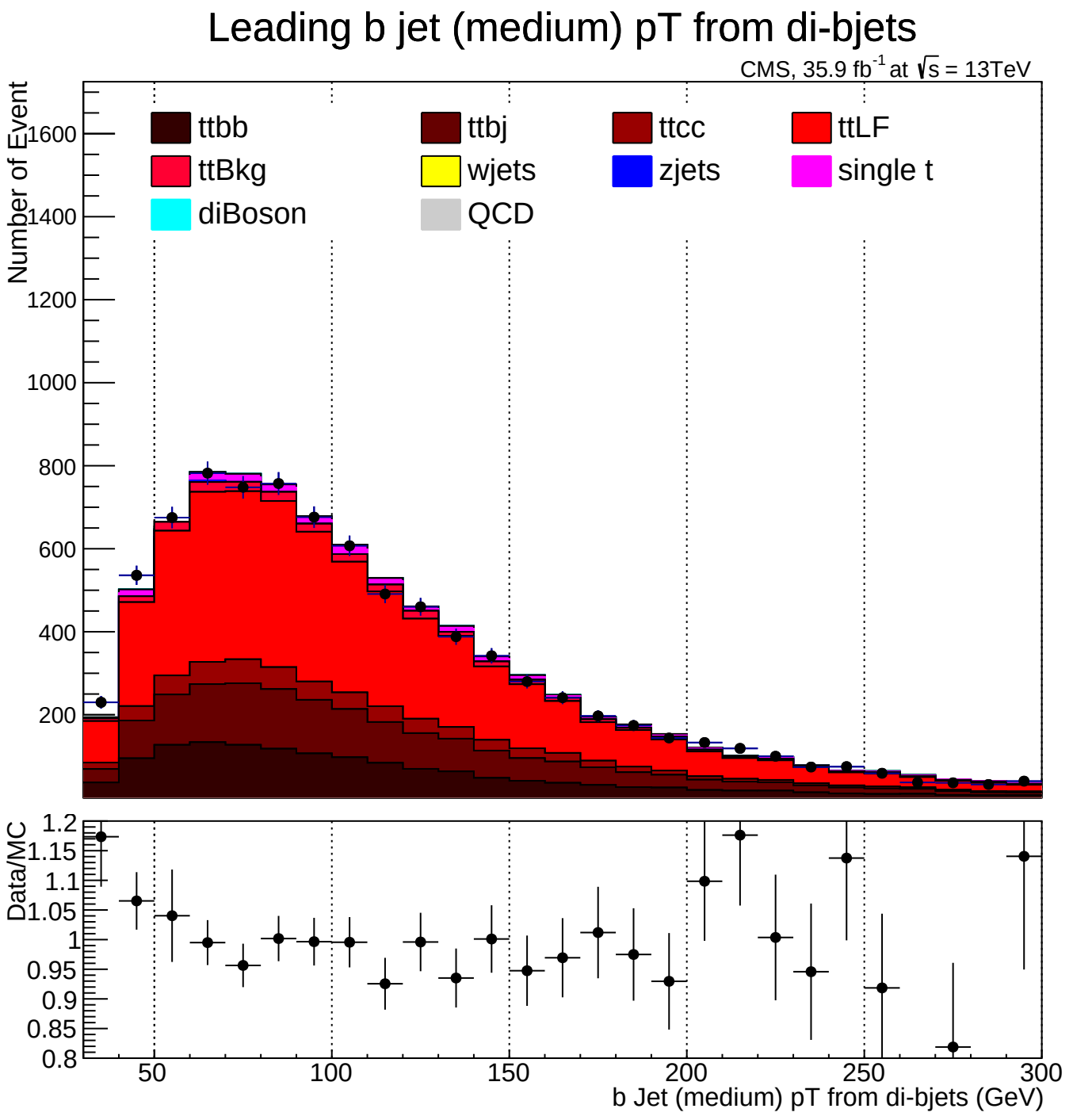

Number of c tagged jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
7000
6000
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
c-tagged Jet Multiplicity (M)

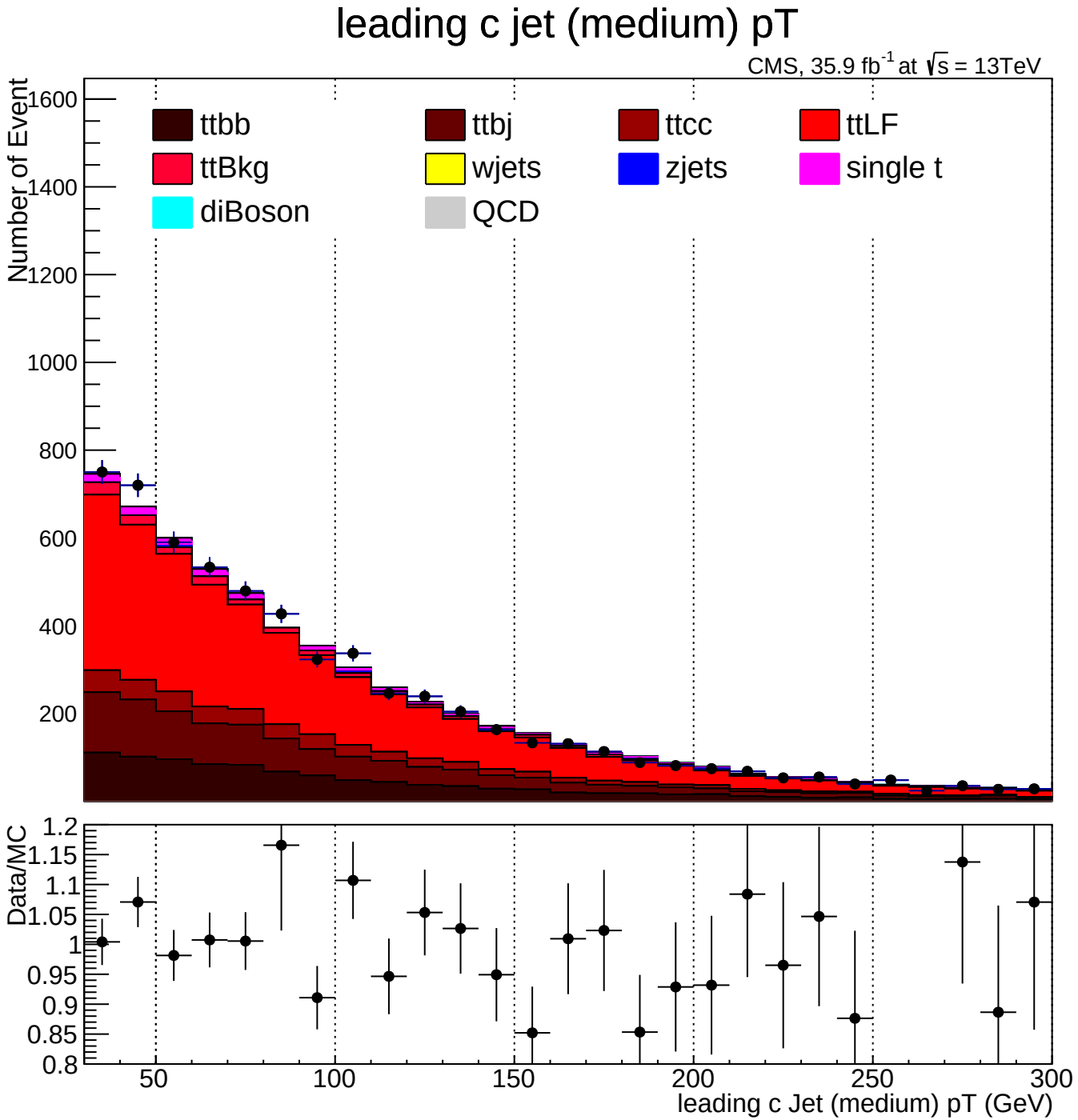

MET
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
MET (GeV)

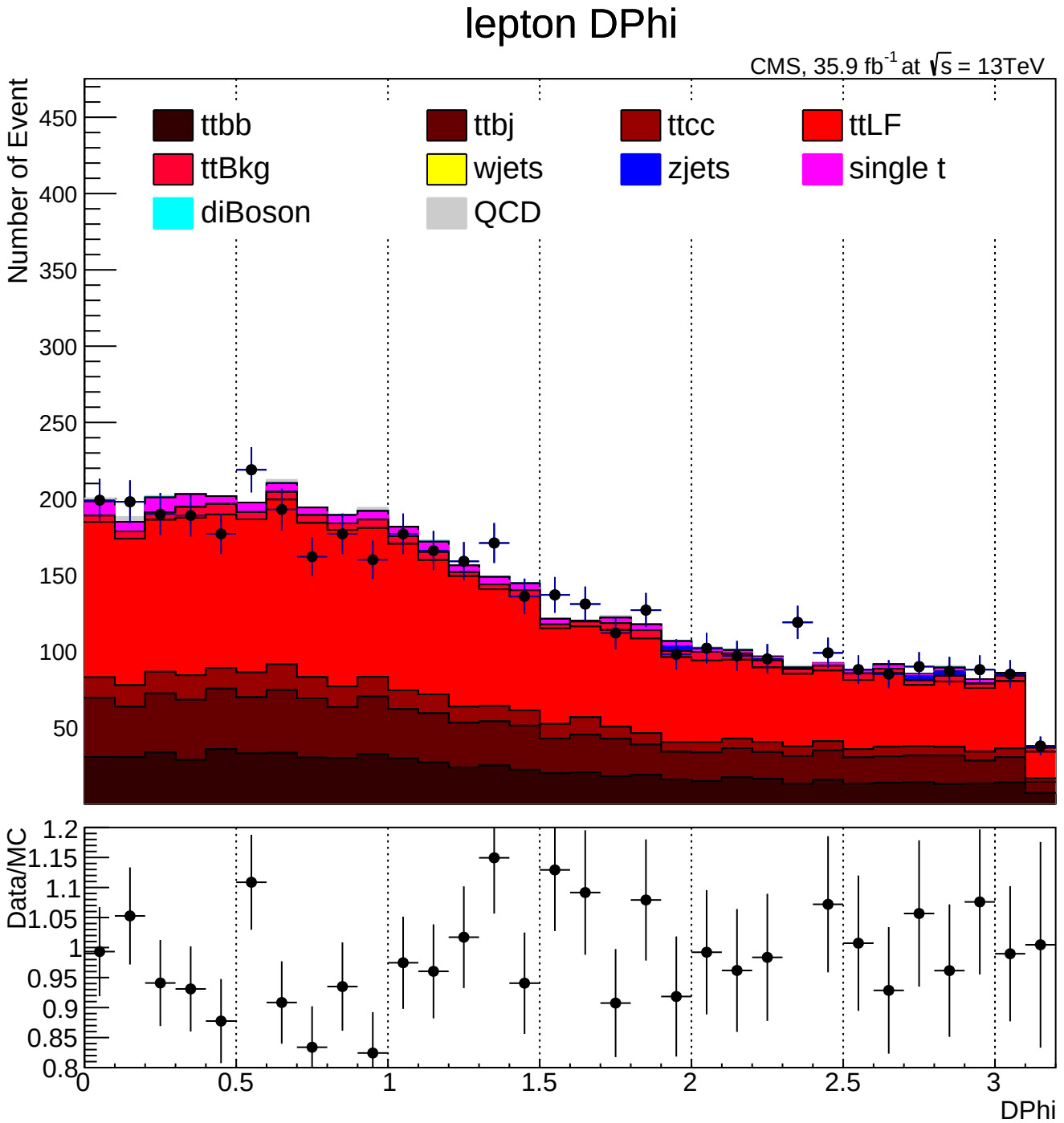

W Mass
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Transverse Mass (GeV)

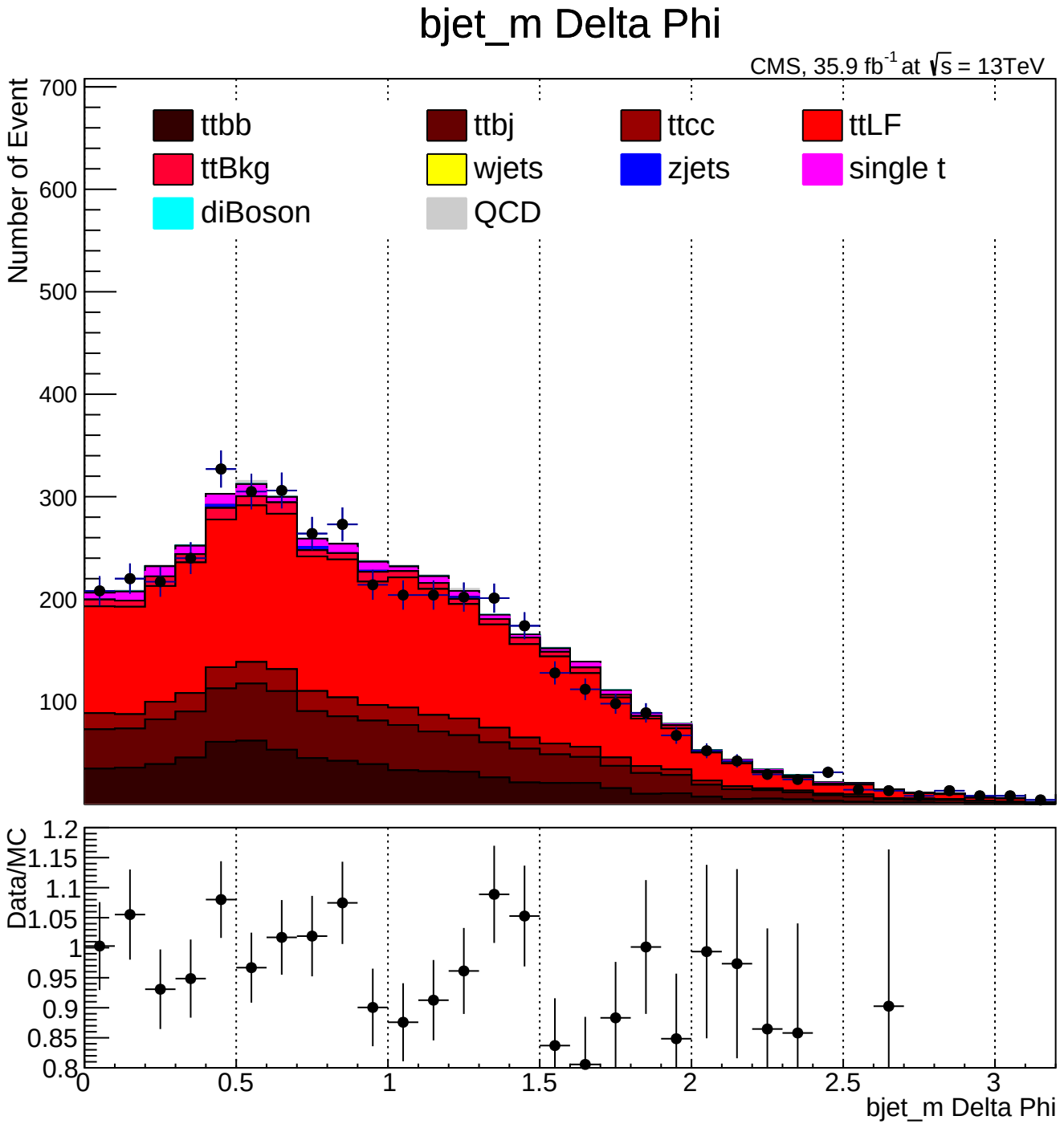
Di-bjet Mass (medium) wrt min DR

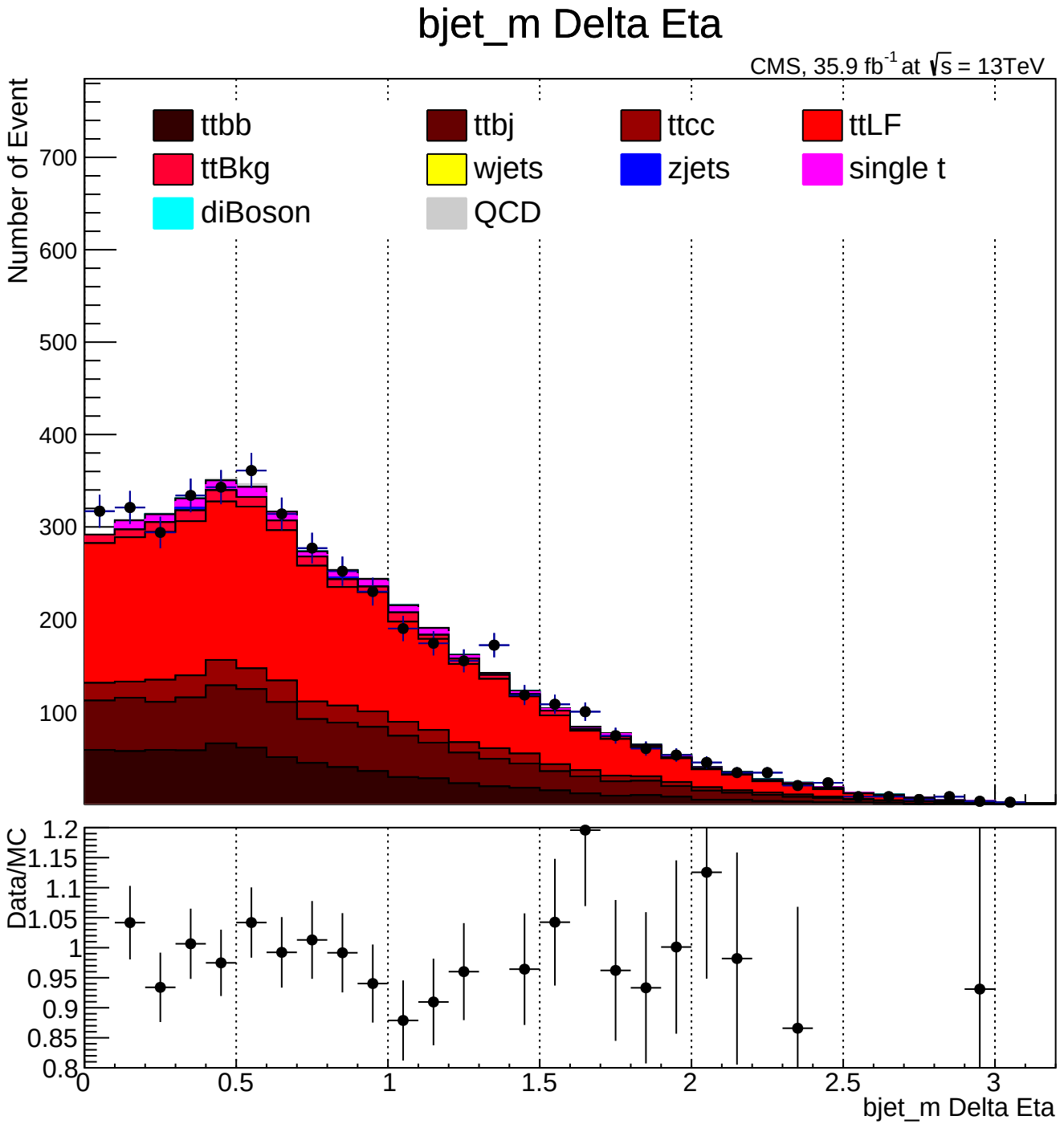


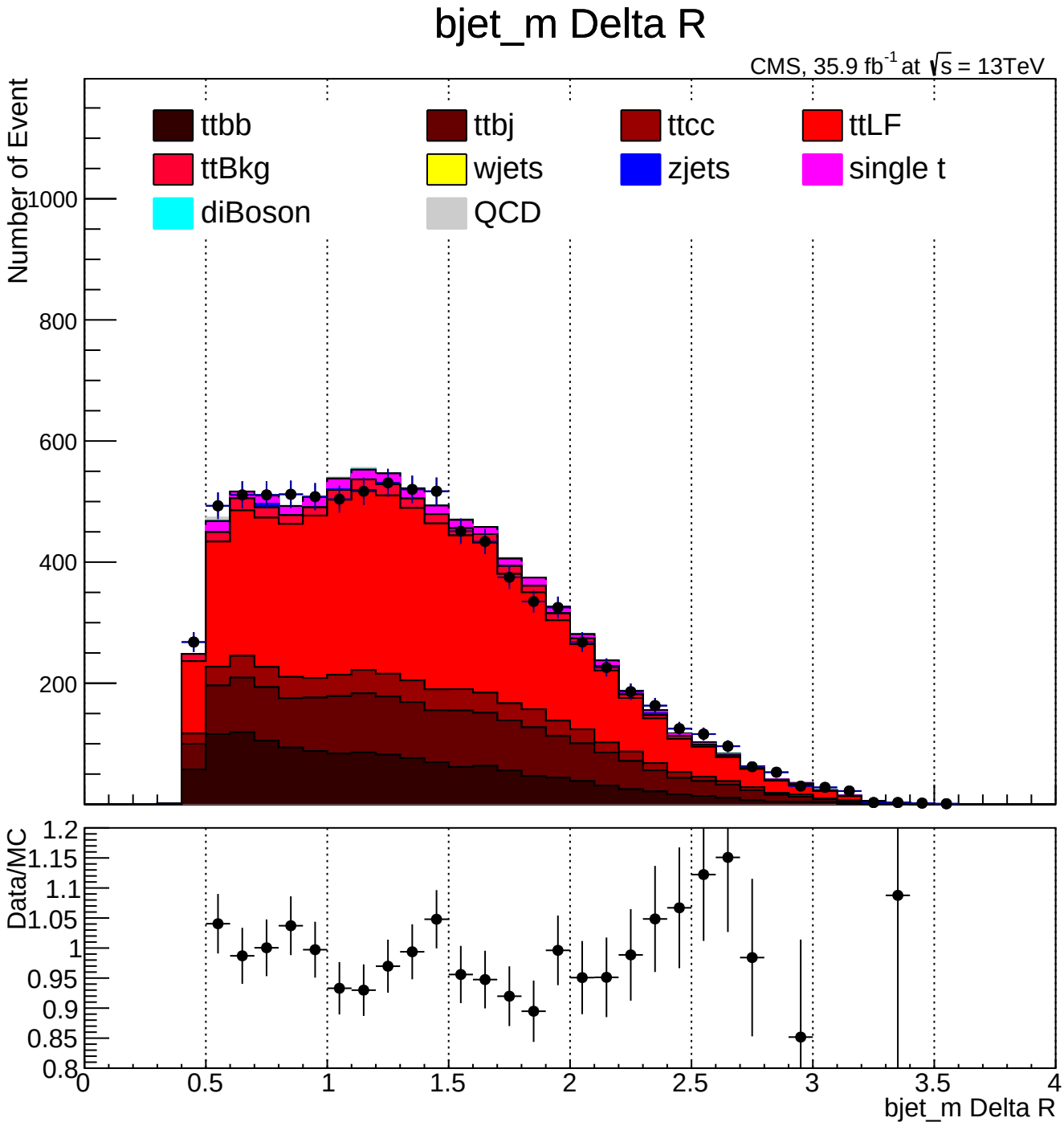

Leading b jet (medium) pT from di-bjets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b Jet (medium) pT from di-bjets (GeV)

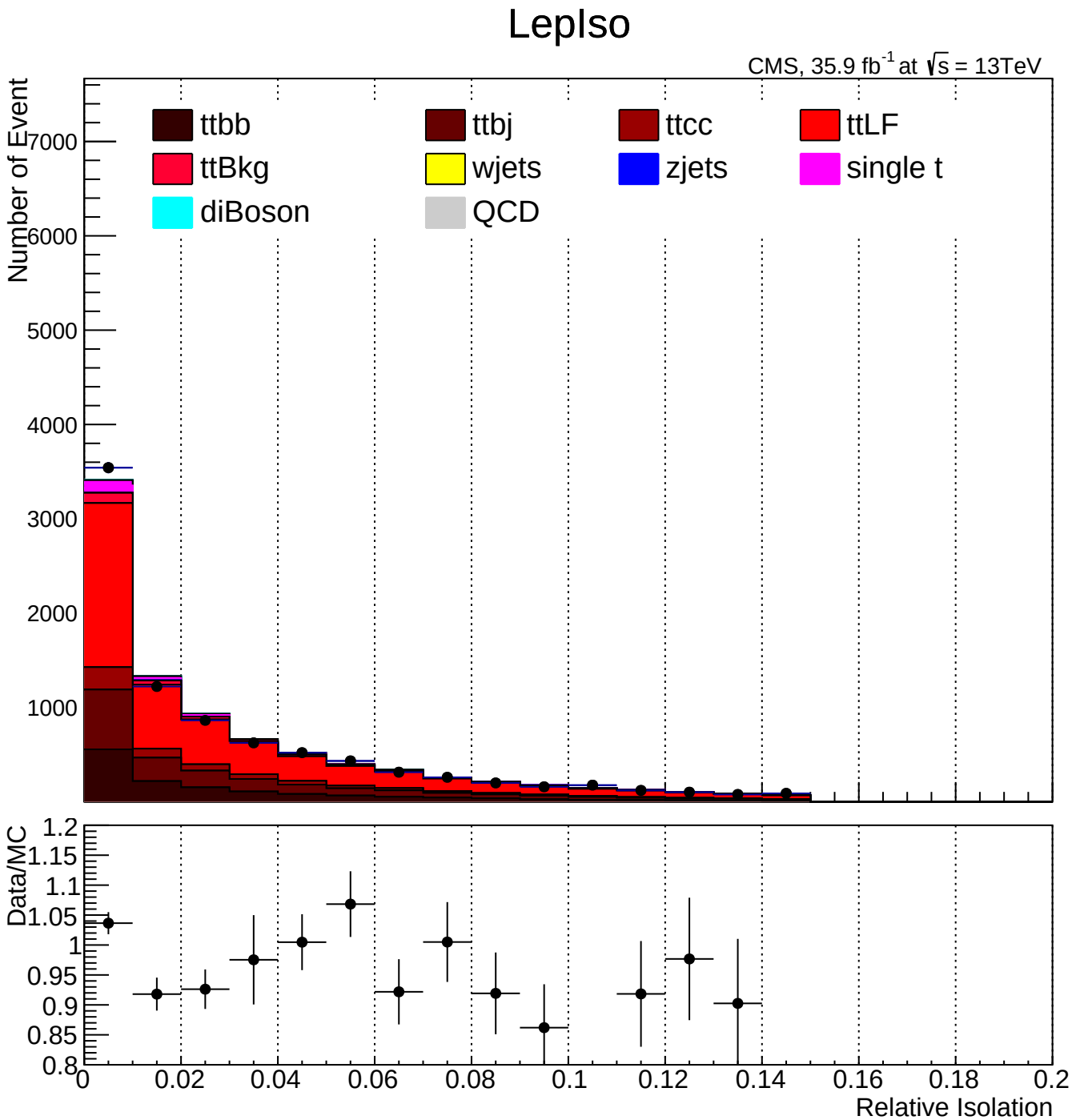

leading c jet (medium) pT
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
leading c Jet (medium) pT (GeV)

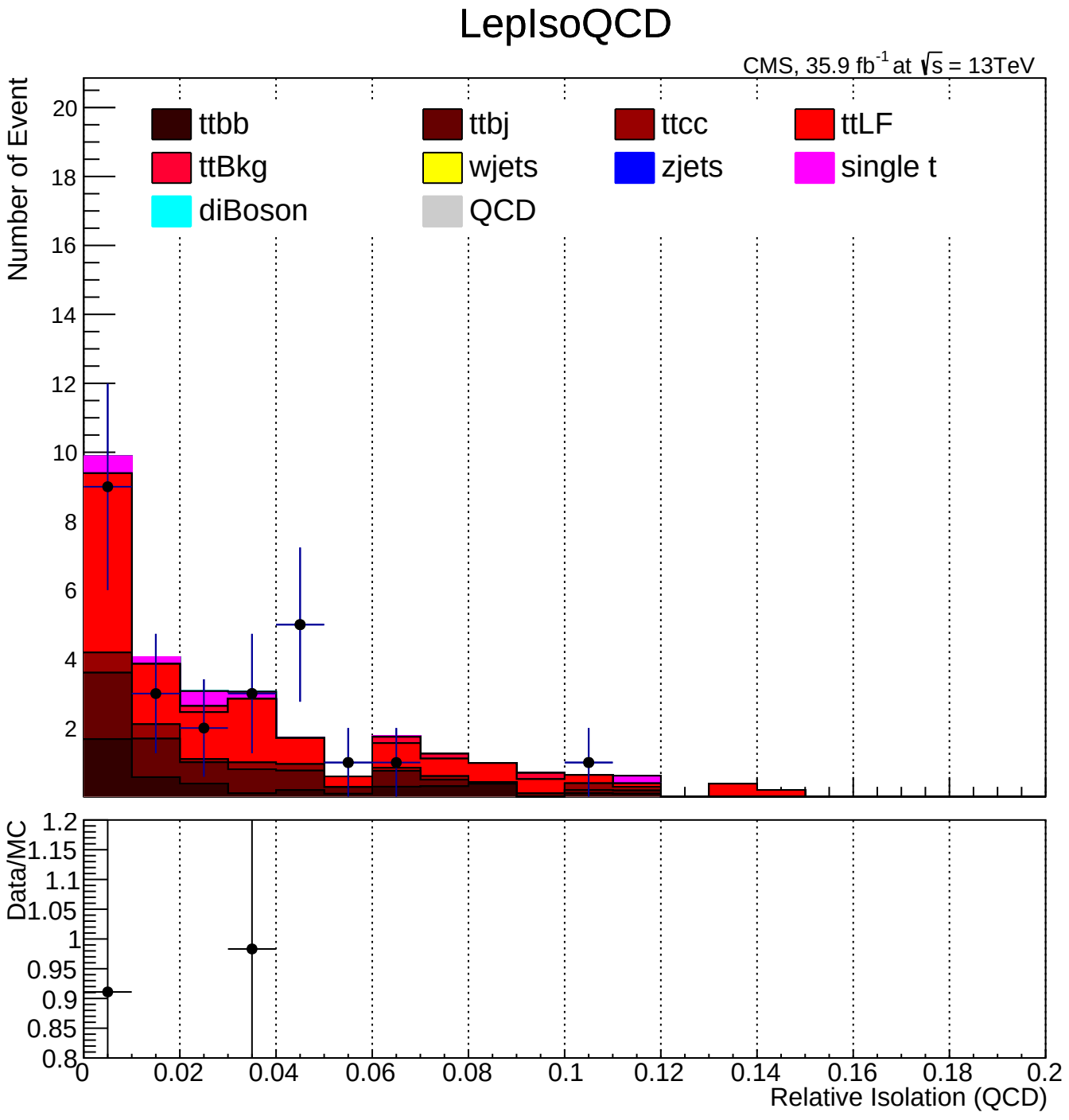

lepton DPhi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
DPhi

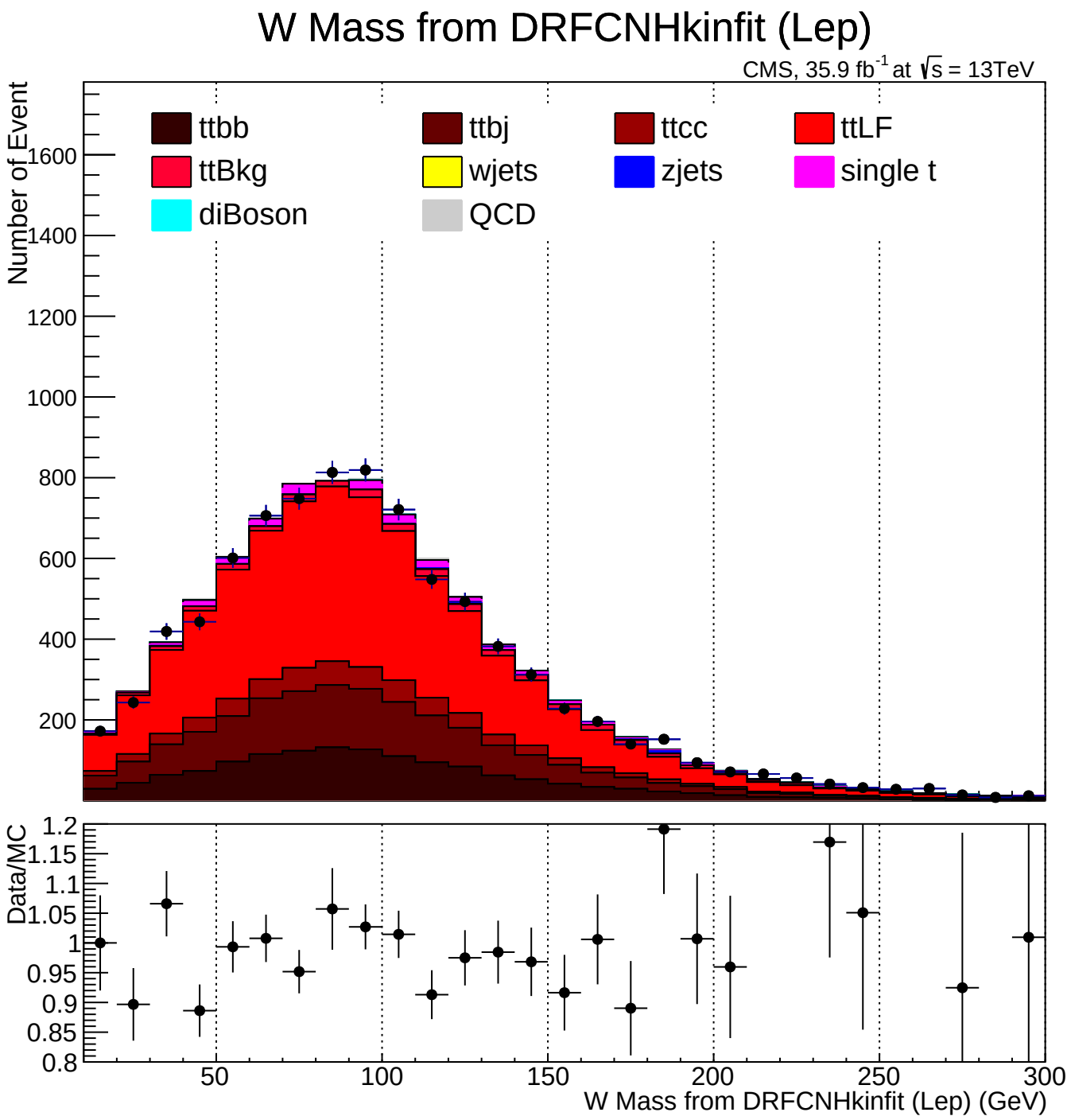

bjet_m Delta Phi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta Phi

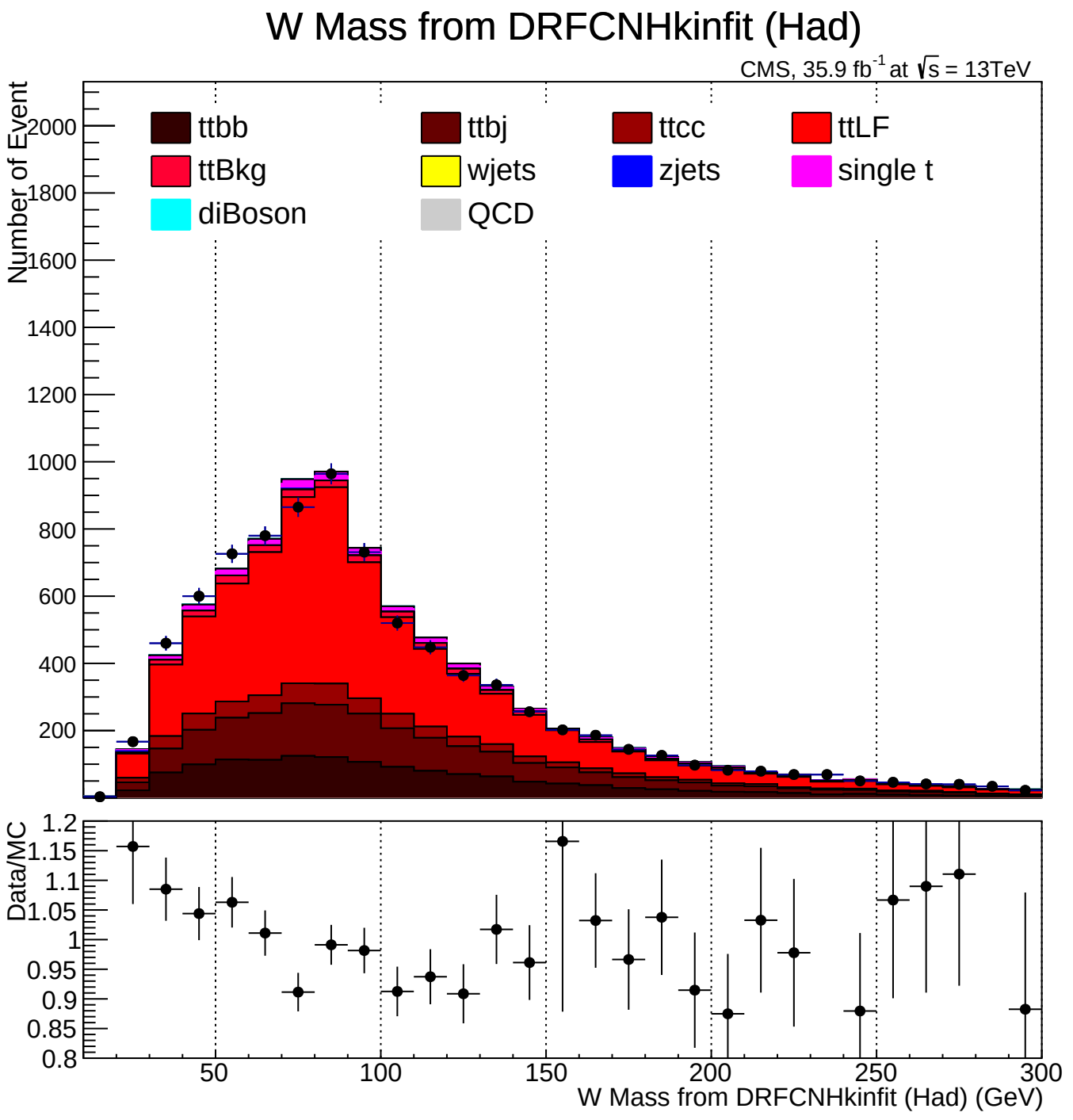

bjet_m Delta Eta
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta Eta

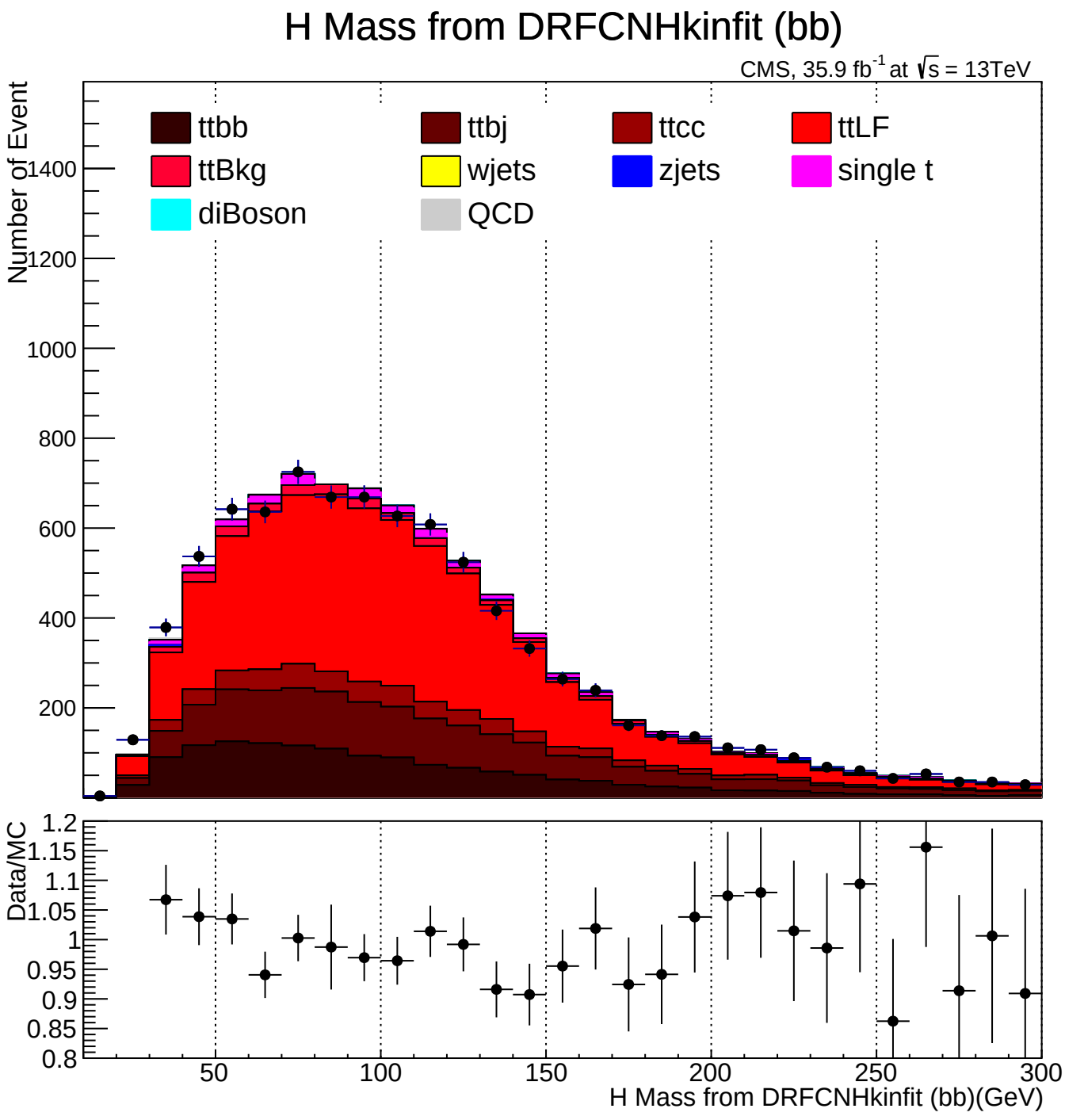

bjet_m Delta R
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
1000
800
600
400
200
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
3.5
4
bjet_m Delta R

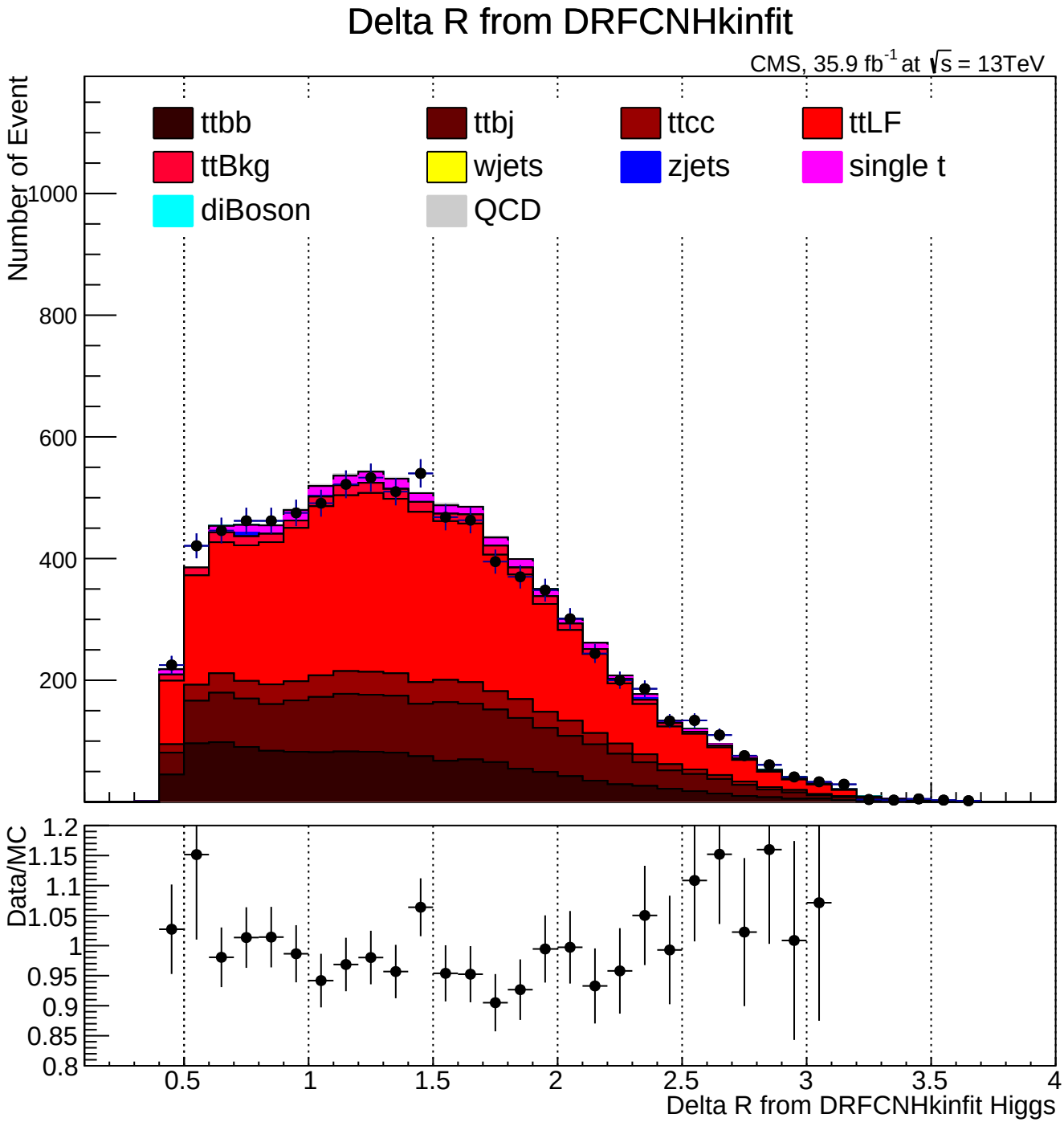

LepIso
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
7000
6000
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation

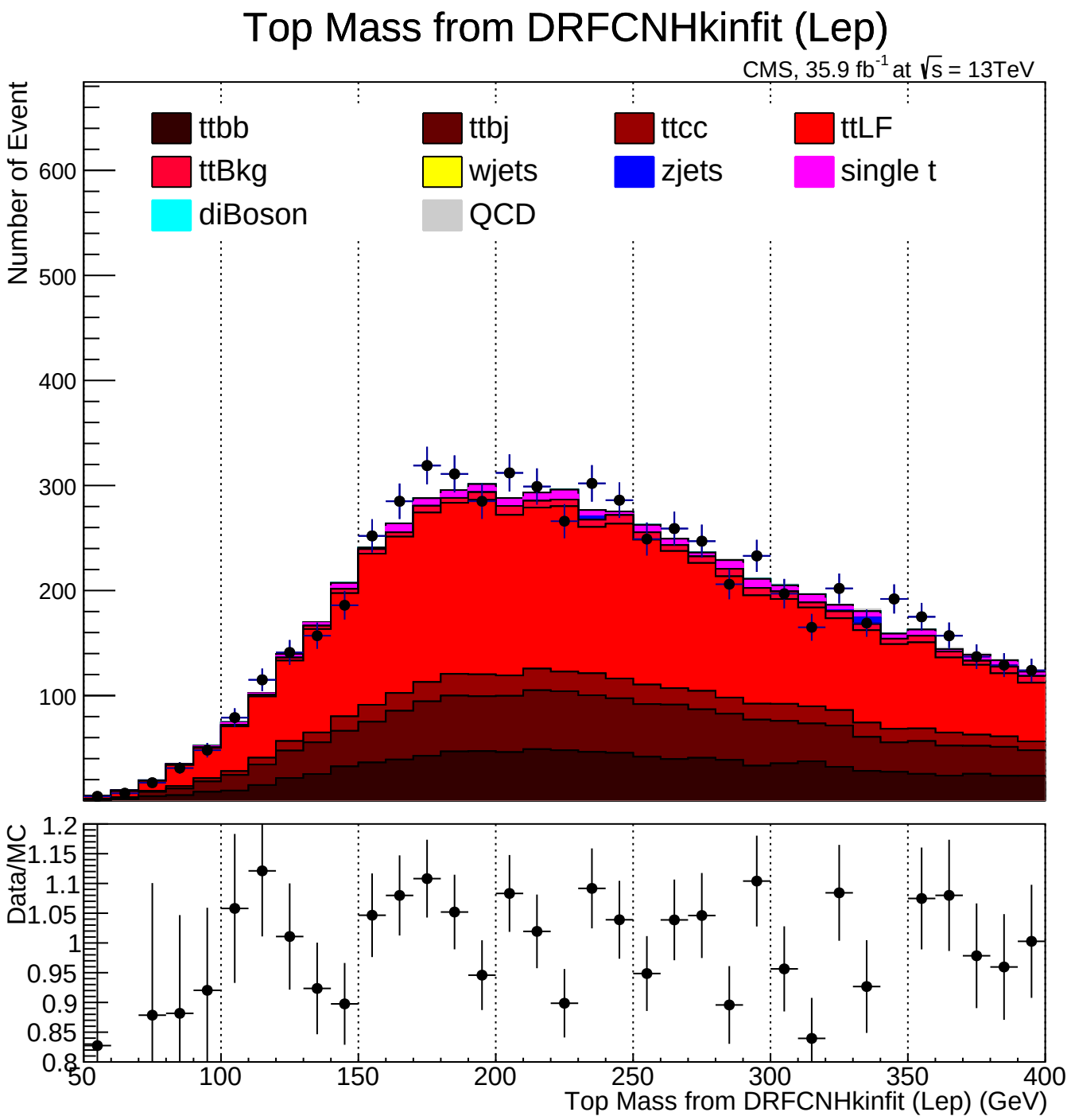

LepIsoQCD
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation (QCD)

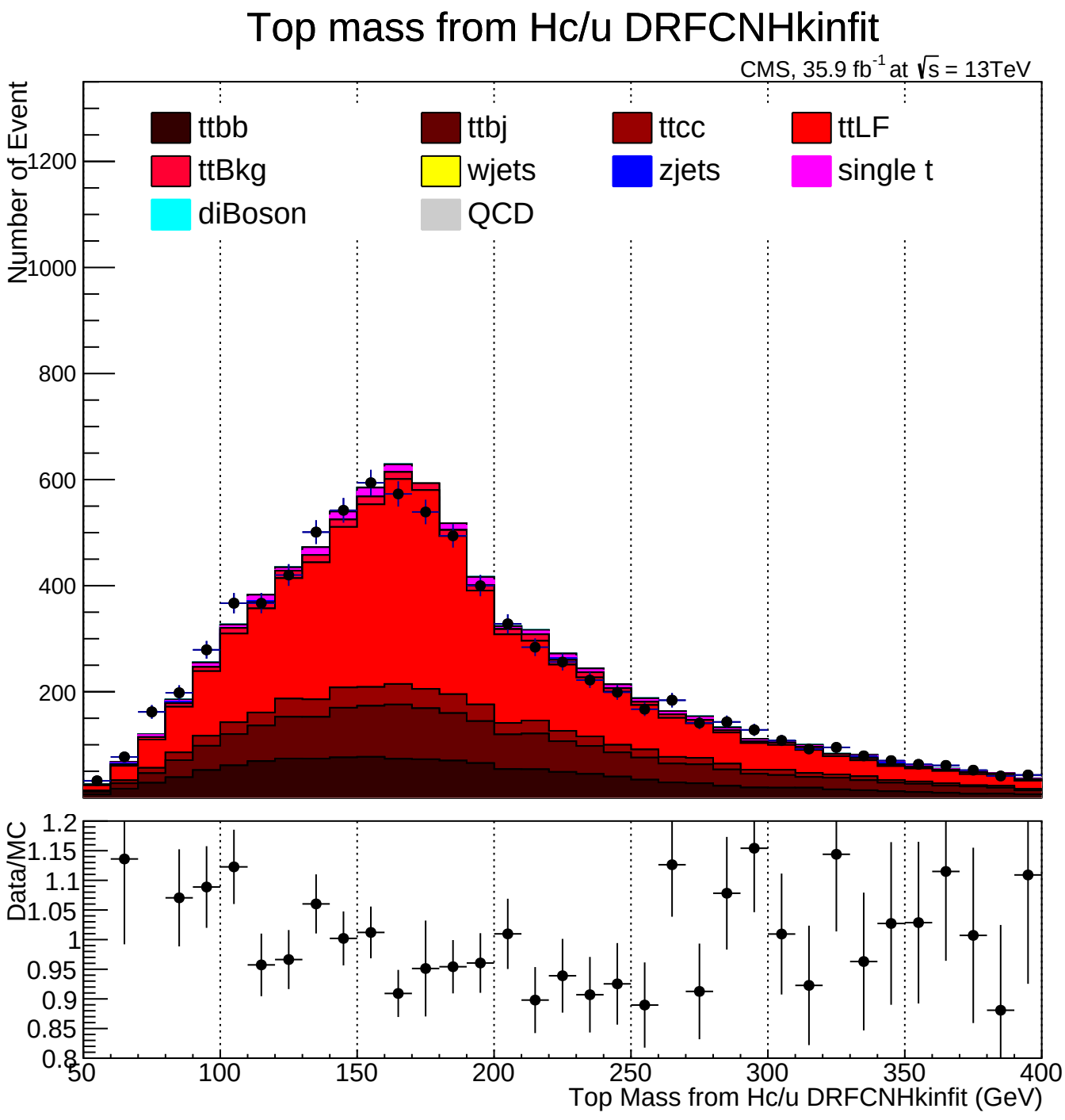

W Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
W Mass from DRFCNHkinfit (Lep) (GeV)

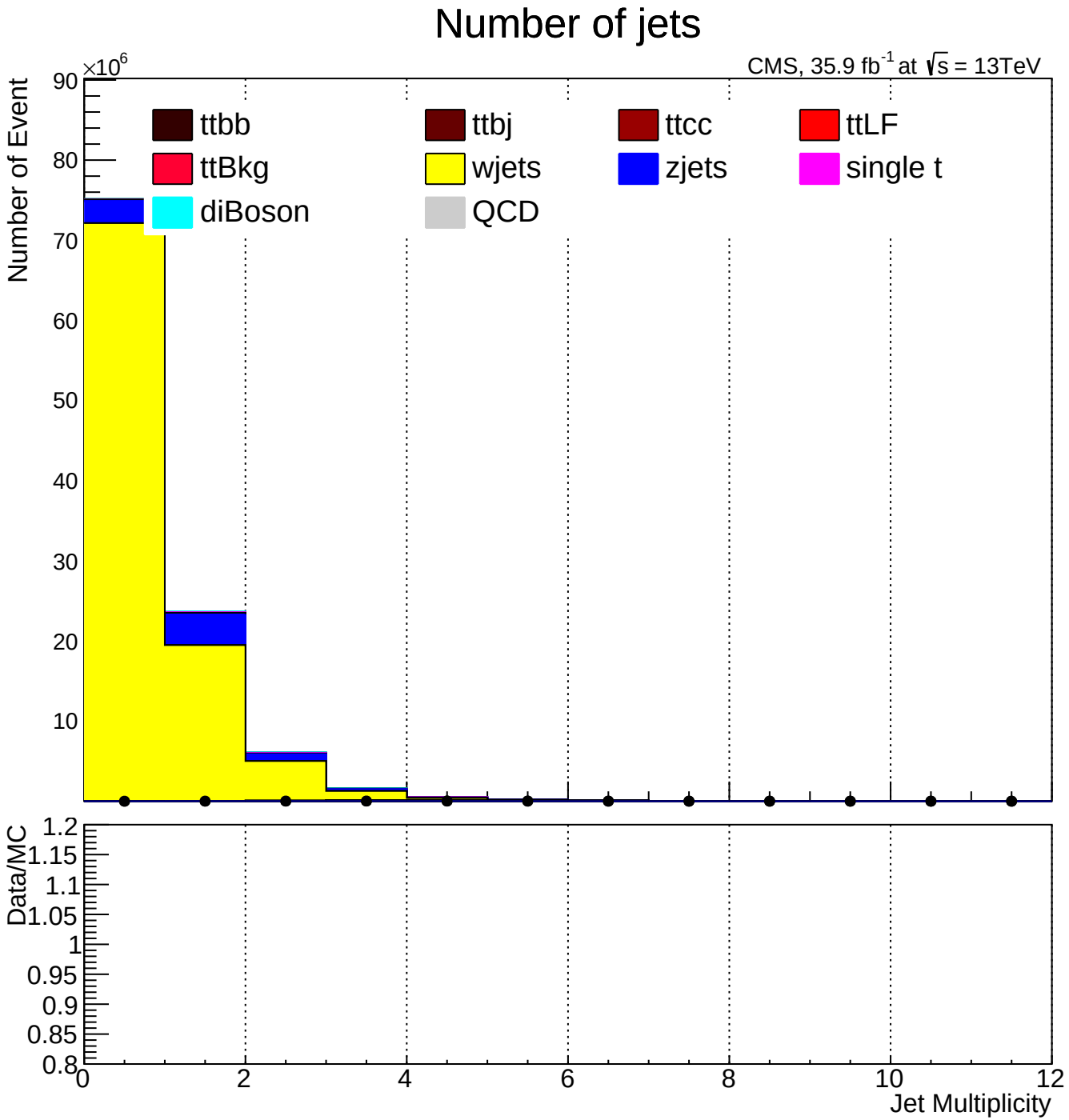

W Mass from DRFCNHkinfit (Had)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
W Mass from DRFCNHkinfit (Had) (GeV)


H Mass from DRFCNHkinfit (bb)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
H Mass from DRFCNHkinfit (bb)(GeV)

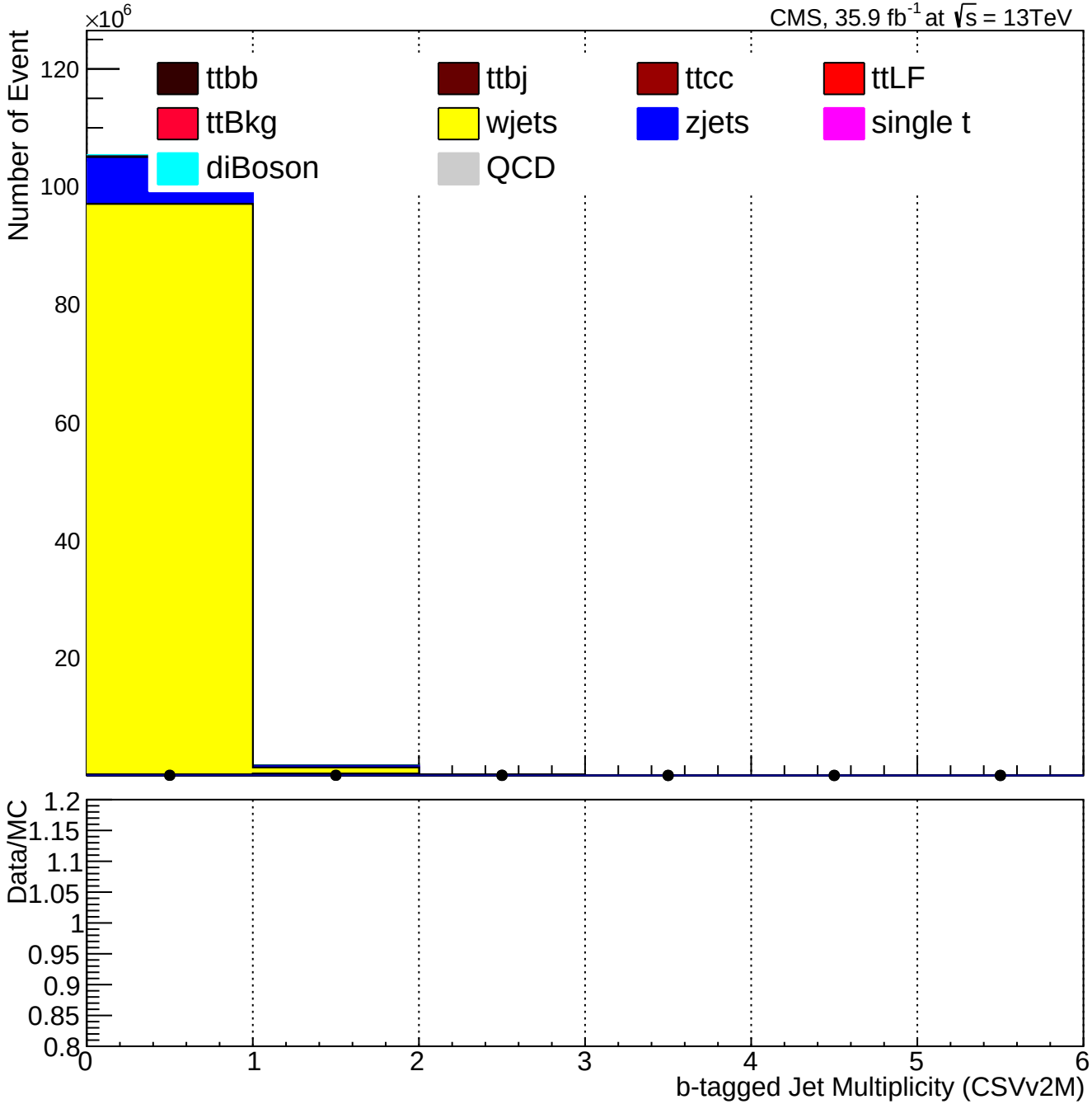

Delta R from DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
1000
800
600
400
200
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0.5
1
1.5
2
2.5
3
3.5
4
Delta R from DRFCNHkinfit Higgs

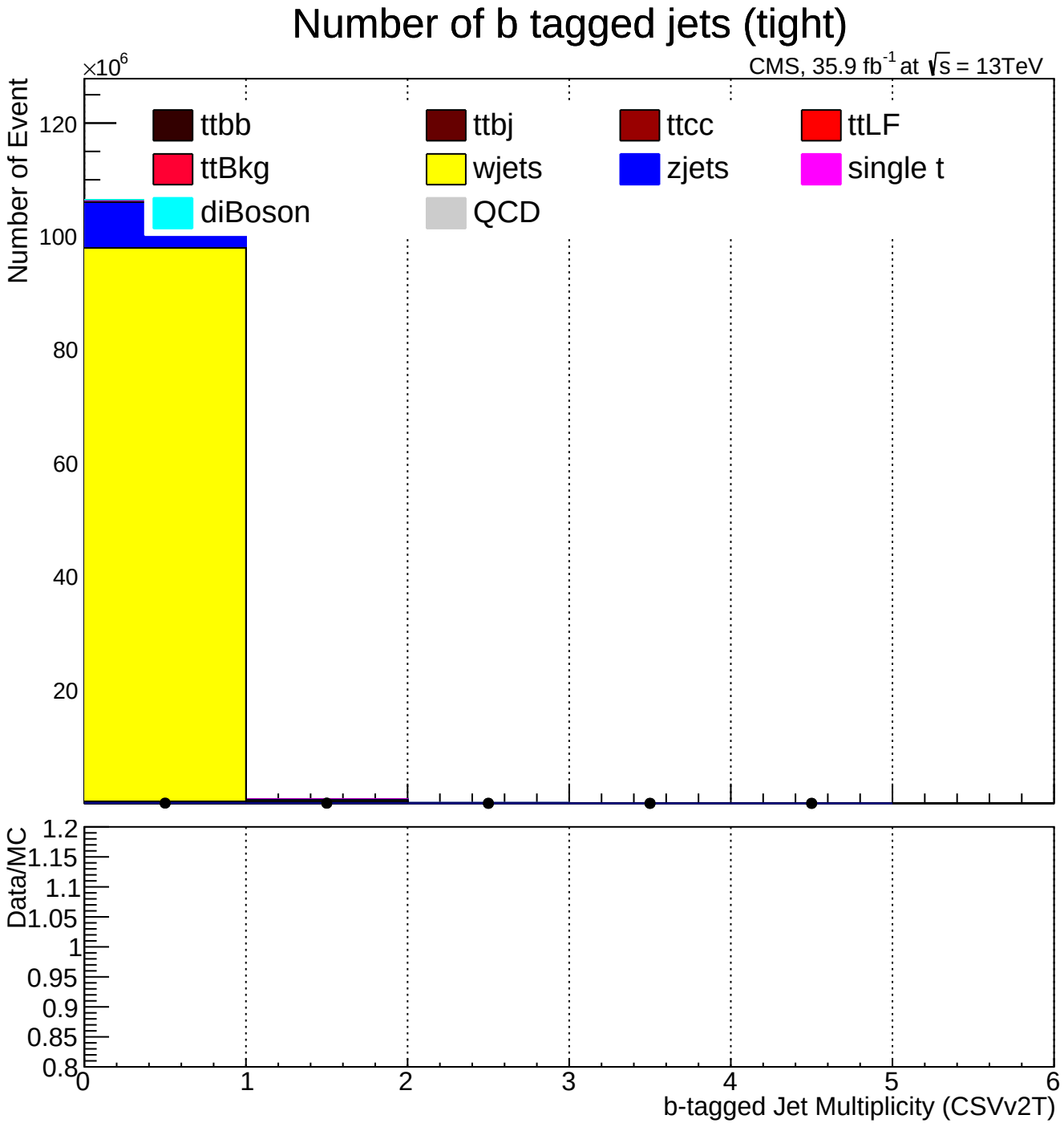

Top Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
600
500
400
300
200
100
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
350
400
Top Mass from DRFCNHkinfit (Lep) (GeV)

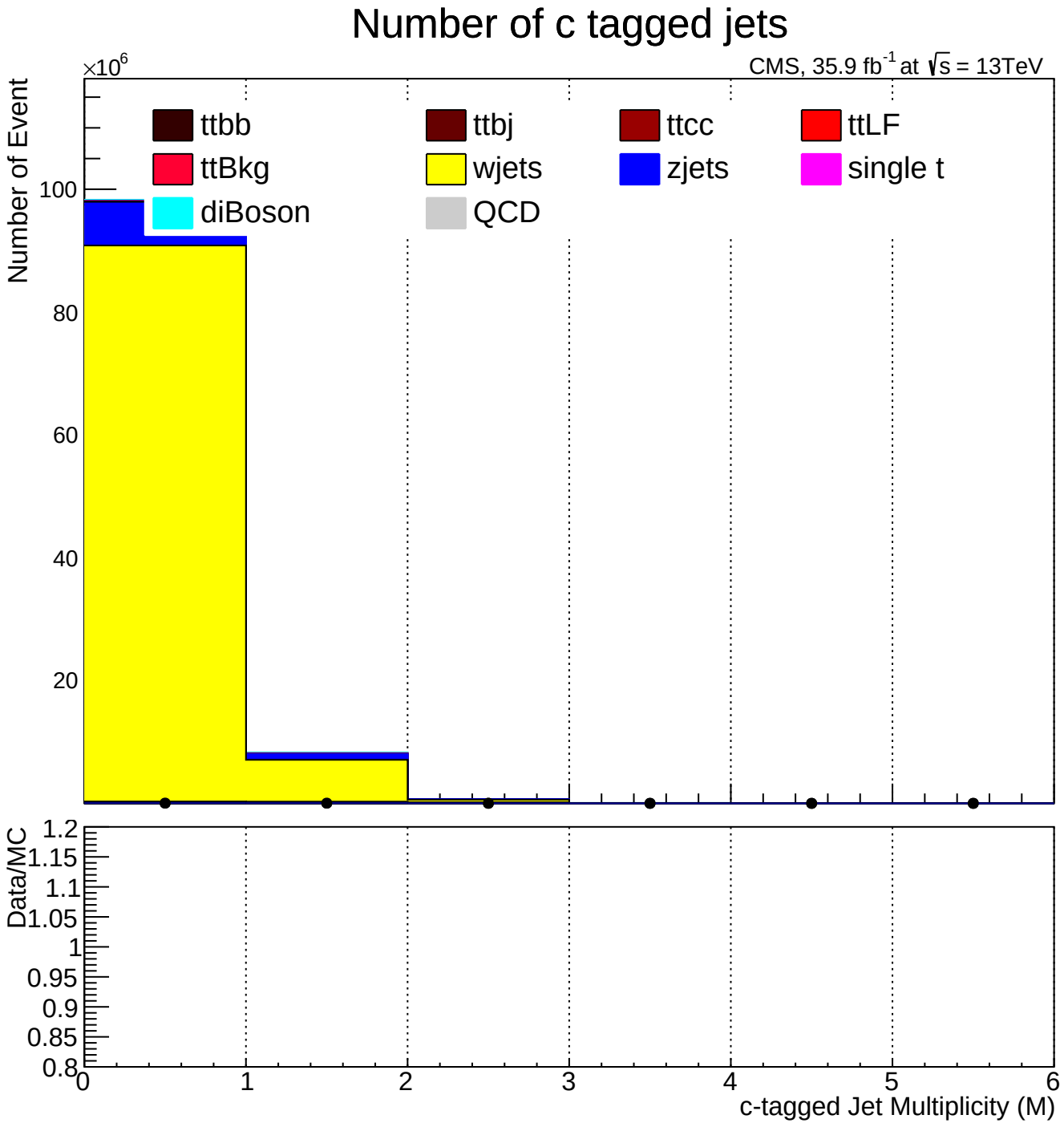

Top mass from Hc/u DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
Top Mass from Hc/u DRFCNHkinfit (GeV)

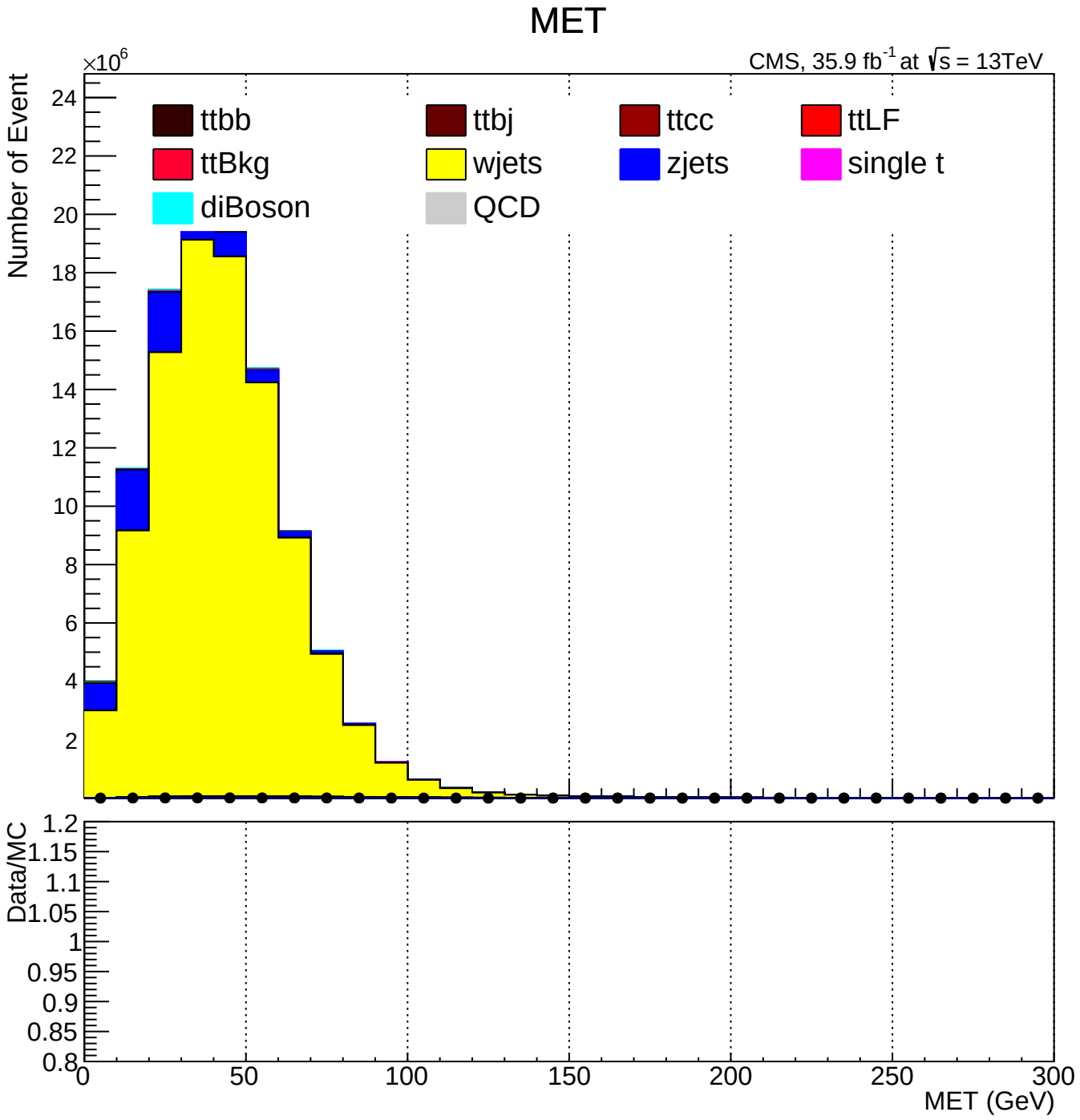

Number of jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^6
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Jet Multiplicity

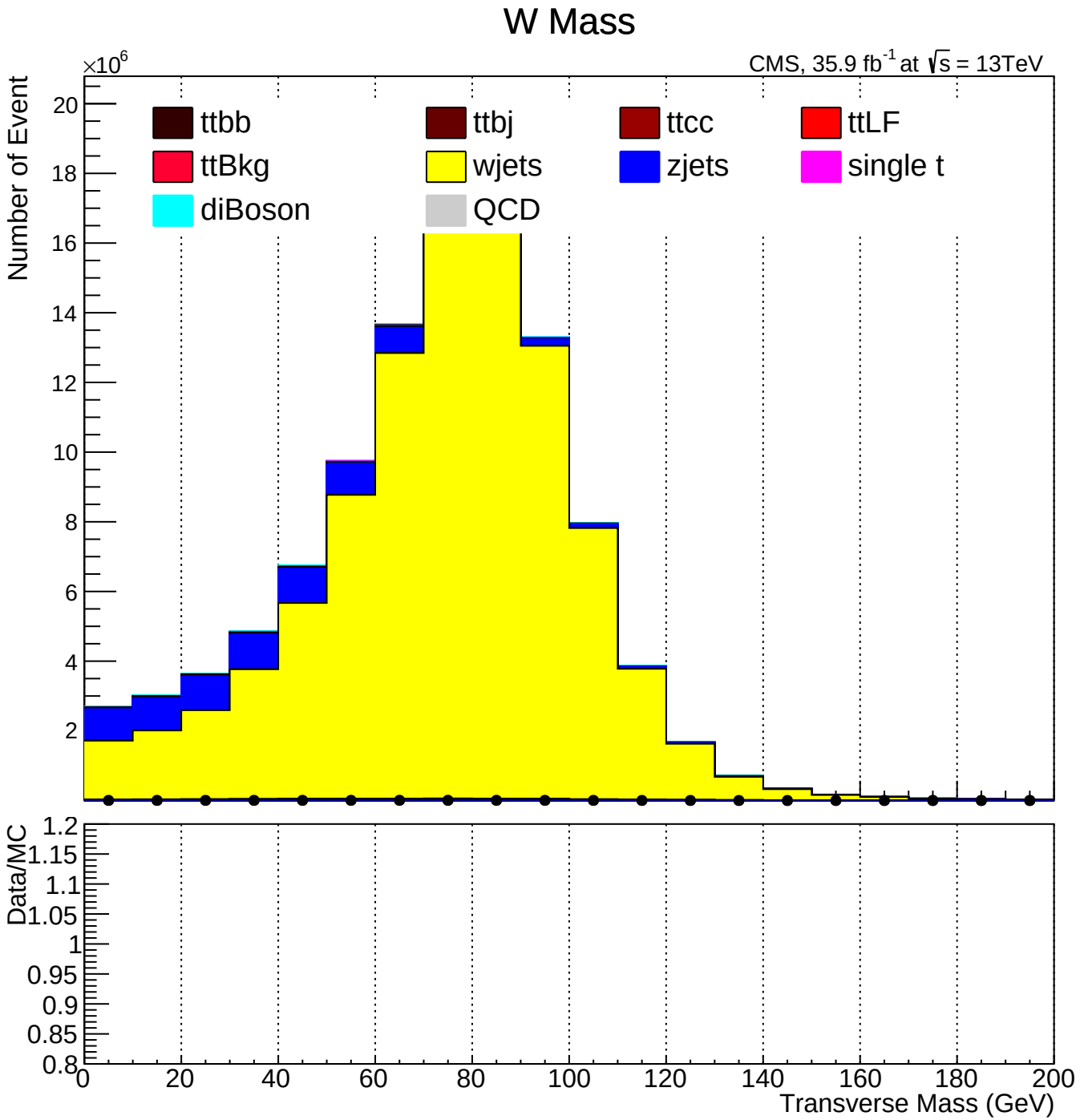
Number of b tagged jets (medium)

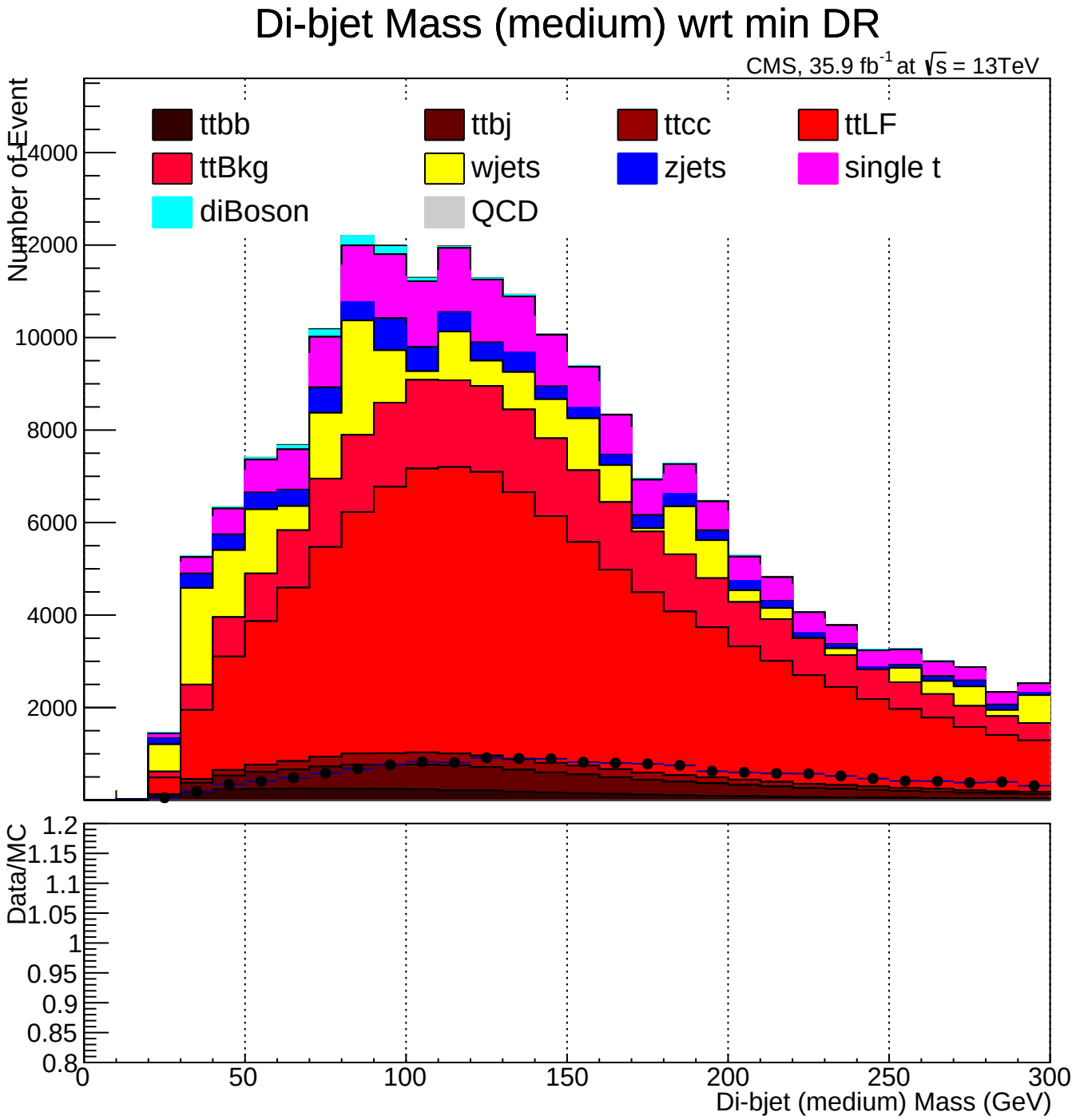


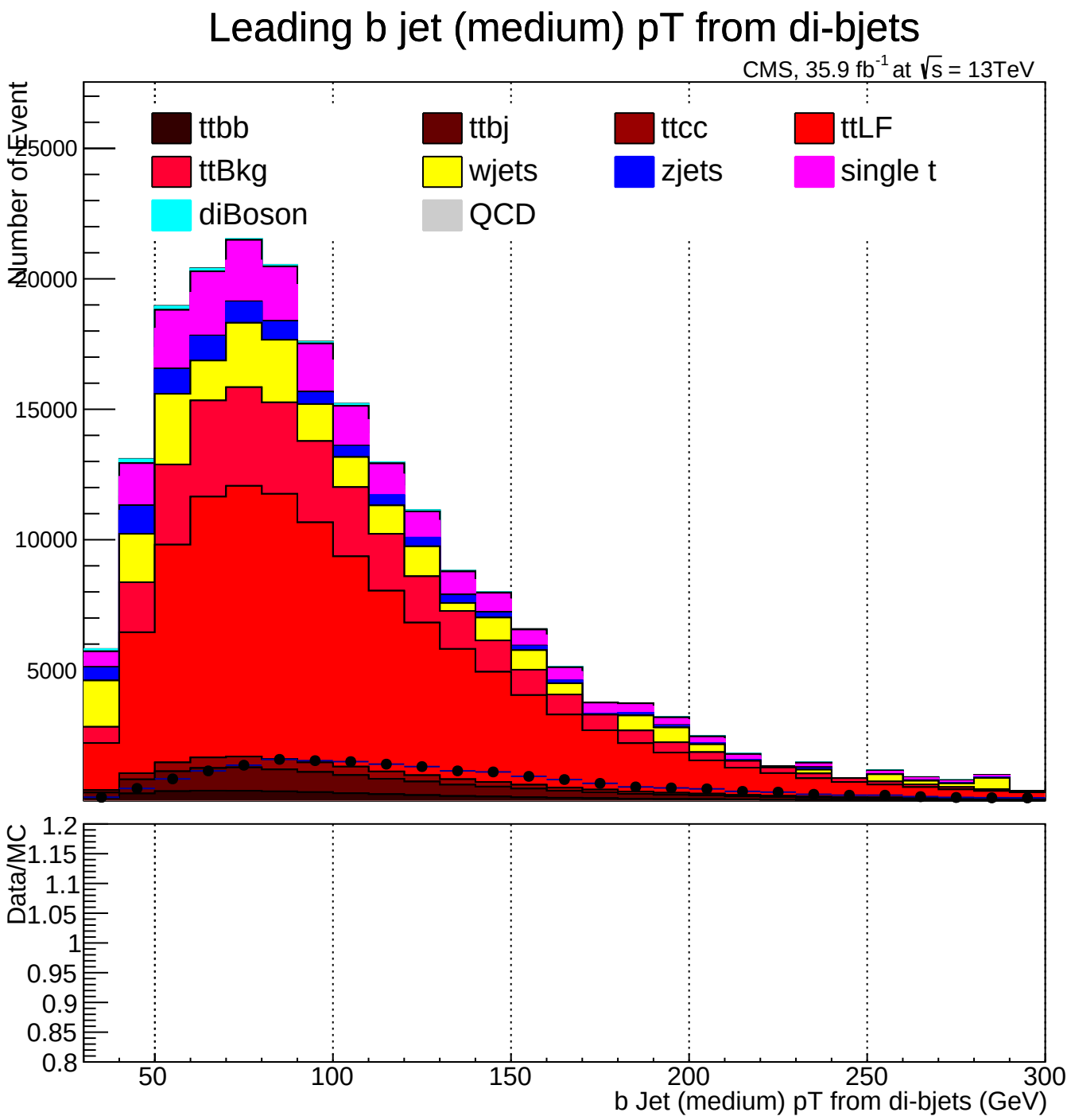

Number of b tagged jets (tight)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
$\times 10^6$
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b-tagged Jet Multiplicity (CSVv2T)

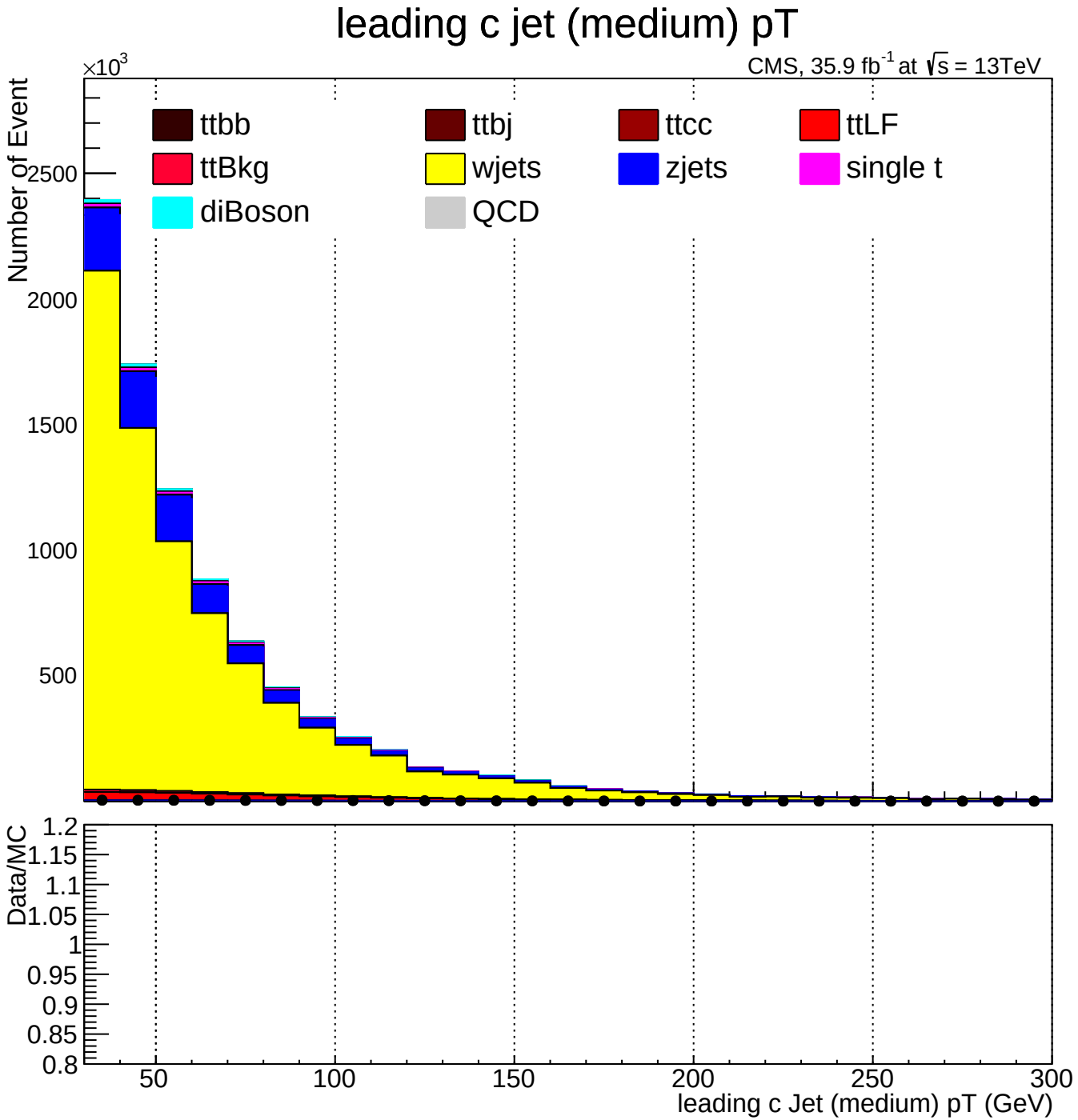

Number of c tagged jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
$\times 10^6$
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
100
80
60
40
20
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
c-tagged Jet Multiplicity (M)

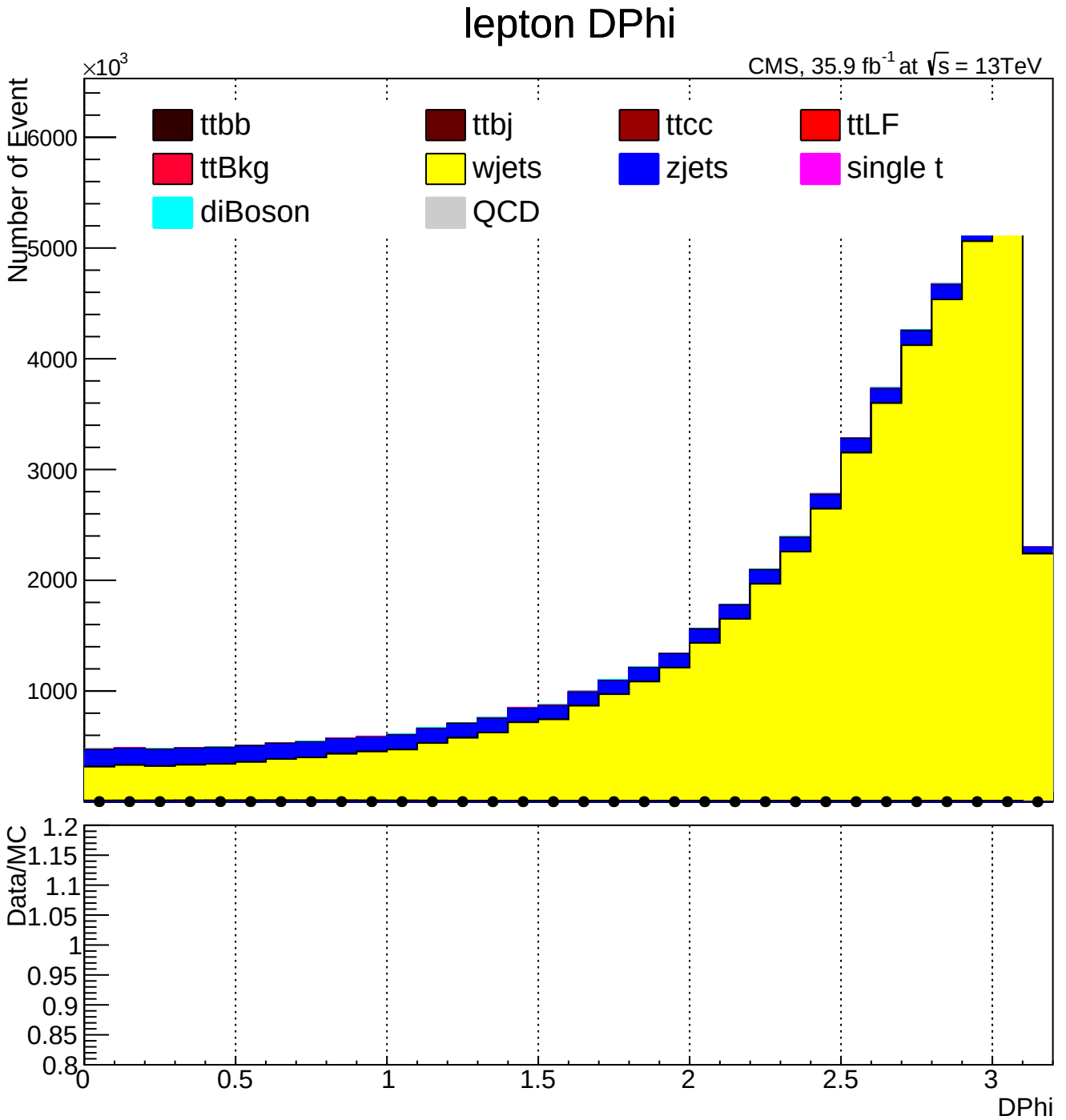

MET
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^6
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
MET (GeV)

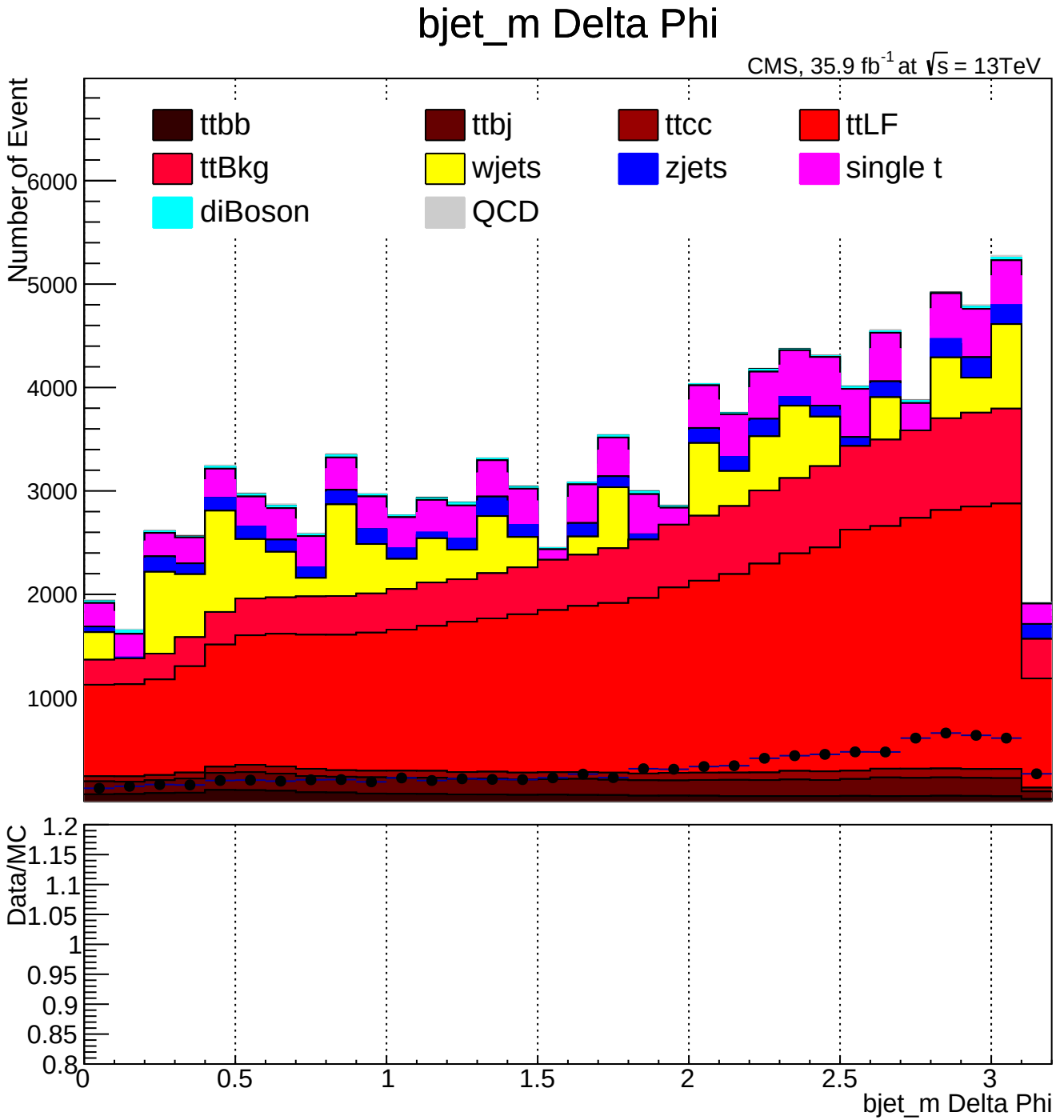

W Mass
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
$\times 10^6$
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Transverse Mass (GeV)

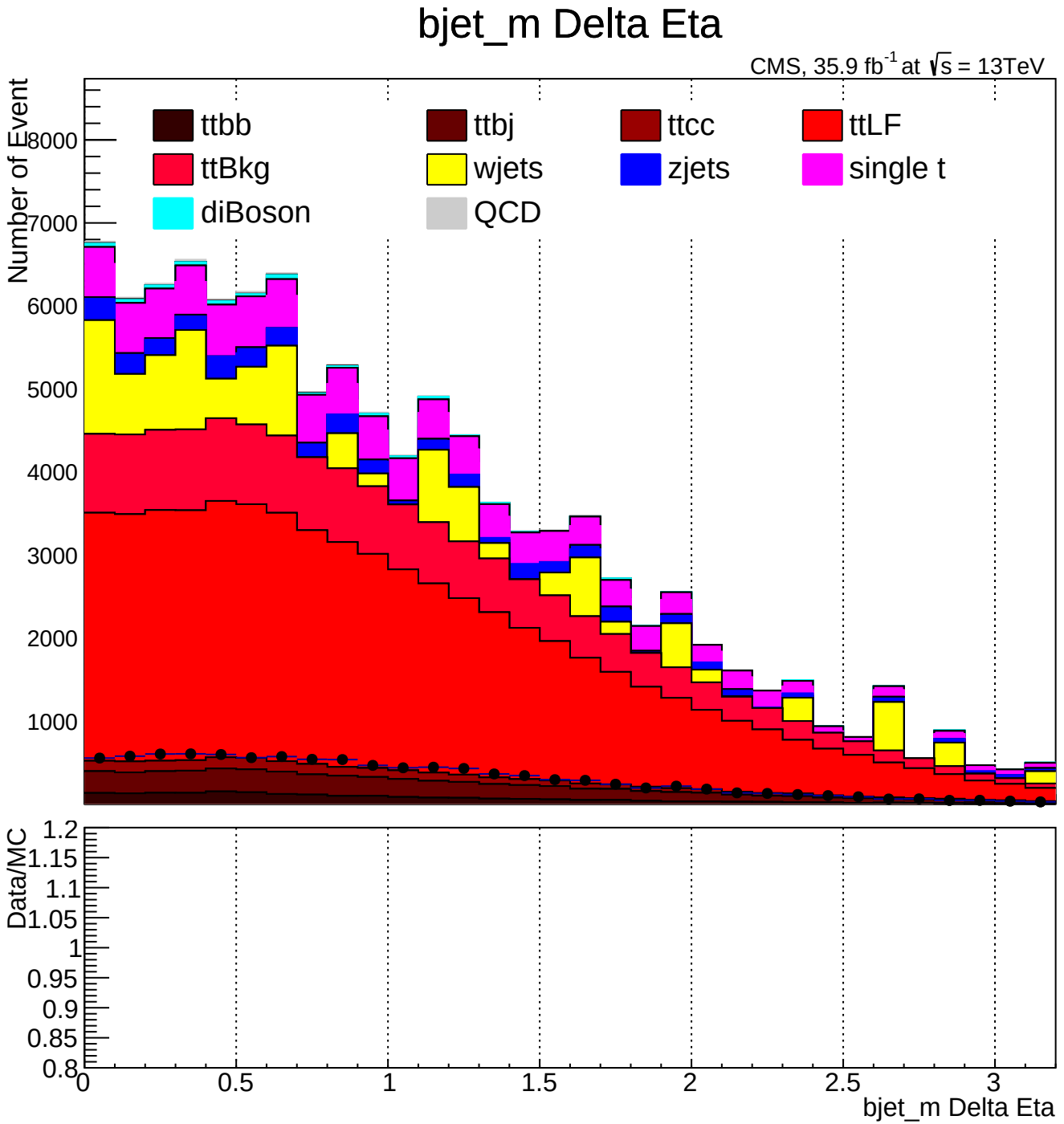

Di-bjet Mass (medium) wrt min DR
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
Di-bjet (medium) Mass (GeV)

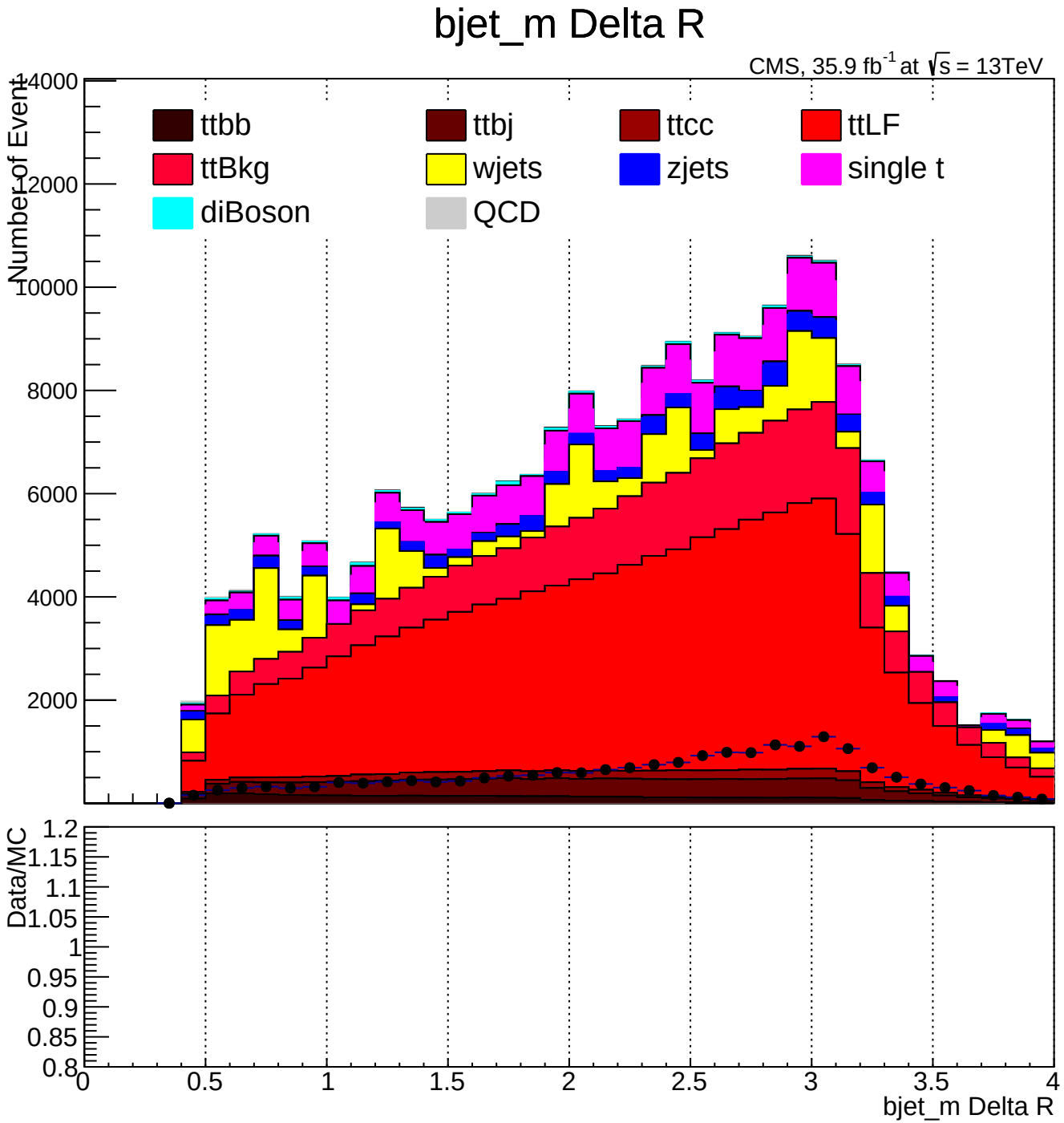

Leading b jet (medium) pT from di-bjets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
25000
20000
15000
10000
5000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
b Jet (medium) pT from di-bjets (GeV)

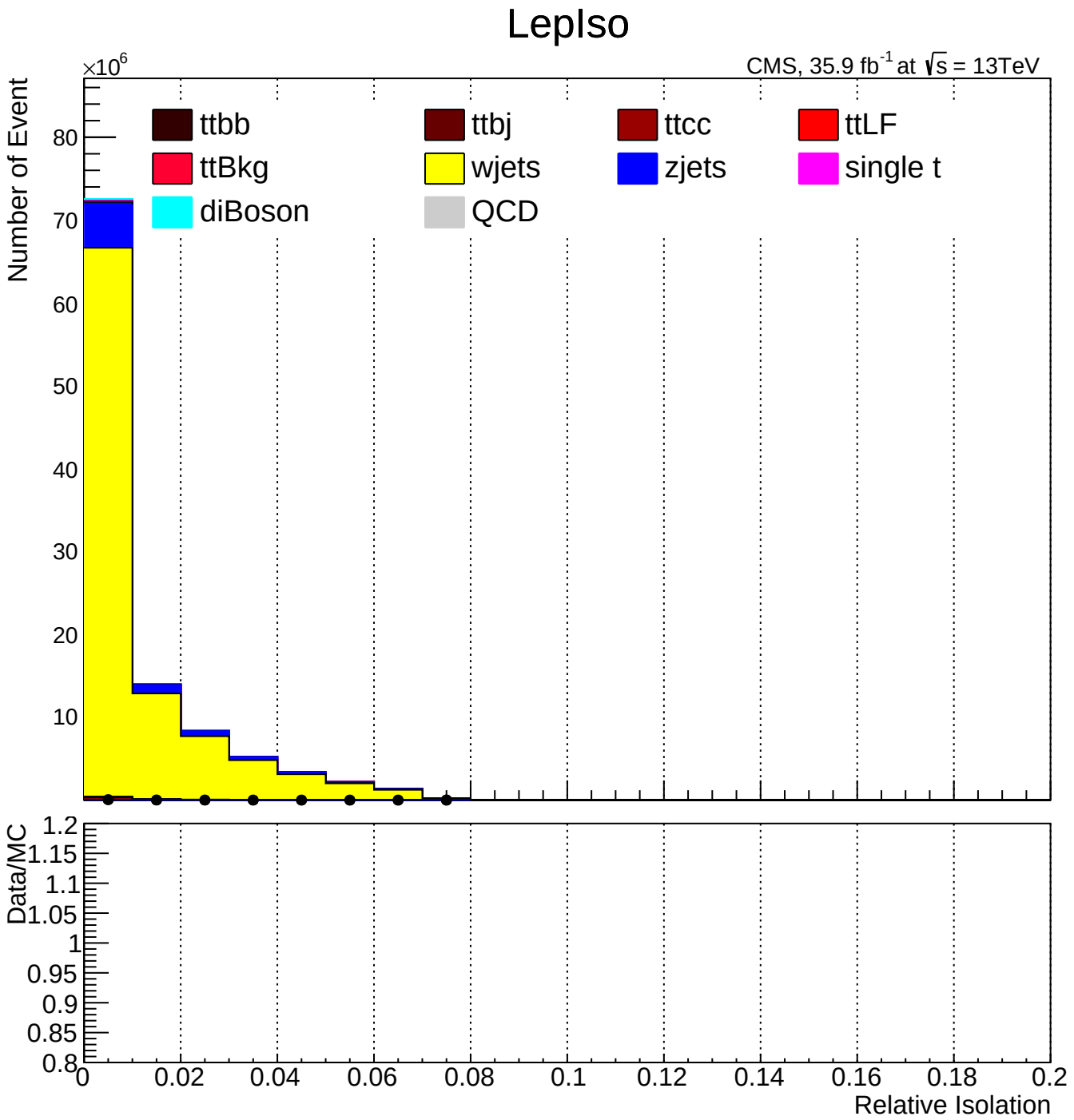

leading c jet (medium) pT
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
2500
2000
1500
1000
500
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
leading c Jet (medium) pT (GeV)

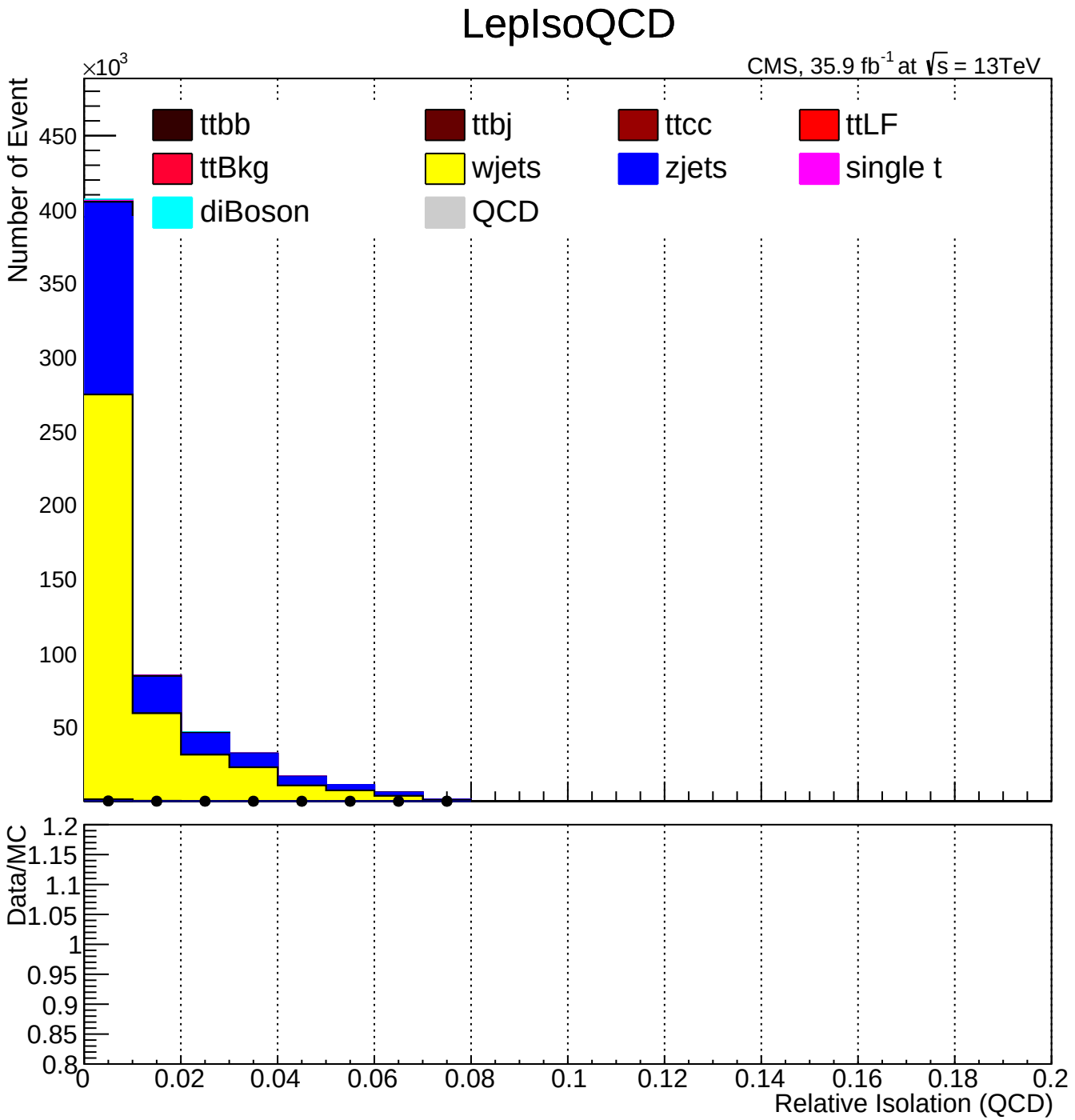

lepton DPhi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
DPhi

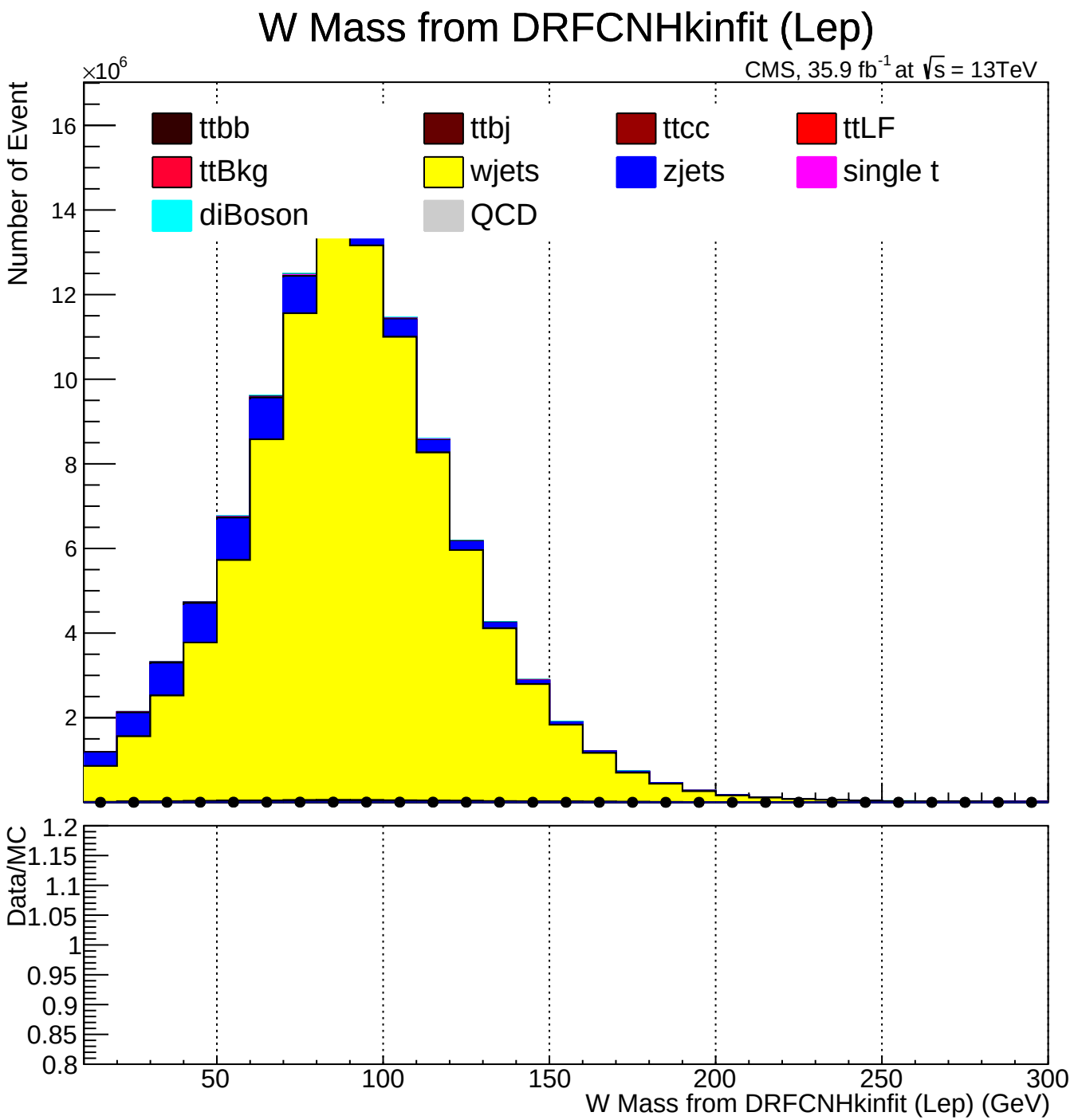

bjet_m Delta Phi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
6000
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Phi

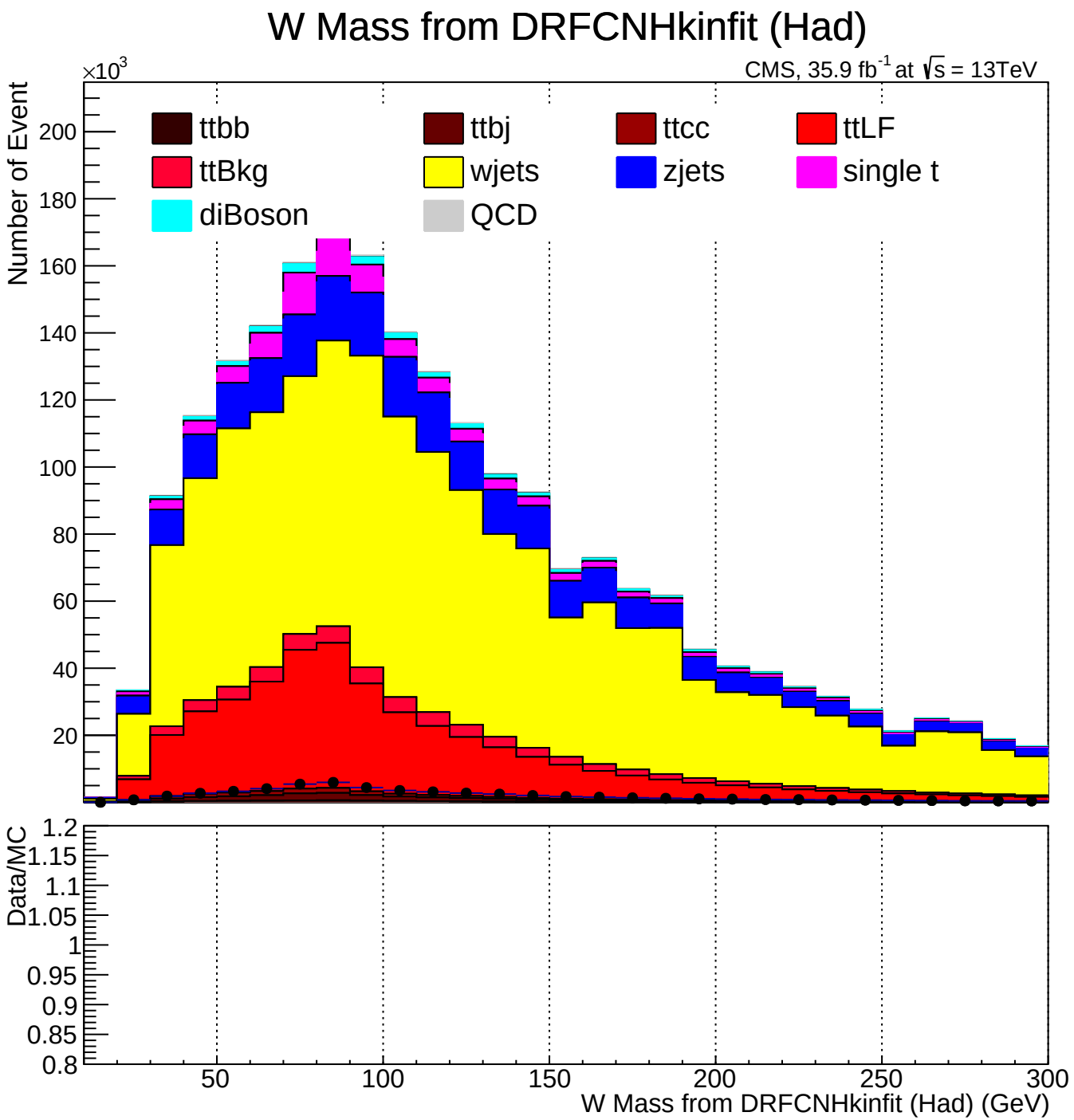

bjet_m Delta Eta
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
8000
7000
6000
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Eta

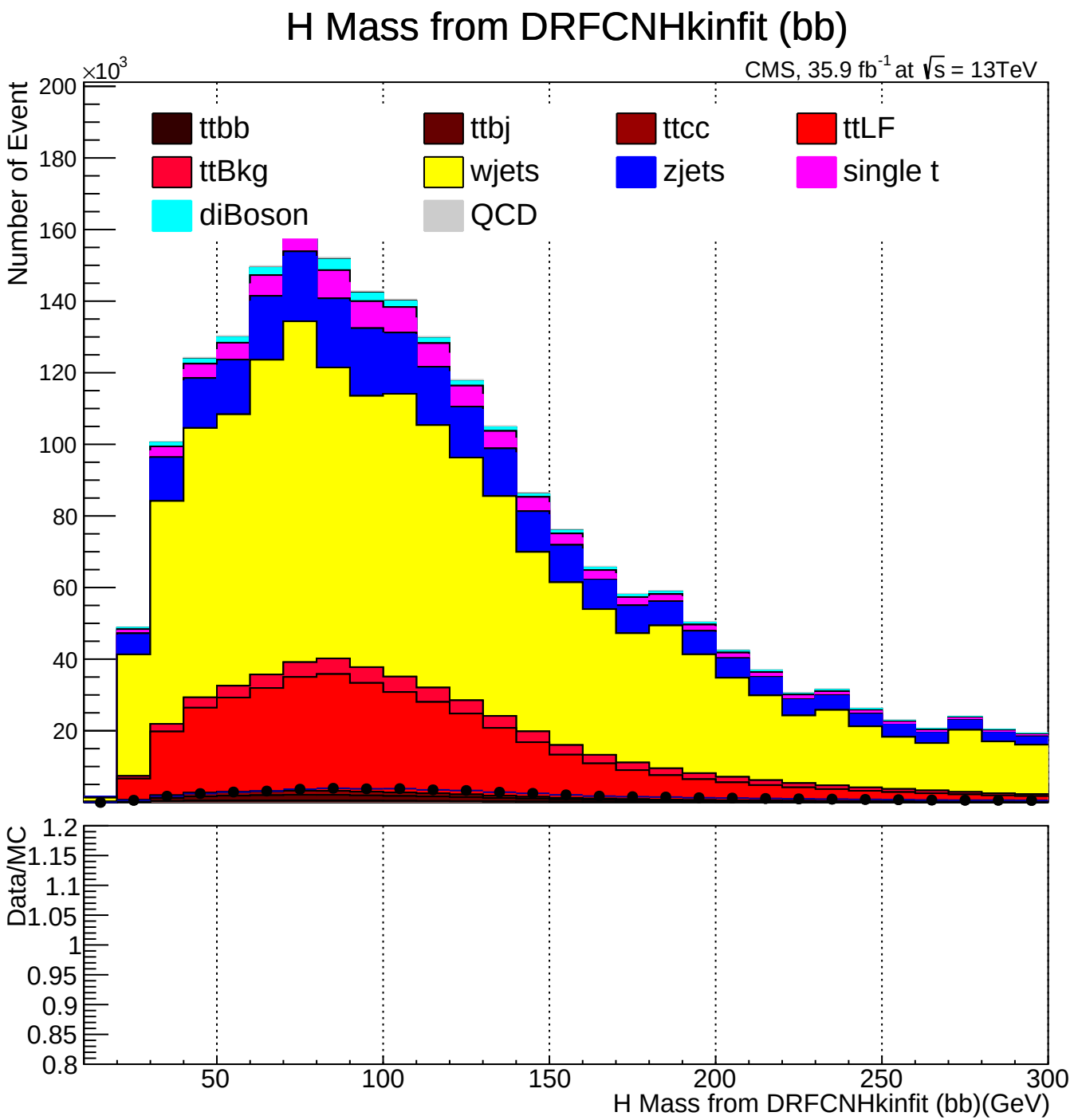

bjet_m Delta R
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta R

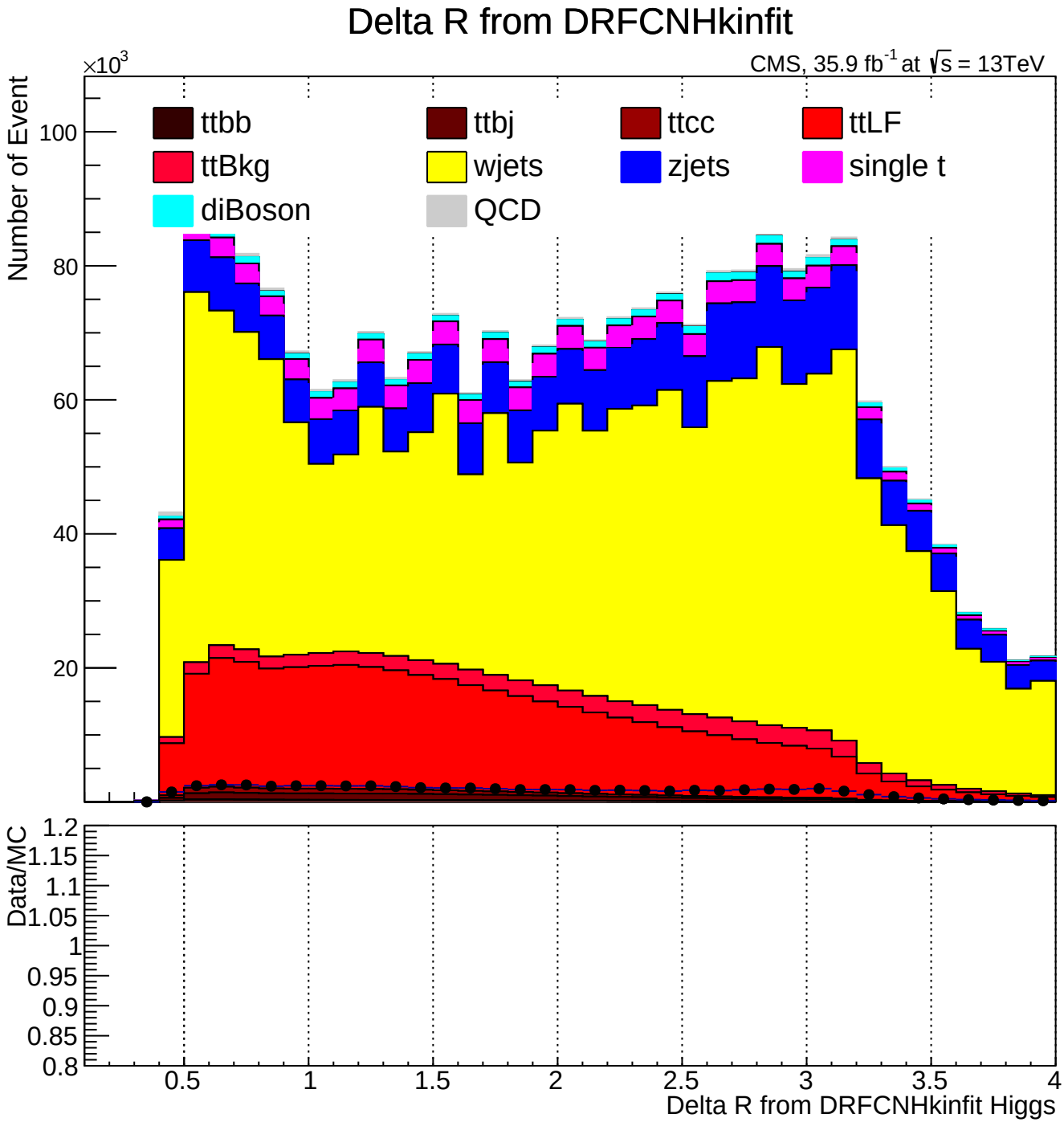

LepIso
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^6
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation

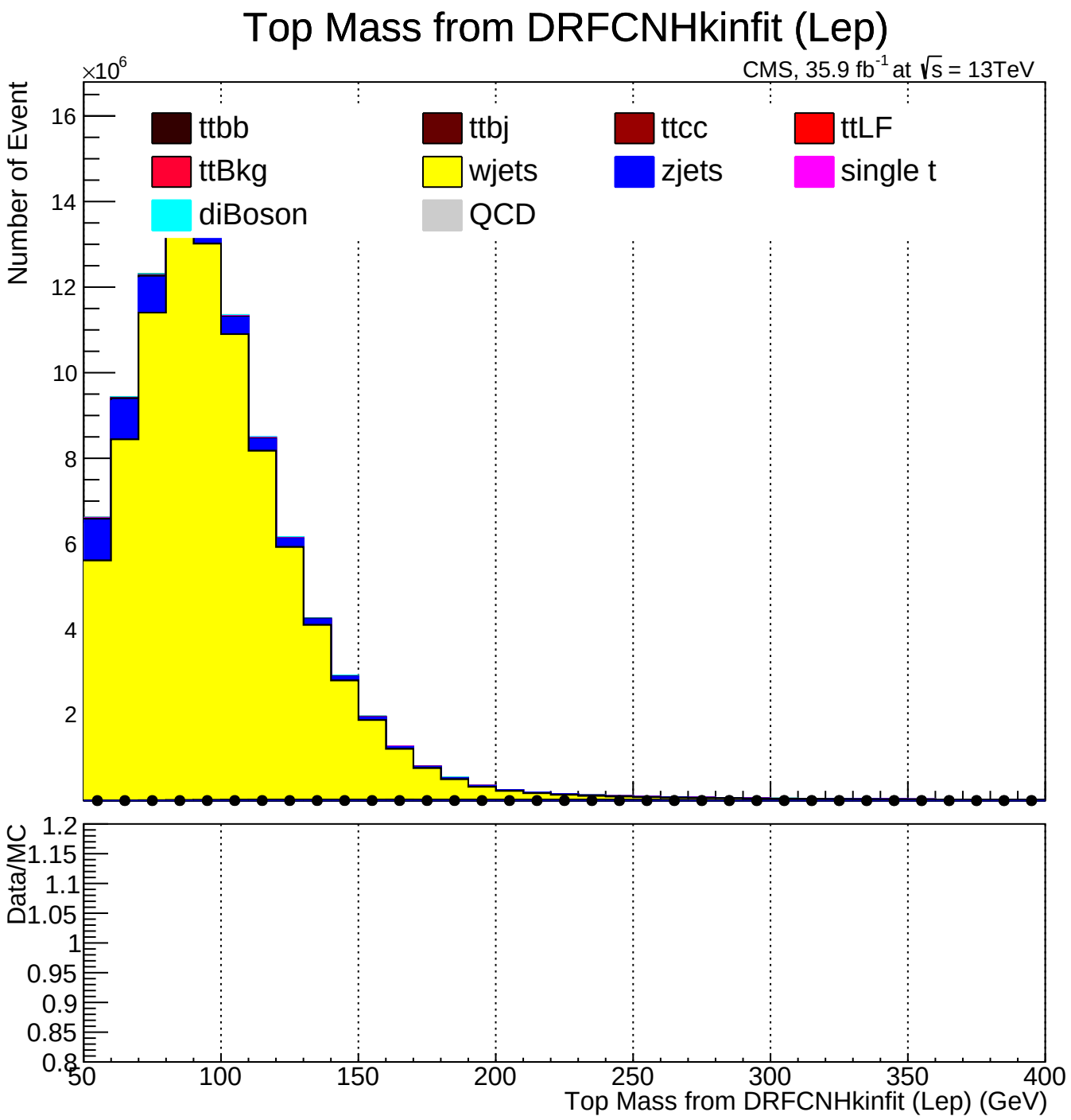

LepIsoQCD
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation (QCD)

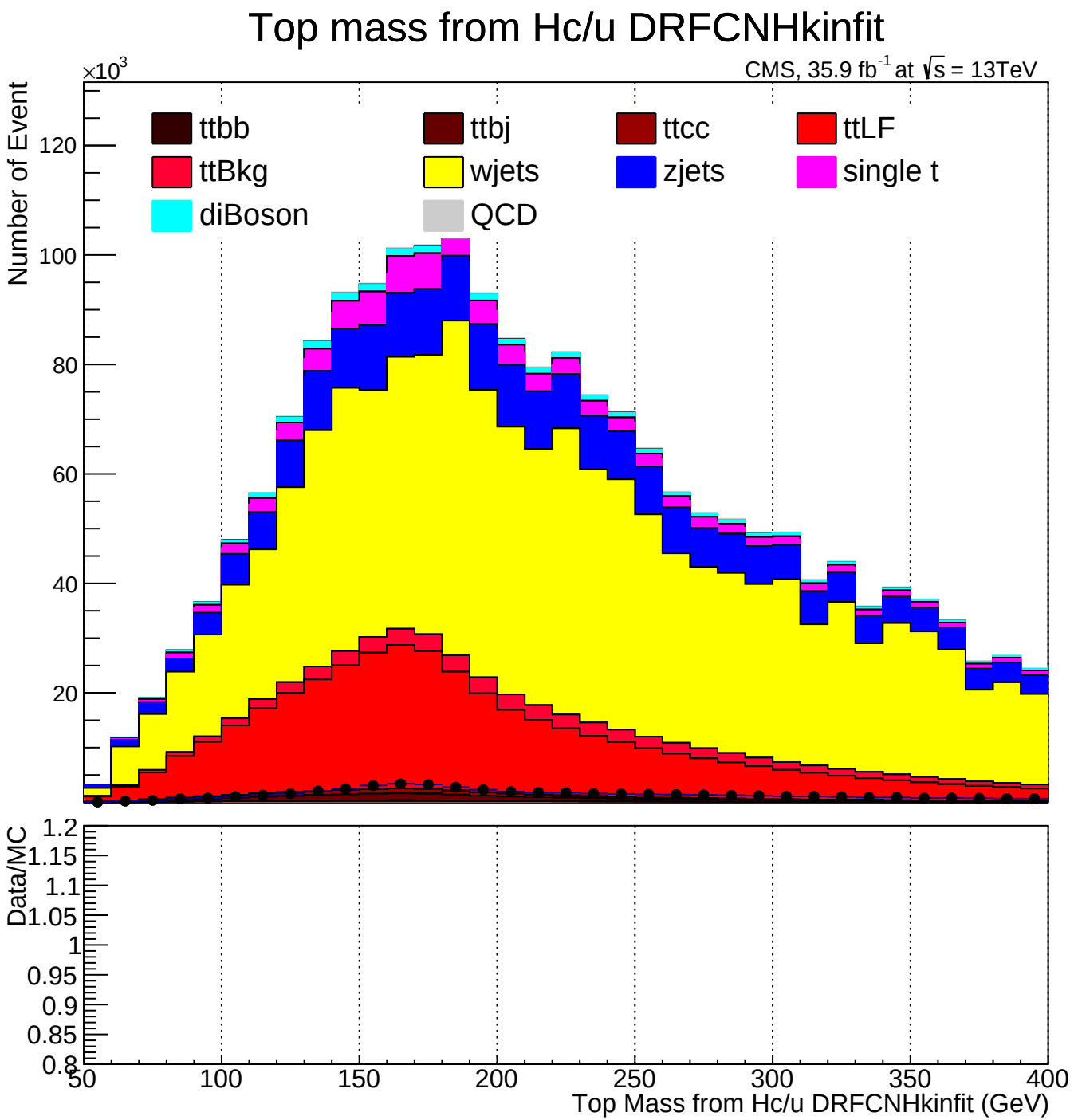

W Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^6
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
W Mass from DRFCNHkinfit (Lep) (GeV)

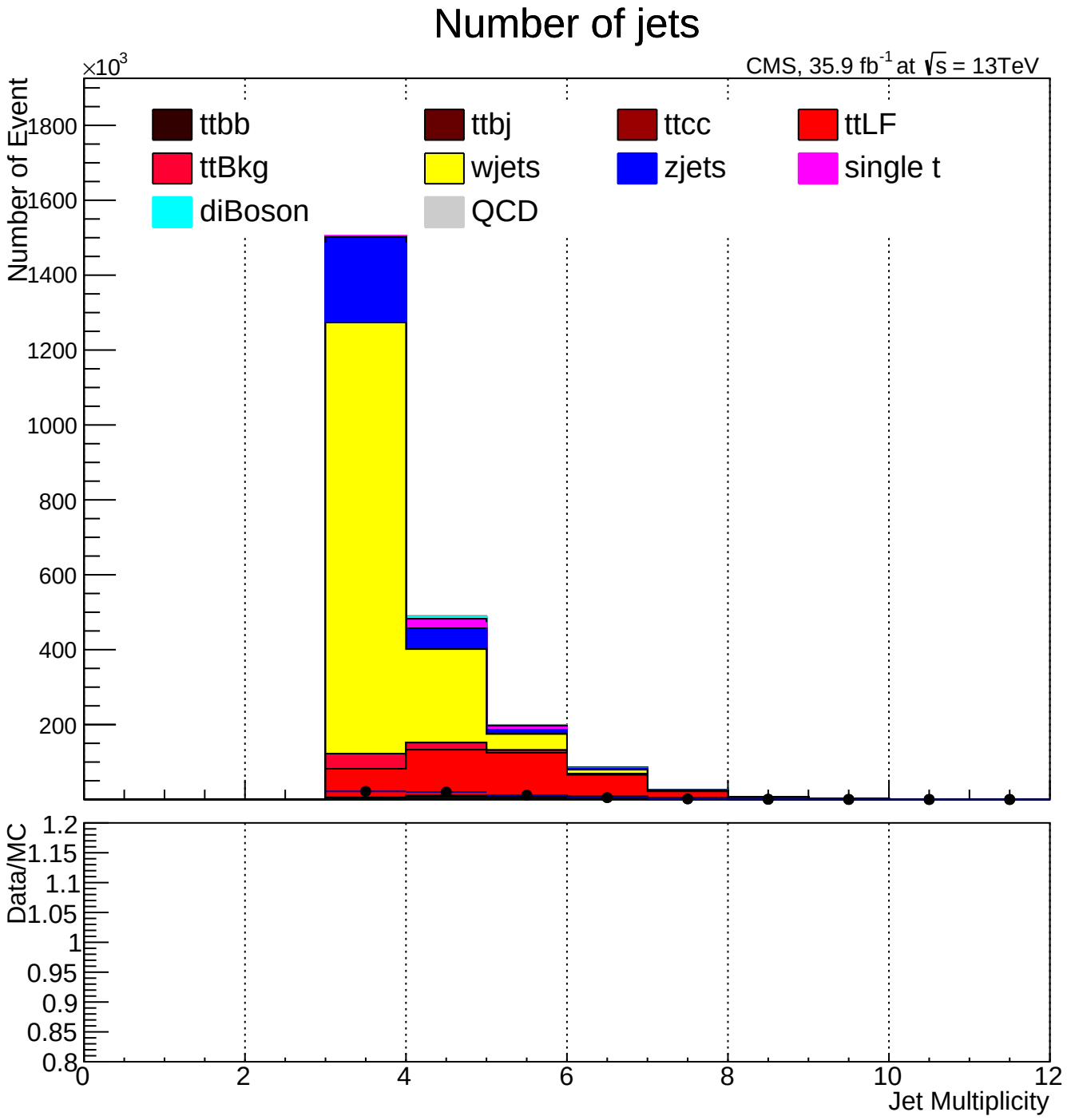

W Mass from DRFCNHkinfit (Had)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
W Mass from DRFCNHkinfit (Had) (GeV)

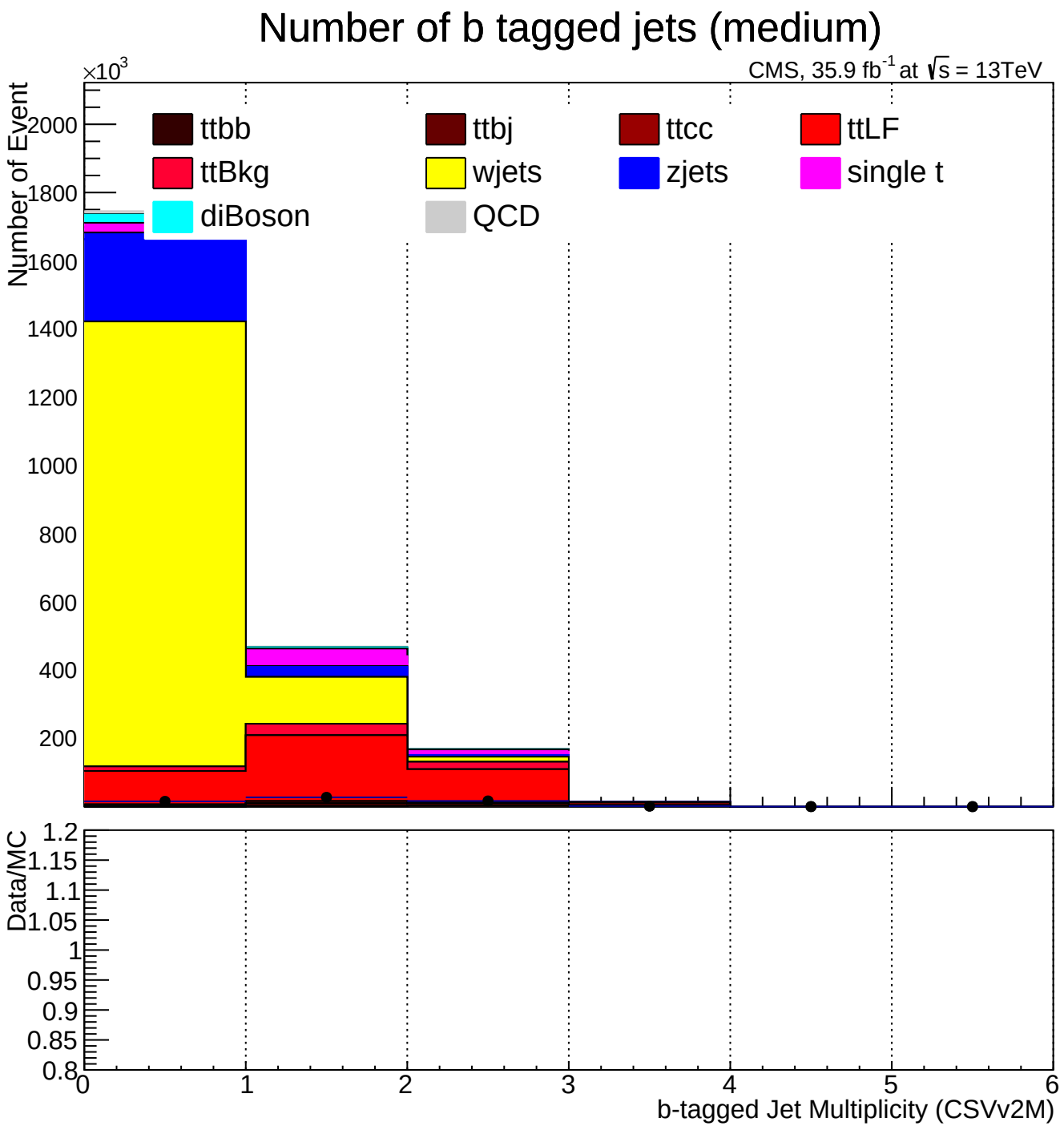

H Mass from DRFCNHkinfit (bb)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
H Mass from DRFCNHkinfit (bb)(GeV)

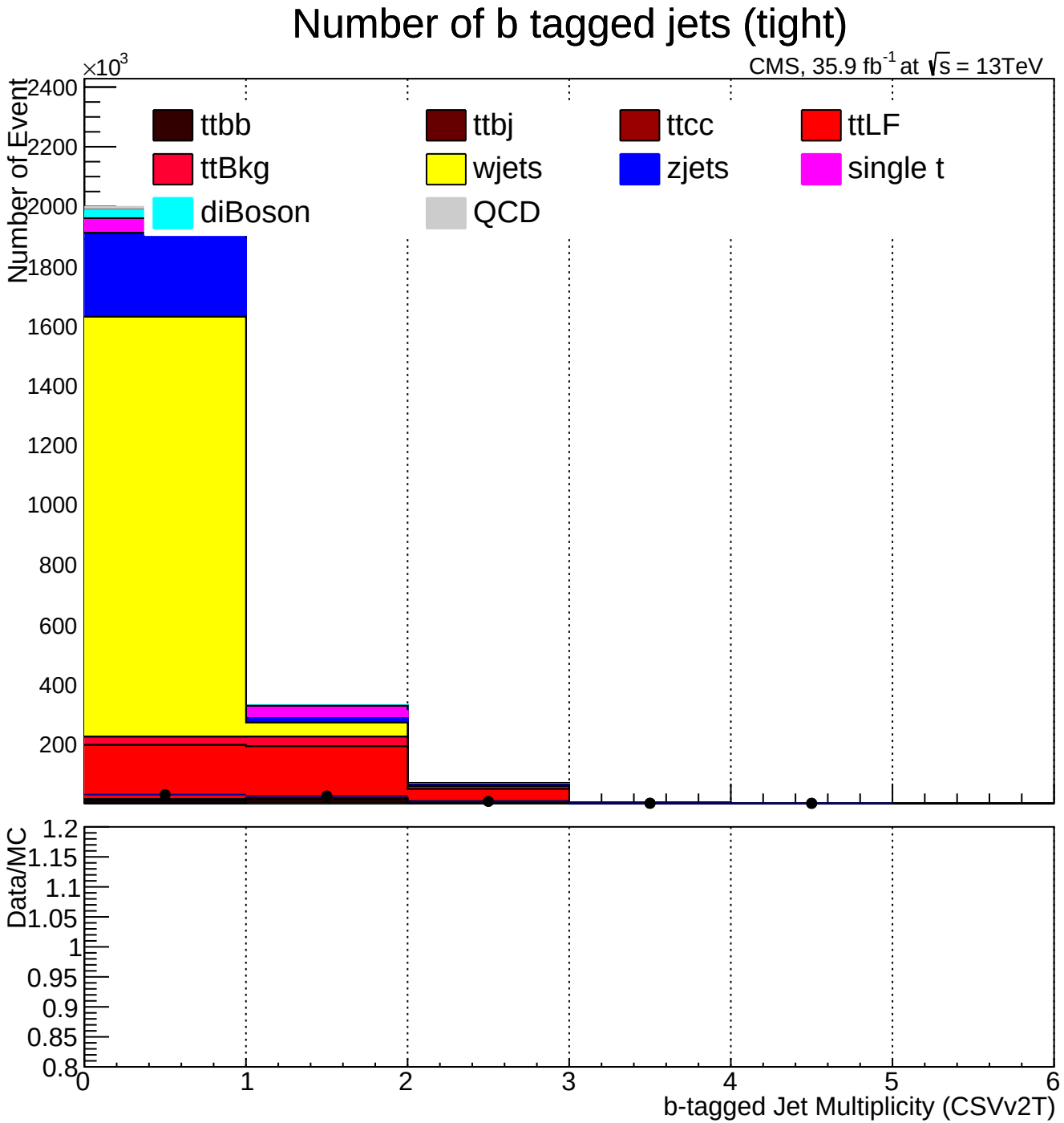

Delta R from DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Delta R from DRFCNHkinfit Higgs

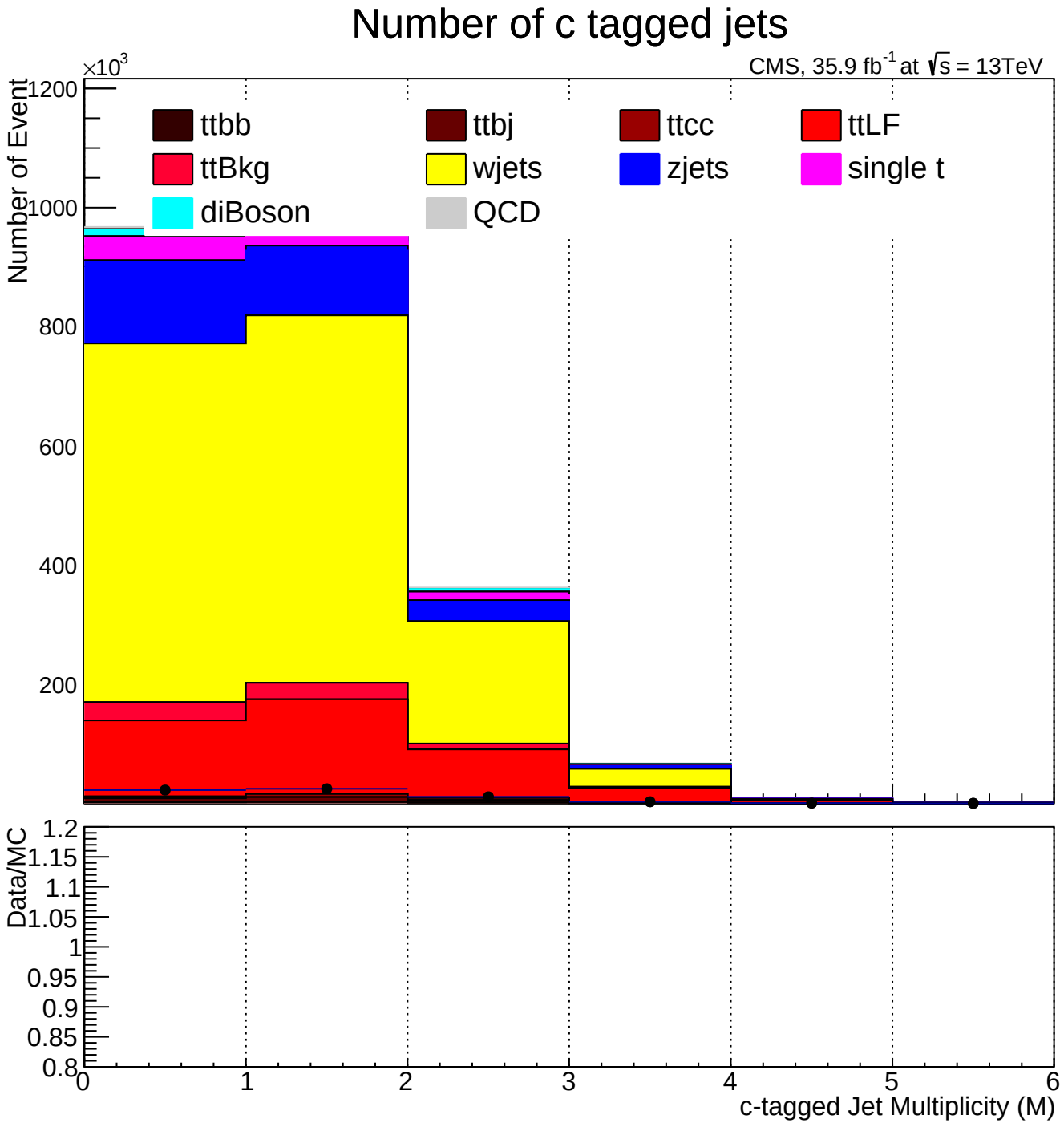

Top Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb-1 at √s = 13TeV
×10^6
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Top Mass from DRFCNHkinfit (Lep) (GeV)

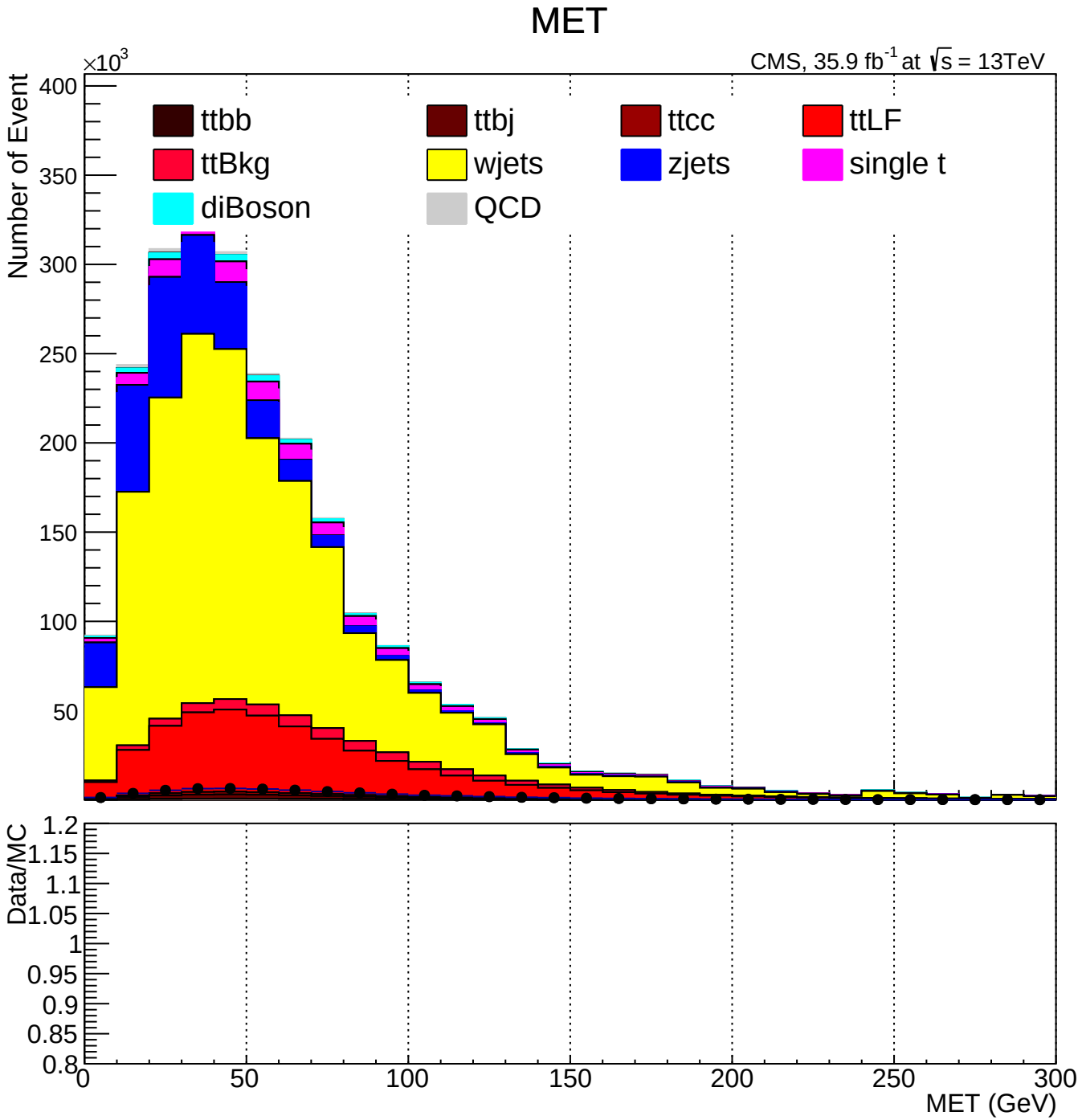

Top mass from Hc/u DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Top Mass from Hc/u DRFCNHkinfit (GeV)

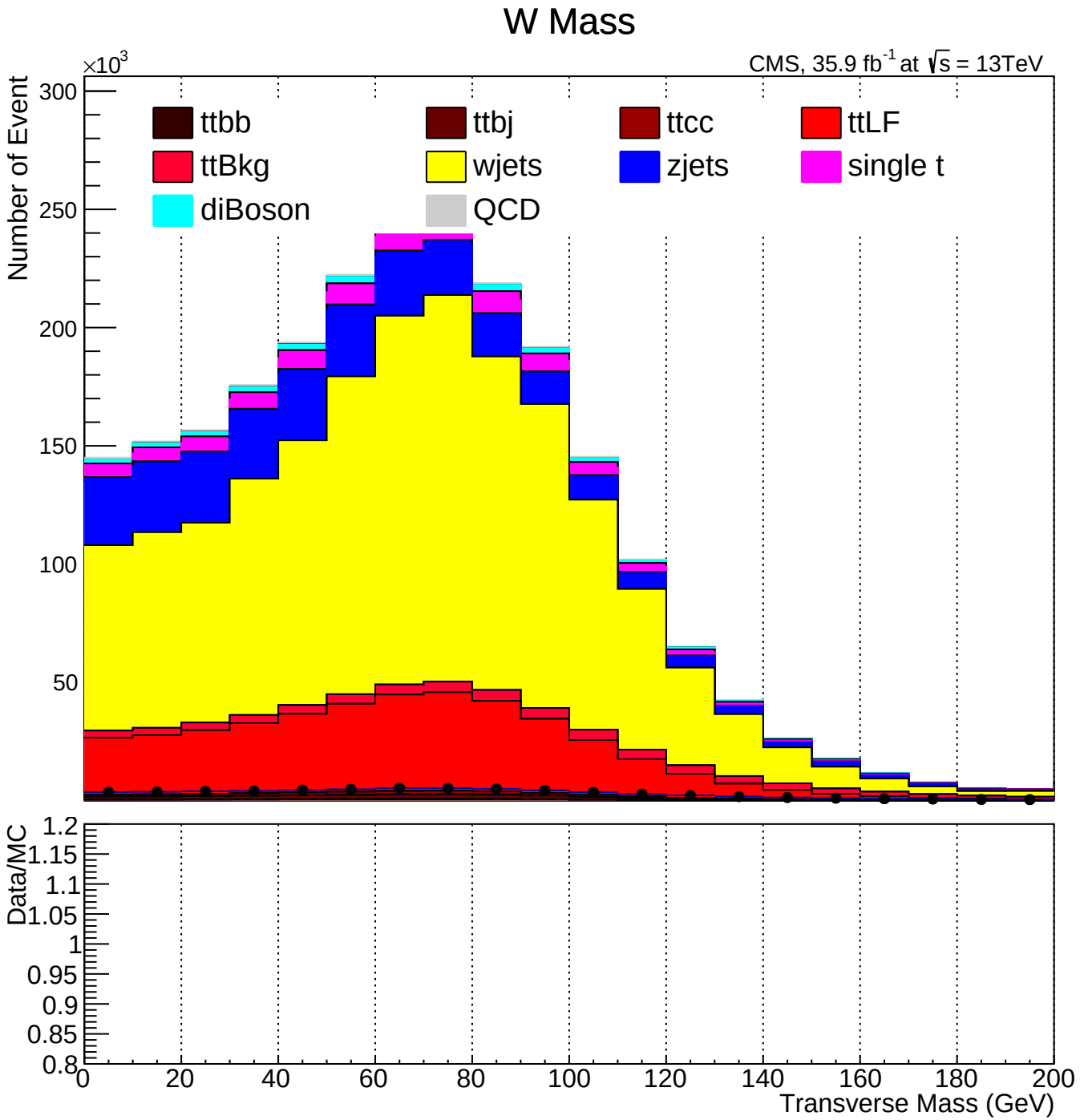

Number of jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
1800
1600
1400
1200
1000
800
600
400
200
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
2
4
6
8
10
12
Jet Multiplicity

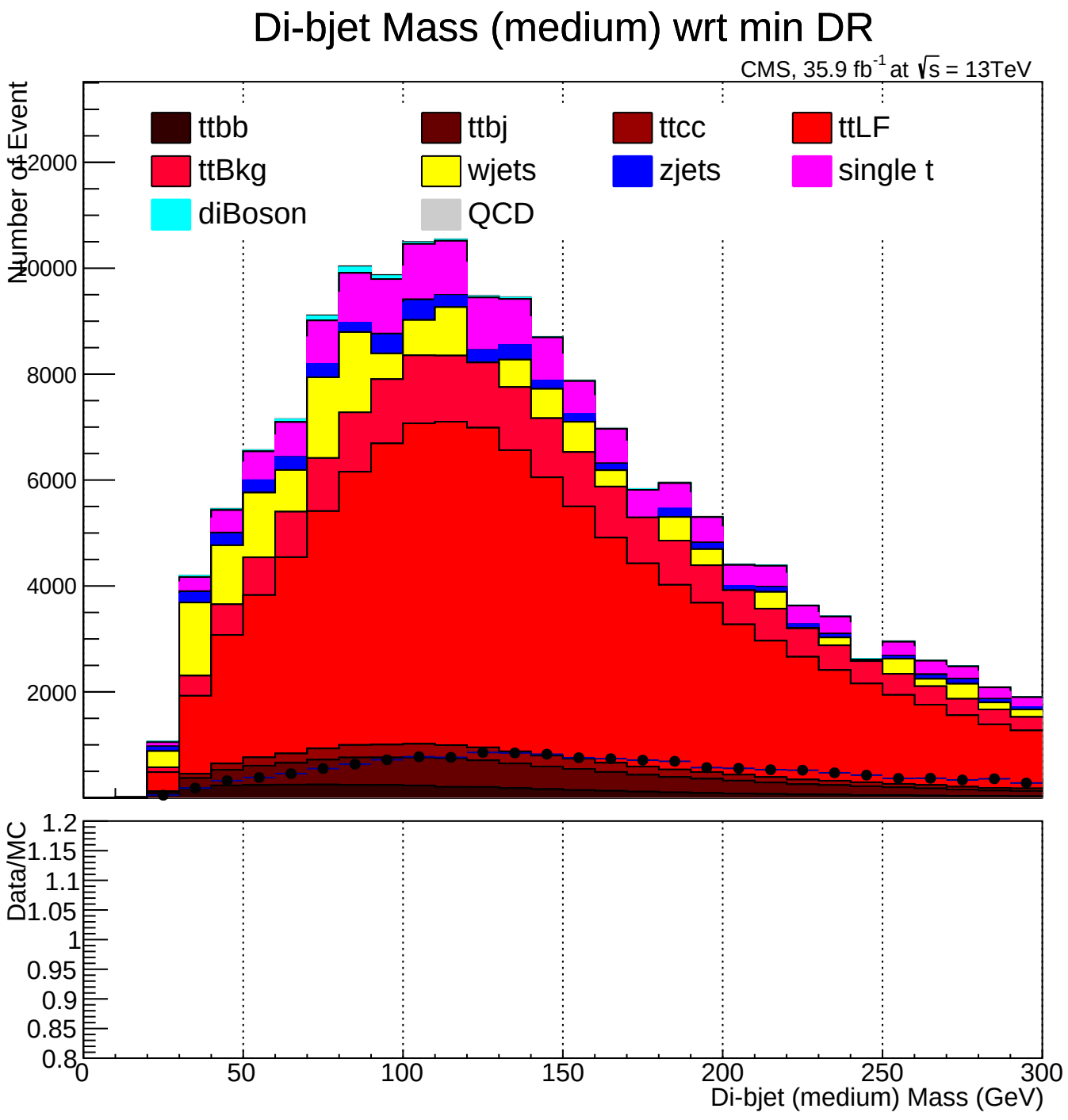

Number of b tagged jets (medium)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
$\times 10^3$
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b-tagged Jet Multiplicity (CSVv2M)

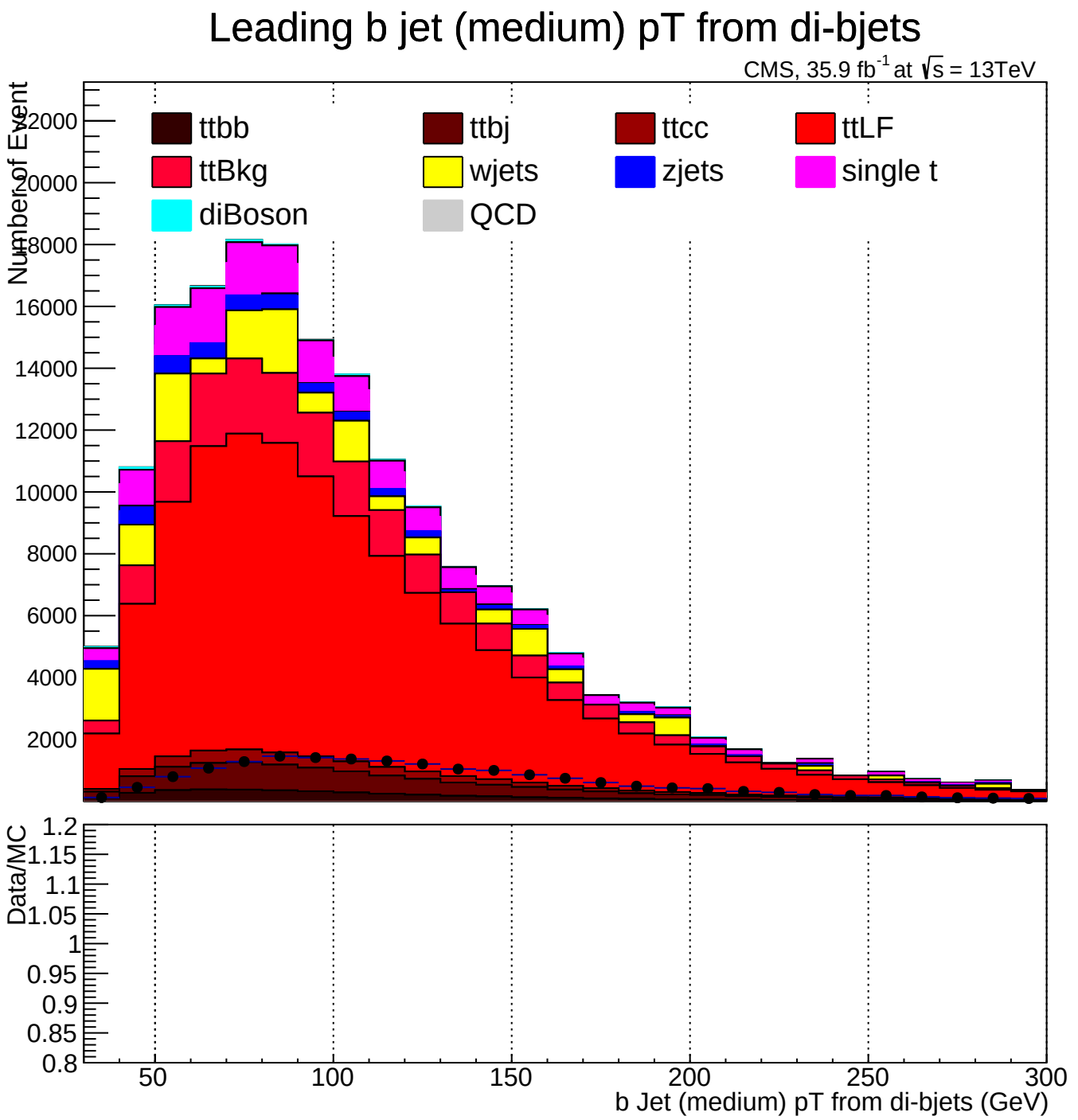

Number of b tagged jets (tight)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b-tagged Jet Multiplicity (CSVv2T)

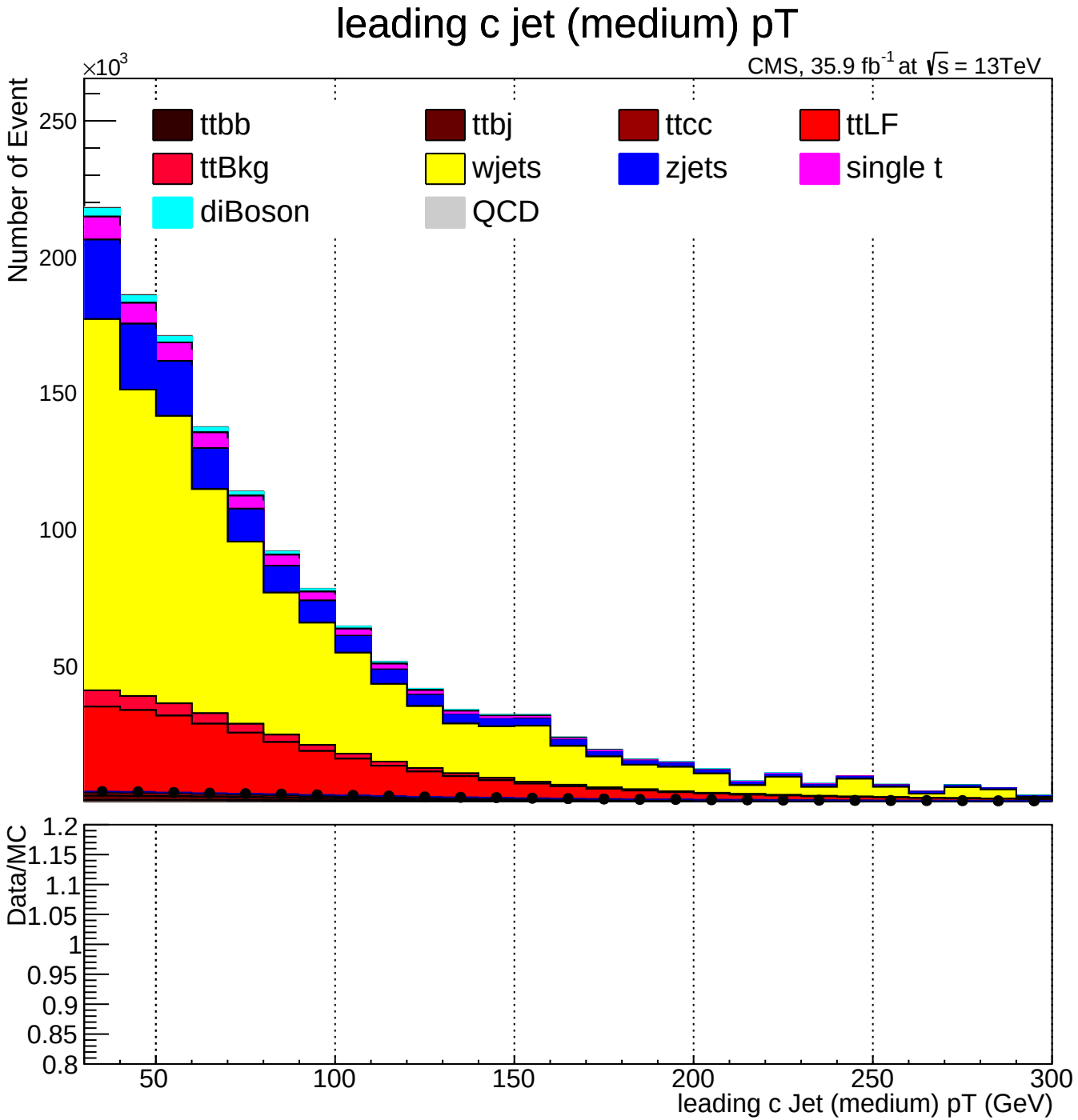

Number of c tagged jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
1200
1000
800
600
400
200
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
c-tagged Jet Multiplicity (M)

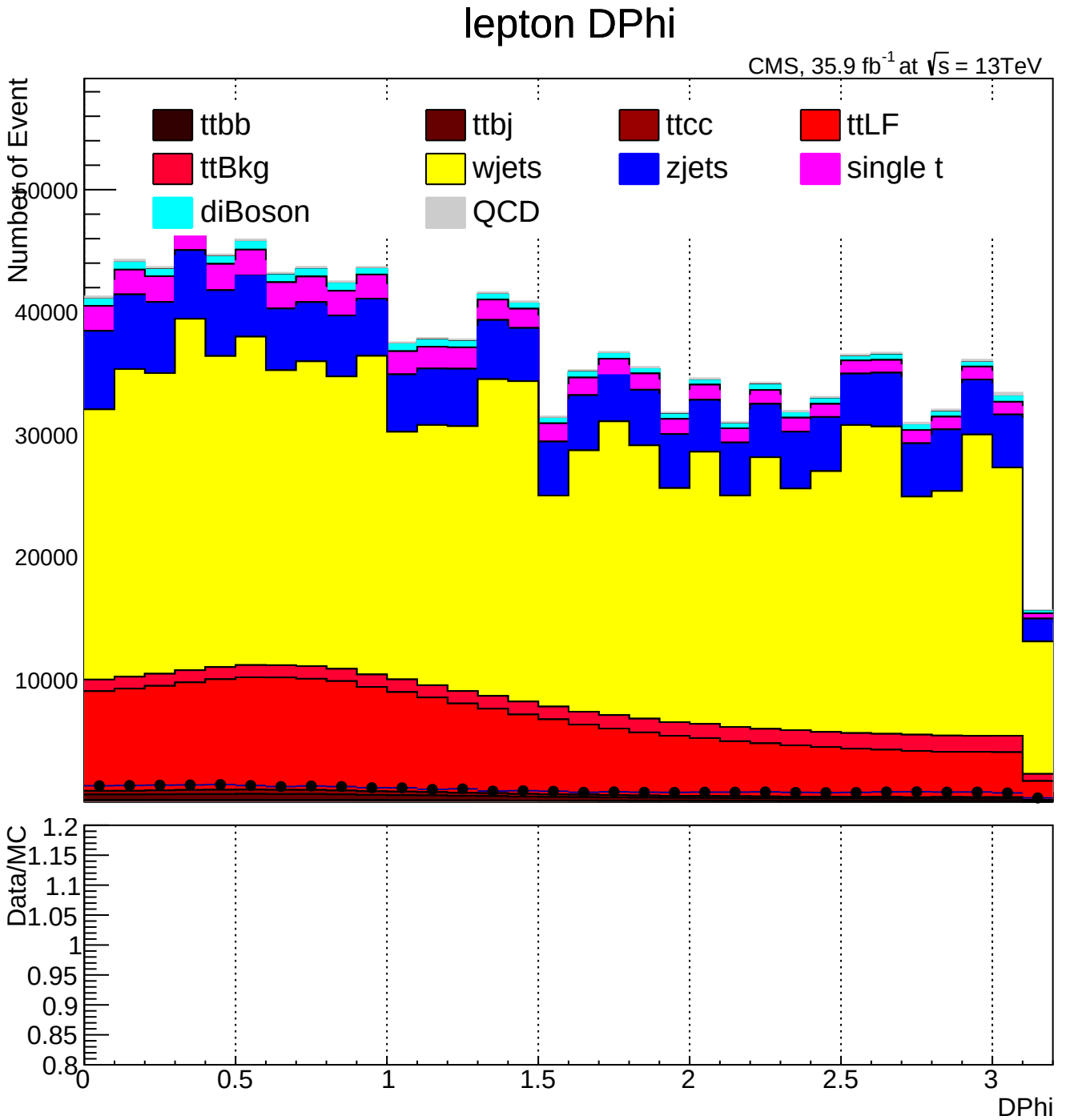

MET
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
MET (GeV)

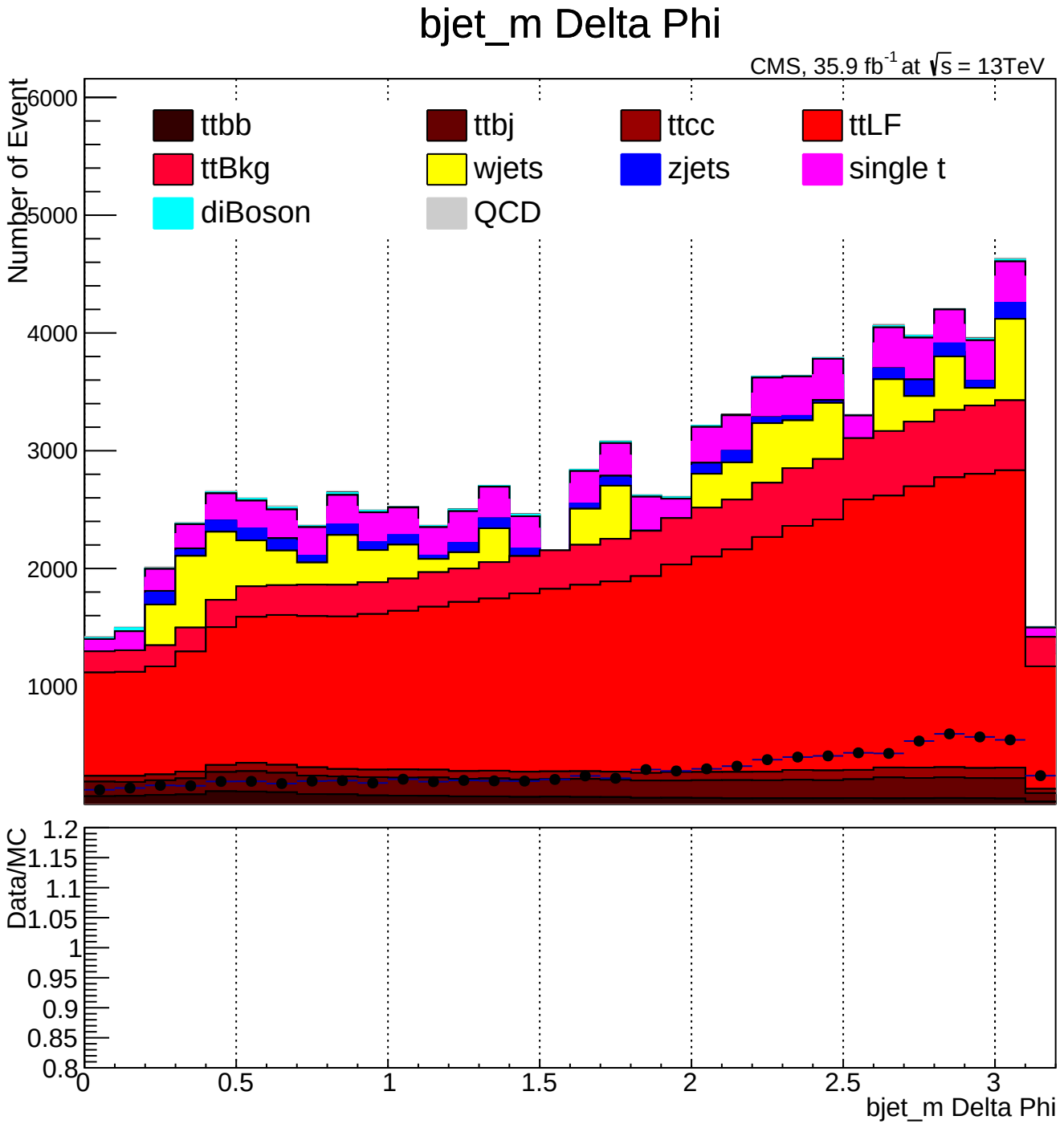

W Mass
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Transverse Mass (GeV)

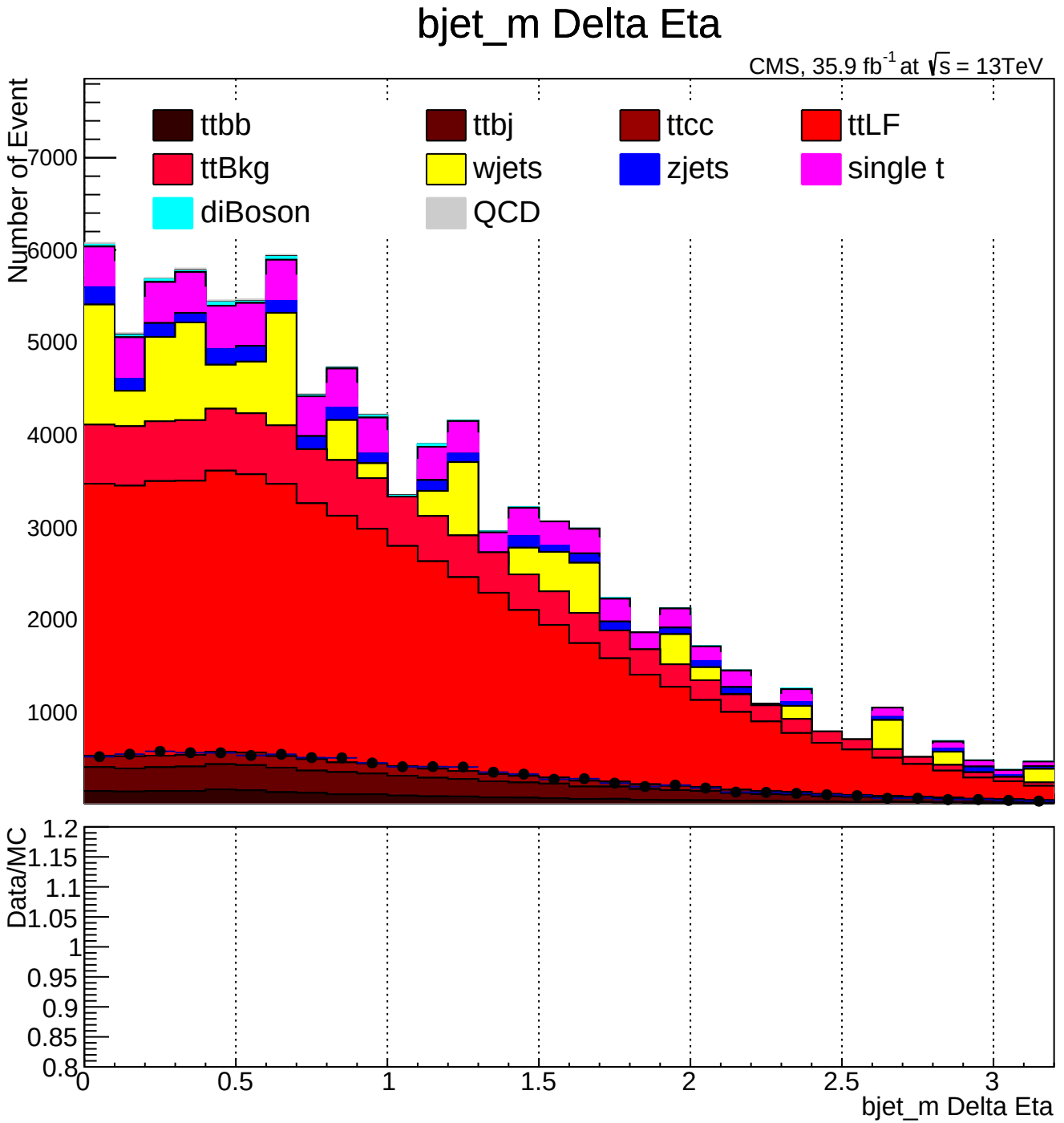

Di-bjet Mass (medium) wrt min DR
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
2000
4000
6000
8000
10000
12000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
50
100
150
200
250
300
Di-bjet (medium) Mass (GeV)

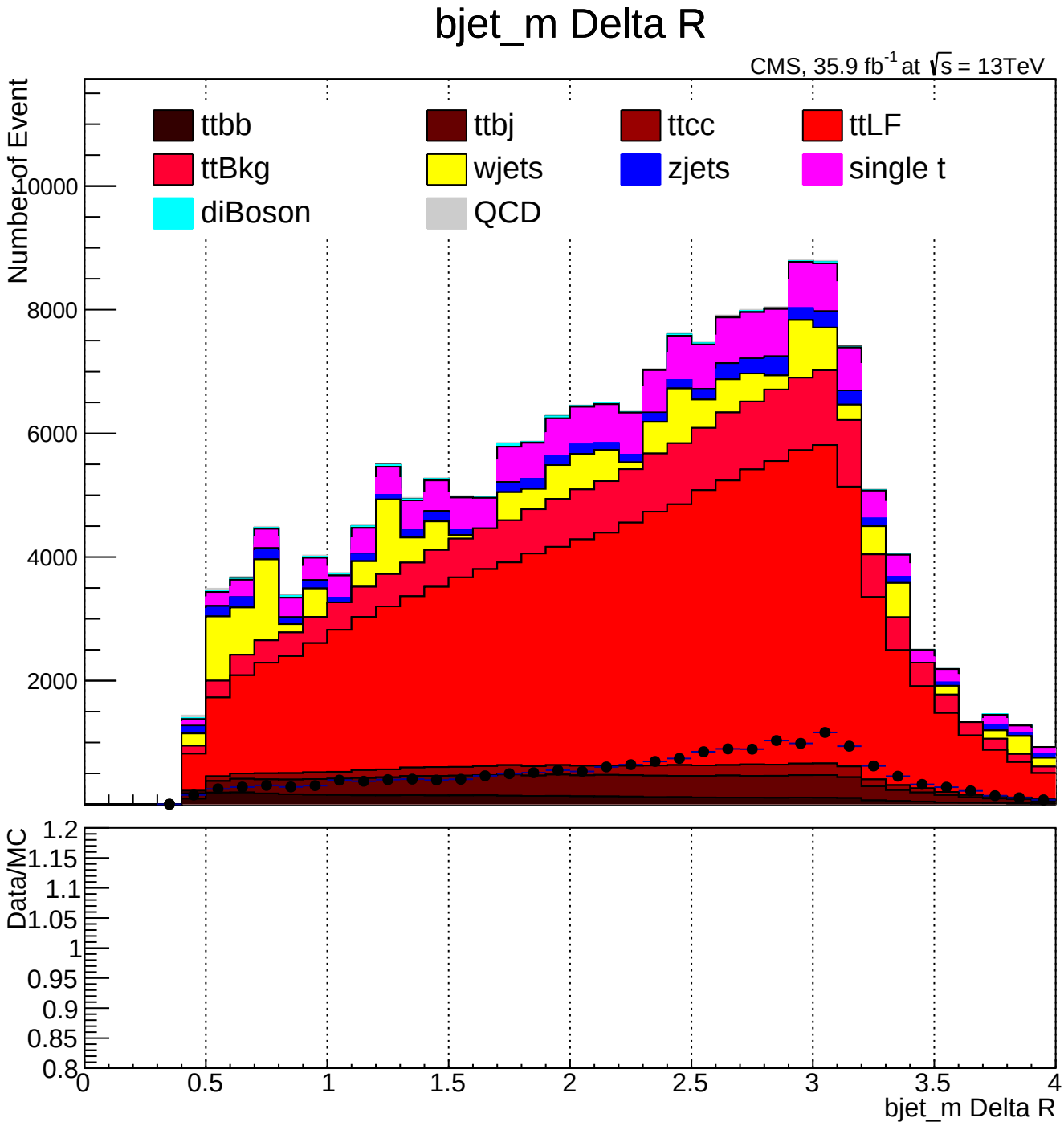

Leading b jet (medium) pT from di-bjets
CMS, 35.9 fb-1 at √s = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b Jet (medium) pT from di-bjets (GeV)

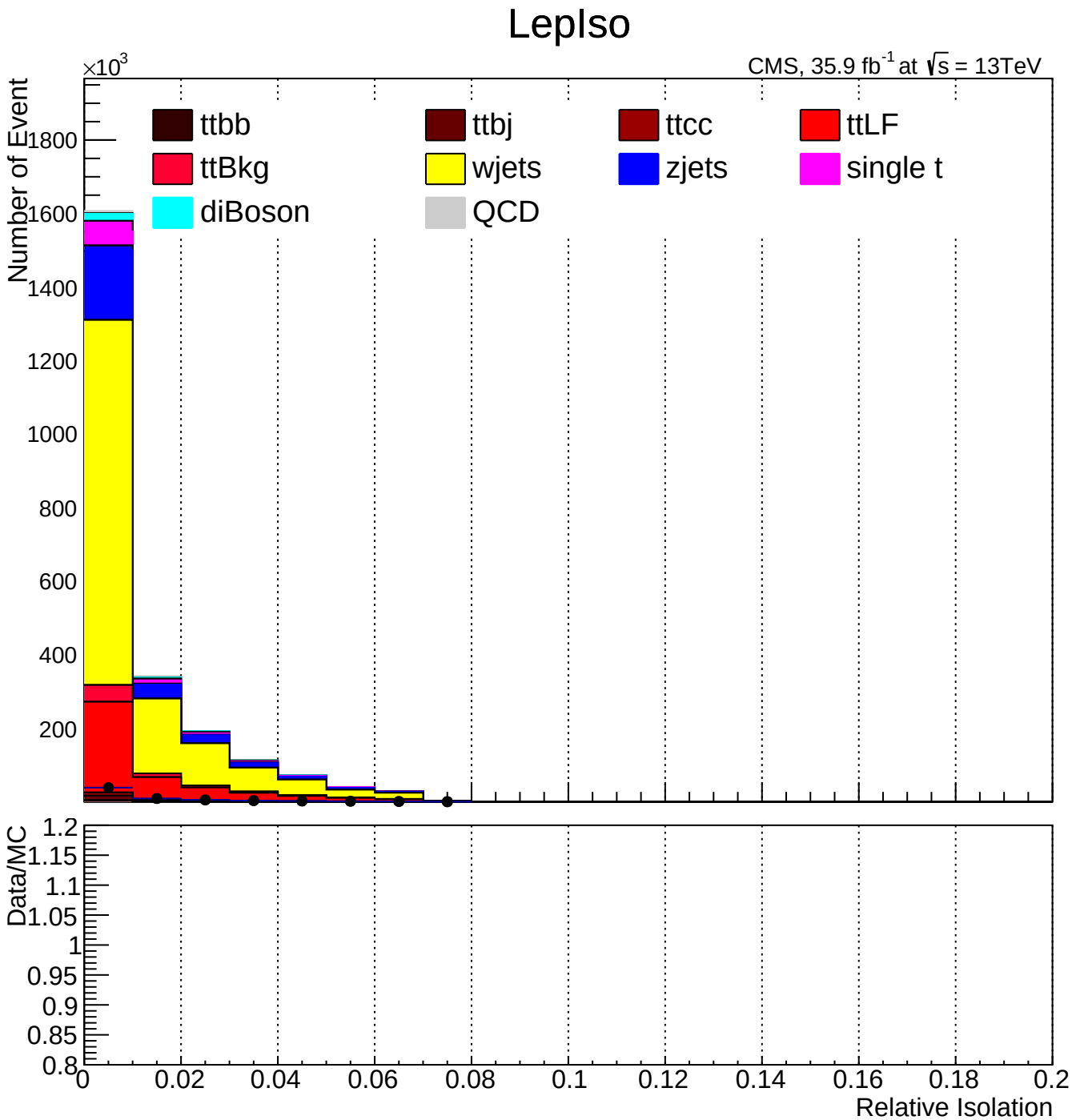

leading c jet (medium) pT
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
leading c Jet (medium) pT (GeV)

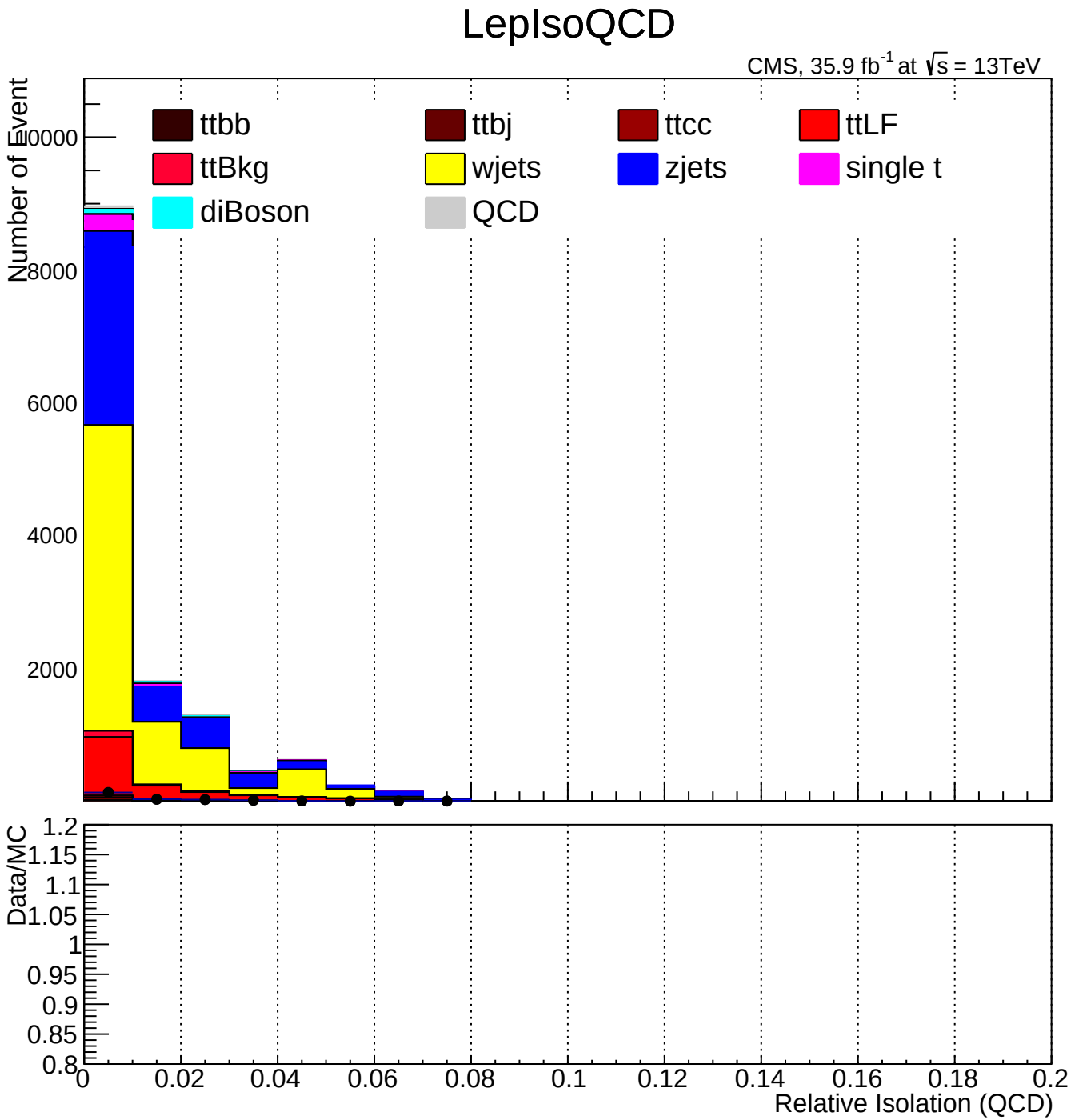

lepton DPhi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
50000
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
DPhi

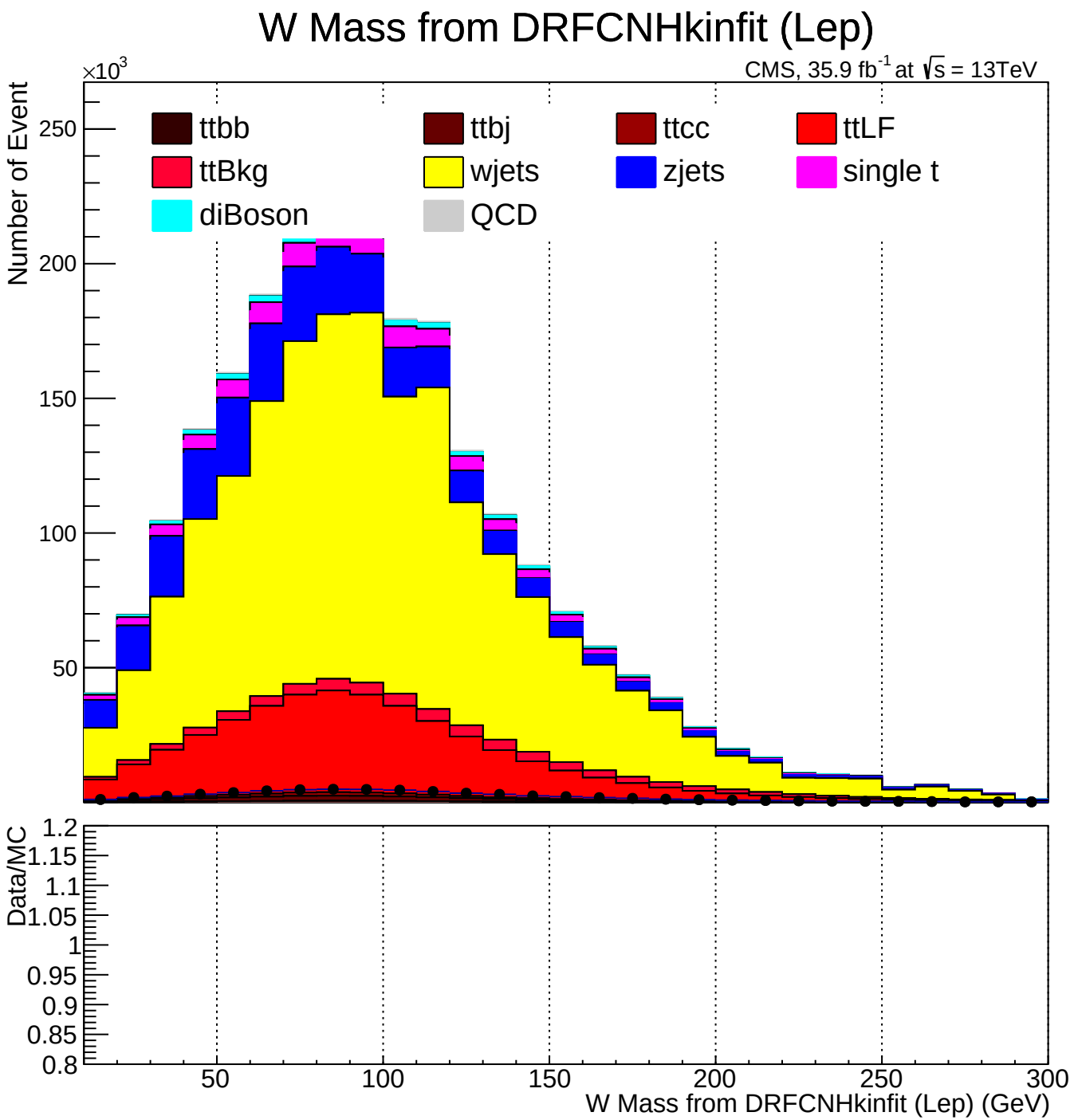

bjet_m Delta Phi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta Phi

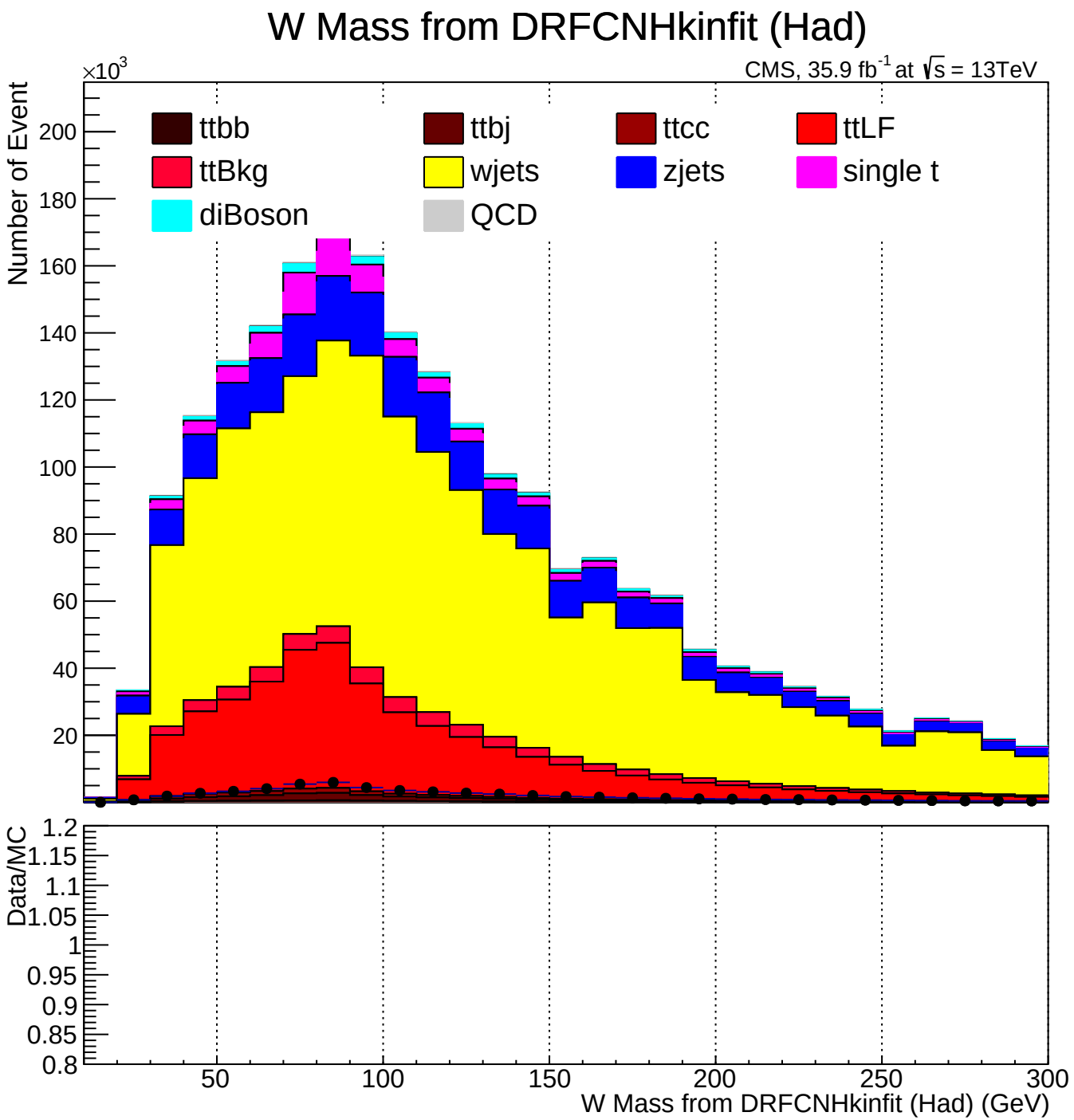

bjet_m Delta Eta
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
7000
6000
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Eta

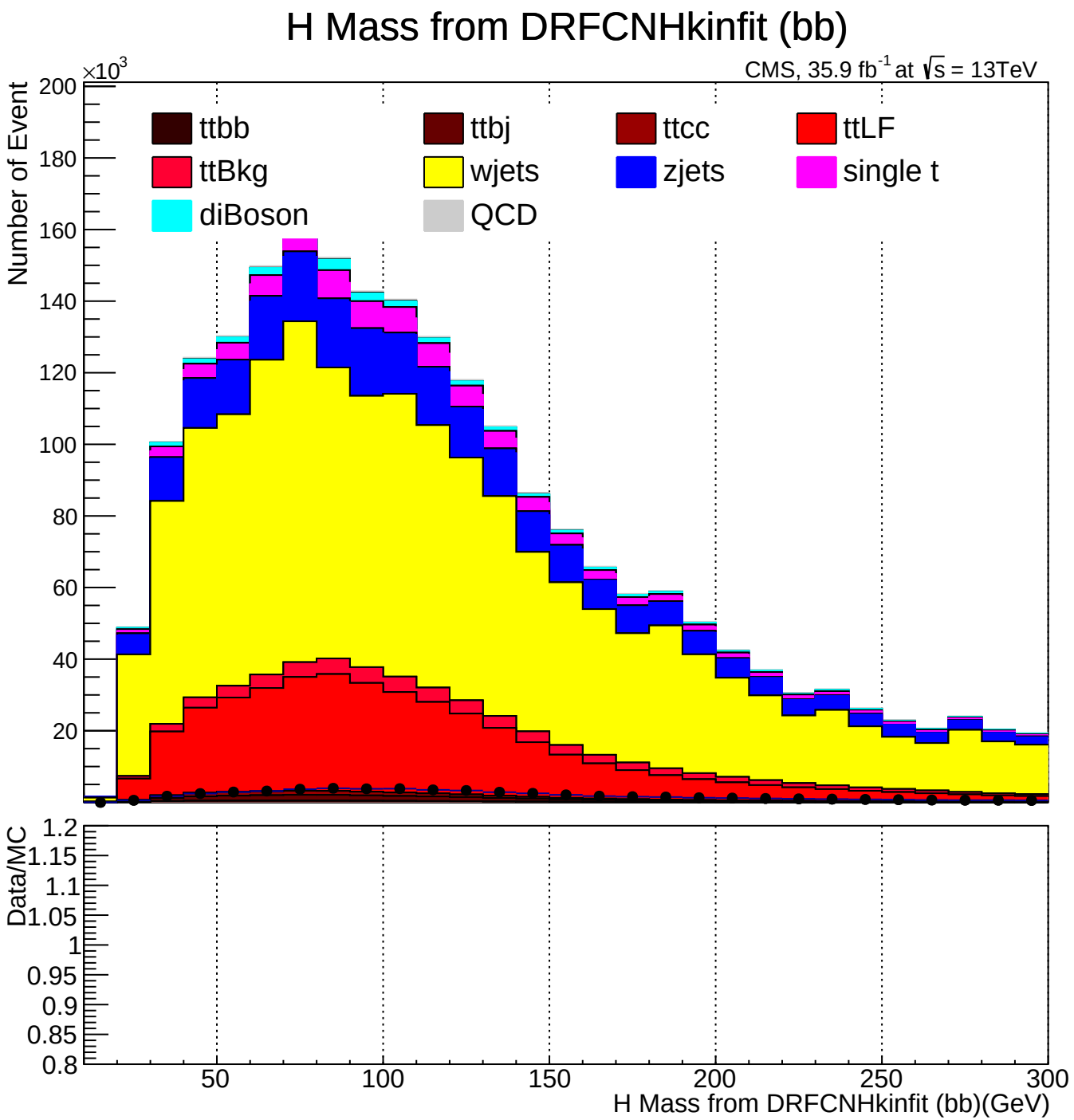

bjet_m Delta R
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
3.5
4
bjet_m Delta R

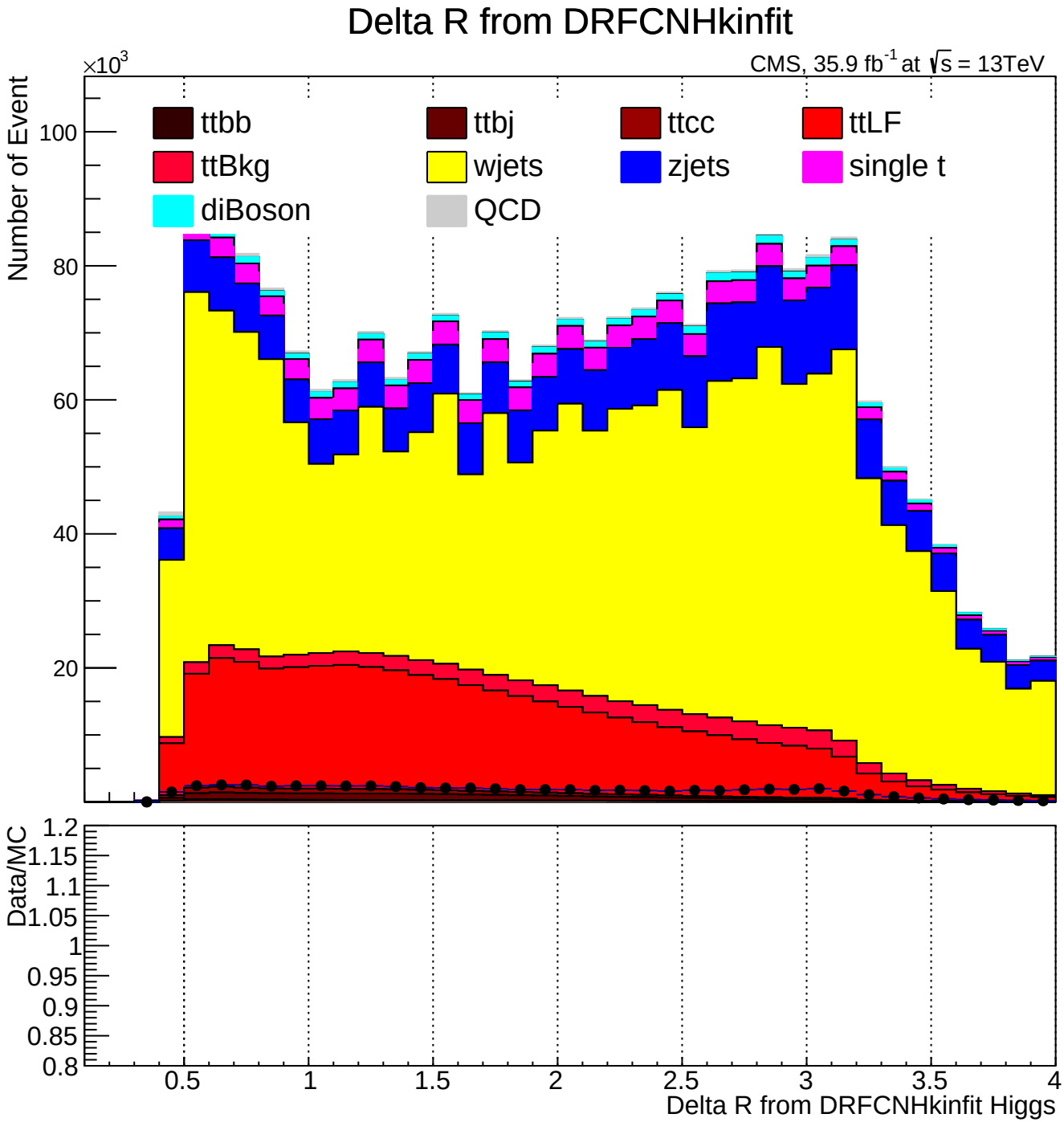

LepIso
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
1800
1600
1400
1200
1000
800
600
400
200
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation

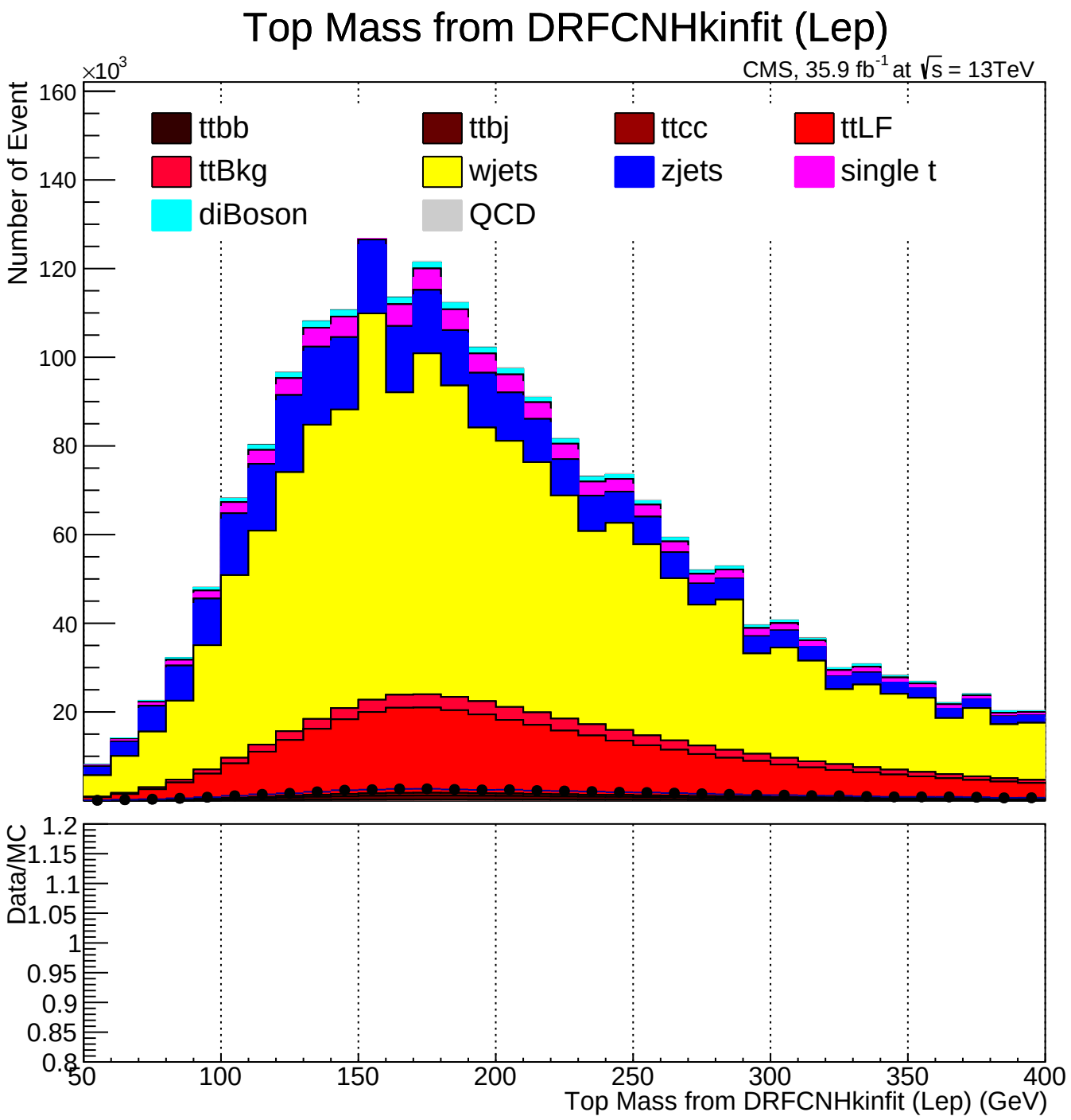

LepIsoQCD
CMS, 35.9 fb-1 at √s = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation (QCD)

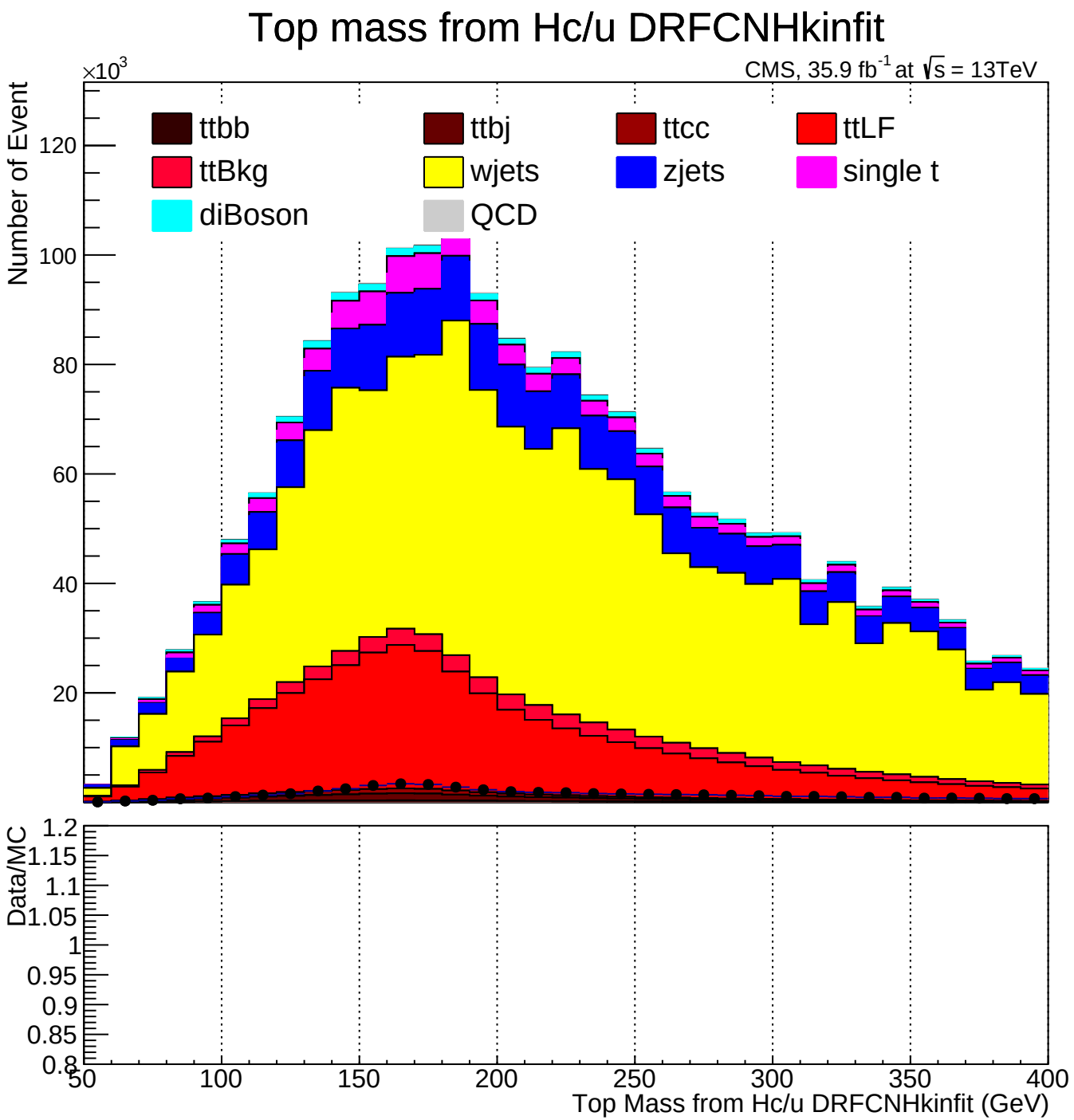

W Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
250
200
150
100
50
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
W Mass from DRFCNHkinfit (Lep) (GeV)

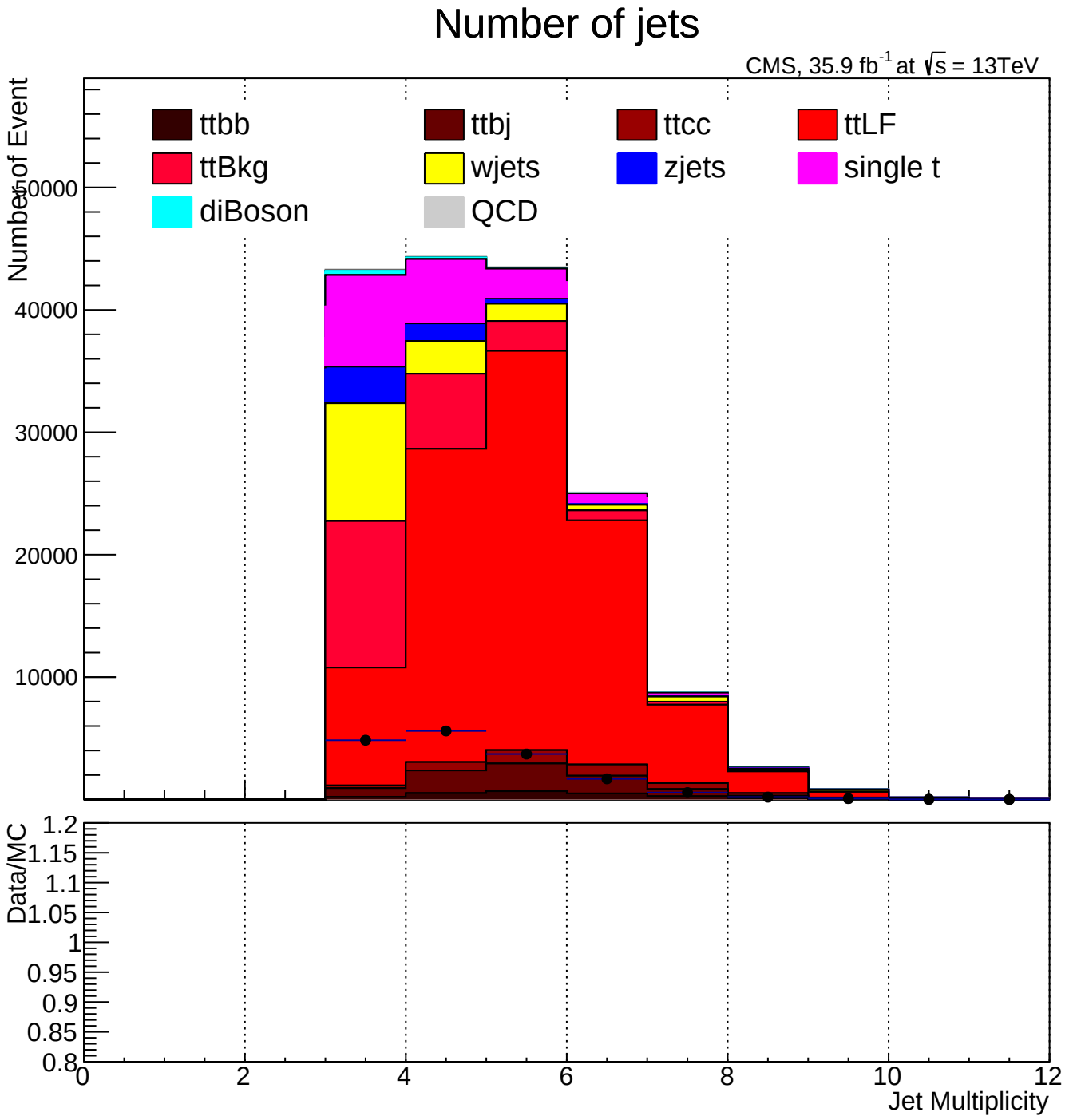

W Mass from DRFCNHkinfit (Had)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
W Mass from DRFCNHkinfit (Had) (GeV)

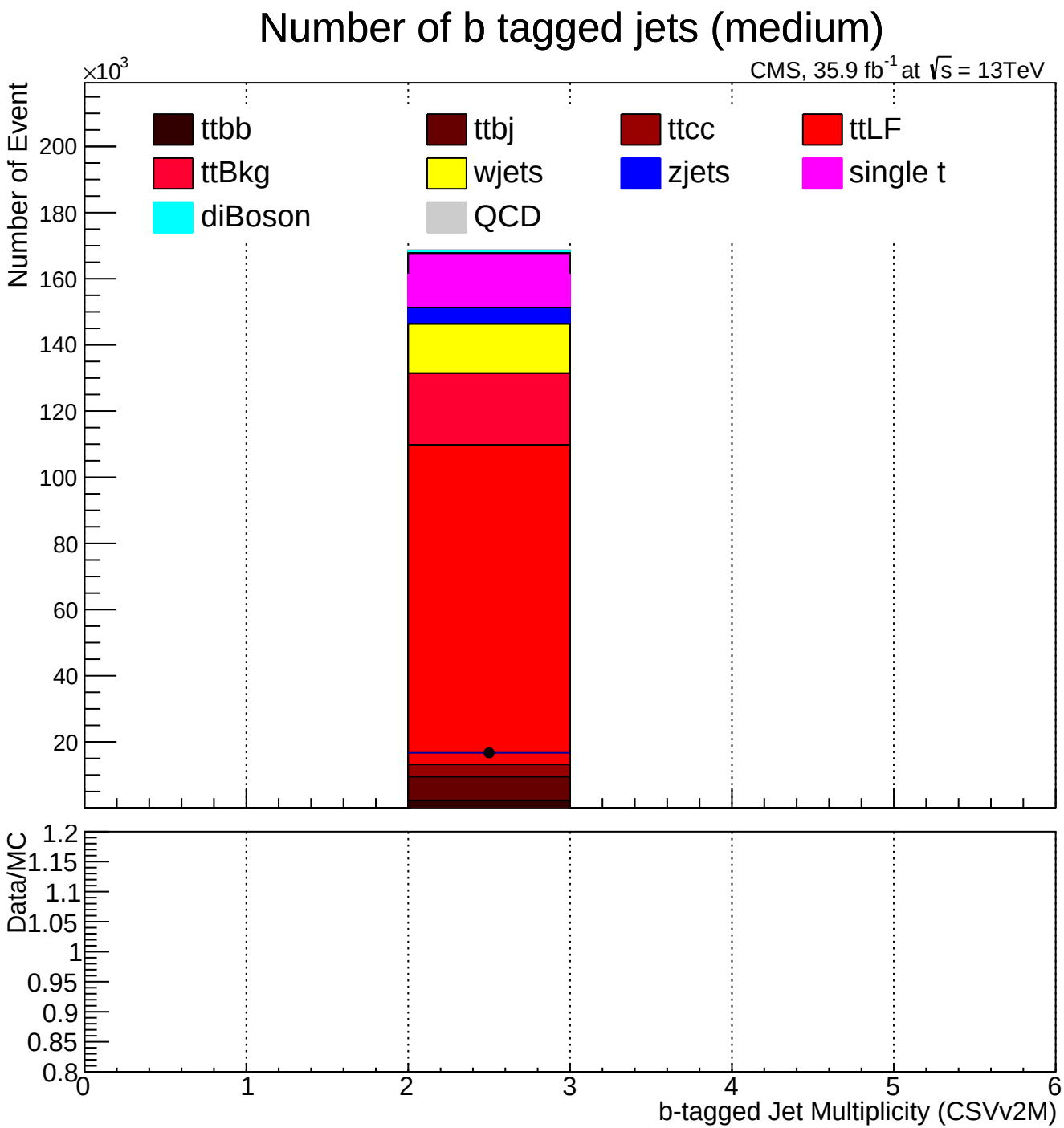

H Mass from DRFCNHkinfit (bb)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
H Mass from DRFCNHkinfit (bb)(GeV)

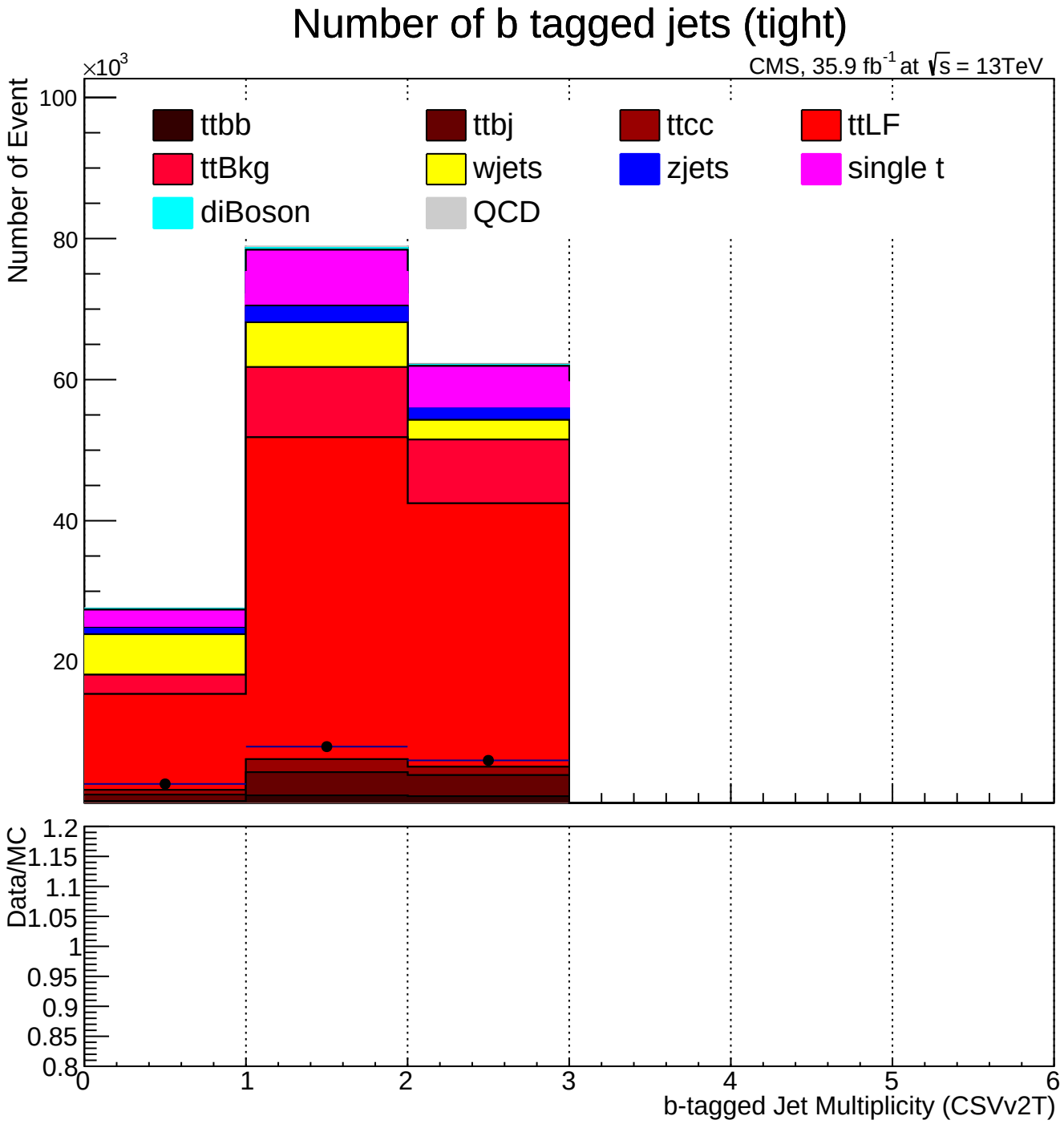

Delta R from DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Delta R from DRFCNHkinfit Higgs

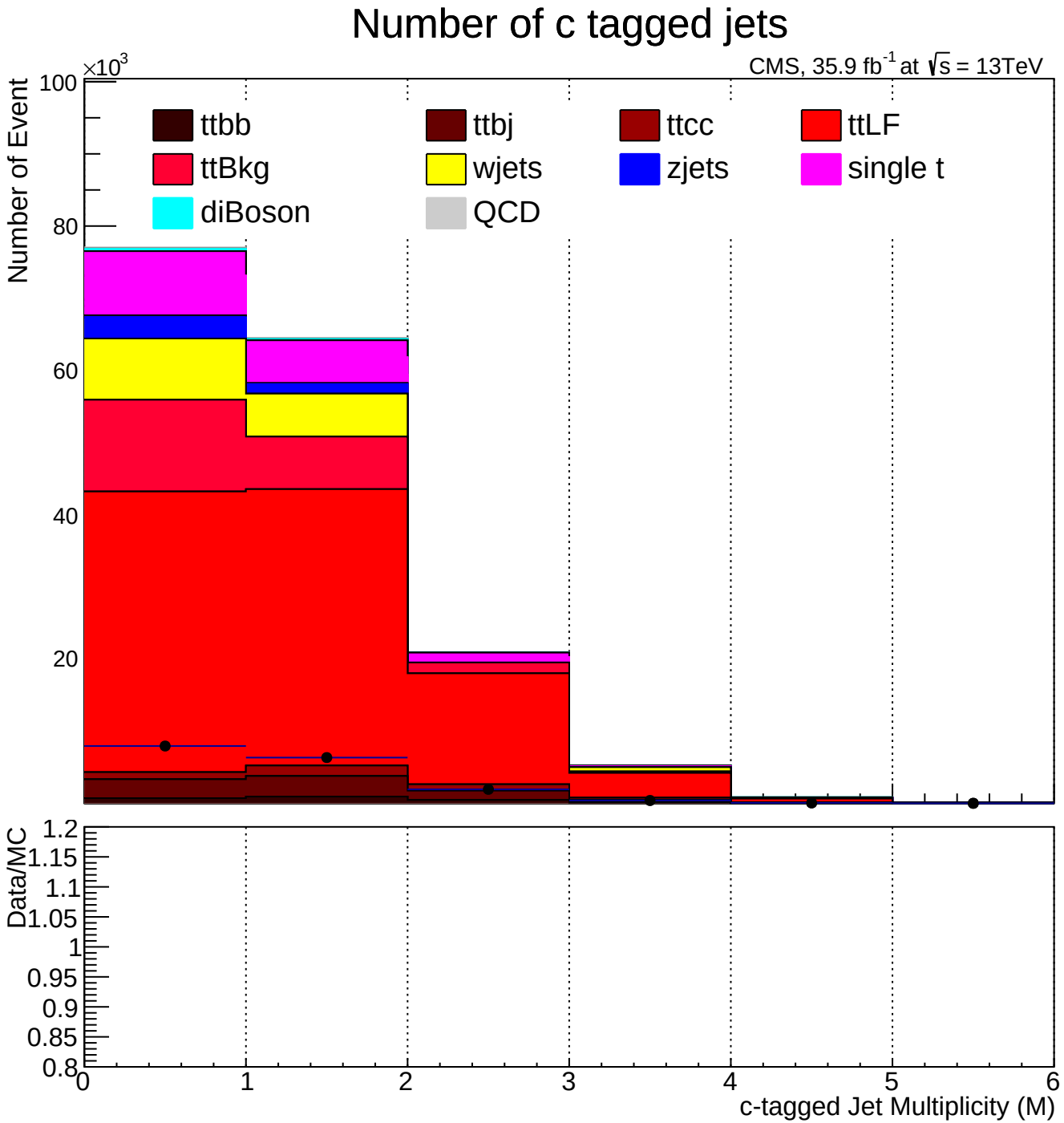

Top Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Top Mass from DRFCNHkinfit (Lep) (GeV)

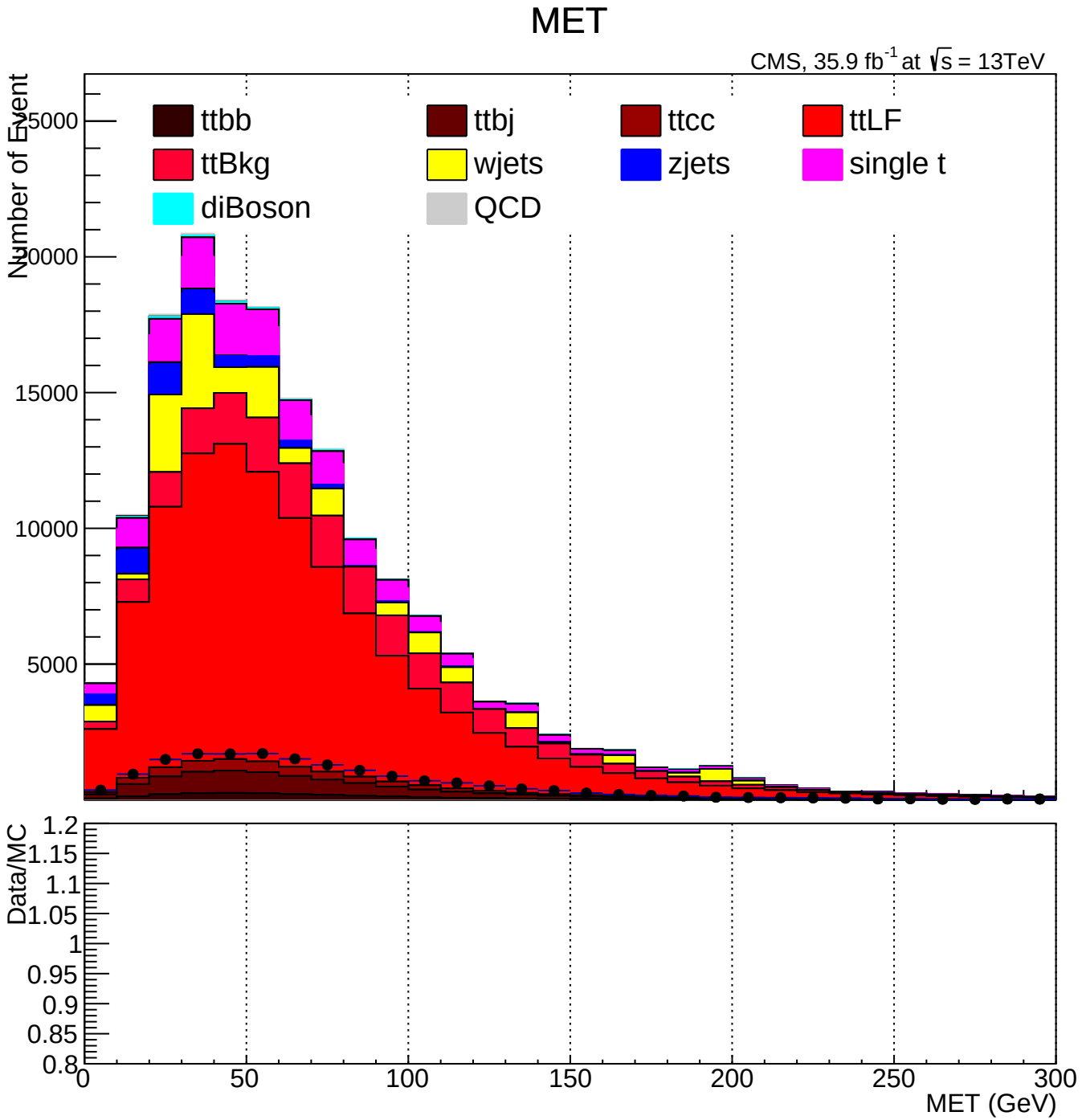

Top mass from Hc/u DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Top Mass from Hc/u DRFCNHkinfit (GeV)

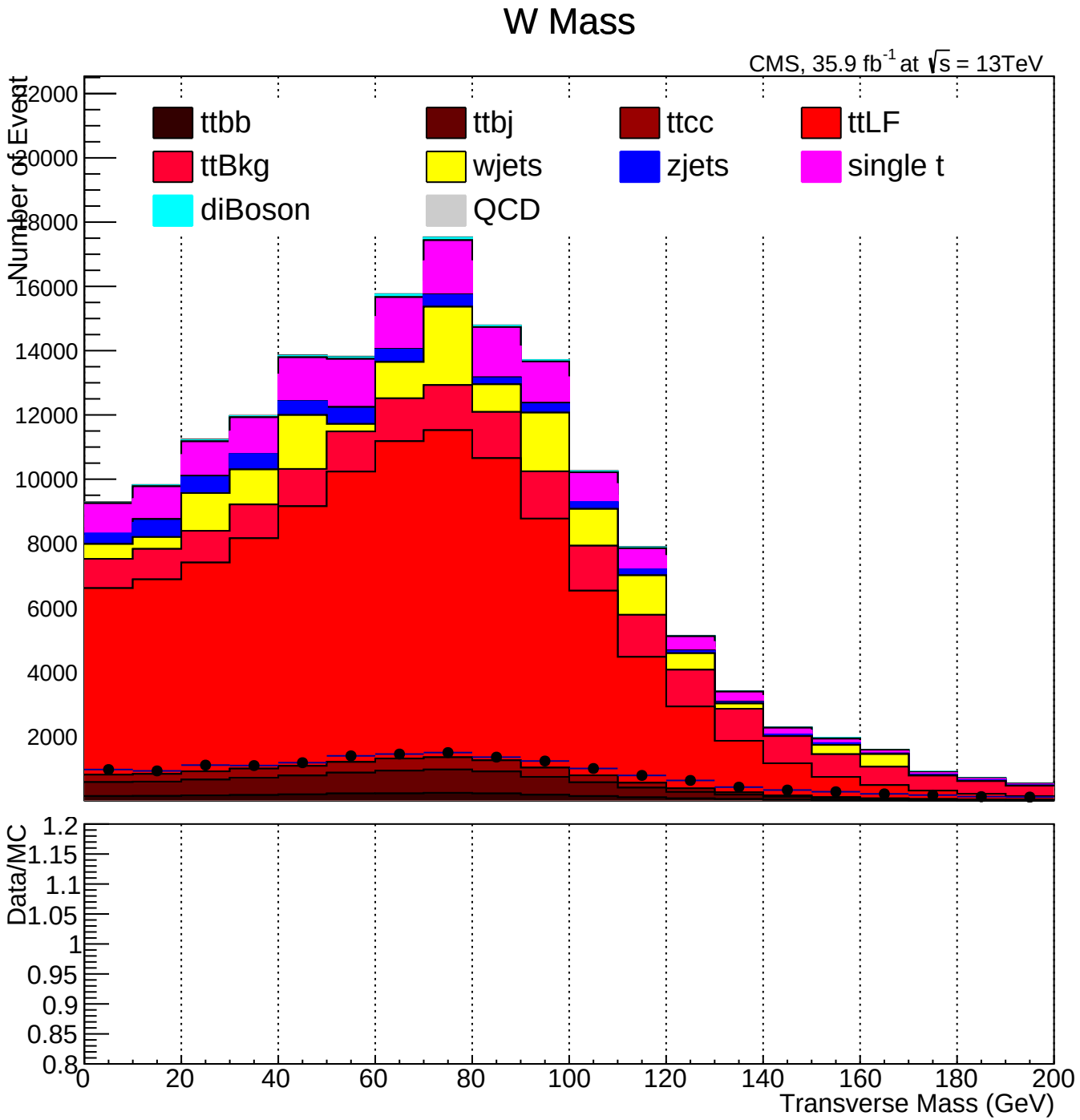

Number of jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
50000
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
2
4
6
8
10
12
Jet Multiplicity

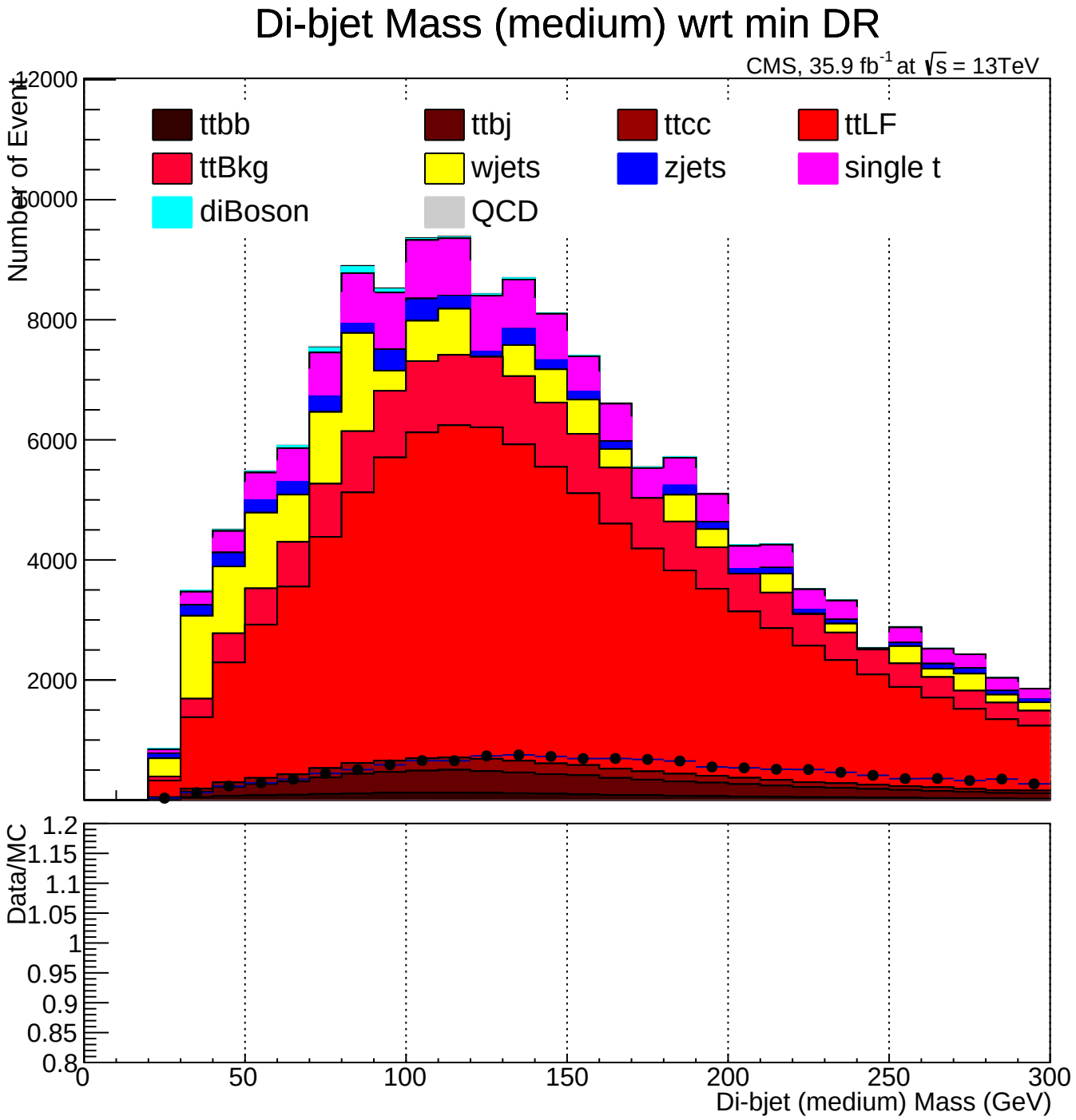

Number of b tagged jets (medium)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
$\times 10^3$
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b-tagged Jet Multiplicity (CSVv2M)

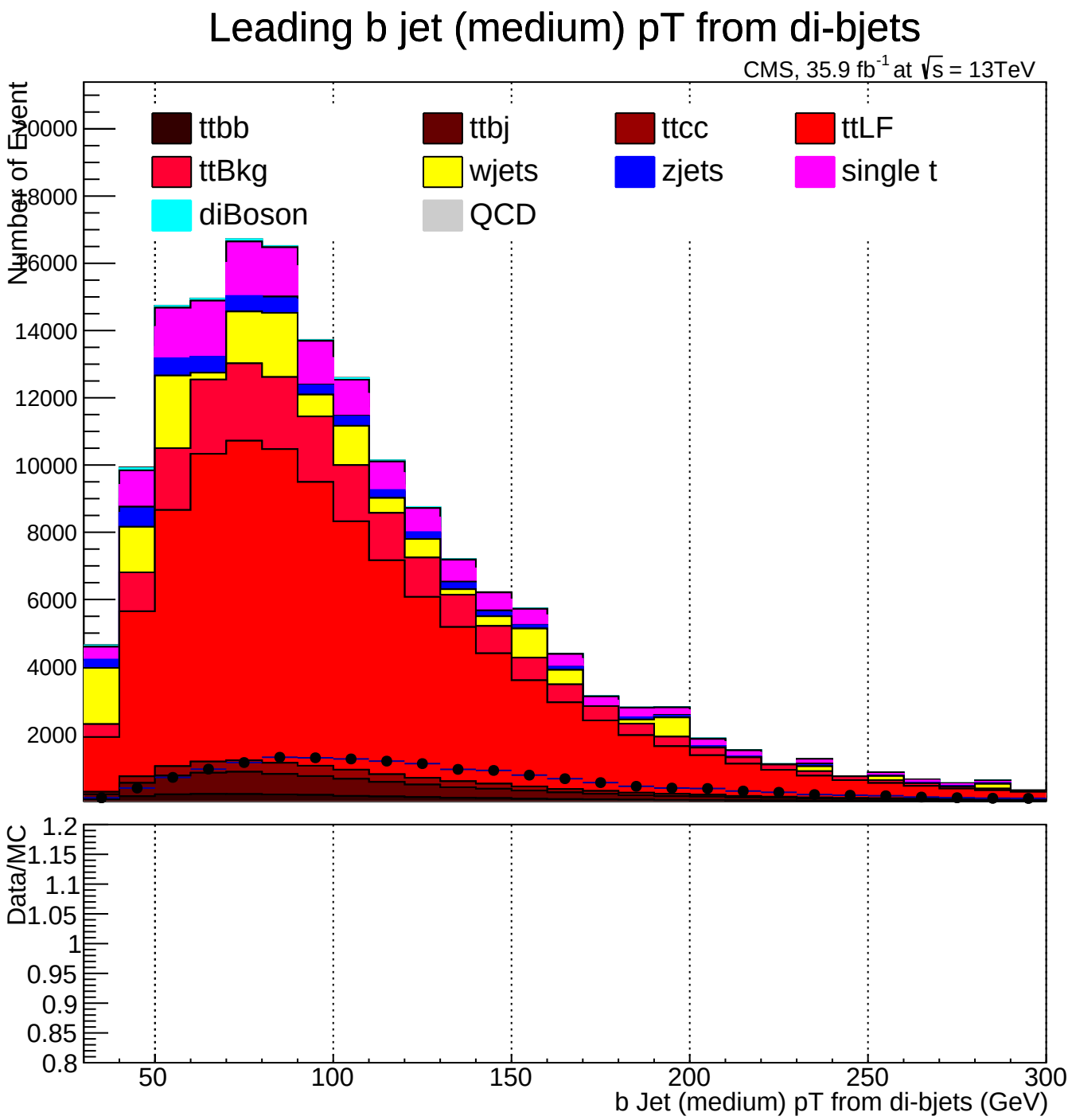

Number of b tagged jets (tight)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
$\times 10^3$
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b-tagged Jet Multiplicity (CSVv2T)

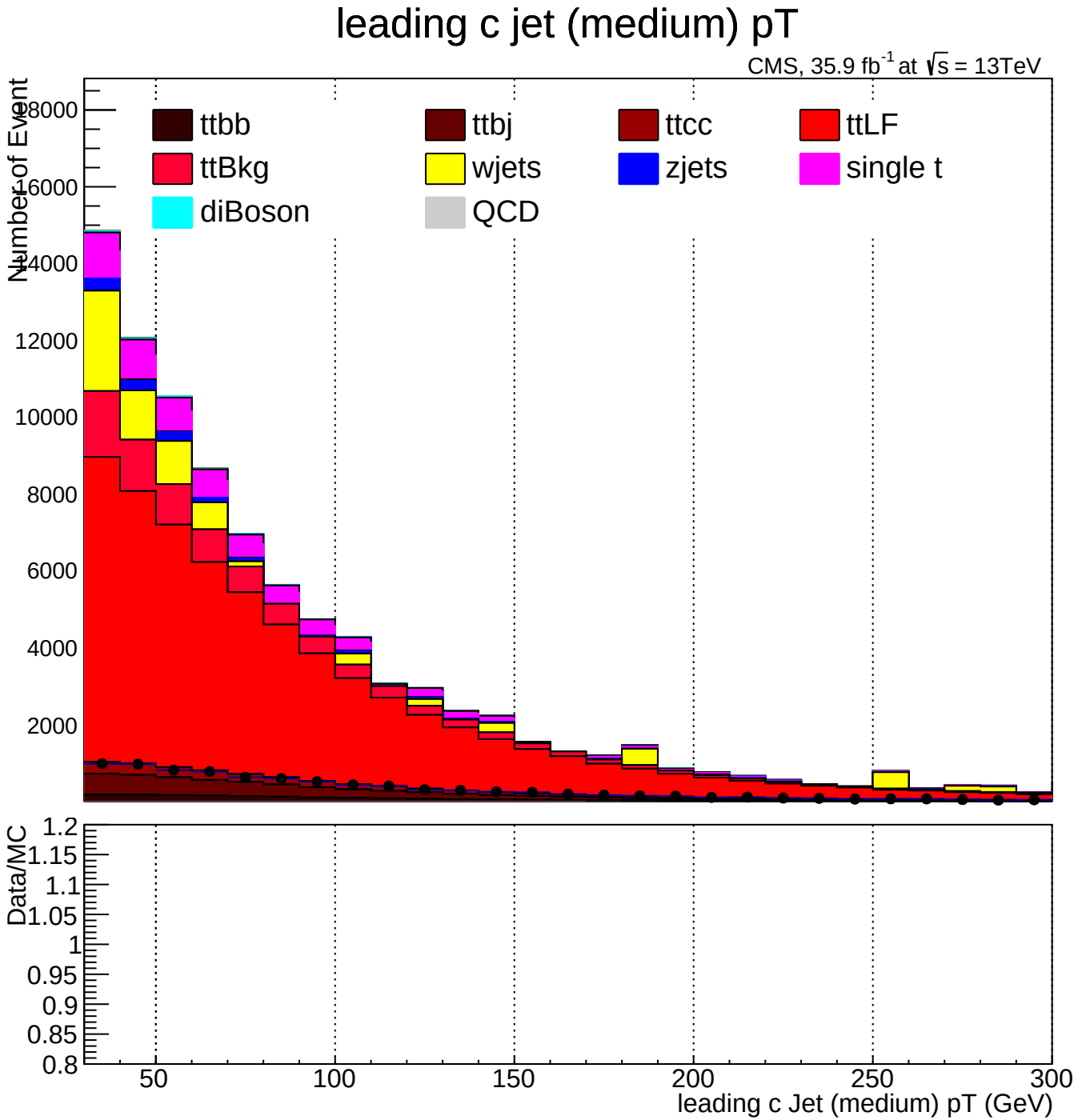

Number of c tagged jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
c-tagged Jet Multiplicity (M)

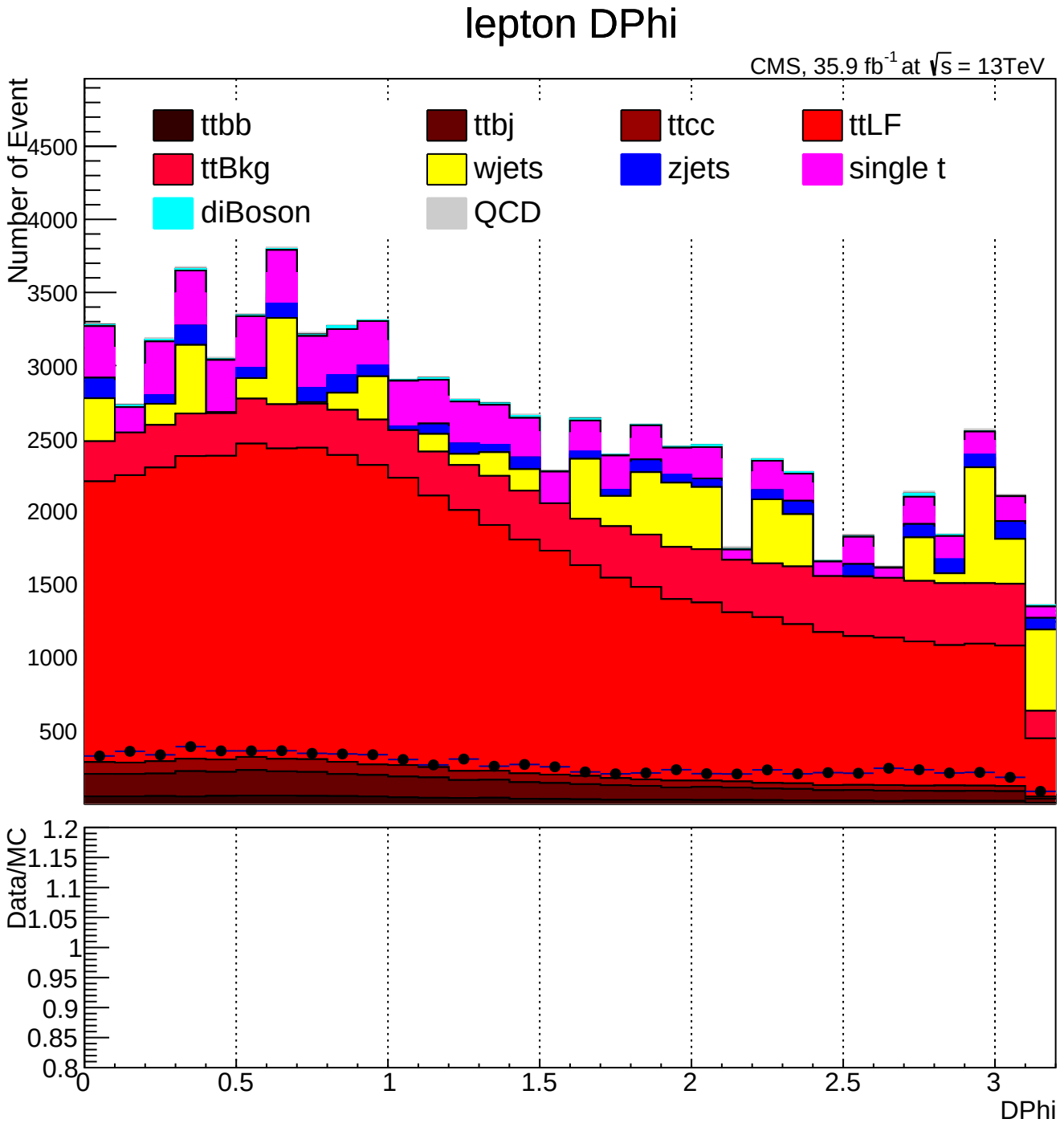

MET
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
25000
20000
15000
10000
5000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
50
100
150
200
250
300
MET (GeV)

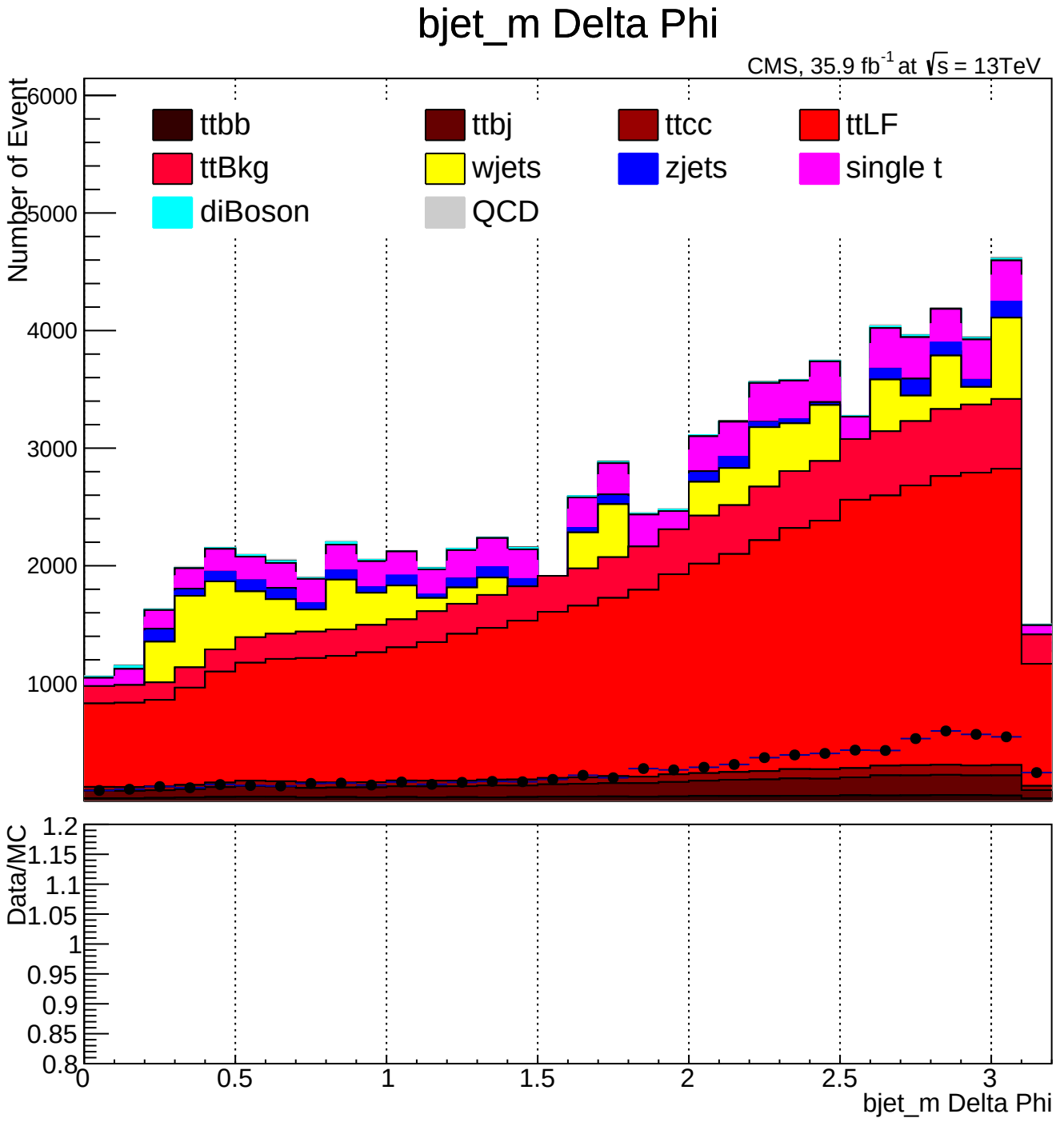

W Mass
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
Transverse Mass (GeV)

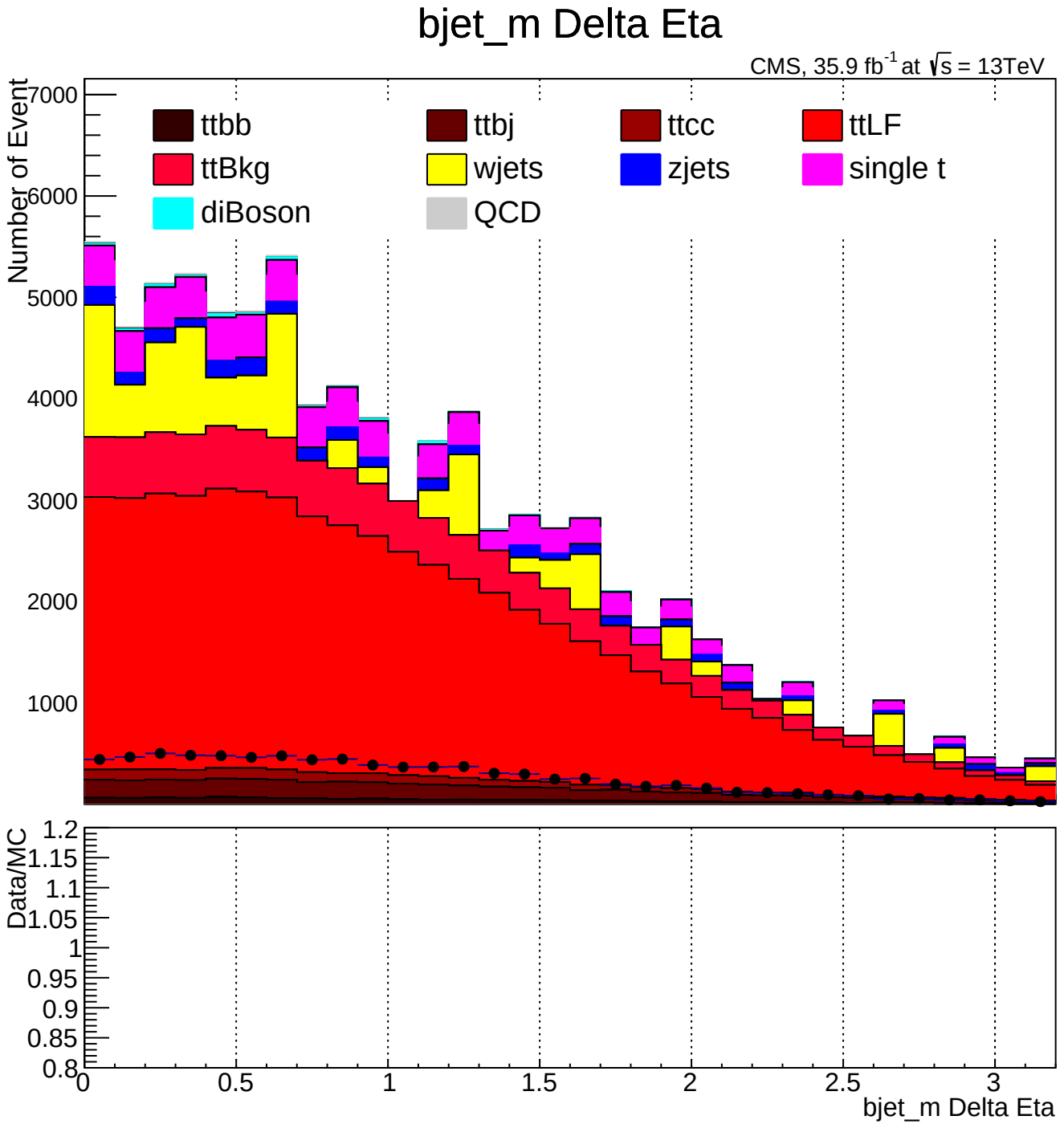

Di-bjet Mass (medium) wrt min DR
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Di-bjet (medium) Mass (GeV)

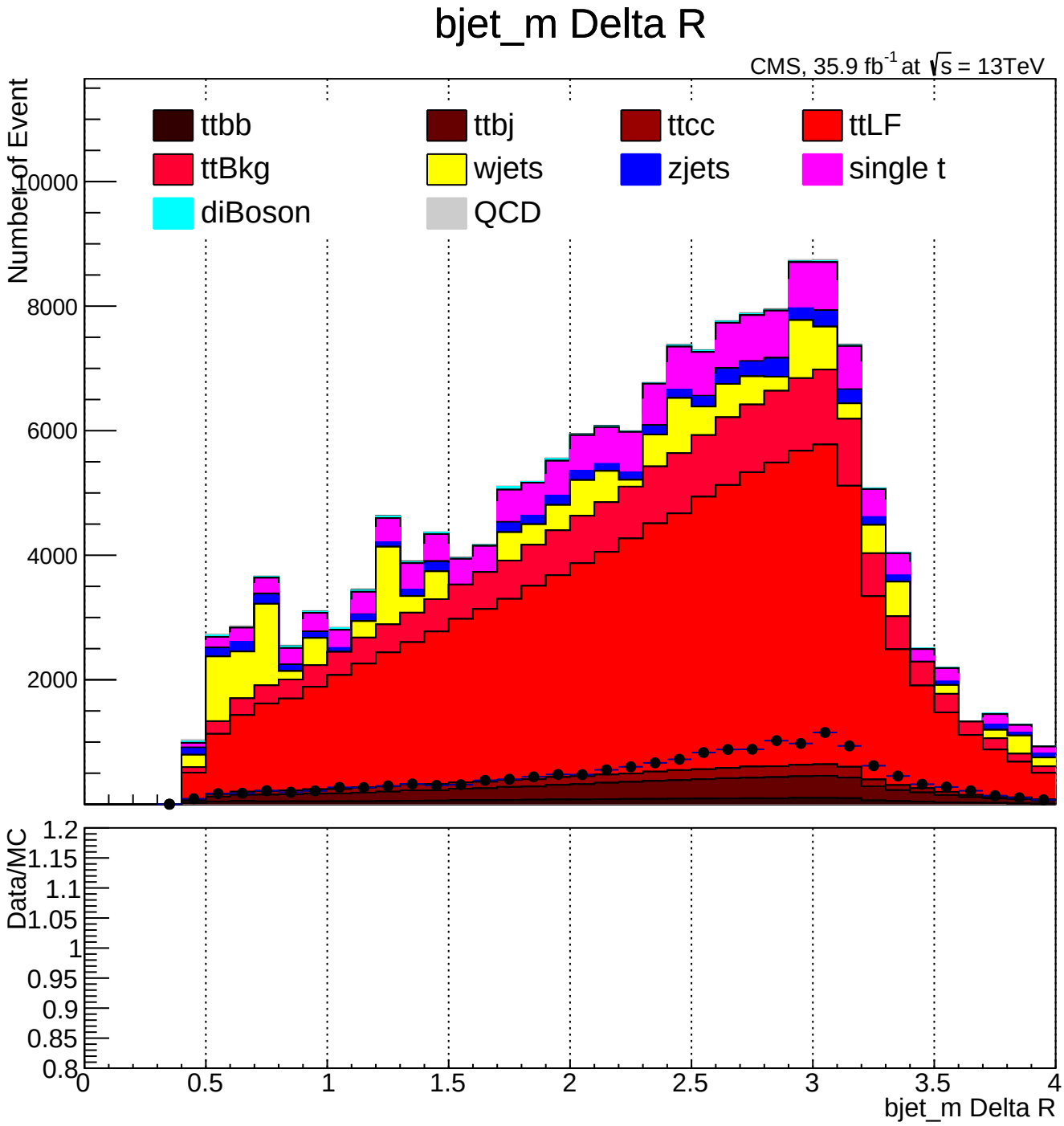

Leading b jet (medium) pT from di-bjets
CMS, 35.9 fb-1 at √s = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b Jet (medium) pT from di-bjets (GeV)

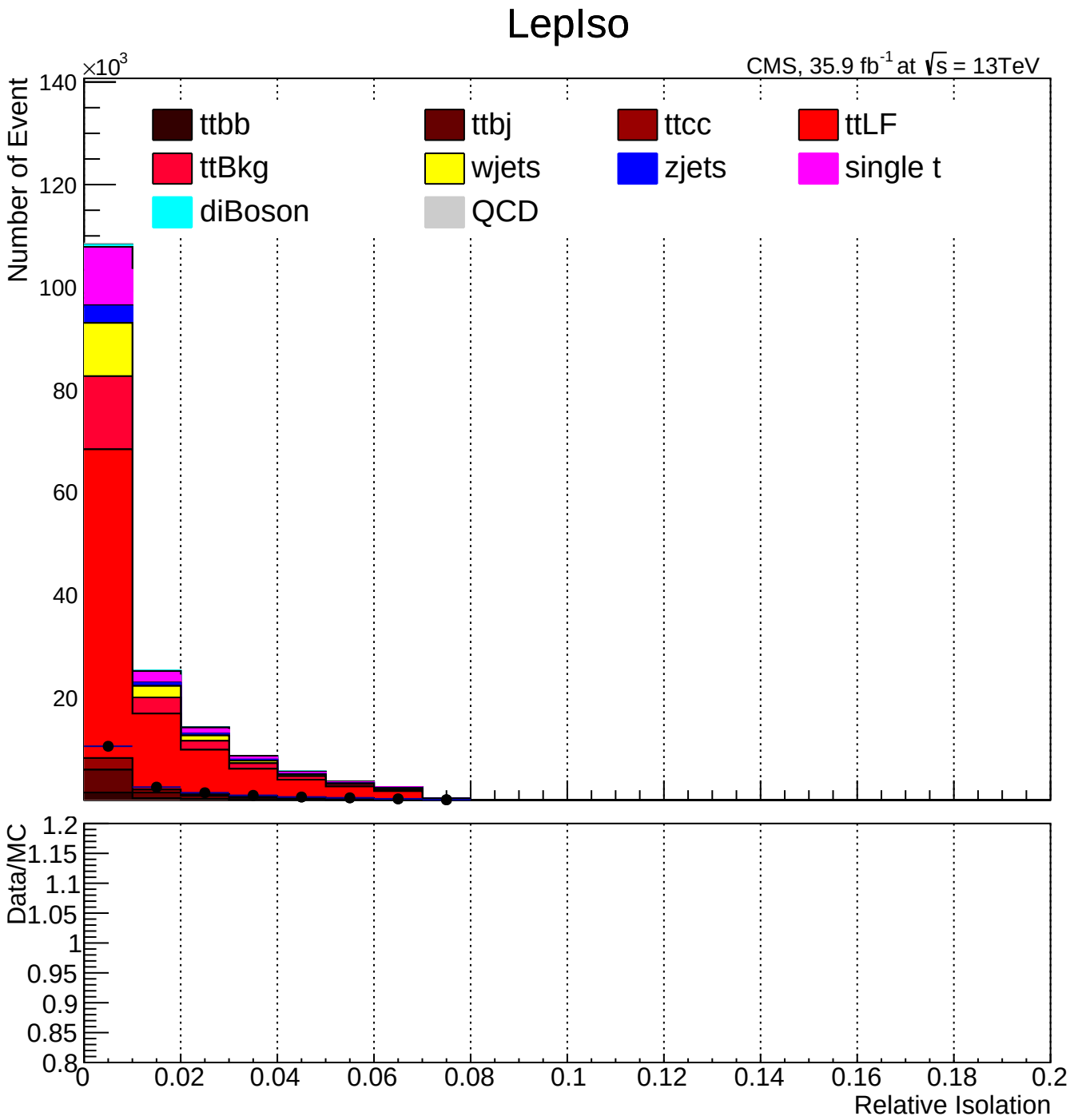

leading c jet (medium) pT
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
leading c Jet (medium) pT (GeV)

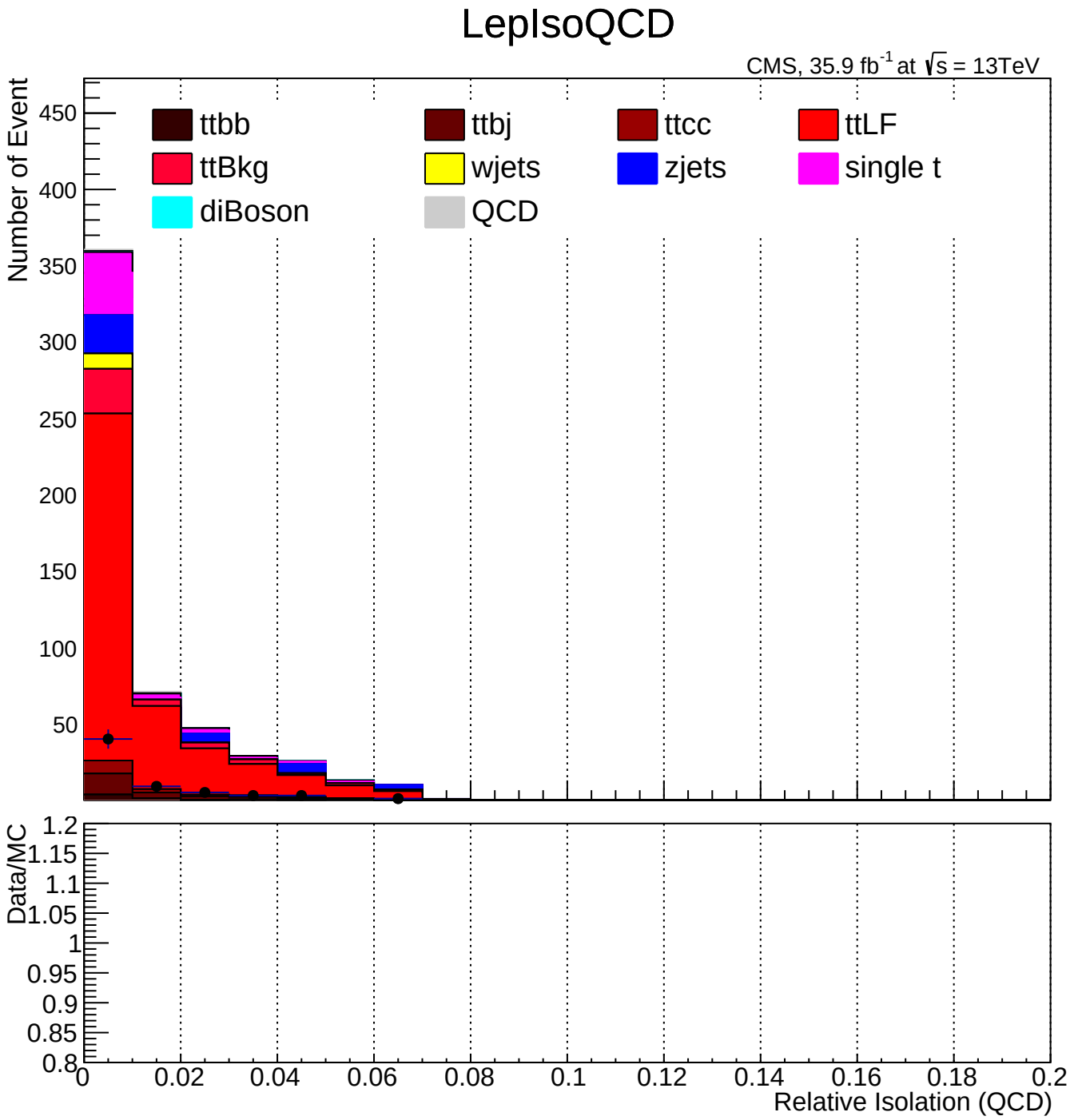

lepton DPhi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
4500
4000
3500
3000
2500
2000
1500
1000
500
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
DPhi

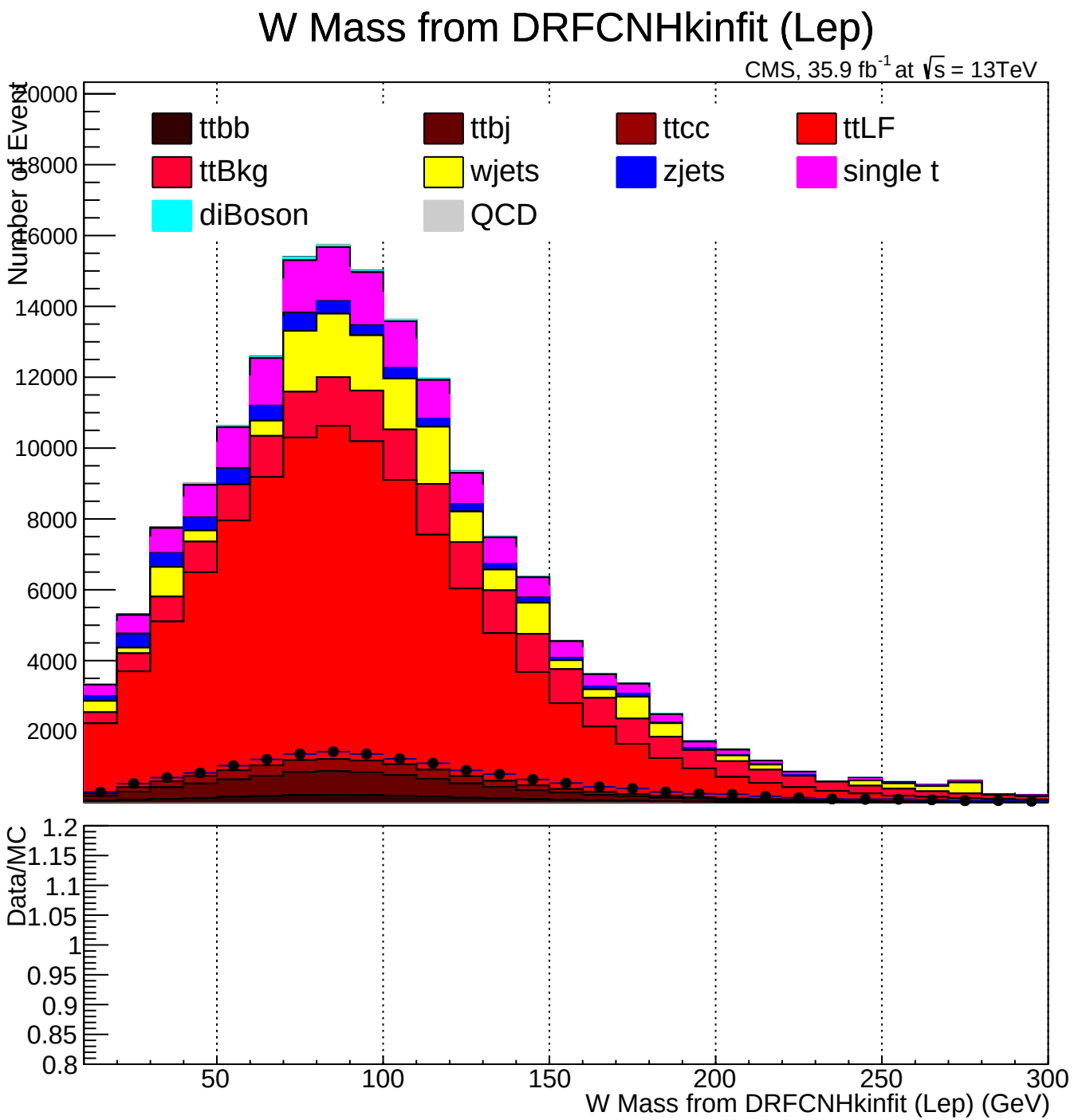

bjet_m Delta Phi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta Phi

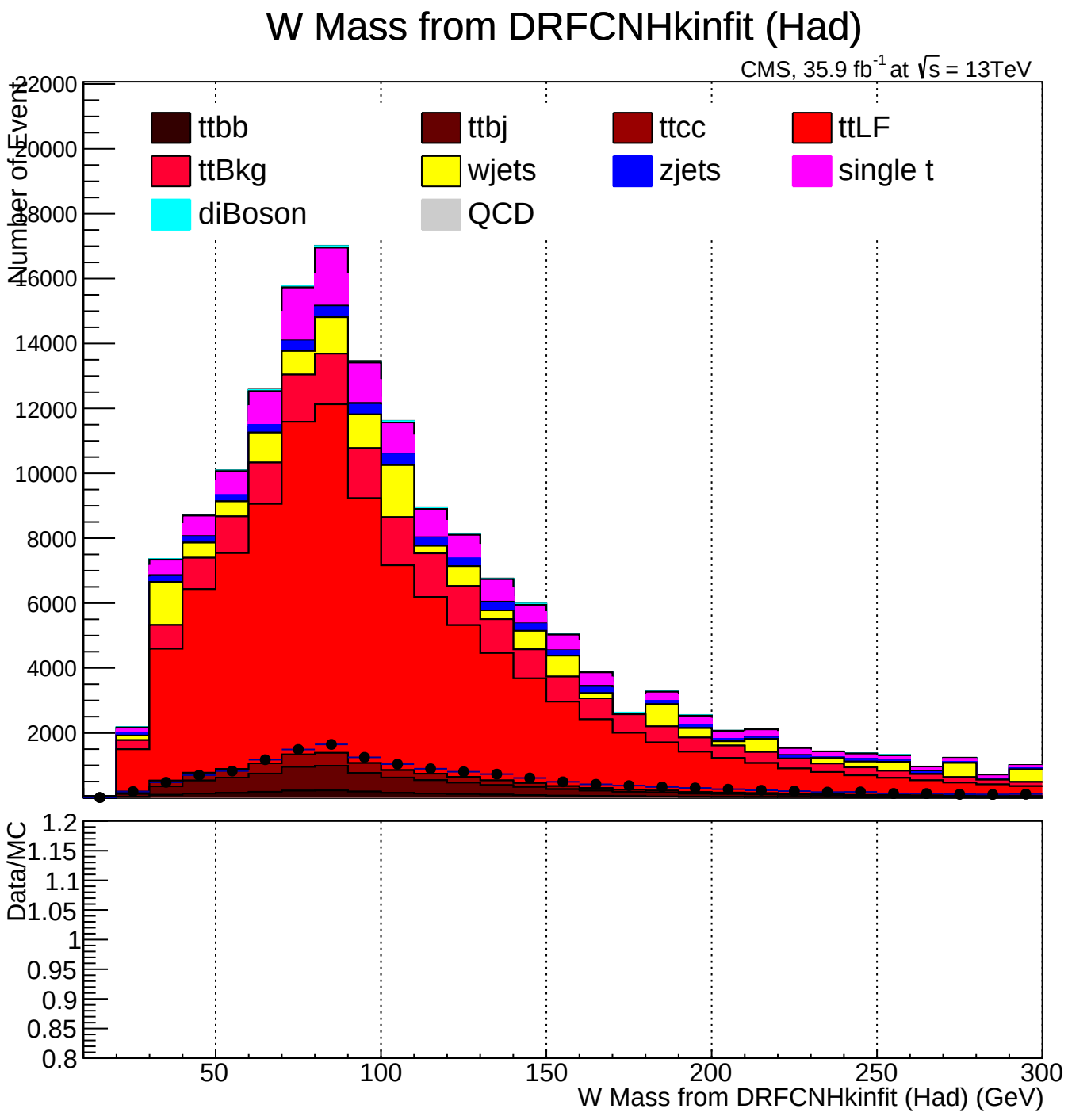

bjet_m Delta Eta
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
7000
6000
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Eta

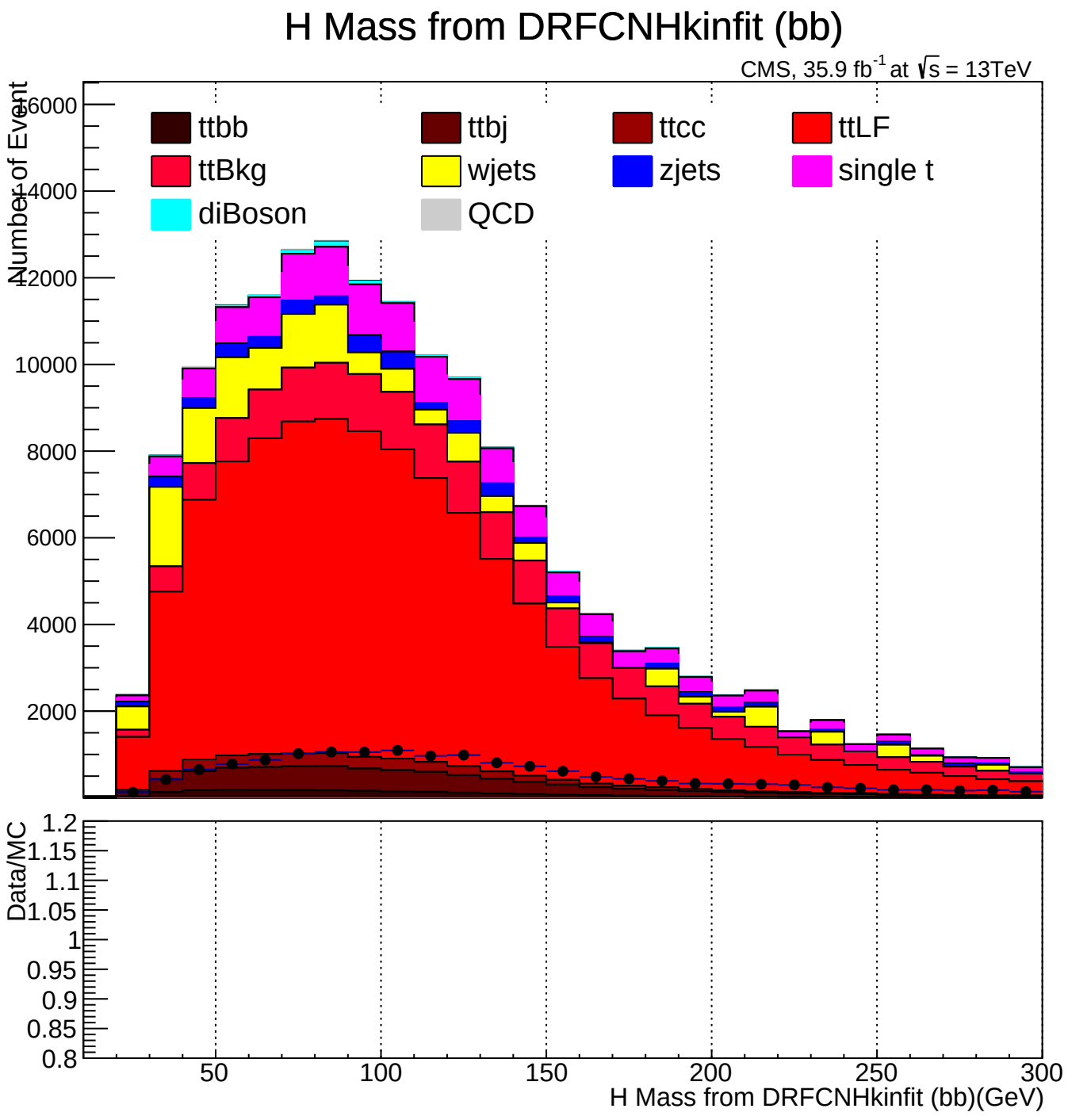

bjet_m Delta R
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
3.5
4
bjet_m Delta R

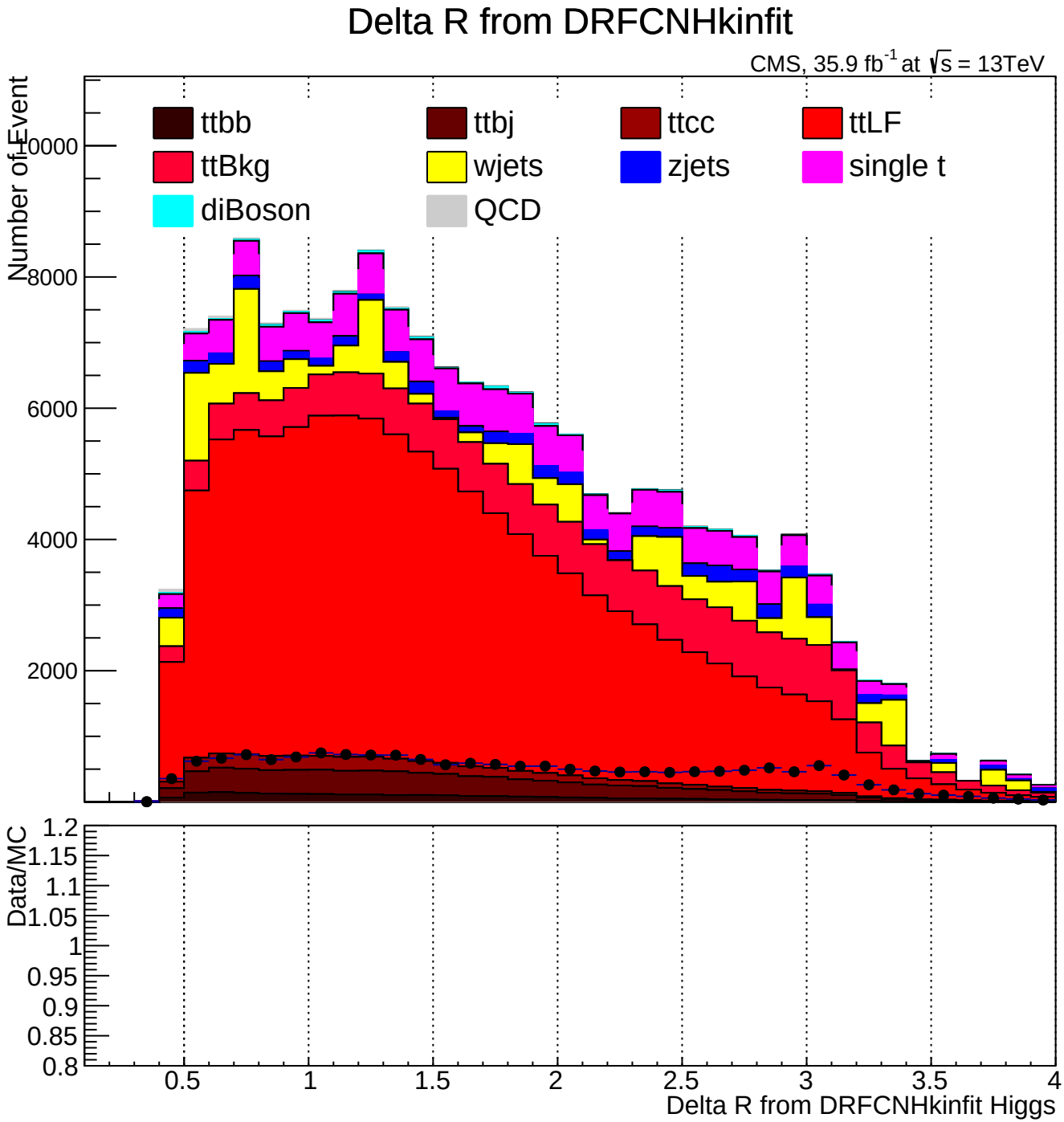

LepIso
CMS, 35.9 fb-1 at √s = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation

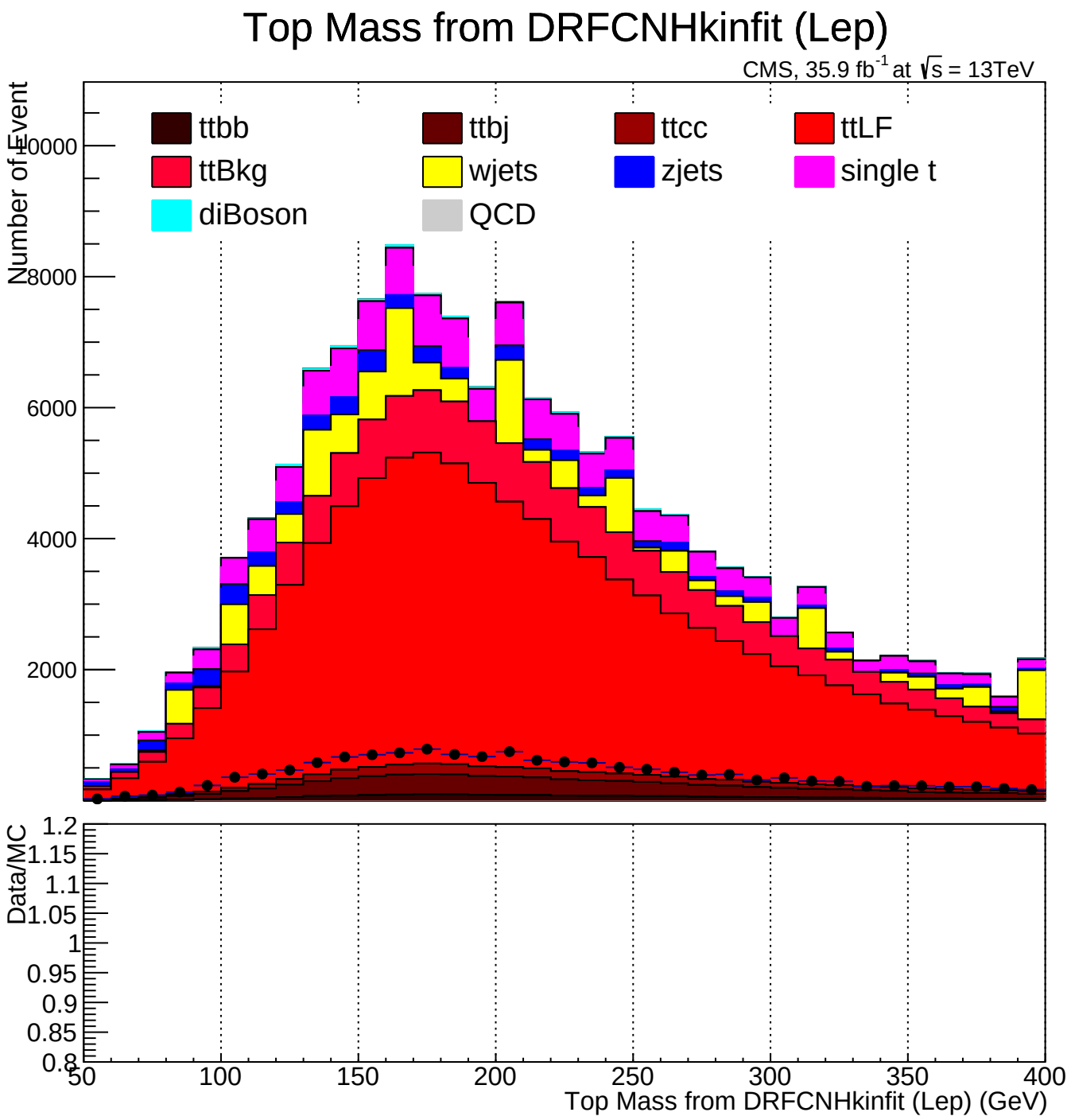

LepIsoQCD
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation (QCD)

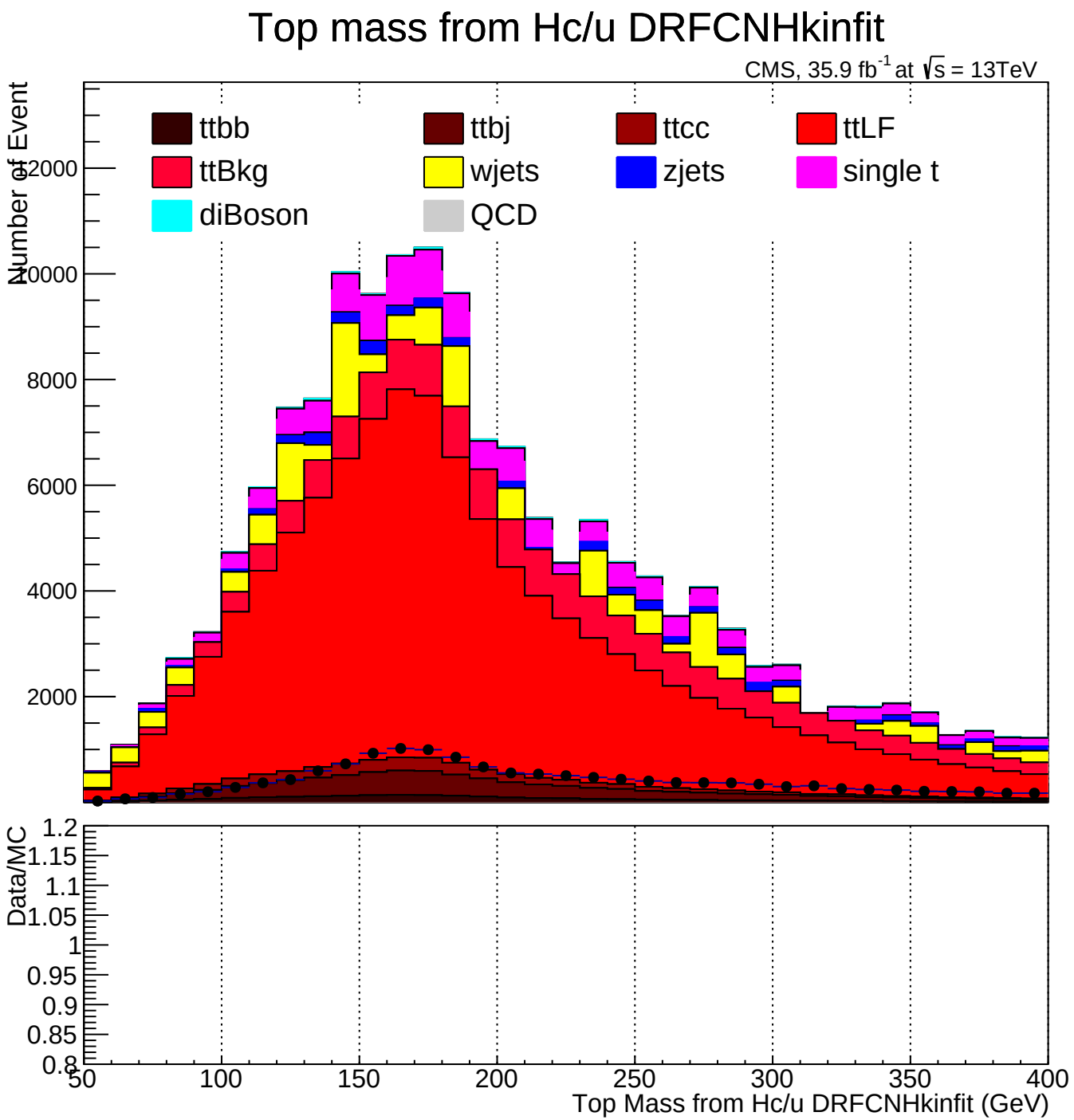

W Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
W Mass from DRFCNHkinfit (Lep) (GeV)

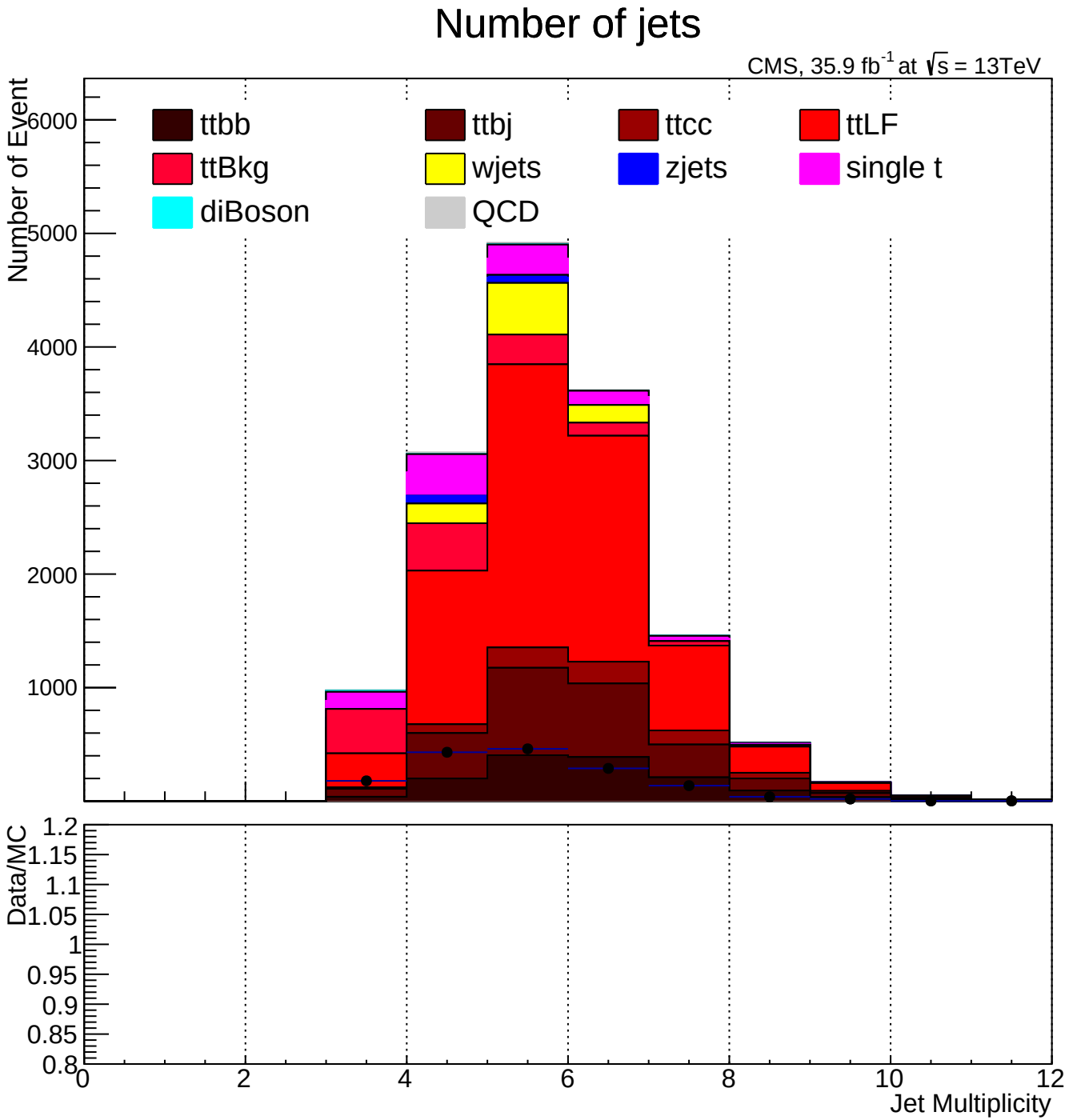

W Mass from DRFCNHkinfit (Had)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
W Mass from DRFCNHkinfit (Had) (GeV)

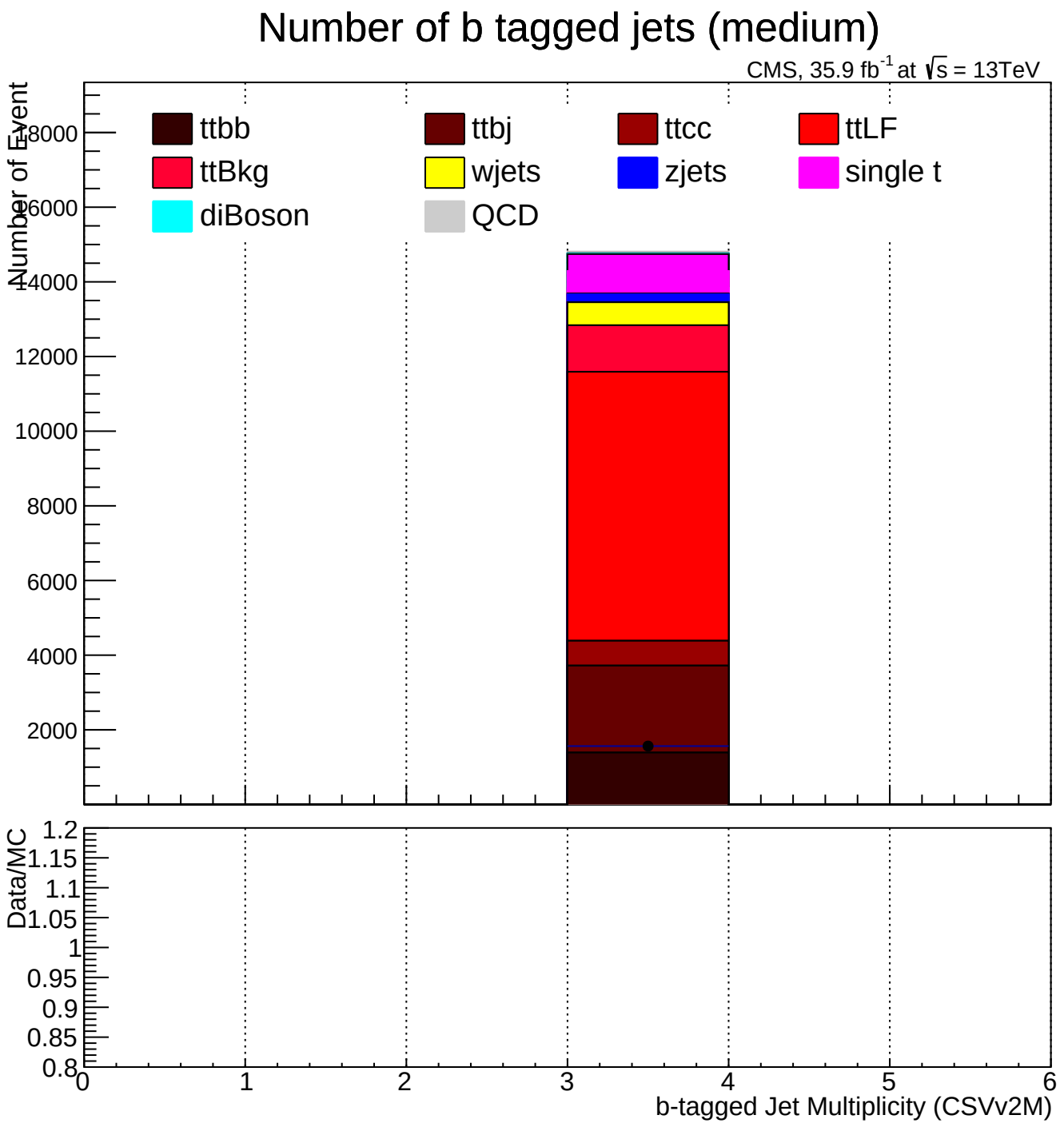

H Mass from DRFCNHkinfit (bb)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
16000
14000
12000
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
H Mass from DRFCNHkinfit (bb)(GeV)

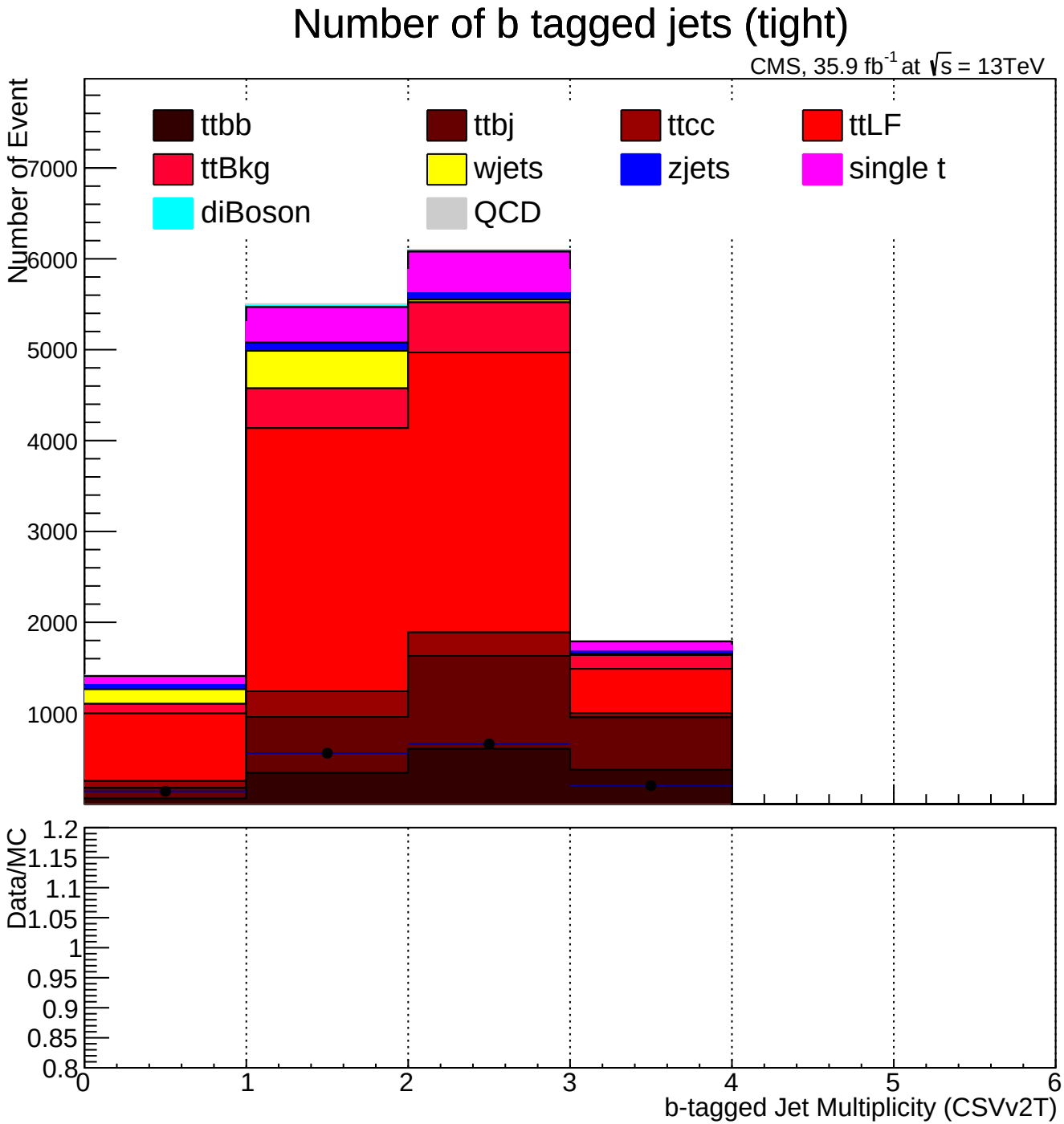

Delta R from DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0.5
1
1.5
2
2.5
3
3.5
4
Delta R from DRFCNHkinfit Higgs

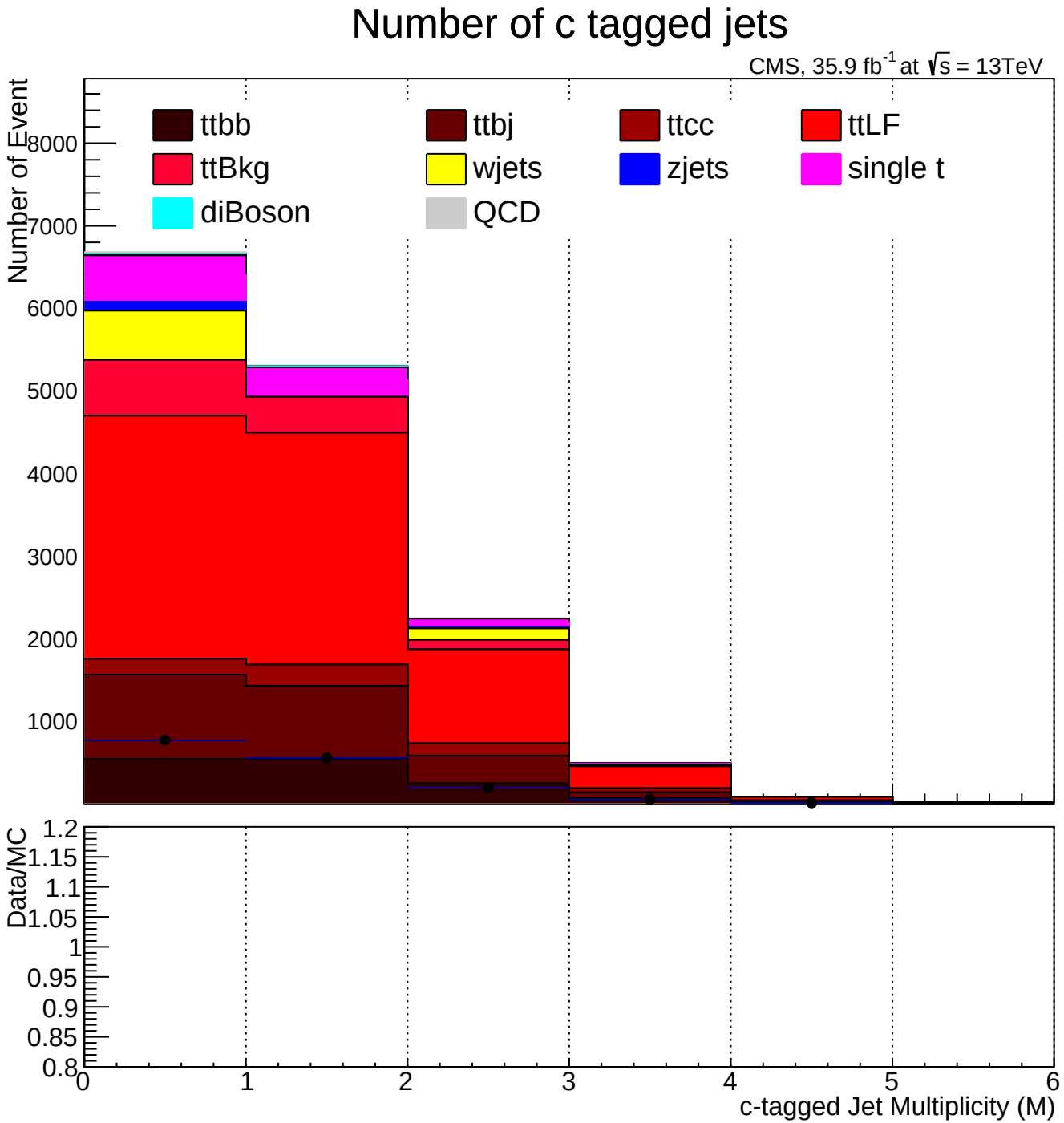

Top Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
350
400
Top Mass from DRFCNHkinfit (Lep) (GeV)

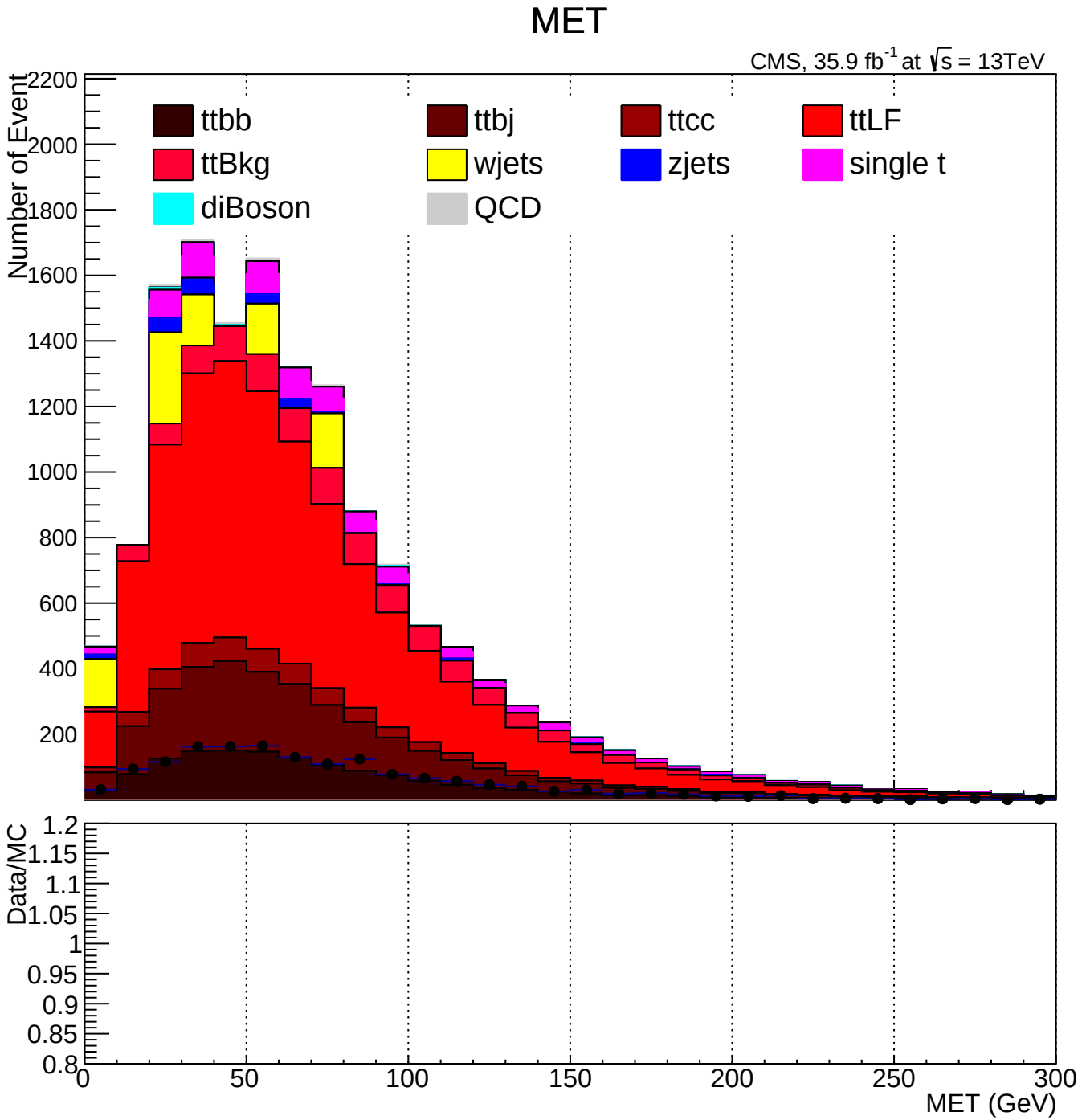

Top mass from Hc/u DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
12000
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
350
400
Top Mass from Hc/u DRFCNHkinfit (GeV)

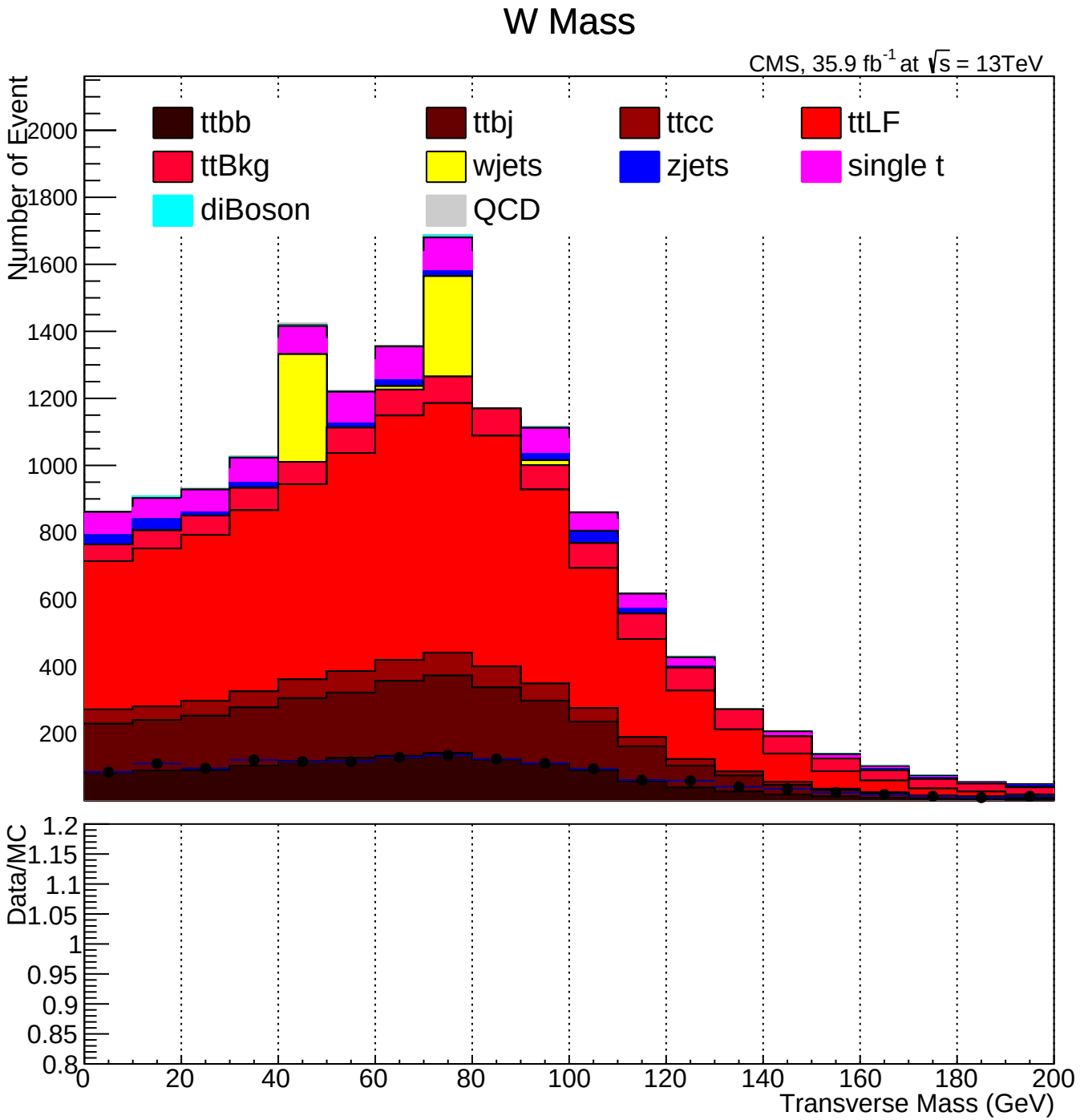

Number of jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
6000
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
2
4
6
8
10
12
Jet Multiplicity


Number of b tagged jets (medium)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
8000
6000
4000
2000
14000
12000
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2M)

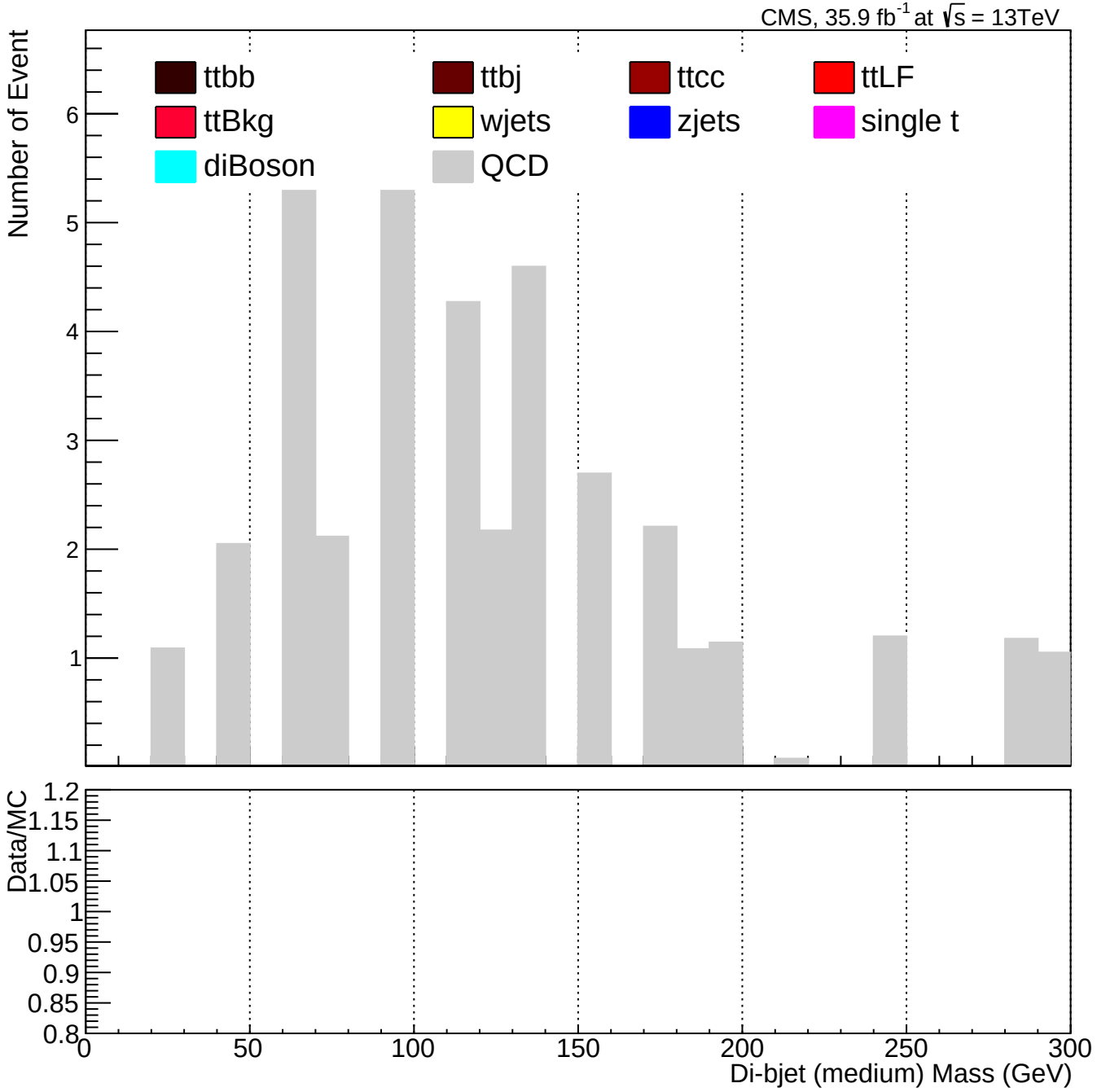

Number of b tagged jets (tight)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
7000
6000
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2T)

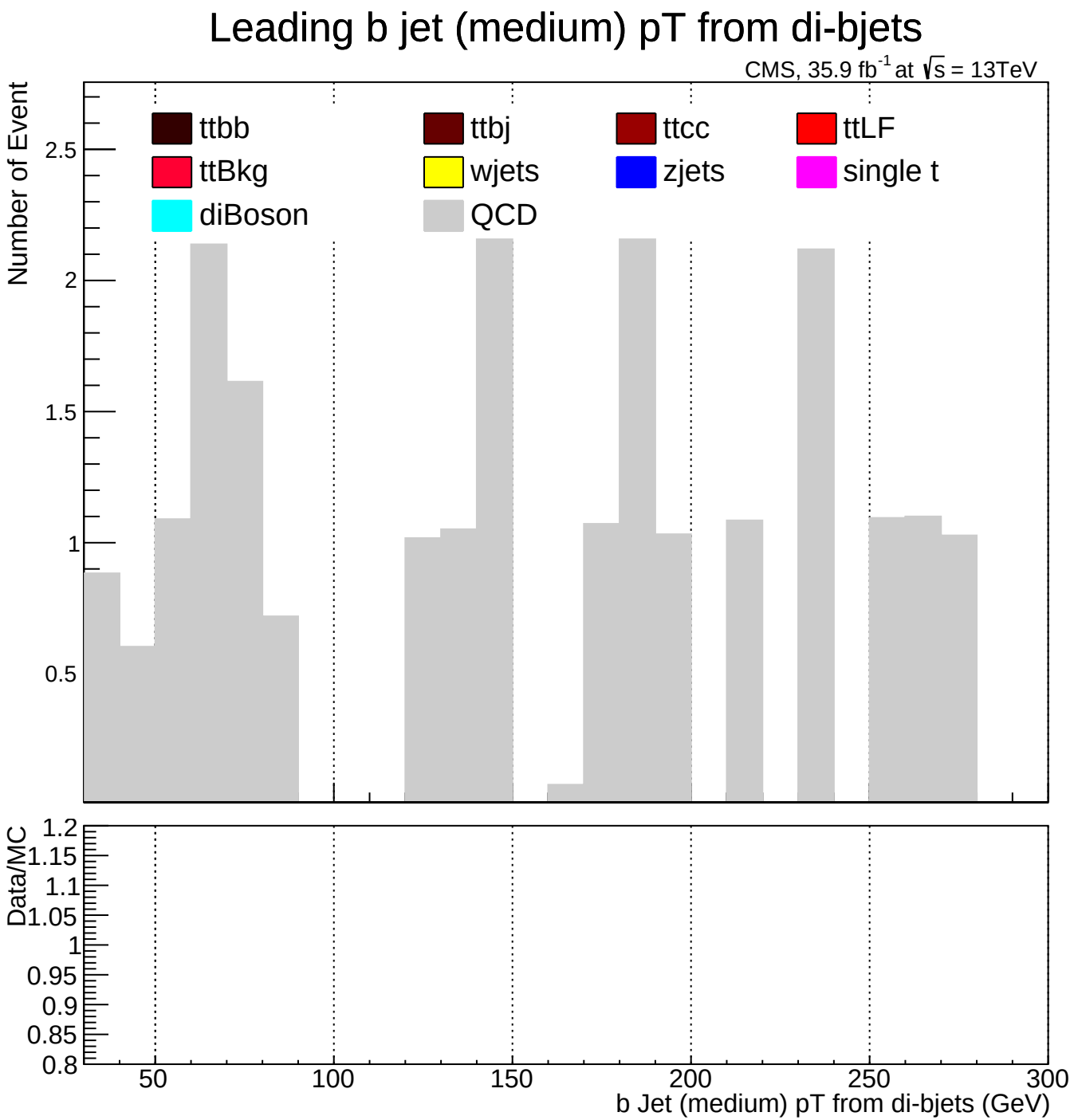

Number of c tagged jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
8000
7000
6000
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
c-tagged Jet Multiplicity (M)

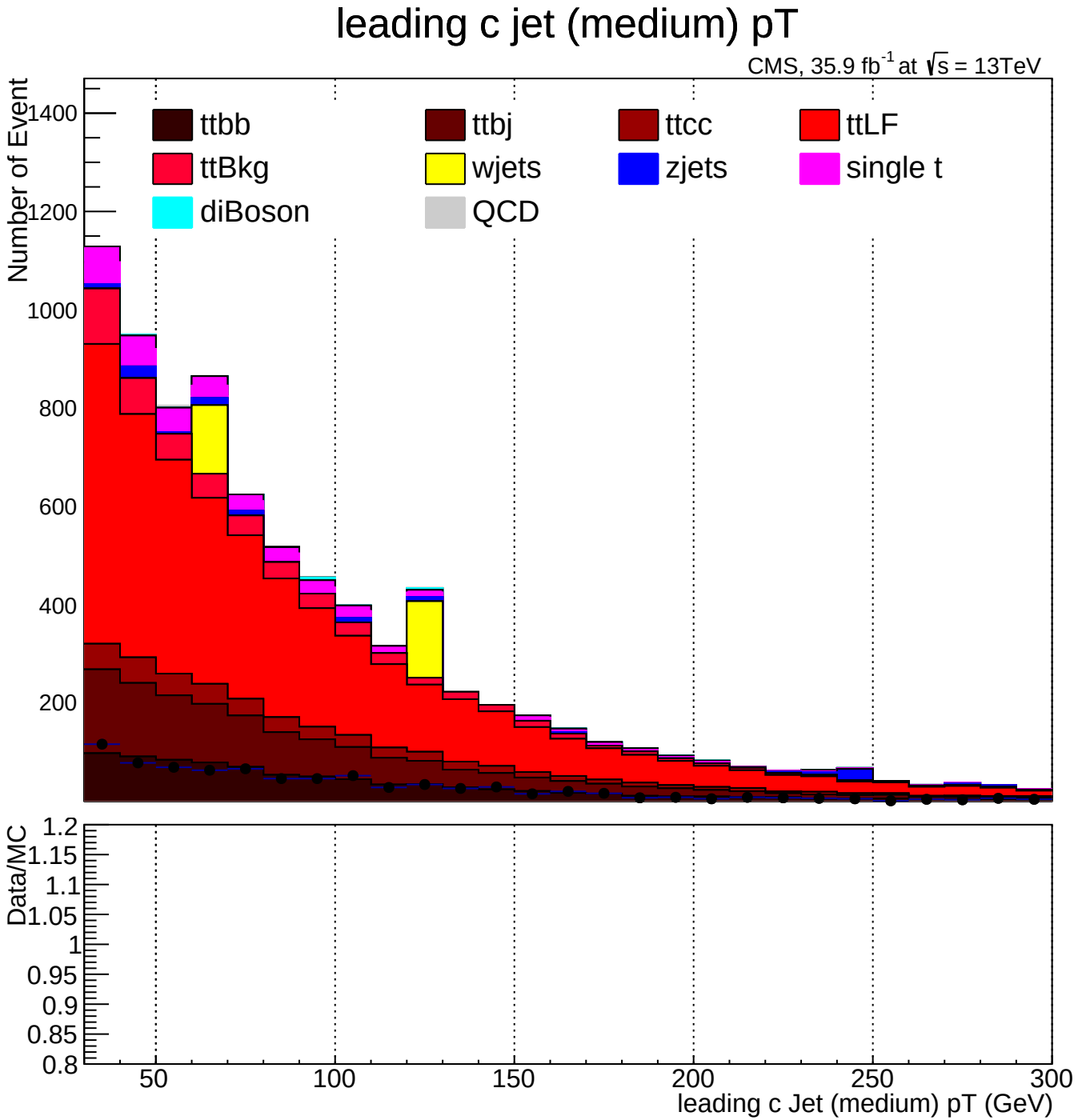

MET
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
MET (GeV)

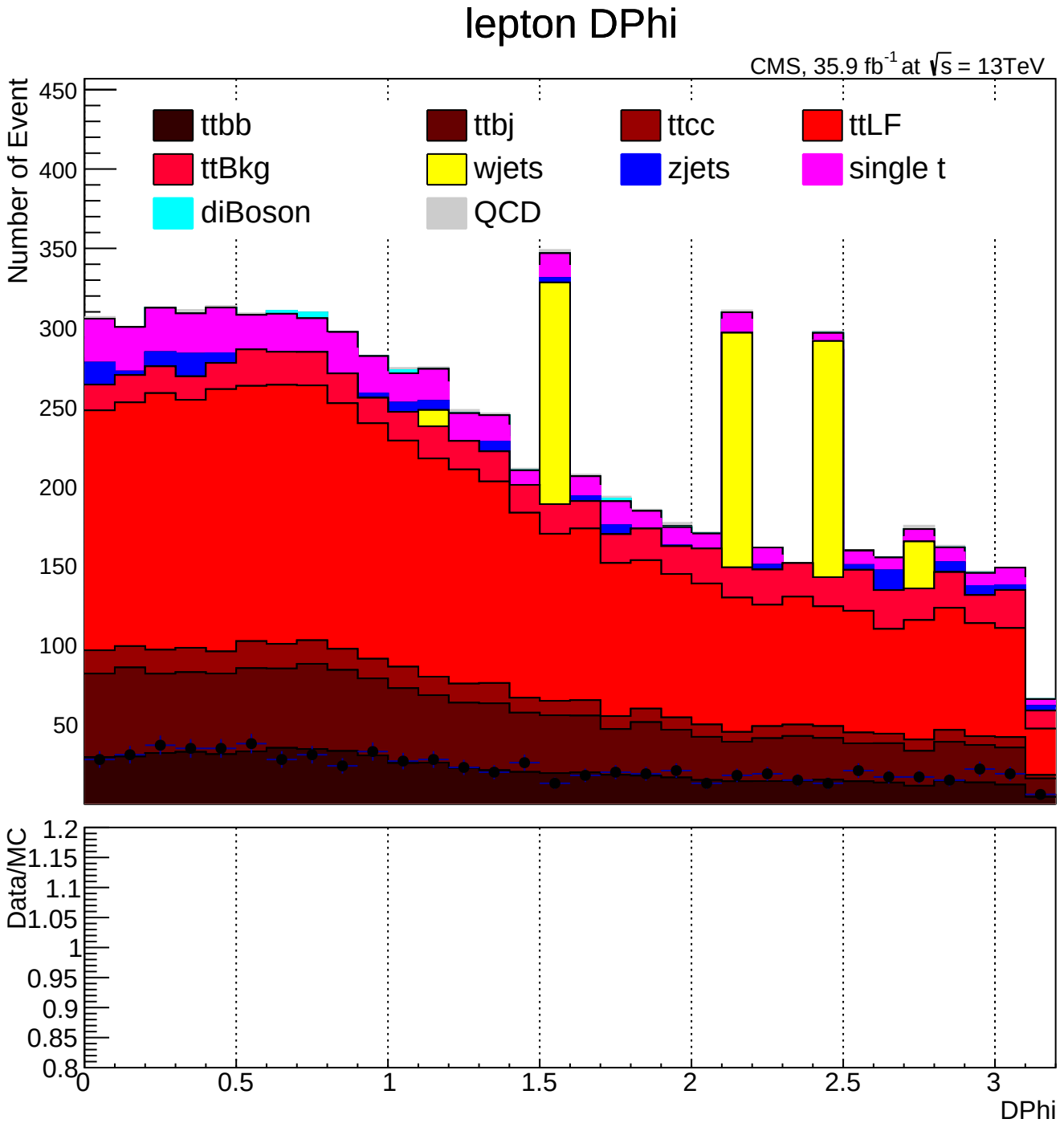

W Mass
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Transverse Mass (GeV)

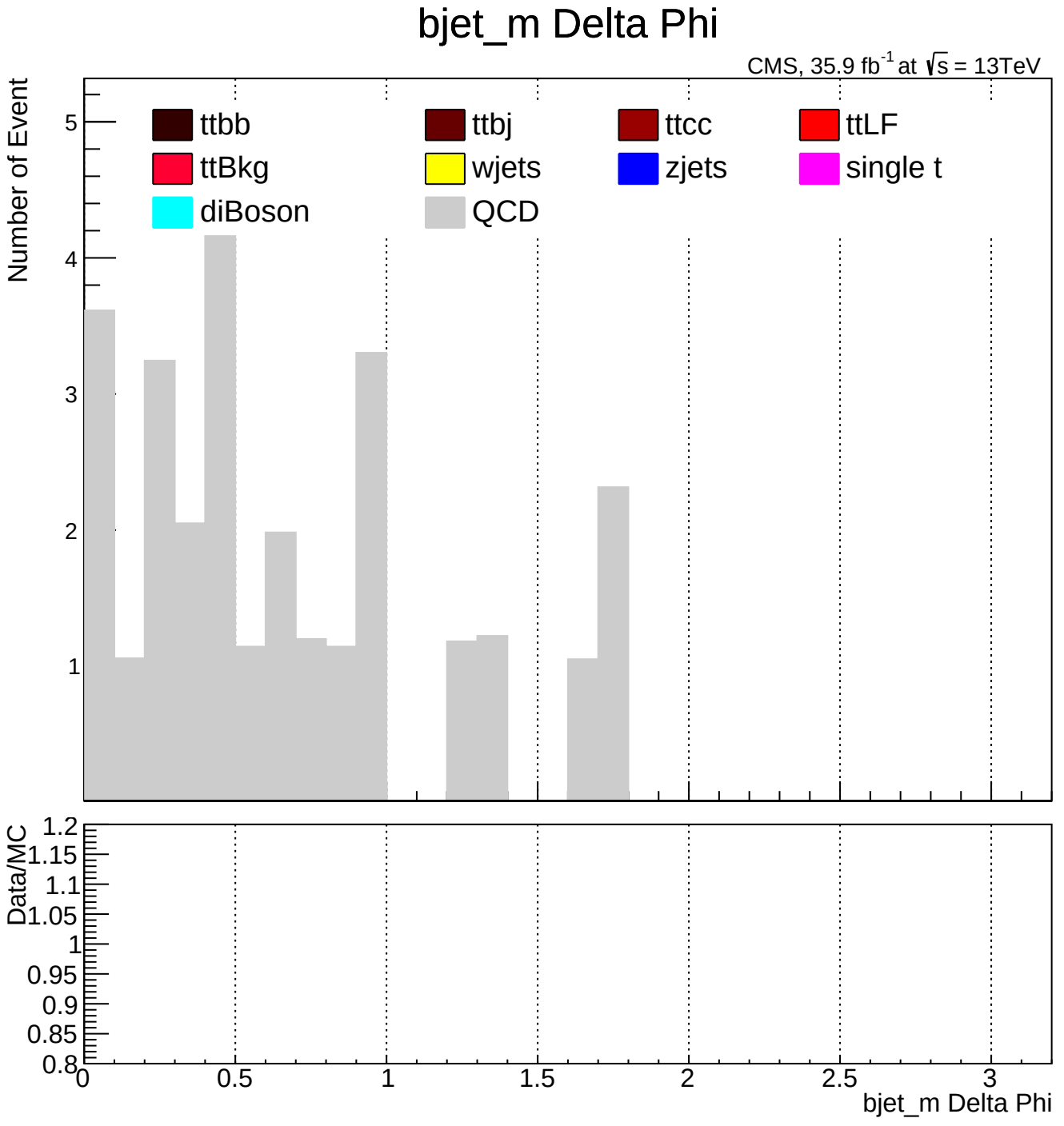
Di-bjet Mass (medium) wrt min DR

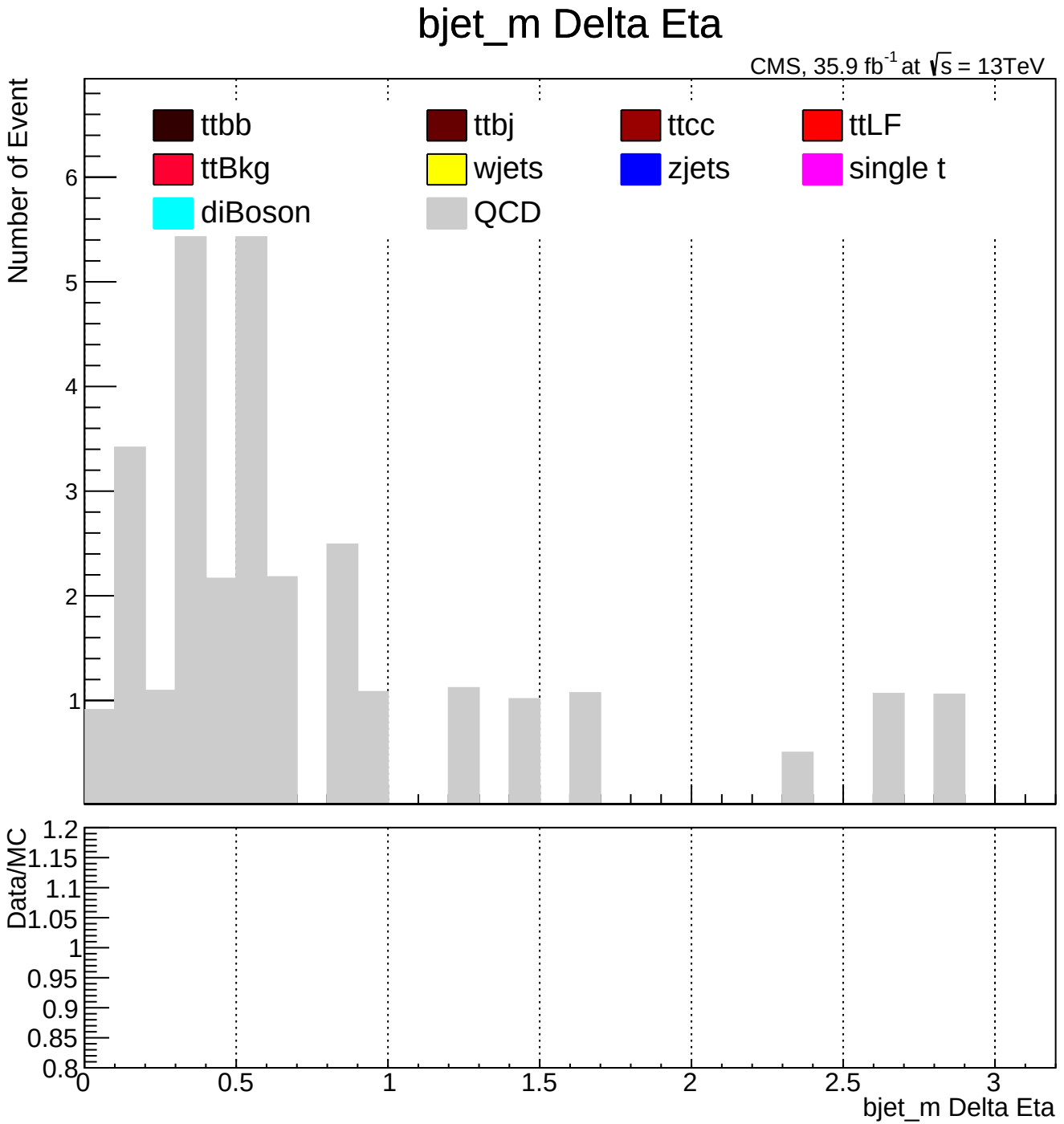


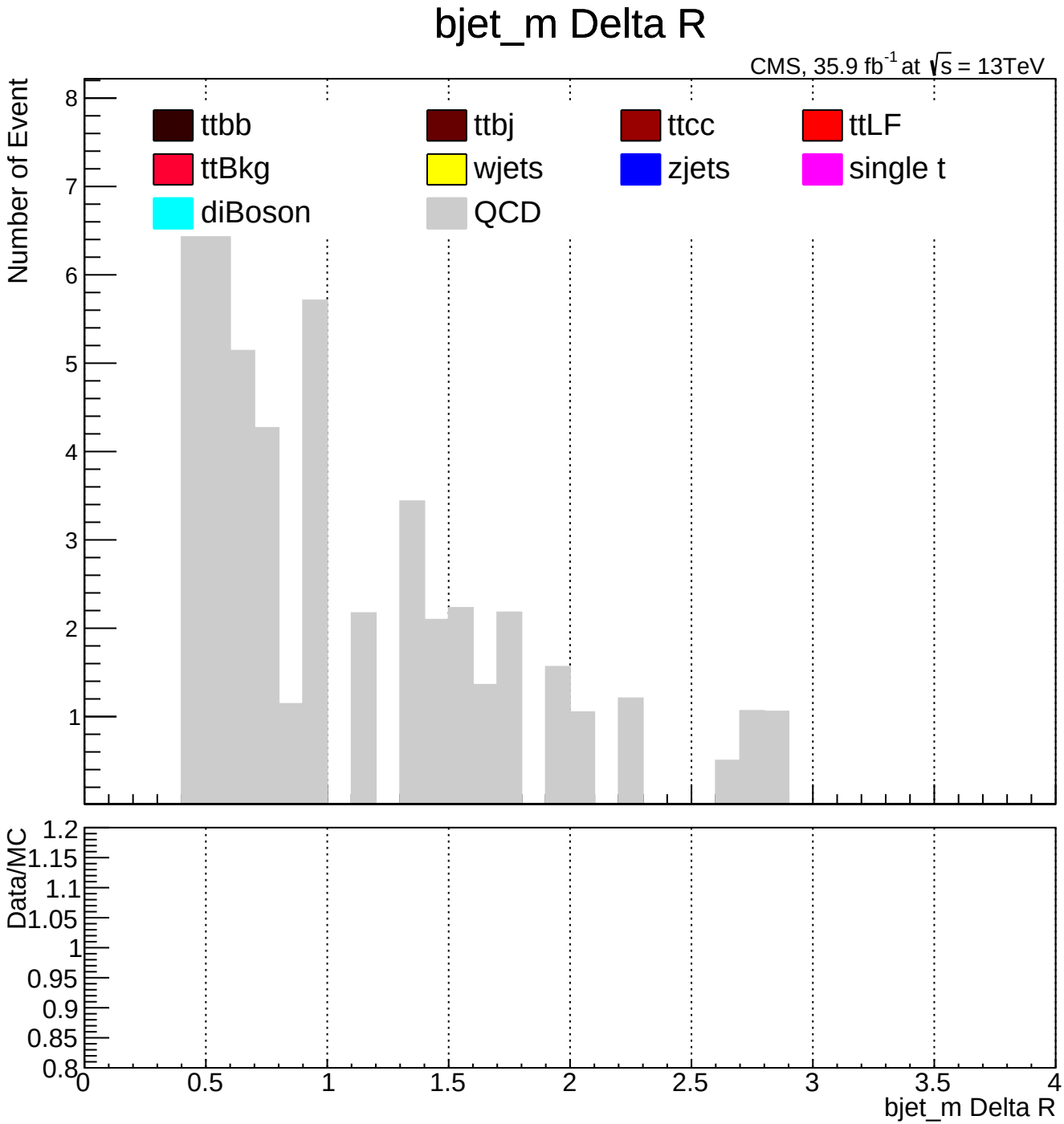

Leading b jet (medium) pT from di-bjets
CMS, 35.9 fb-1 at √s = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
2.5
2
1.5
1
0.5
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
b Jet (medium) pT from di-bjets (GeV)

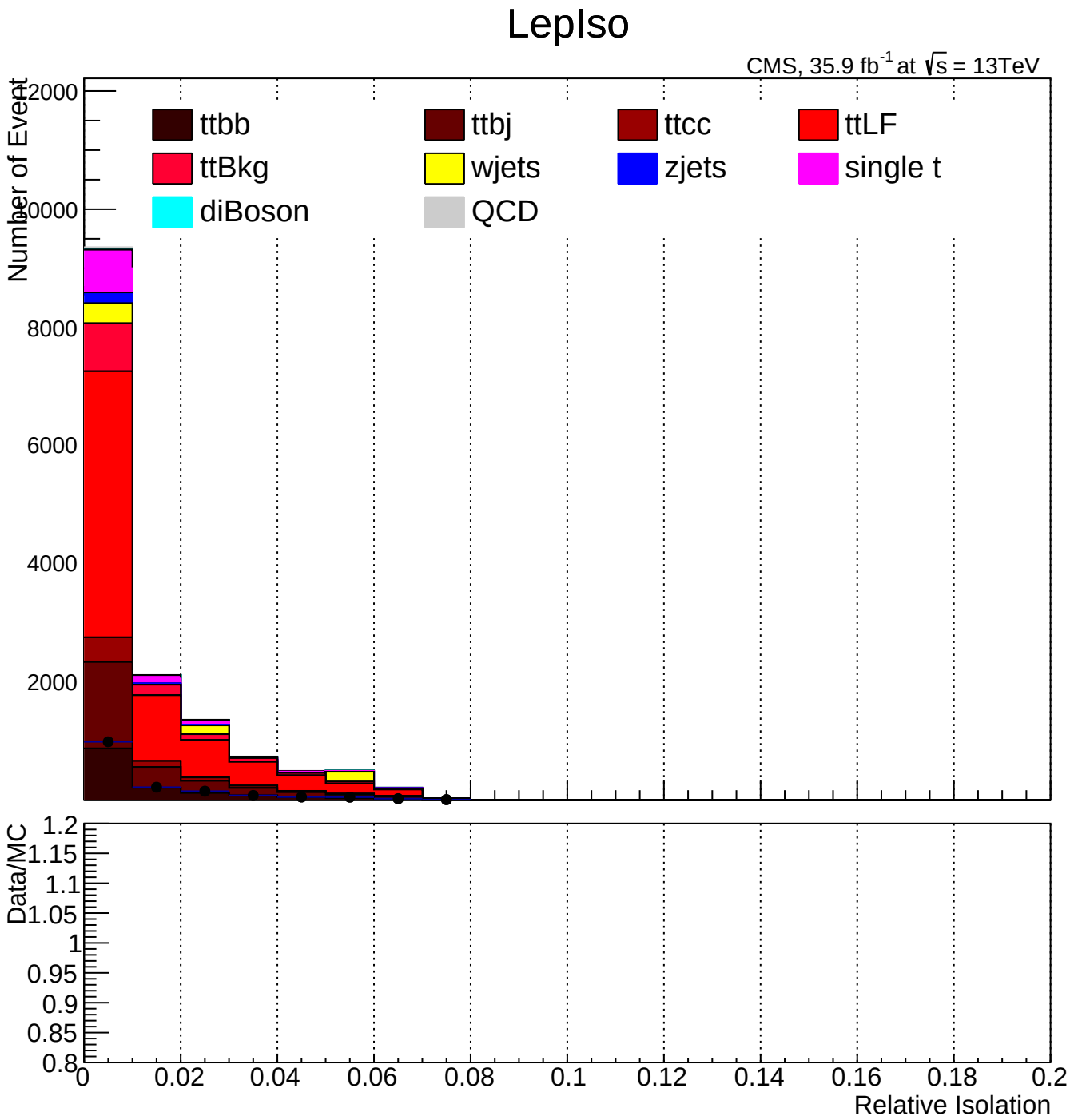

leading c jet (medium) pT
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
leading c Jet (medium) pT (GeV)

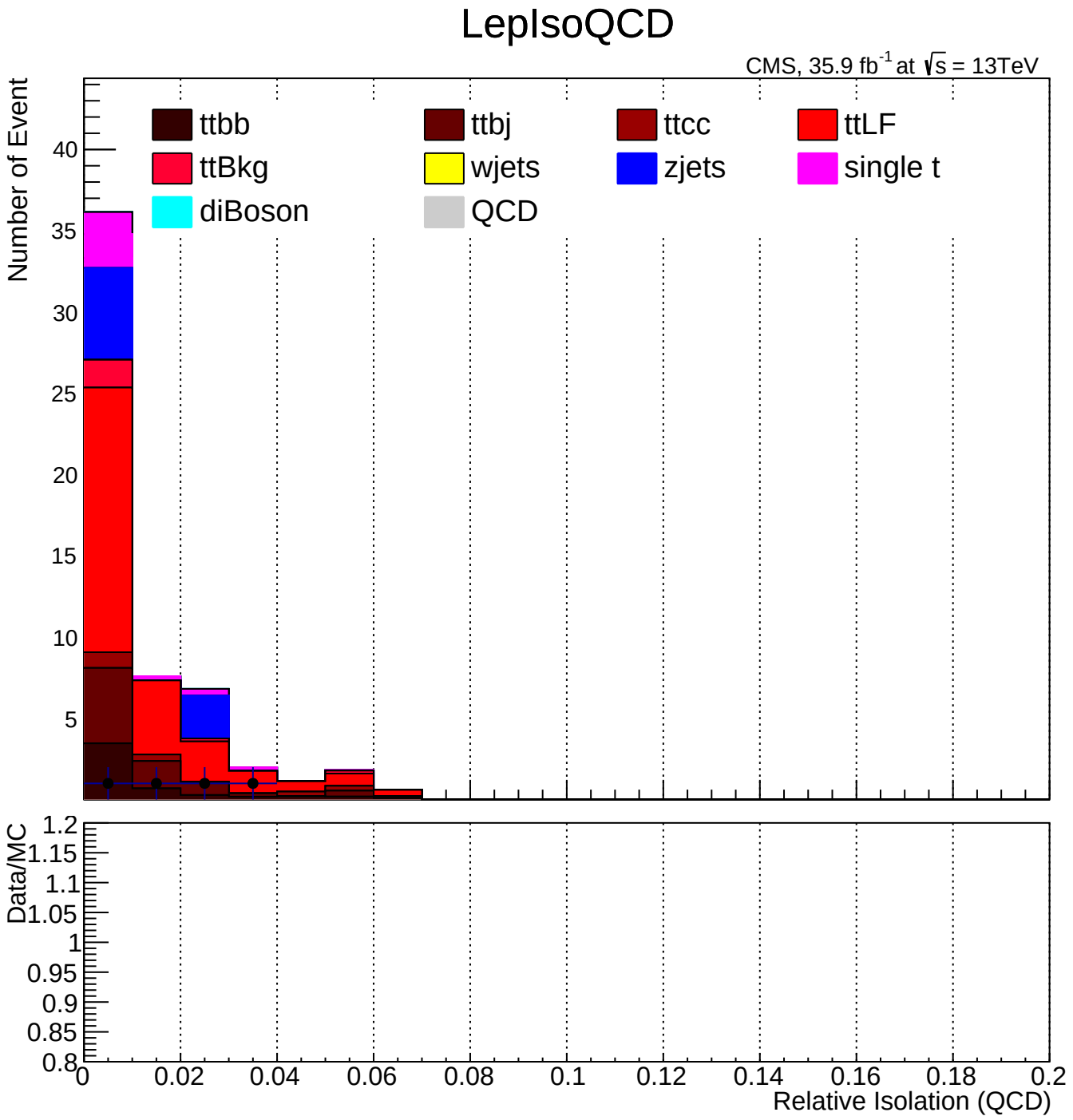

lepton DPhi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
DPhi

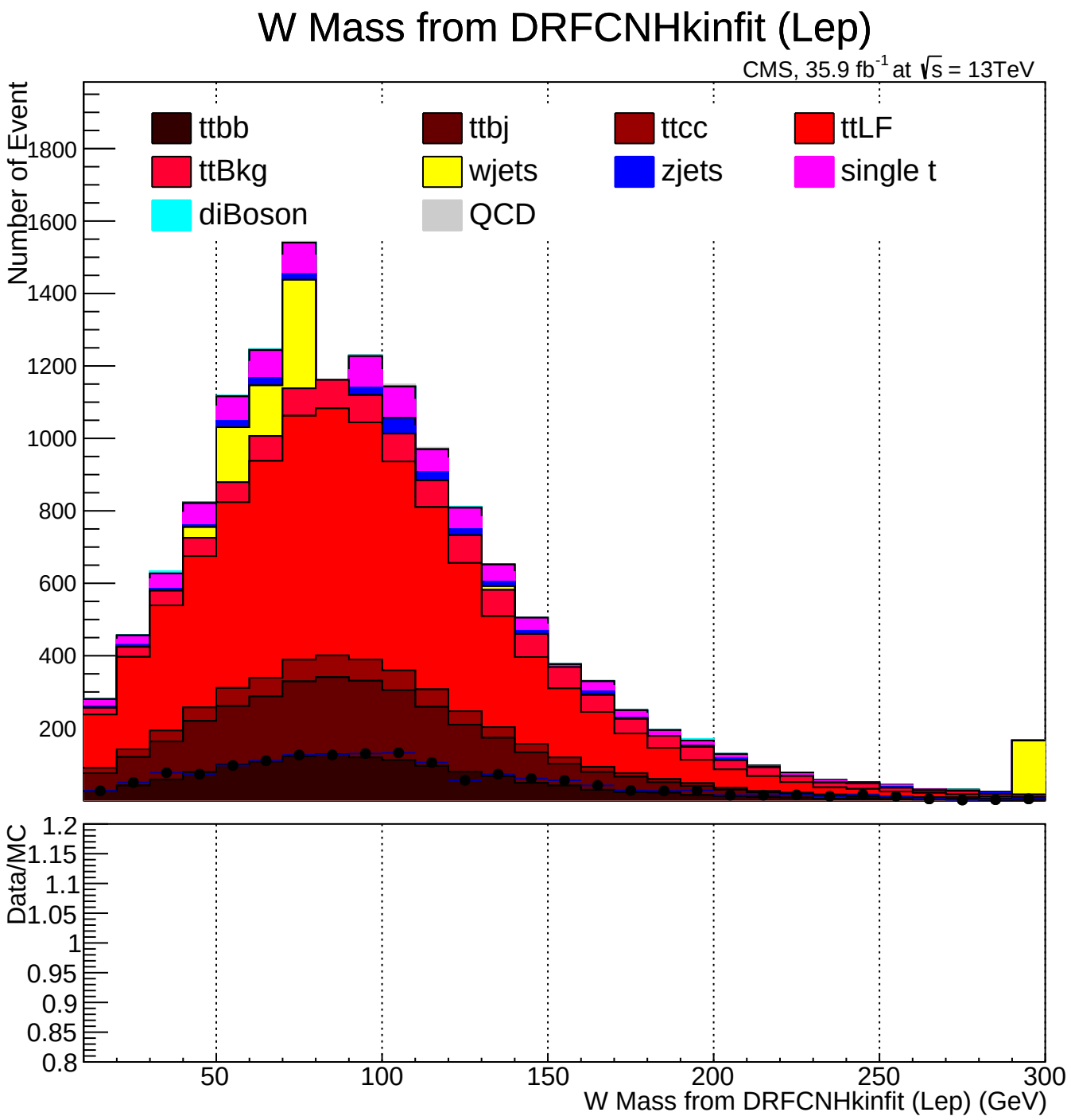

bjet_m Delta Phi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta Phi

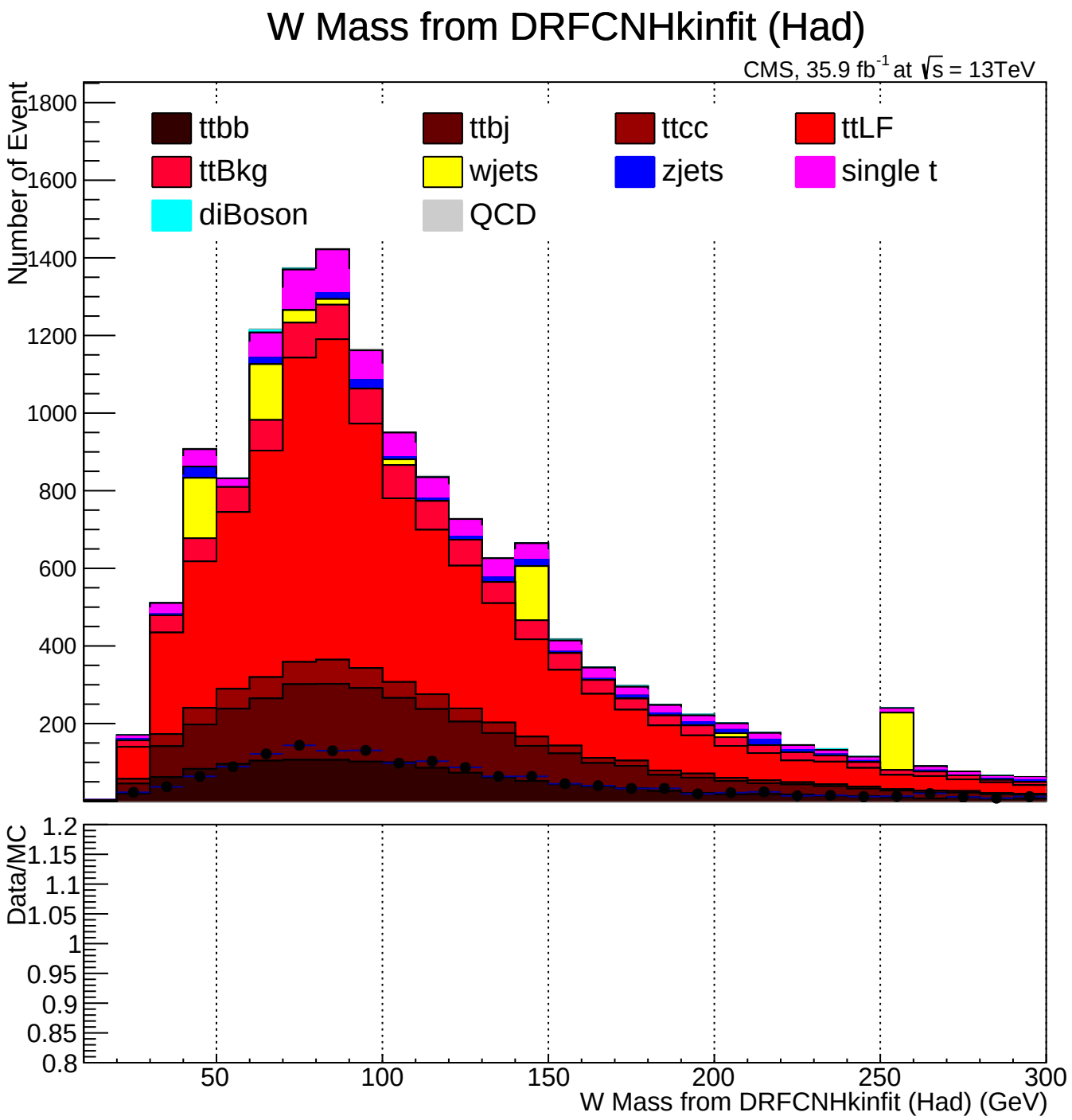

bjet_m Delta Eta
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta Eta

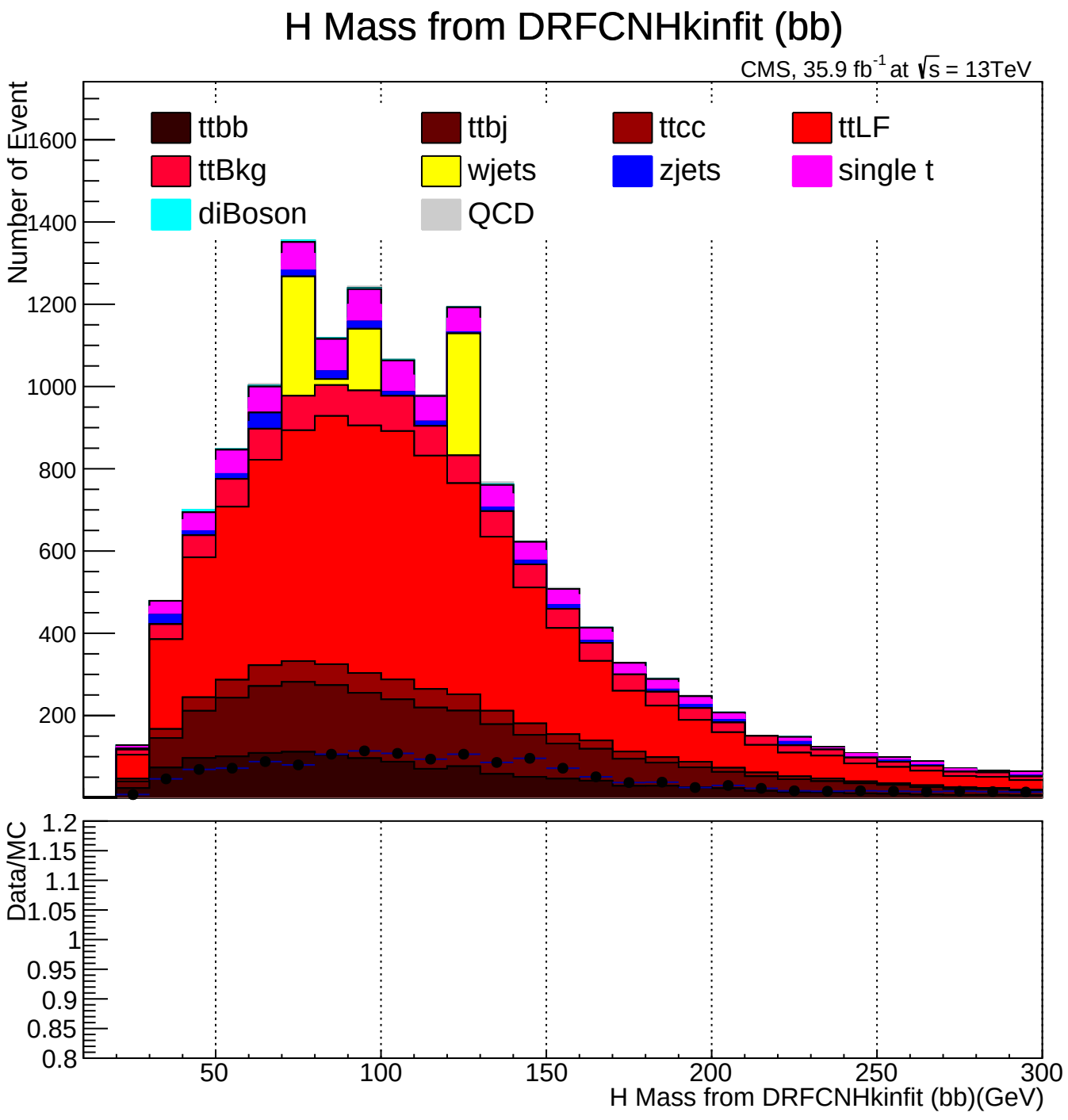

bjet_m Delta R
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta R

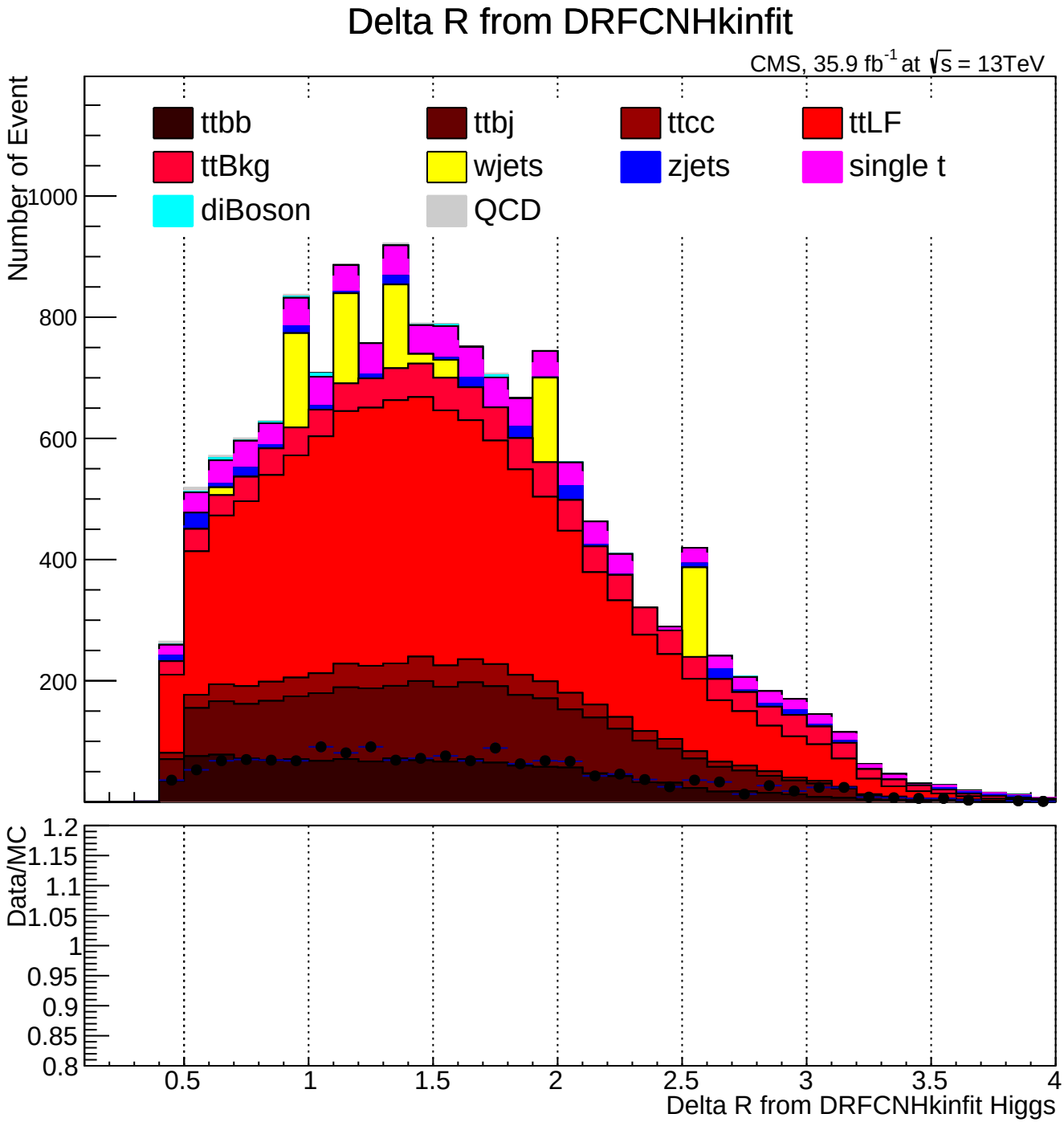

LepIso
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation

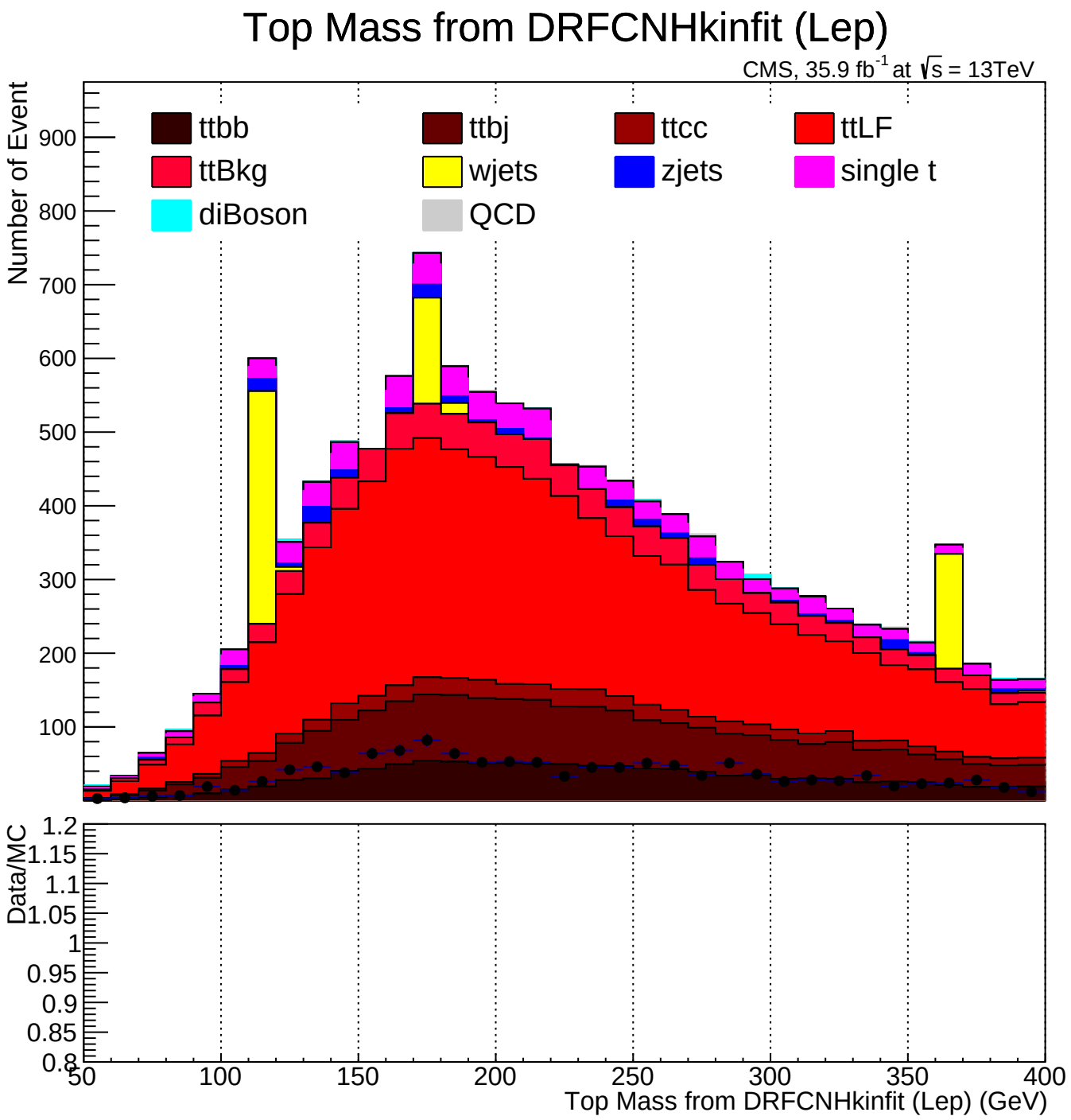

LepIsoQCD
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
Relative Isolation (QCD)

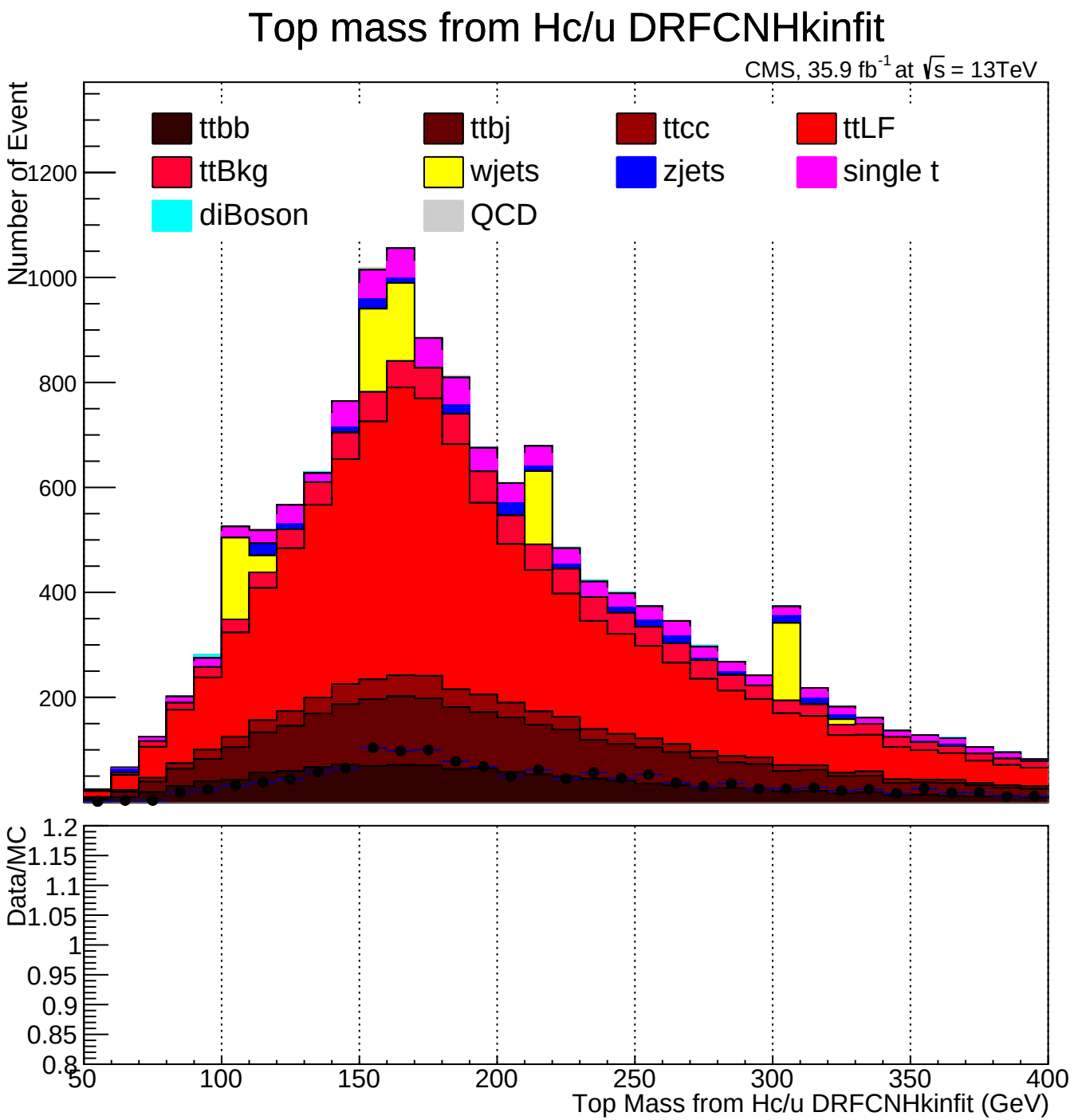

W Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
W Mass from DRFCNHkinfit (Lep) (GeV)

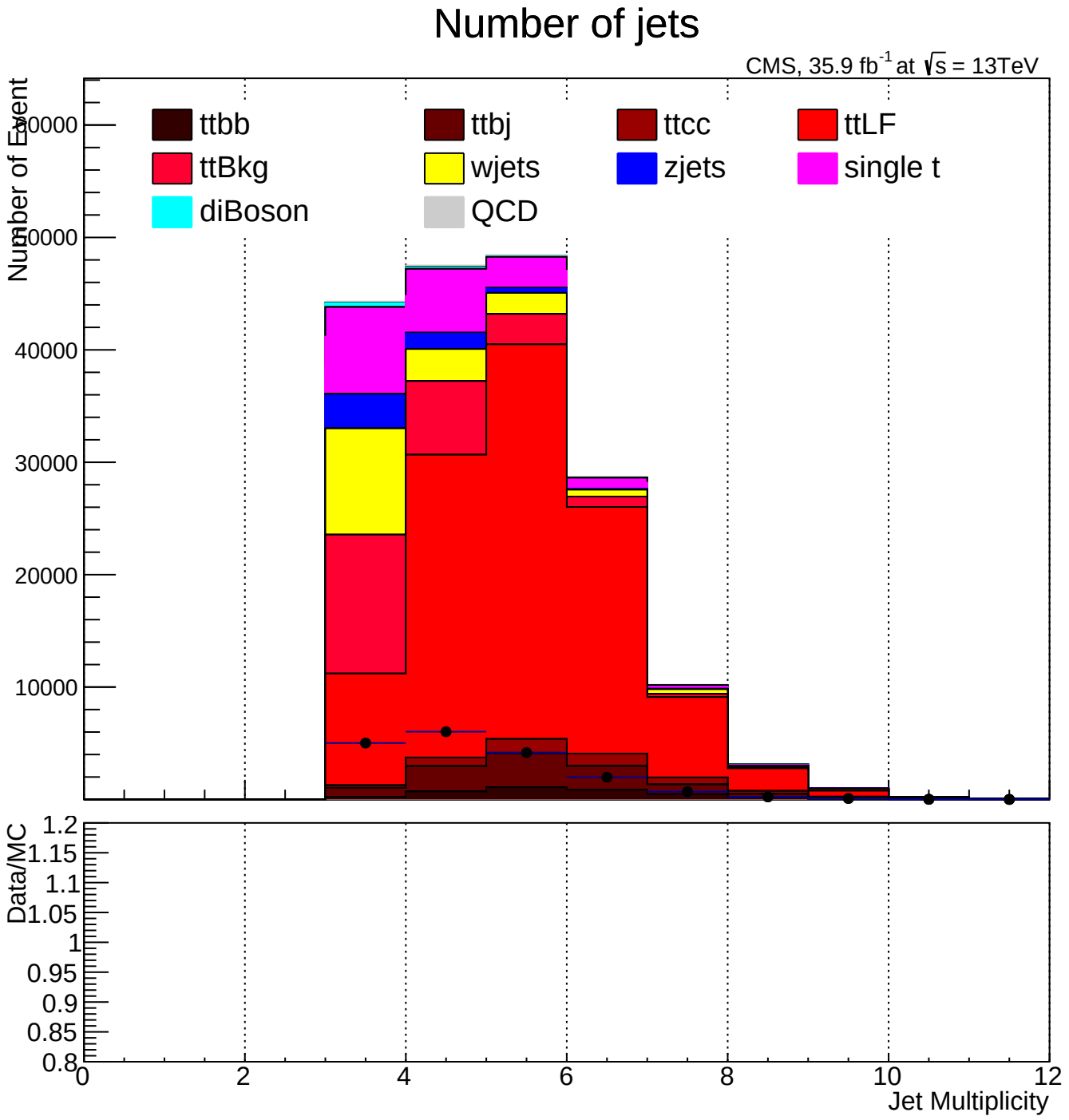

W Mass from DRFCNHkinfit (Had)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
W Mass from DRFCNHkinfit (Had) (GeV)

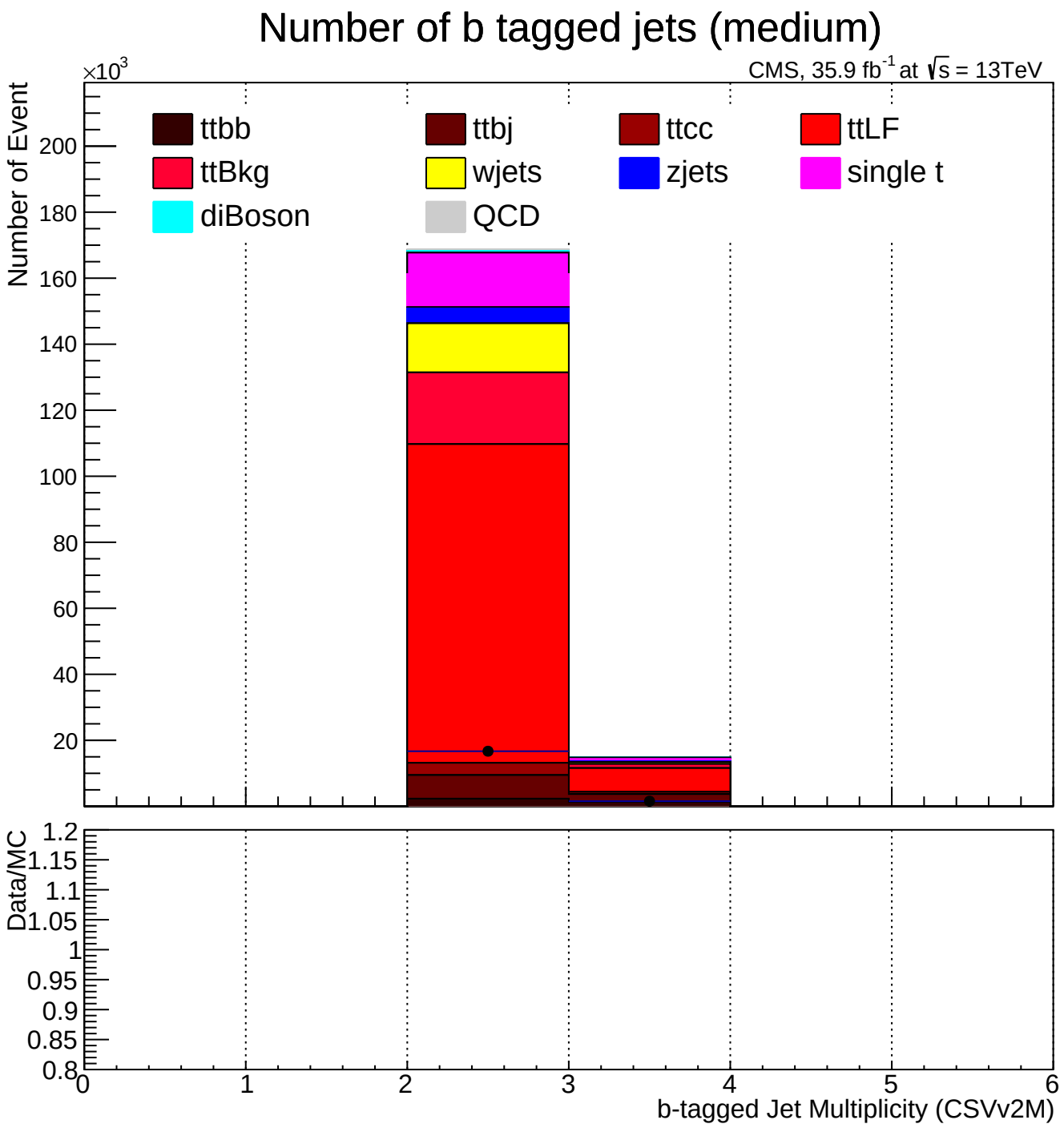

H Mass from DRFCNHkinfit (bb)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
H Mass from DRFCNHkinfit (bb)(GeV)

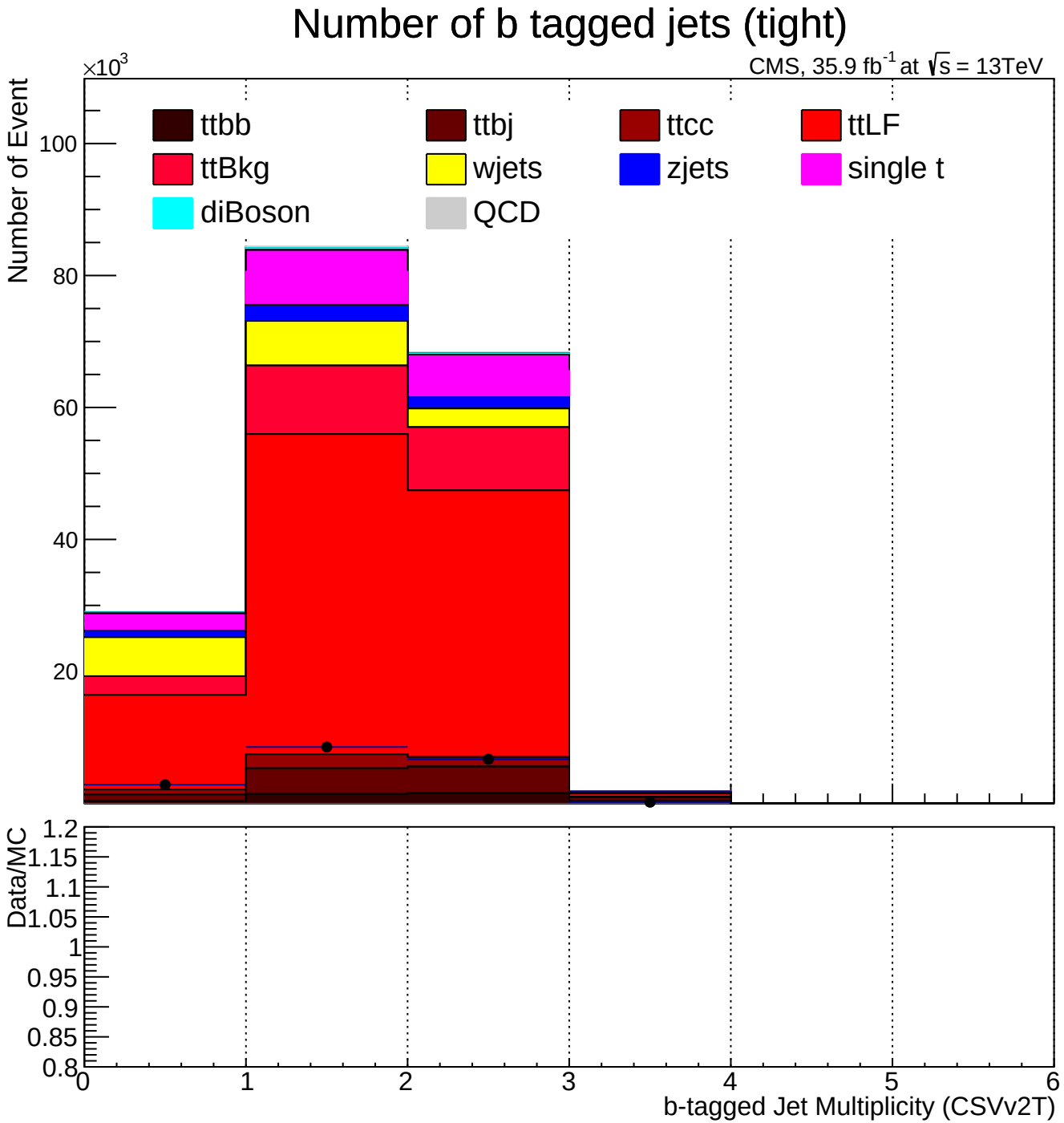

Delta R from DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
1000
800
600
400
200
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0.5
1
1.5
2
2.5
3
3.5
4
Delta R from DRFCNHkinfit Higgs

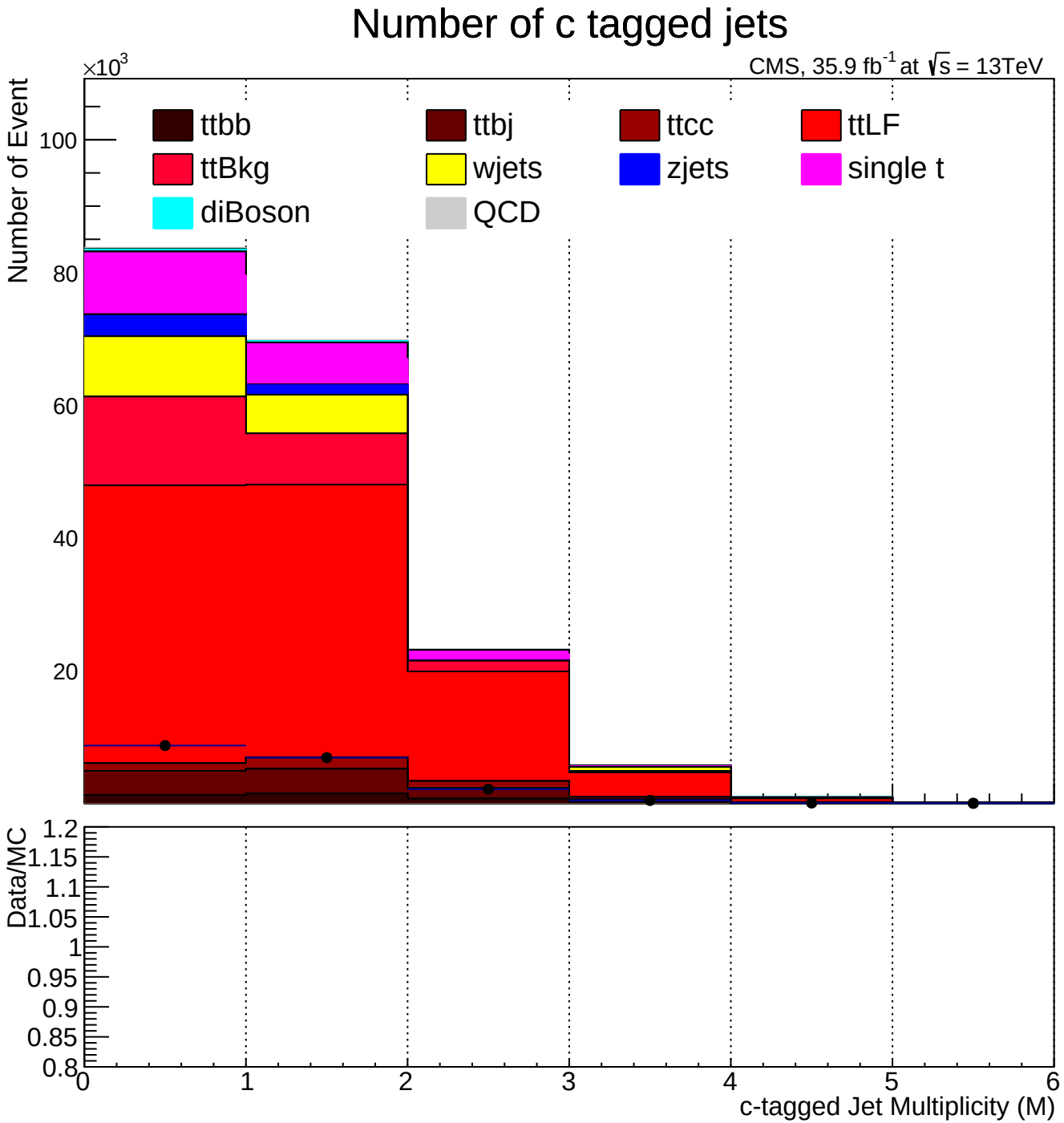

Top Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb-1 at √s = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Top Mass from DRFCNHkinfit (Lep) (GeV)

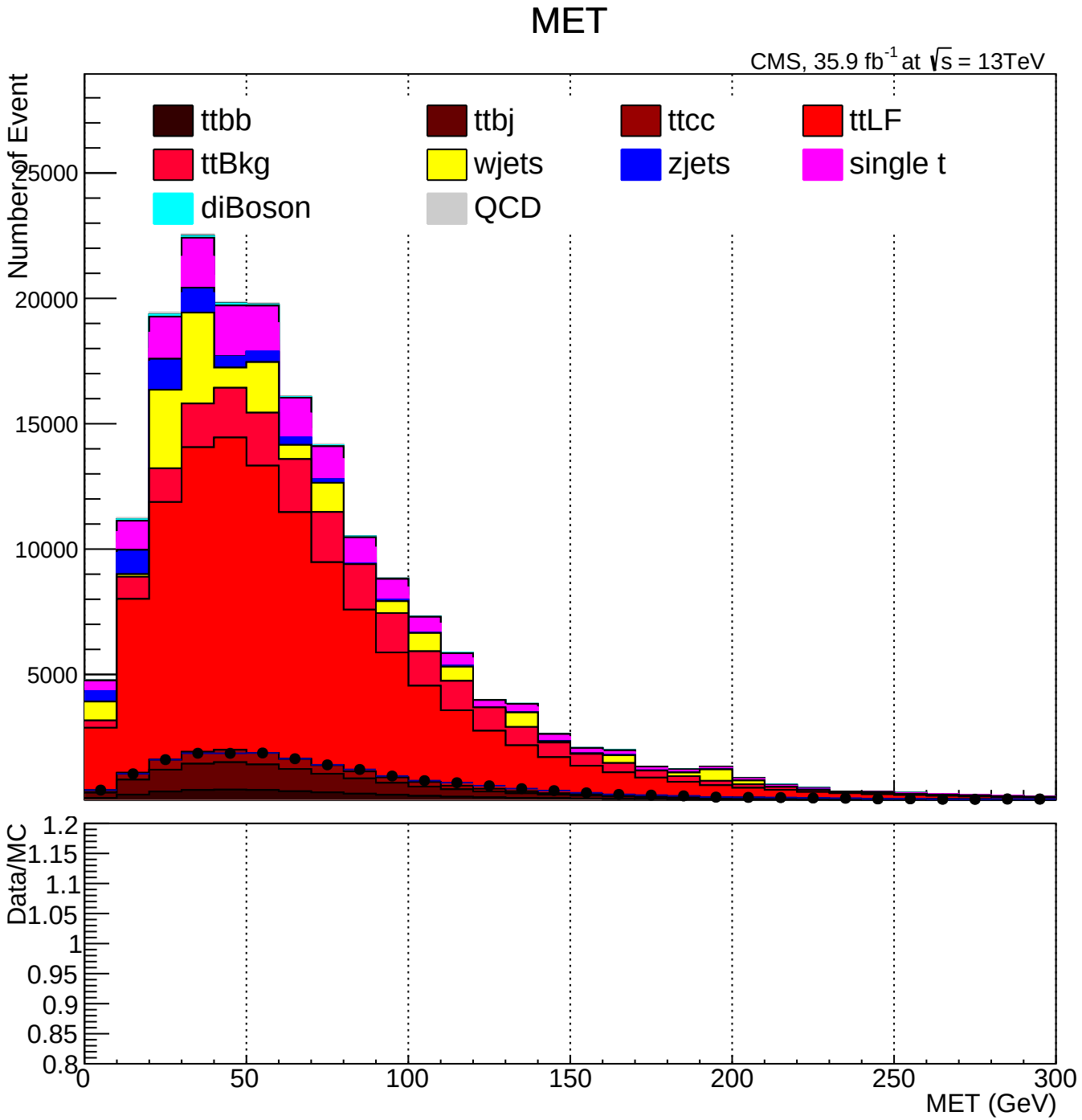

Top mass from Hc/u DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
Top Mass from Hc/u DRFCNHkinfit (GeV)

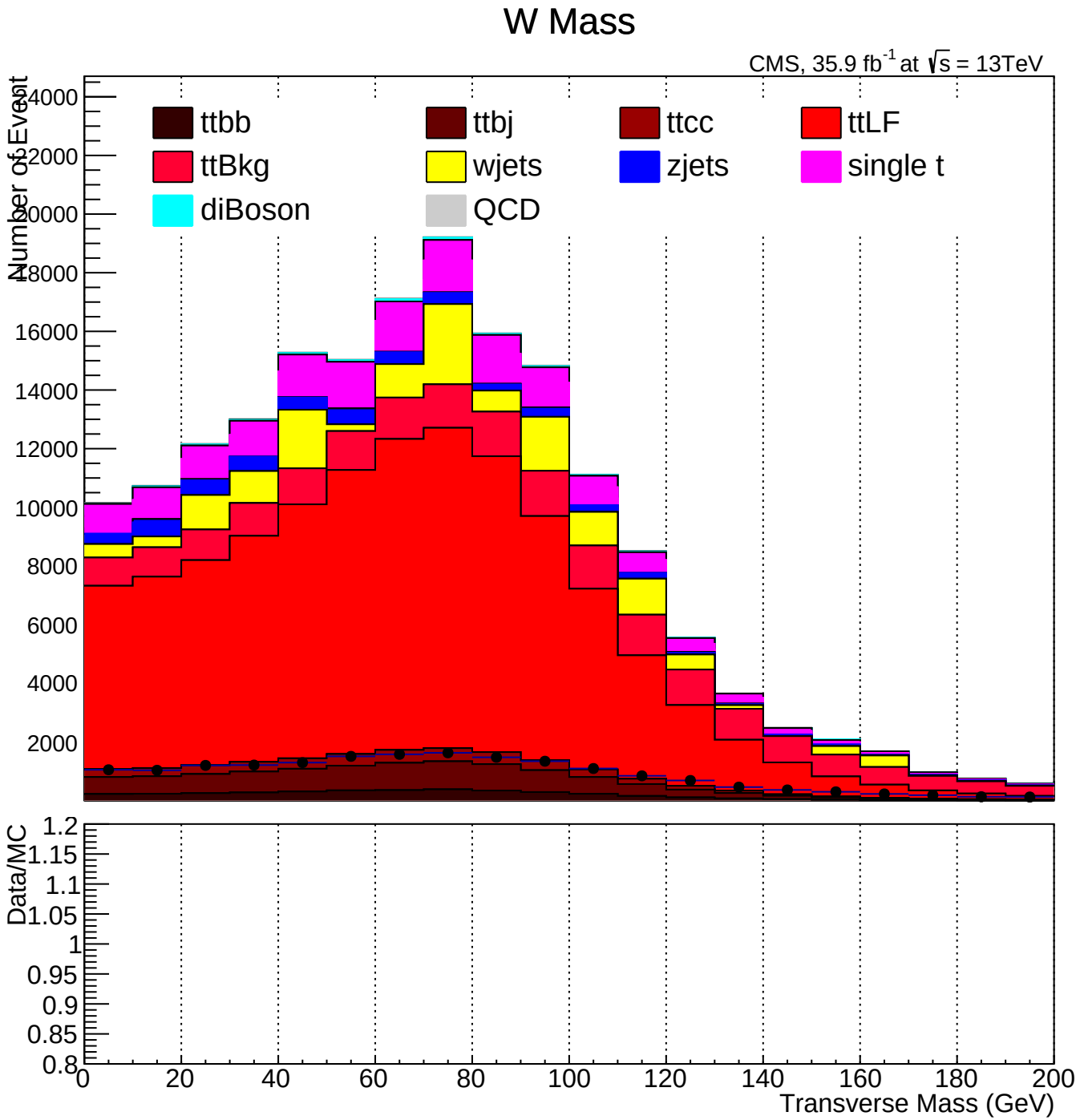

Number of jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
50000
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
2
4
6
8
10
12
Jet Multiplicity

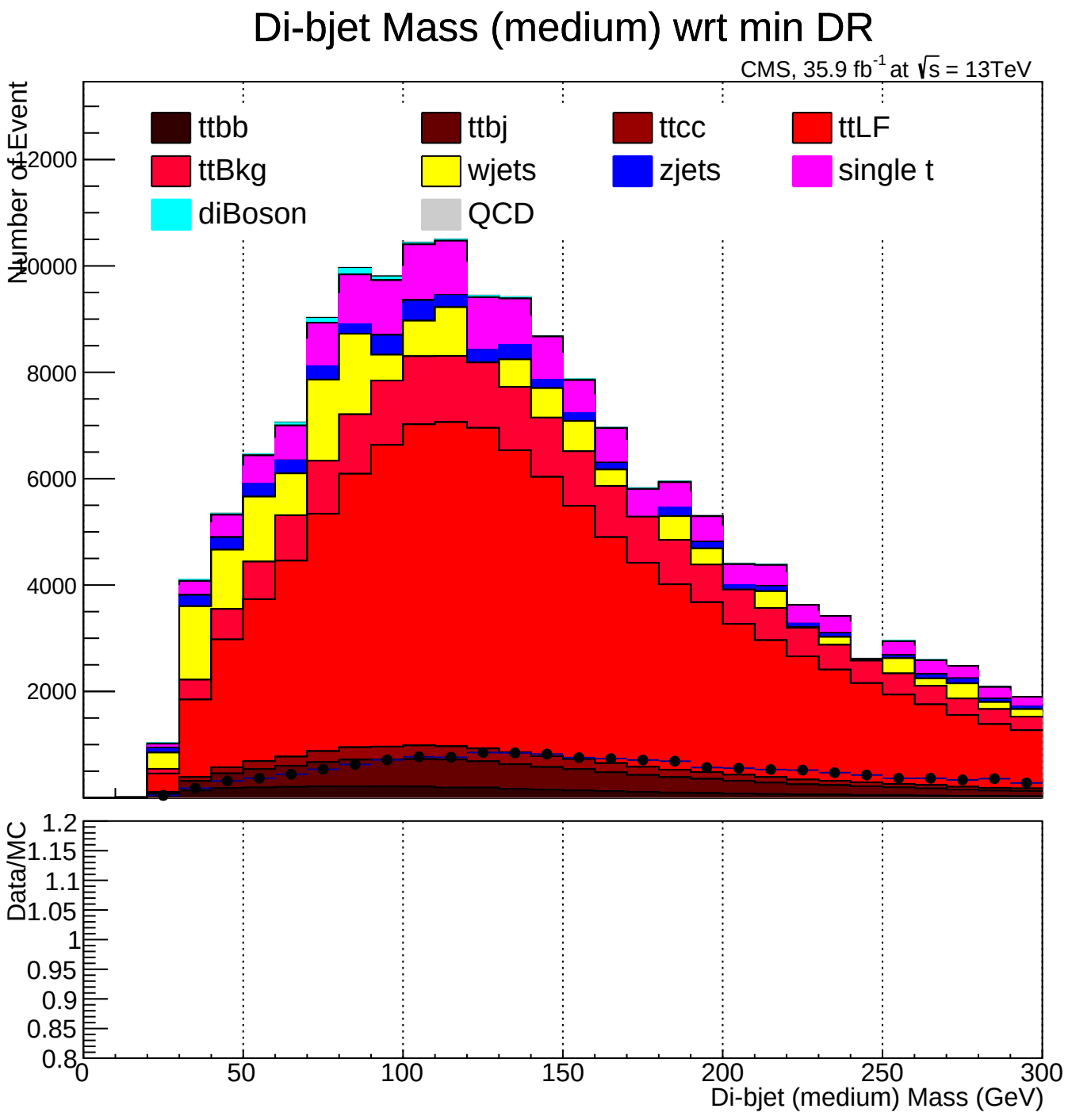

Number of b tagged jets (medium)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b-tagged Jet Multiplicity (CSVv2M)

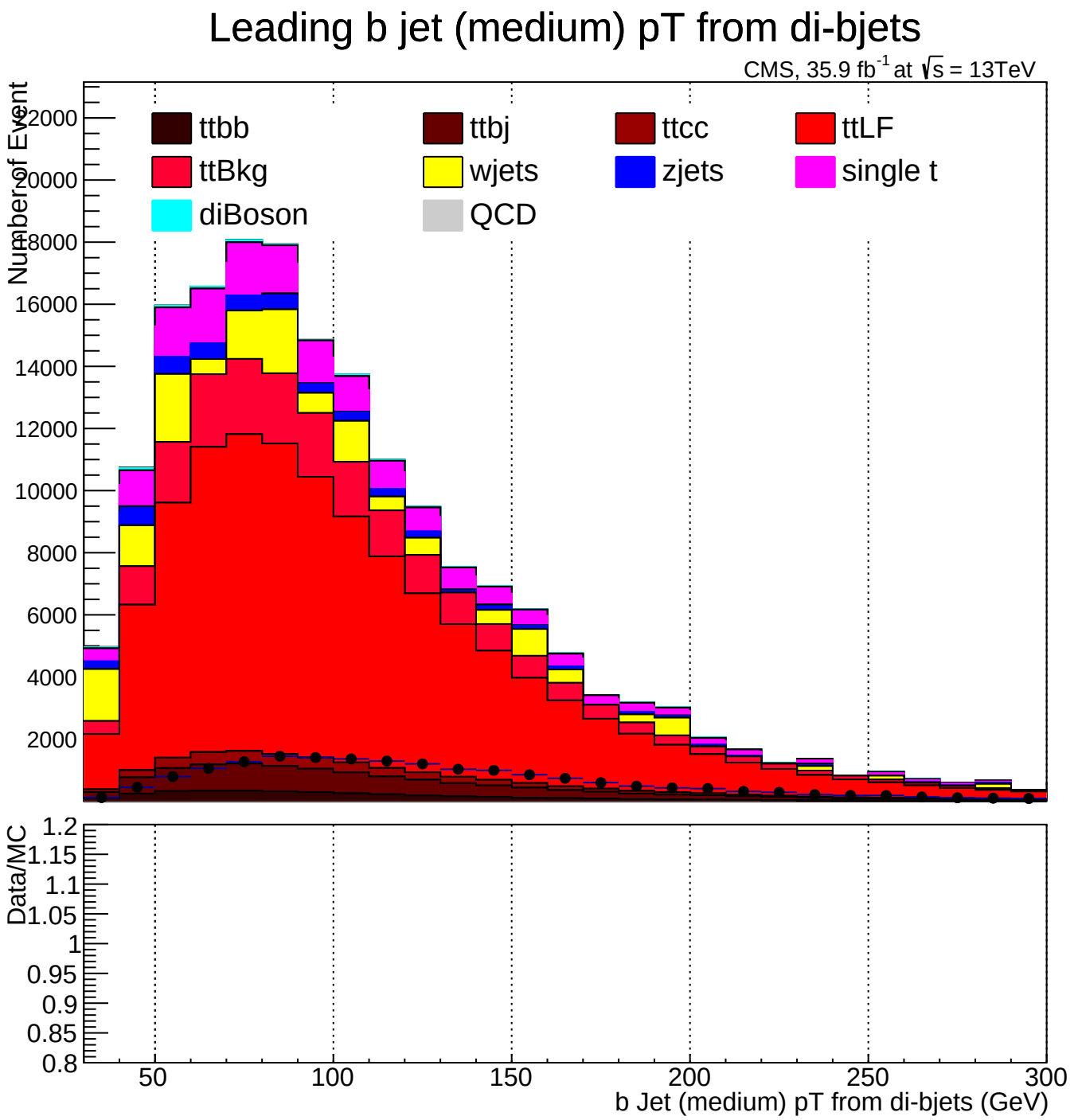

Number of b tagged jets (tight)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b-tagged Jet Multiplicity (CSVv2T)

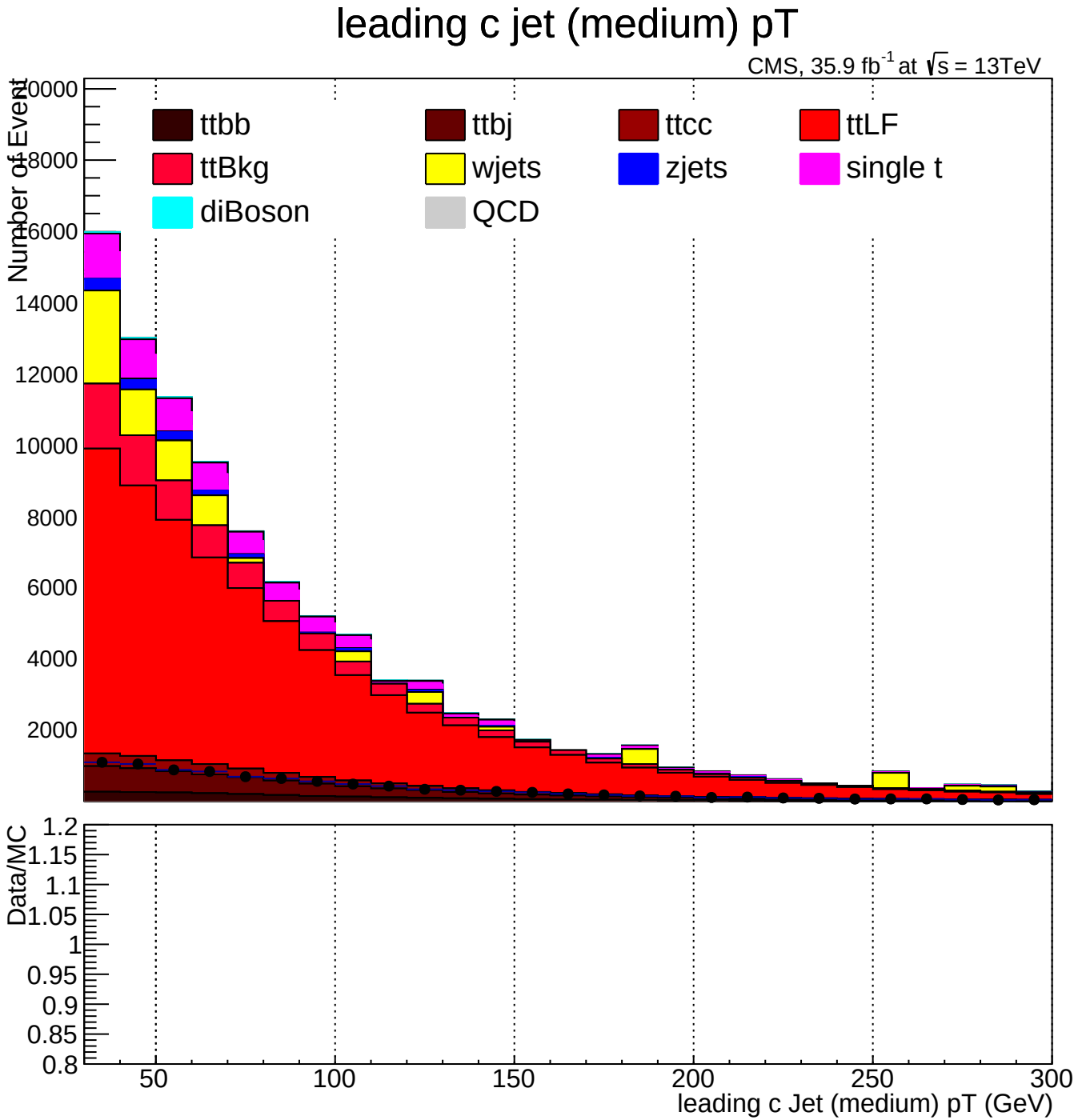

Number of c tagged jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
c-tagged Jet Multiplicity (M)

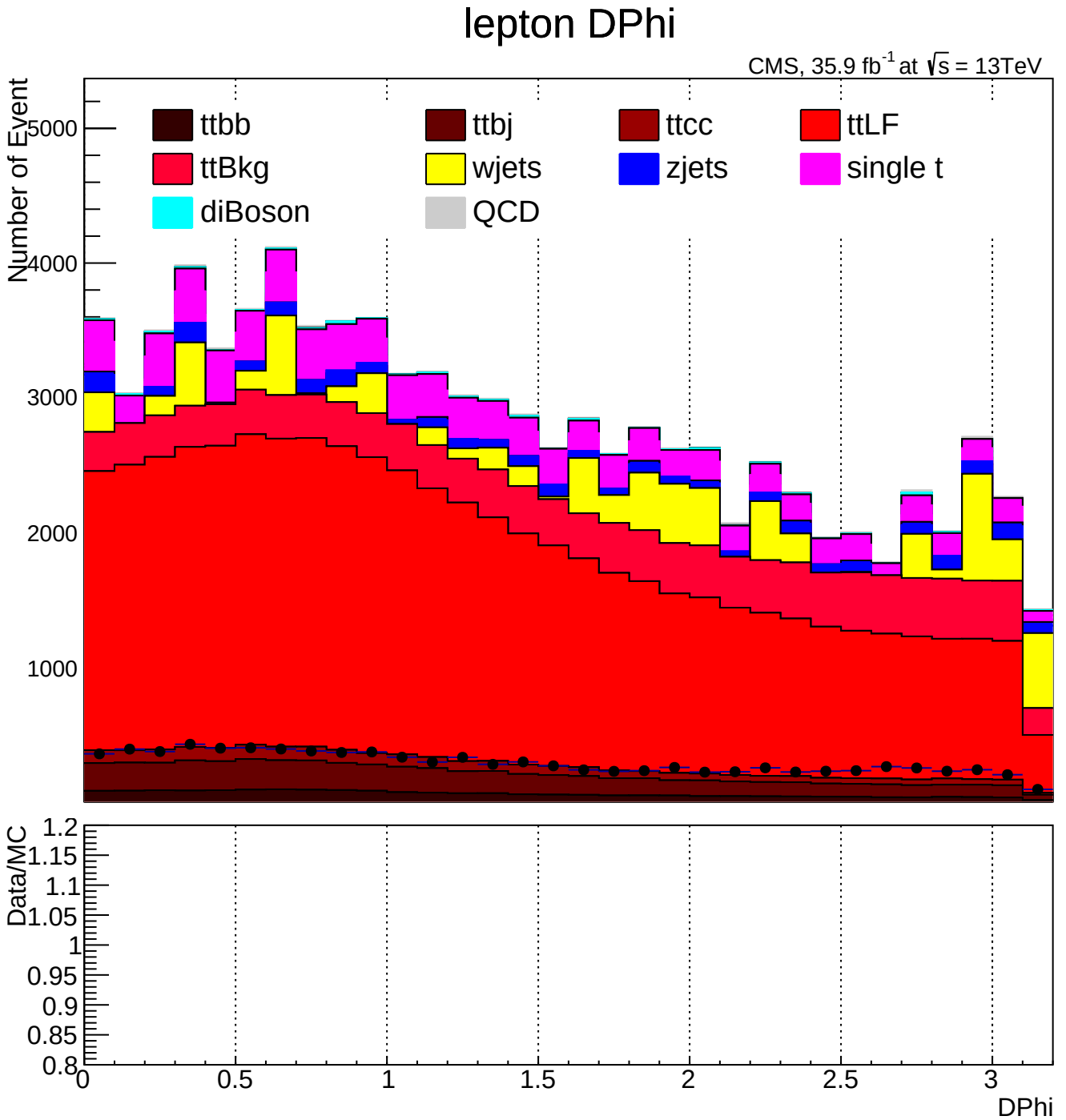

MET
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
25000
20000
15000
10000
5000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
50
100
150
200
250
300
MET (GeV)

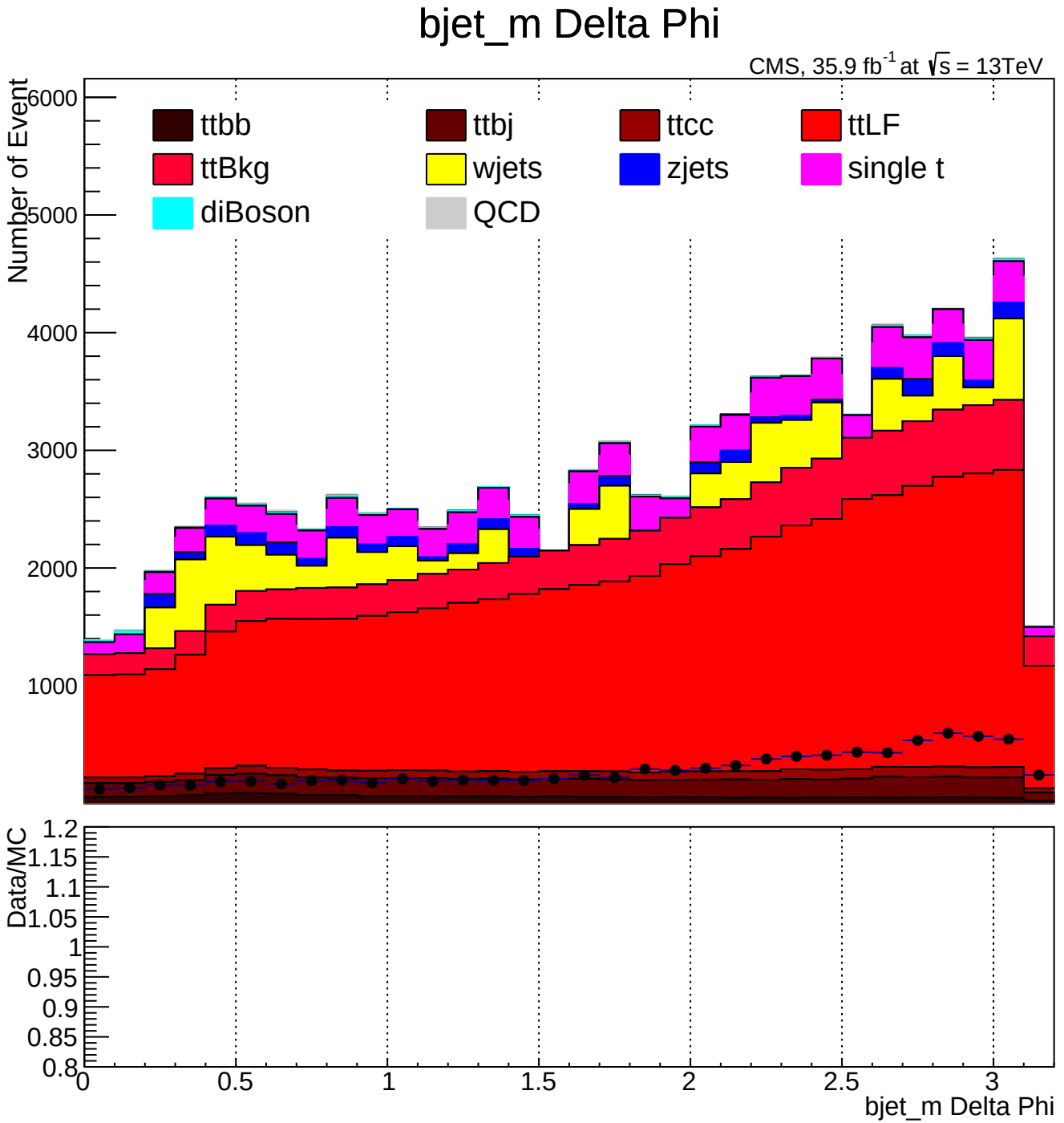

W Mass
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
Transverse Mass (GeV)

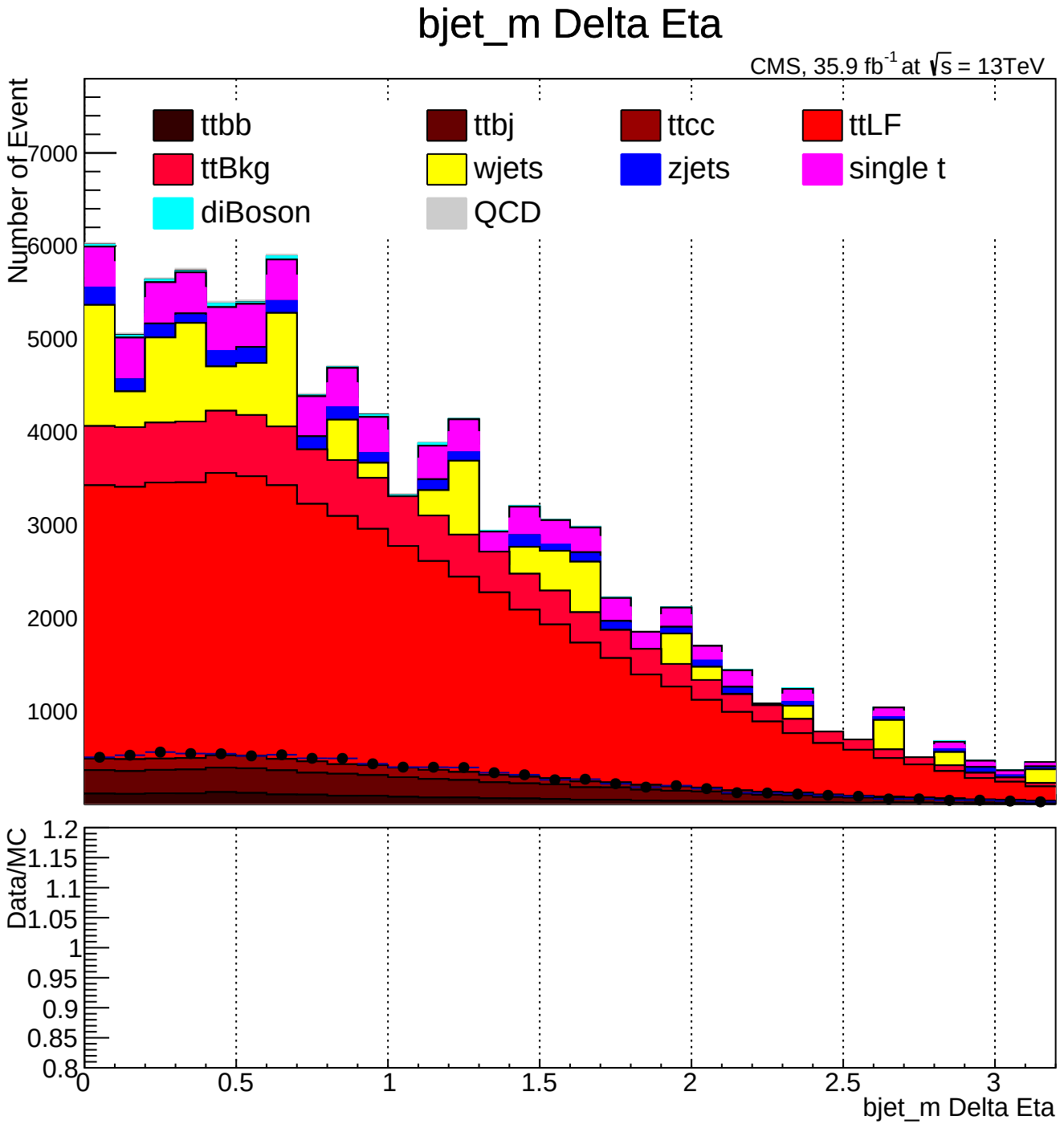

Di-bjet Mass (medium) wrt min DR
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
2000
4000
6000
8000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
50
100
150
200
250
300
Di-bjet (medium) Mass (GeV)

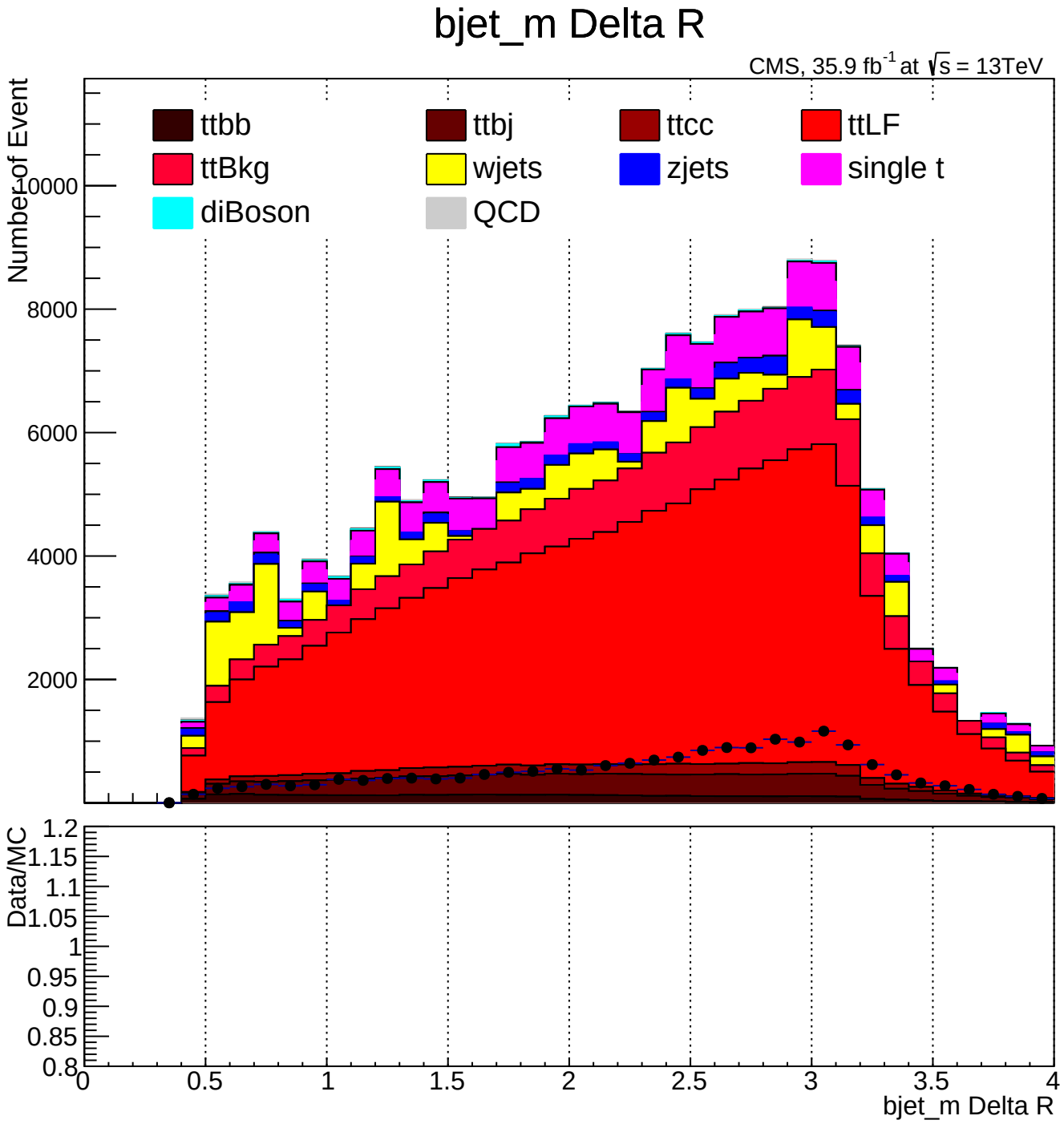

Leading b jet (medium) pT from di-bjets
CMS, 35.9 fb-1 at √s = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b Jet (medium) pT from di-bjets (GeV)

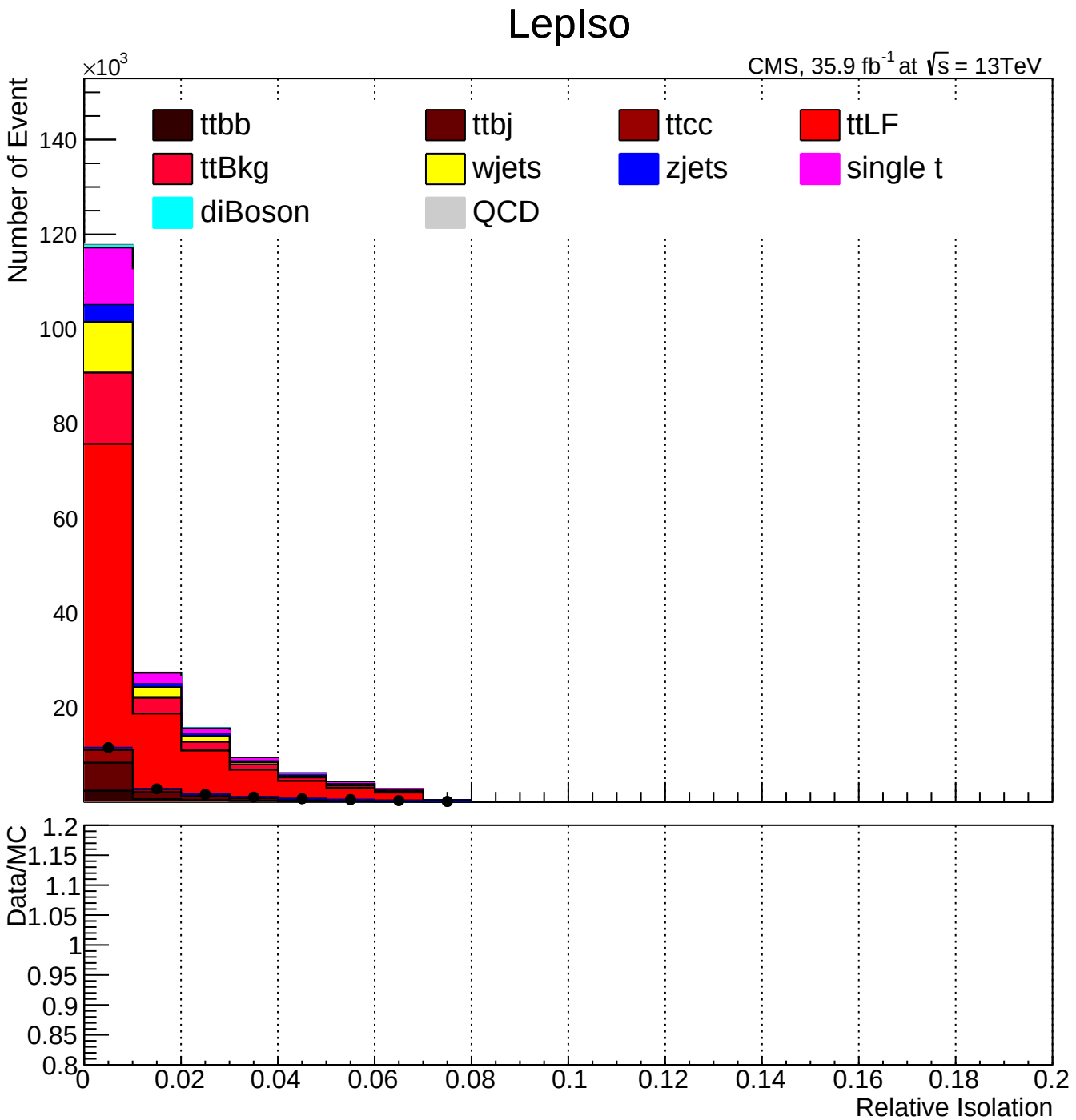

leading c jet (medium) pT
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
leading c Jet (medium) pT (GeV)

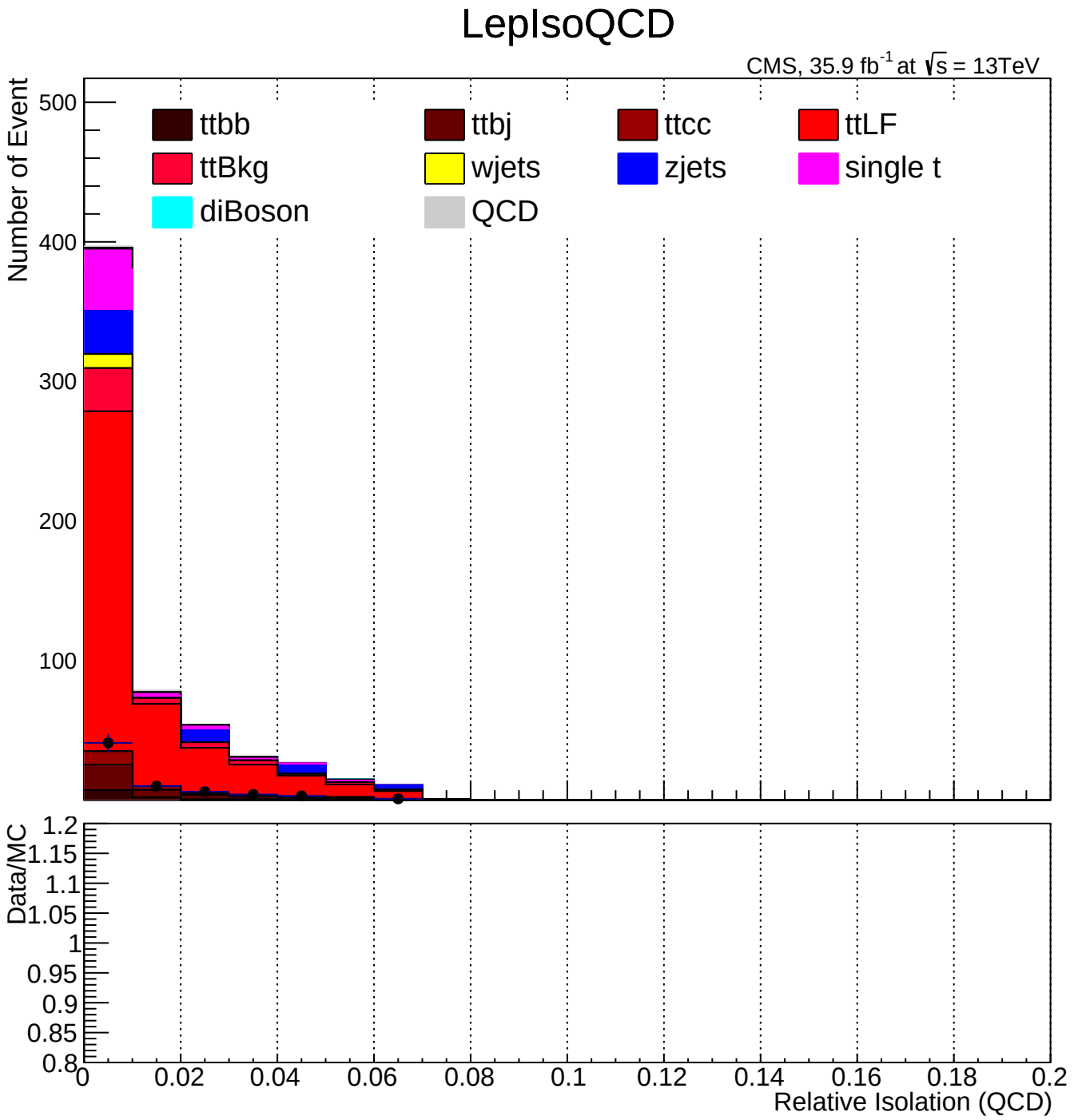

lepton DPhi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
DPhi

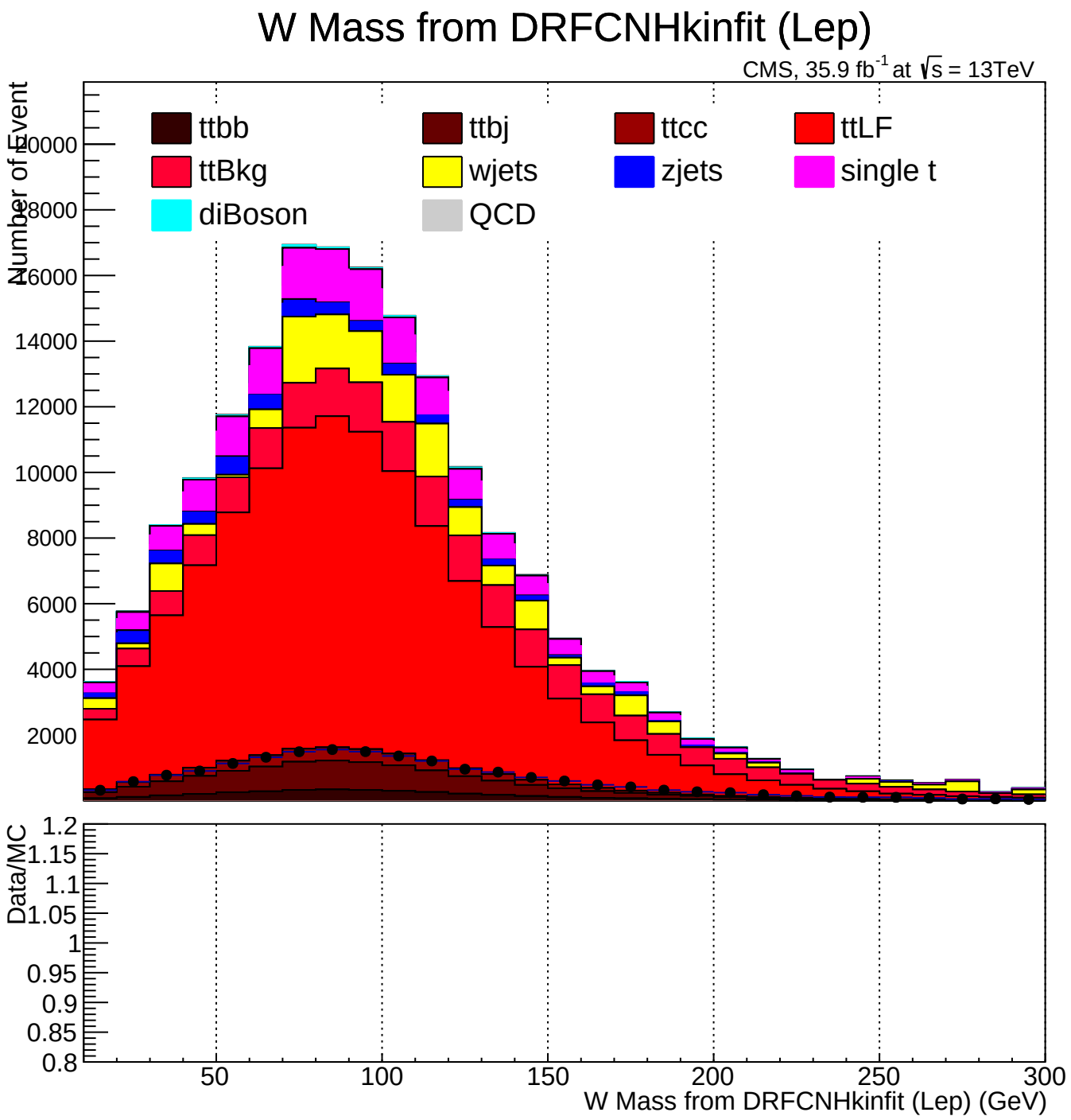

bjet_m Delta Phi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta Phi

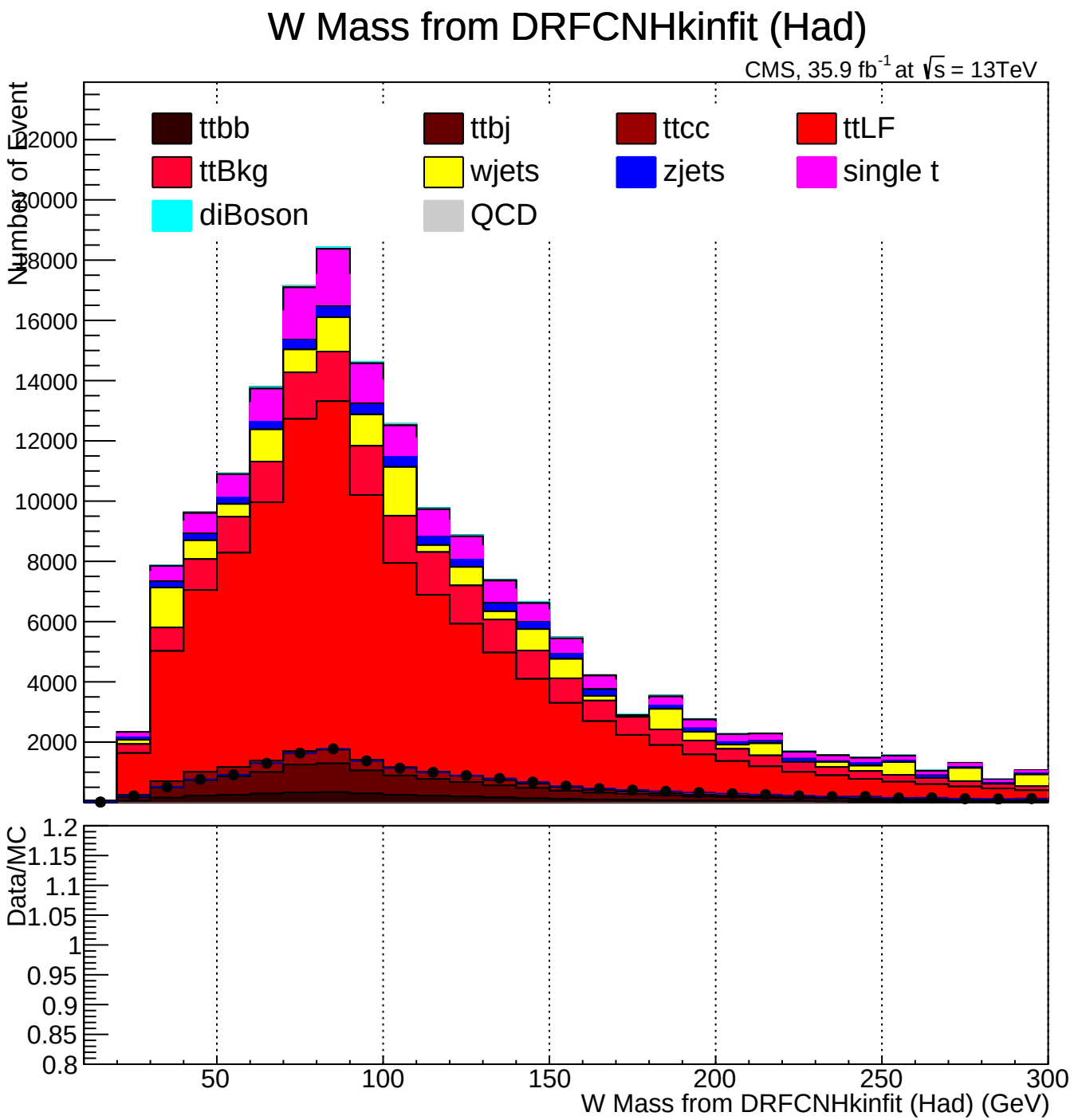

bjet_m Delta Eta
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
7000
6000
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Eta

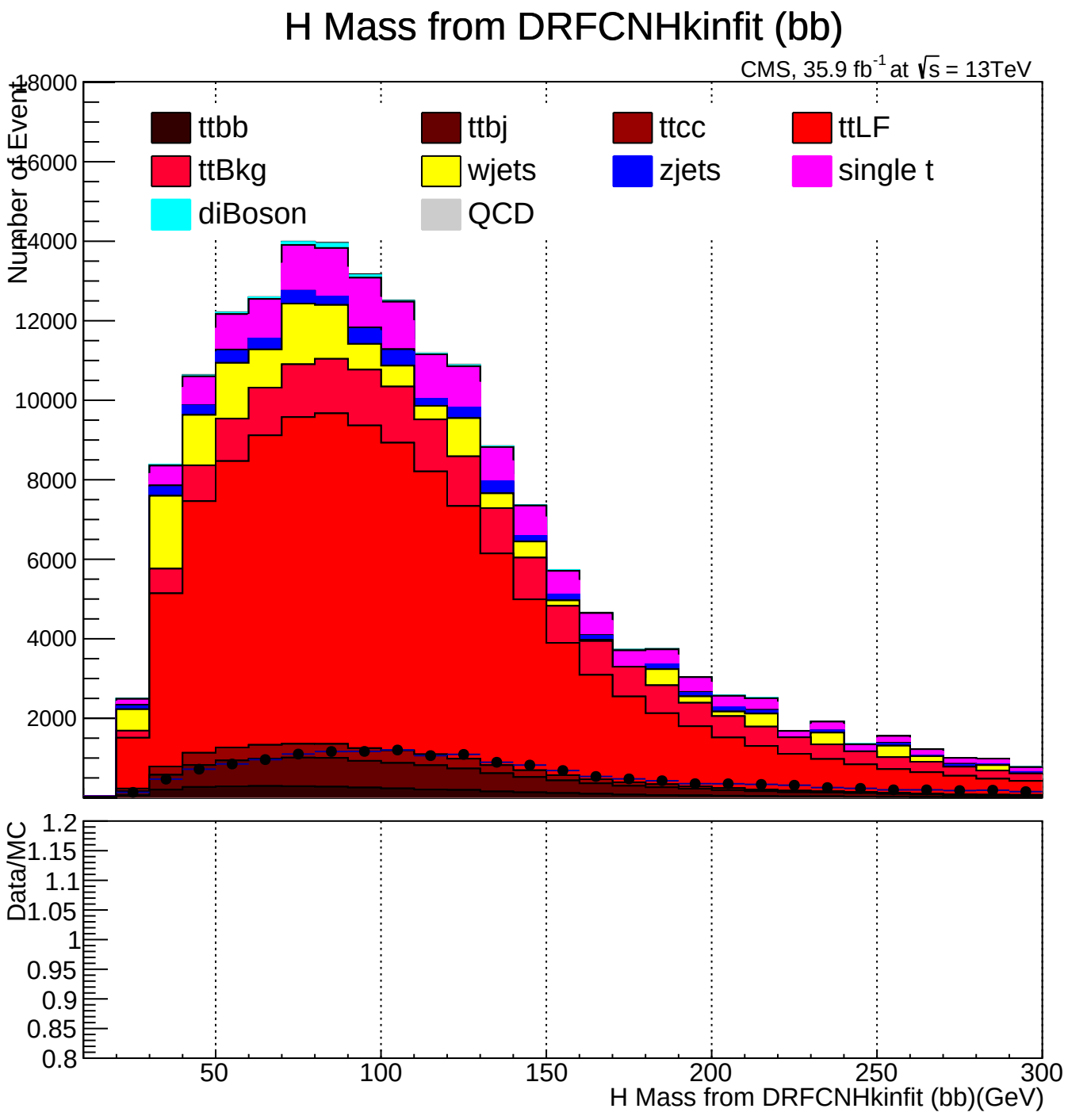

bjet_m Delta R
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
3.5
4
bjet_m Delta R

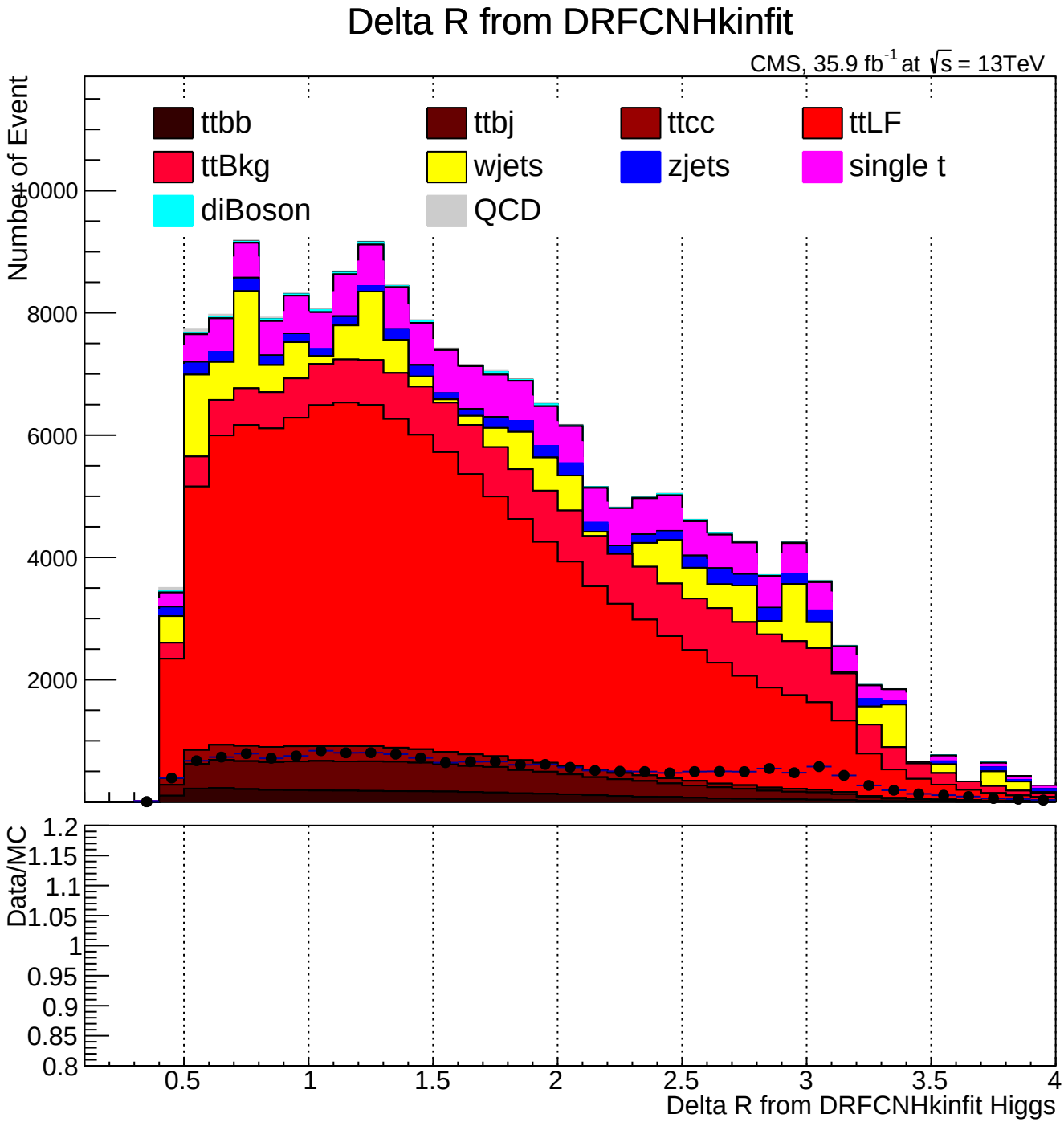

LepIso
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation

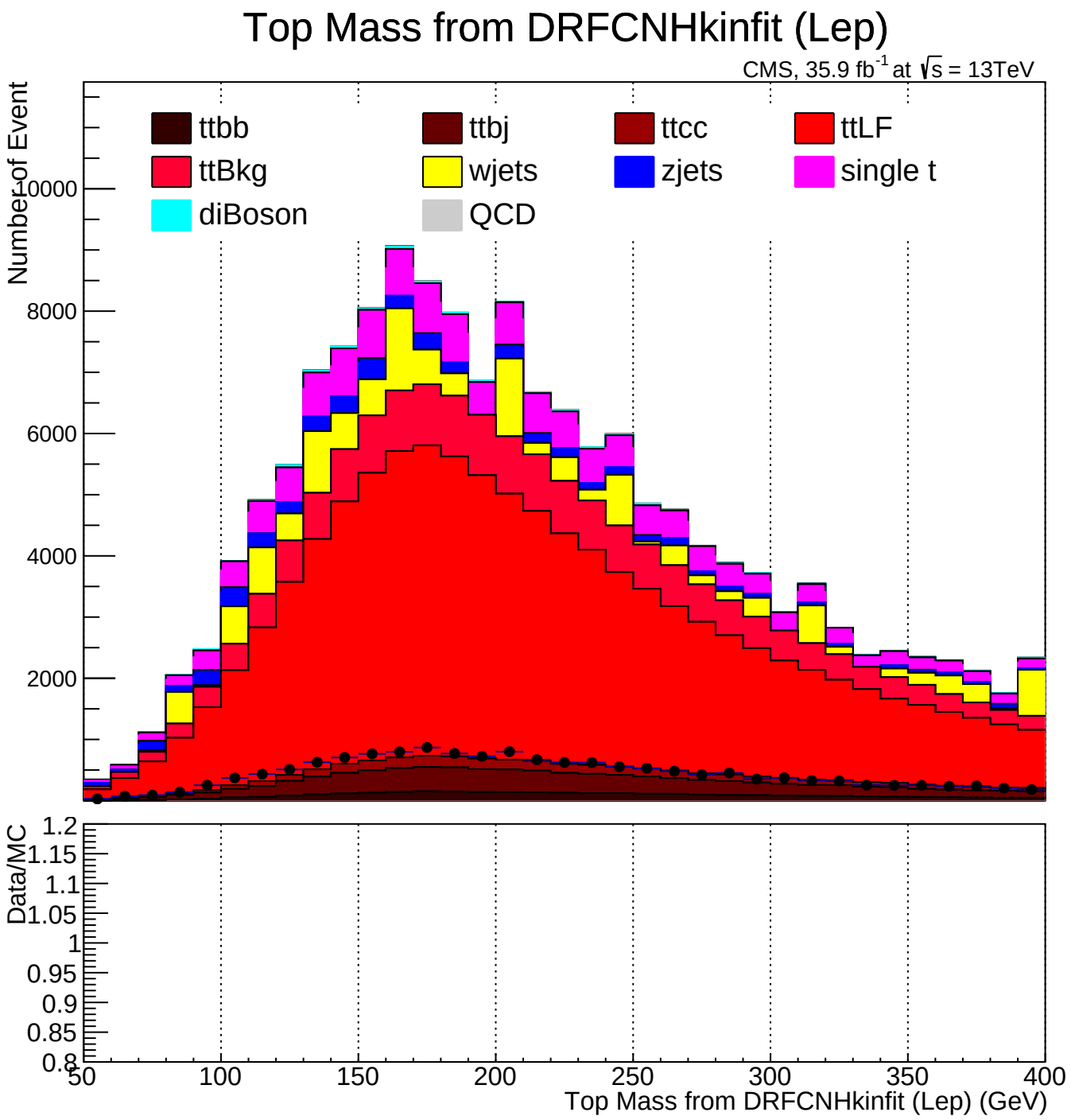

LepIsoQCD
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
500
400
300
200
100
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation (QCD)

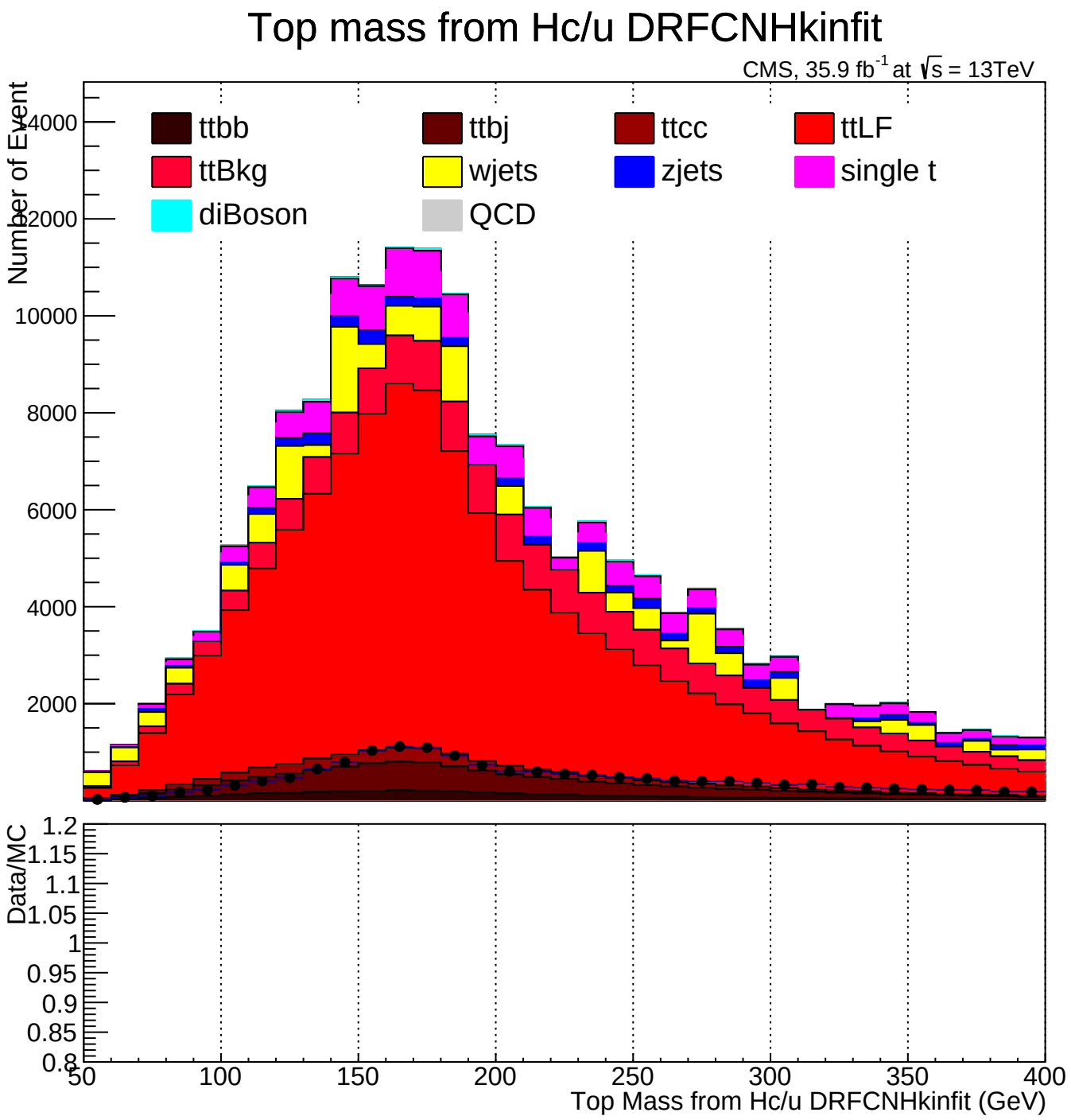

W Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
W Mass from DRFCNHkinfit (Lep) (GeV)

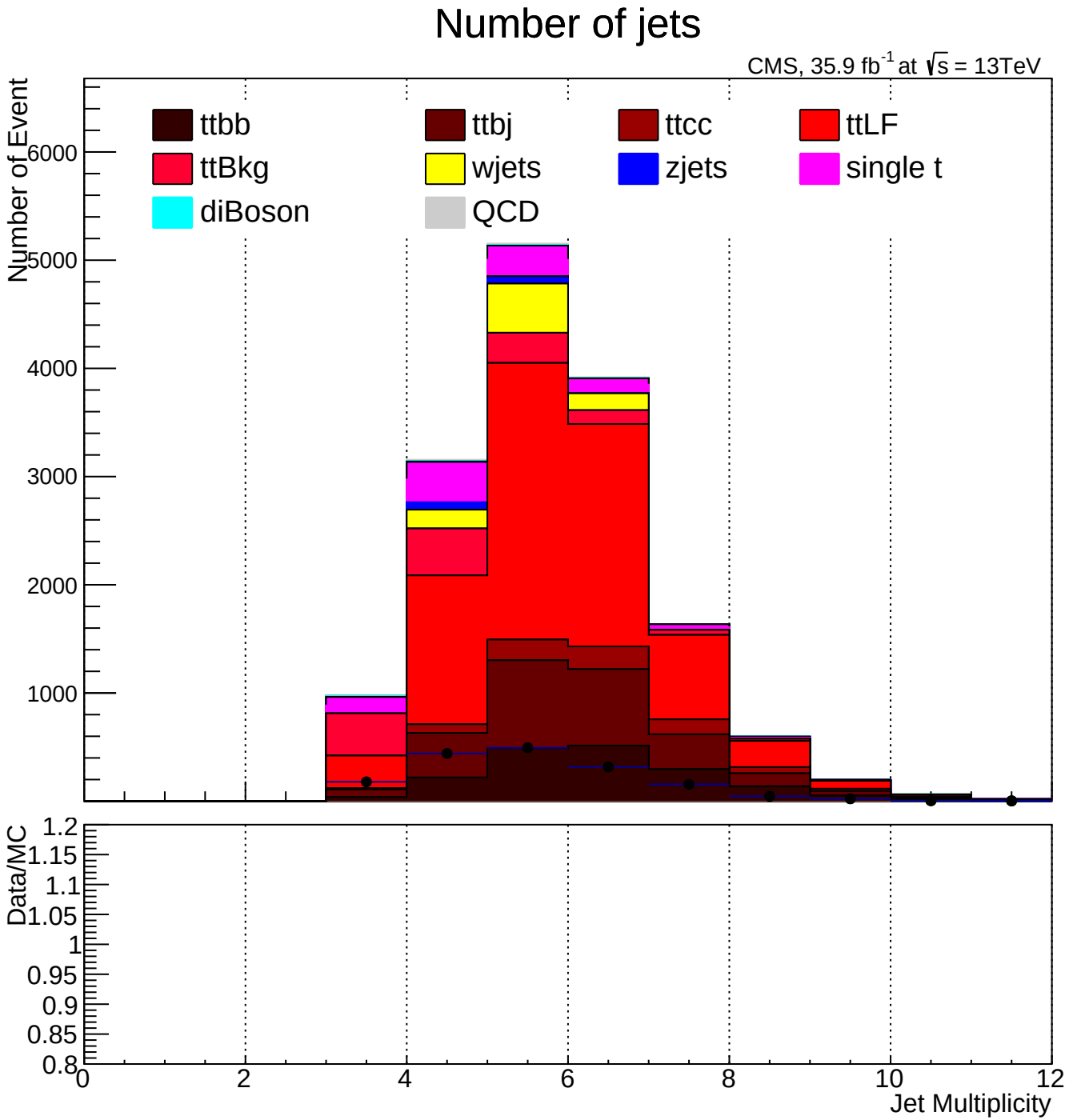

W Mass from DRFCNHkinfit (Had)
CMS, 35.9 fb-1 at √s = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
W Mass from DRFCNHkinfit (Had) (GeV)

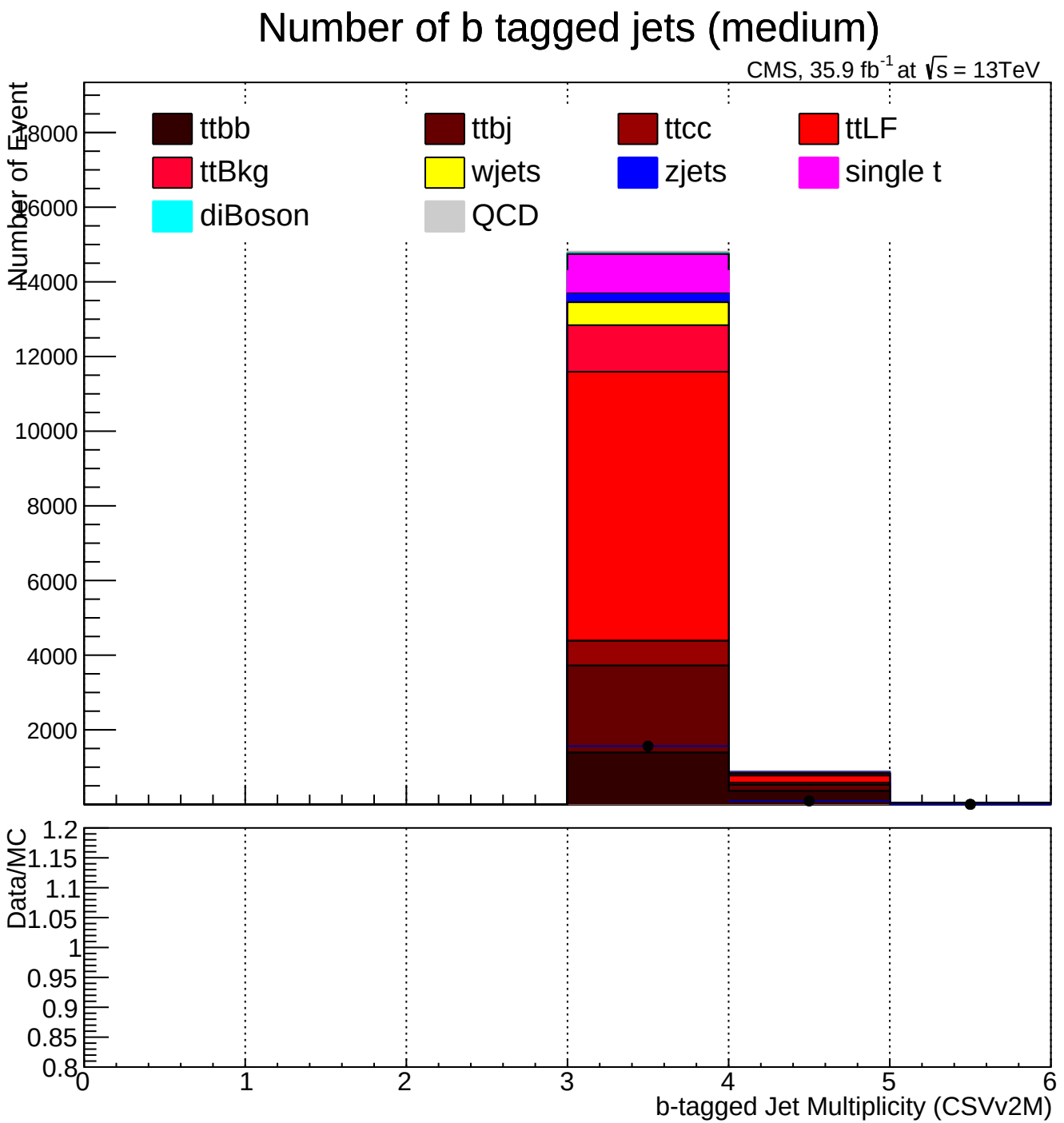

H Mass from DRFCNHkinfit (bb)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
H Mass from DRFCNHkinfit (bb)(GeV)

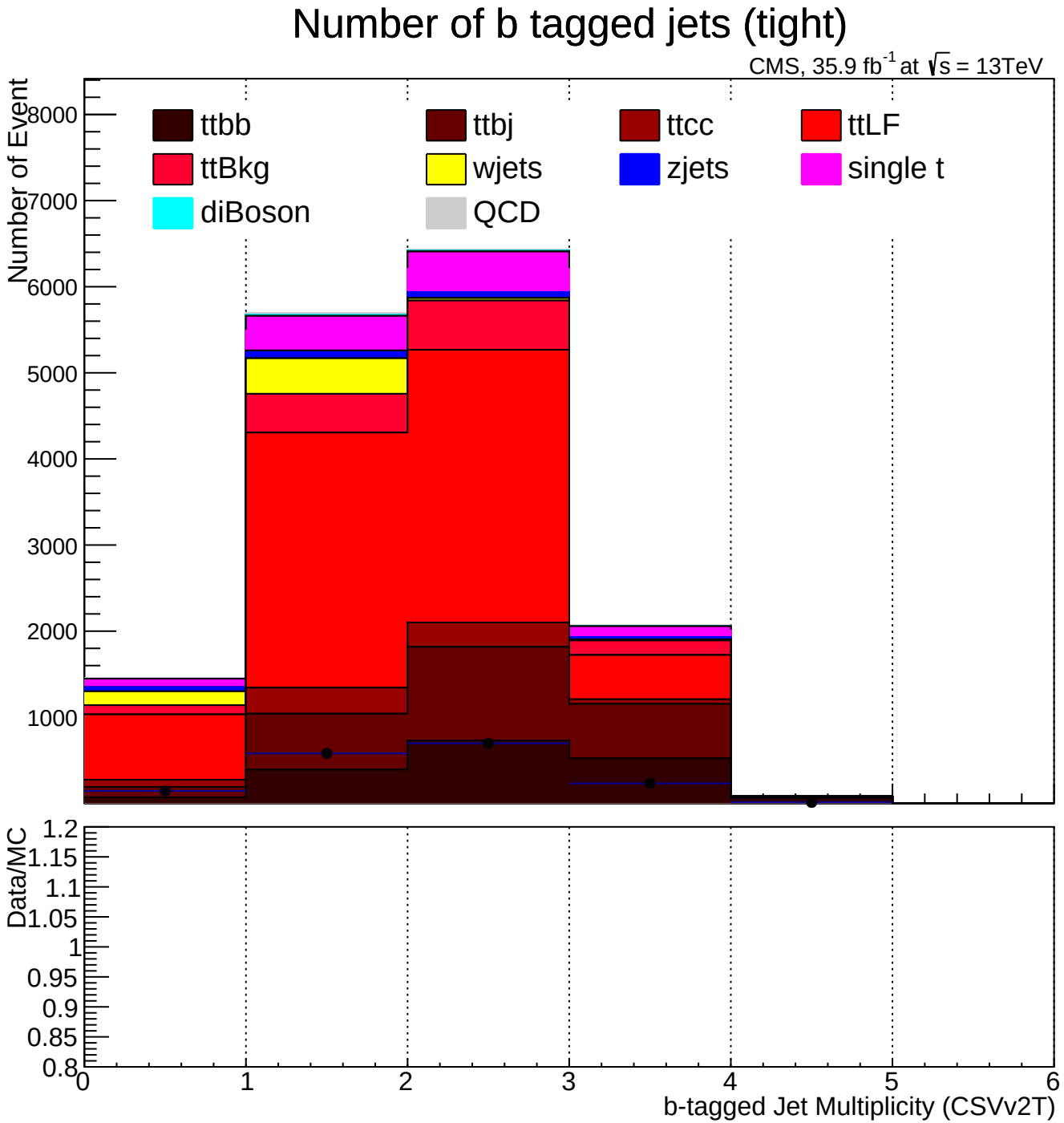

Delta R from DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0.5
1
1.5
2
2.5
3
3.5
4
Delta R from DRFCNHkinfit Higgs

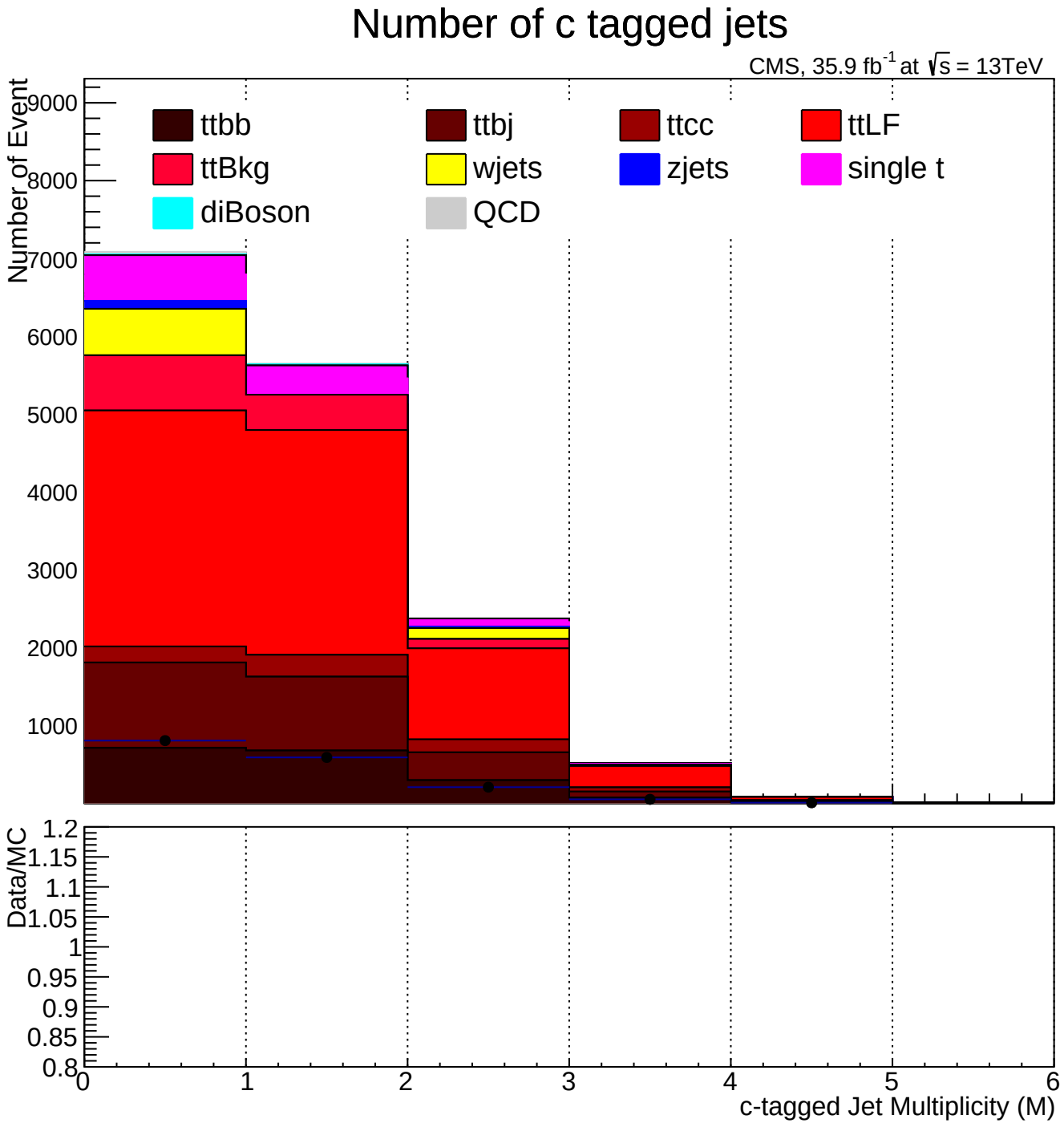

Top Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
350
400
Top Mass from DRFCNHkinfit (Lep) (GeV)

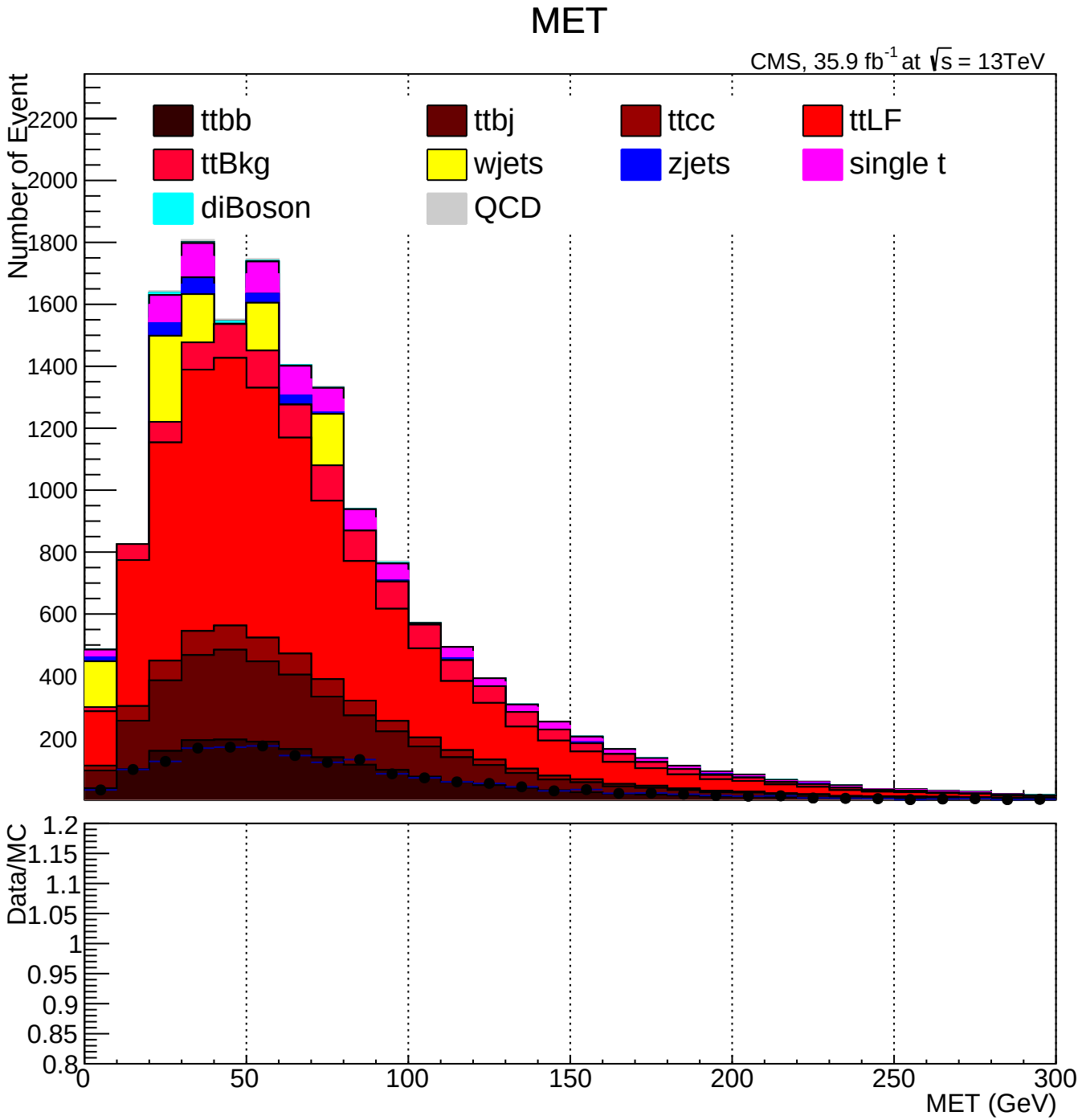

Top mass from Hc/u DRFCNHkinfit
CMS, 35.9 fb-1 at √s = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Top Mass from Hc/u DRFCNHkinfit (GeV)

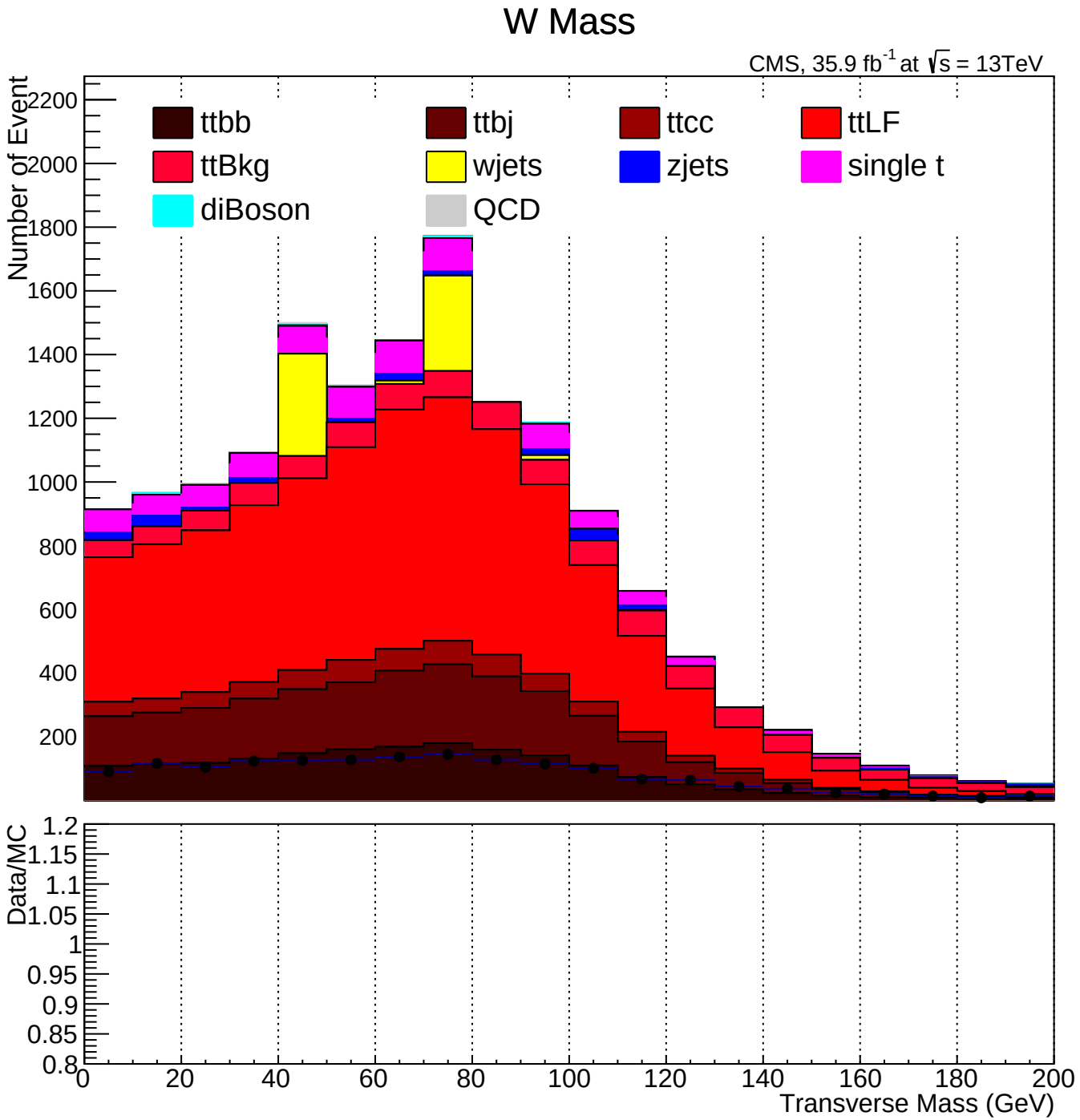

Number of jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
6000
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
2
4
6
8
10
12
Jet Multiplicity

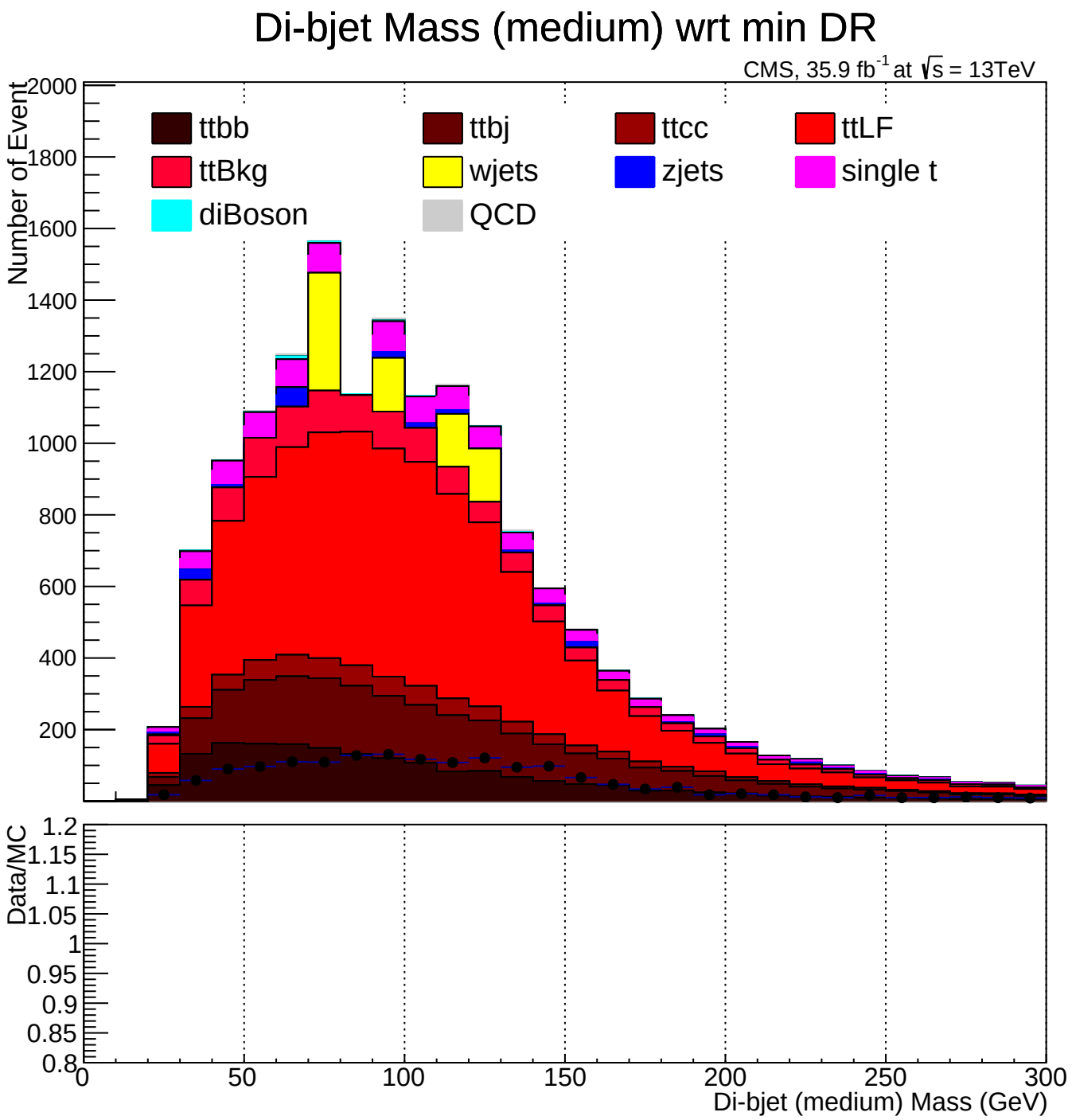

Number of b tagged jets (medium)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b-tagged Jet Multiplicity (CSVv2M)

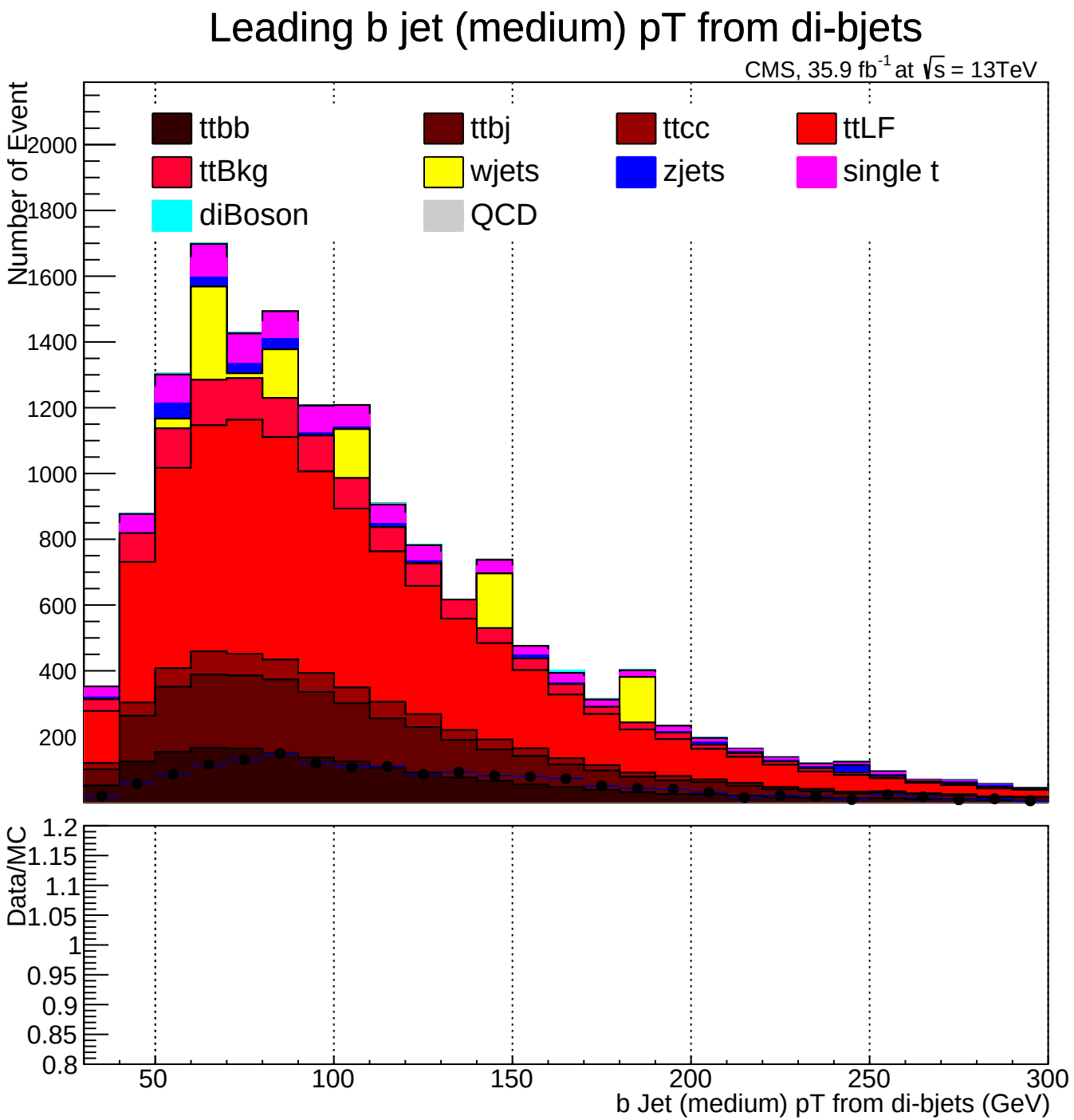

Number of b tagged jets (tight)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
8000
7000
6000
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2T)

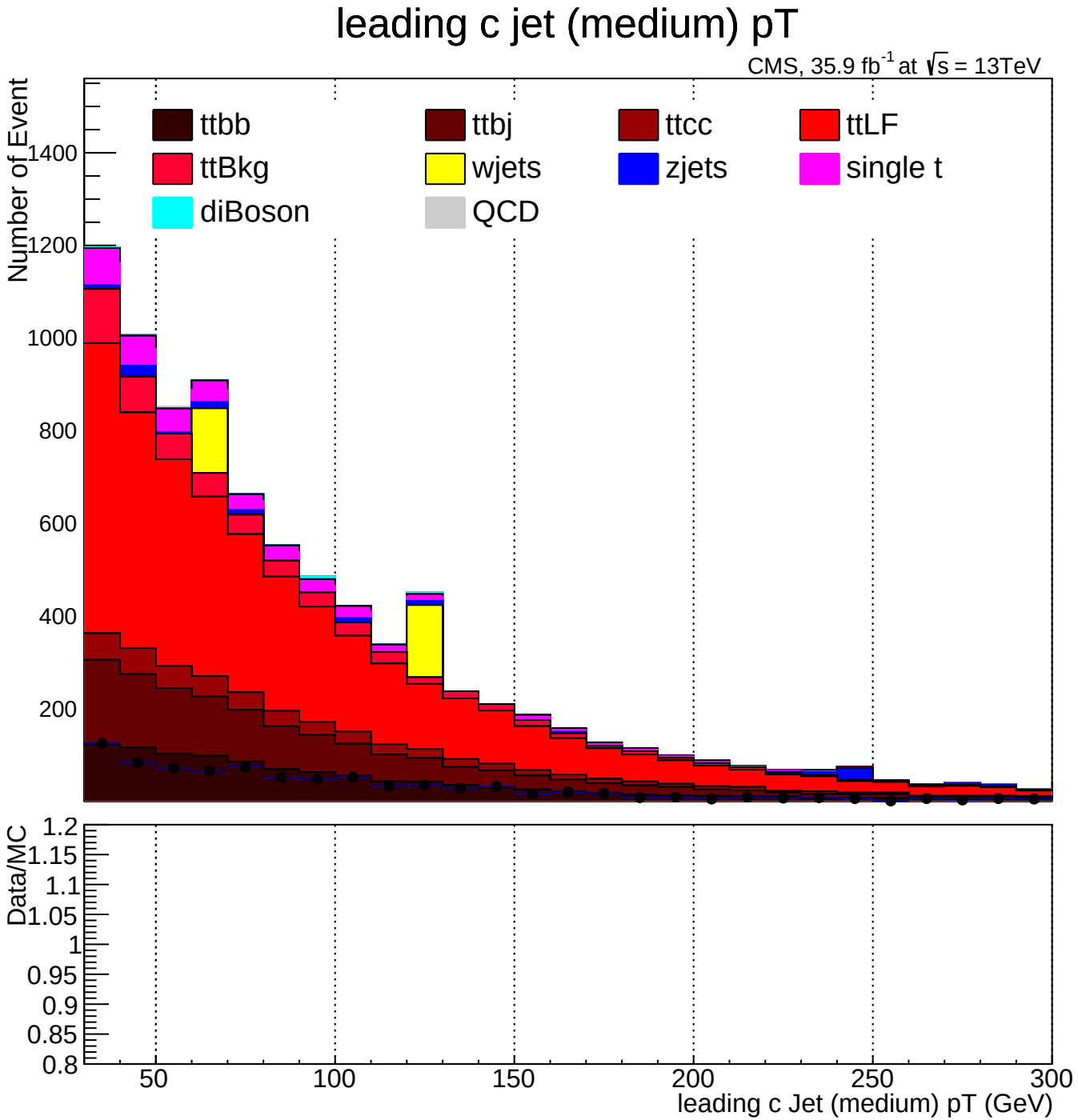

Number of c tagged jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
c-tagged Jet Multiplicity (M)

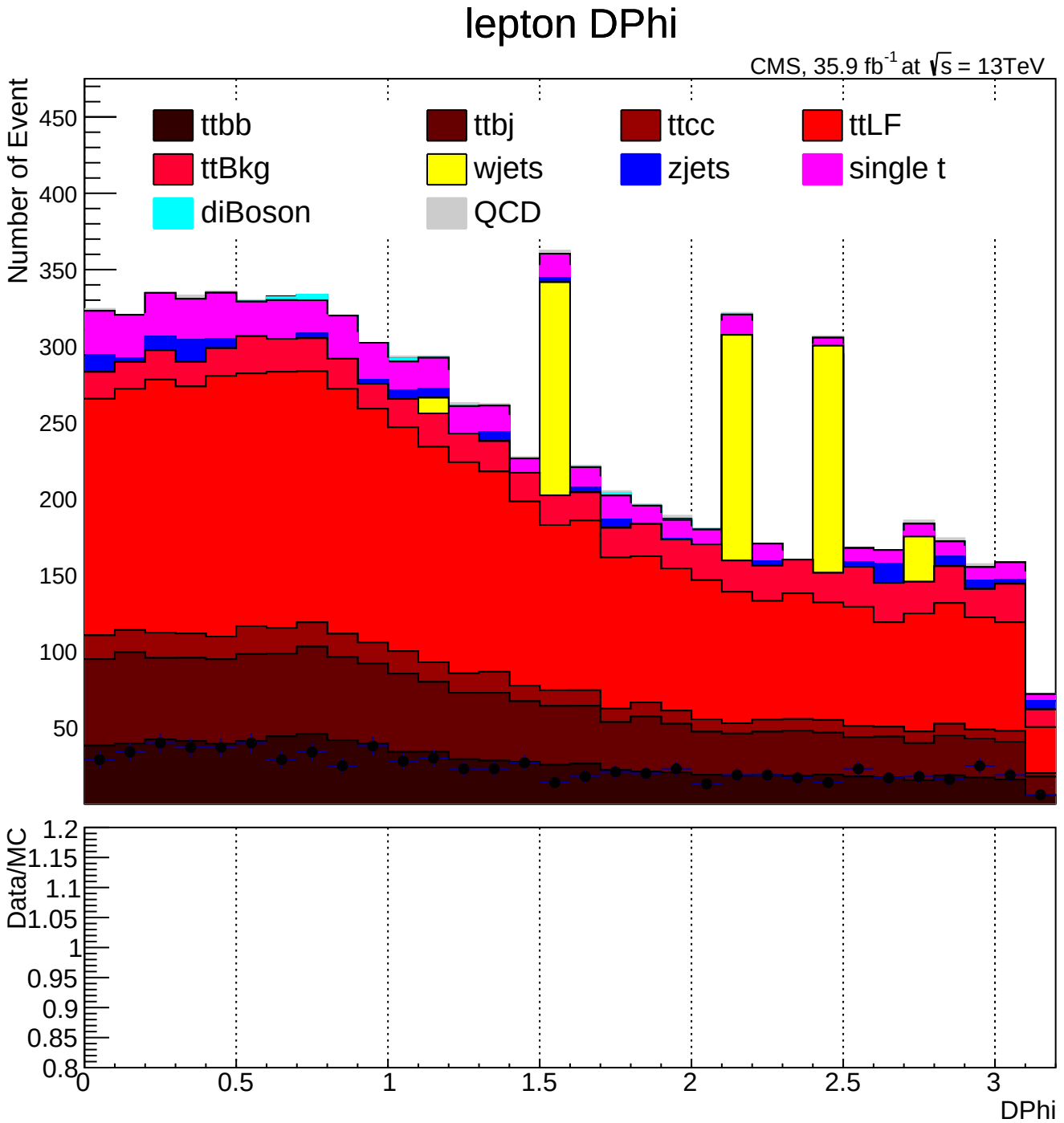

MET
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
MET (GeV)

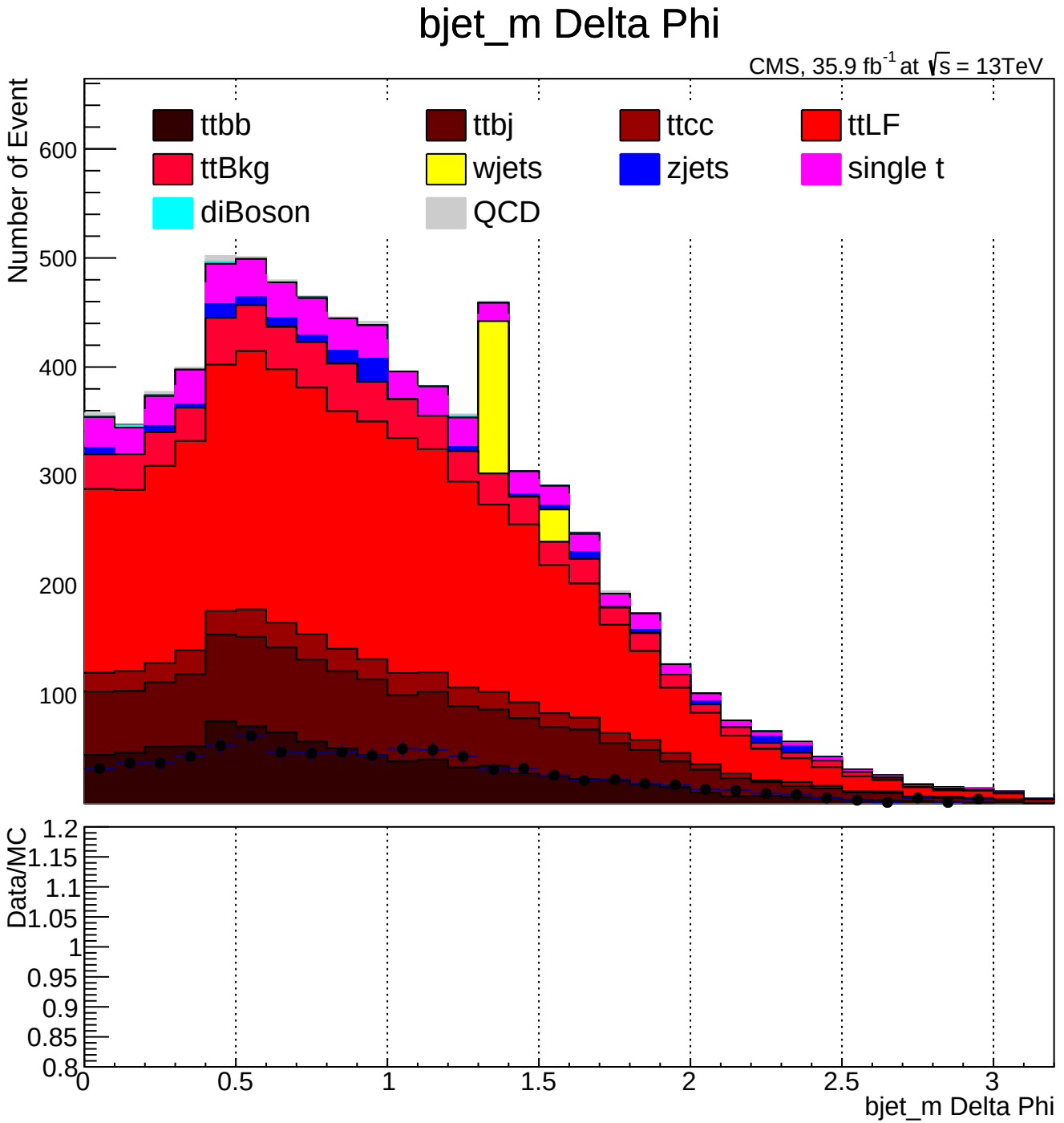

W Mass
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Transverse Mass (GeV)

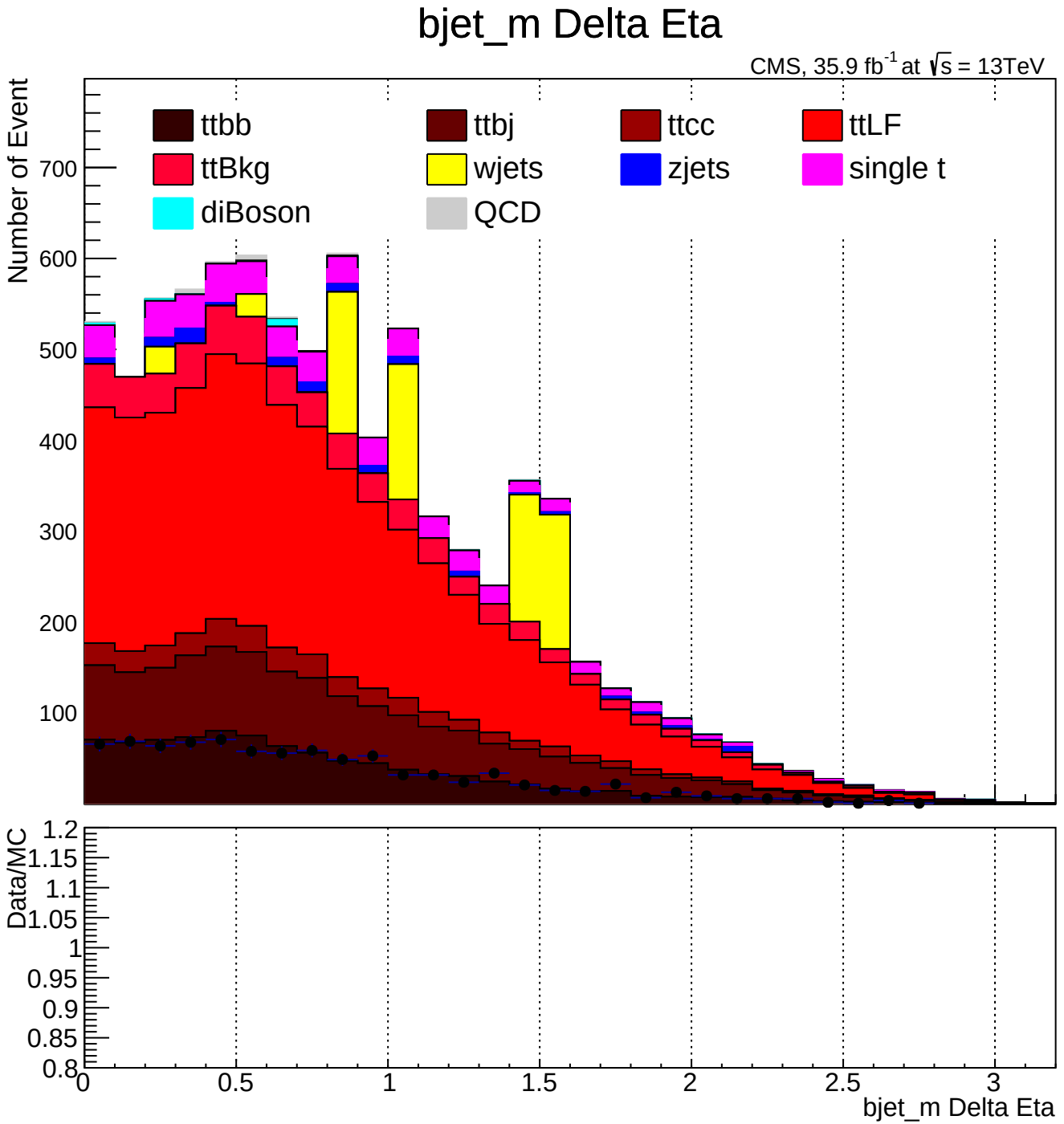

Di-bjet Mass (medium) wrt min DR
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Di-bjet (medium) Mass (GeV)

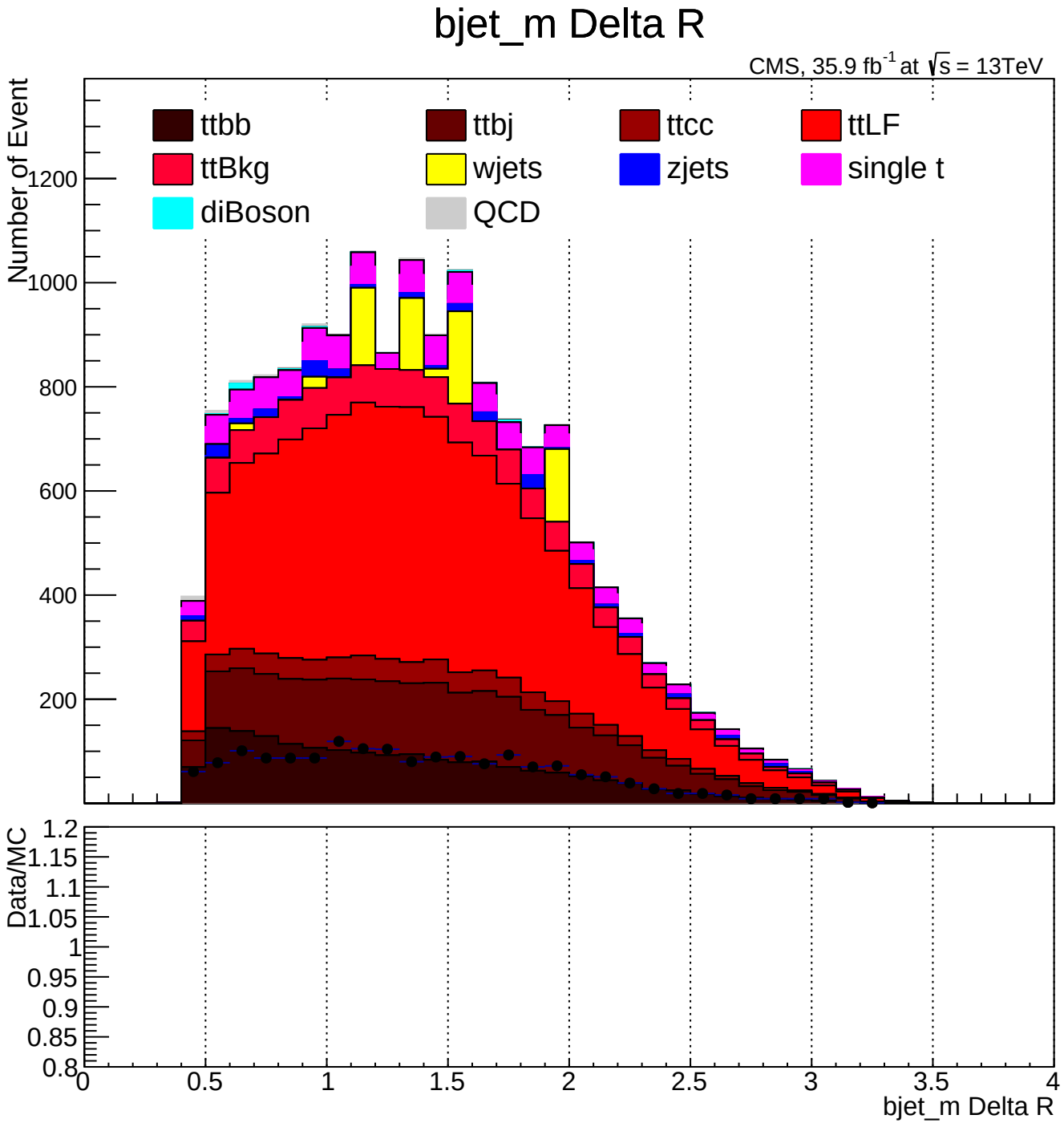

Leading b jet (medium) pT from di-bjets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
2000
1800
1600
1400
1200
1000
800
600
400
200
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
b Jet (medium) pT from di-bjets (GeV)

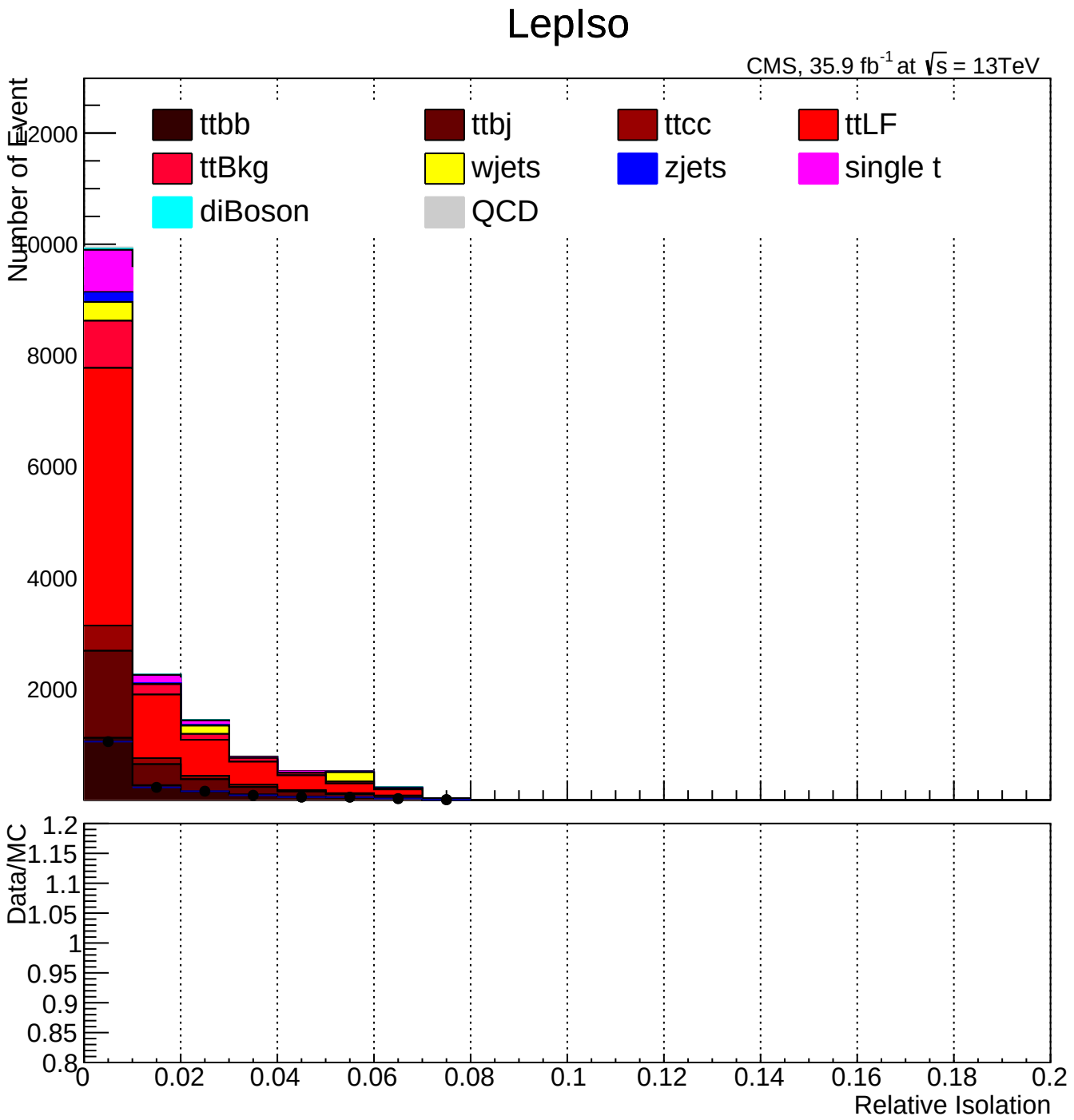

leading c jet (medium) pT
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
1400
1200
1000
800
600
400
200
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
leading c Jet (medium) pT (GeV)

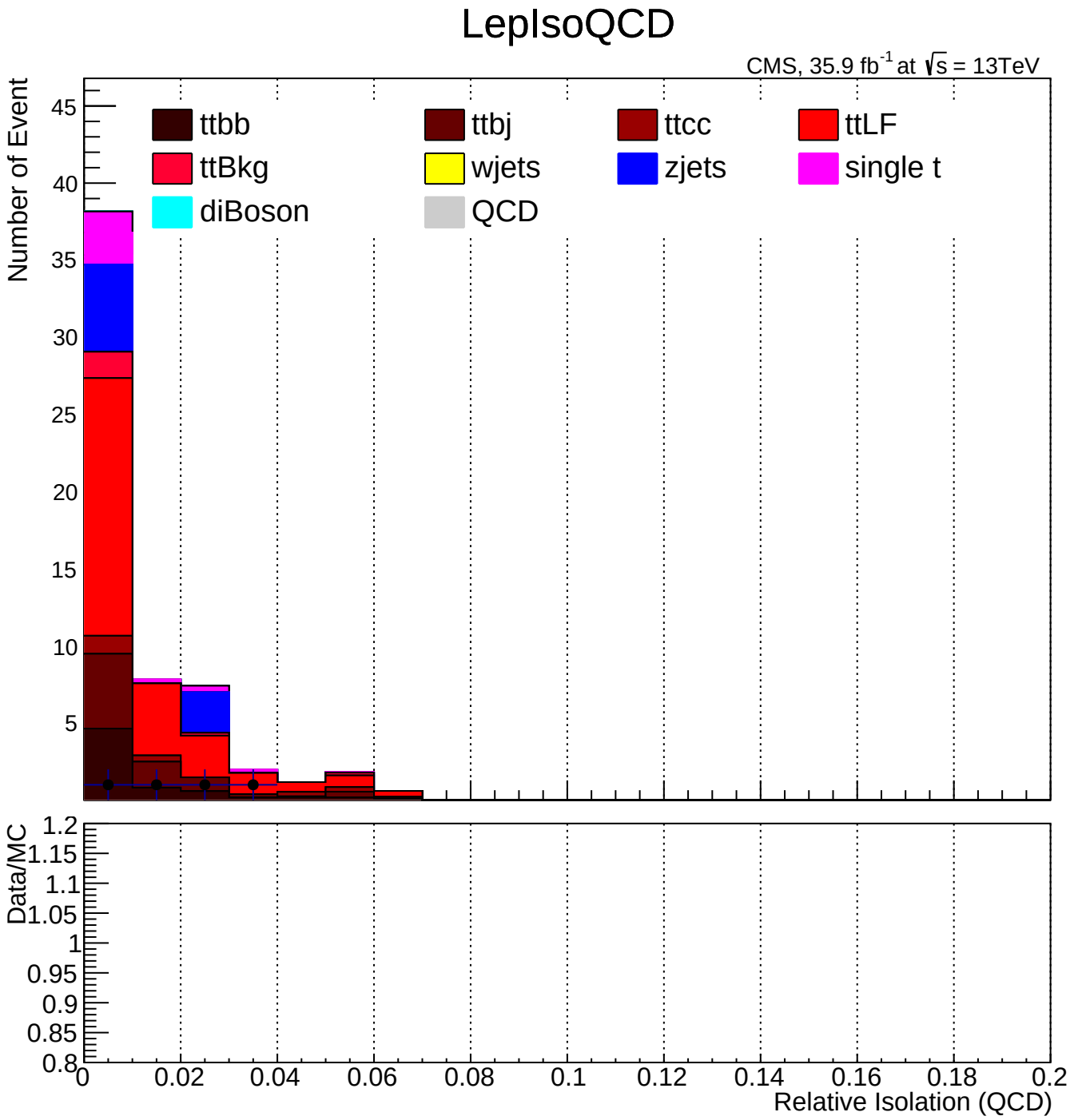

lepton DPhi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
450
400
350
300
250
200
150
100
50
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
DPhi

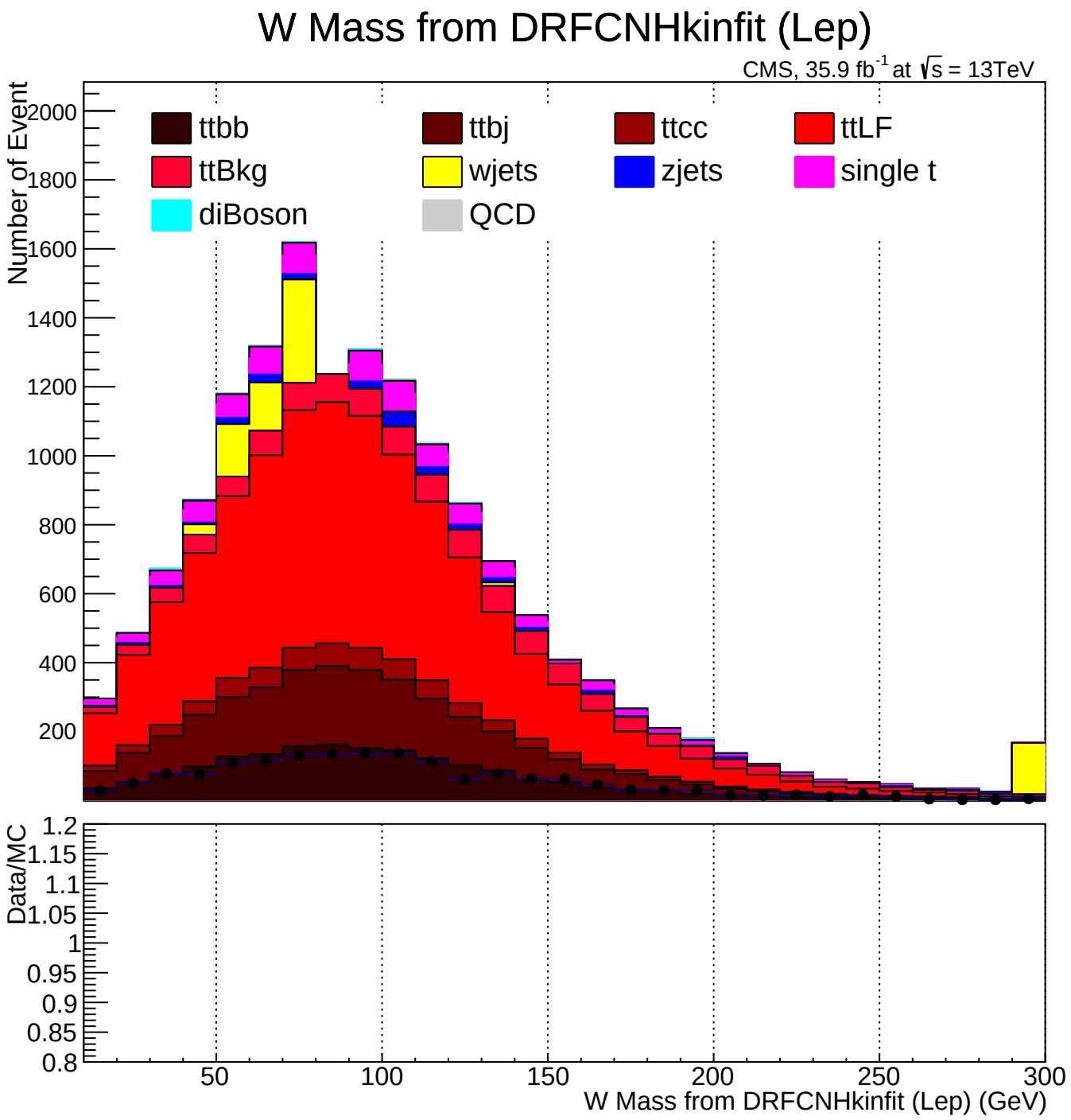

bjet_m Delta Phi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
600
500
400
300
200
100
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Phi

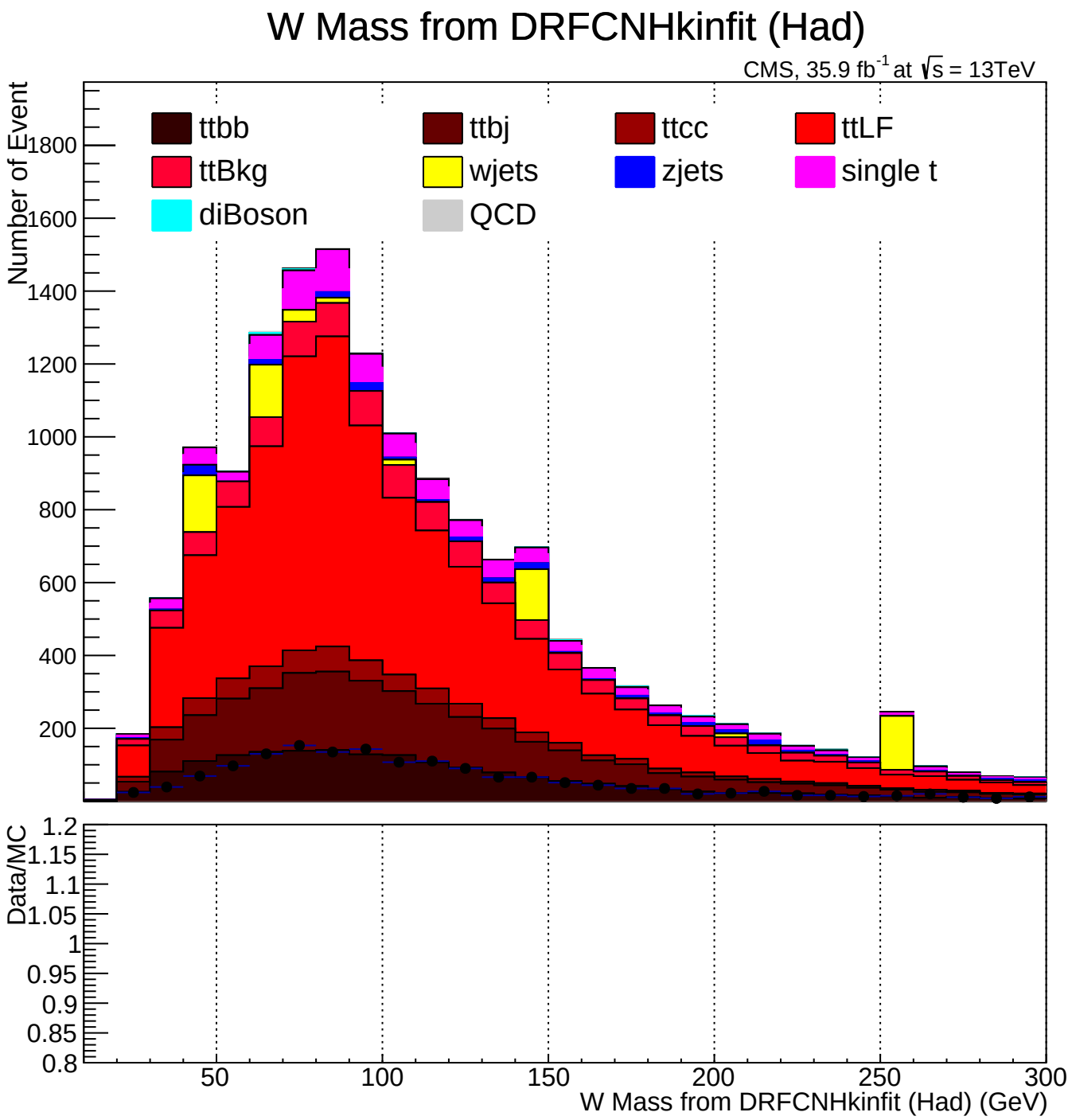

bjet_m Delta Eta
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
700
600
500
400
300
200
100
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Eta

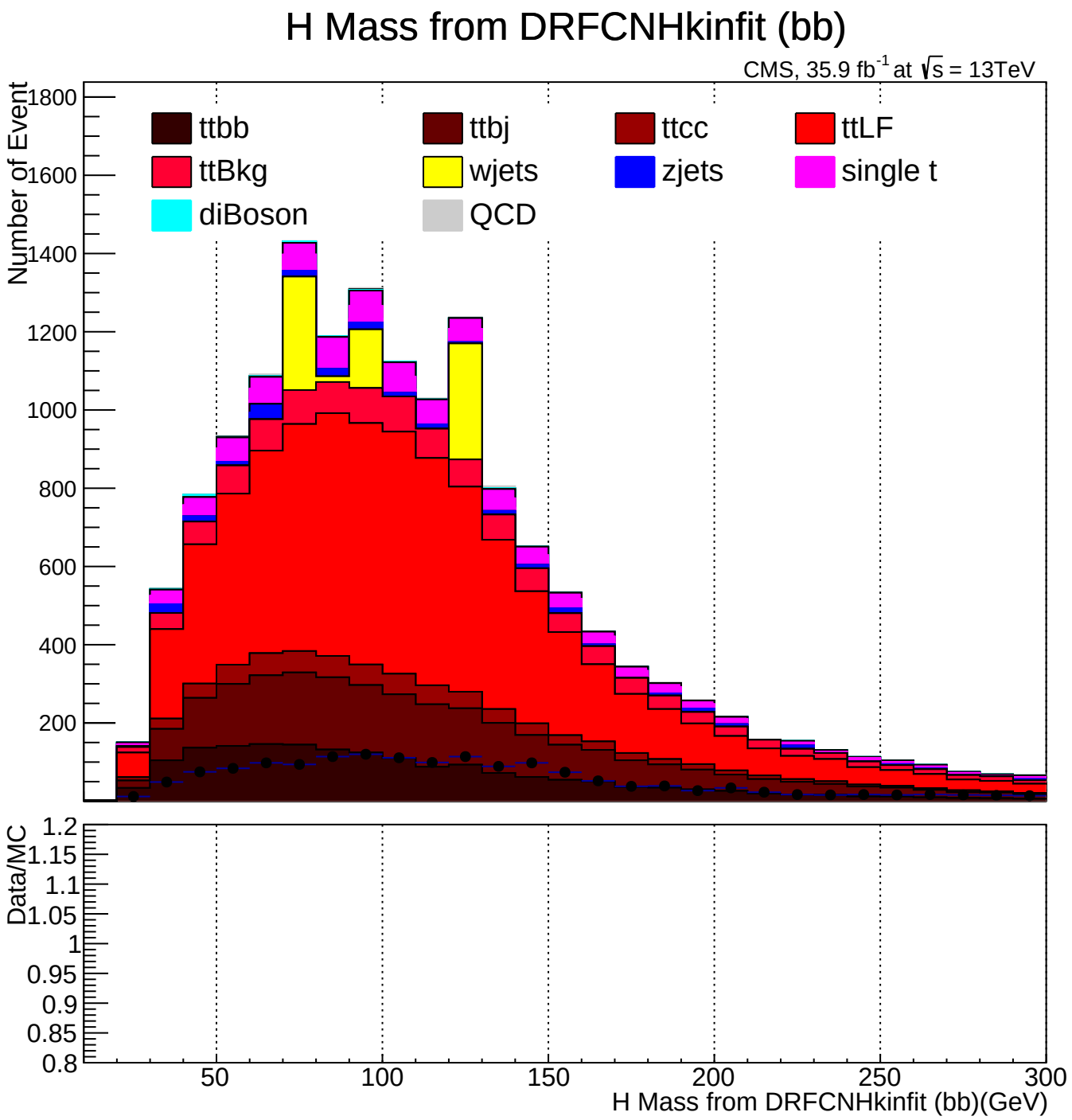

bjet_m Delta R
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
1200
1000
800
600
400
200
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
3.5
4
bjet_m Delta R

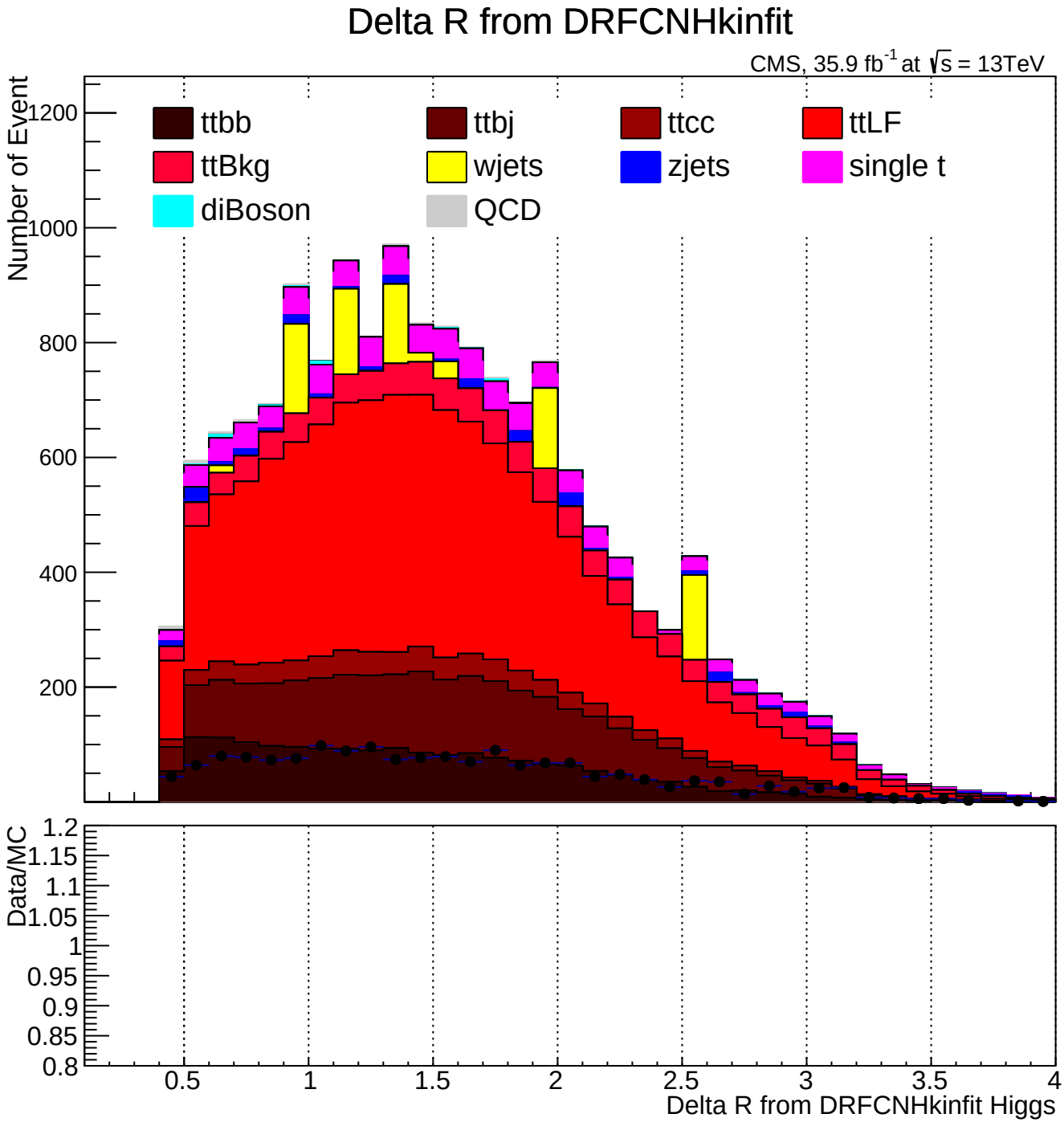

LepIso
CMS, 35.9 fb-1 at √s = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
12000
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation

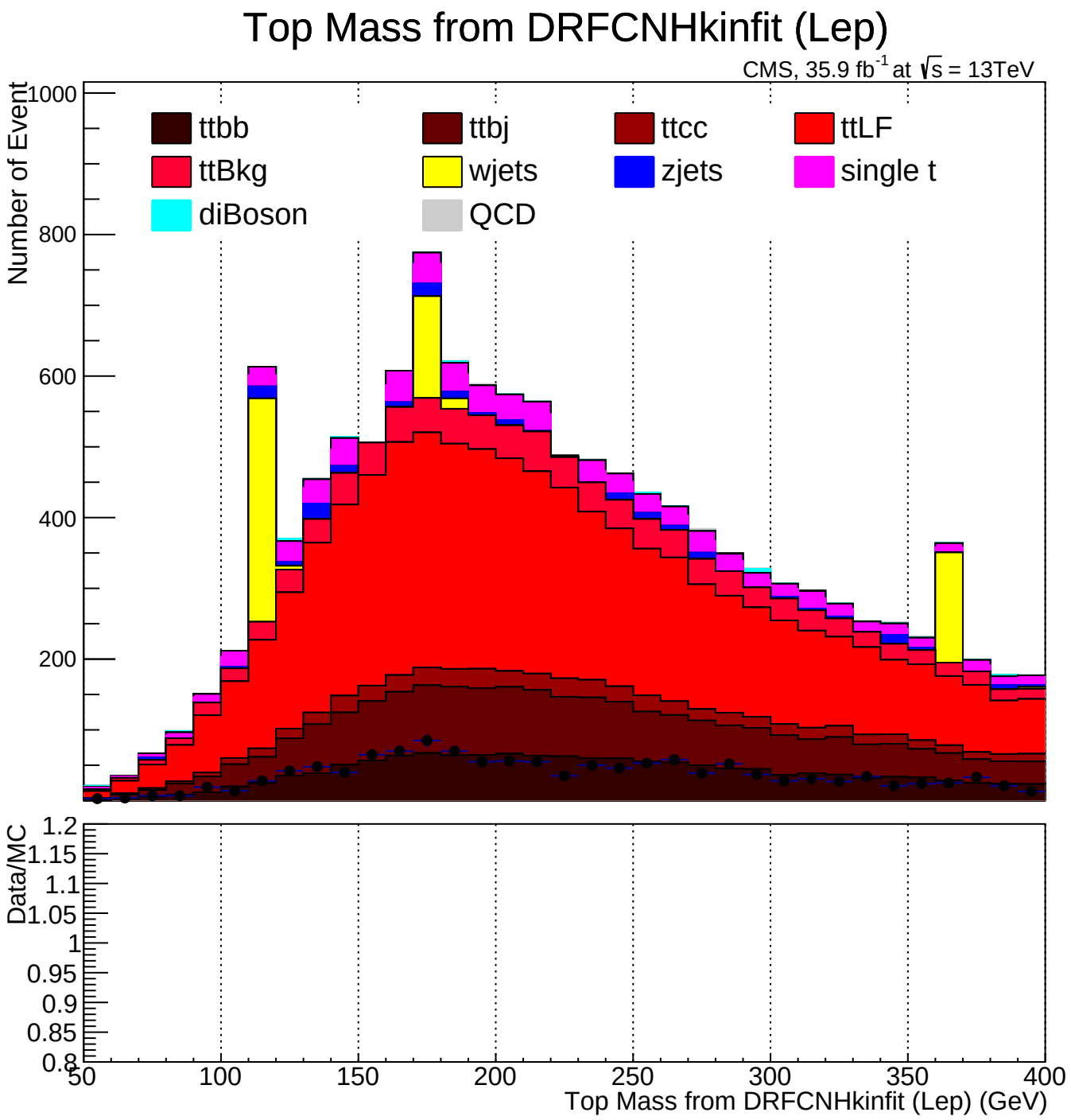

LepIsoQCD
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation (QCD)


W Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
W Mass from DRFCNHkinfit (Lep) (GeV)

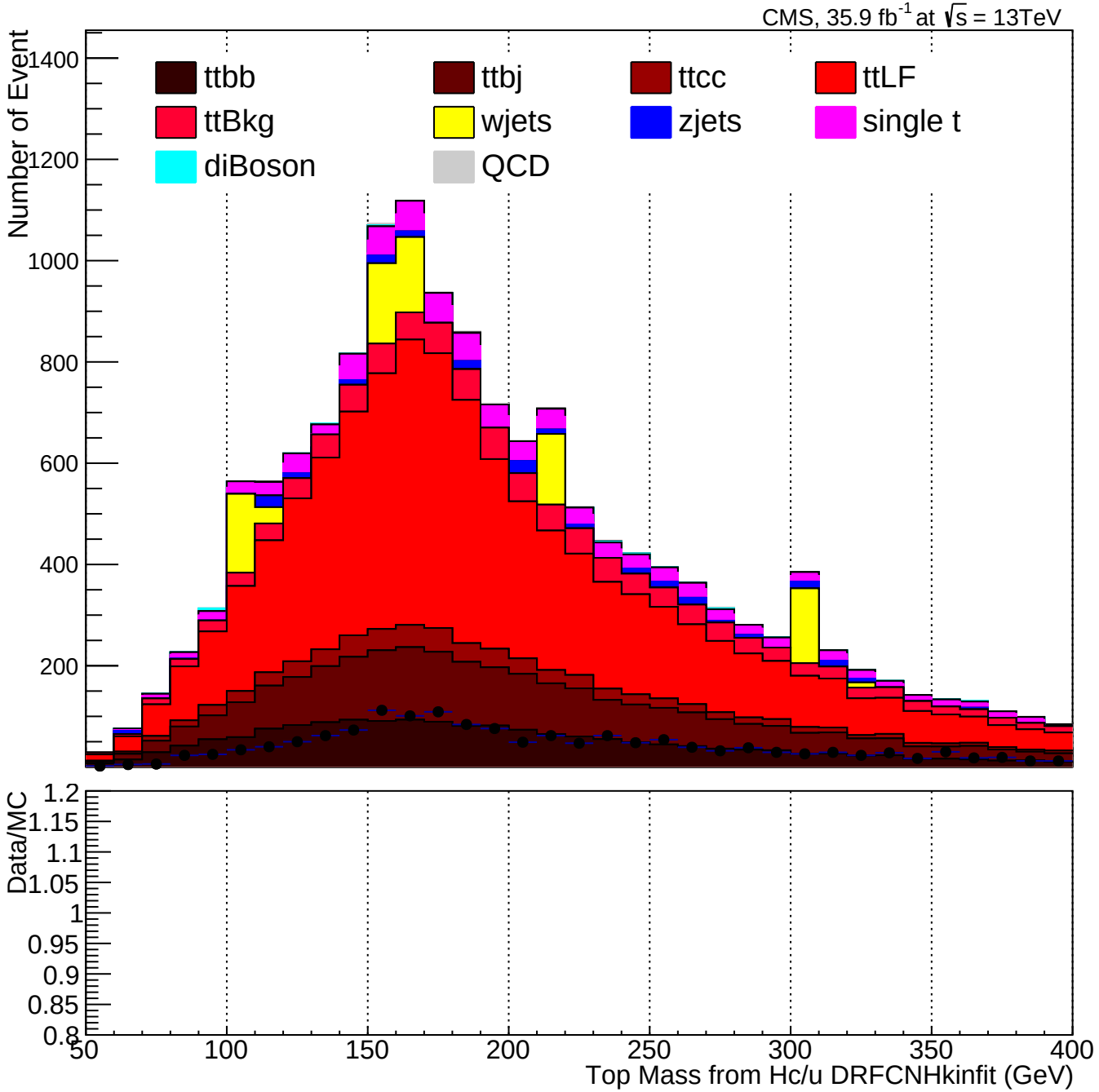

W Mass from DRFCNHkinfit (Had)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
W Mass from DRFCNHkinfit (Had) (GeV)

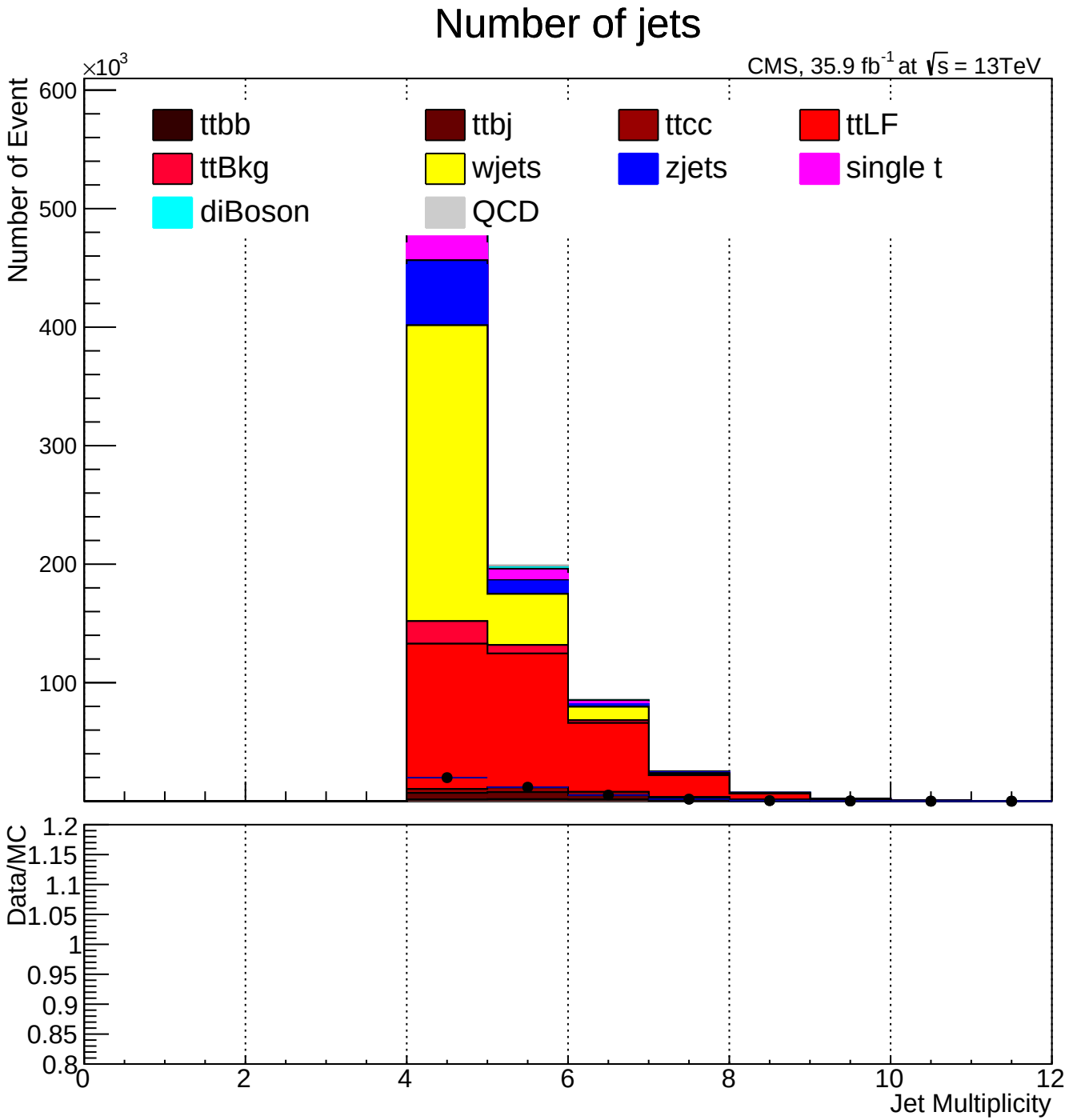

H Mass from DRFCNHkinfit (bb)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
H Mass from DRFCNHkinfit (bb)(GeV)

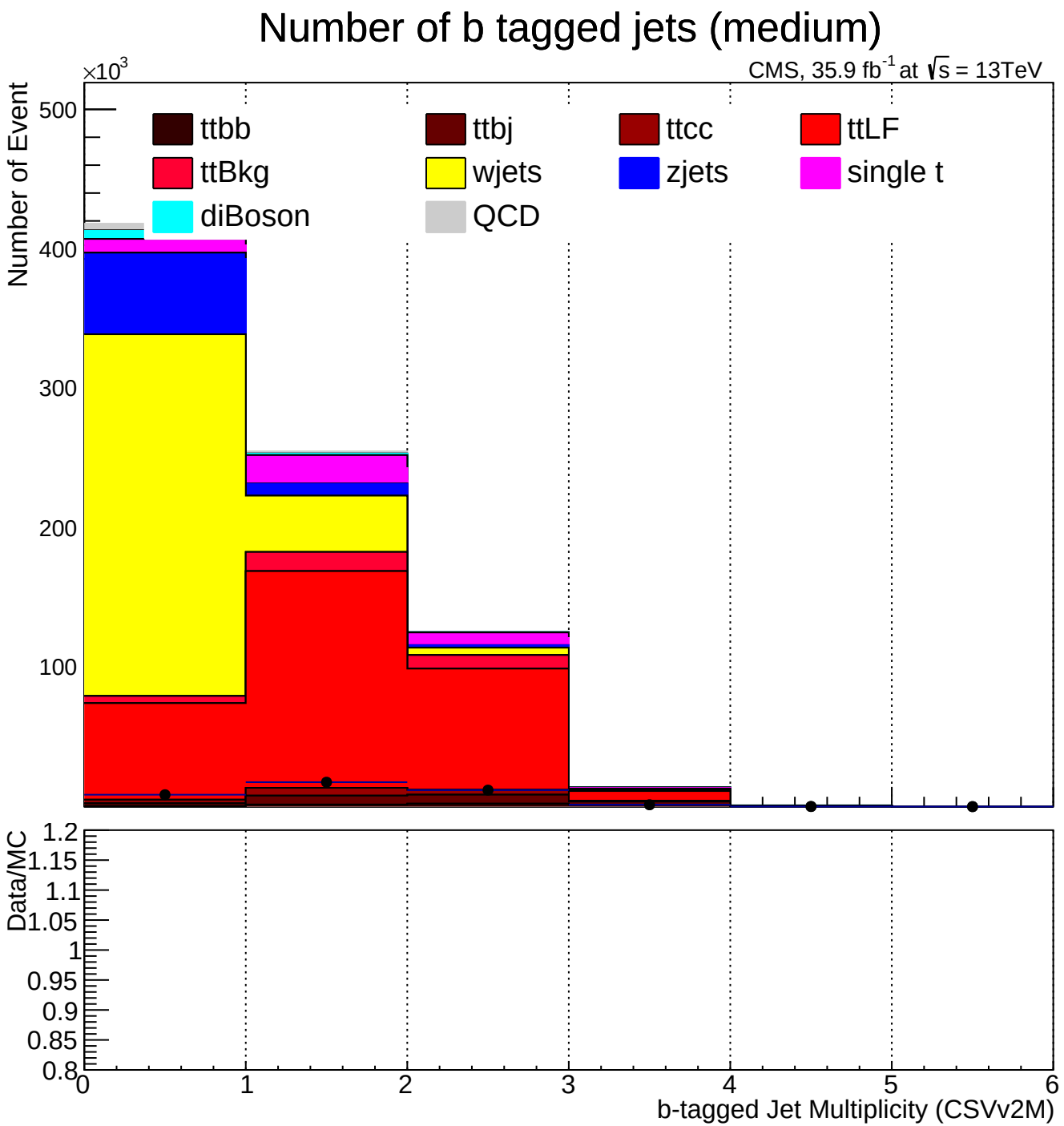

Delta R from DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Delta R from DRFCNHkinfit Higgs

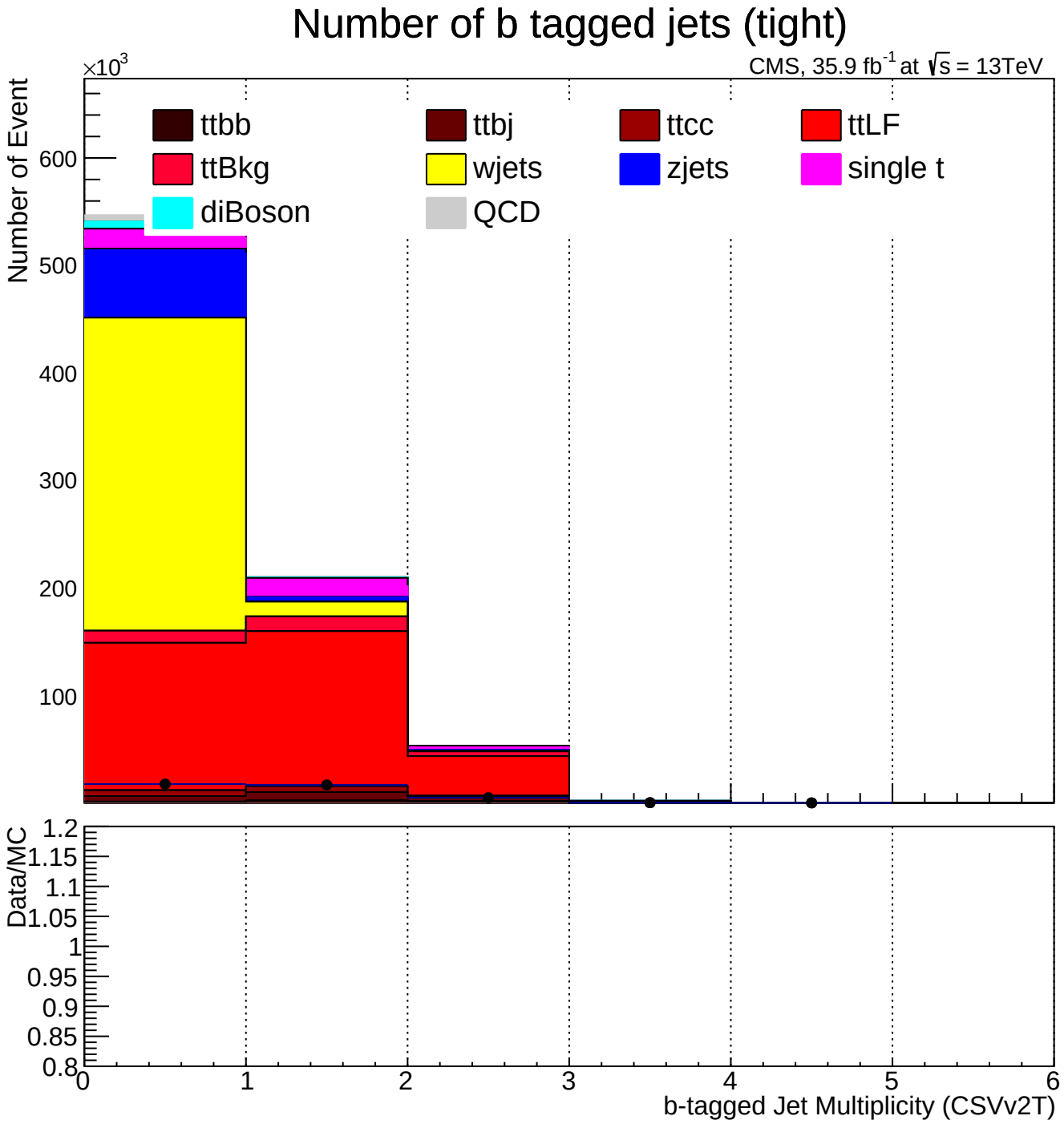

Top Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Top Mass from DRFCNHkinfit (Lep) (GeV)

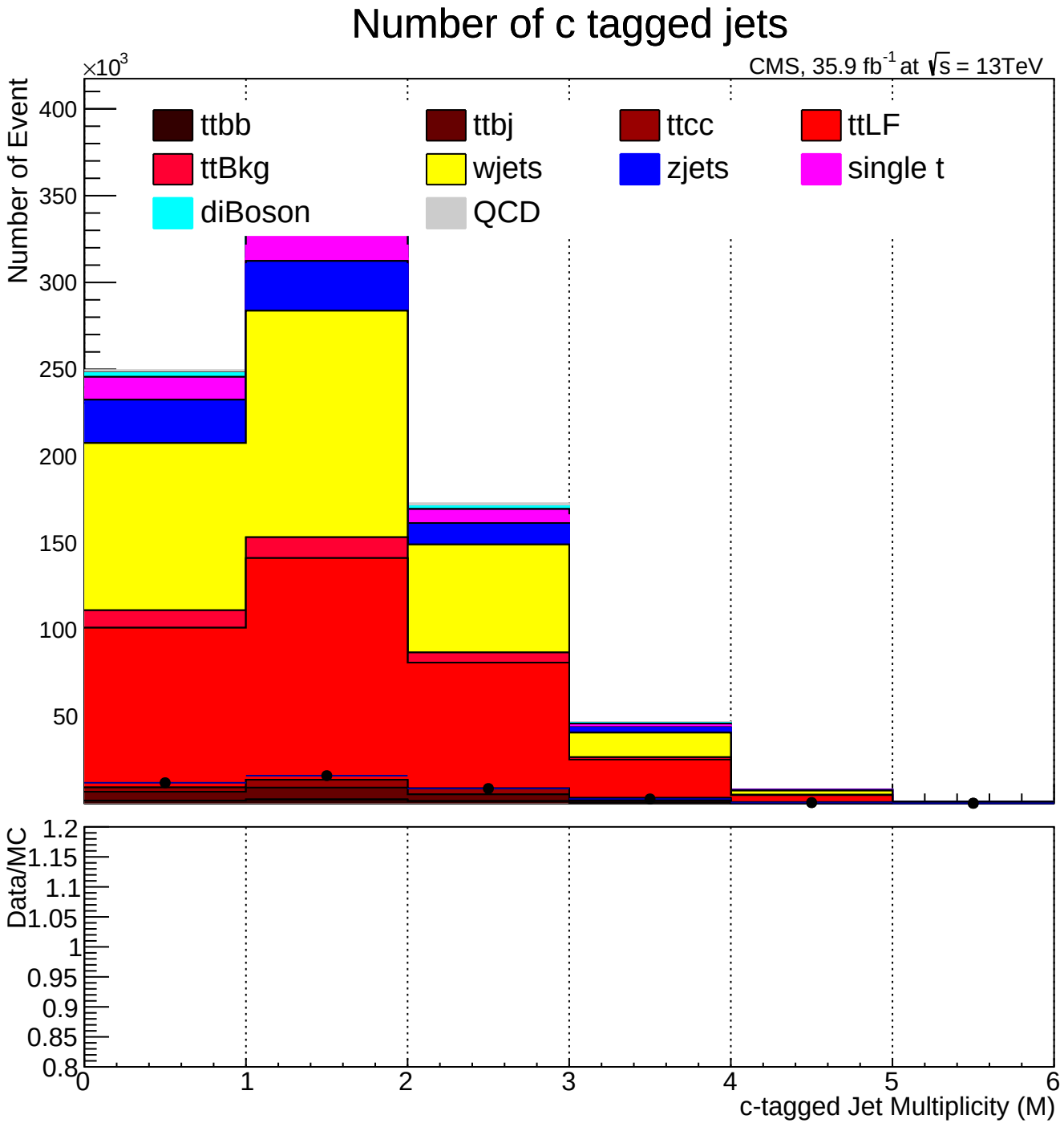
Top mass from Hc/u DRFCNHkinfit

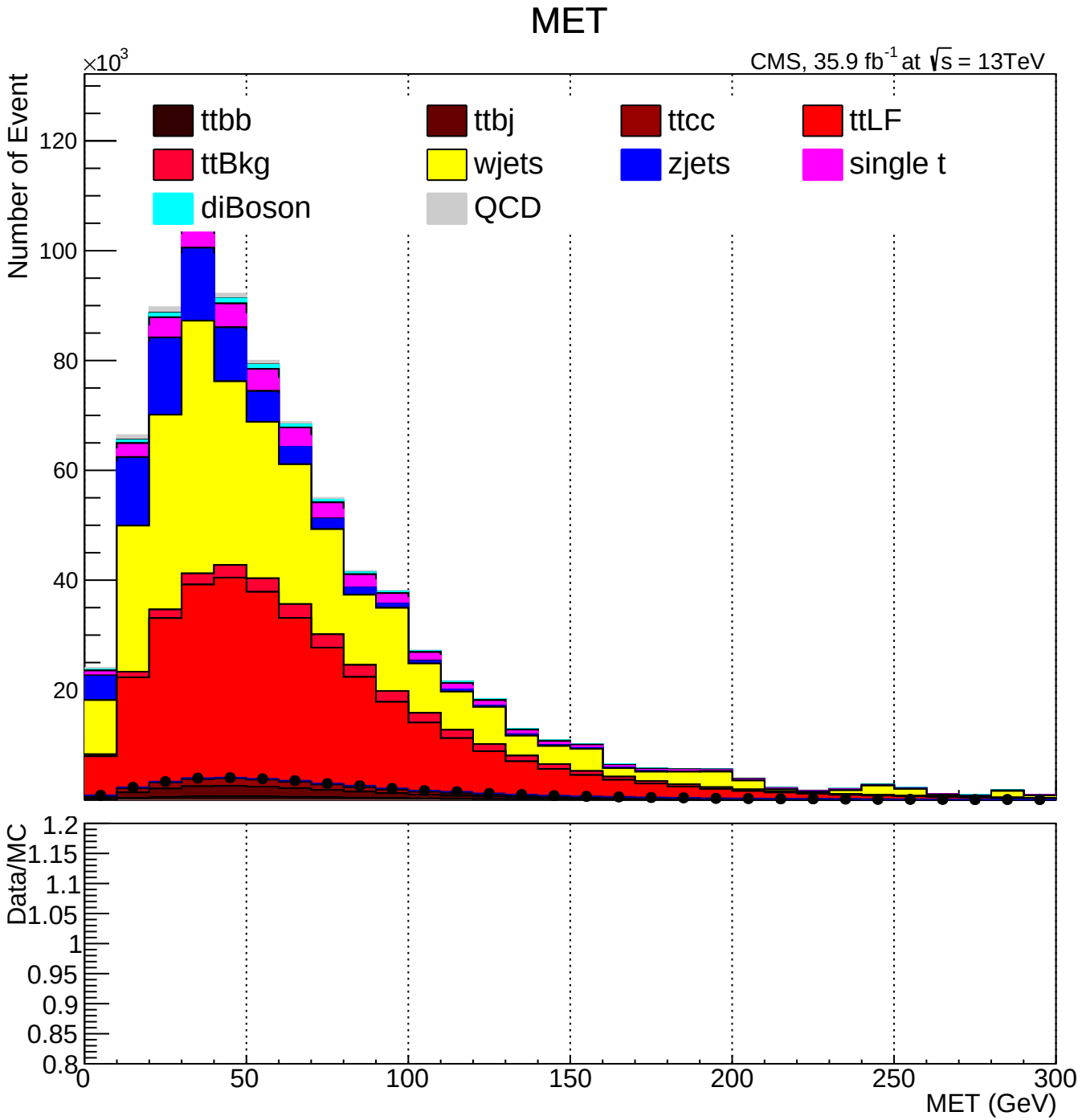


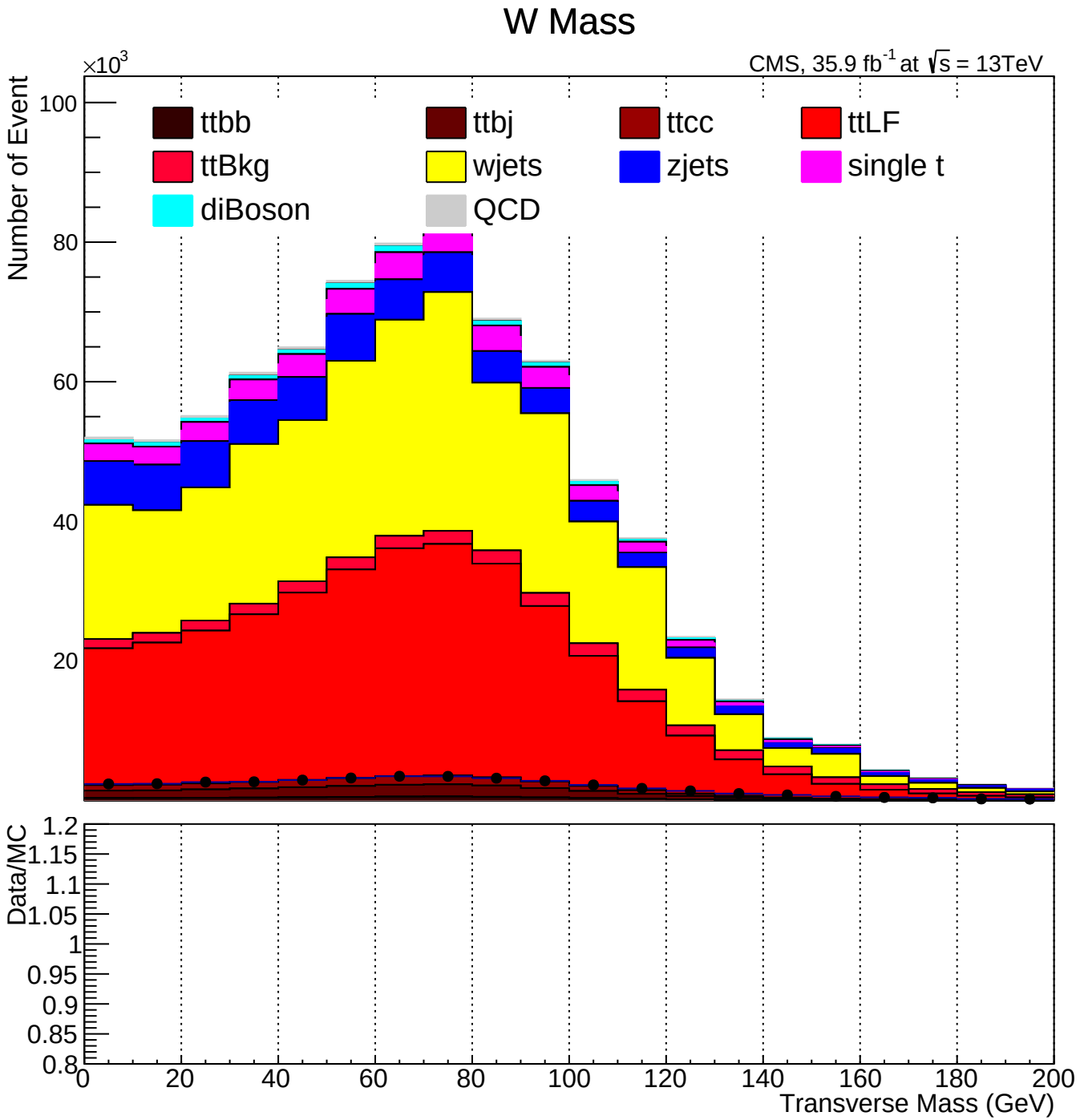

Number of jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
600
500
400
300
200
100
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
2
4
6
8
10
12
Jet Multiplicity

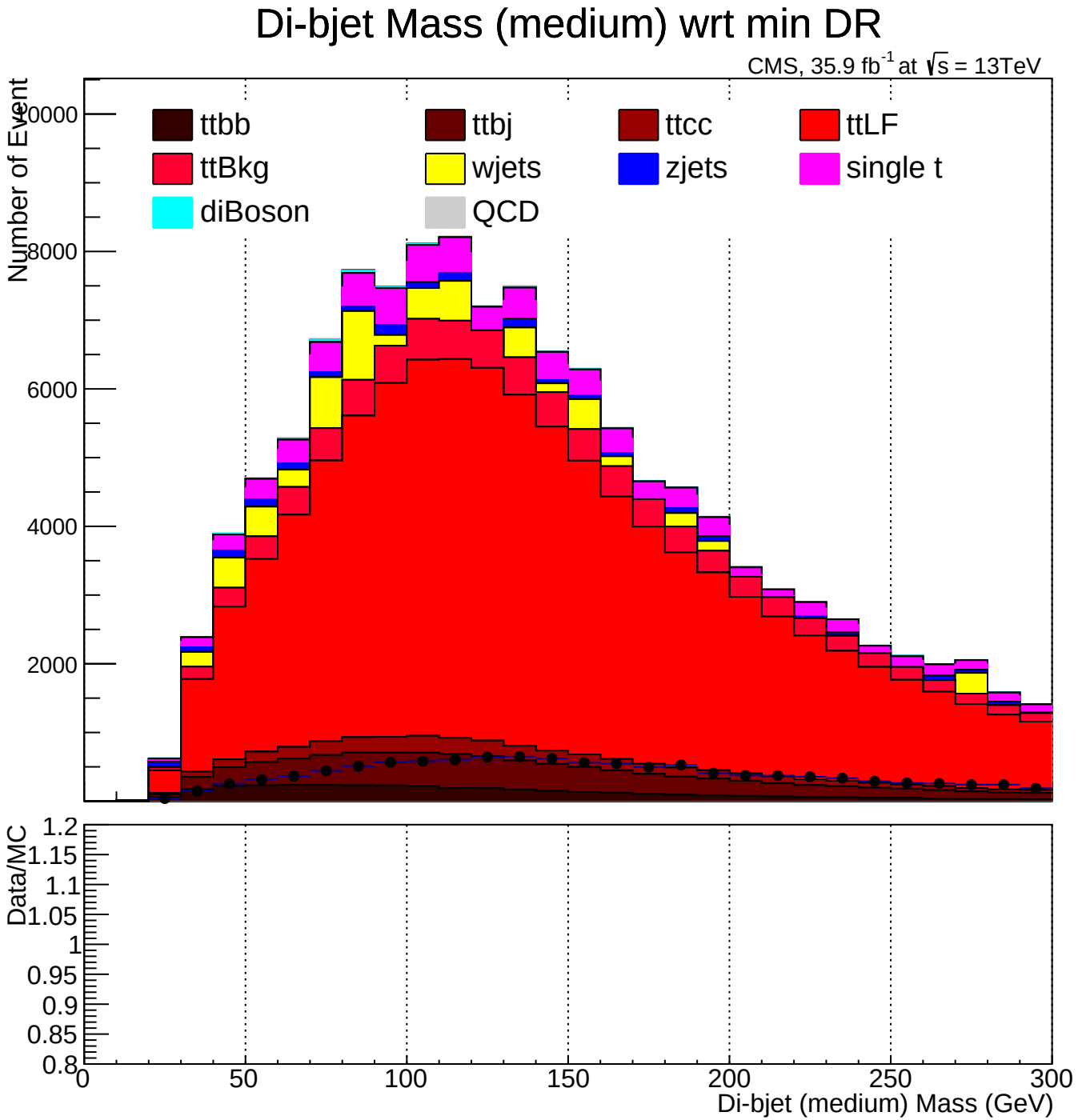

Number of b tagged jets (medium)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
$\times 10^3$
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b-tagged Jet Multiplicity (CSVv2M)

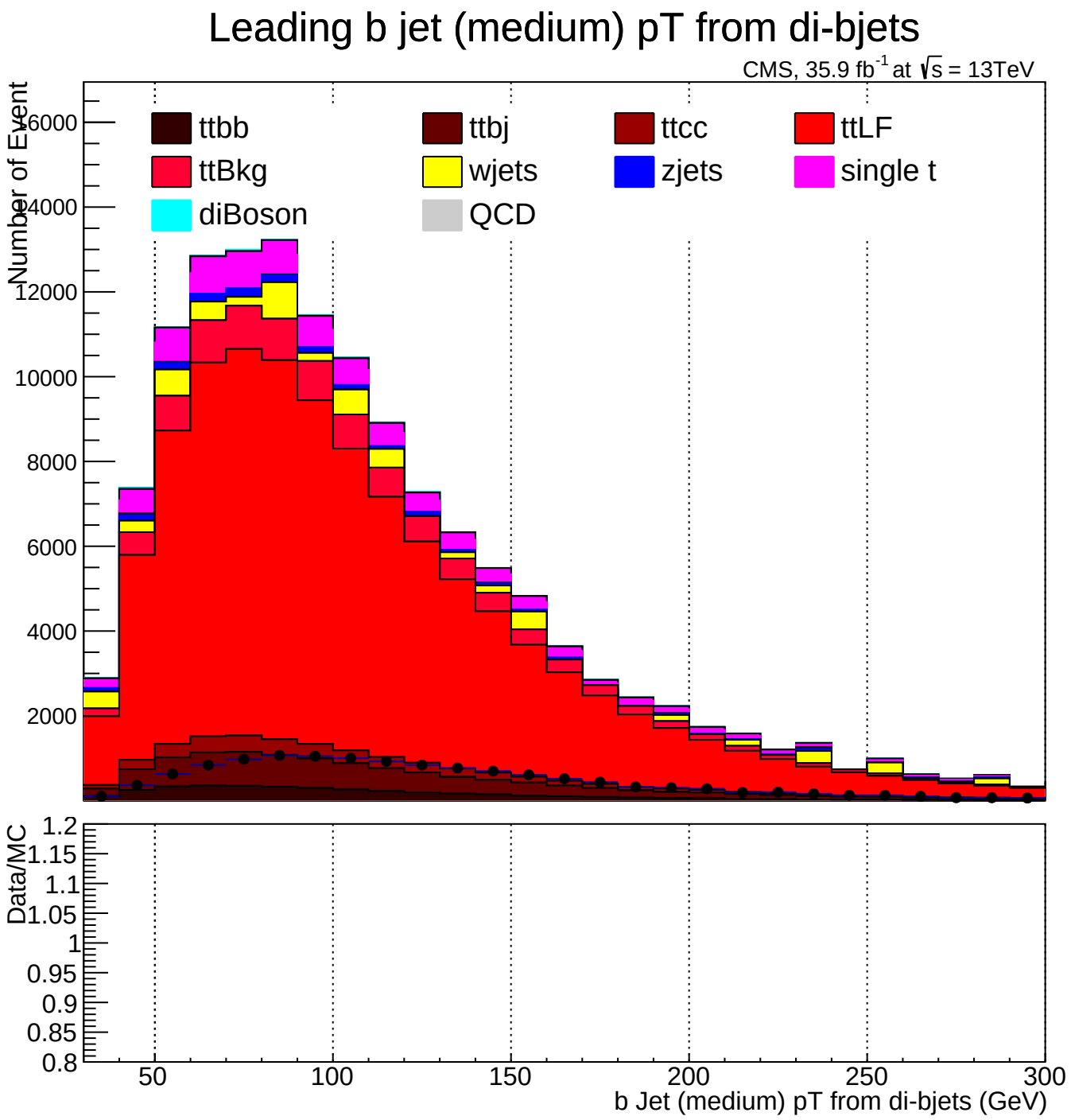

Number of b tagged jets (tight)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
600
500
400
300
200
100
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2T)

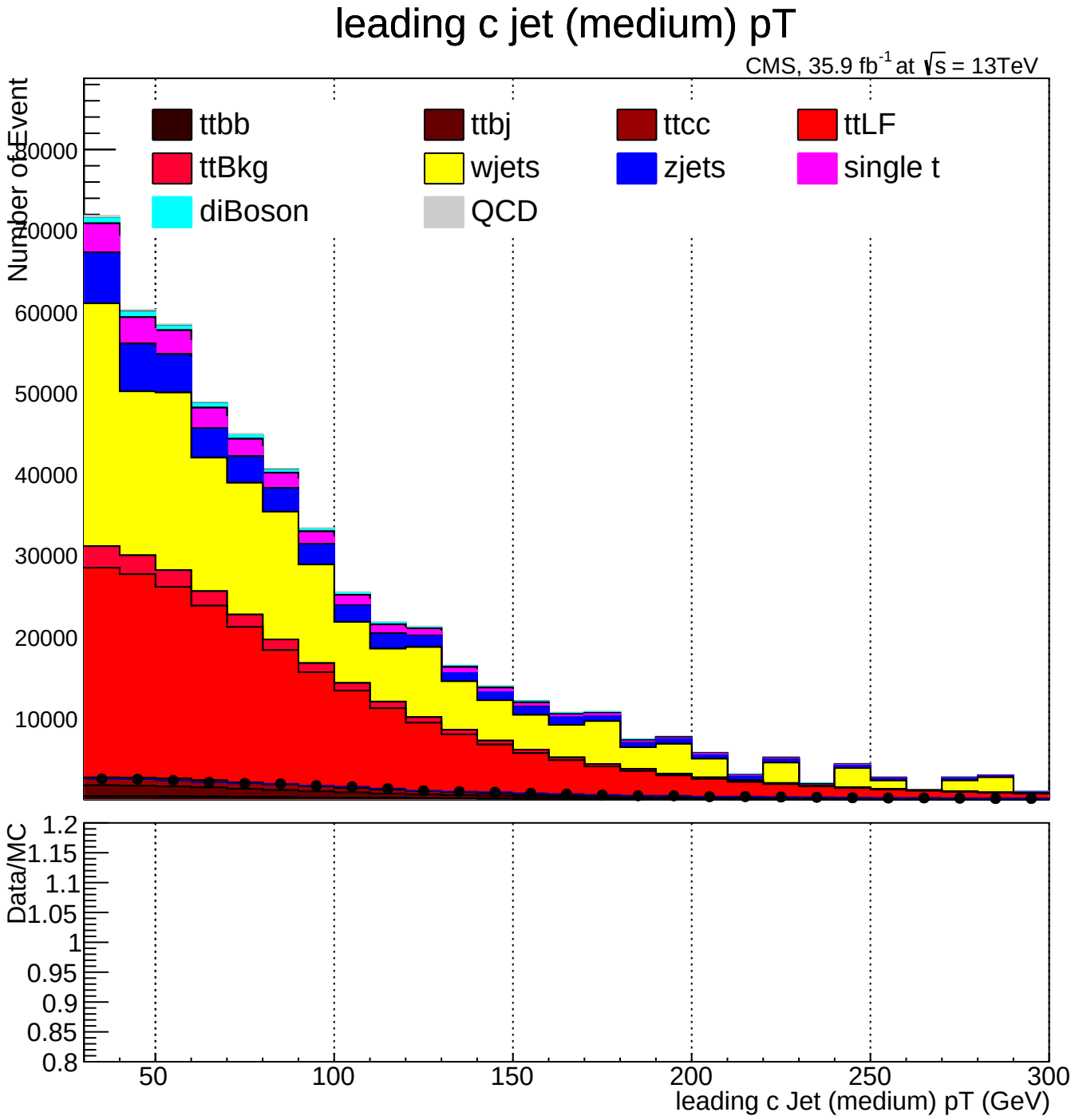

Number of c tagged jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
c-tagged Jet Multiplicity (M)

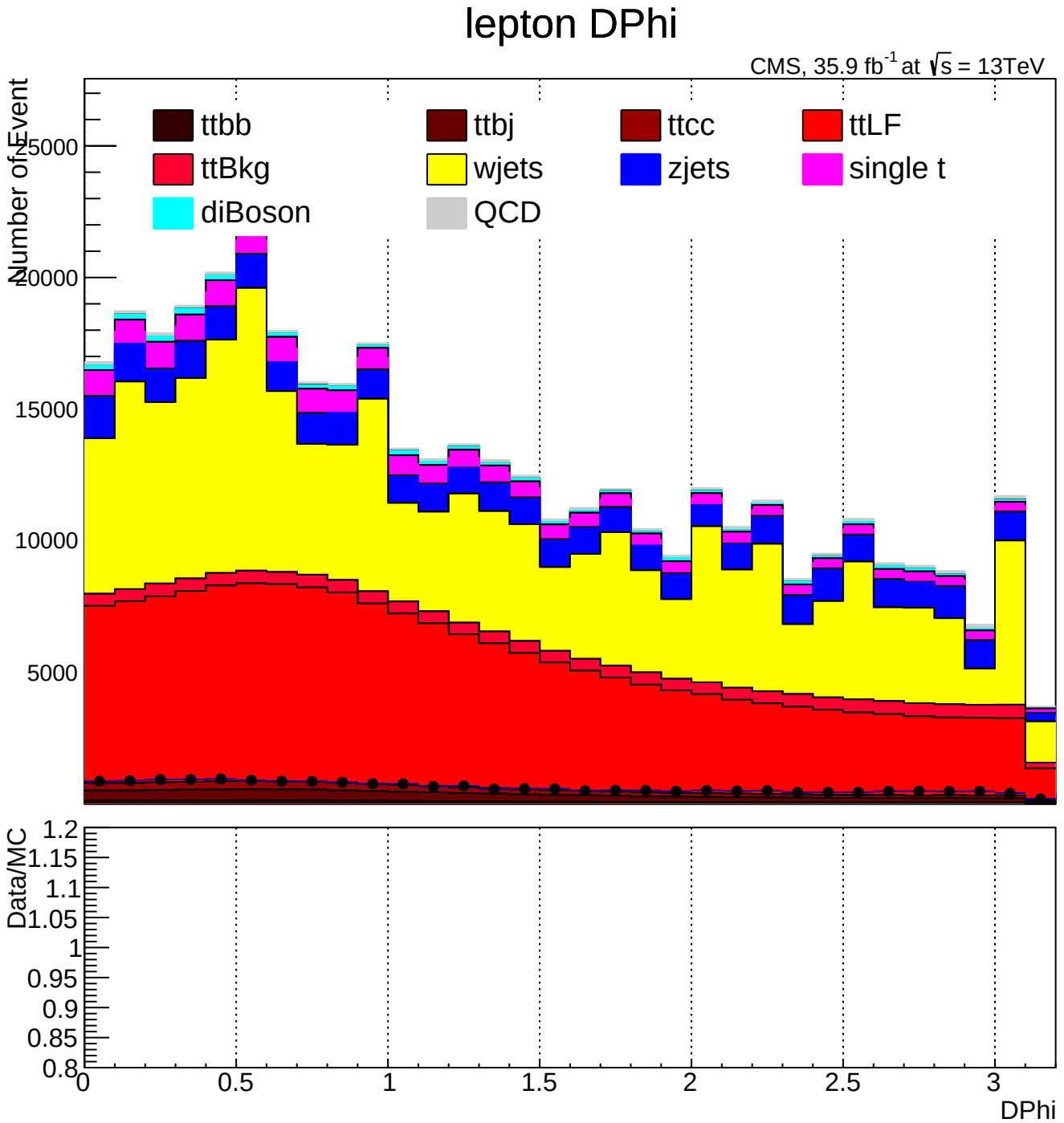

MET
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
MET (GeV)

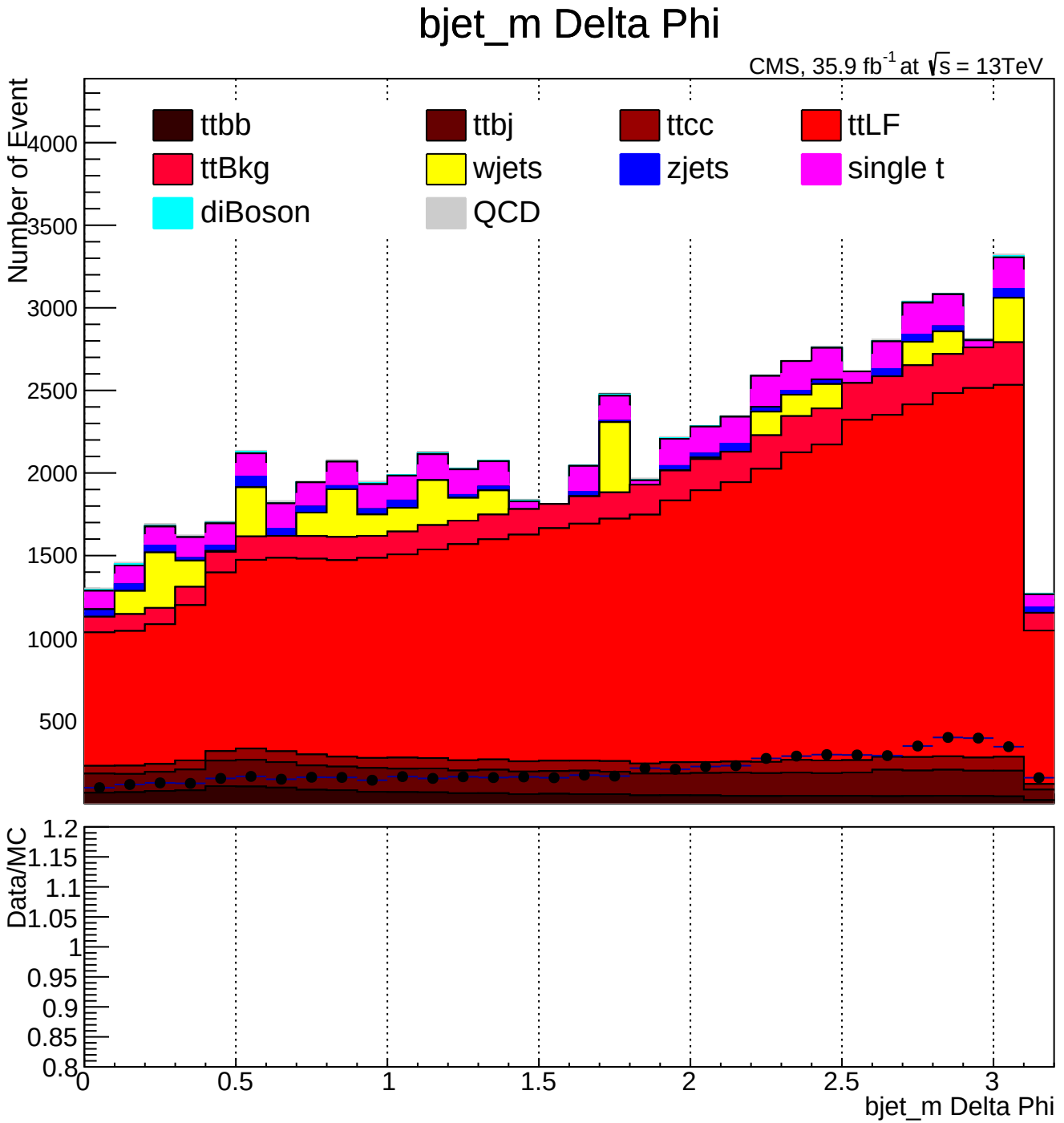

W Mass
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Transverse Mass (GeV)

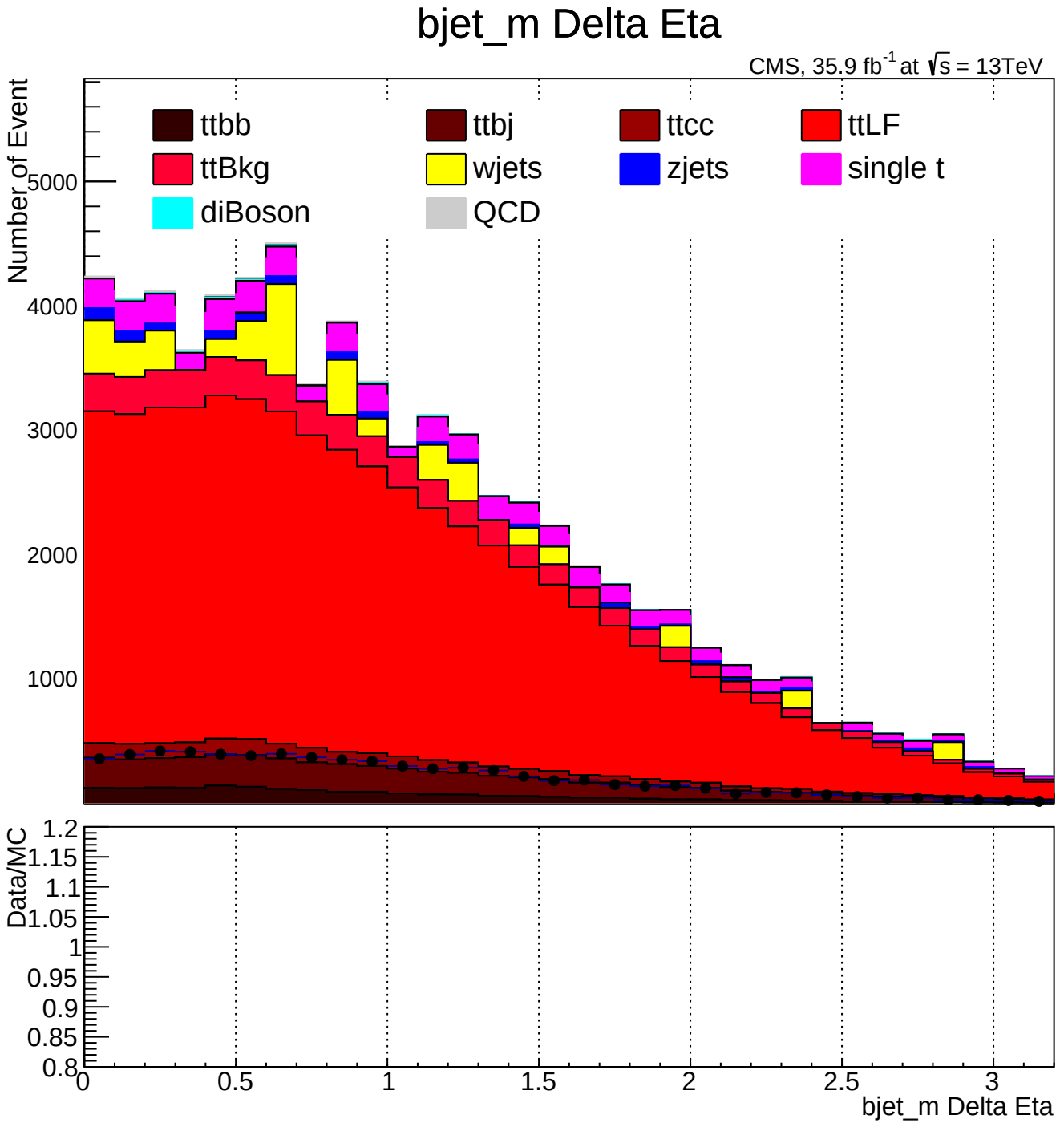

Di-bjet Mass (medium) wrt min DR
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
50
100
150
200
250
300
Di-bjet (medium) Mass (GeV)

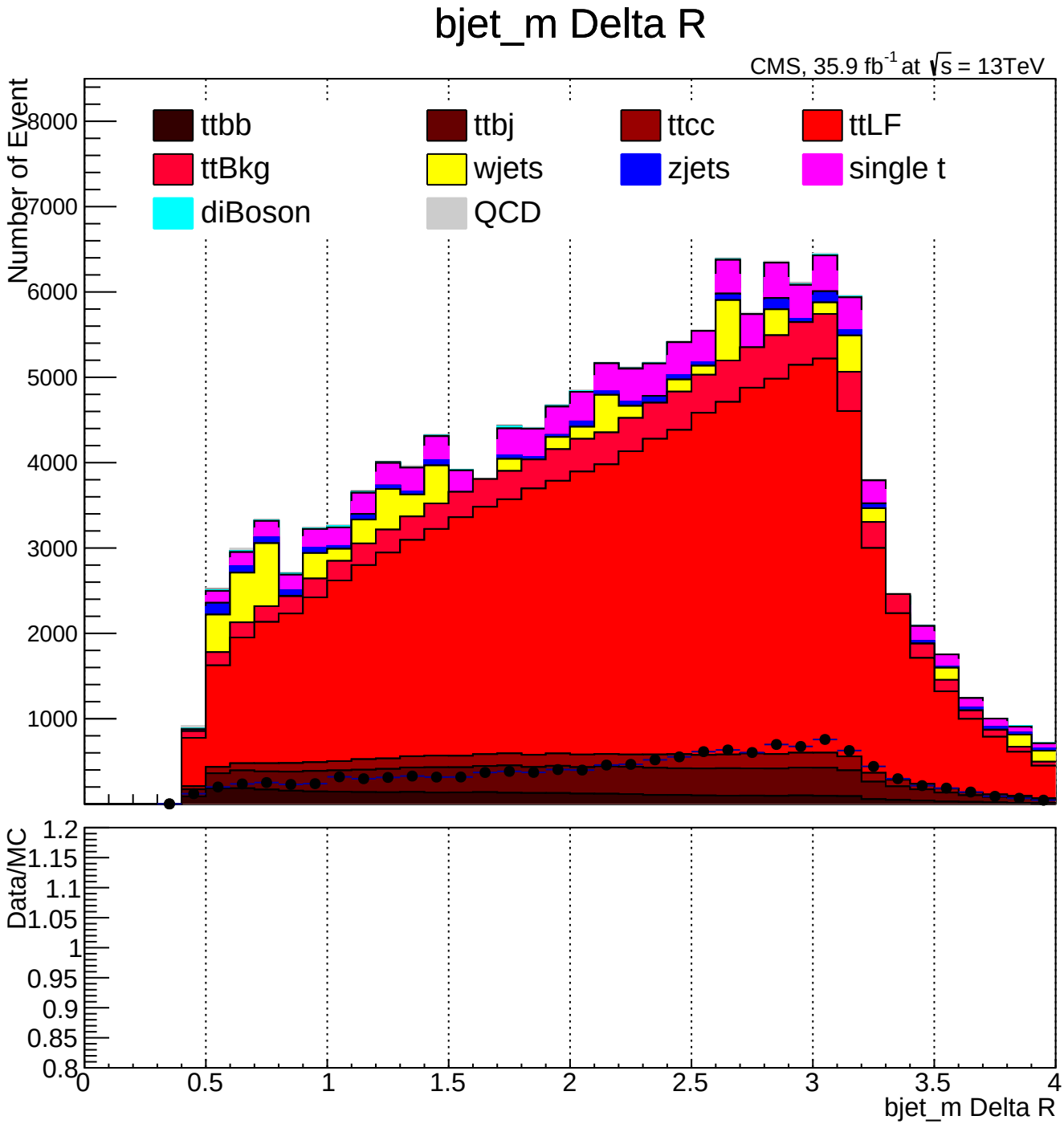

Leading b jet (medium) pT from di-bjets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b Jet (medium) pT from di-bjets (GeV)

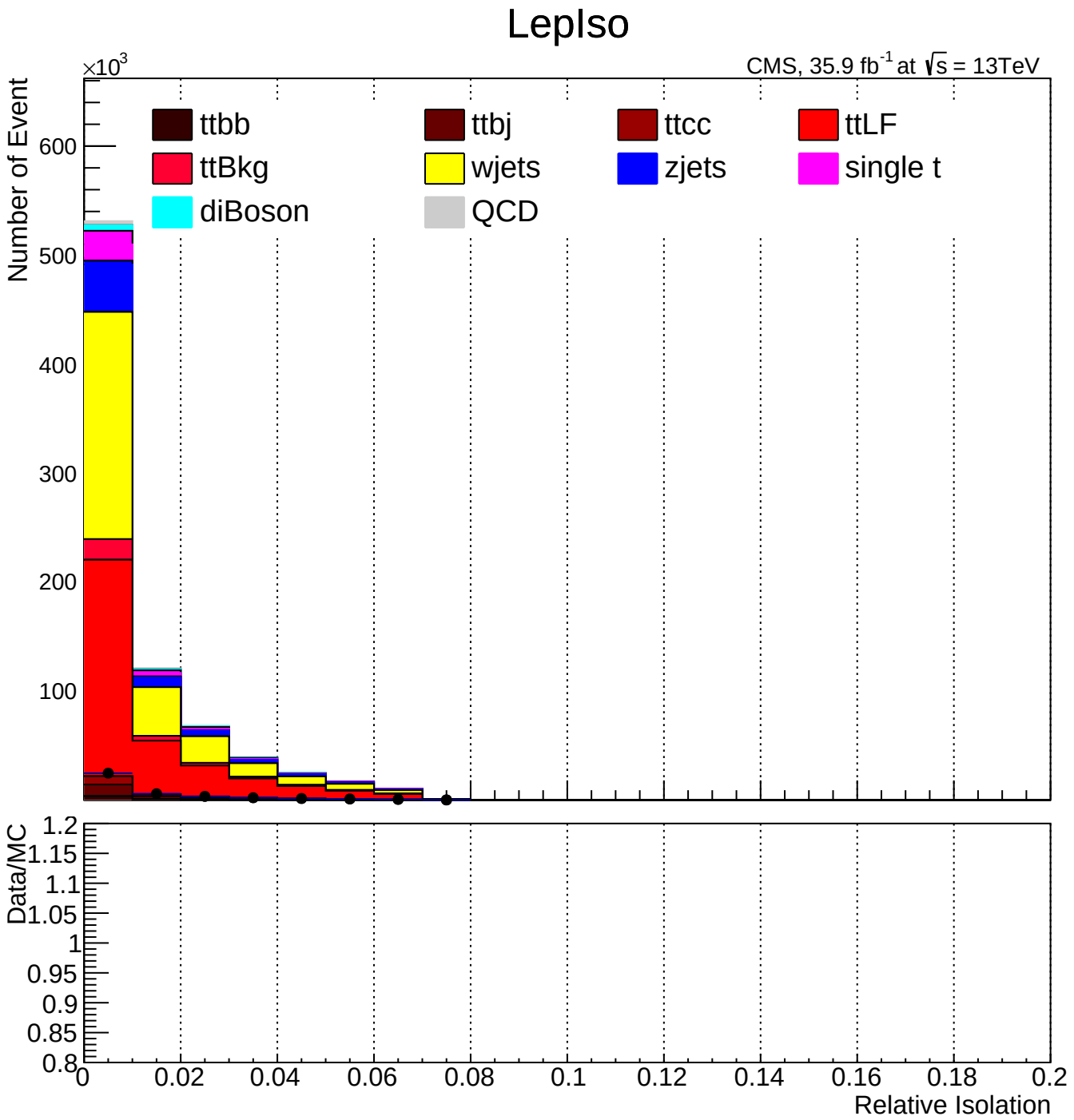

leading c jet (medium) pT
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
70000
60000
50000
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
leading c Jet (medium) pT (GeV)

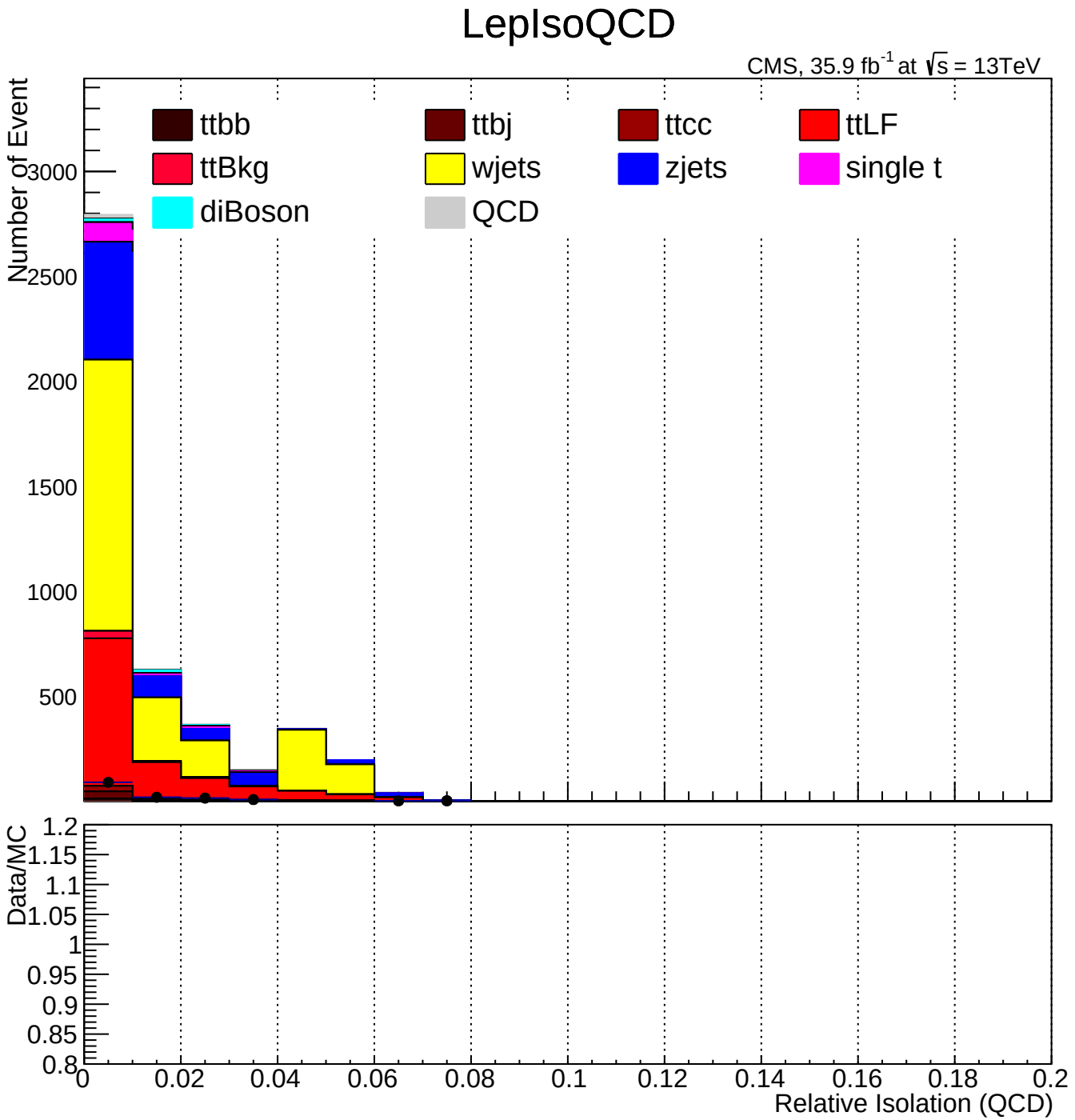

lepton DPhi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
25000
20000
15000
10000
5000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
DPhi

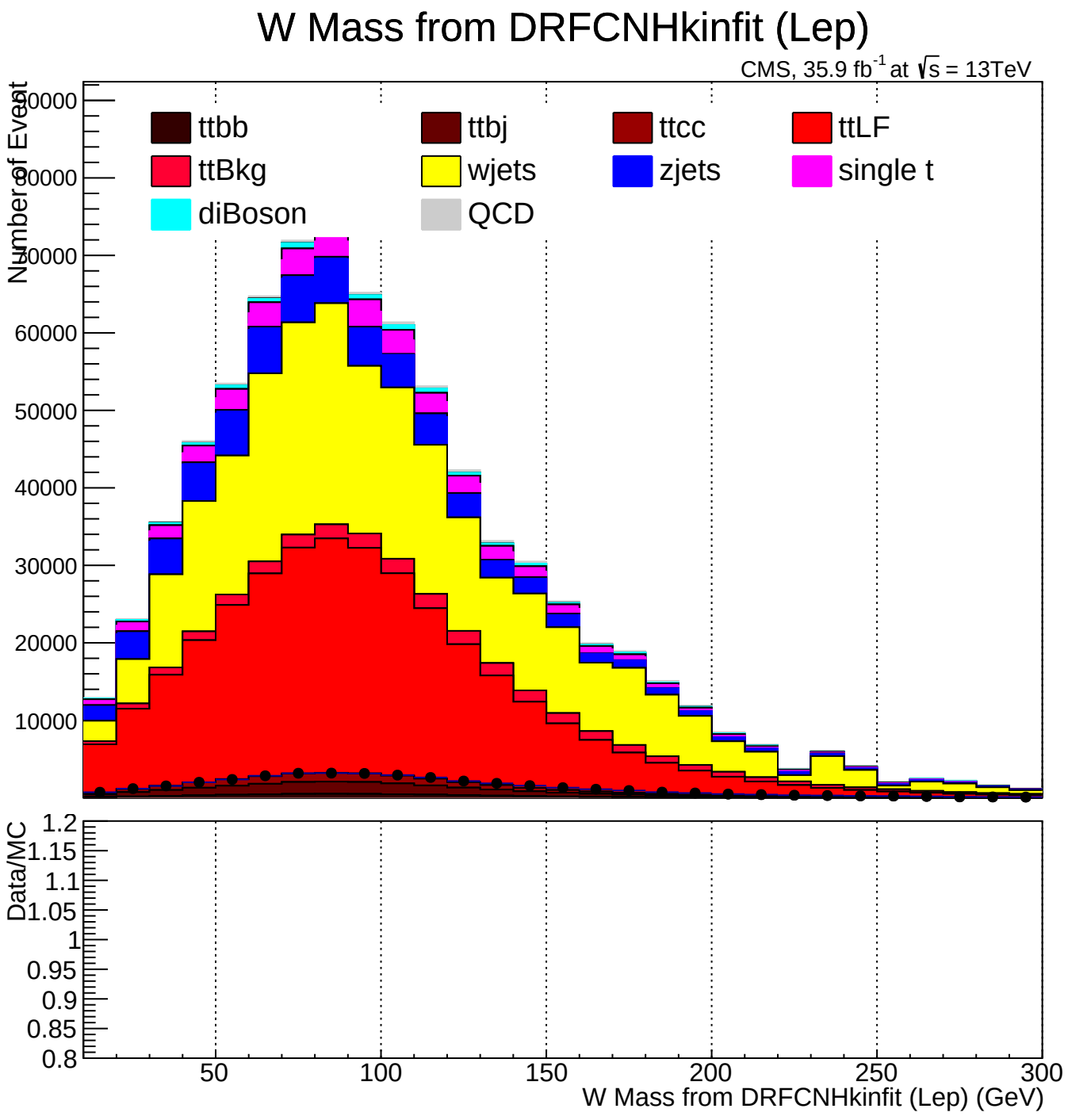

bjet_m Delta Phi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
4000
3500
3000
2500
2000
1500
1000
500
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Phi

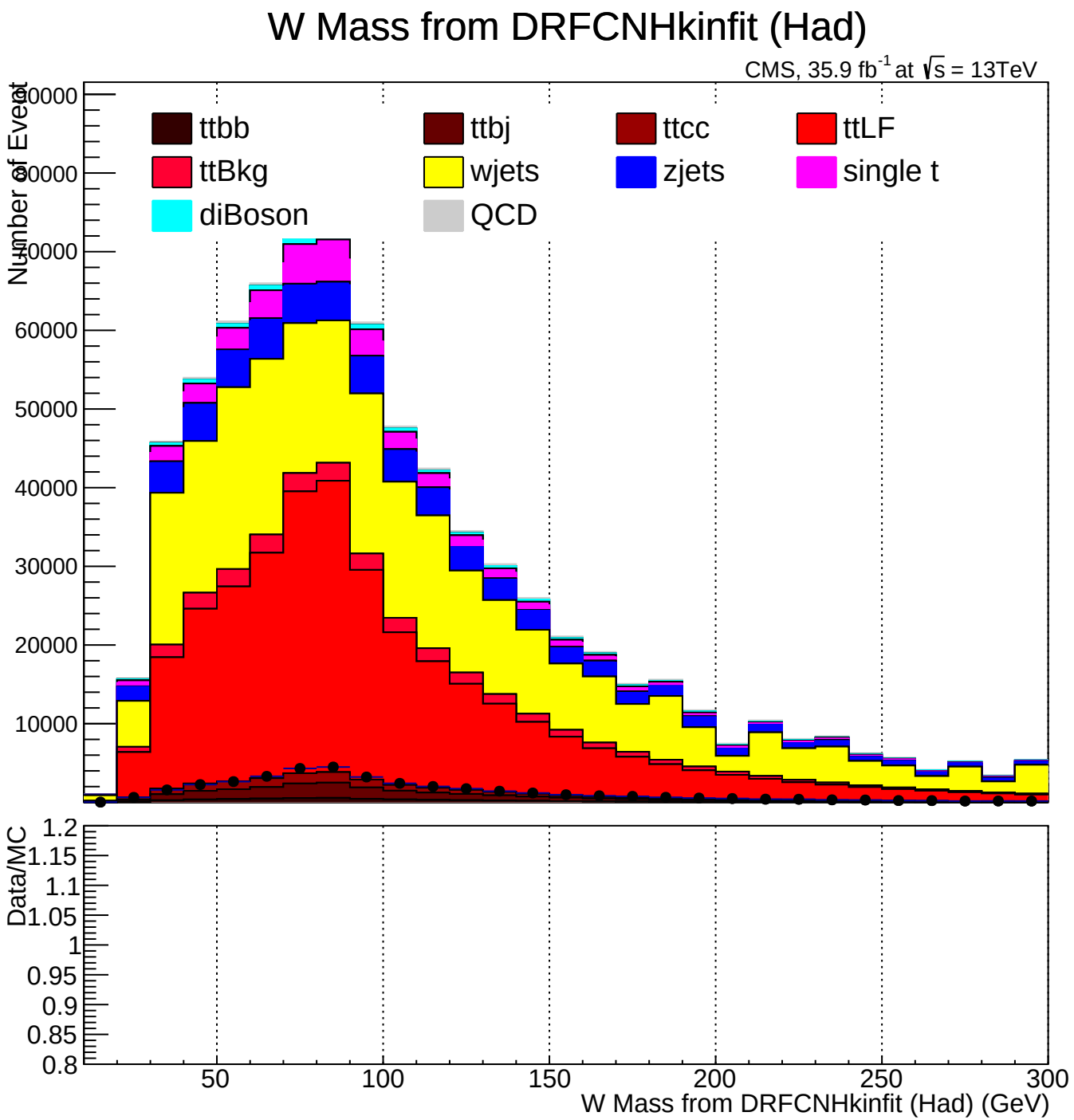

bjet_m Delta Eta
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Eta

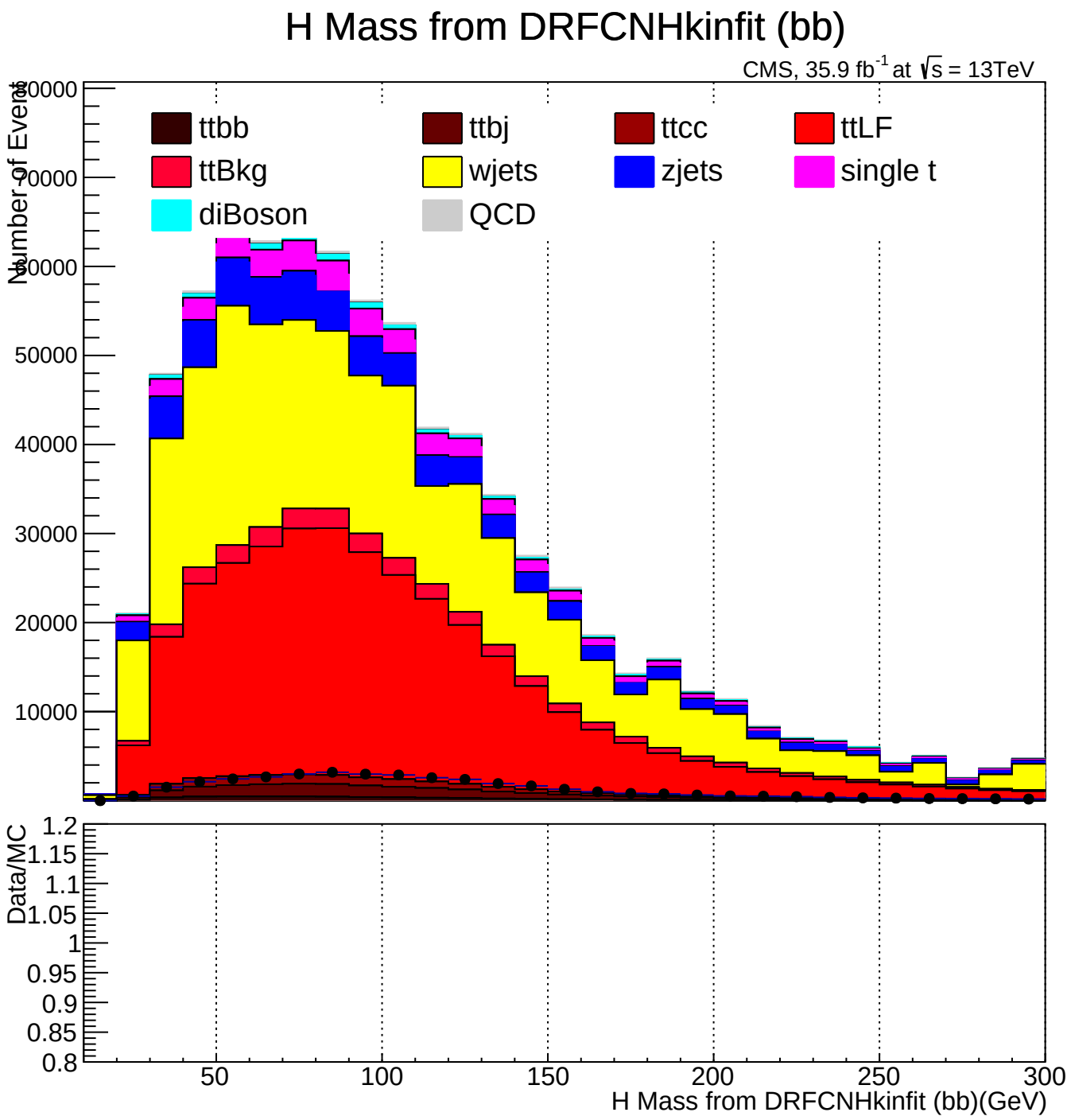

bjet_m Delta R
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta R

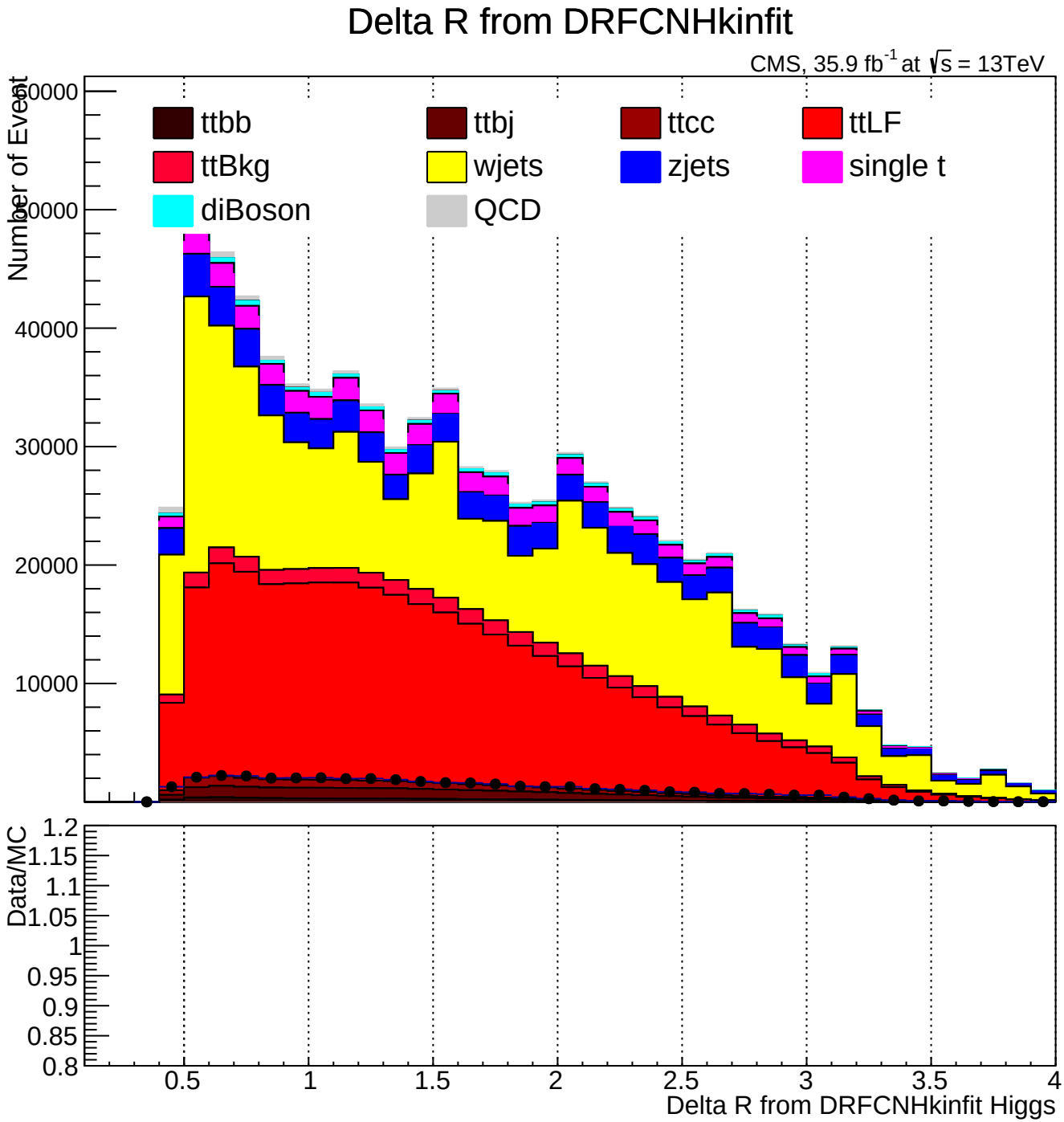

LepIso
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
600
500
400
300
200
100
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation

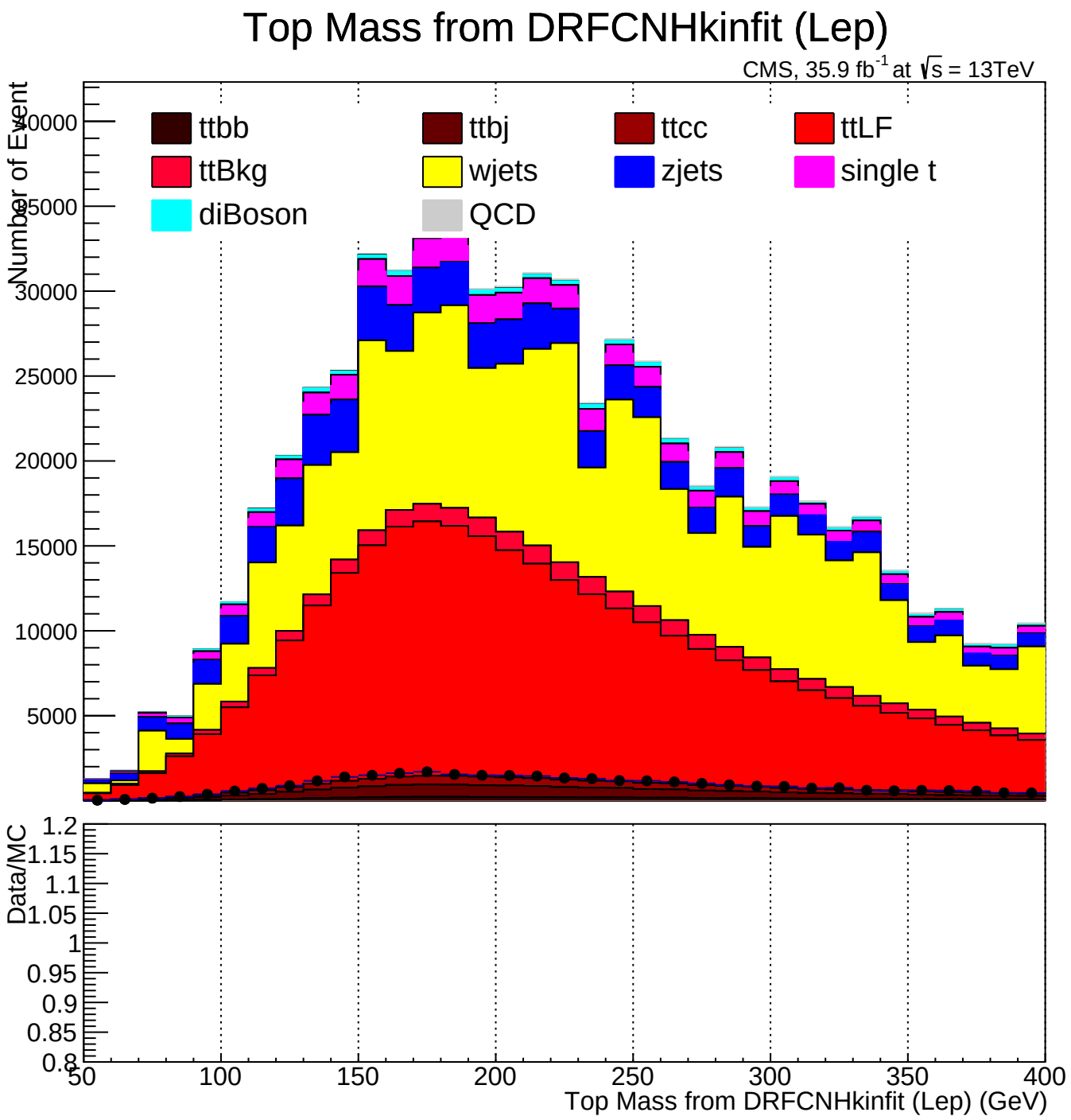

LepIsoQCD
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
3000
2500
2000
1500
1000
500
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation (QCD)

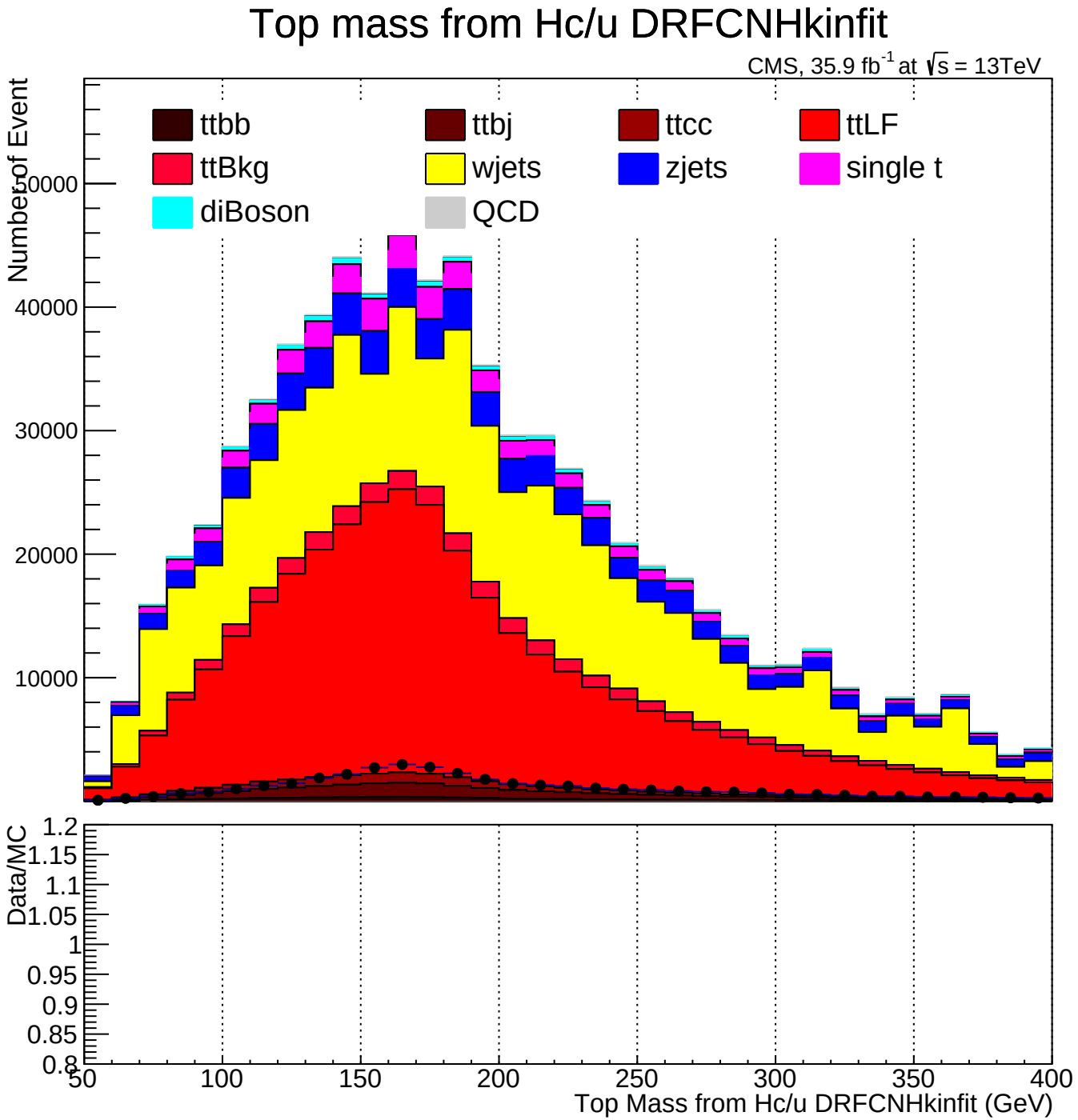

W Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
W Mass from DRFCNHkinfit (Lep) (GeV)

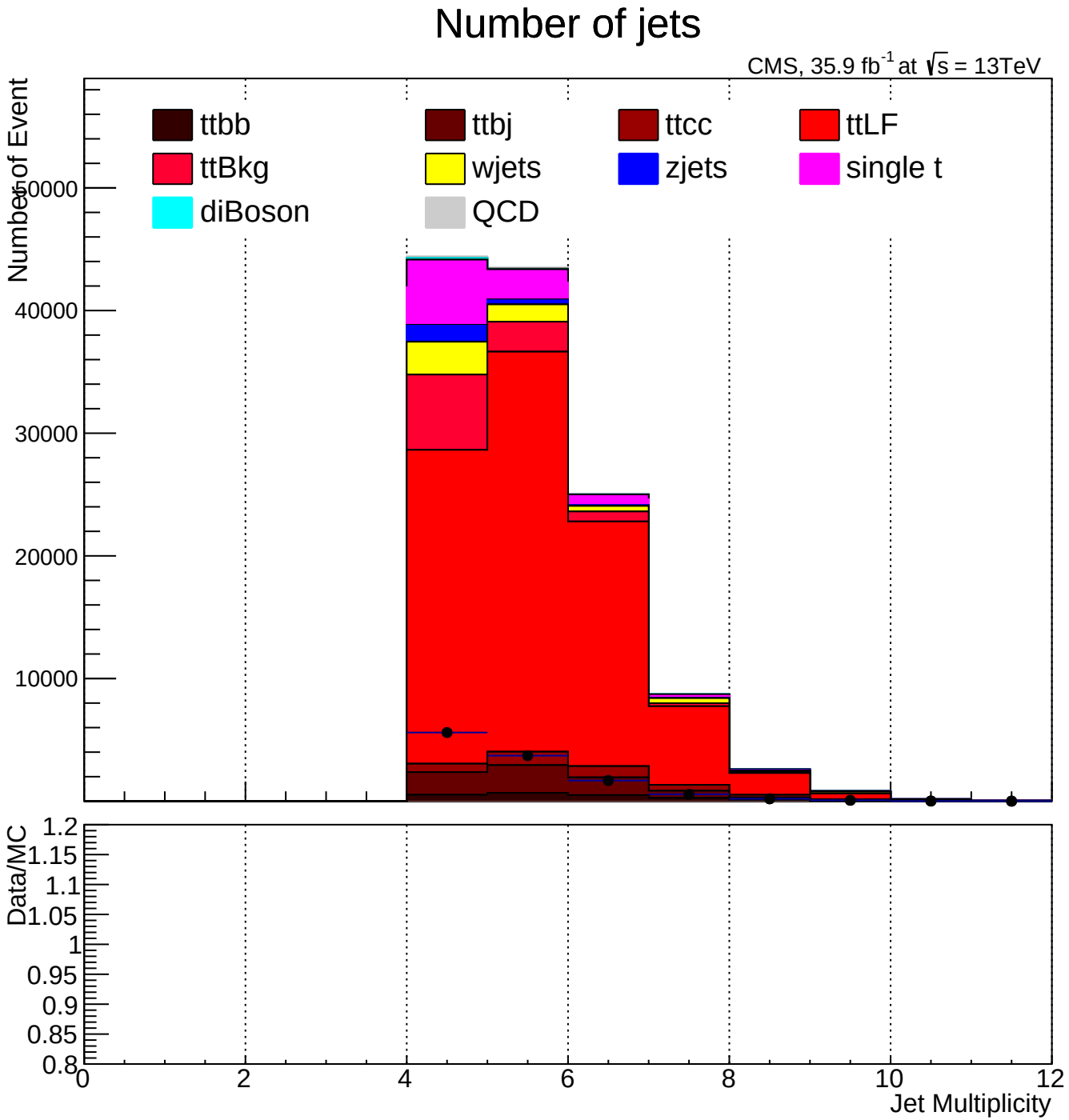

W Mass from DRFCNHkinfit (Had)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
W Mass from DRFCNHkinfit (Had) (GeV)


H Mass from DRFCNHkinfit (bb)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Events
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
H Mass from DRFCNHkinfit (bb)(GeV)

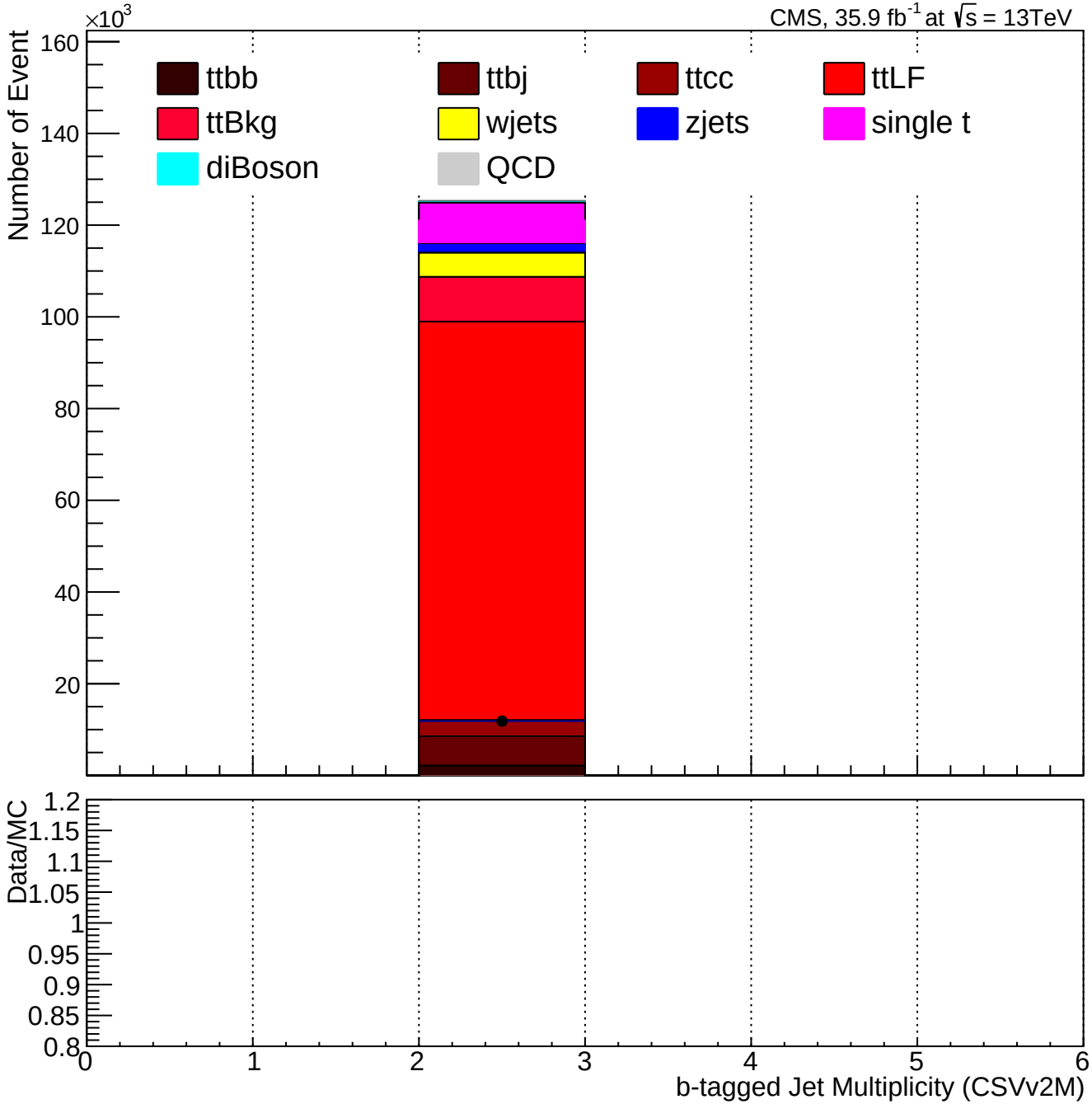

Delta R from DRFCNHkinfit
CMS, 35.9 fb-1 at √s = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Delta R from DRFCNHkinfit Higgs

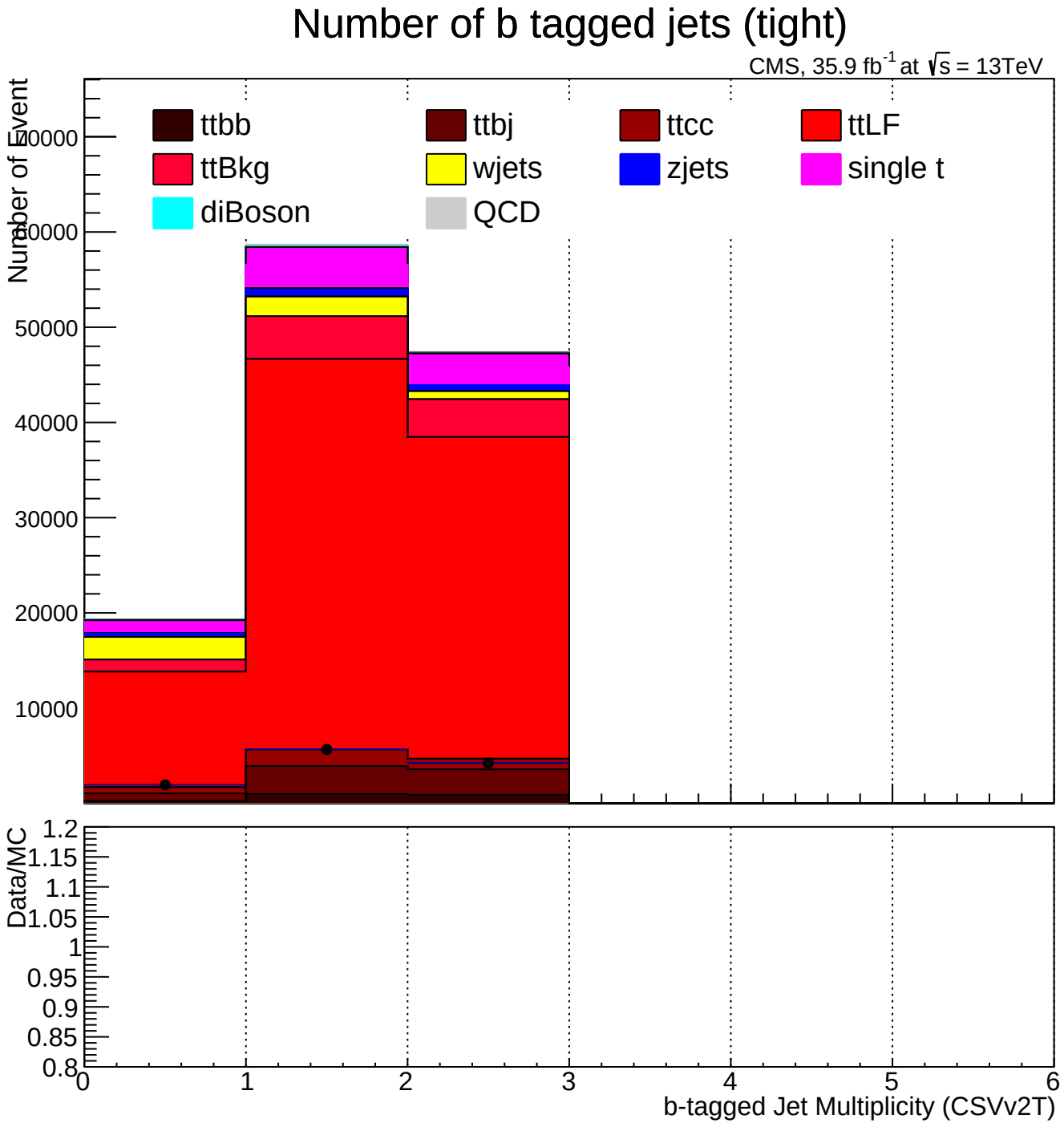

Top Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Top Mass from DRFCNHkinfit (Lep) (GeV)

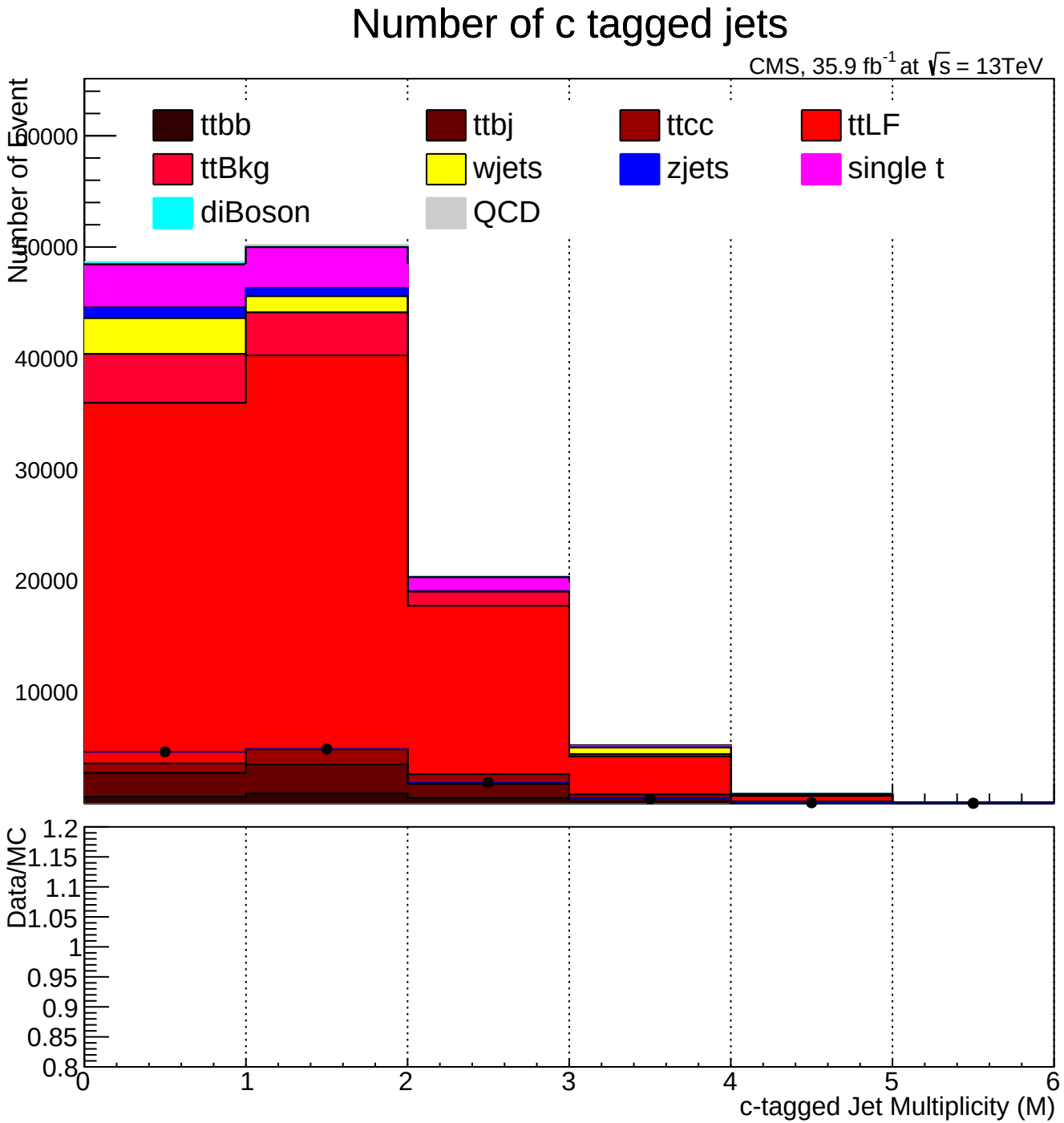

Top mass from Hc/u DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
50000
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
350
400
Top Mass from Hc/u DRFCNHkinfit (GeV)

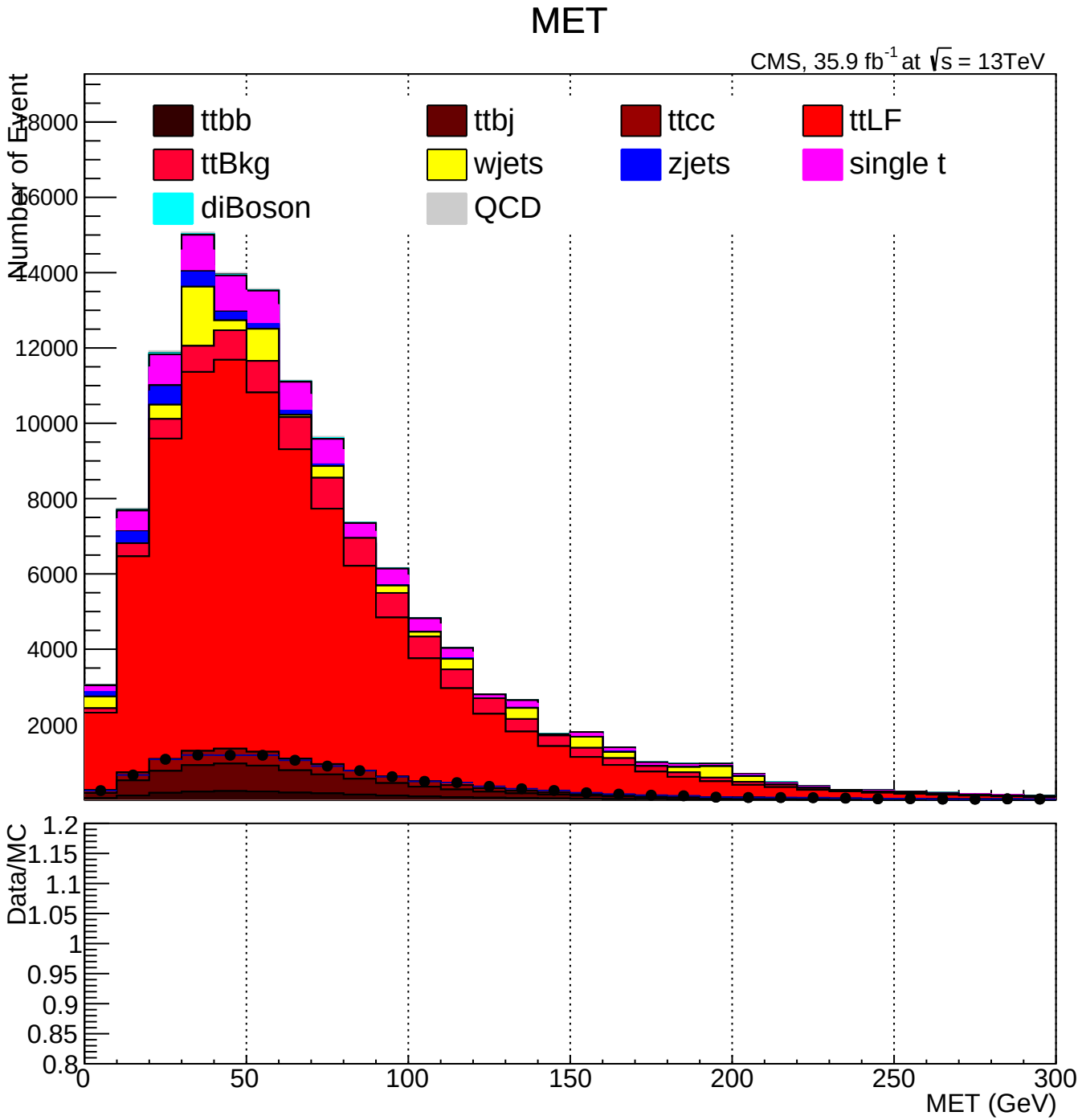

Number of jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
50000
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
2
4
6
8
10
12
Jet Multiplicity

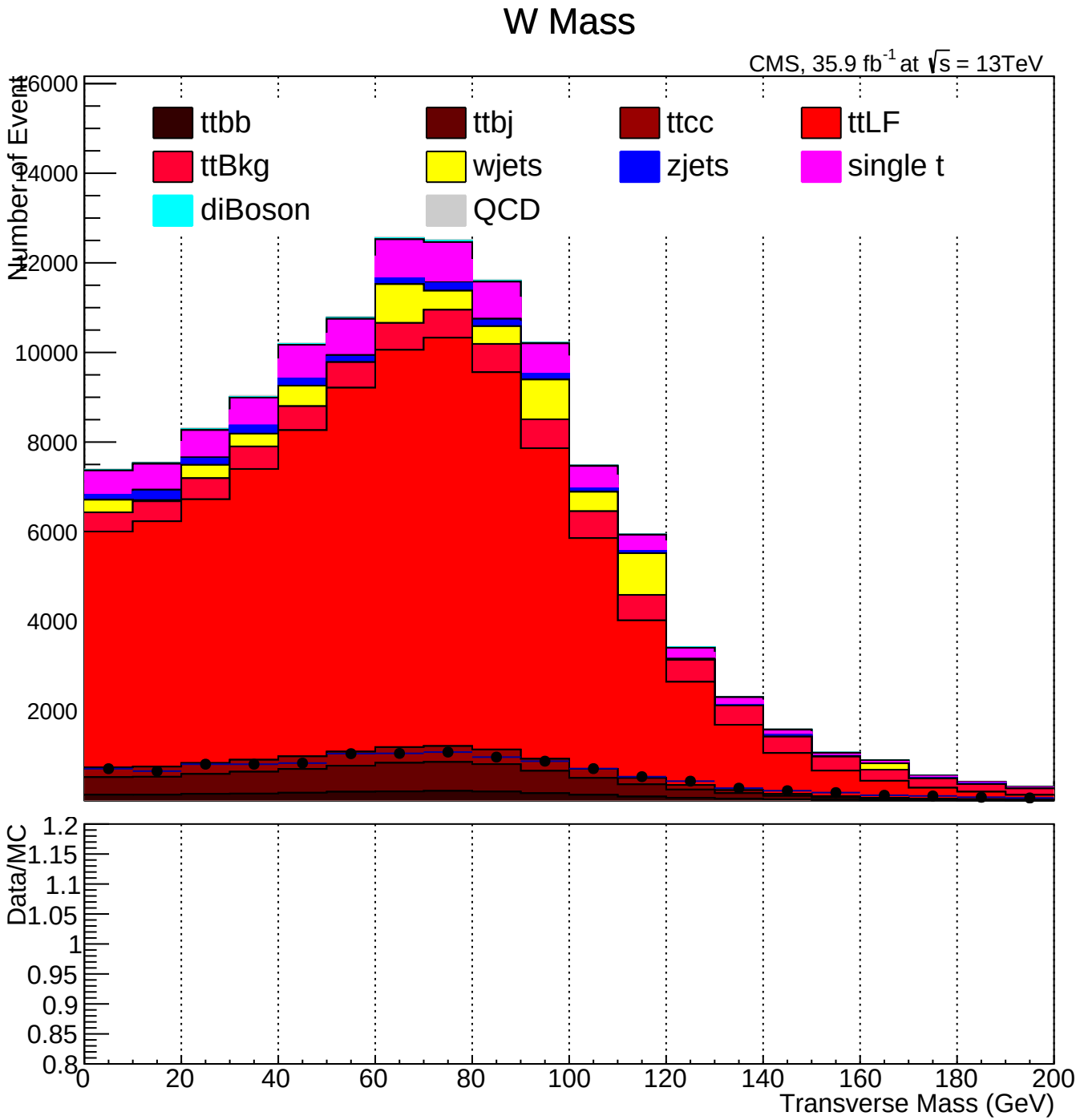
Number of b tagged jets (medium)

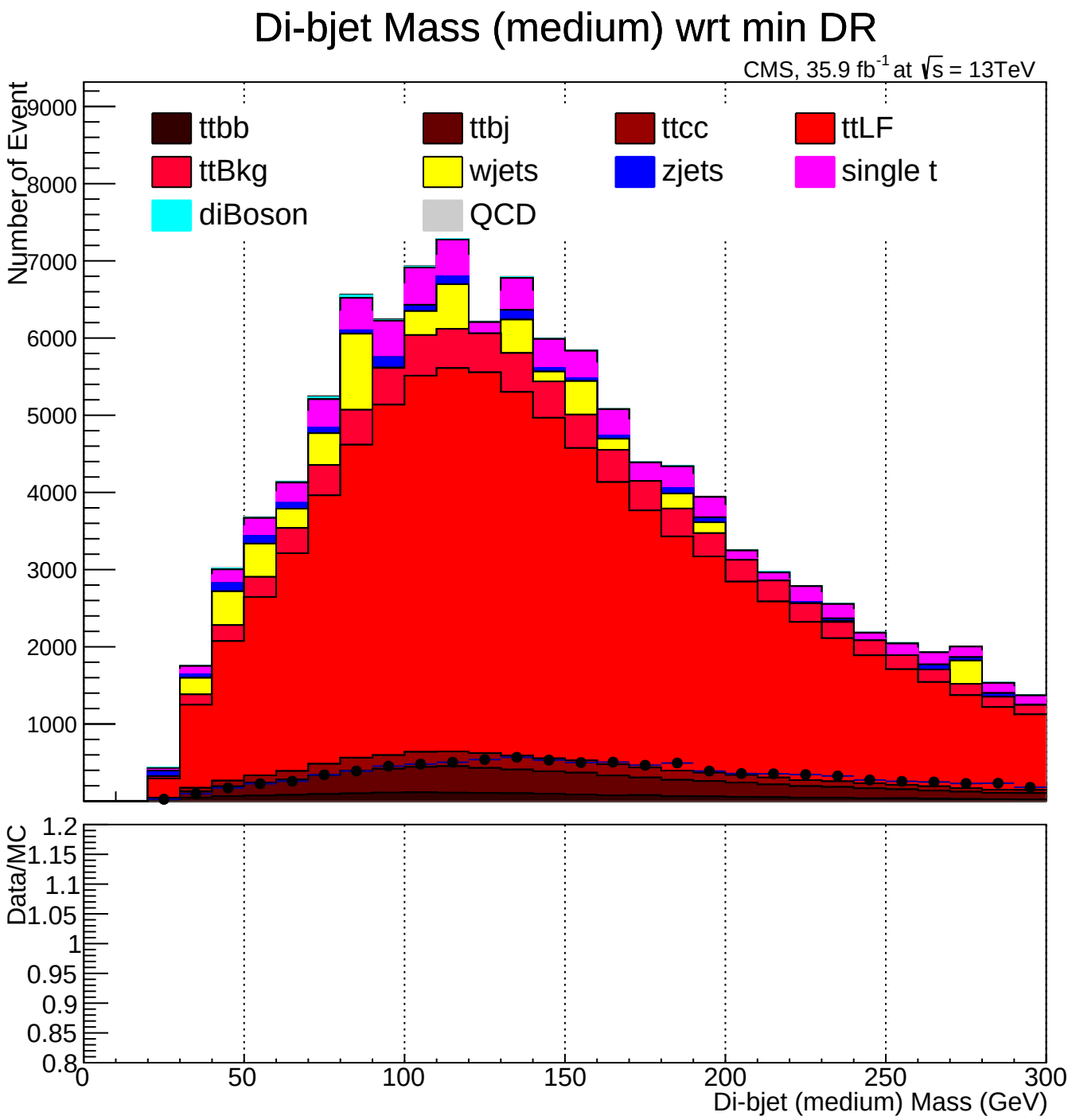


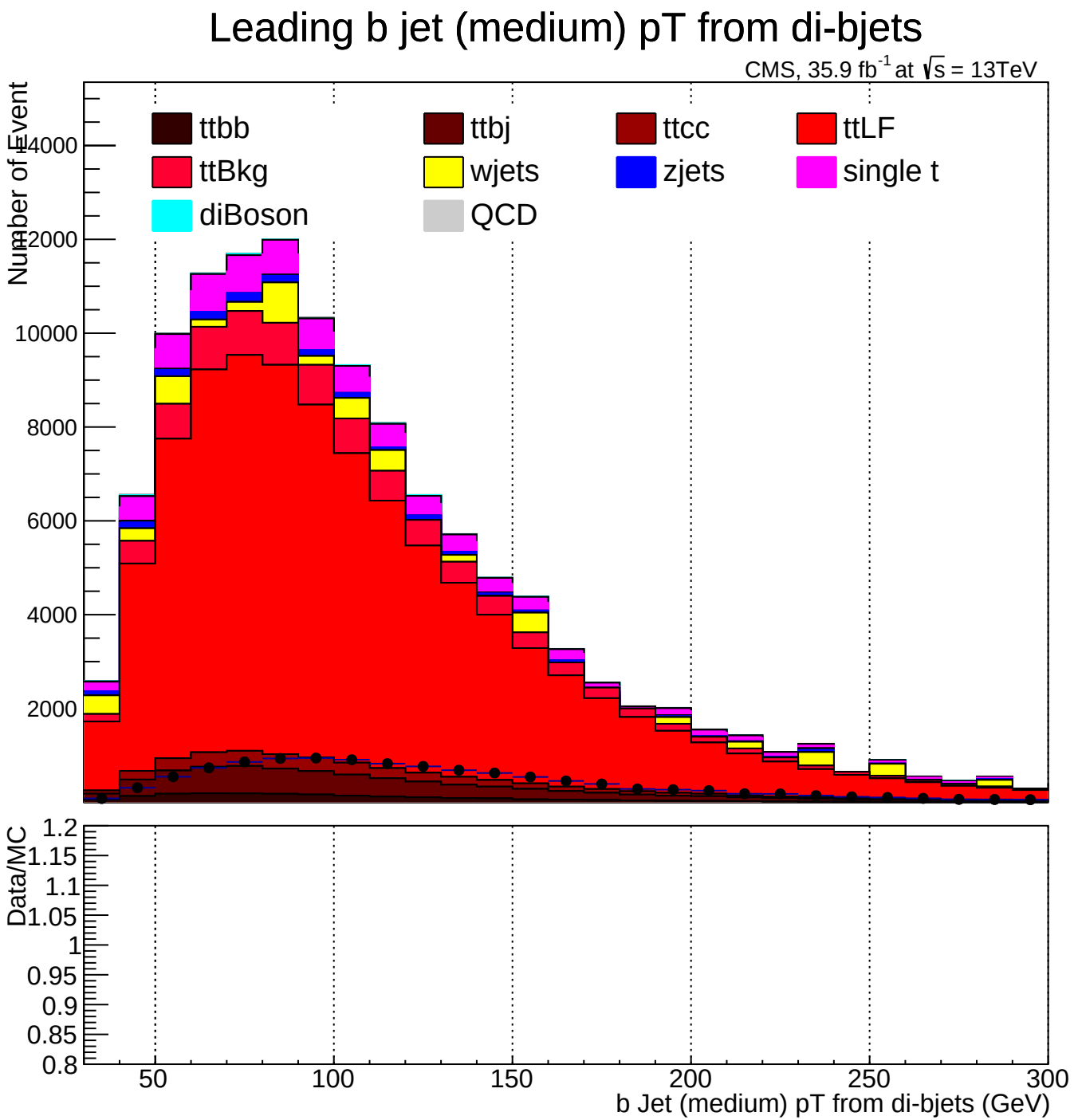

Number of b tagged jets (tight)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
60000
50000
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2T)

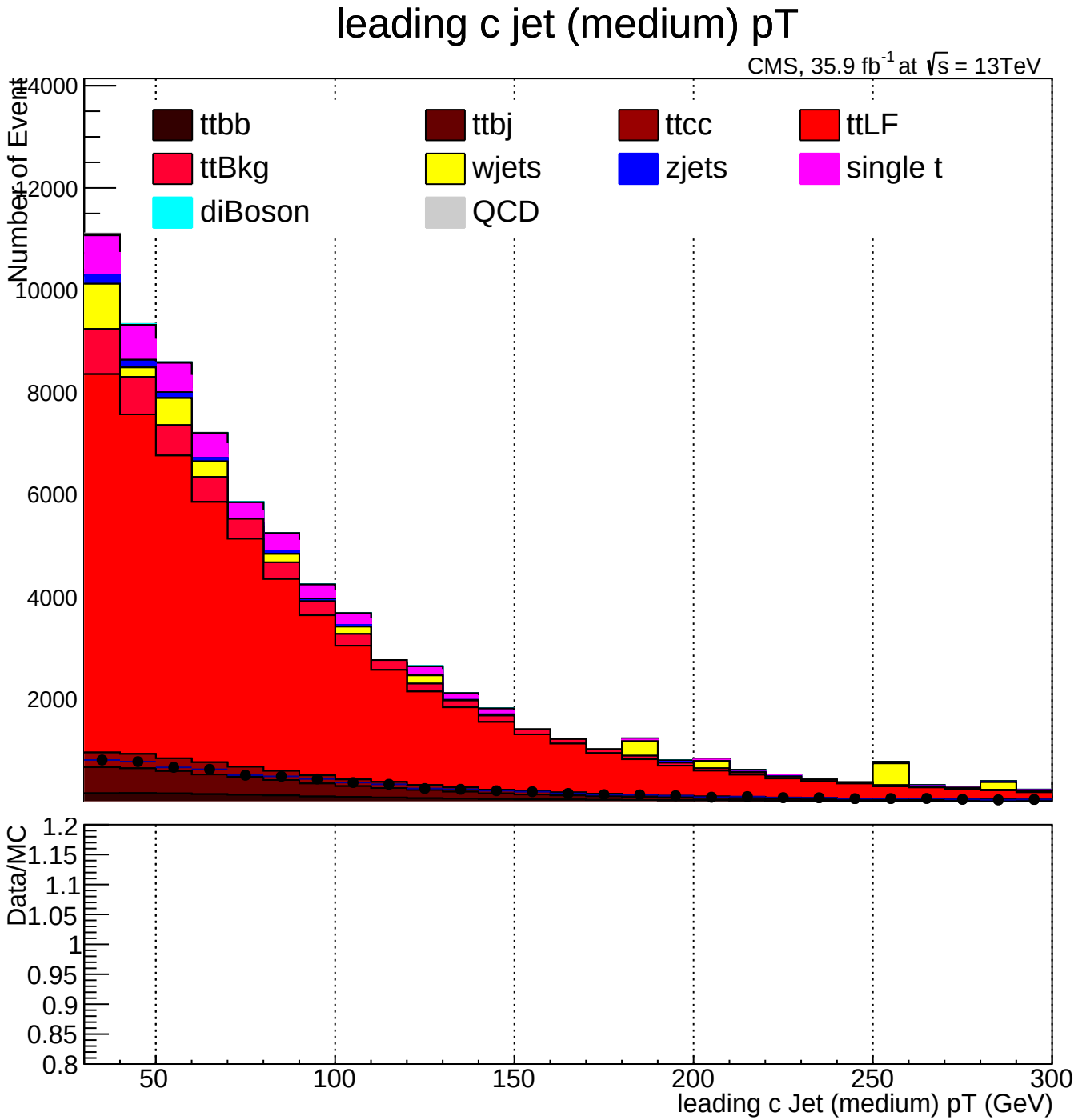

Number of c tagged jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
50000
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
c-tagged Jet Multiplicity (M)

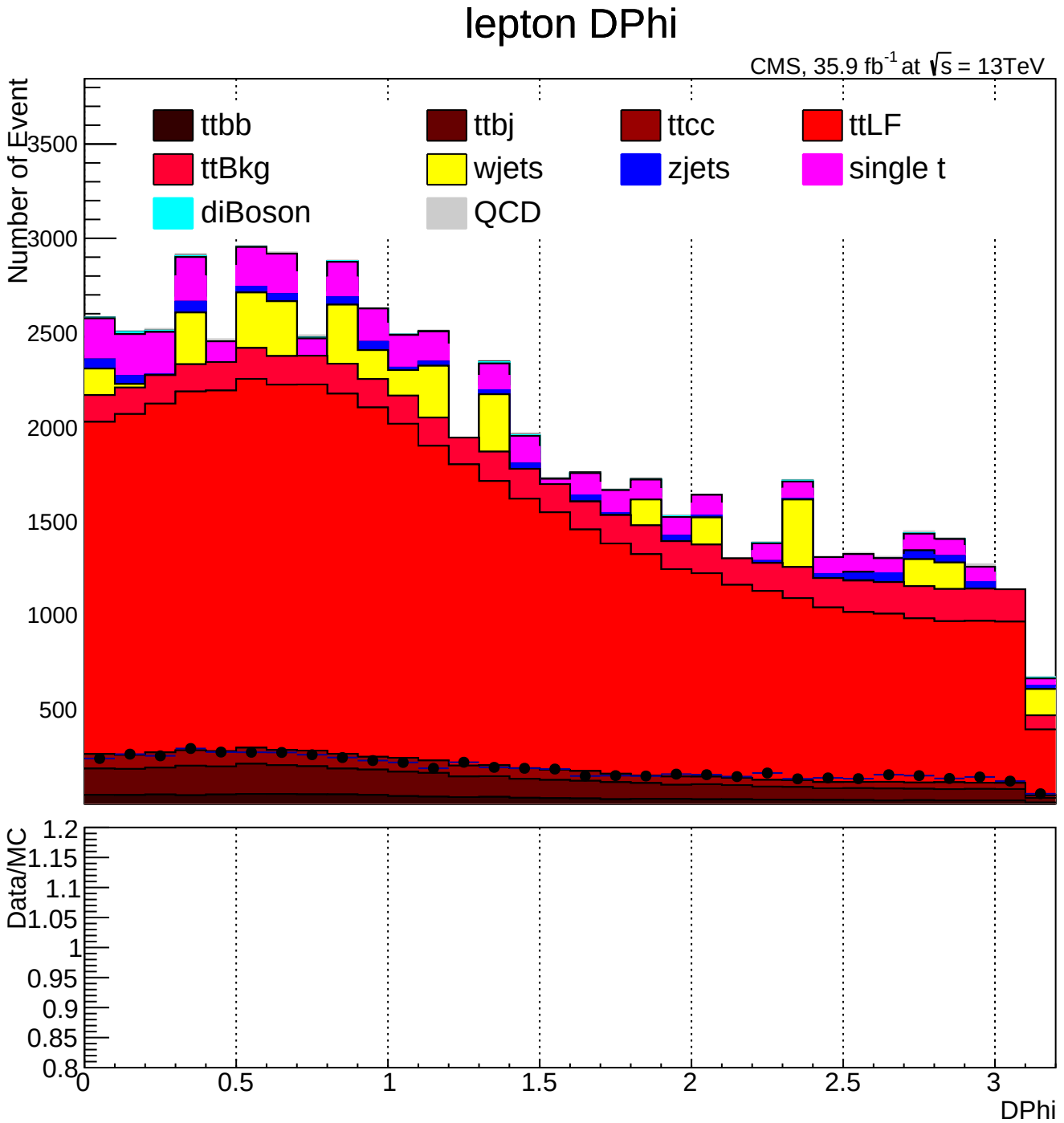

MET
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
MET (GeV)

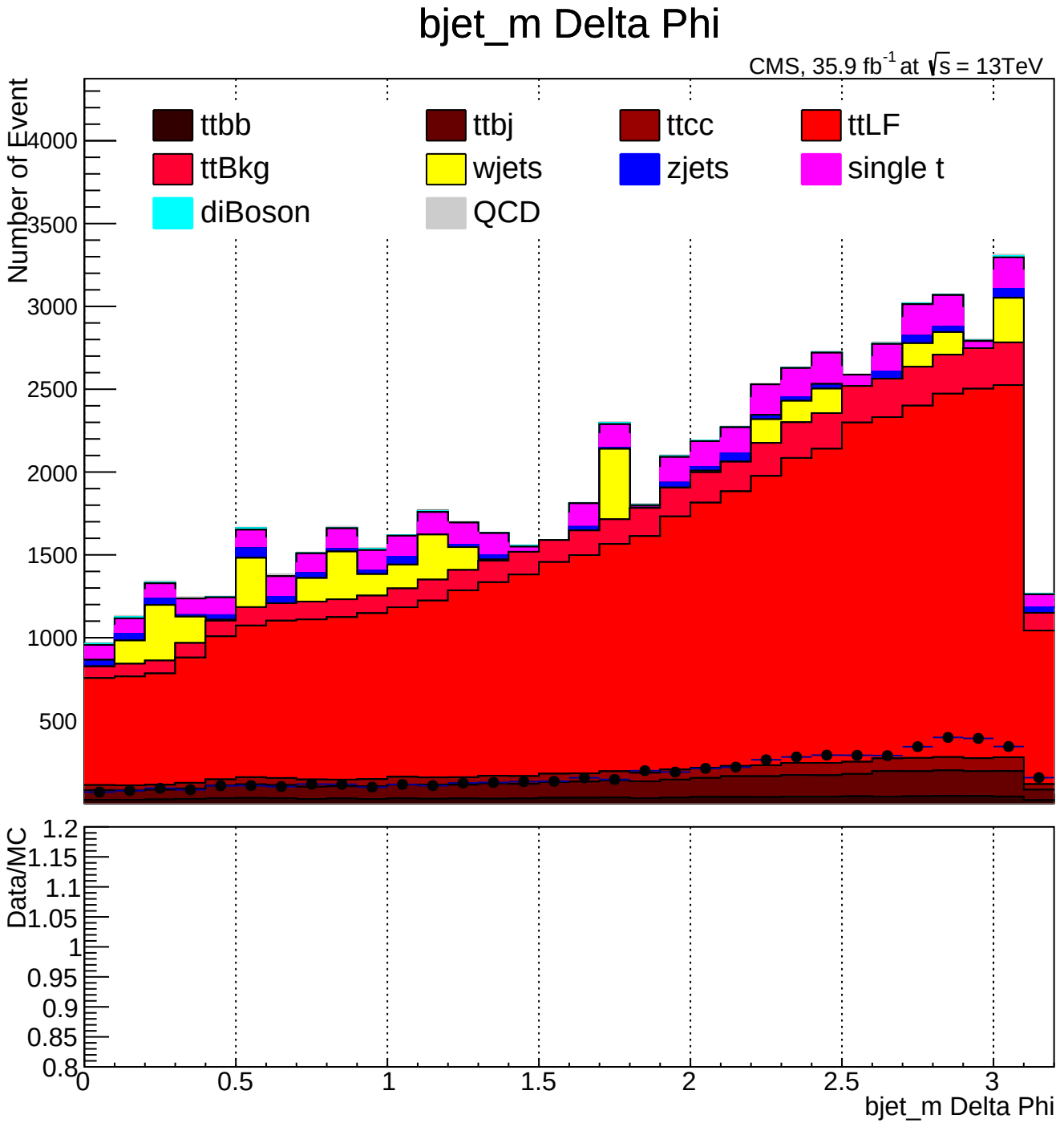

W Mass
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Transverse Mass (GeV)

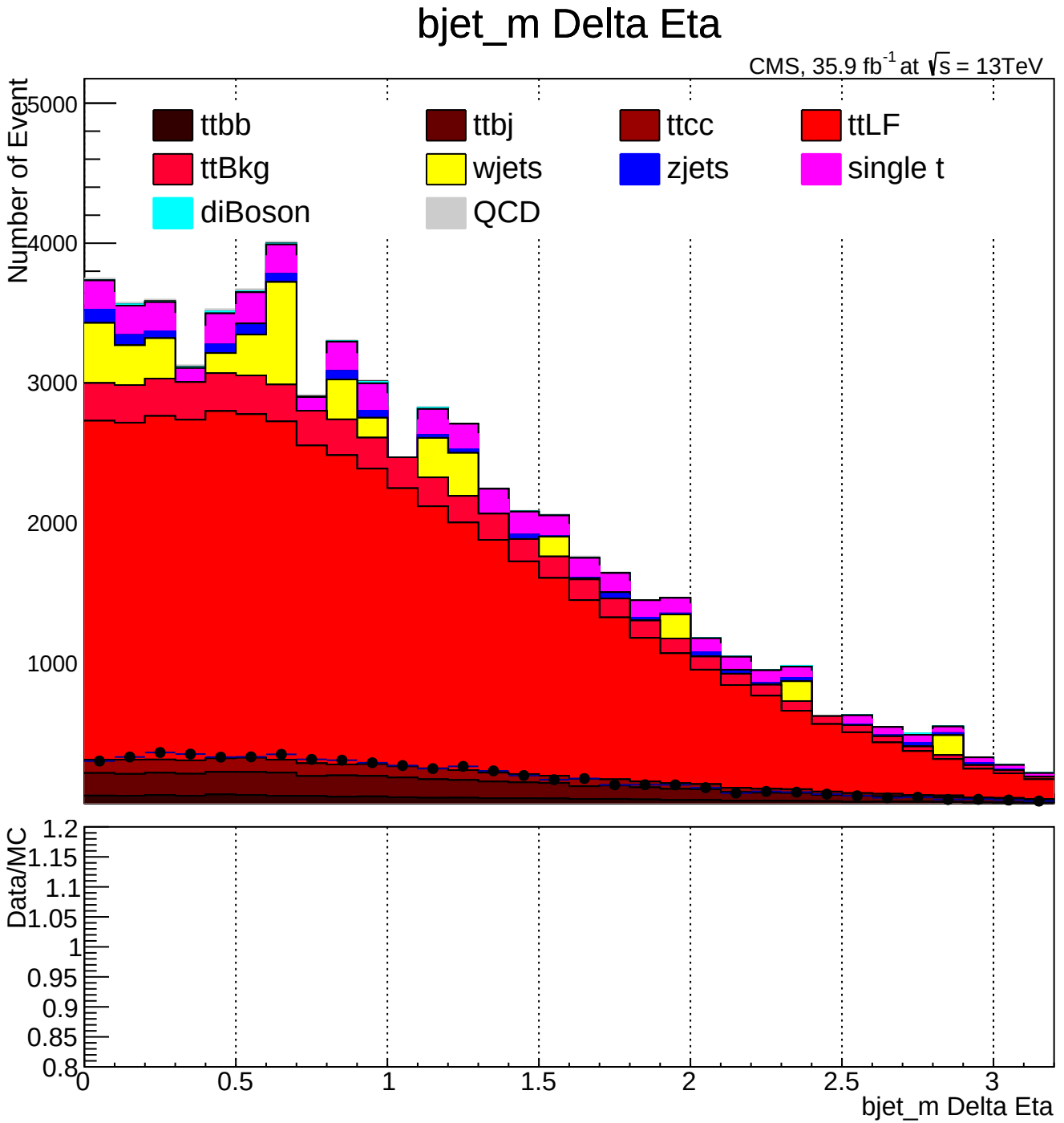

Di-bjet Mass (medium) wrt min DR
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
Di-bjet (medium) Mass (GeV)

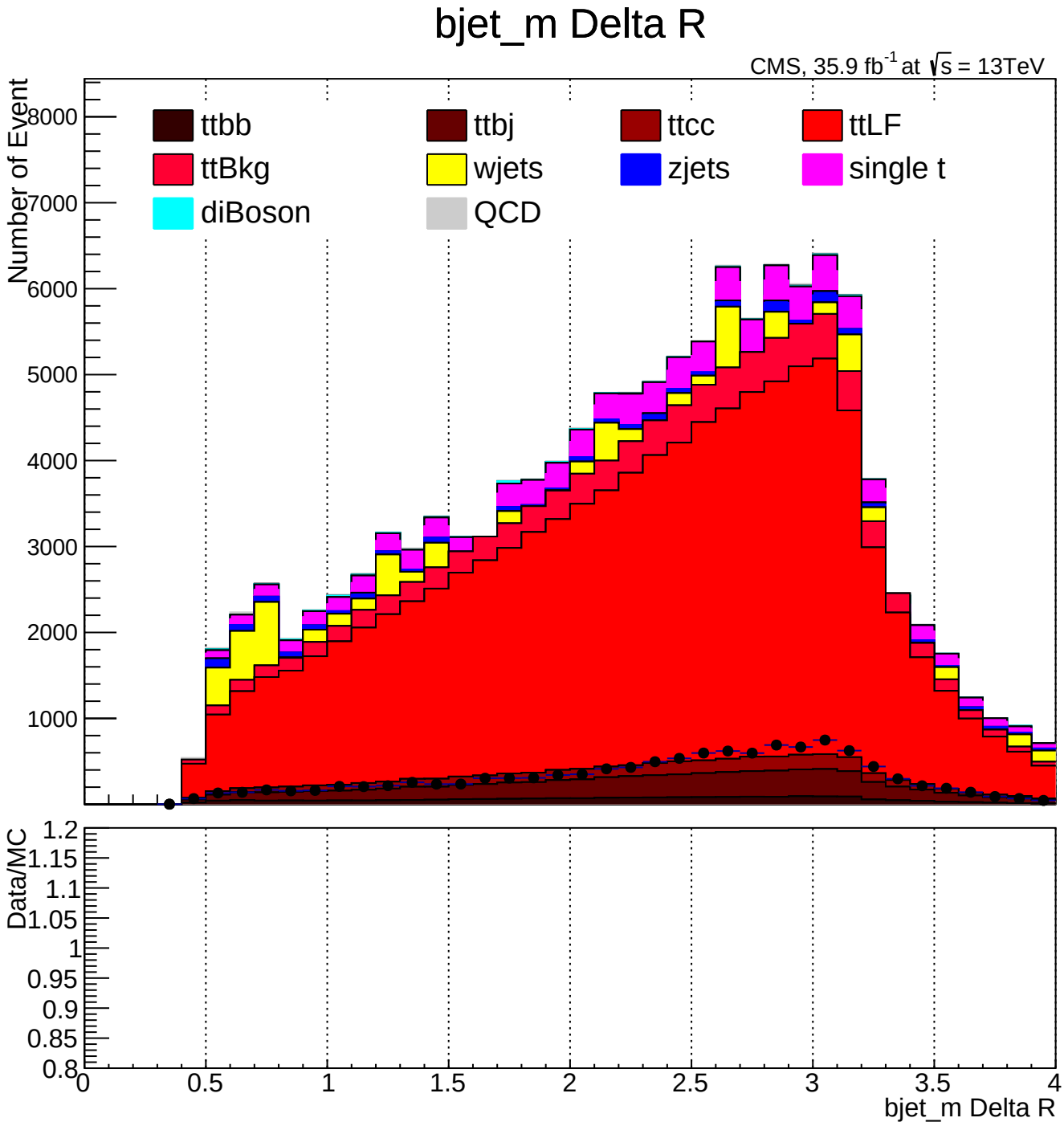

Leading b jet (medium) pT from di-bjets
CMS, 35.9 fb-1 at √s = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
14000
12000
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
b Jet (medium) pT from di-bjets (GeV)

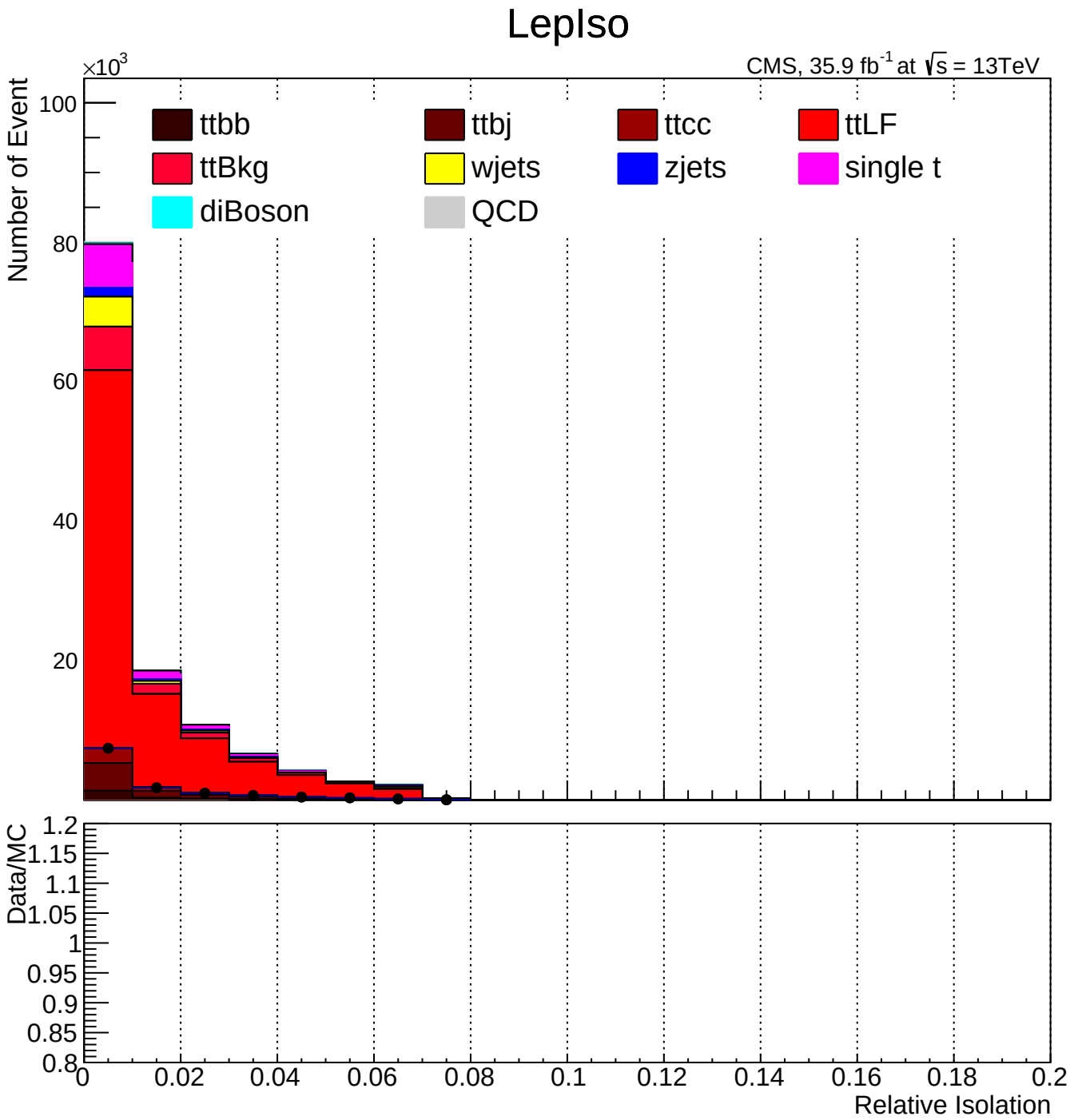

leading c jet (medium) pT
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
leading c Jet (medium) pT (GeV)

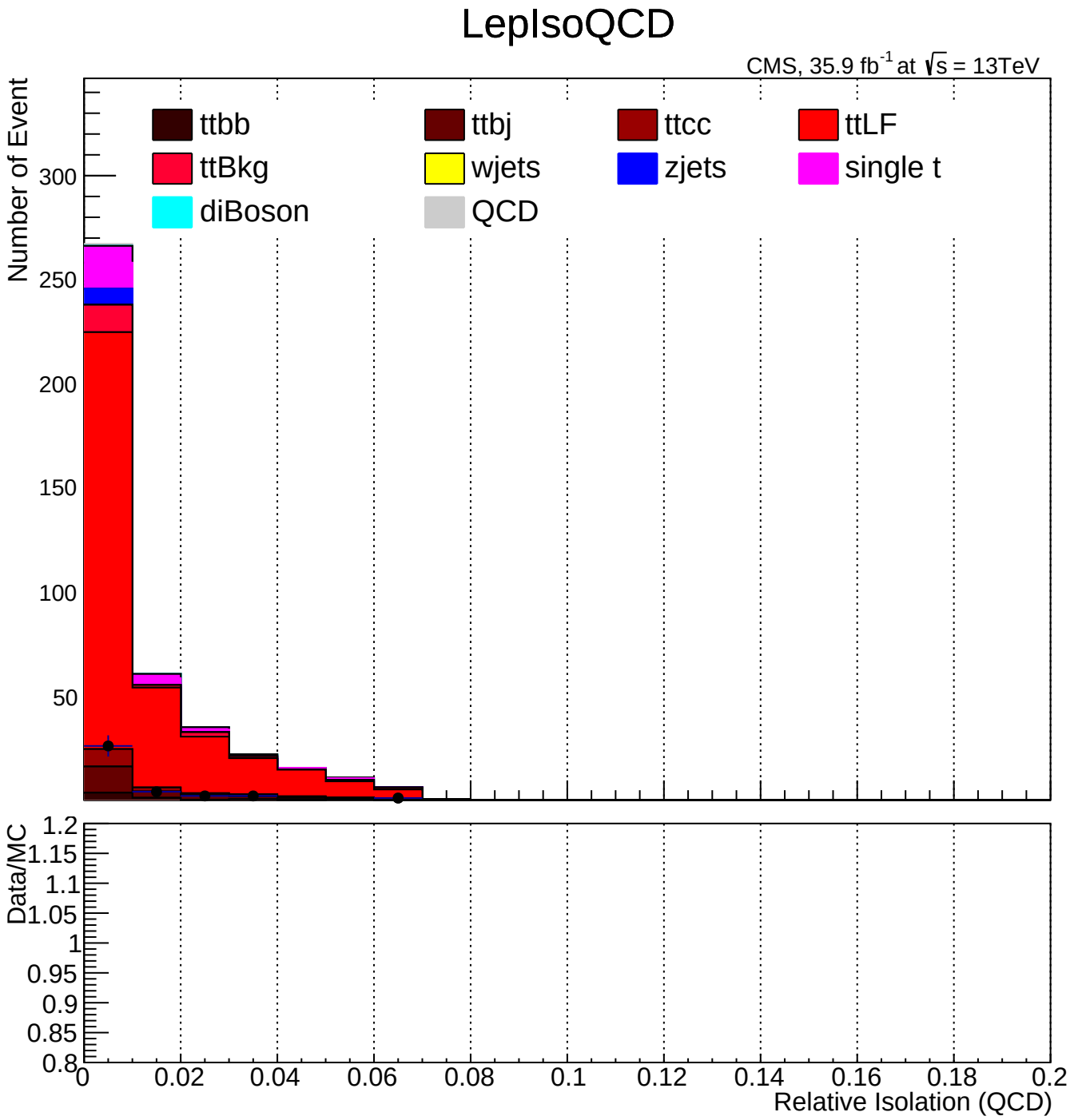

lepton DPhi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
3500
3000
2500
2000
1500
1000
500
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
DPhi

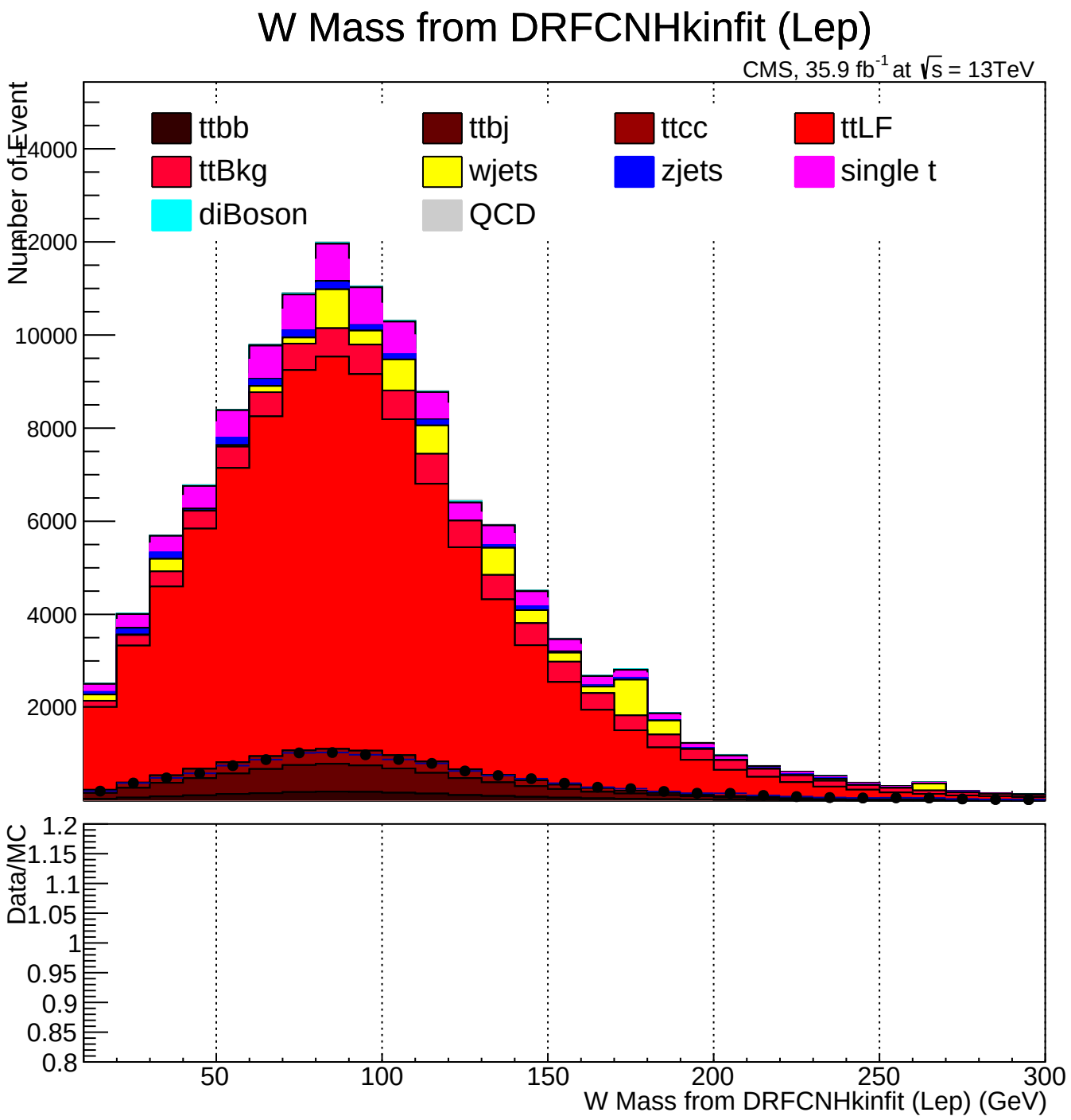

bjet_m Delta Phi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
4000
3500
3000
2500
2000
1500
1000
500
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Phi

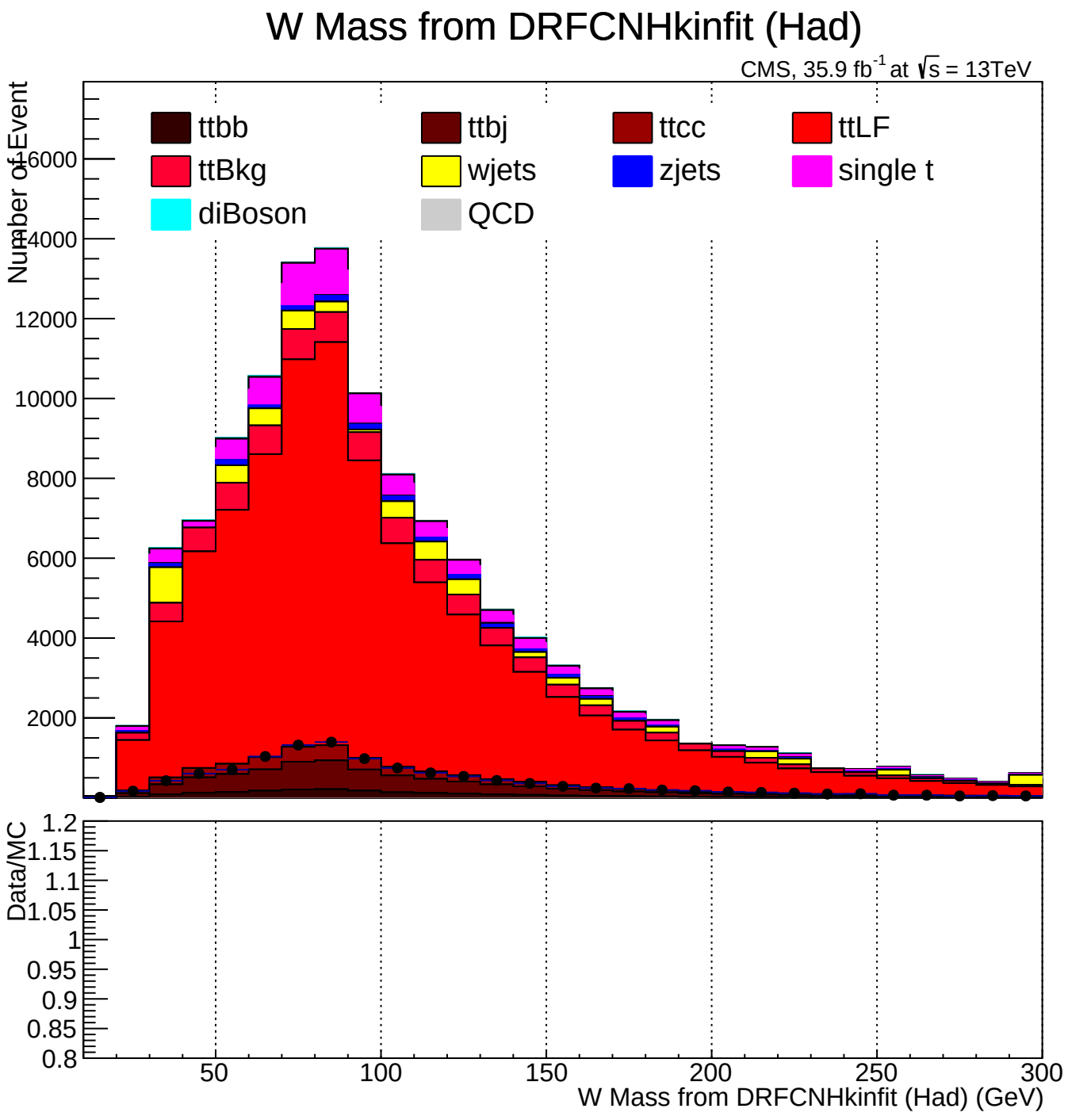

bjet_m Delta Eta
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Eta

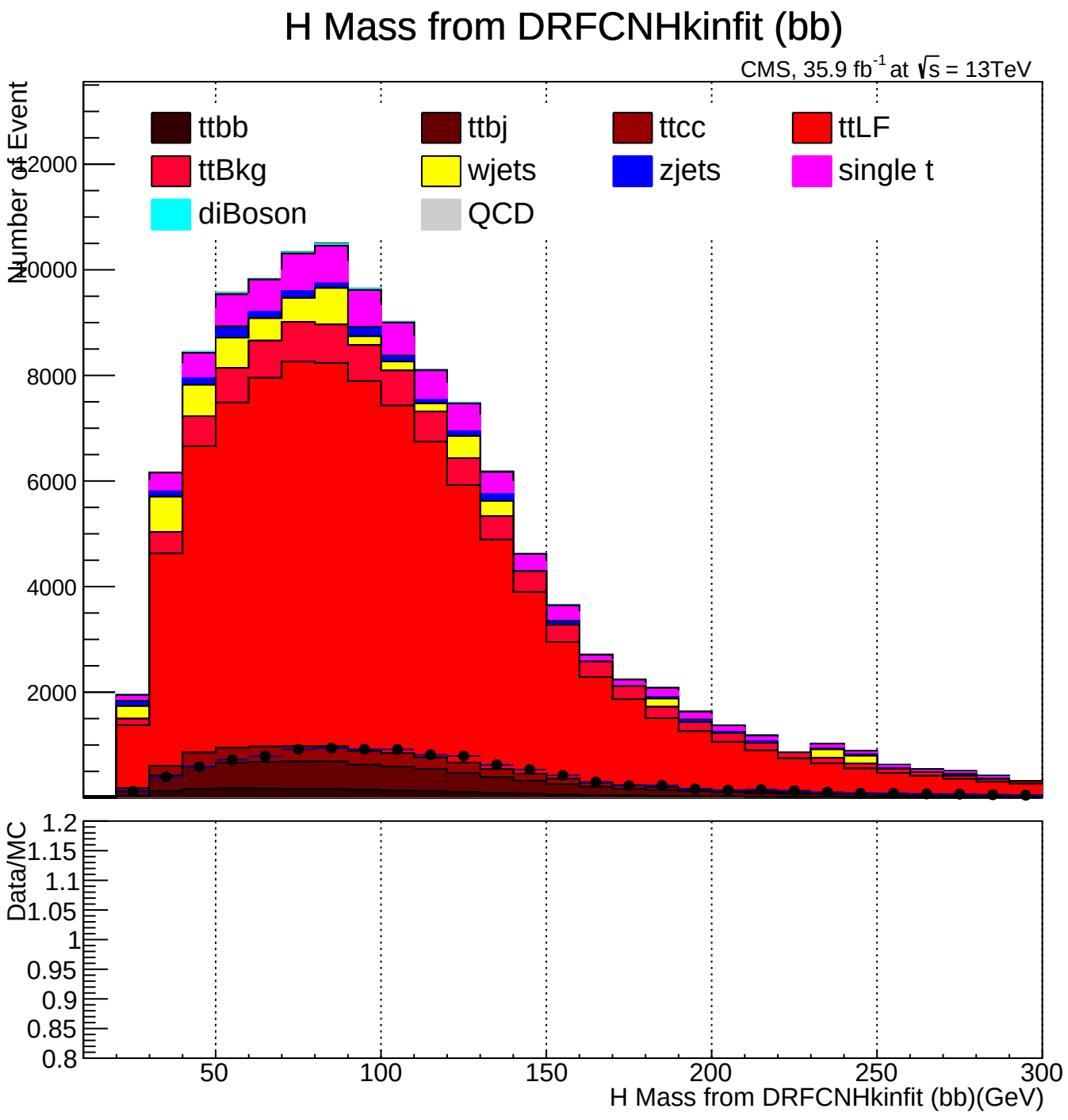

bjet_m Delta R
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
8000
7000
6000
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
3.5
4
bjet_m Delta R

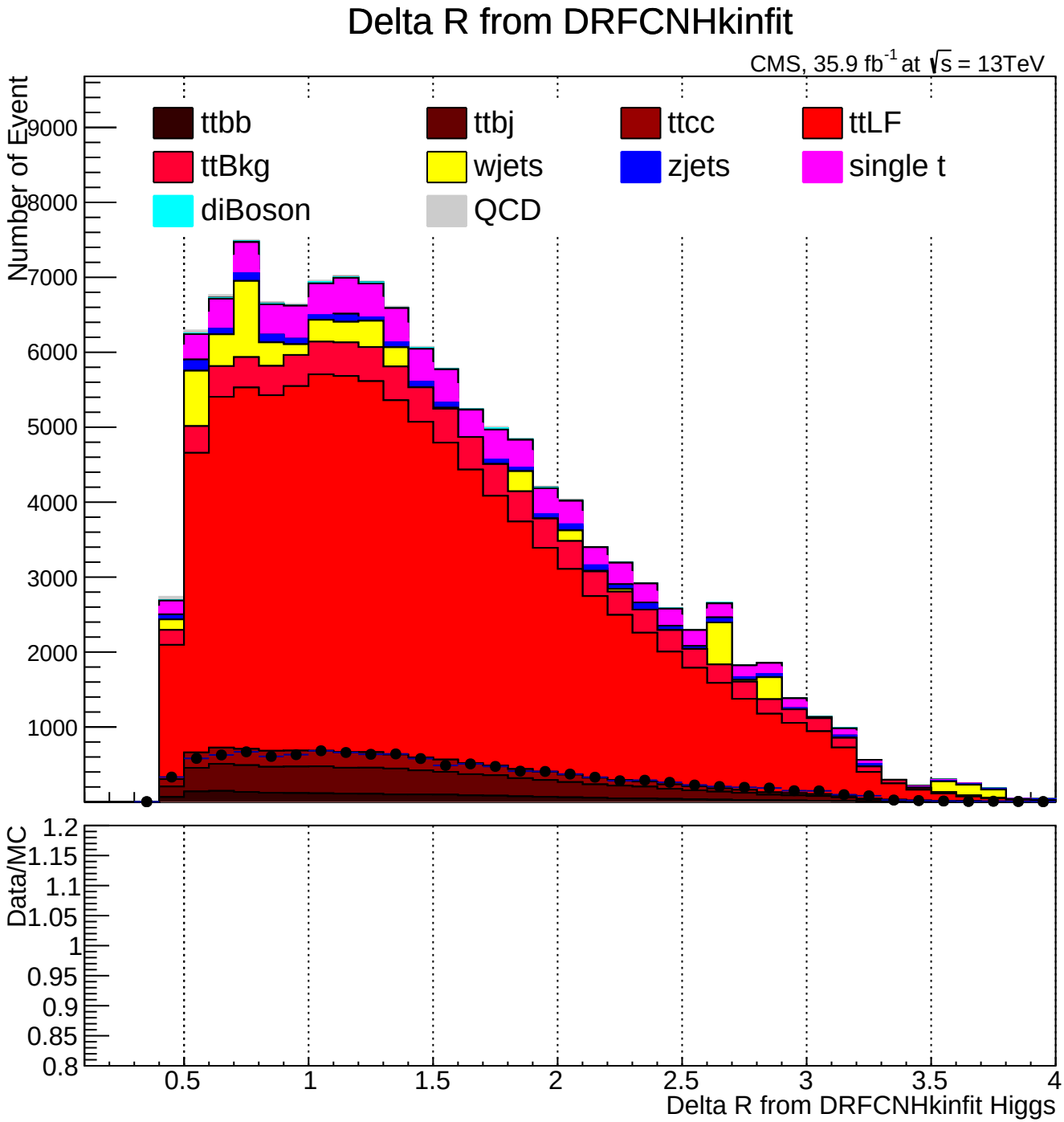

LepIso
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation

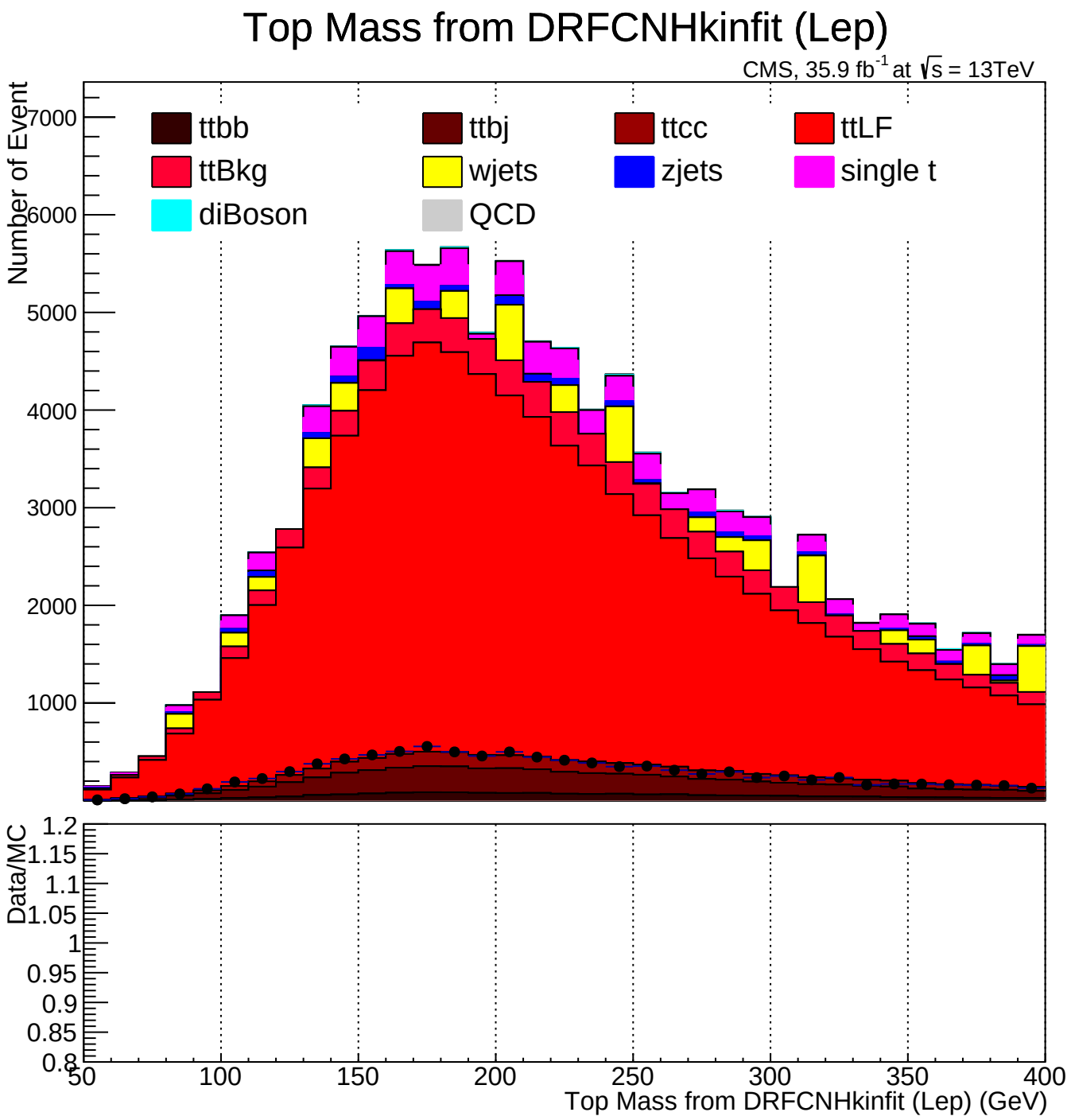

LepIsoQCD
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
300
250
200
150
100
50
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation (QCD)

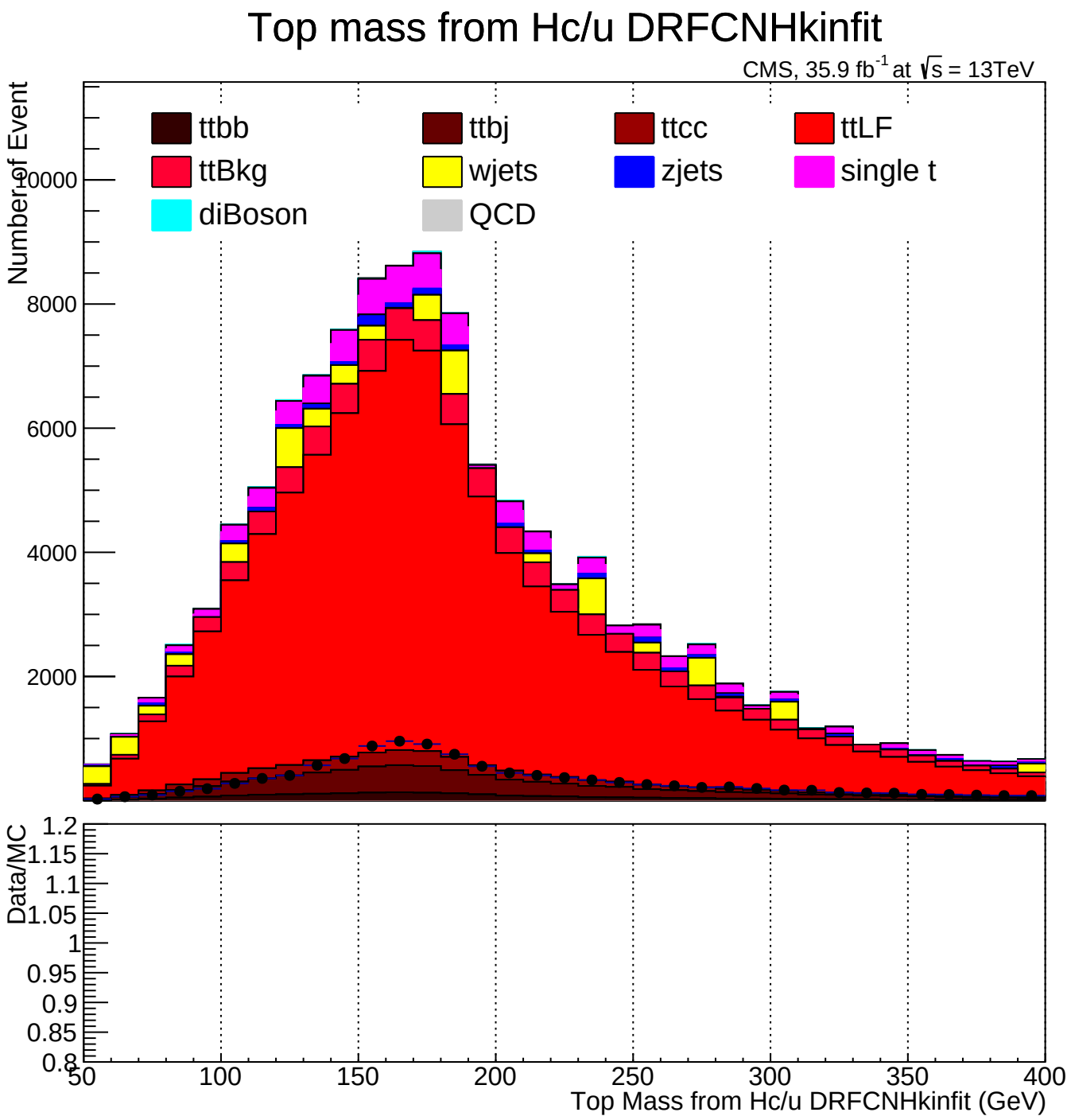

W Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
14000
12000
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
W Mass from DRFCNHkinfit (Lep) (GeV)

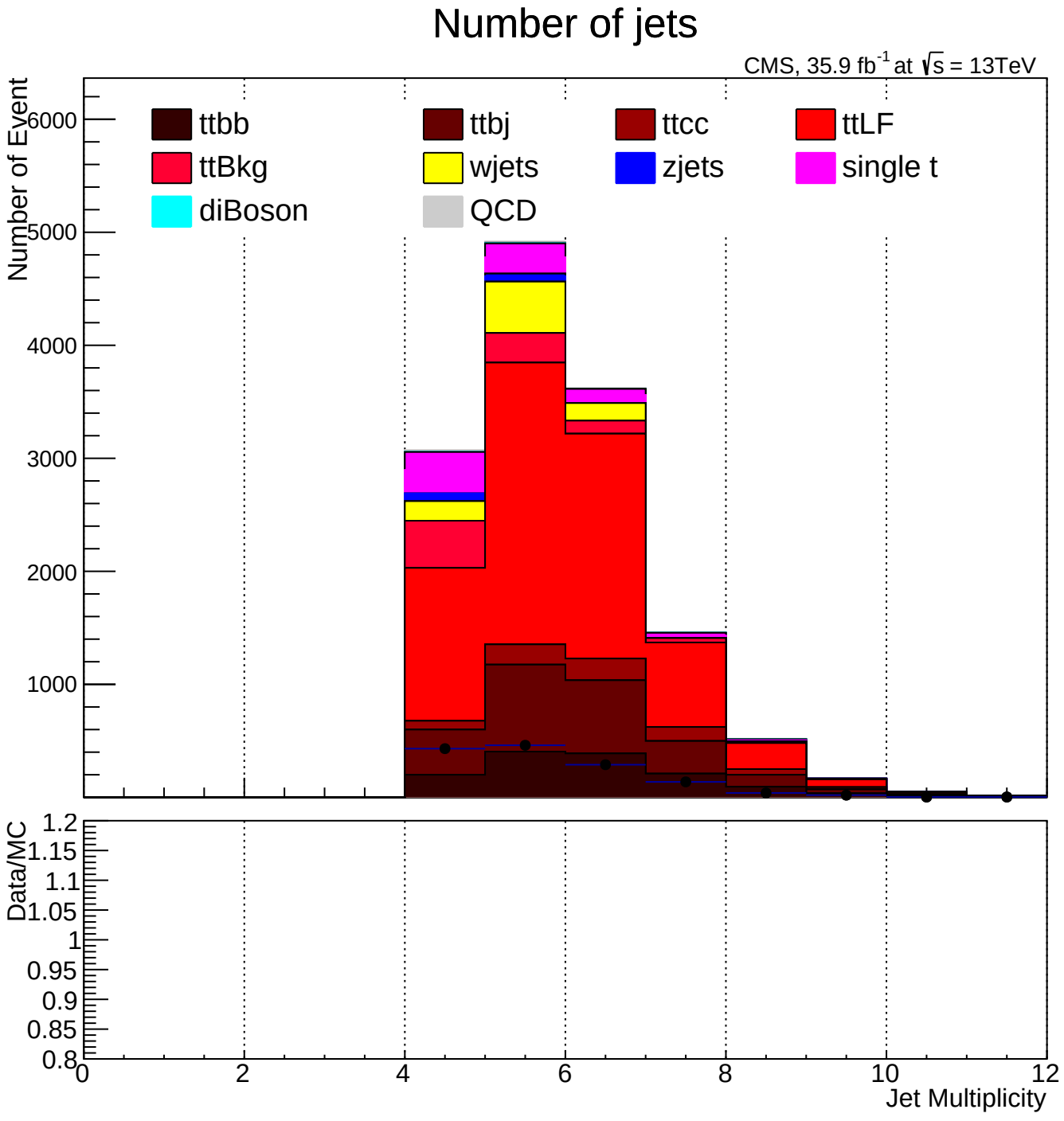

W Mass from DRFCNHkinfit (Had)
CMS, 35.9 fb-1 at √s = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
W Mass from DRFCNHkinfit (Had) (GeV)

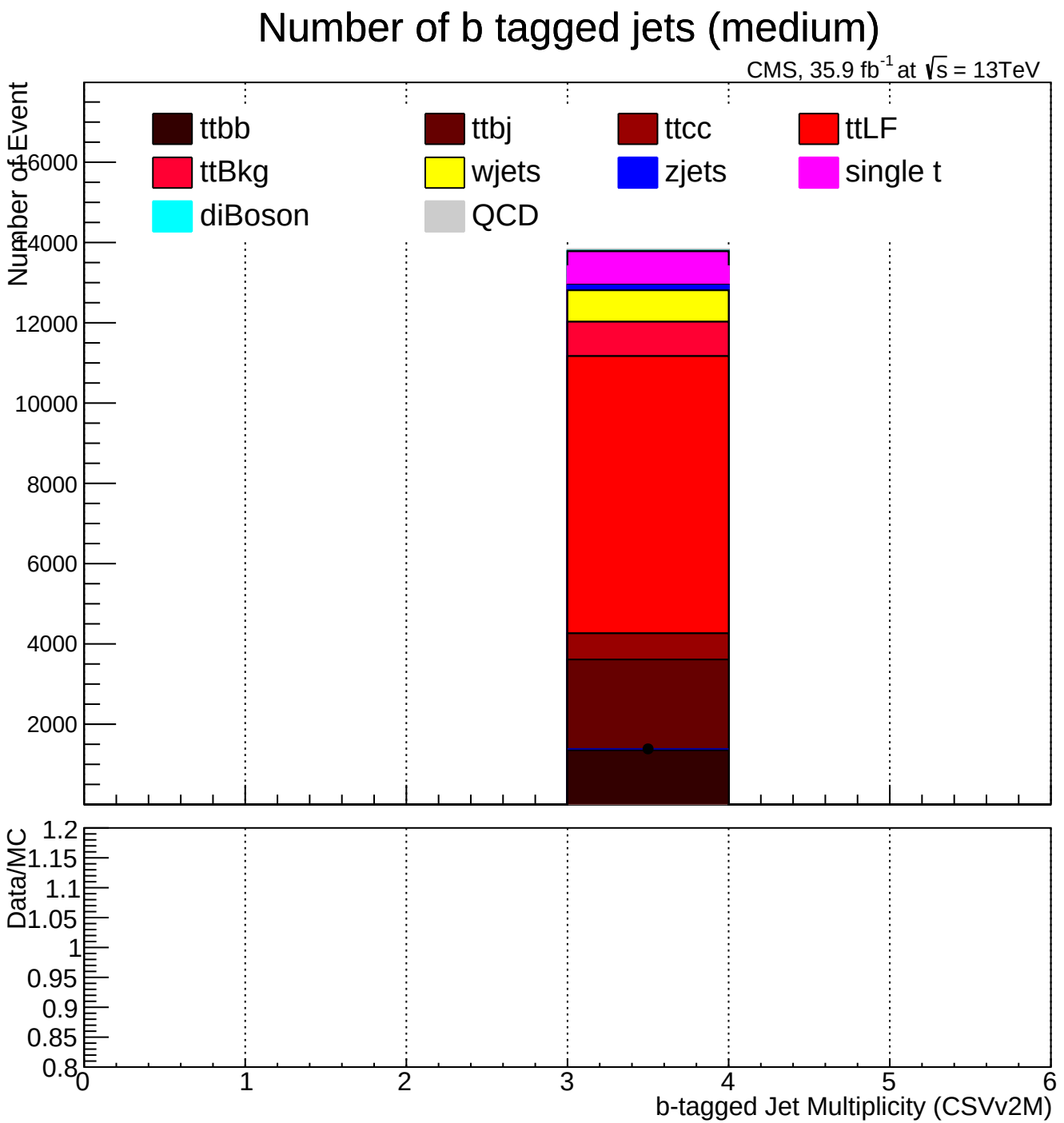

H Mass from DRFCNHkinfit (bb)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
12000
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
H Mass from DRFCNHkinfit (bb)(GeV)

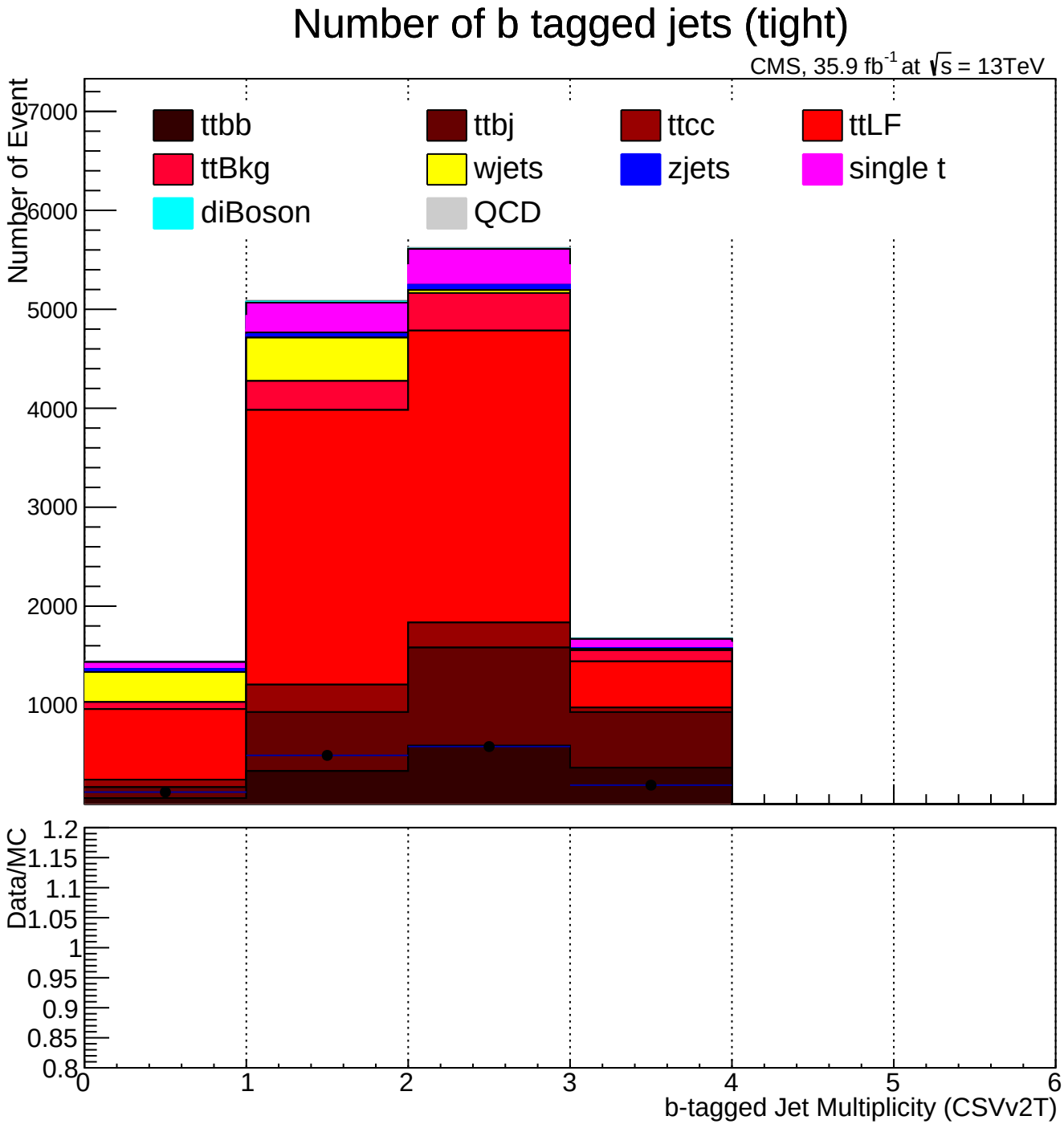

Delta R from DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Delta R from DRFCNHkinfit Higgs

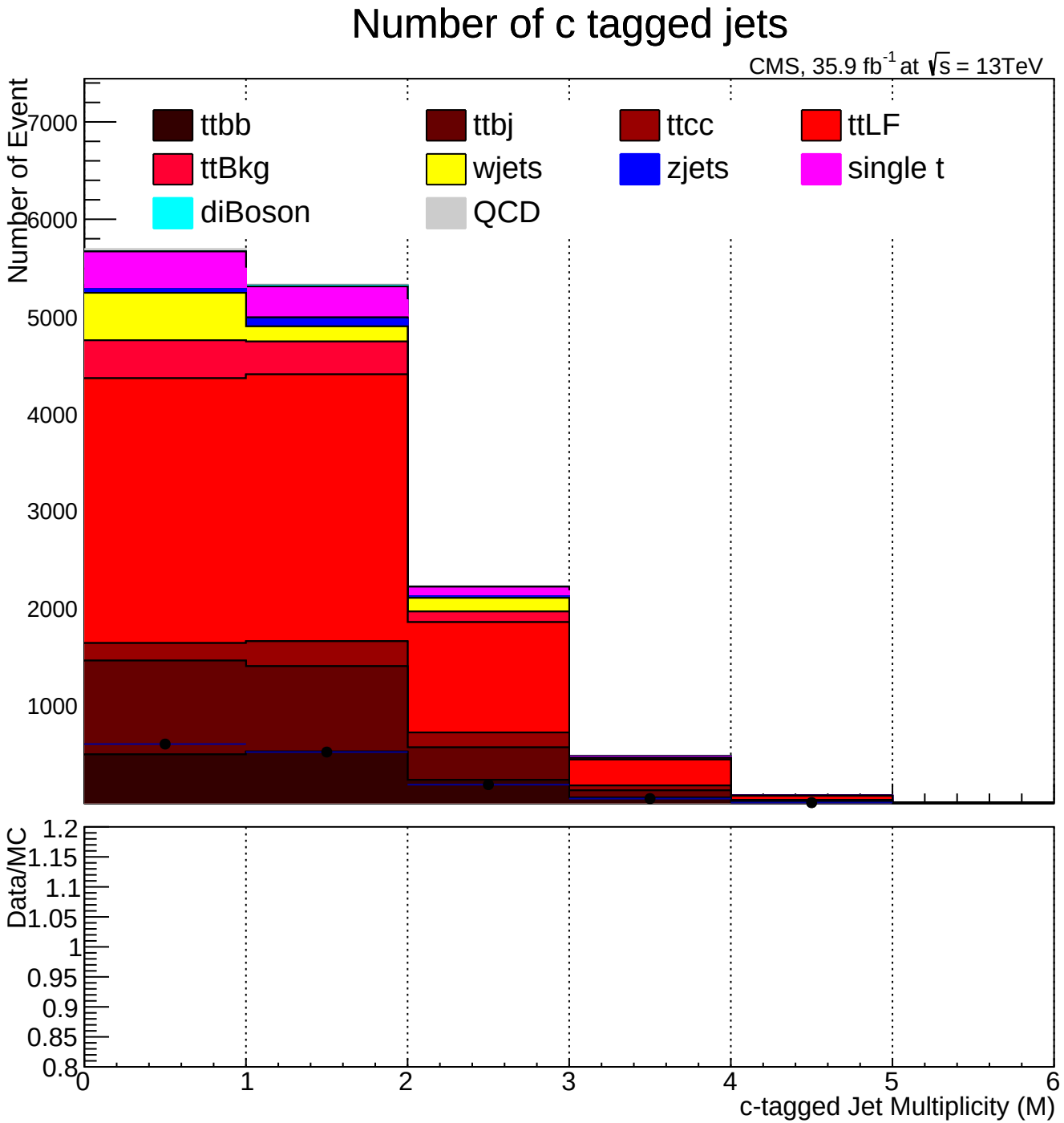

Top Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Top Mass from DRFCNHkinfit (Lep) (GeV)

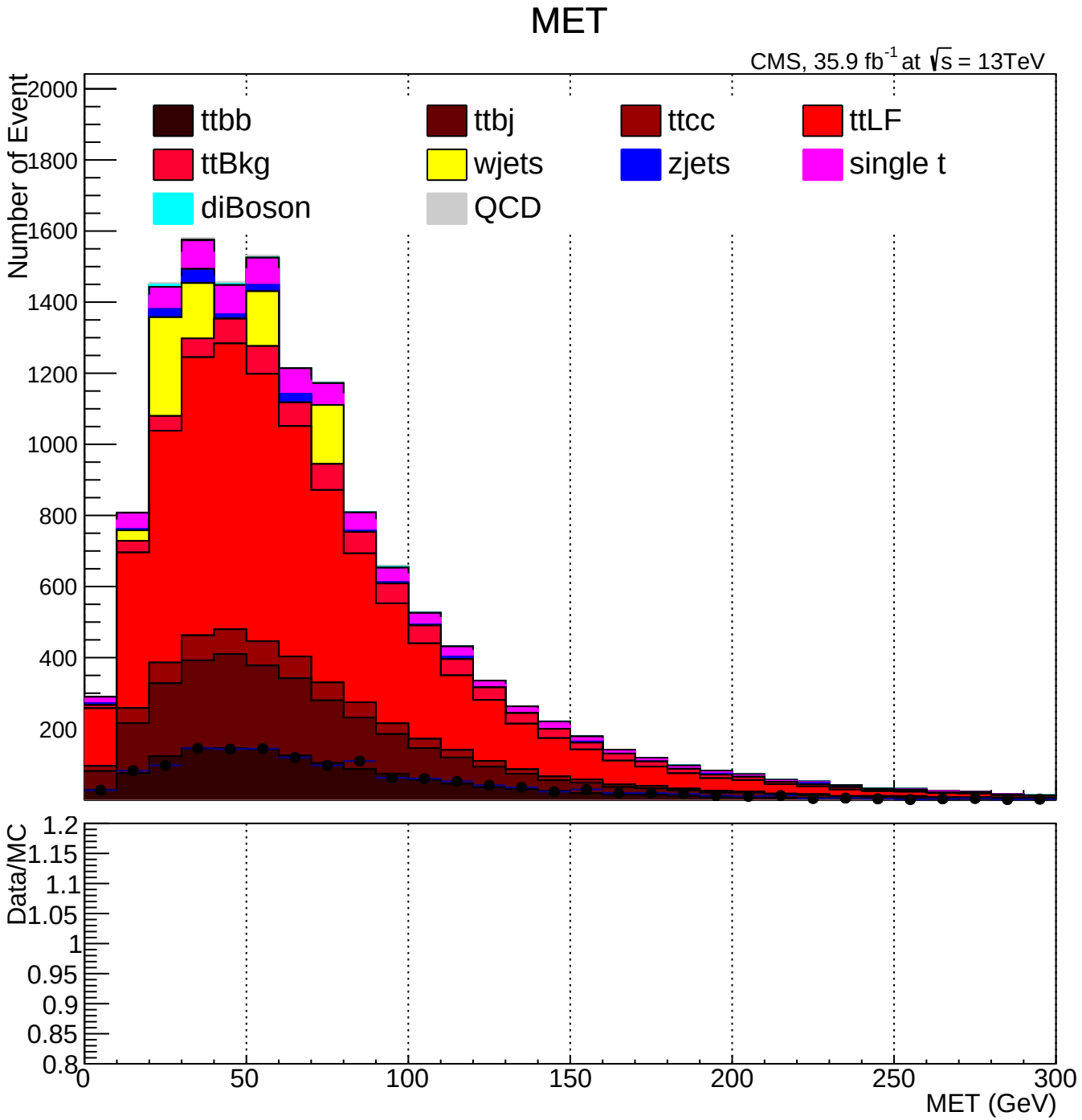

Top mass from Hc/u DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
350
400
Top Mass from Hc/u DRFCNHkinfit (GeV)

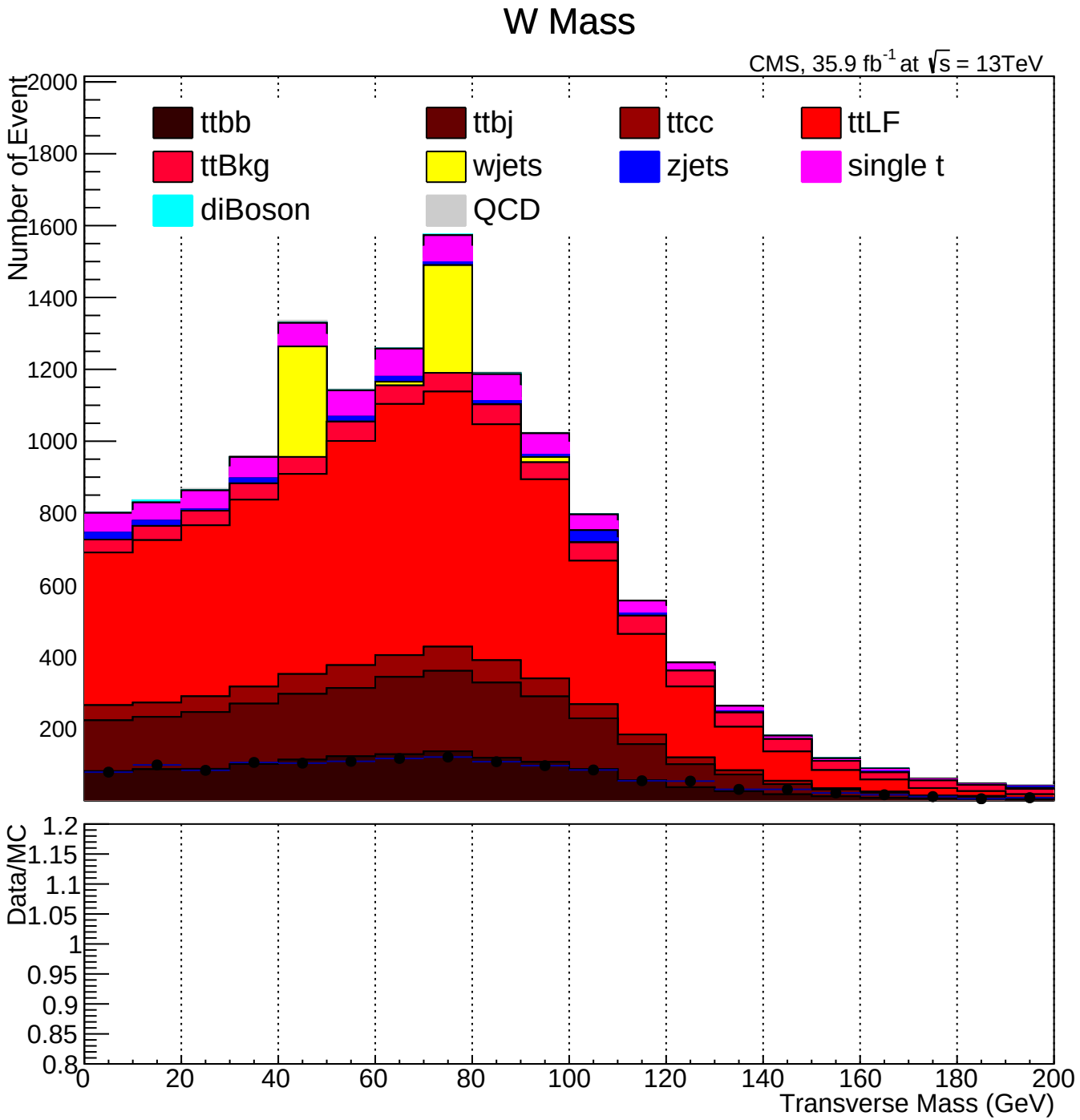

Number of jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
6000
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
2
4
6
8
10
12
Jet Multiplicity

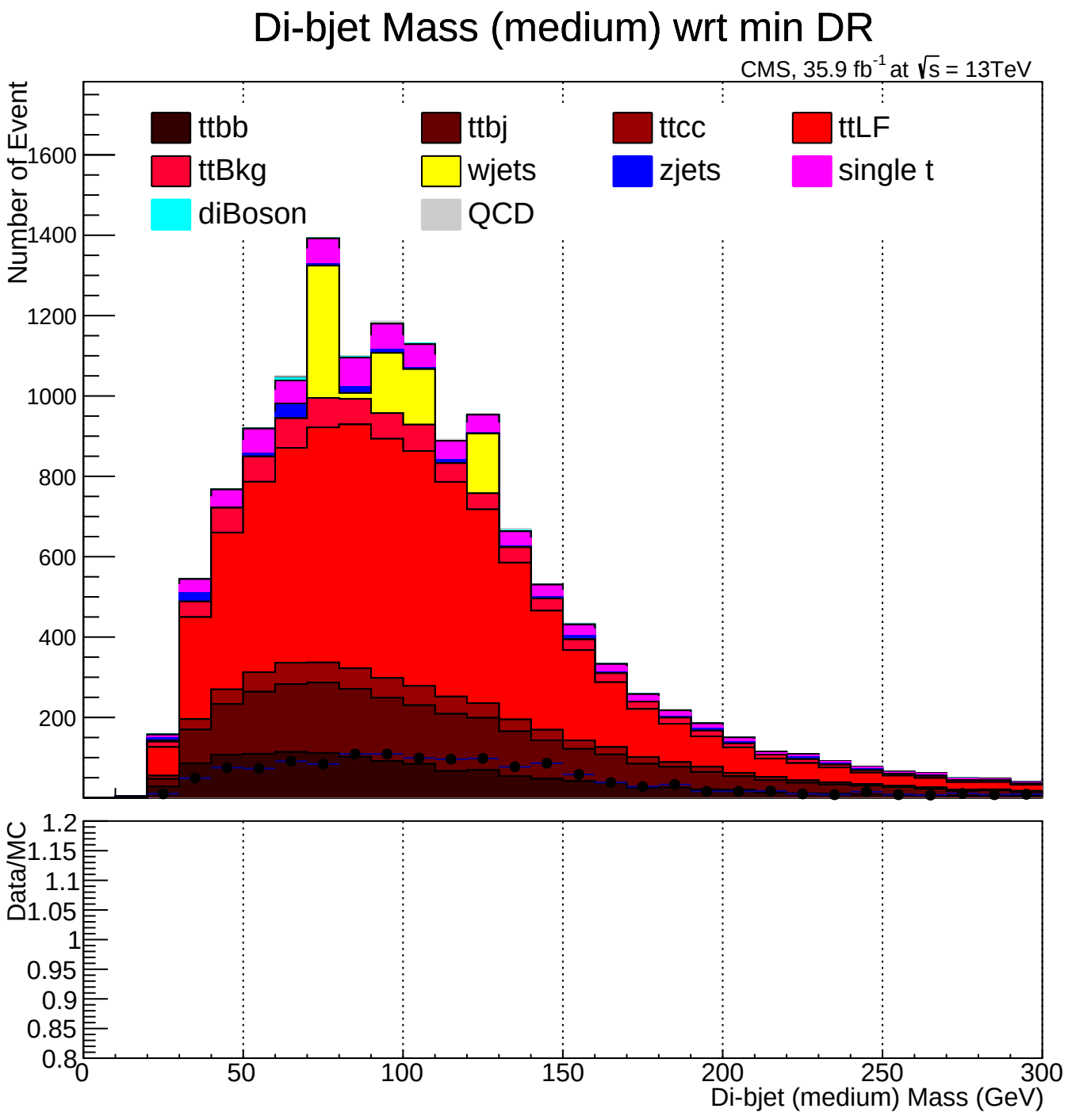

Number of b tagged jets (medium)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
16000
14000
12000
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2M)

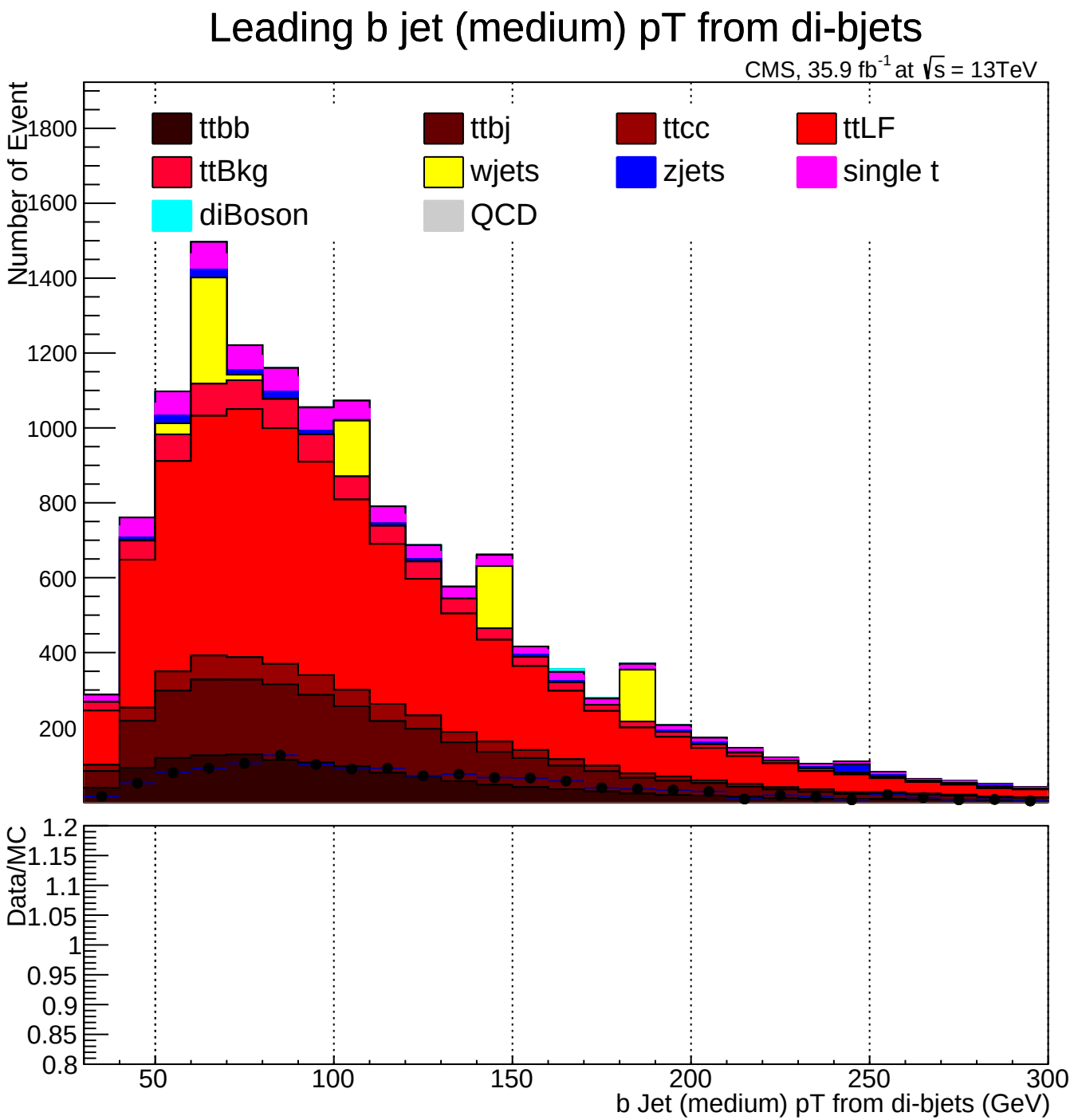

Number of b tagged jets (tight)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
7000
6000
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2T)

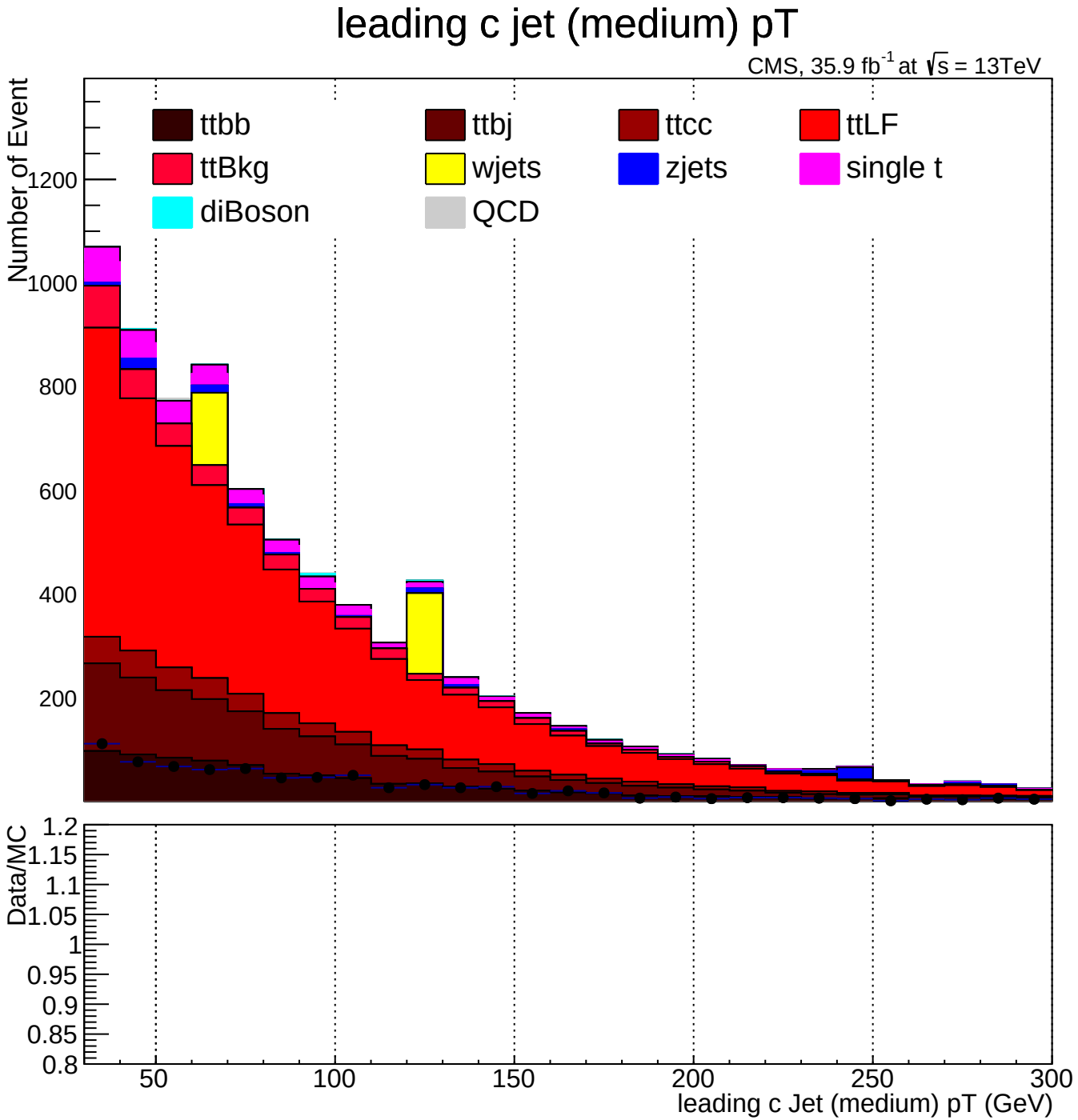

Number of c tagged jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
c-tagged Jet Multiplicity (M)

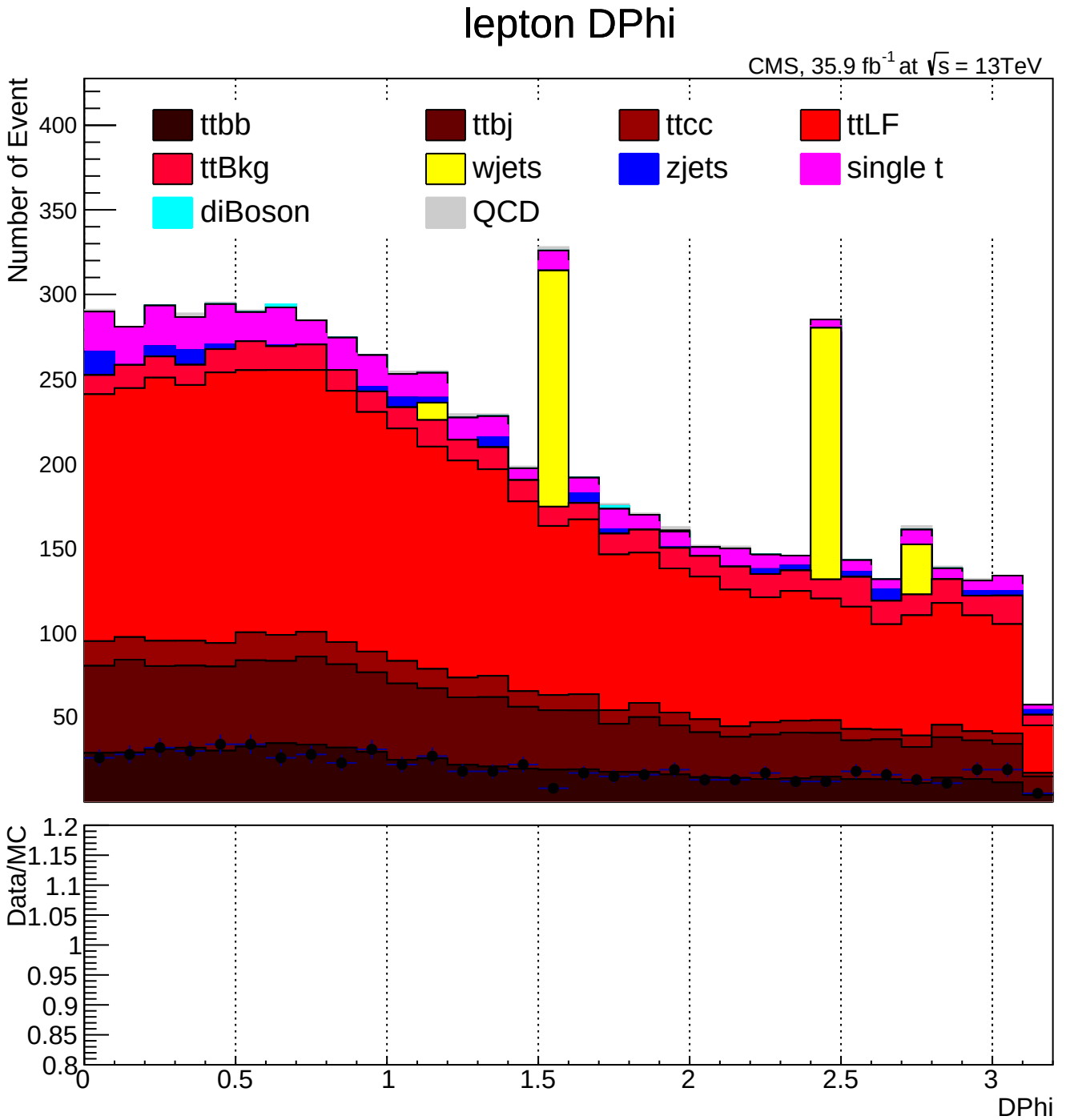

MET
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
MET (GeV)

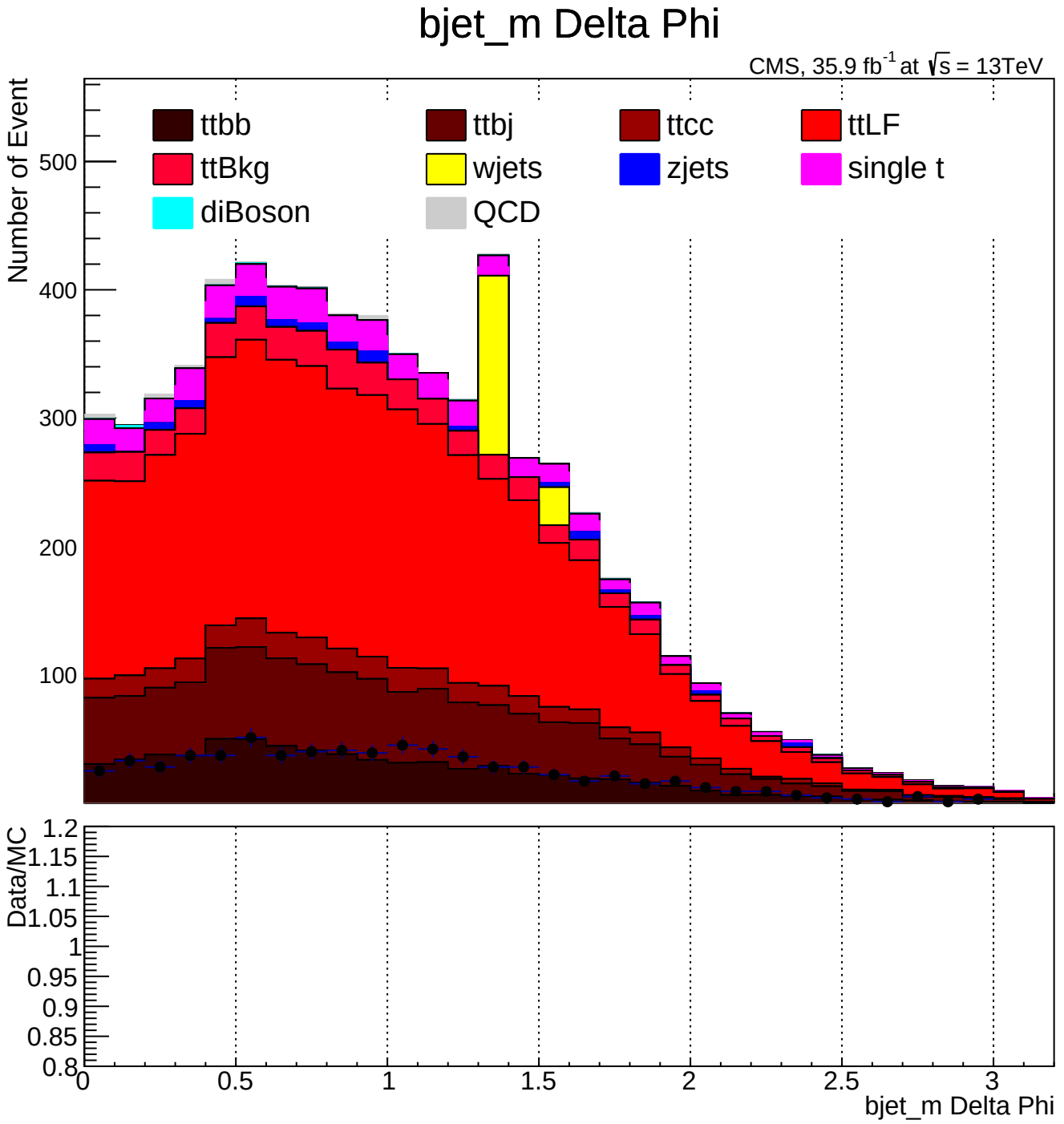

W Mass
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Transverse Mass (GeV)

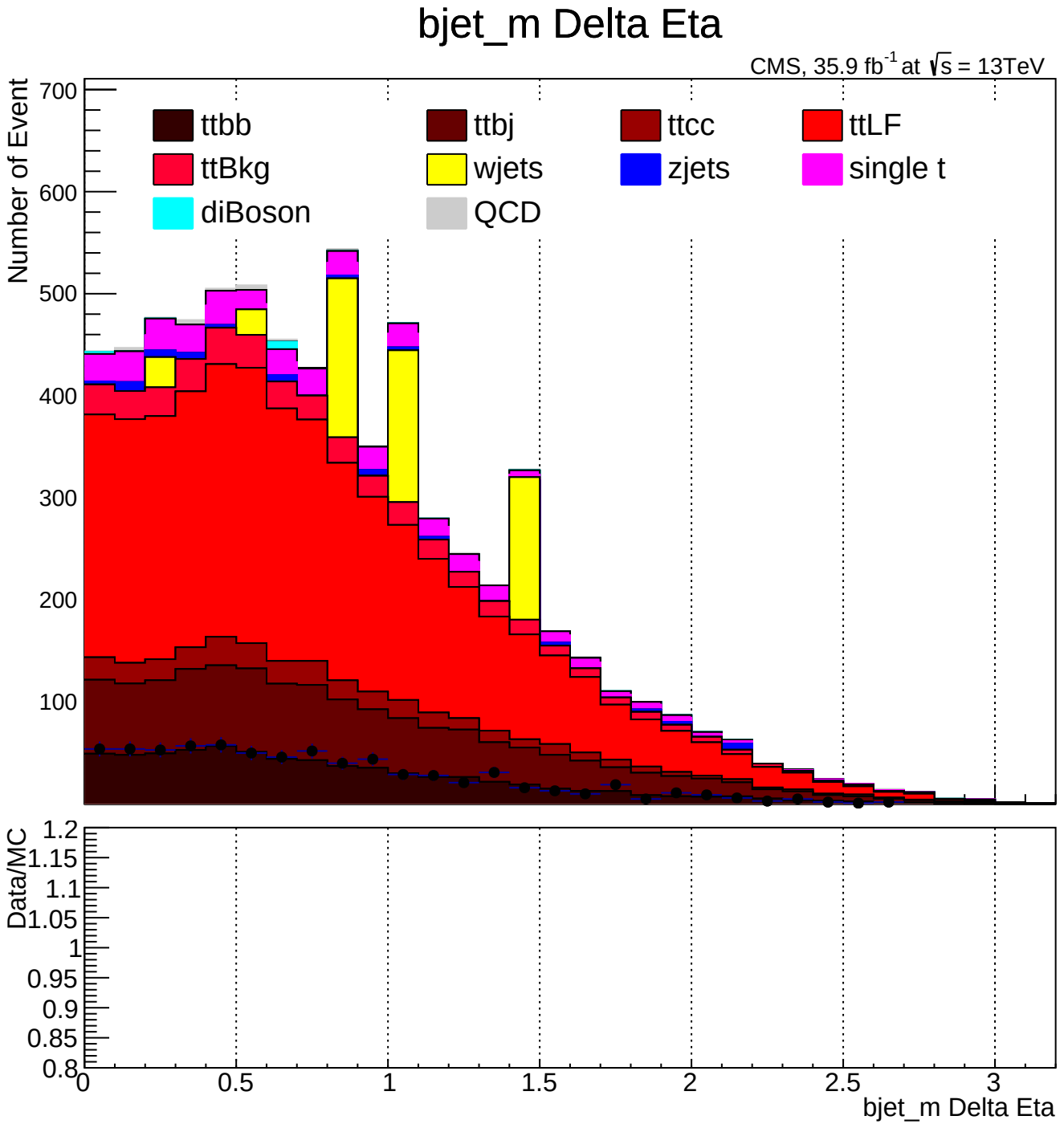

Di-bjet Mass (medium) wrt min DR
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
Di-bjet (medium) Mass (GeV)

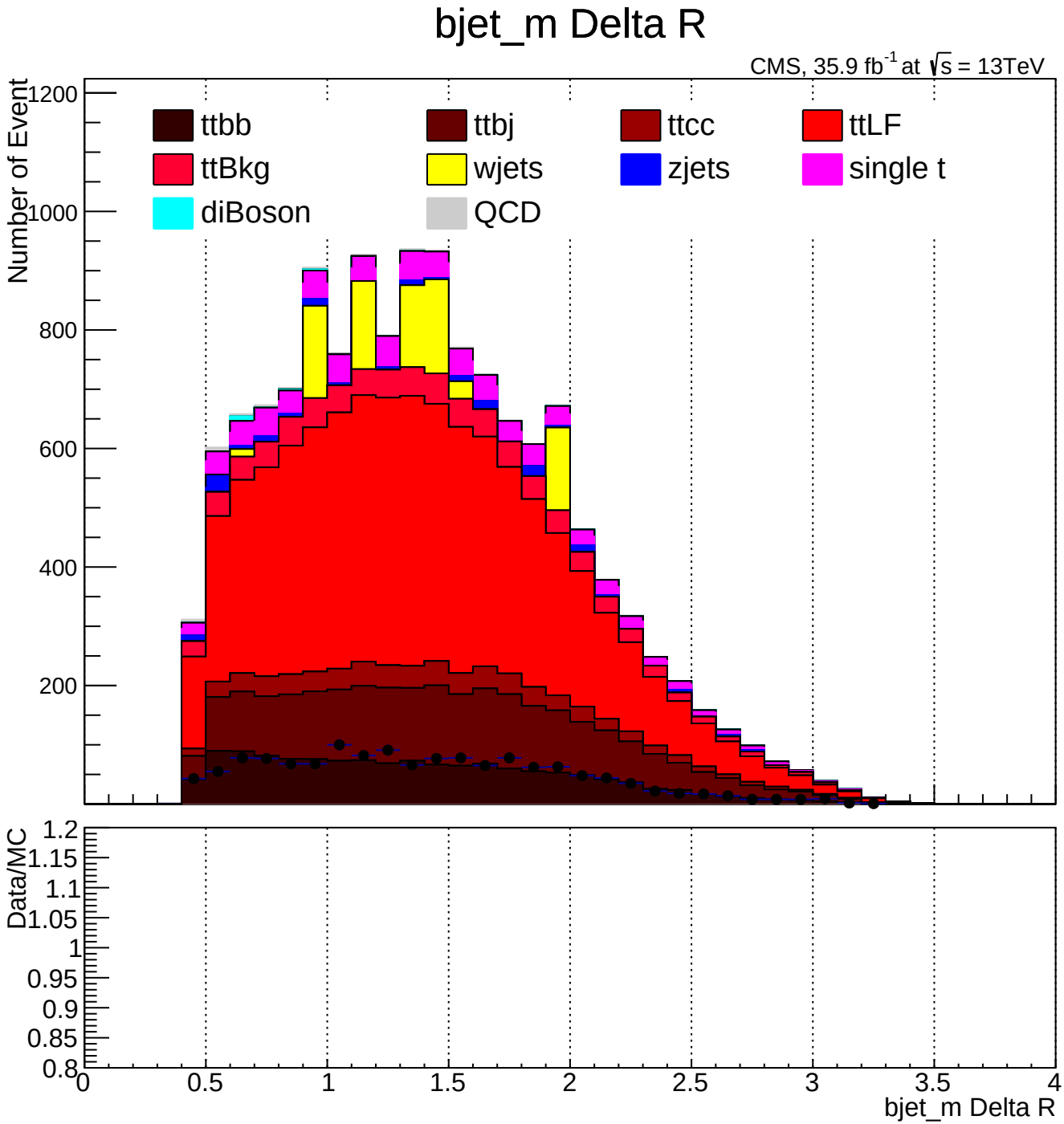

Leading b jet (medium) pT from di-bjets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b Jet (medium) pT from di-bjets (GeV)

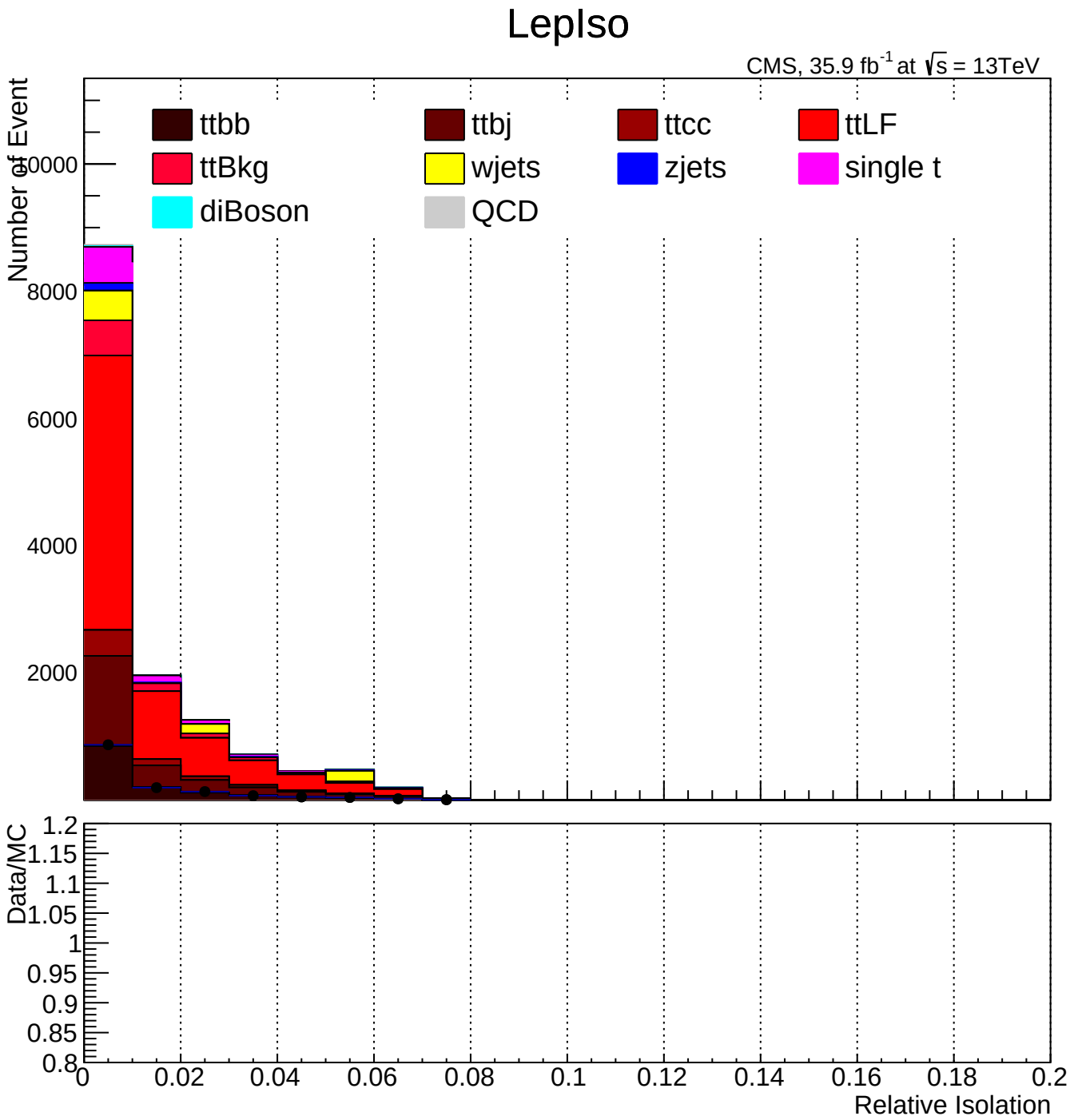

leading c jet (medium) pT
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
1200
1000
800
600
400
200
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
leading c Jet (medium) pT (GeV)

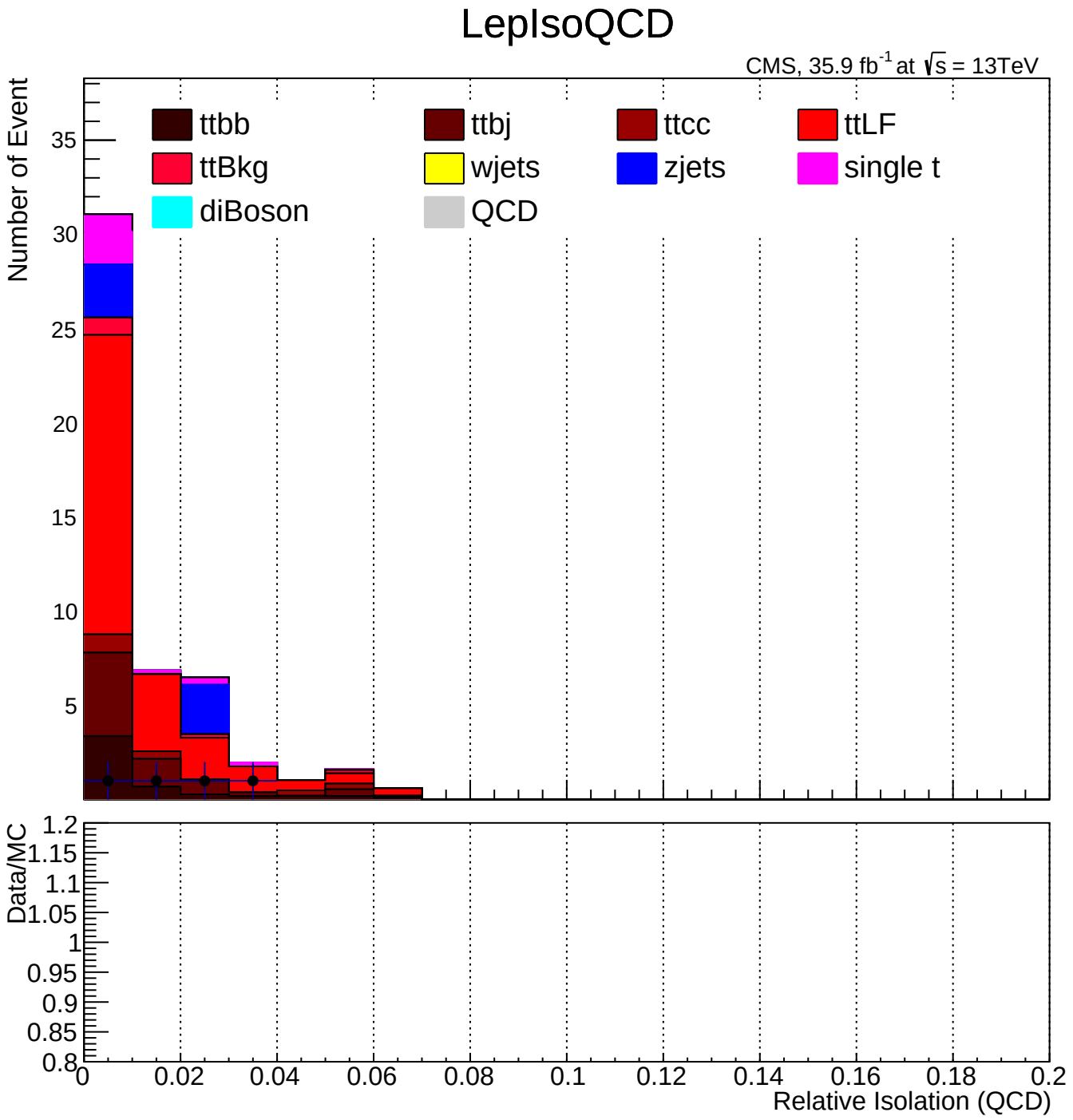

lepton DPhi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
400
350
300
250
200
150
100
50
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
DPhi

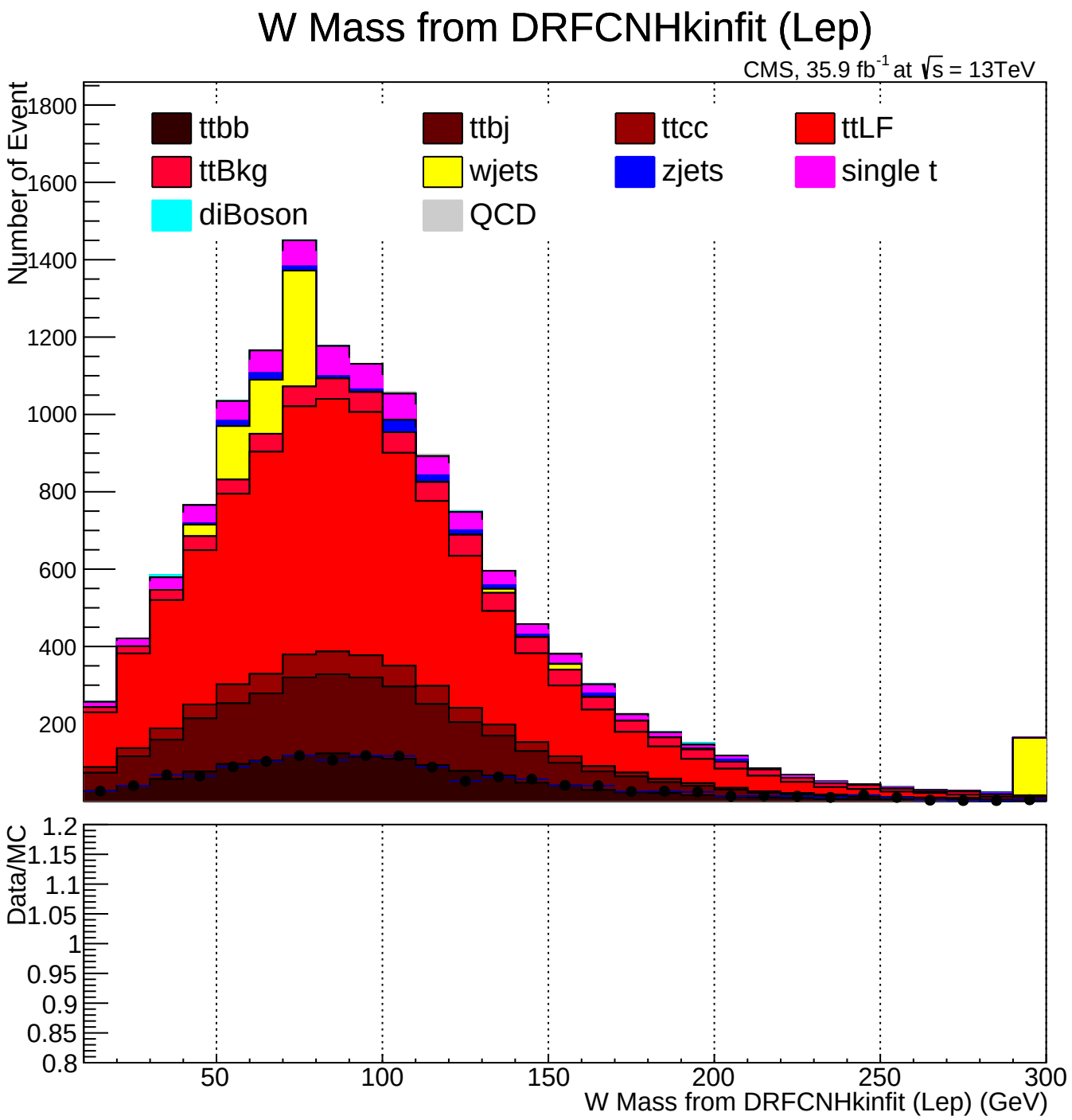

bjet_m Delta Phi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
500
400
300
200
100
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Phi

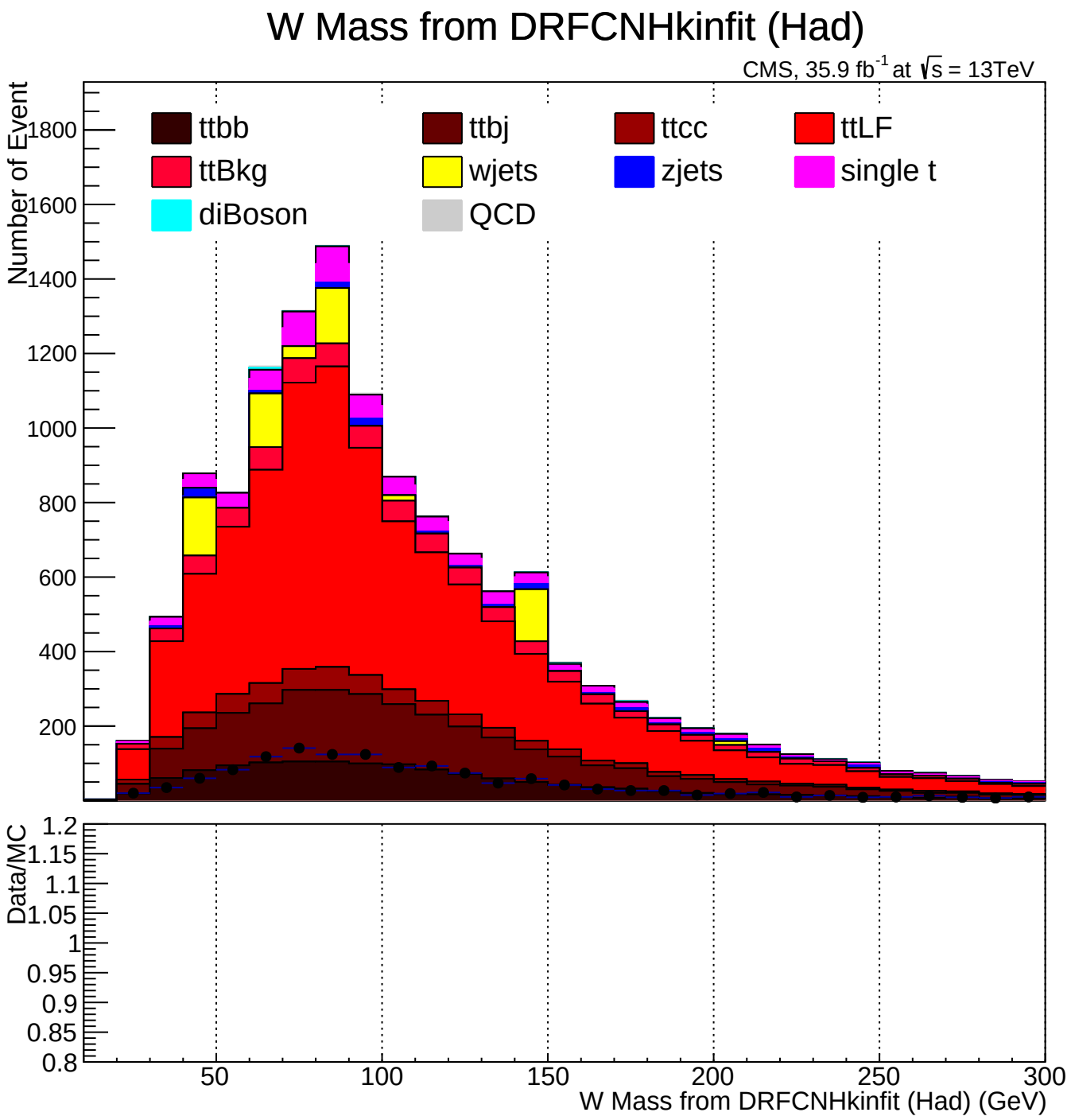

bjet_m Delta Eta
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta Eta

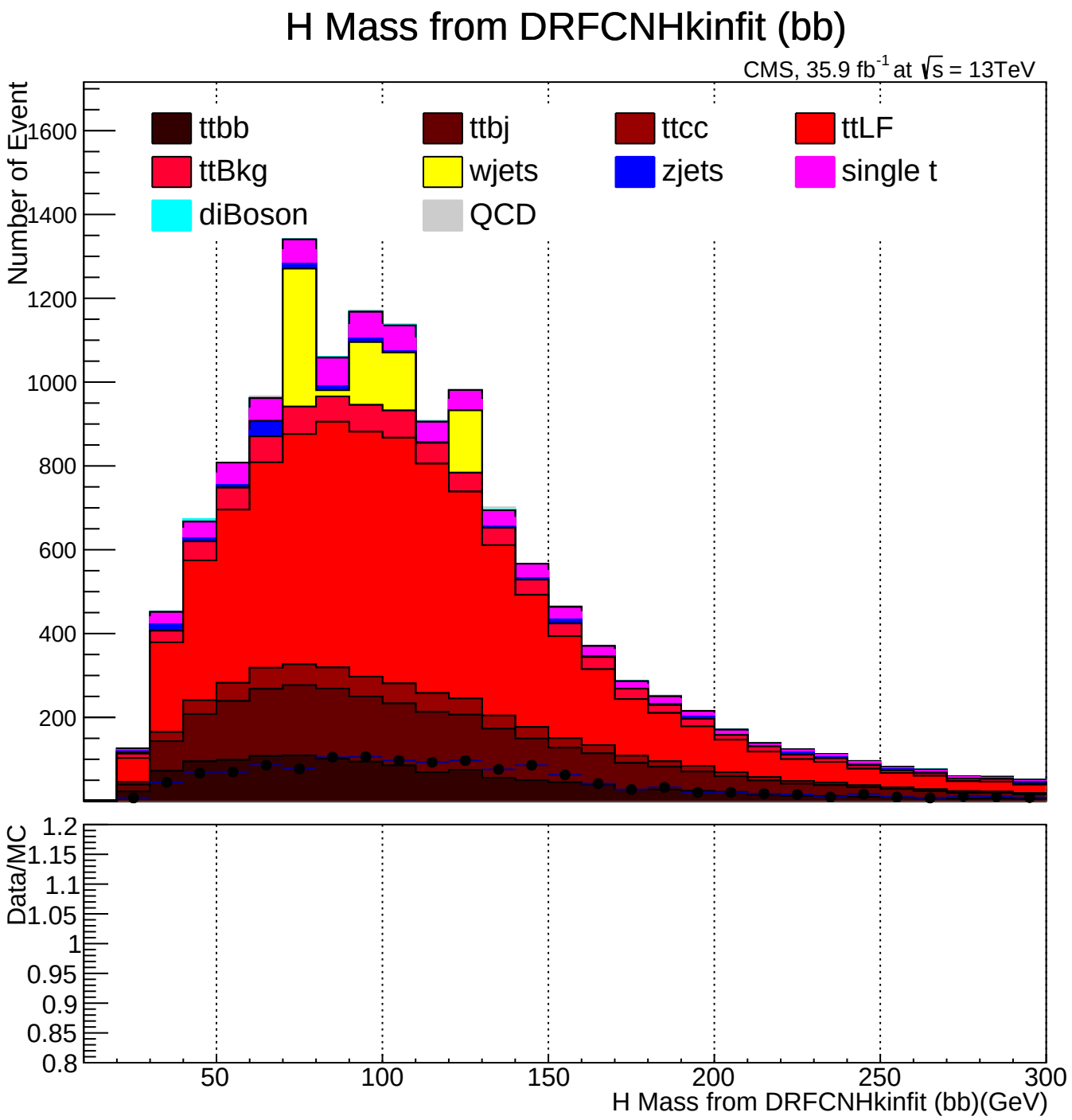

bjet_m Delta R
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta R

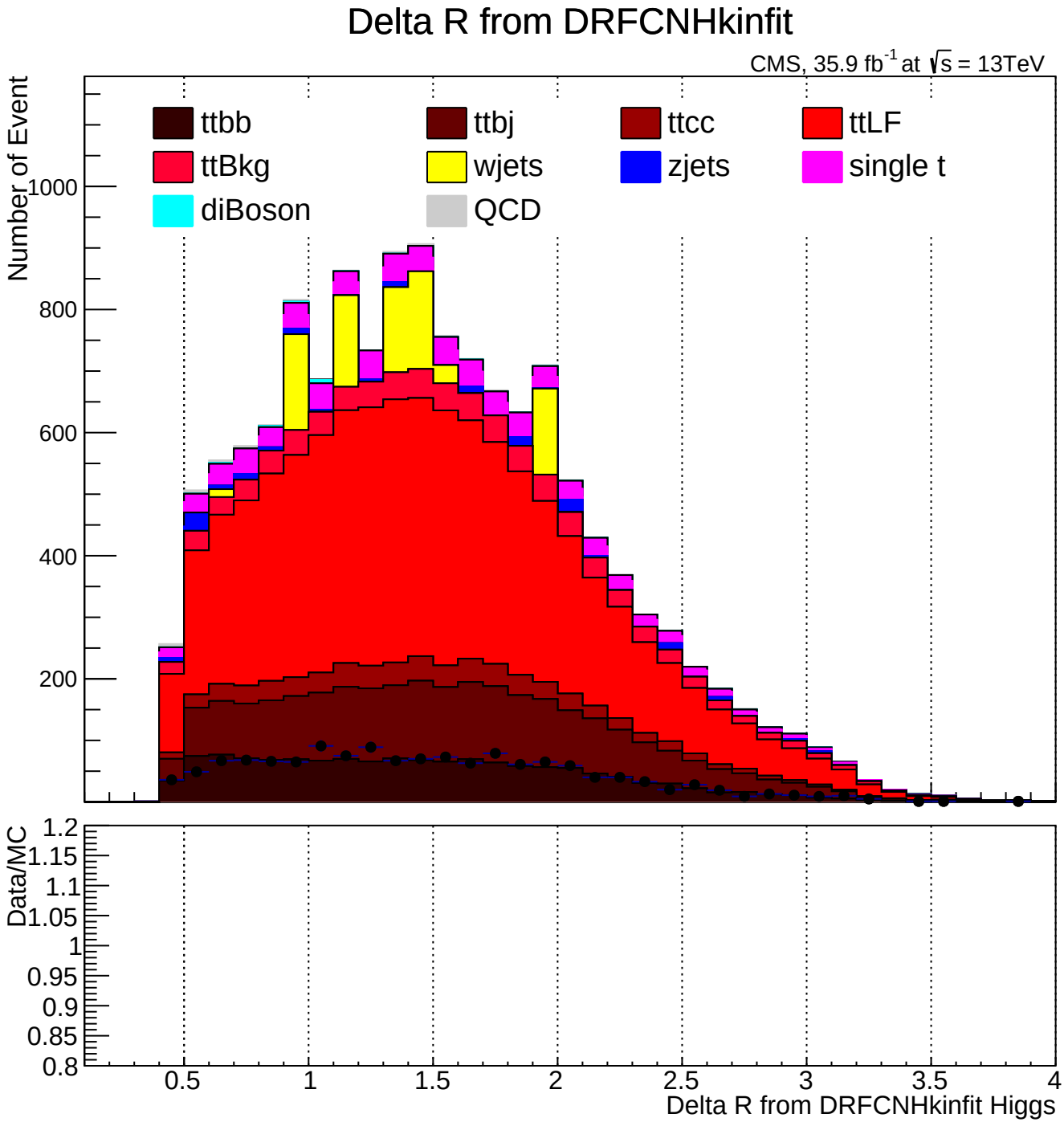

LepIso
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation

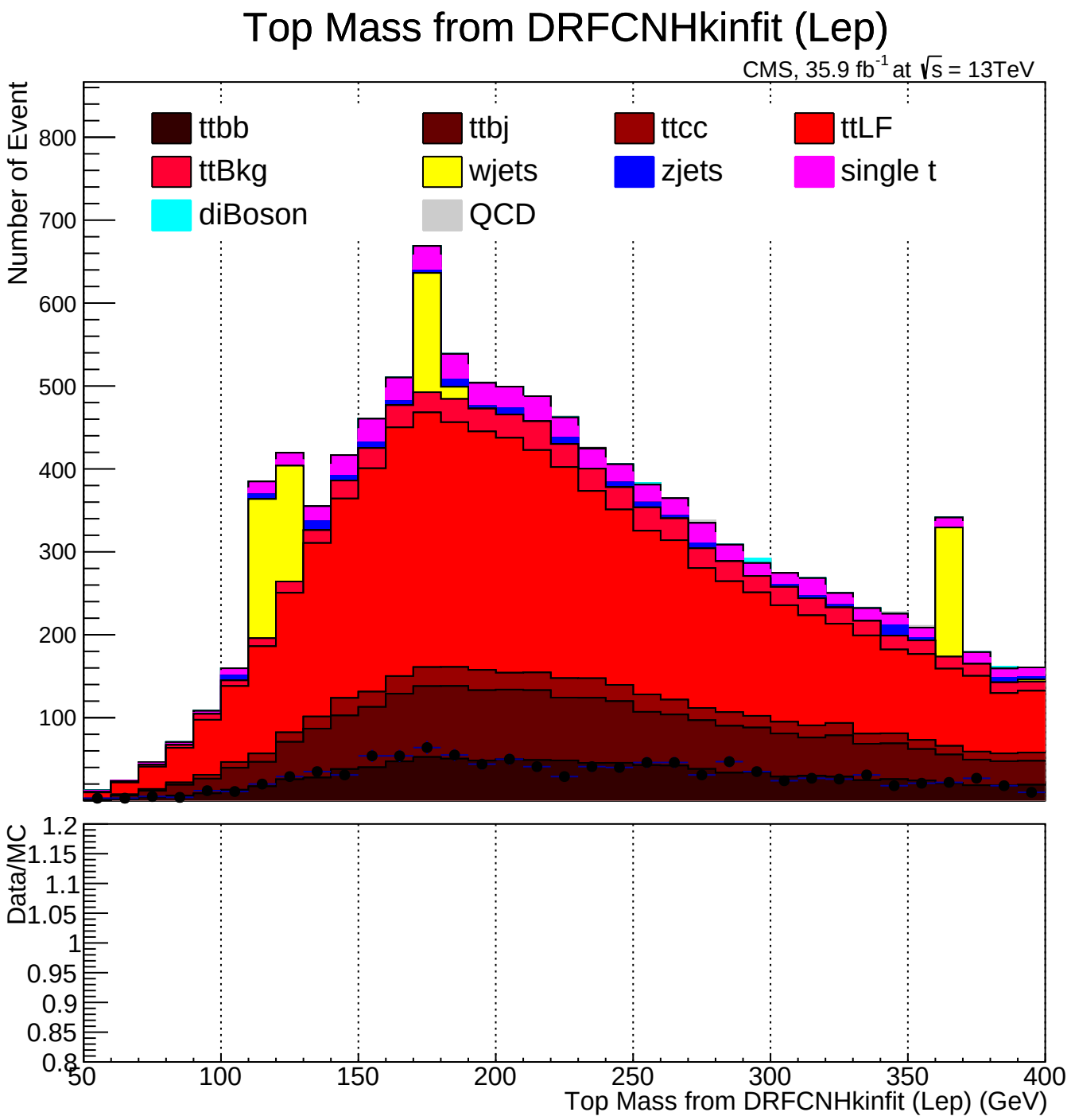

LepIsoQCD
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation (QCD)

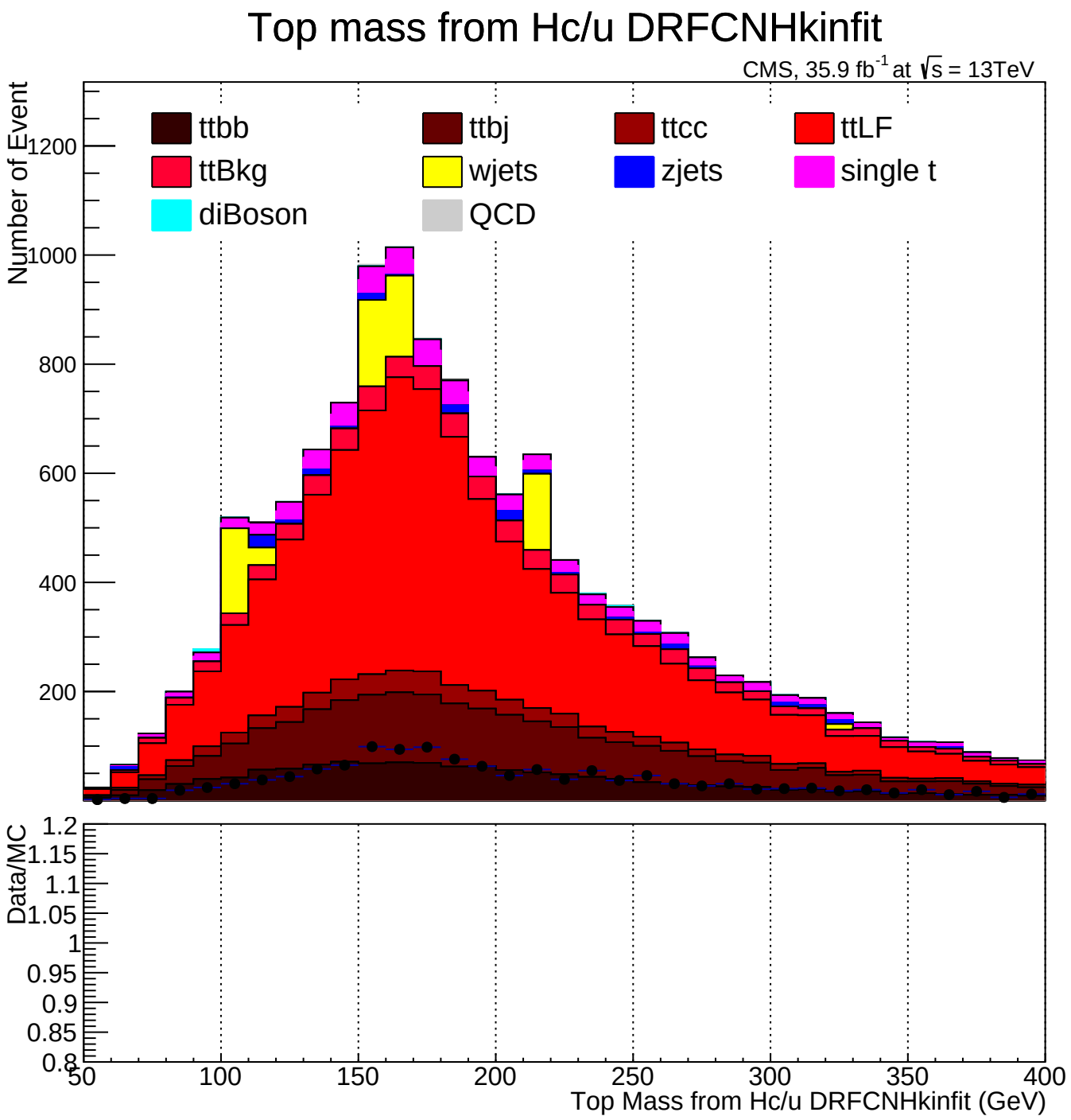

W Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
W Mass from DRFCNHkinfit (Lep) (GeV)

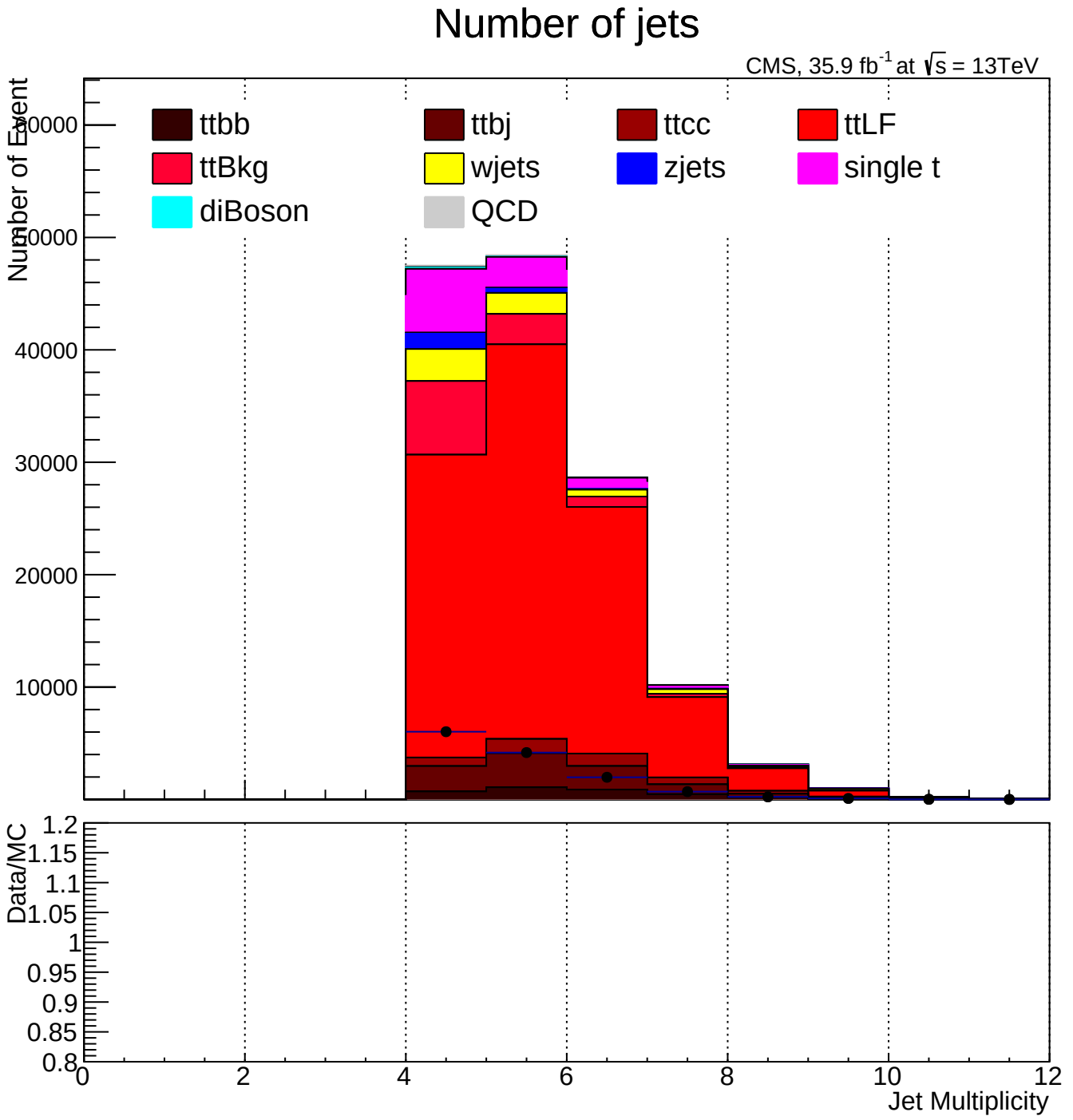

W Mass from DRFCNHkinfit (Had)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
W Mass from DRFCNHkinfit (Had) (GeV)

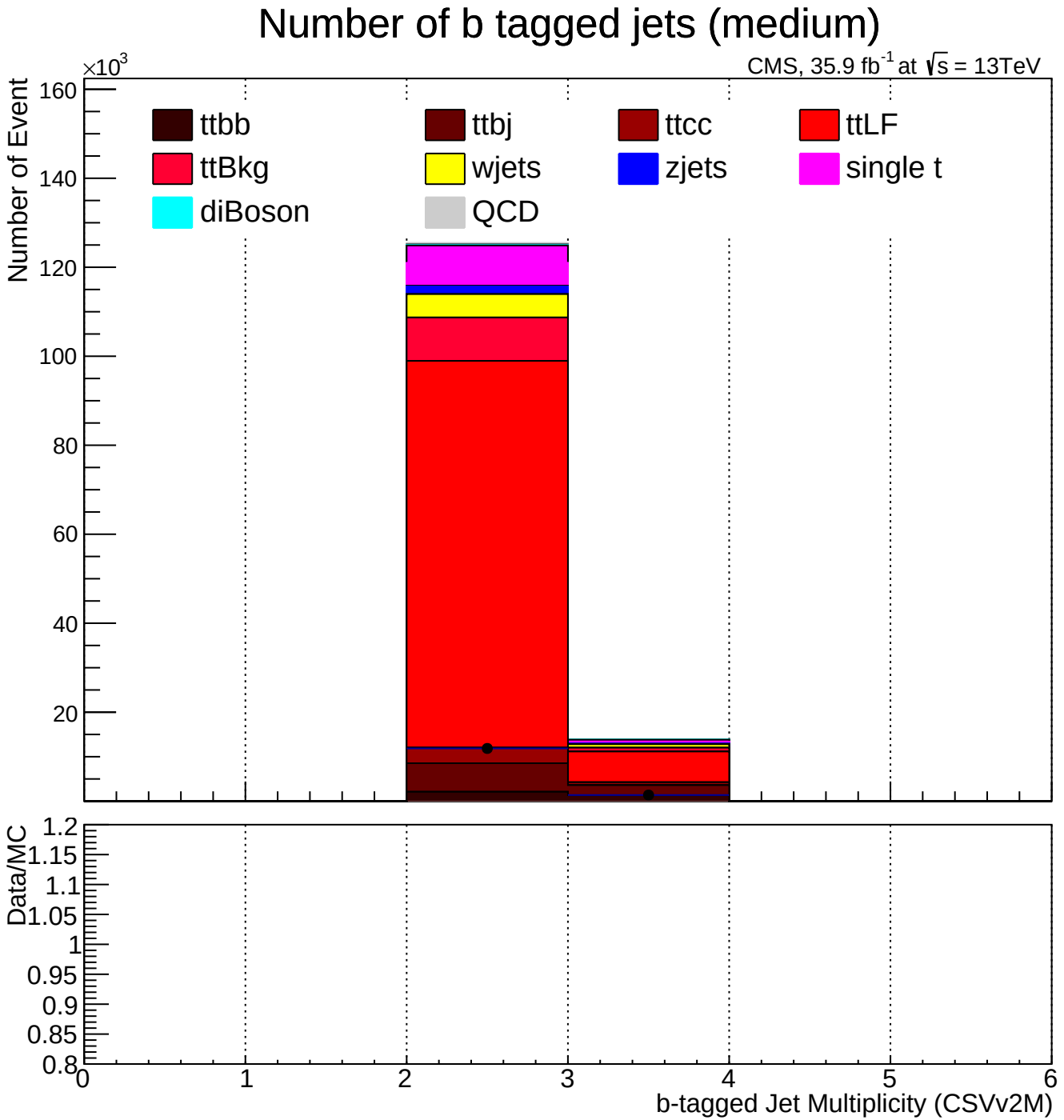

H Mass from DRFCNHkinfit (bb)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
H Mass from DRFCNHkinfit (bb)(GeV)

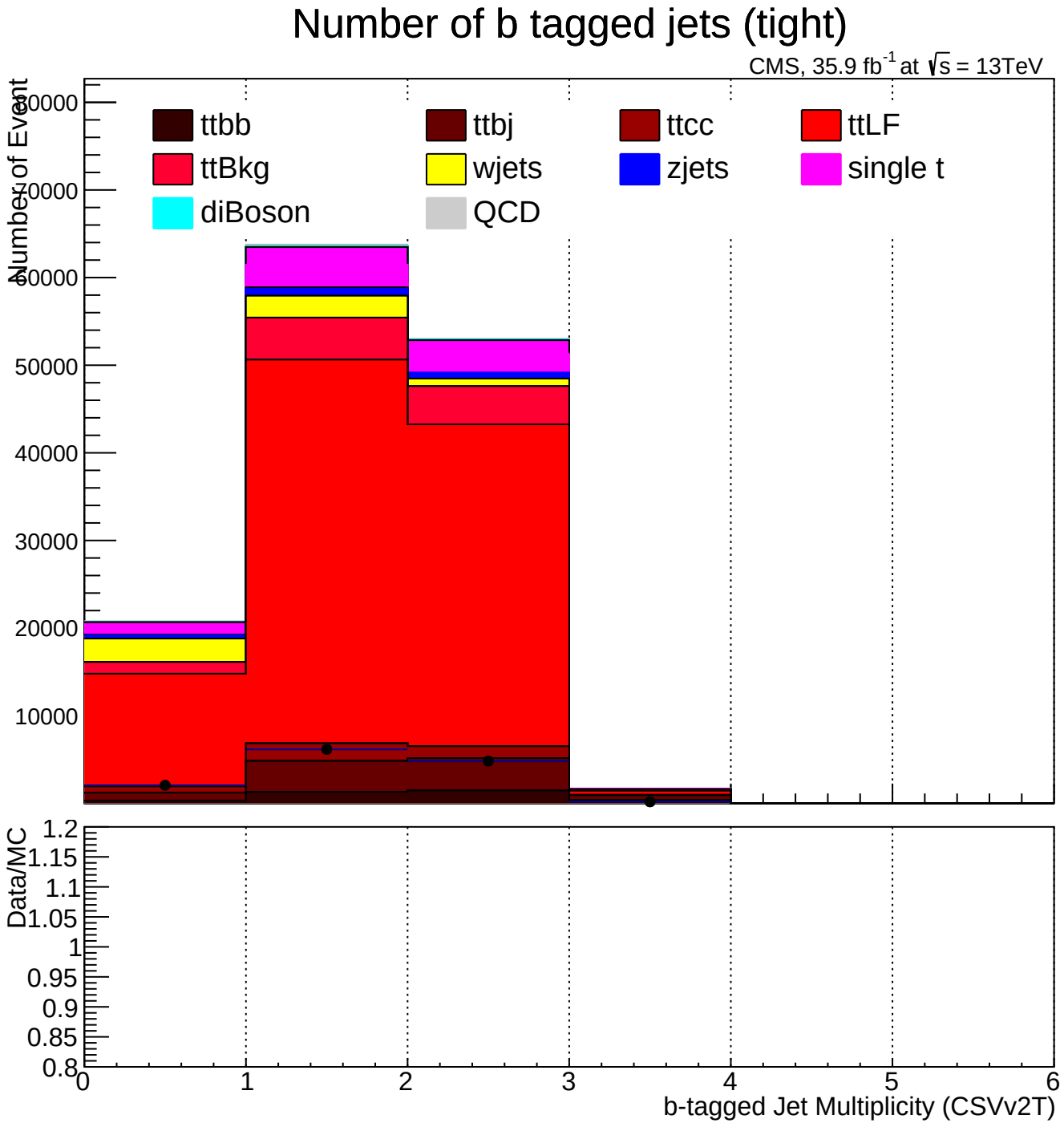

Delta R from DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
1000
800
600
400
200
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0.5
1
1.5
2
2.5
3
3.5
4
Delta R from DRFCNHkinfit Higgs

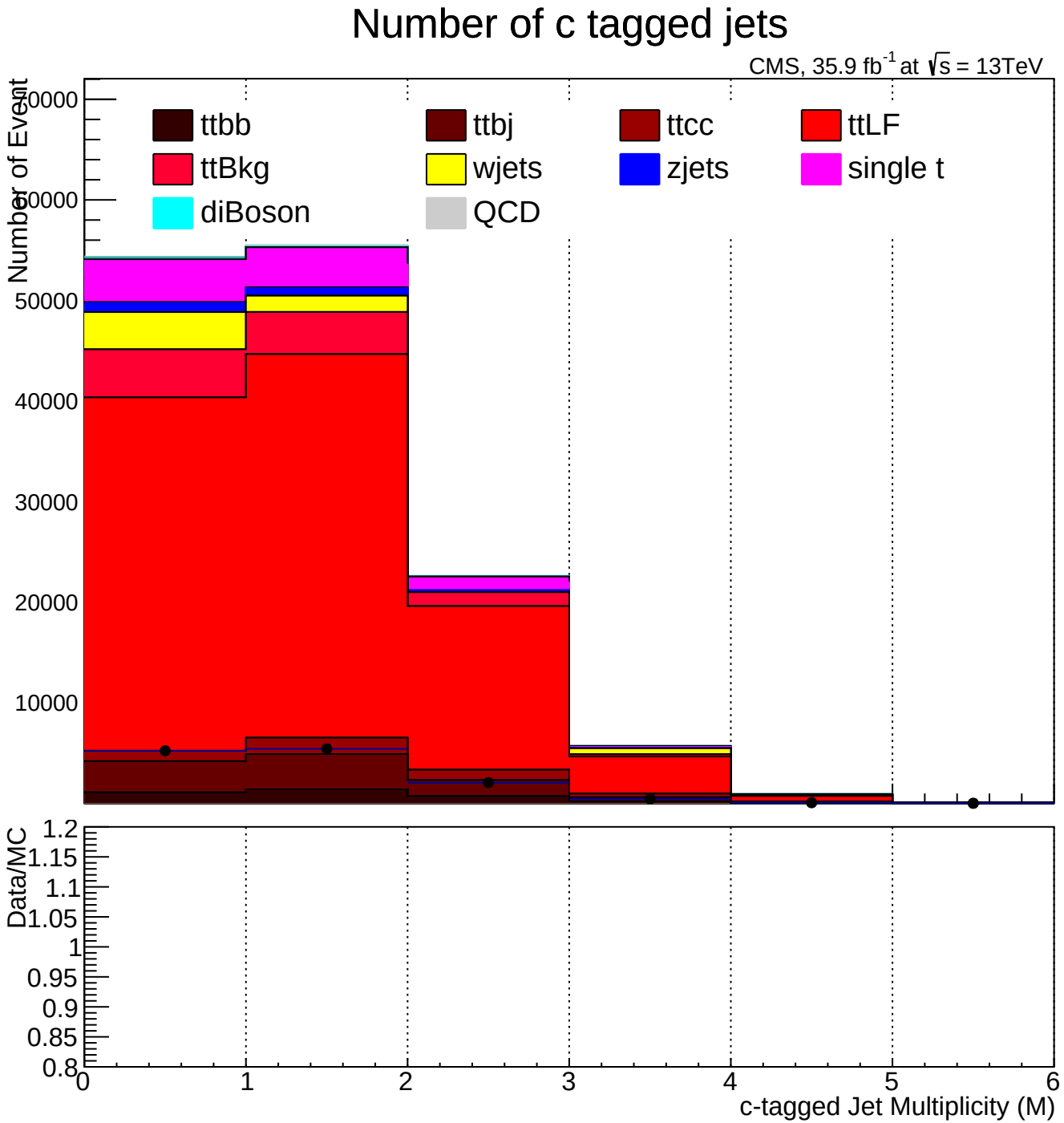

Top Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
Top Mass from DRFCNHkinfit (Lep) (GeV)

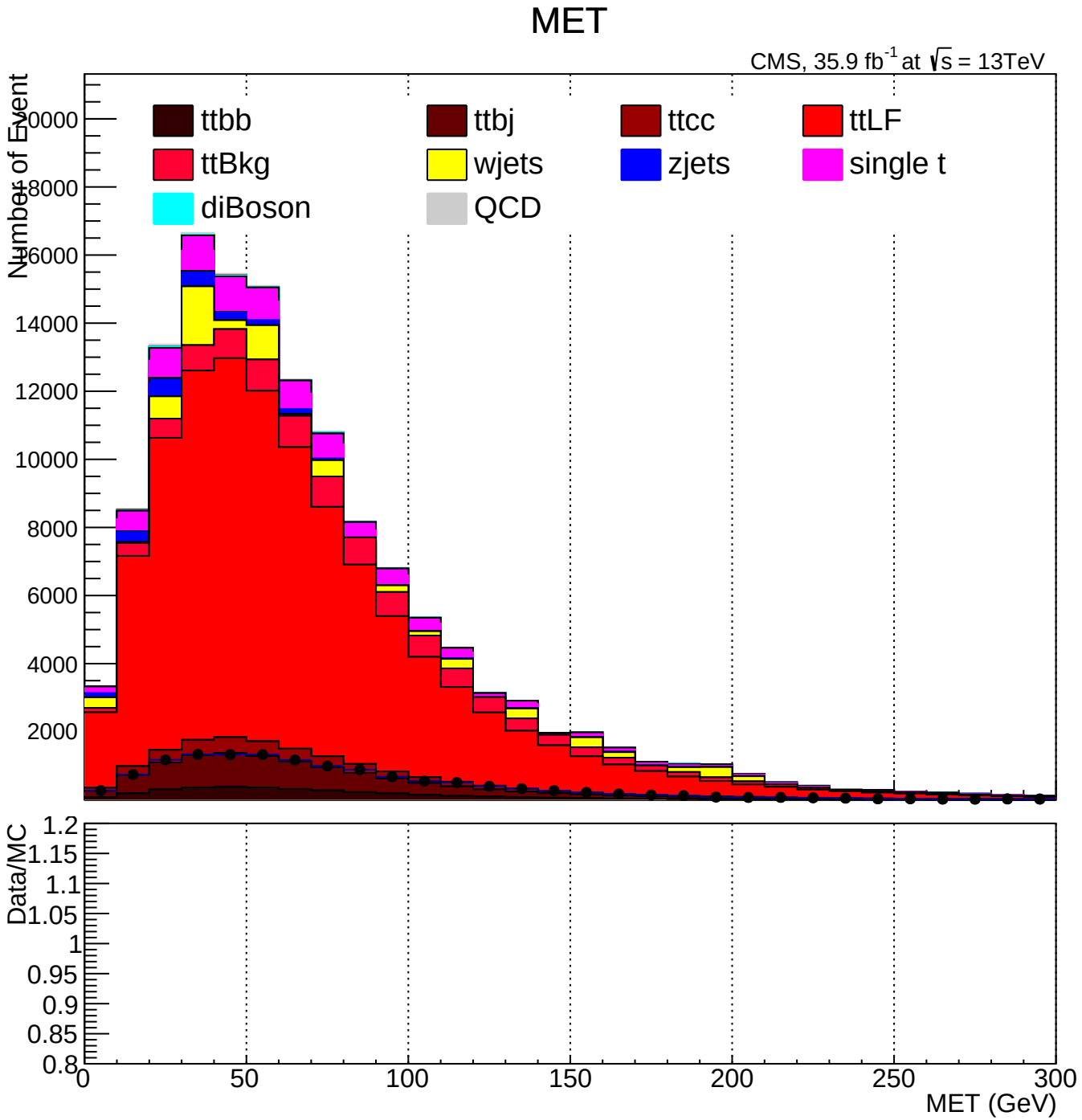

Top mass from Hc/u DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
1200
1000
800
600
400
200
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
350
400
Top Mass from Hc/u DRFCNHkinfit (GeV)

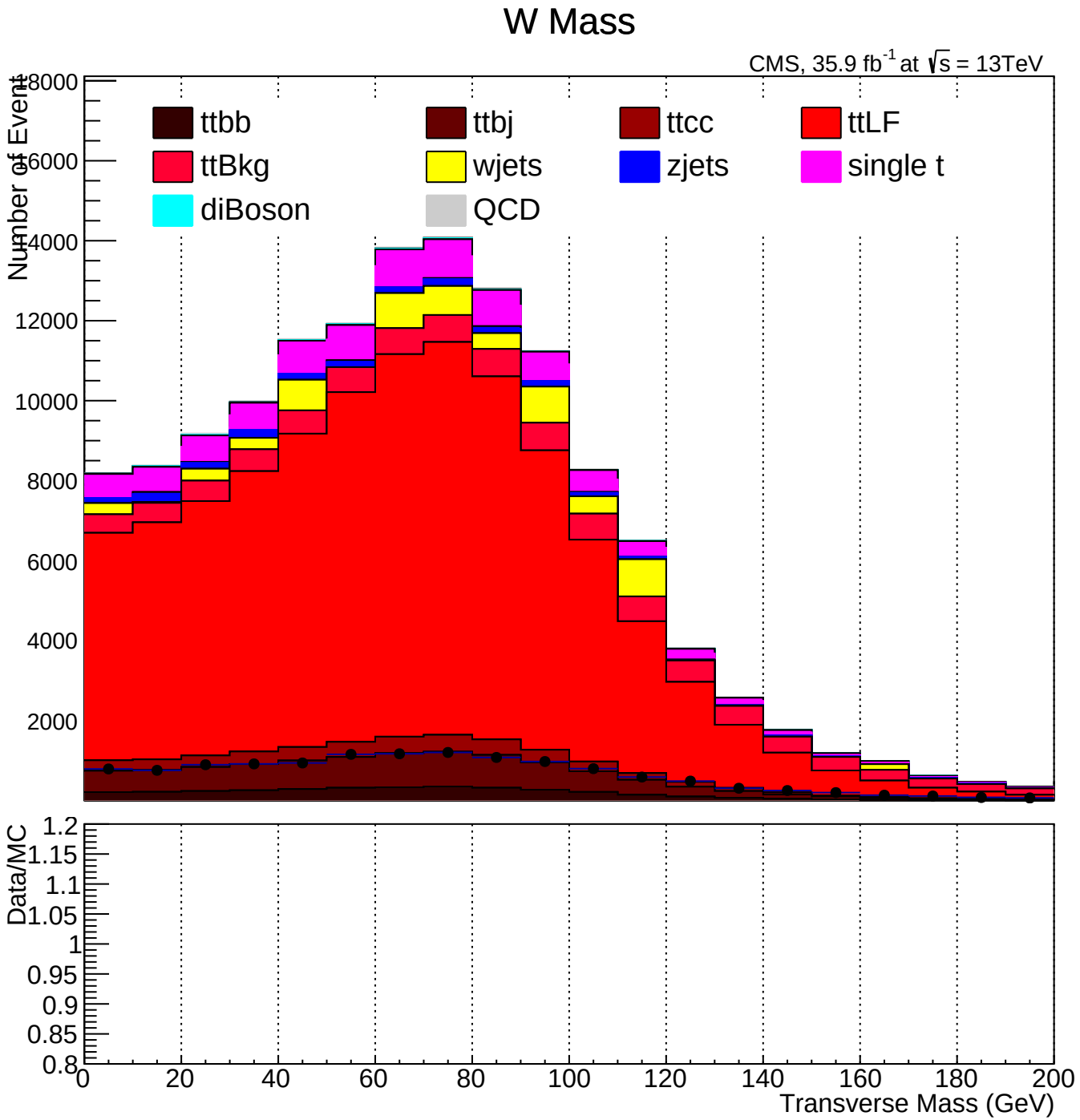

Number of jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
50000
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
2
4
6
8
10
12
Jet Multiplicity

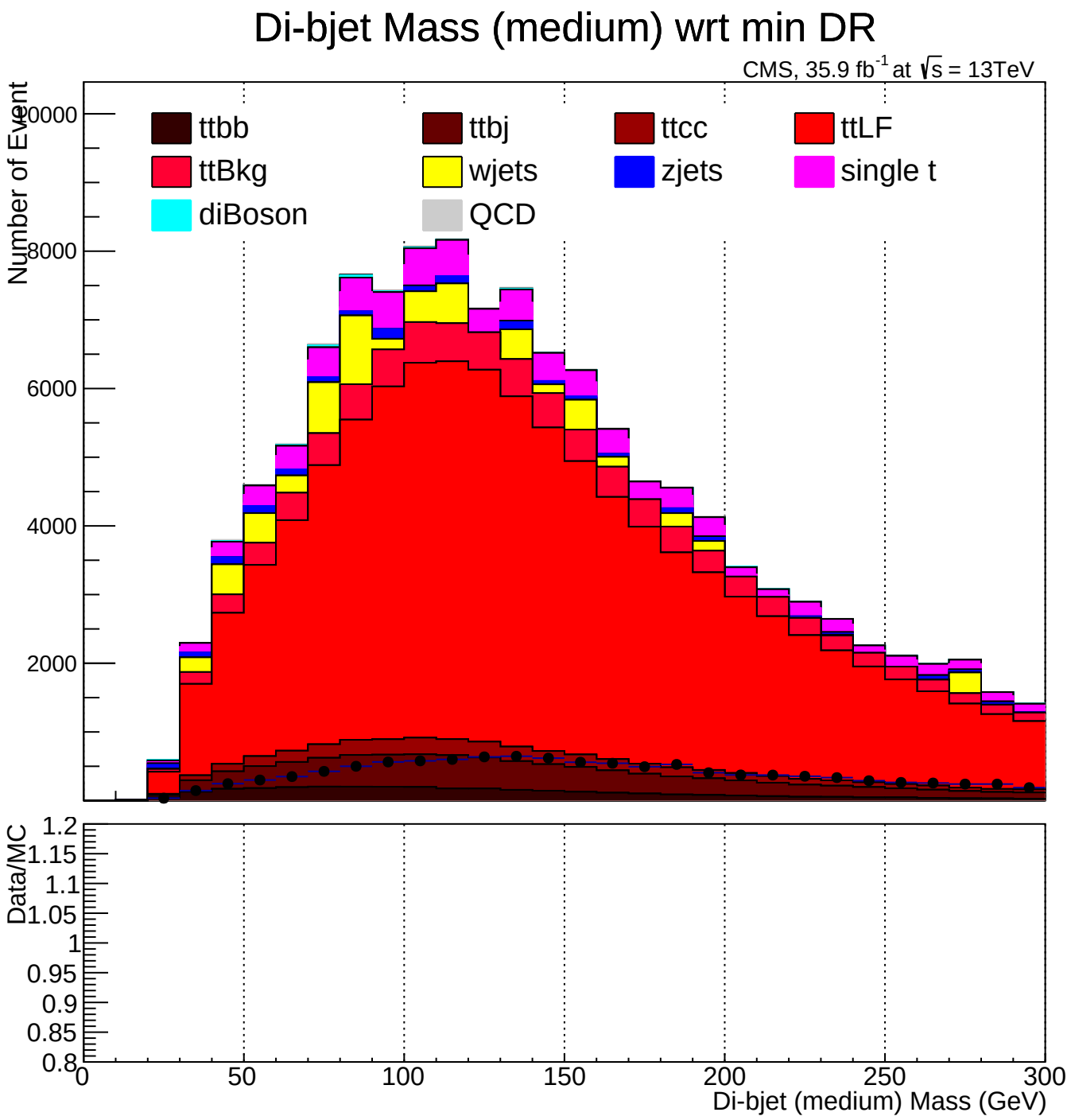

Number of b tagged jets (medium)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
$\times 10^3$
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b-tagged Jet Multiplicity (CSVv2M)

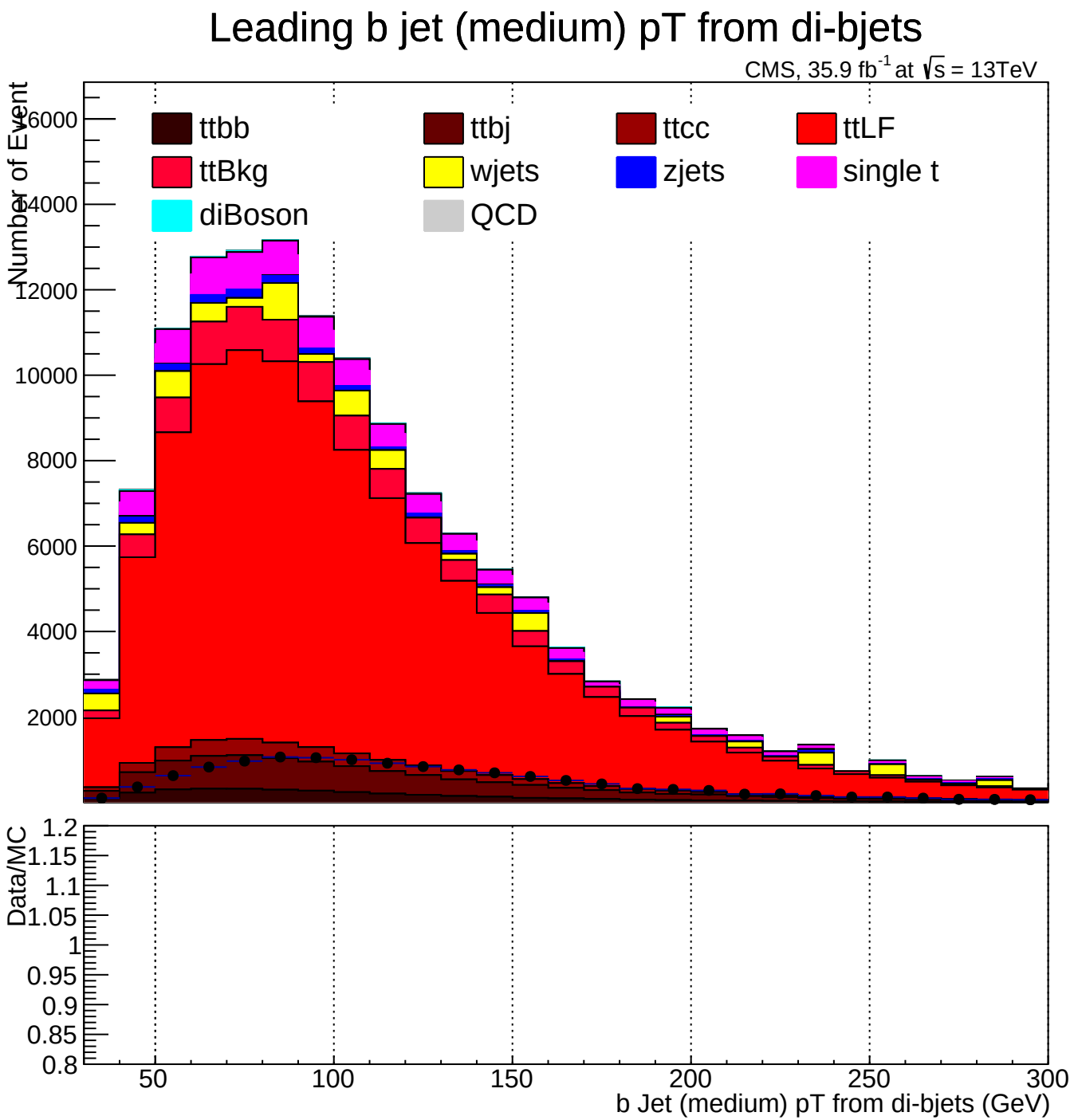

Number of b tagged jets (tight)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b-tagged Jet Multiplicity (CSVv2T)

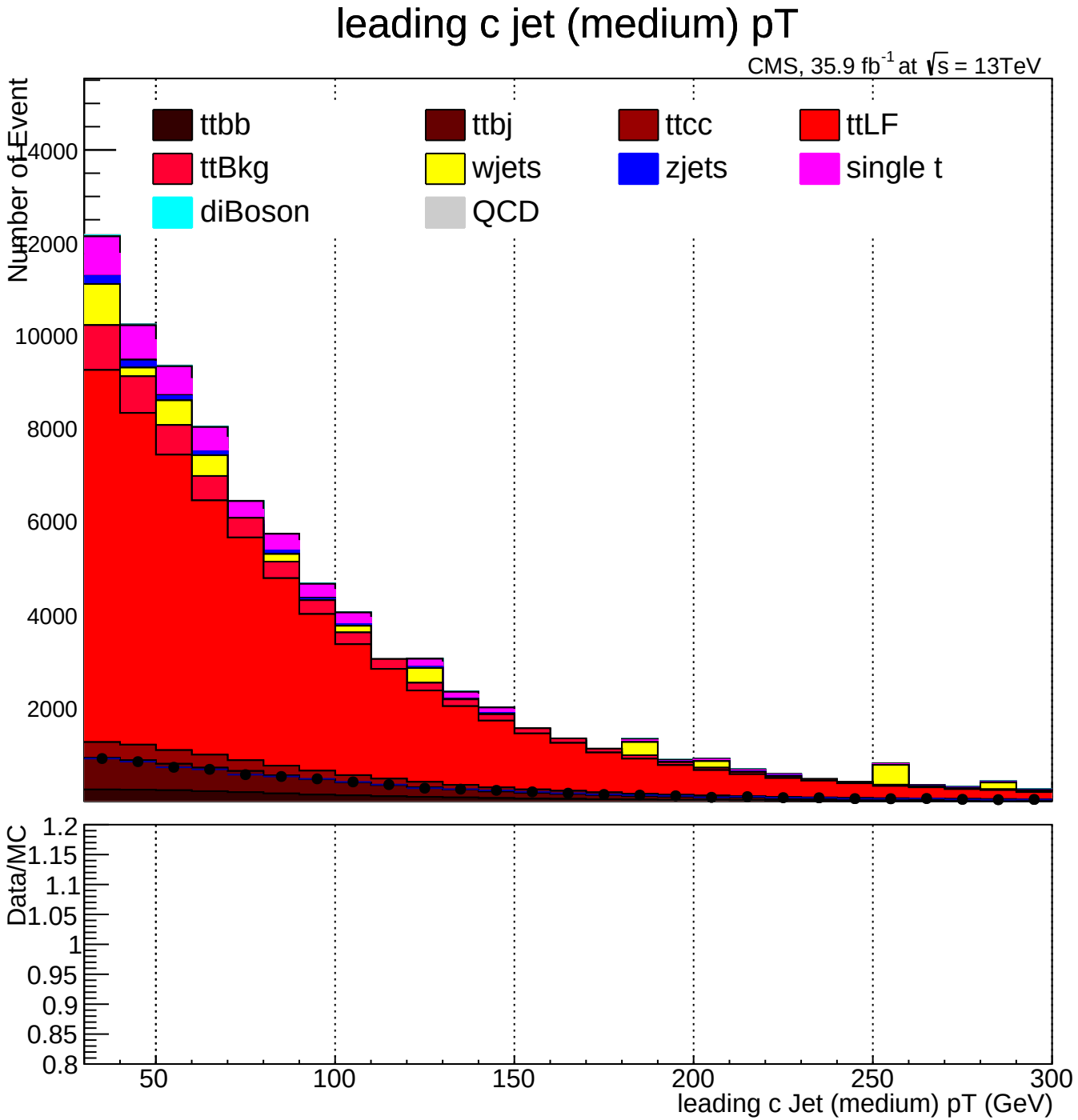

Number of c tagged jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
c-tagged Jet Multiplicity (M)

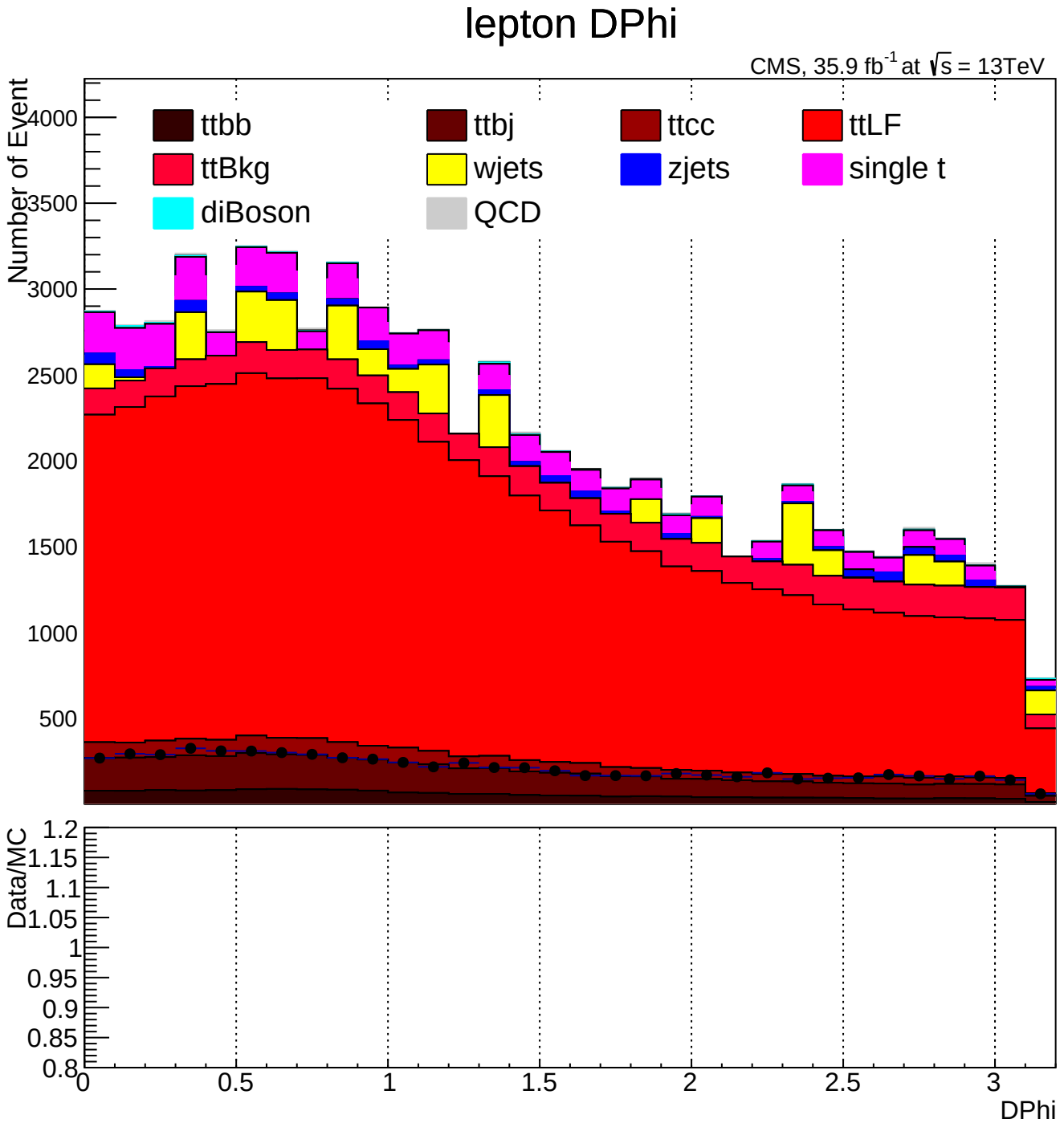

MET
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
MET (GeV)

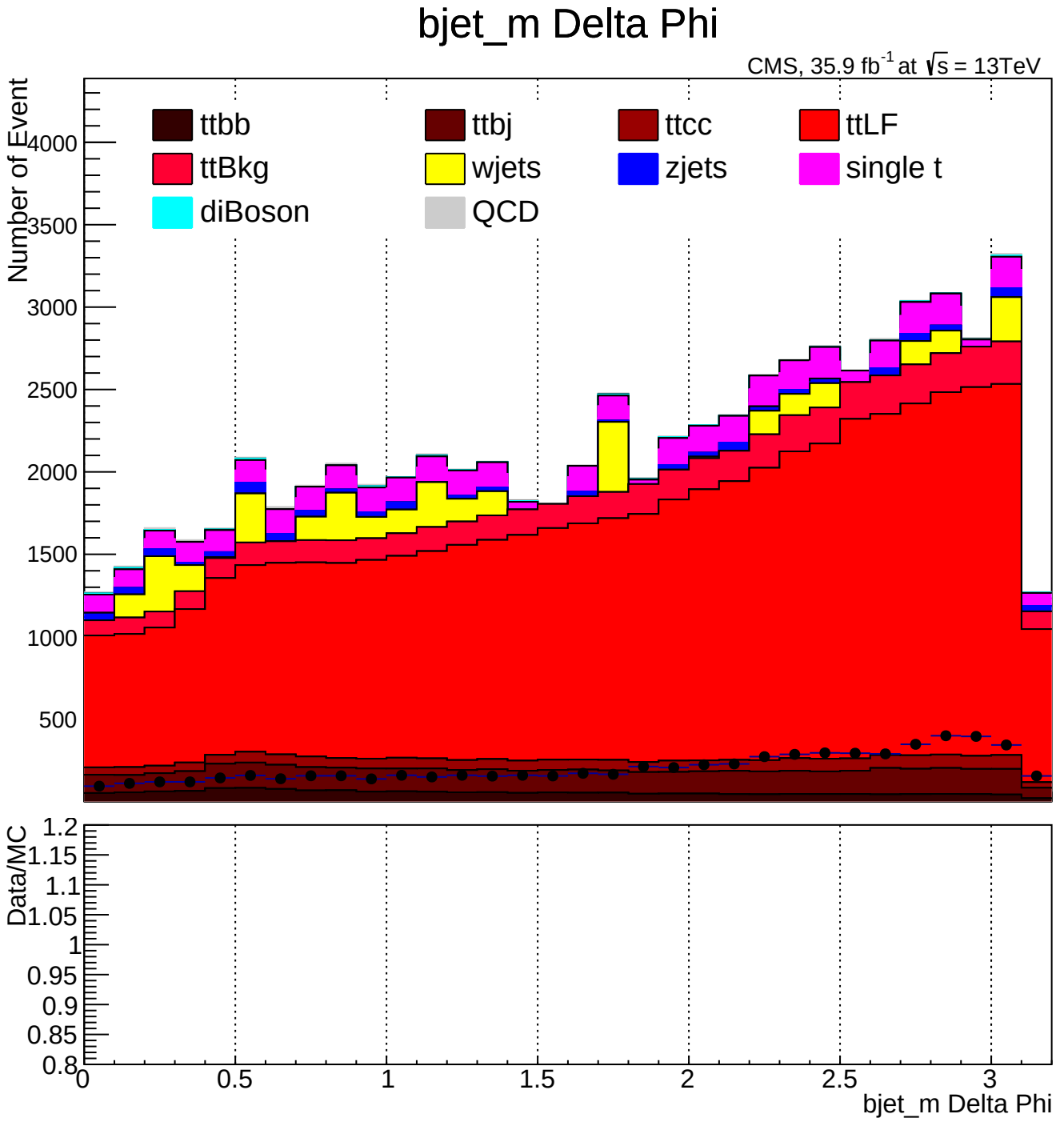

W Mass
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Transverse Mass (GeV)

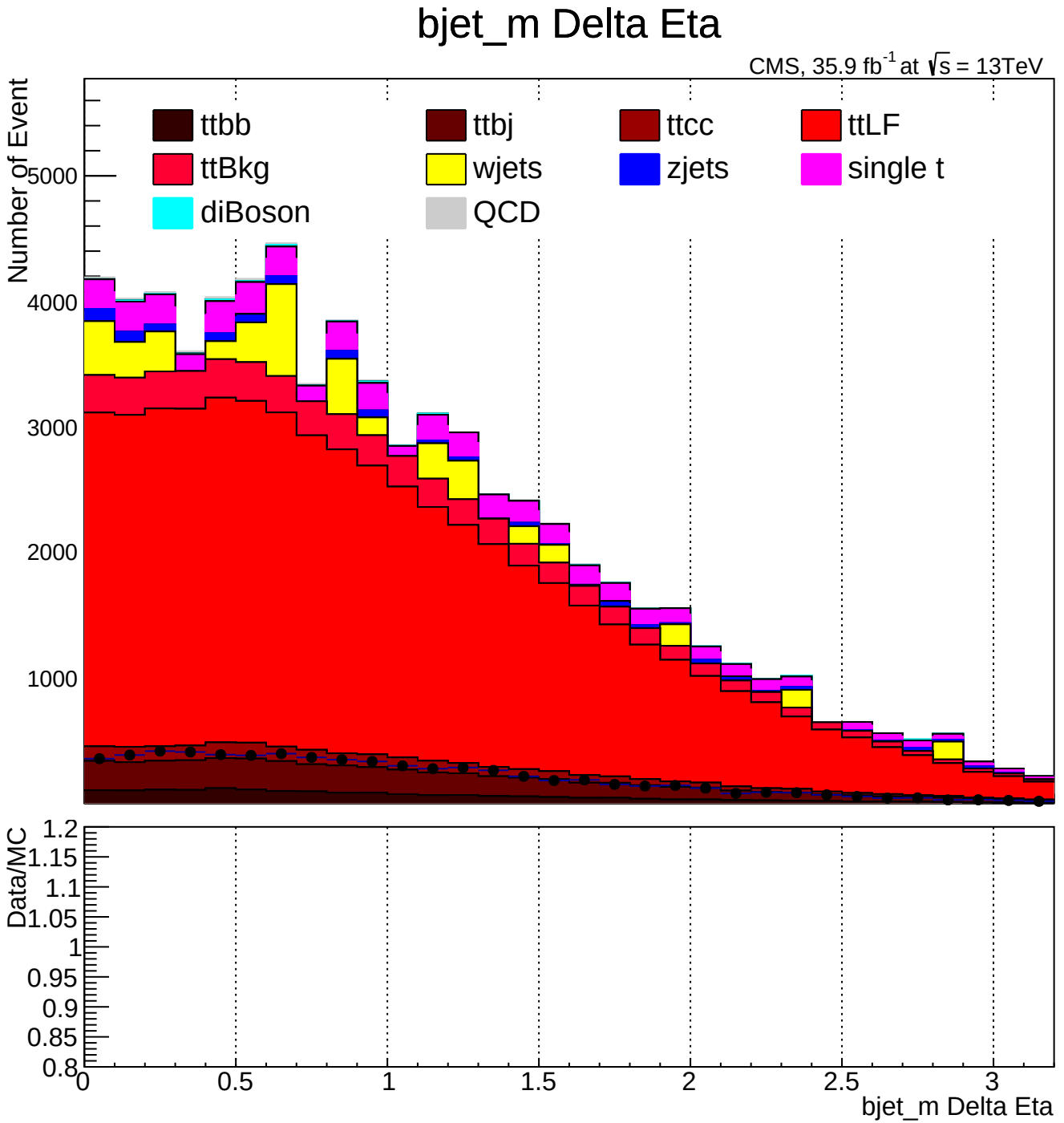

Di-bjet Mass (medium) wrt min DR
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
50
100
150
200
250
300
Di-bjet (medium) Mass (GeV)

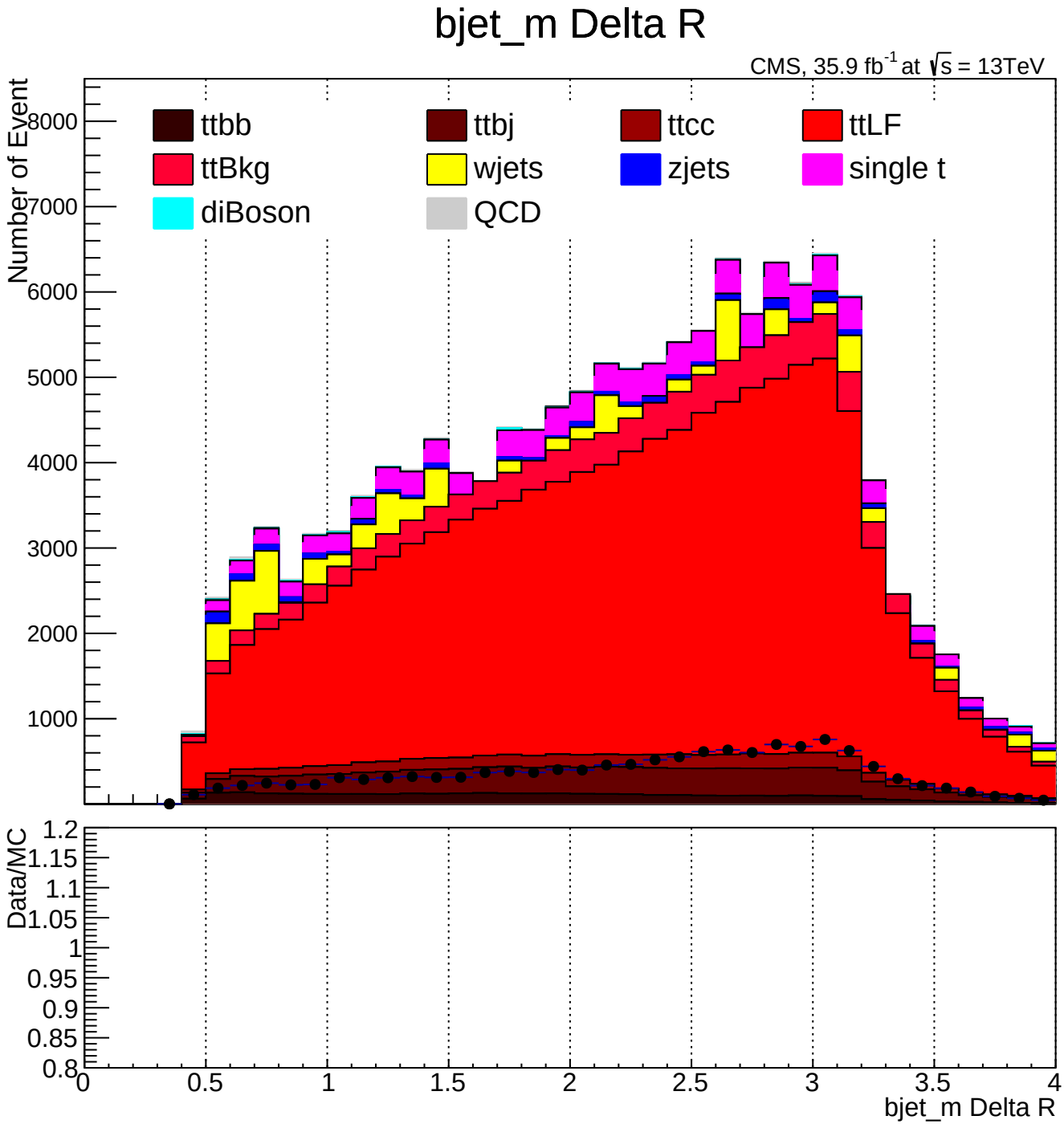

Leading b jet (medium) pT from di-bjets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b Jet (medium) pT from di-bjets (GeV)

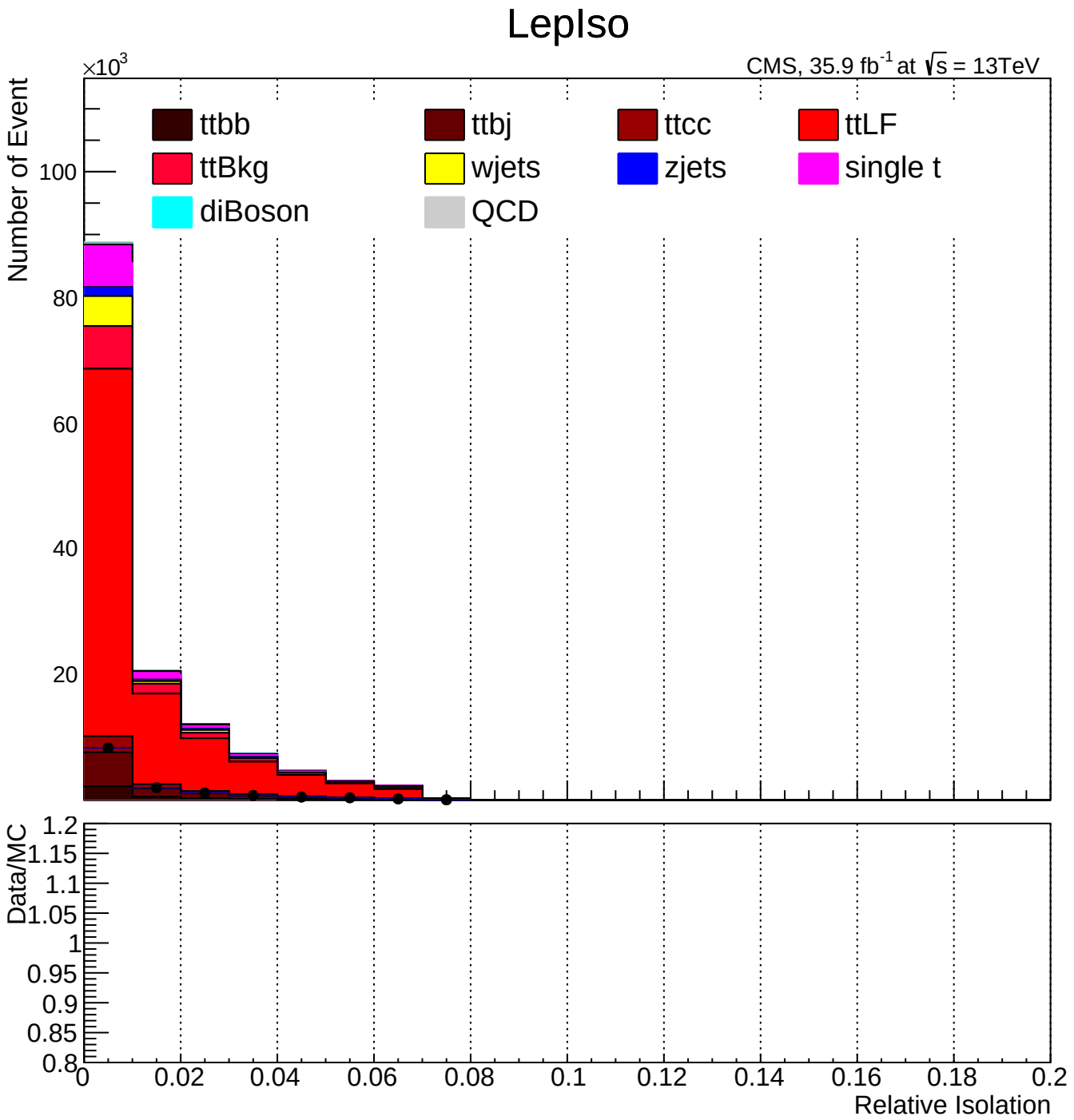

leading c jet (medium) pT
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
4000
2000
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
leading c Jet (medium) pT (GeV)

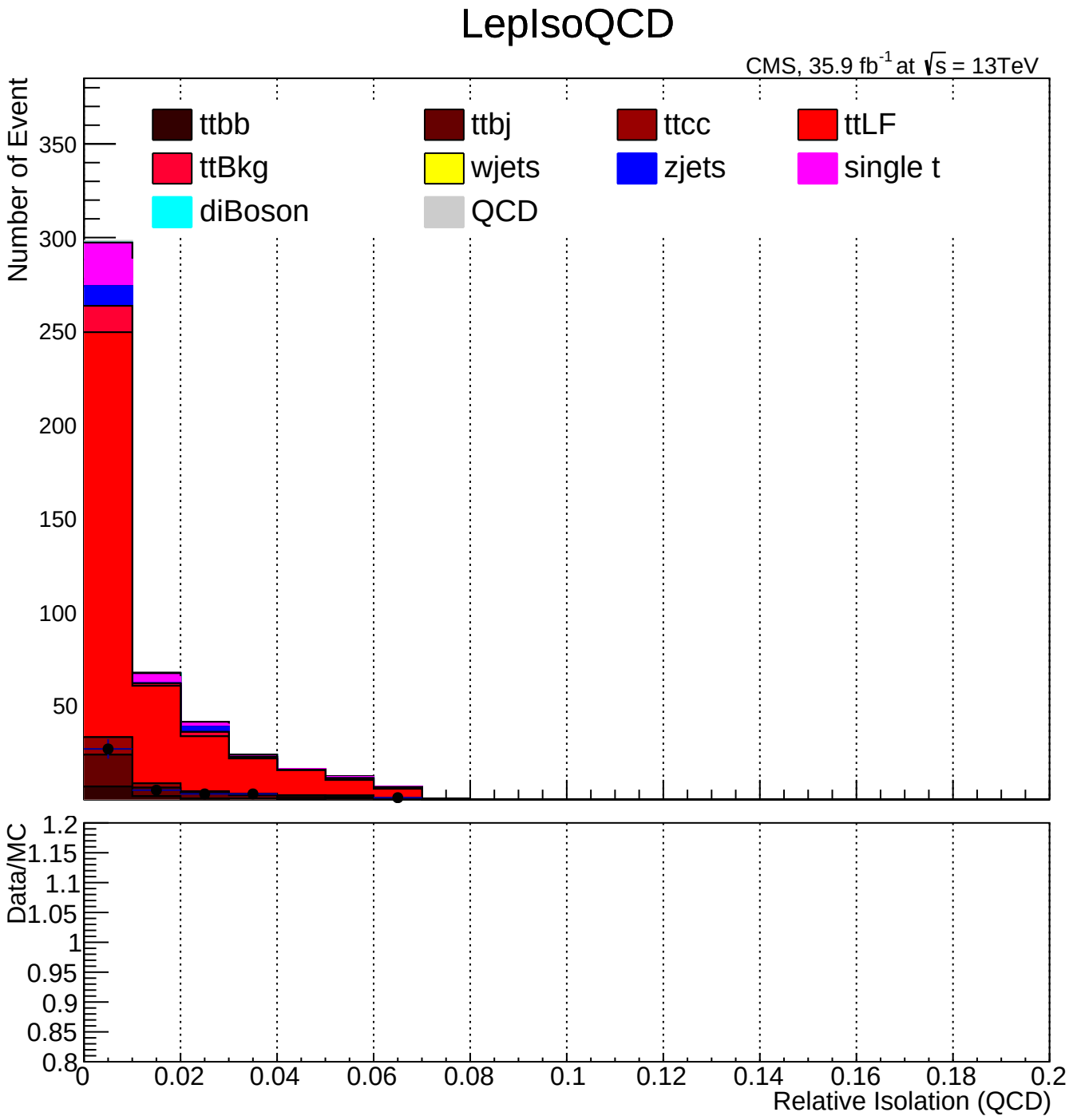

lepton DPhi
CMS, 35.9 fb-1 at √s = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
4000
3500
3000
2500
2000
1500
1000
500
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
DPhi

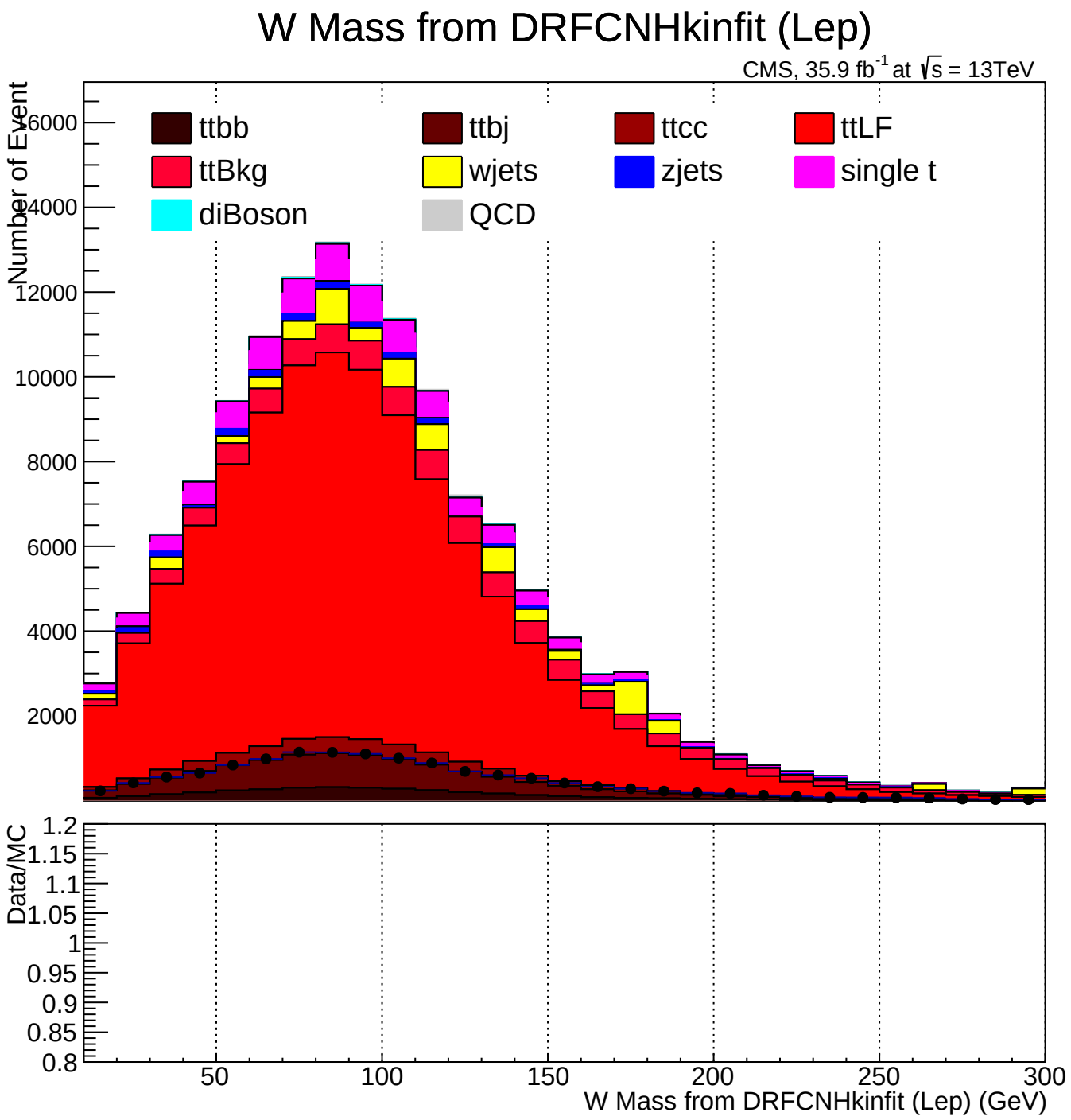

bjet_m Delta Phi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
4000
3500
3000
2500
2000
1500
1000
500
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Phi

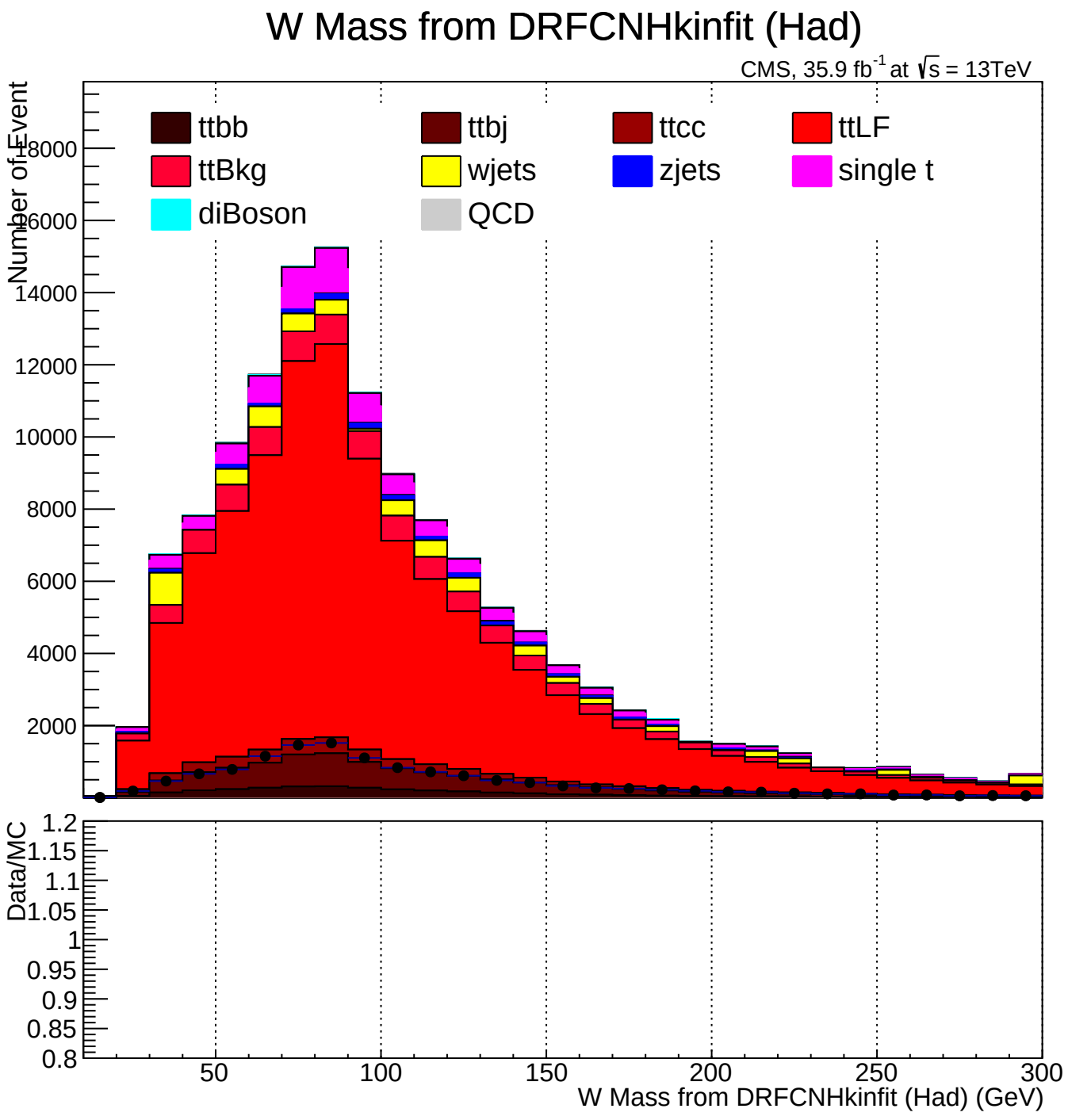

bjet_m Delta Eta
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Eta

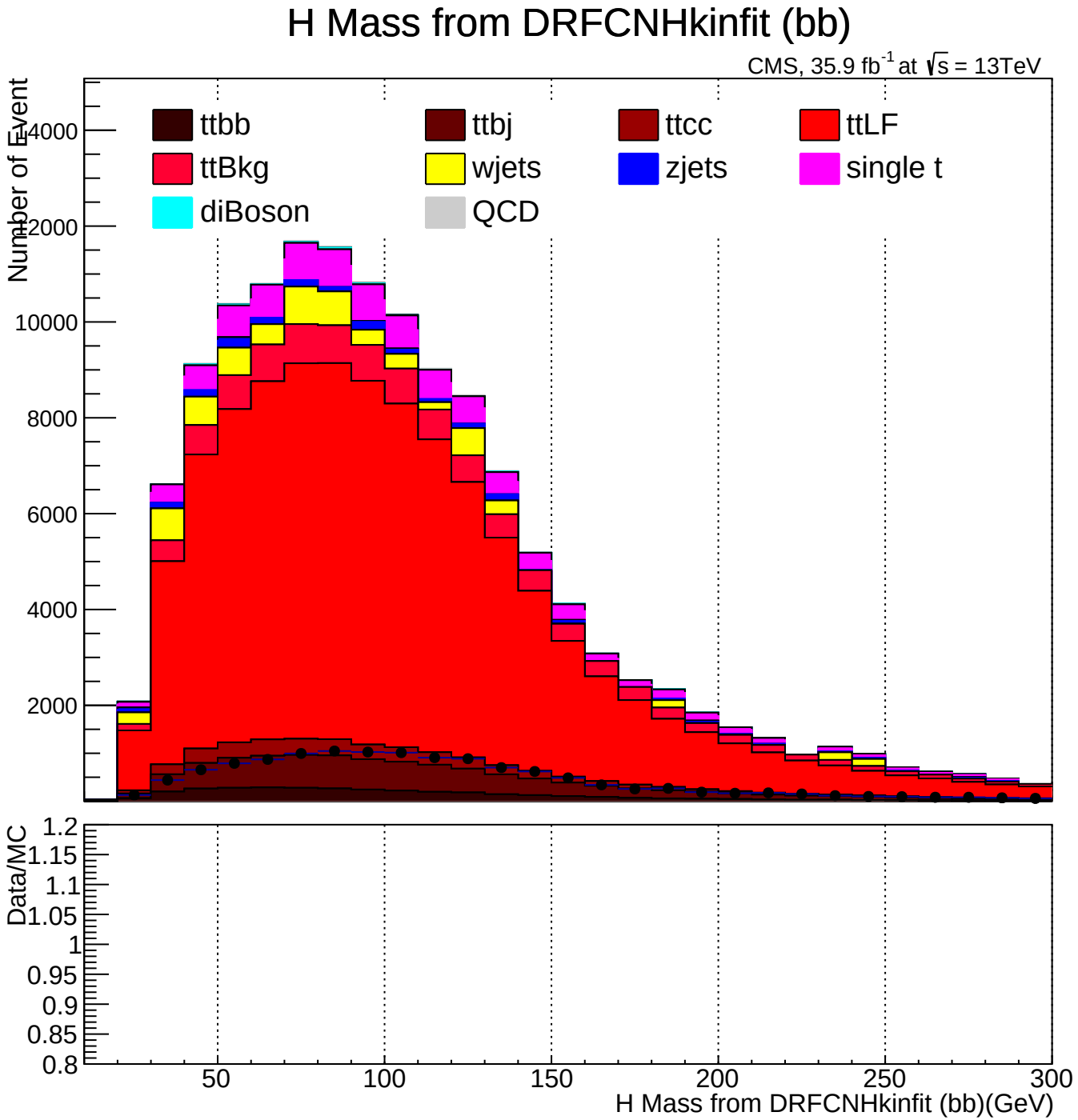

bjet_m Delta R
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta R

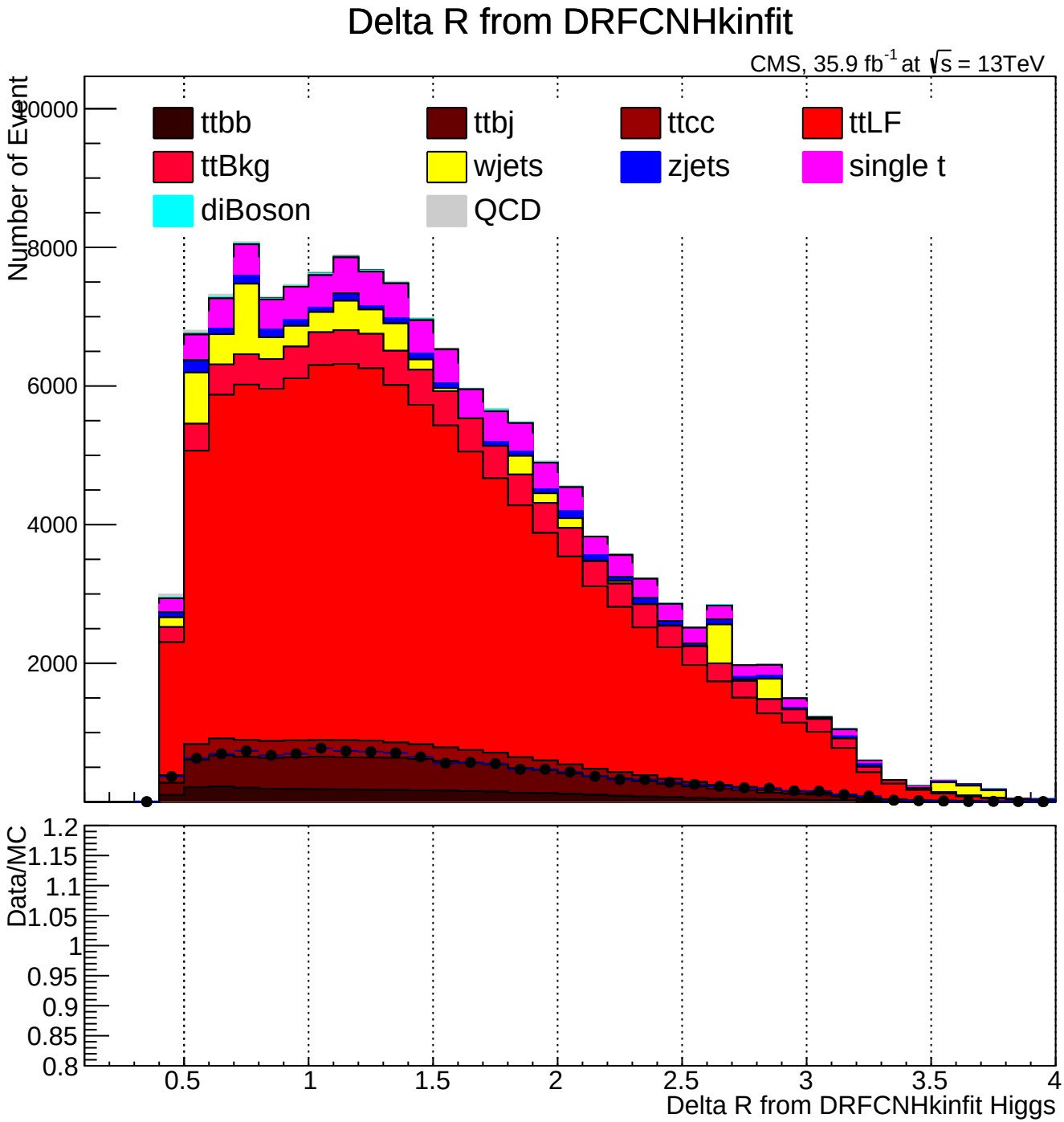

LepIso
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
×10^3
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation

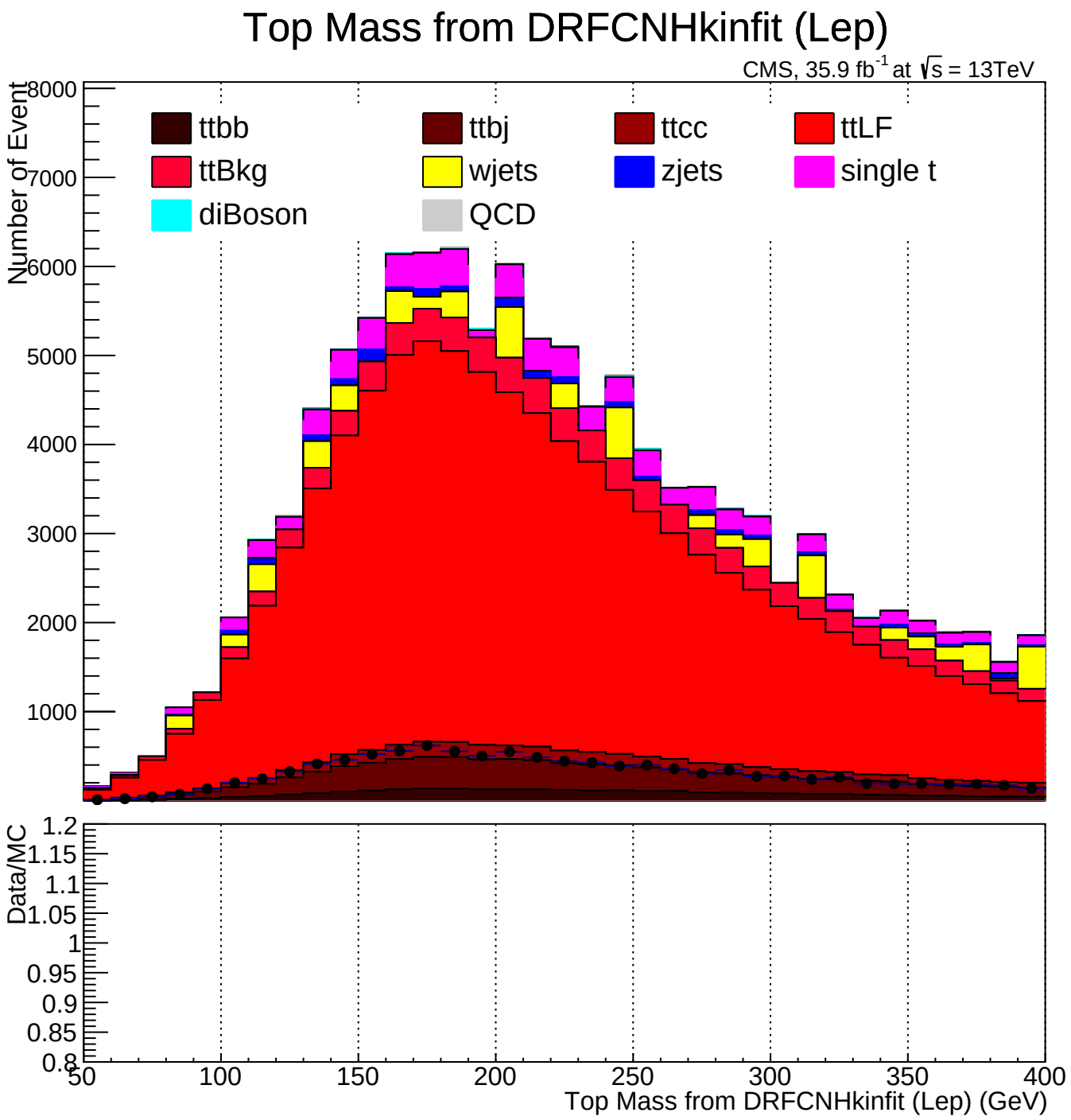

LepIsoQCD
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
350
300
250
200
150
100
50
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation (QCD)

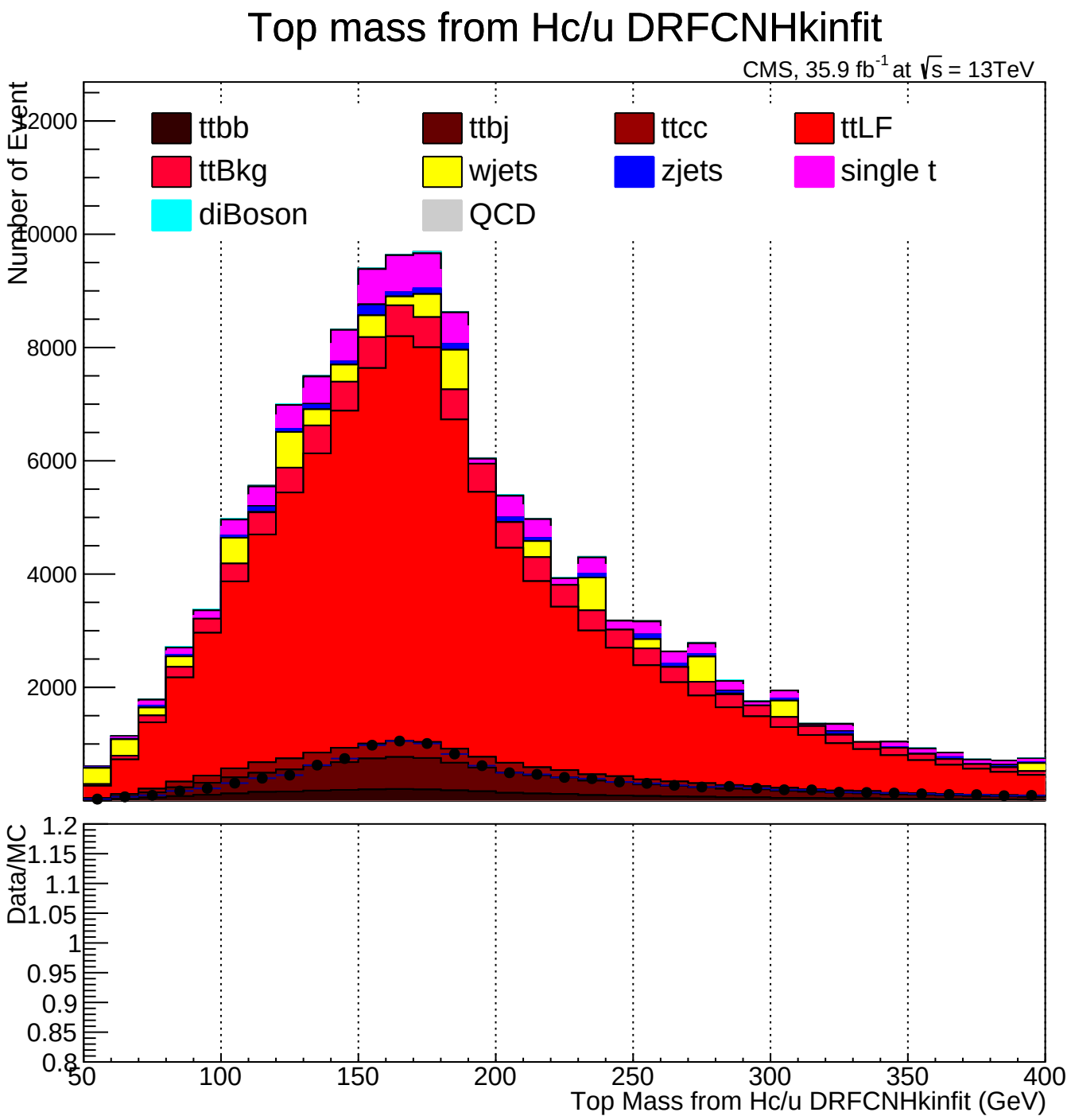

W Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb-1 at √s = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
16000
14000
12000
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
W Mass from DRFCNHkinfit (Lep) (GeV)

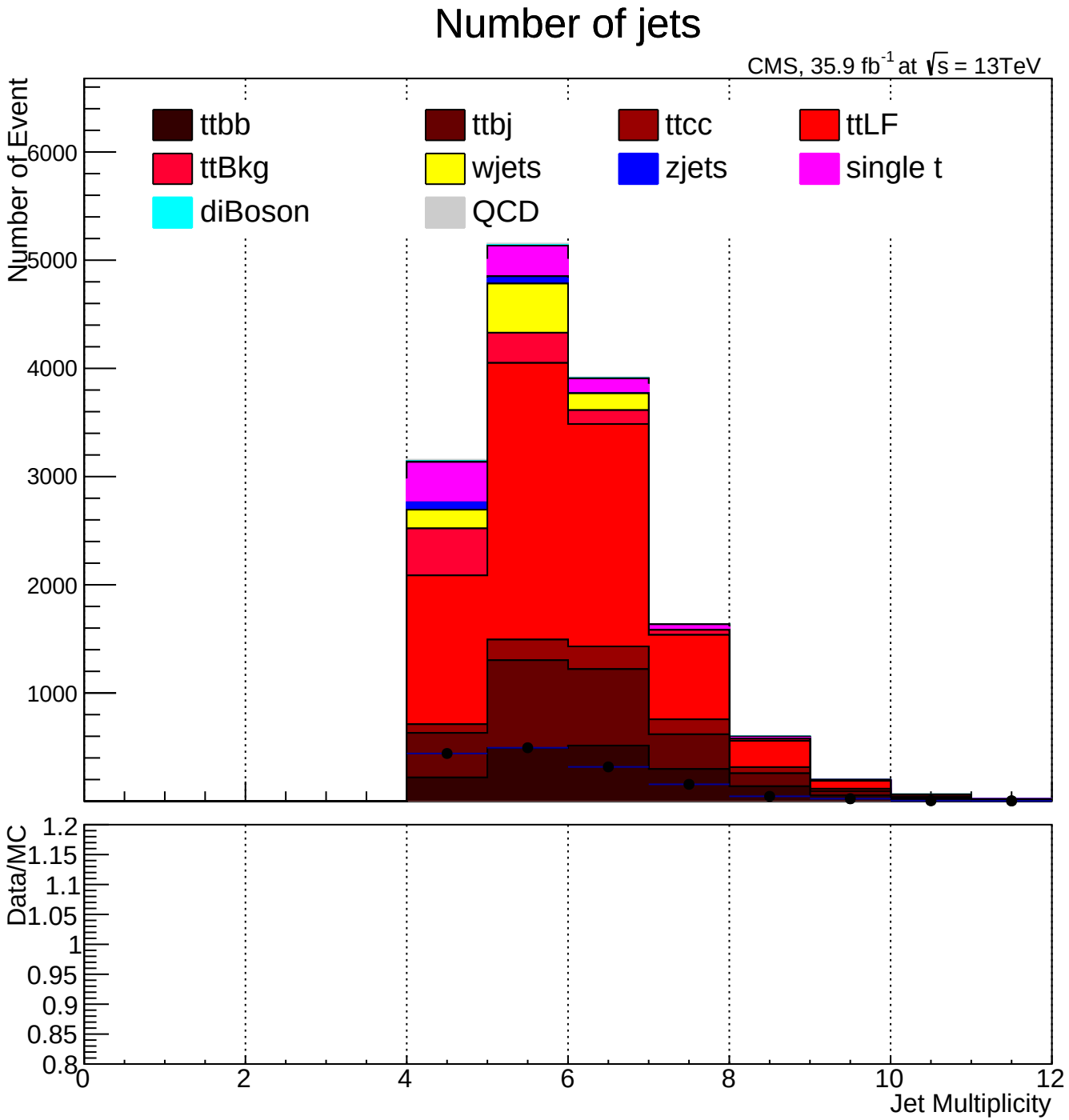

W Mass from DRFCNHkinfit (Had)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
W Mass from DRFCNHkinfit (Had) (GeV)


H Mass from DRFCNHkinfit (bb)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
H Mass from DRFCNHkinfit (bb)(GeV)

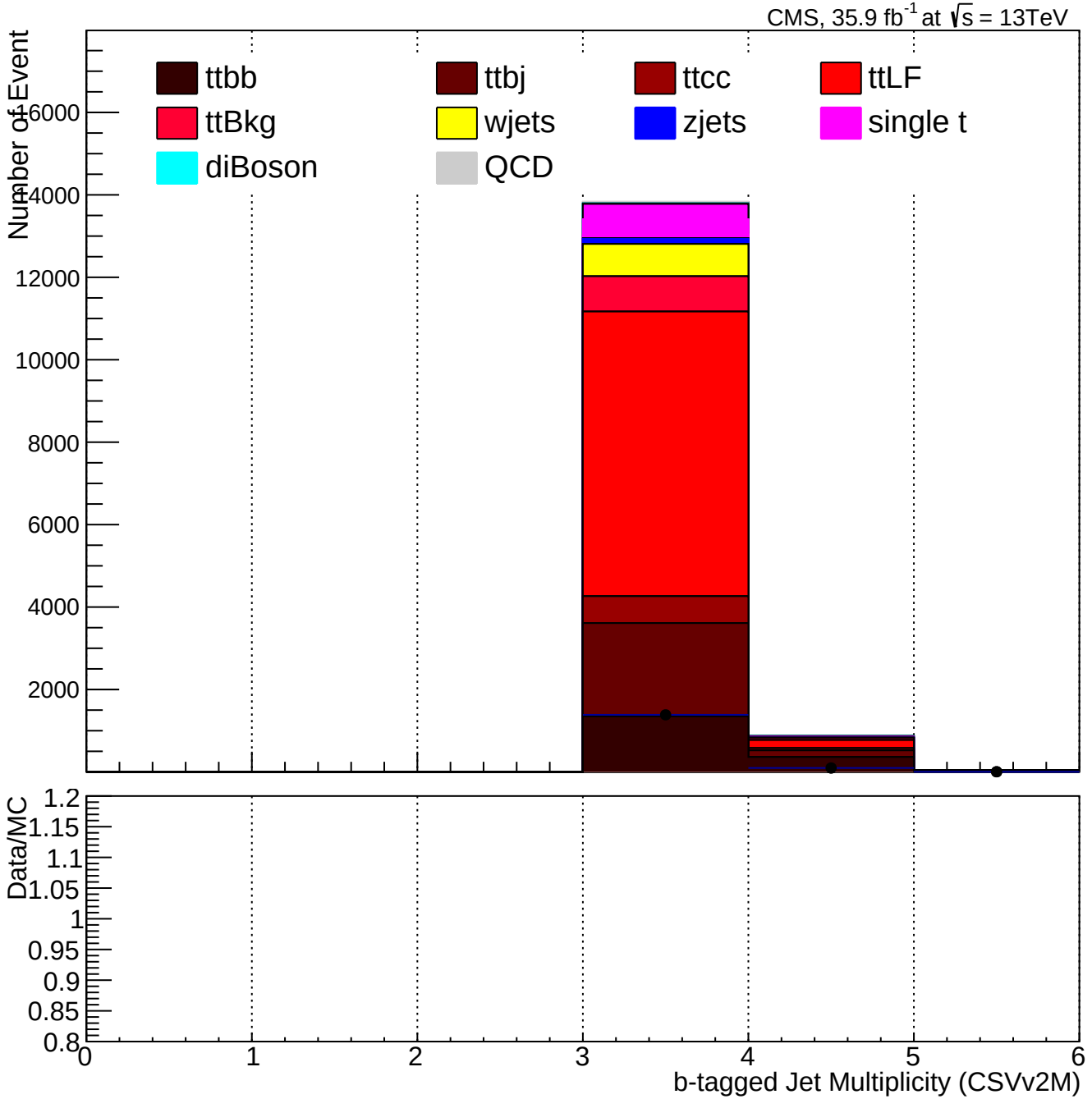

Delta R from DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0.5
1
1.5
2
2.5
3
3.5
4
Delta R from DRFCNHkinfit Higgs

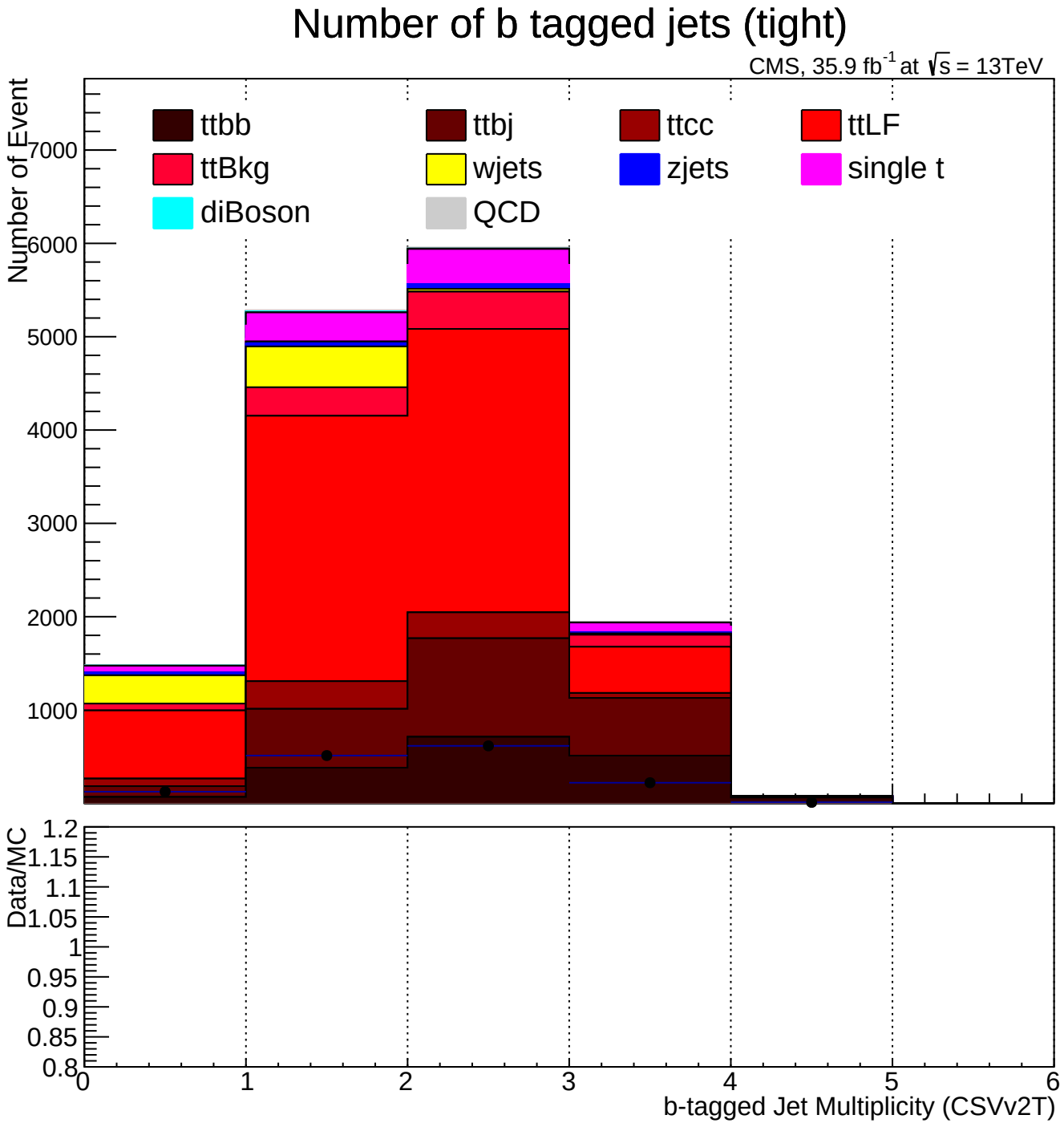

Top Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Top Mass from DRFCNHkinfit (Lep) (GeV)

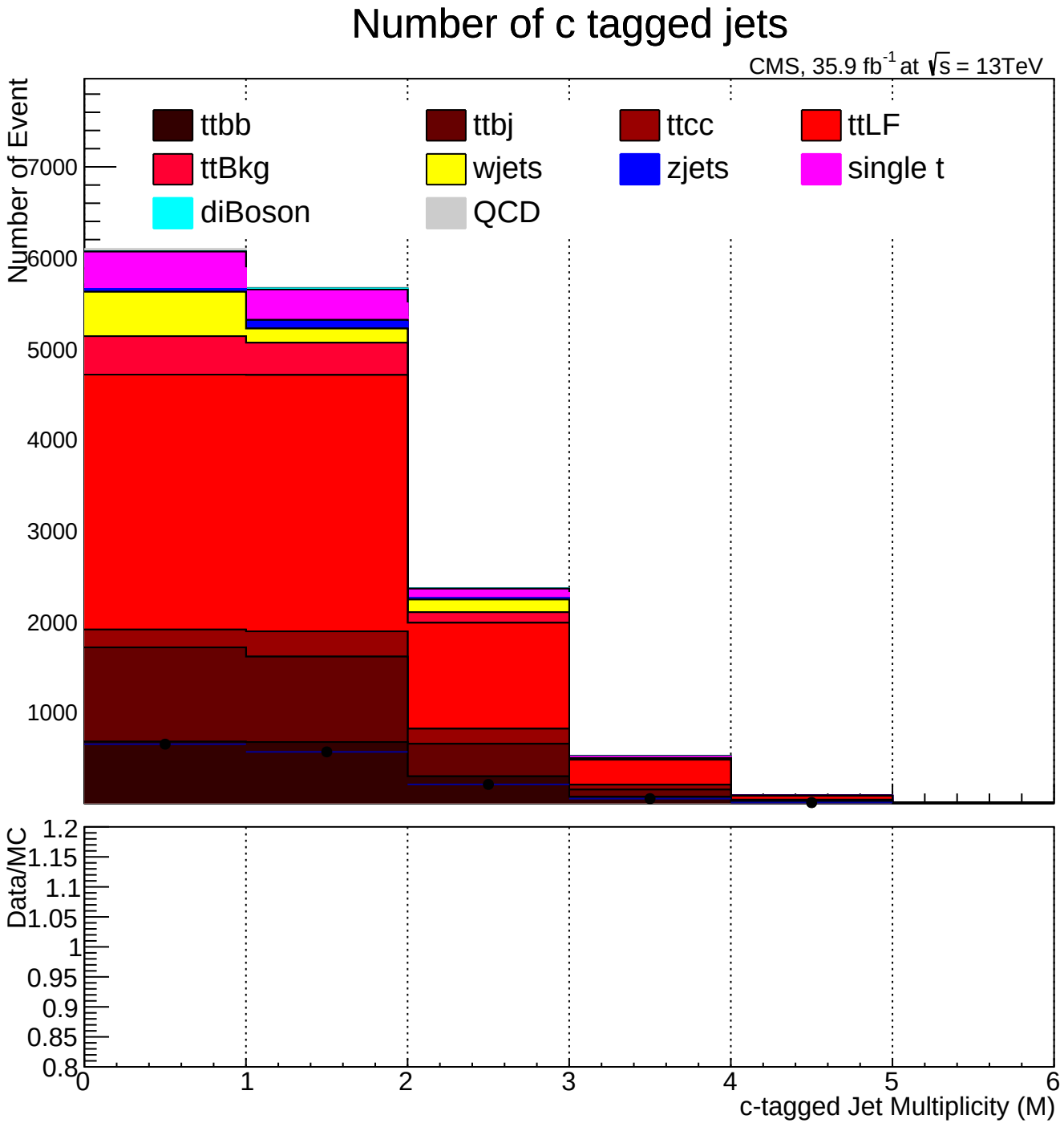

Top mass from Hc/u DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
2000
4000
6000
8000
10000
12000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
350
400
Top Mass from Hc/u DRFCNHkinfit (GeV)

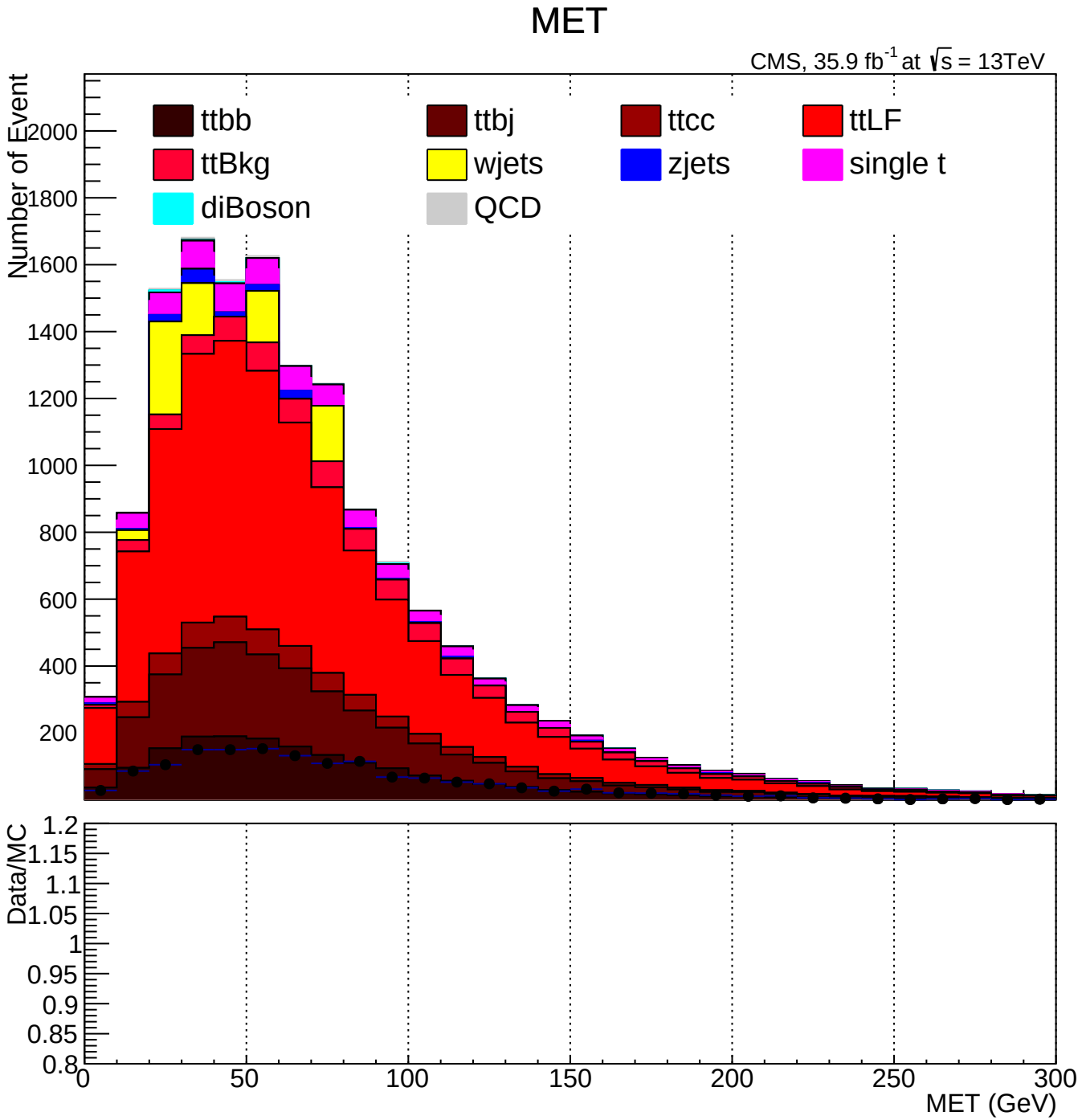

Number of jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
6000
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
2
4
6
8
10
12
Jet Multiplicity

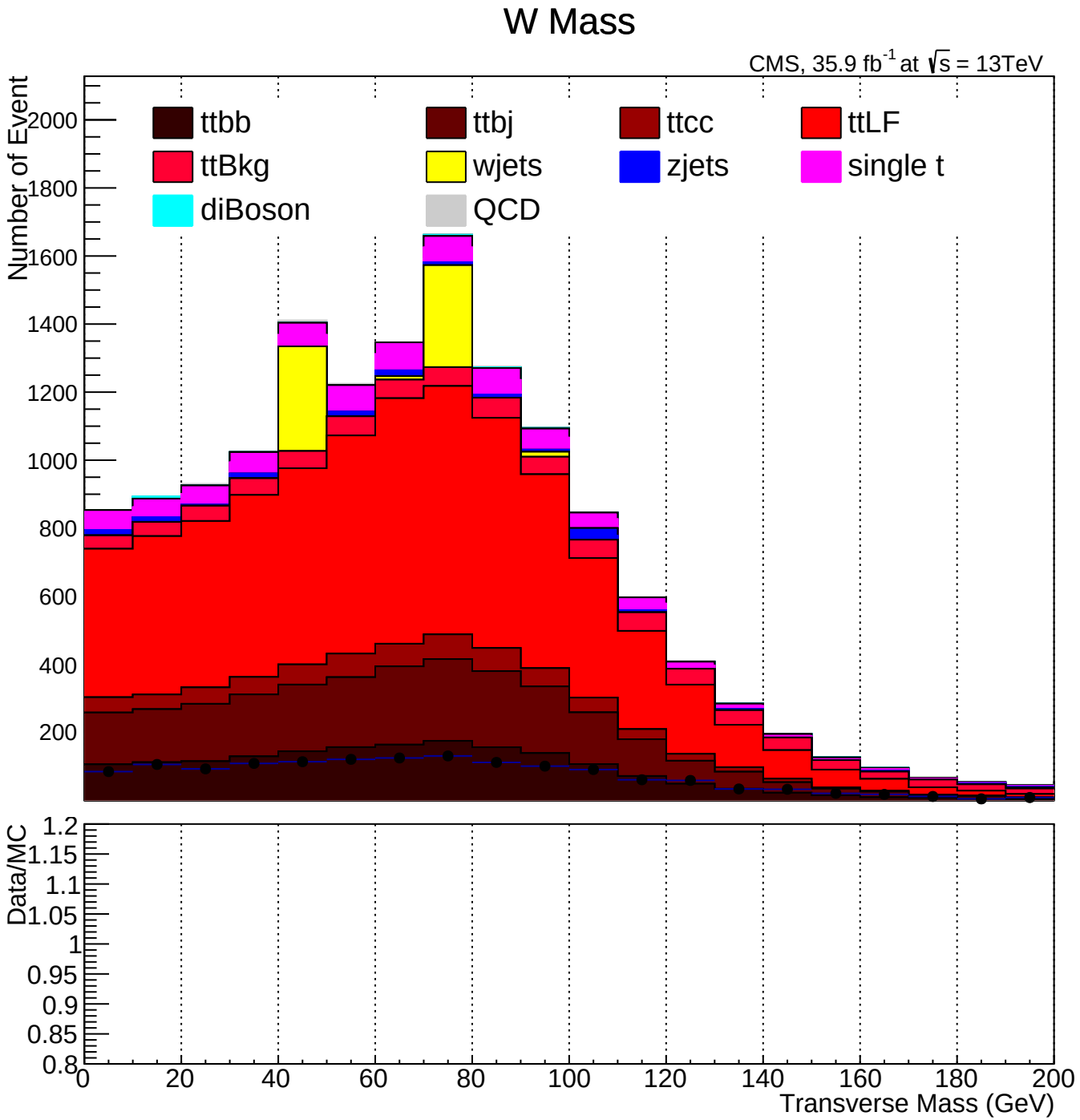
Number of b tagged jets (medium)



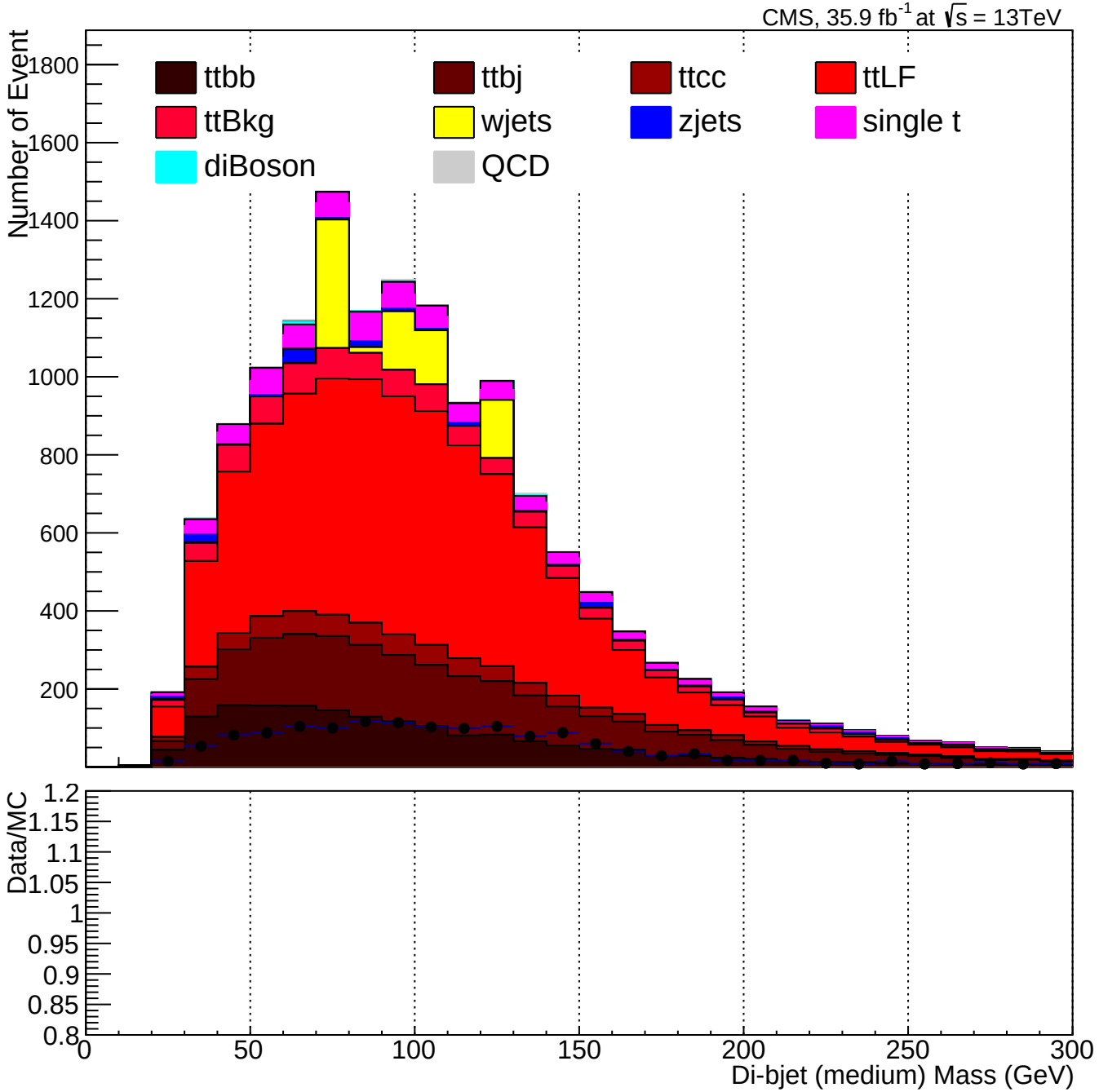

Number of b tagged jets (tight)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
7000
6000
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2T)

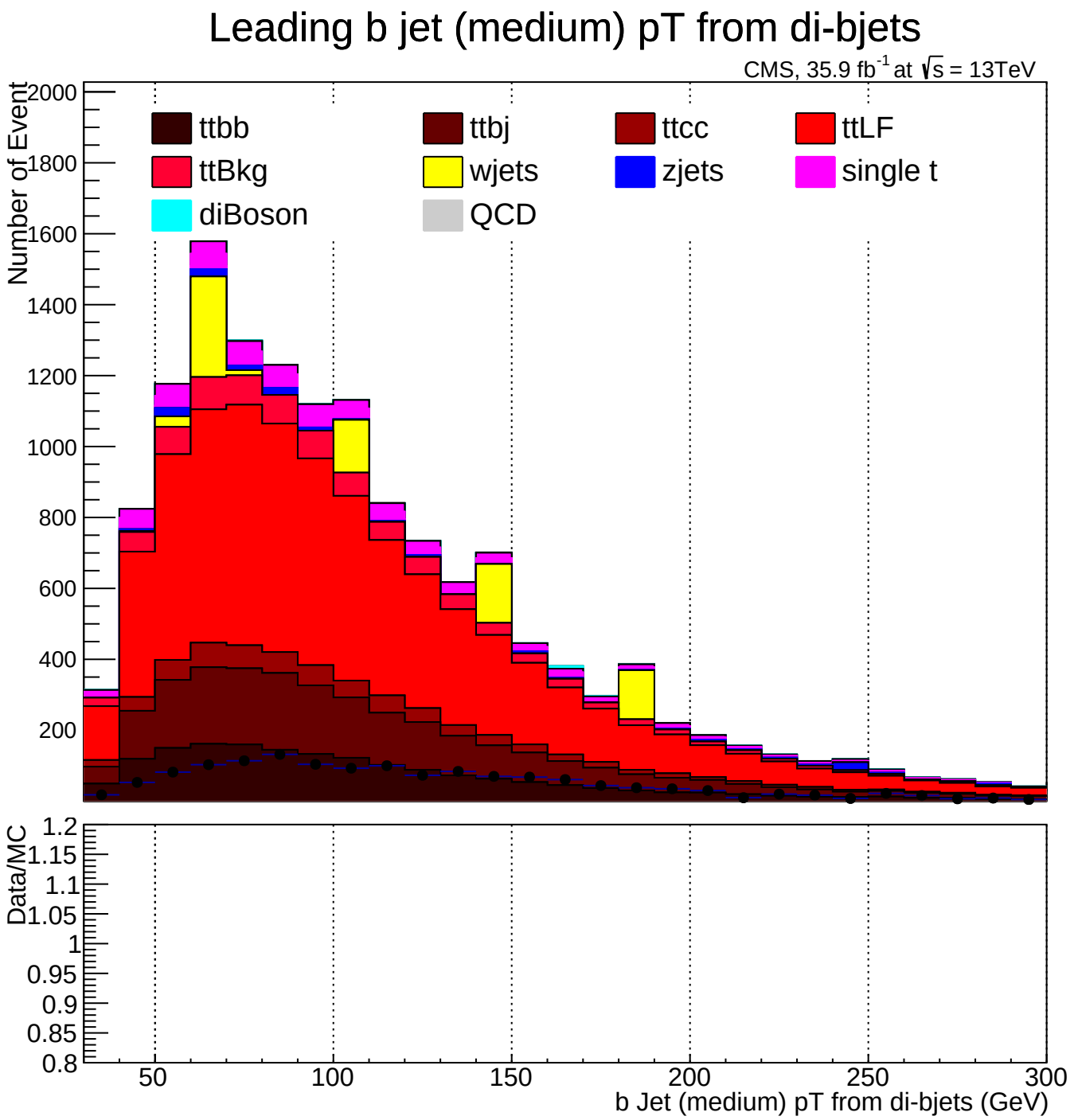

Number of c tagged jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
7000
6000
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
c-tagged Jet Multiplicity (M)

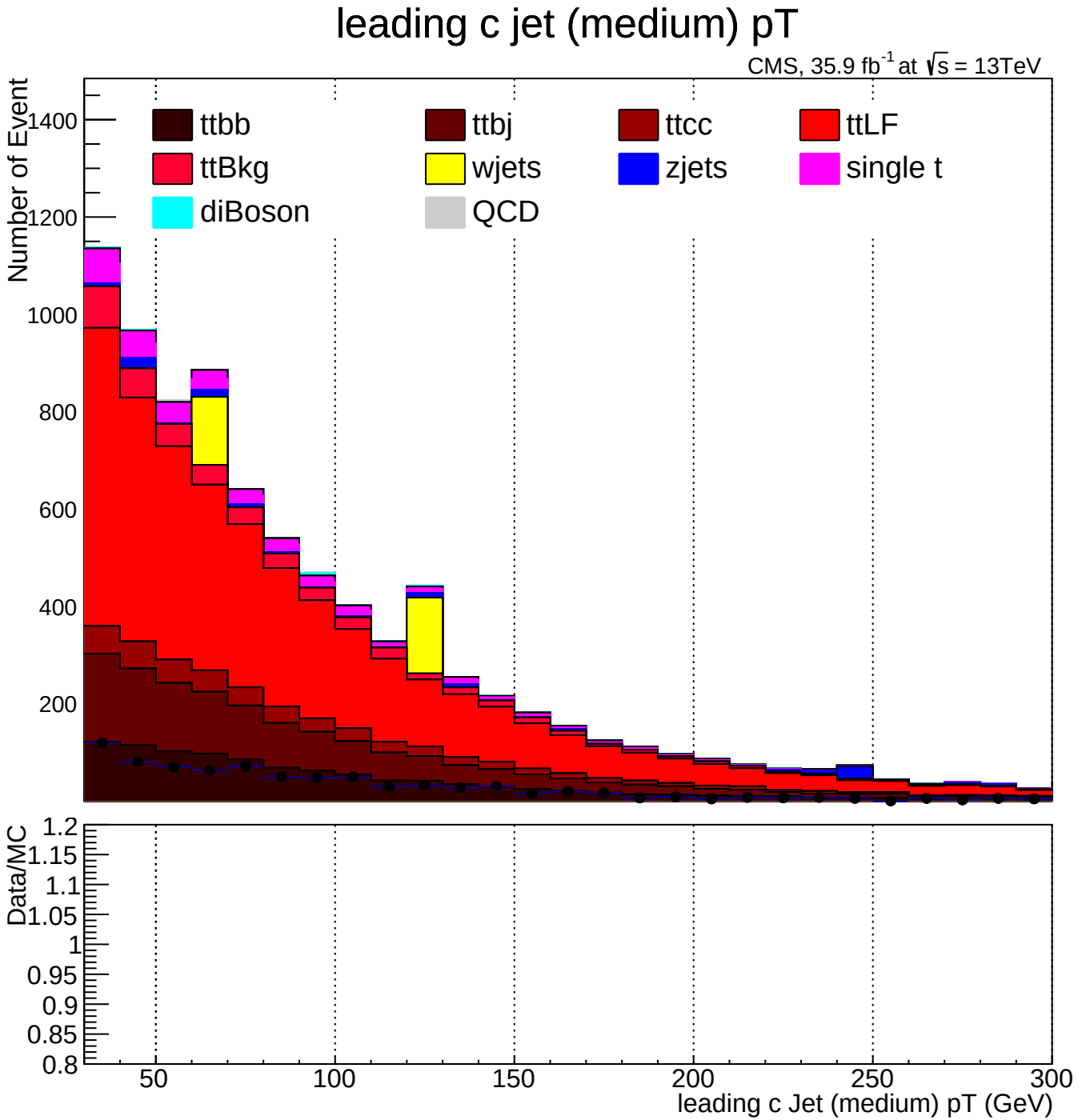

MET
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
2000
1800
1600
1400
1200
1000
800
600
400
200
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
50
100
150
200
250
300
MET (GeV)

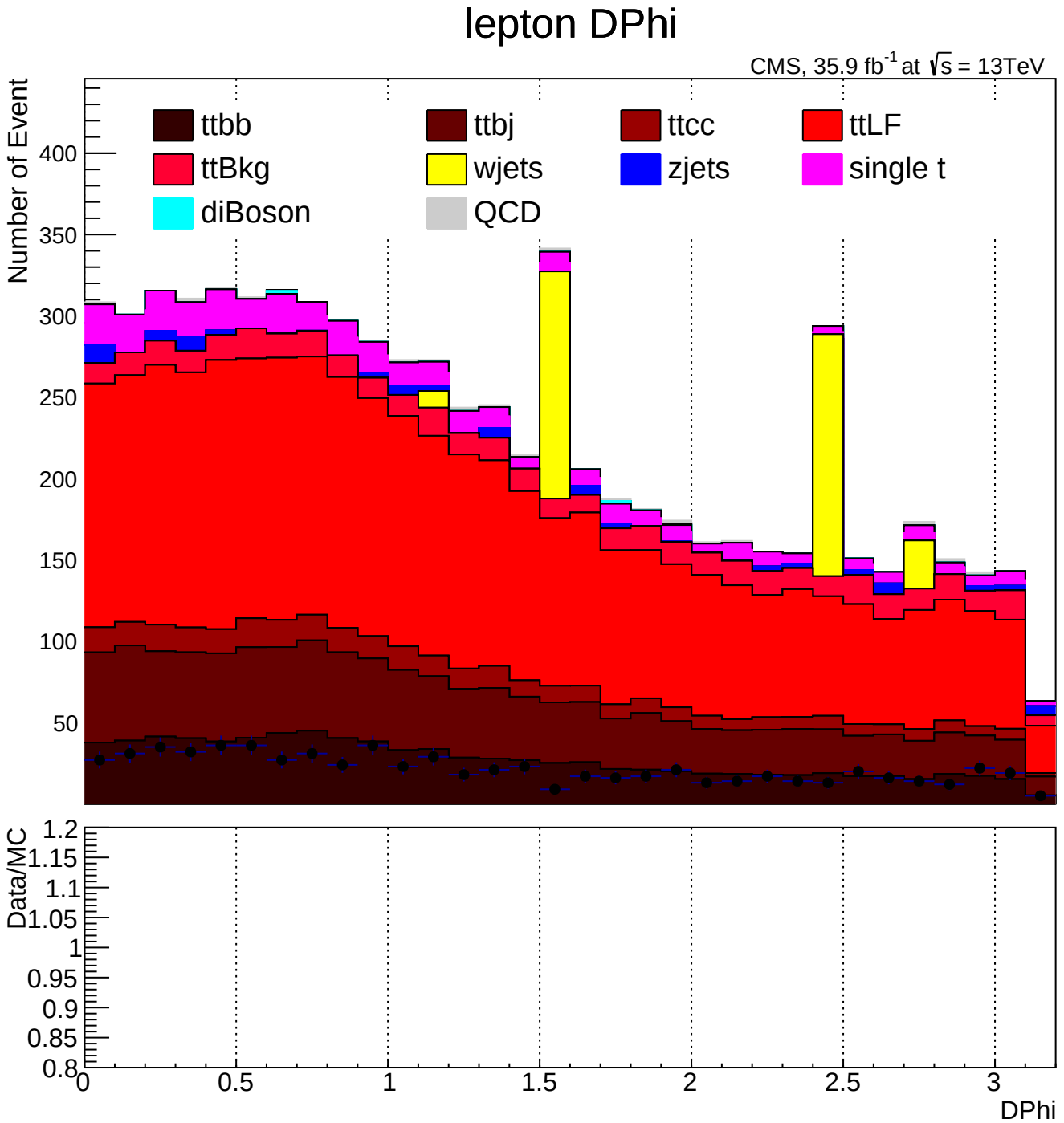

W Mass
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Transverse Mass (GeV)

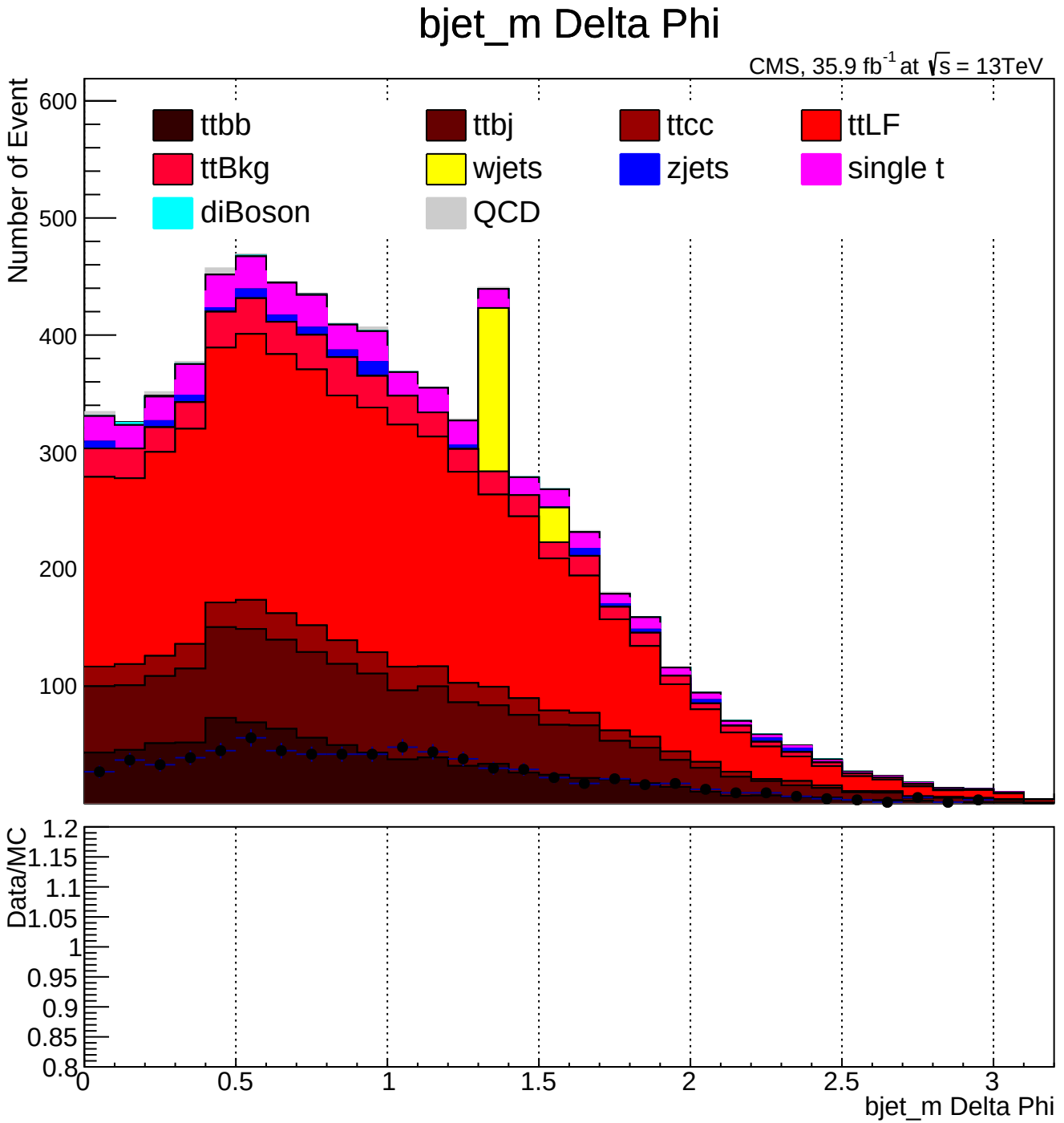
Di-bjet Mass (medium) wrt min DR

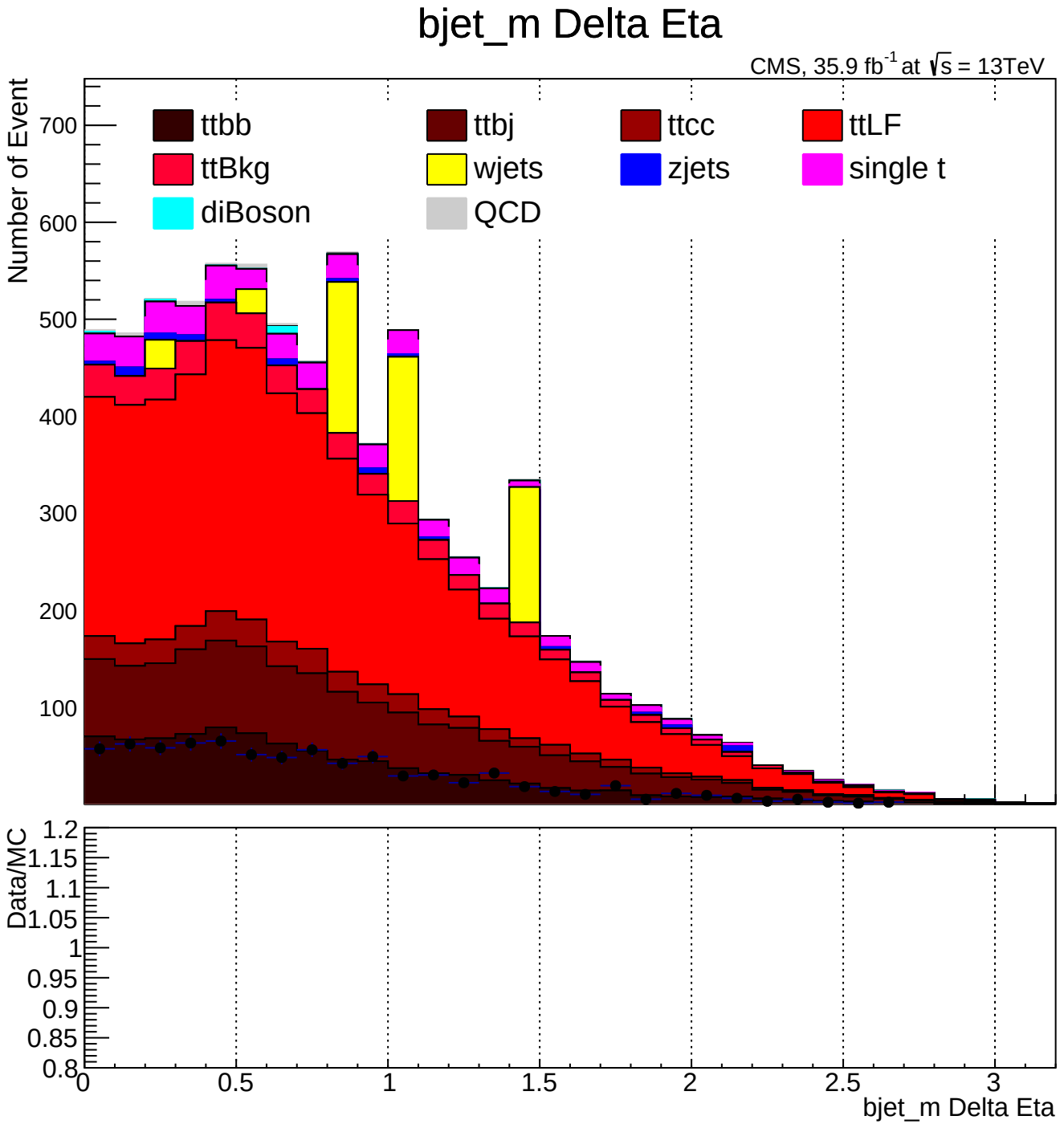


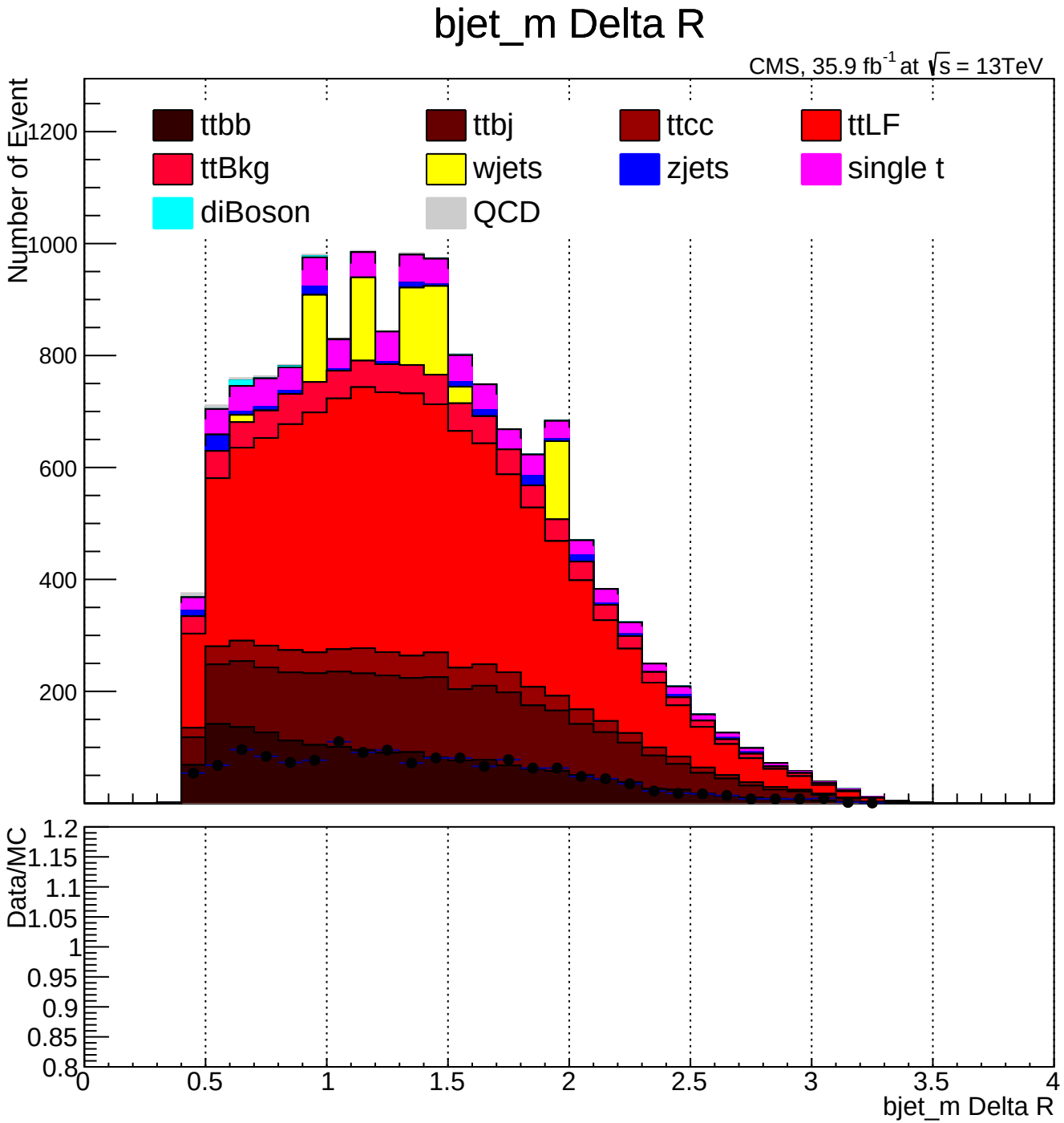

Leading b jet (medium) pT from di-bjets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b Jet (medium) pT from di-bjets (GeV)

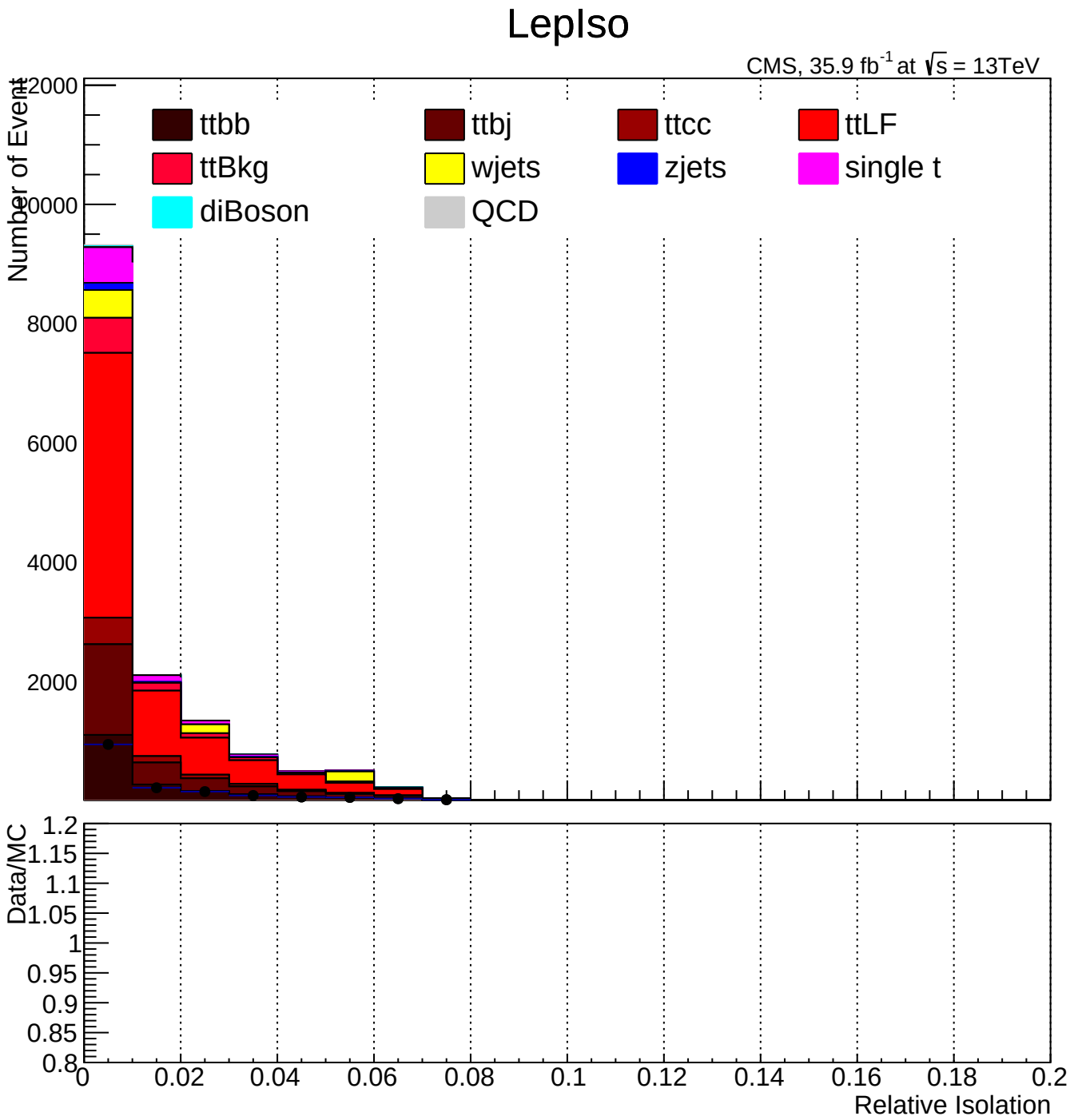

leading c jet (medium) pT
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
leading c Jet (medium) pT (GeV)

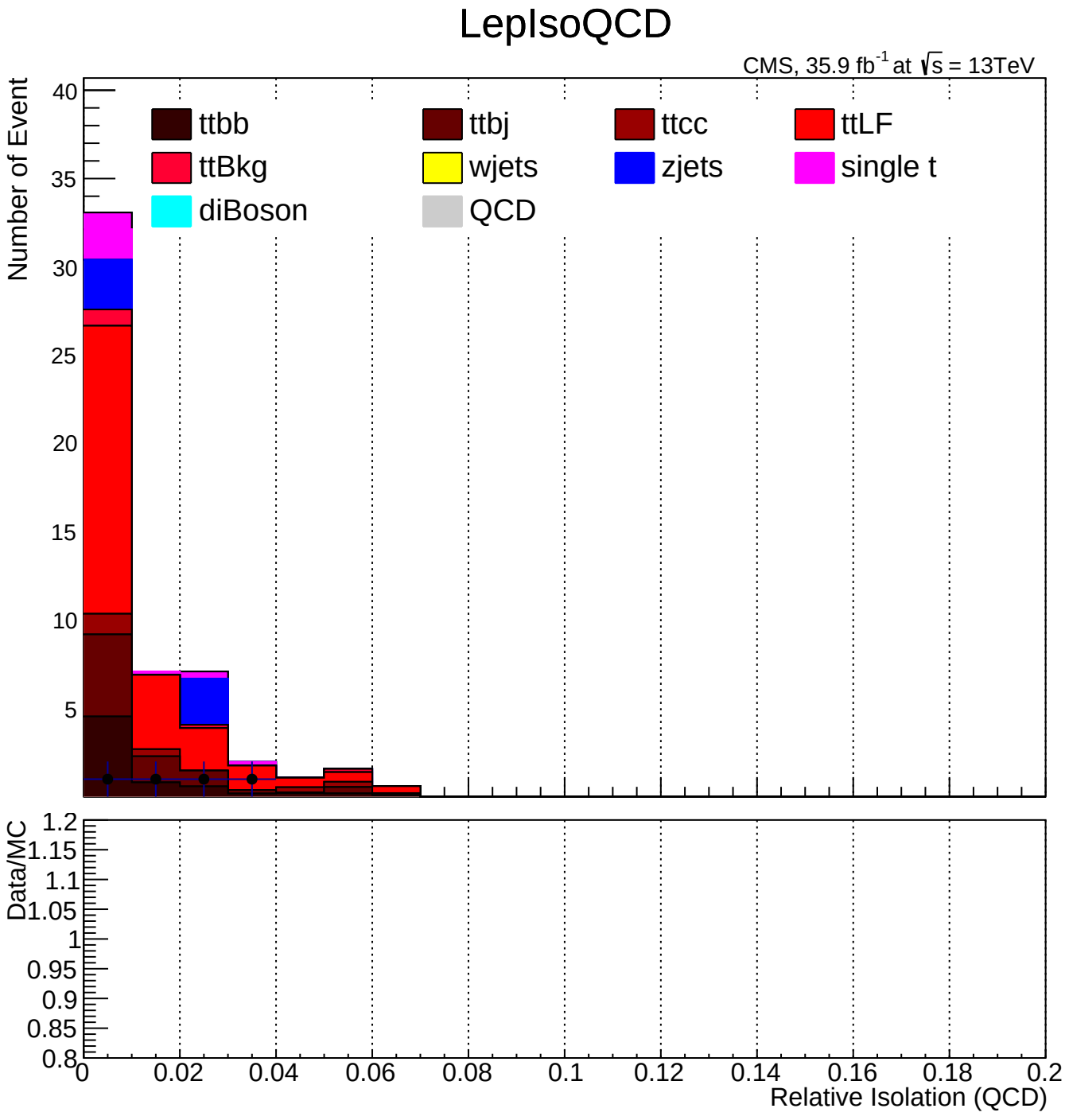

lepton DPhi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
400
350
300
250
200
150
100
50
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
DPhi

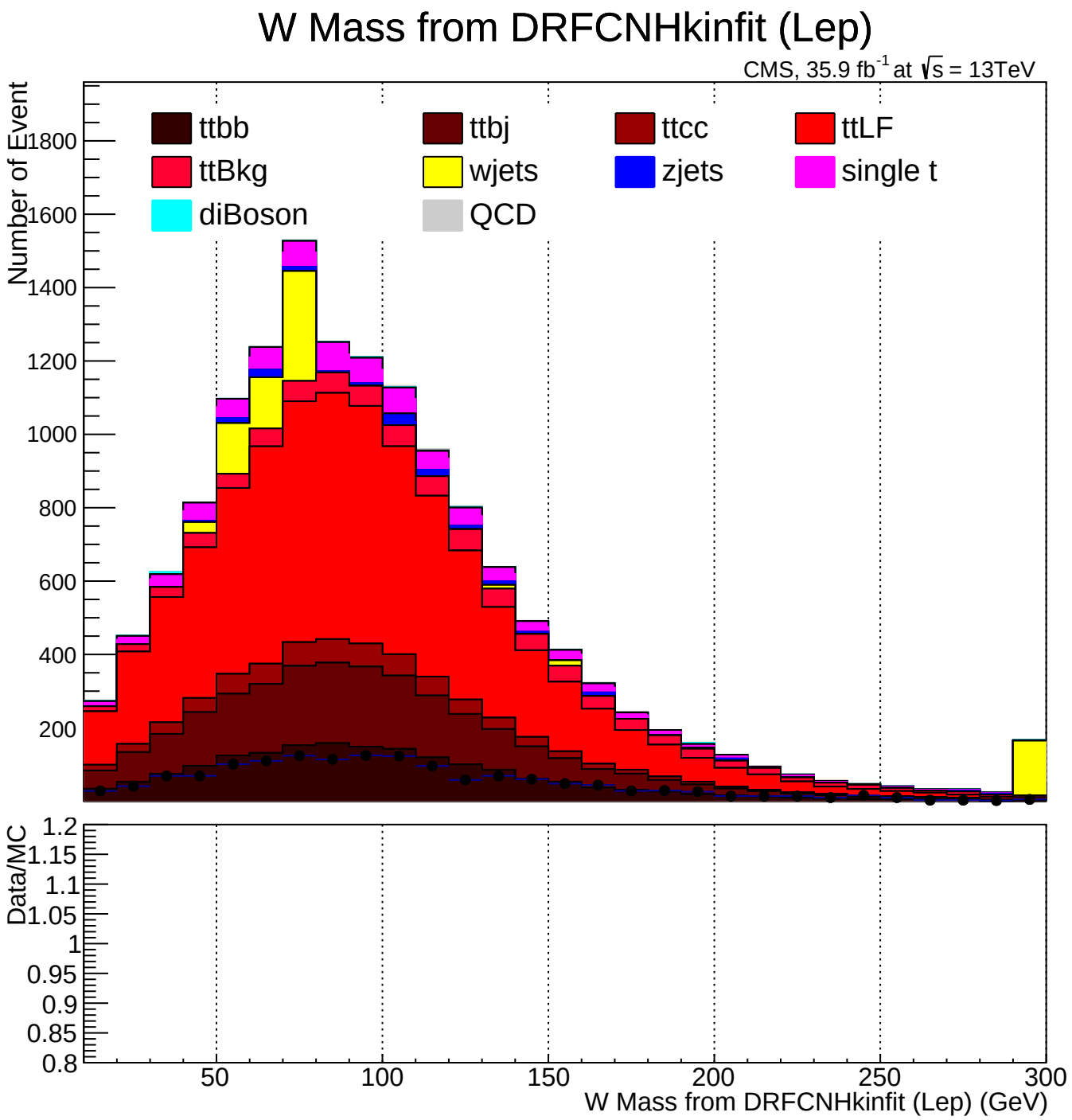

bjet_m Delta Phi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
600
500
400
300
200
100
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Phi

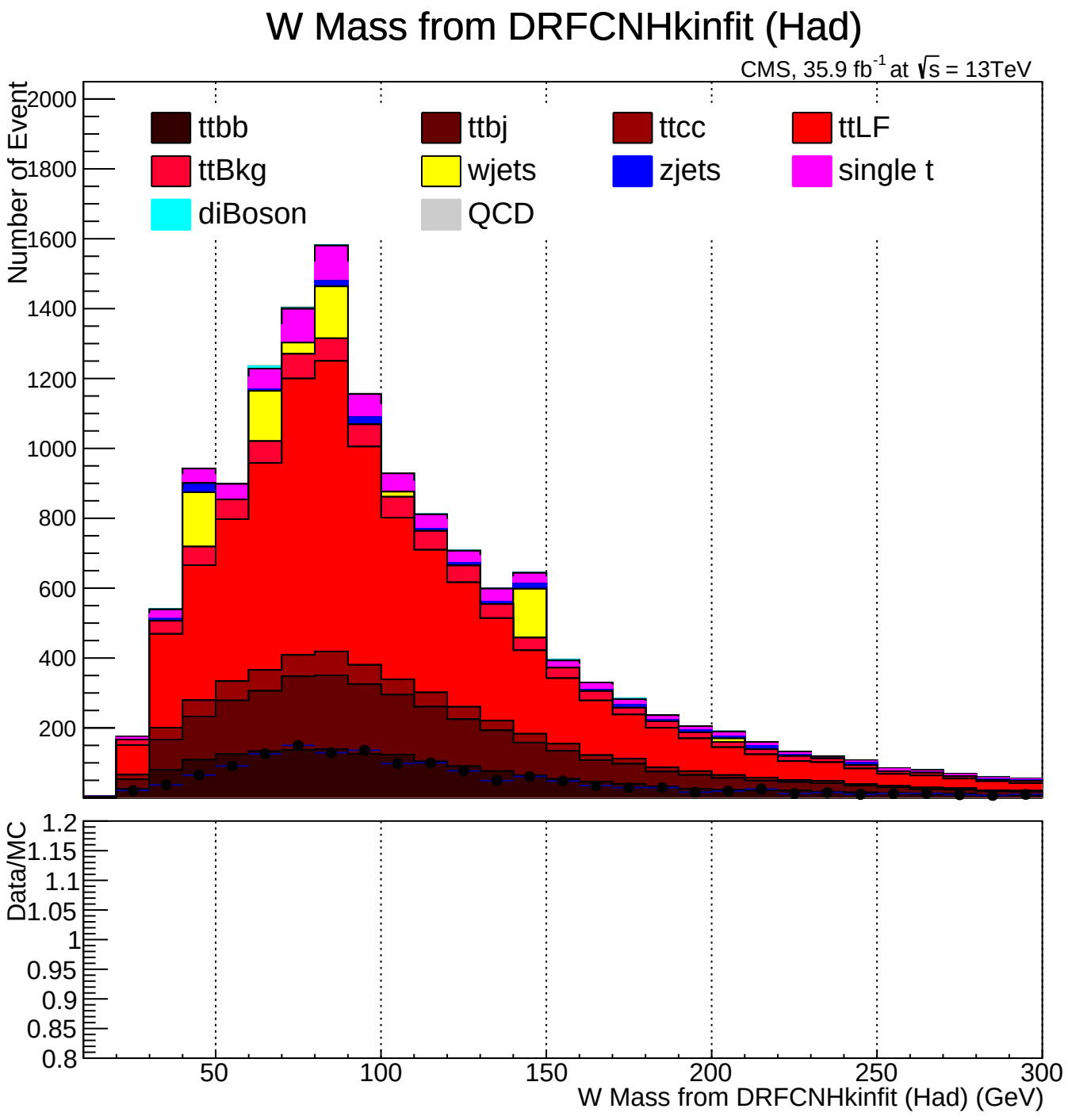

bjet_m Delta Eta
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta Eta

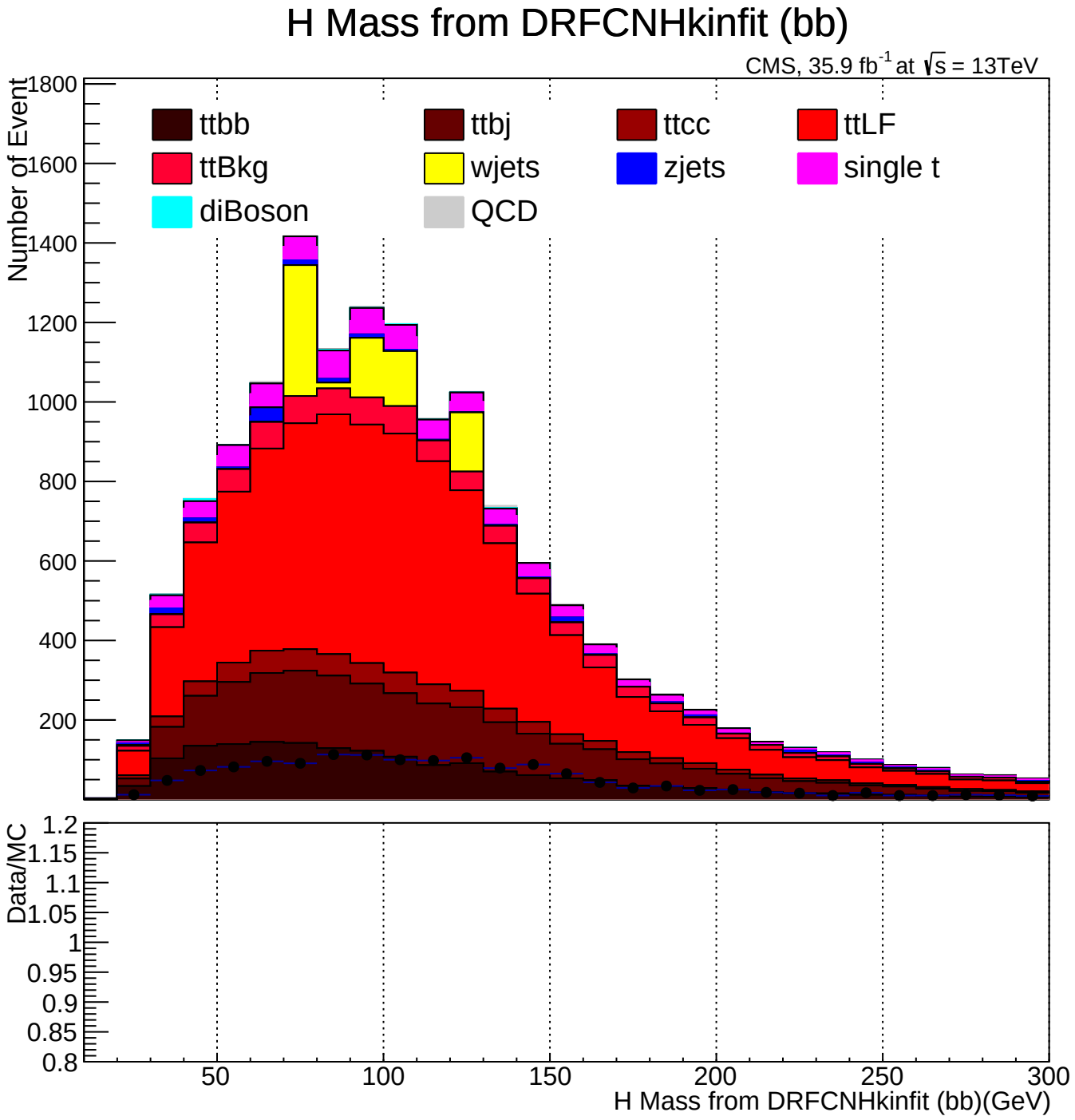

bjet_m Delta R
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
1200
1000
800
600
400
200
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
3.5
4
bjet_m Delta R

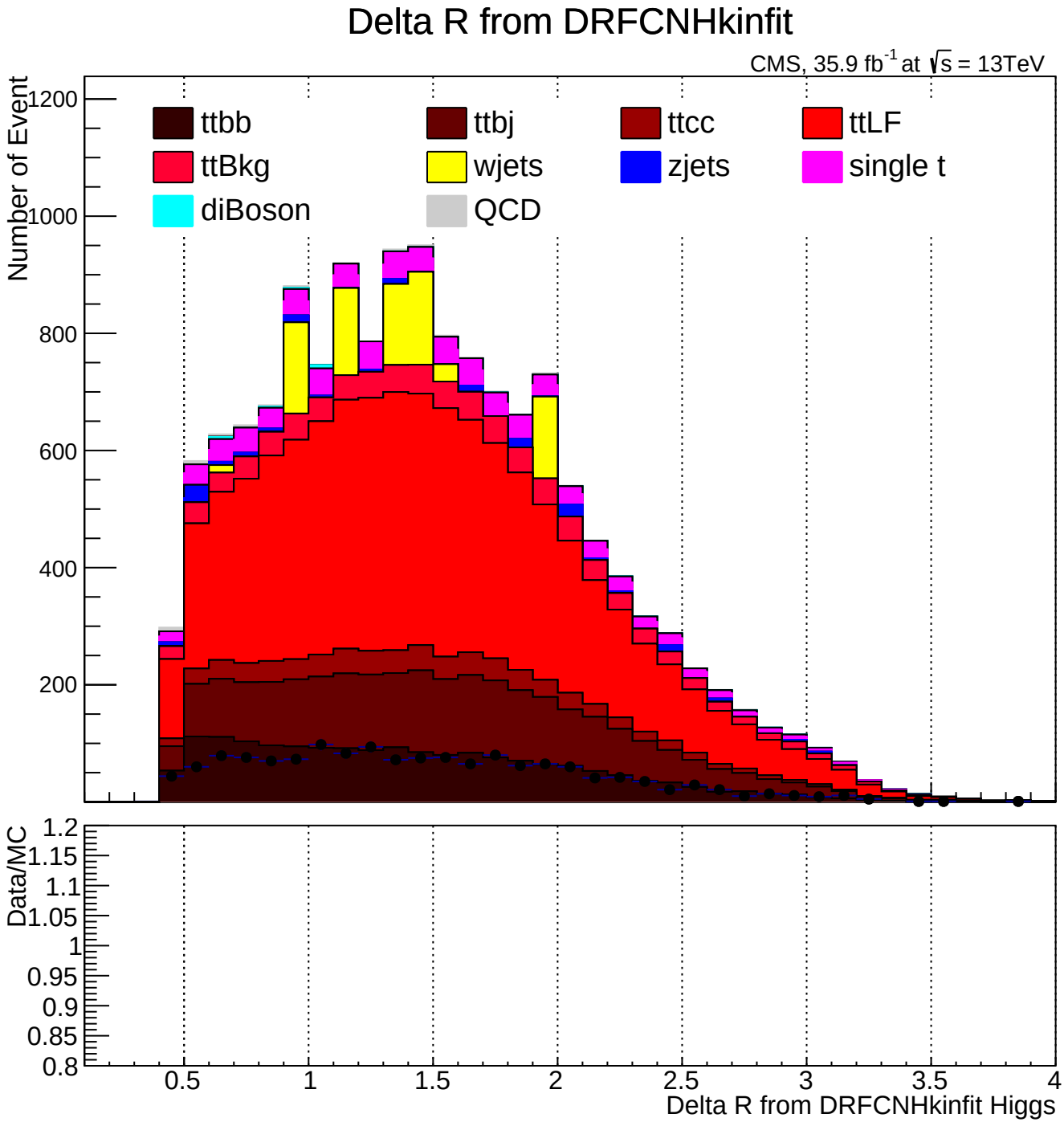

LepIso
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation

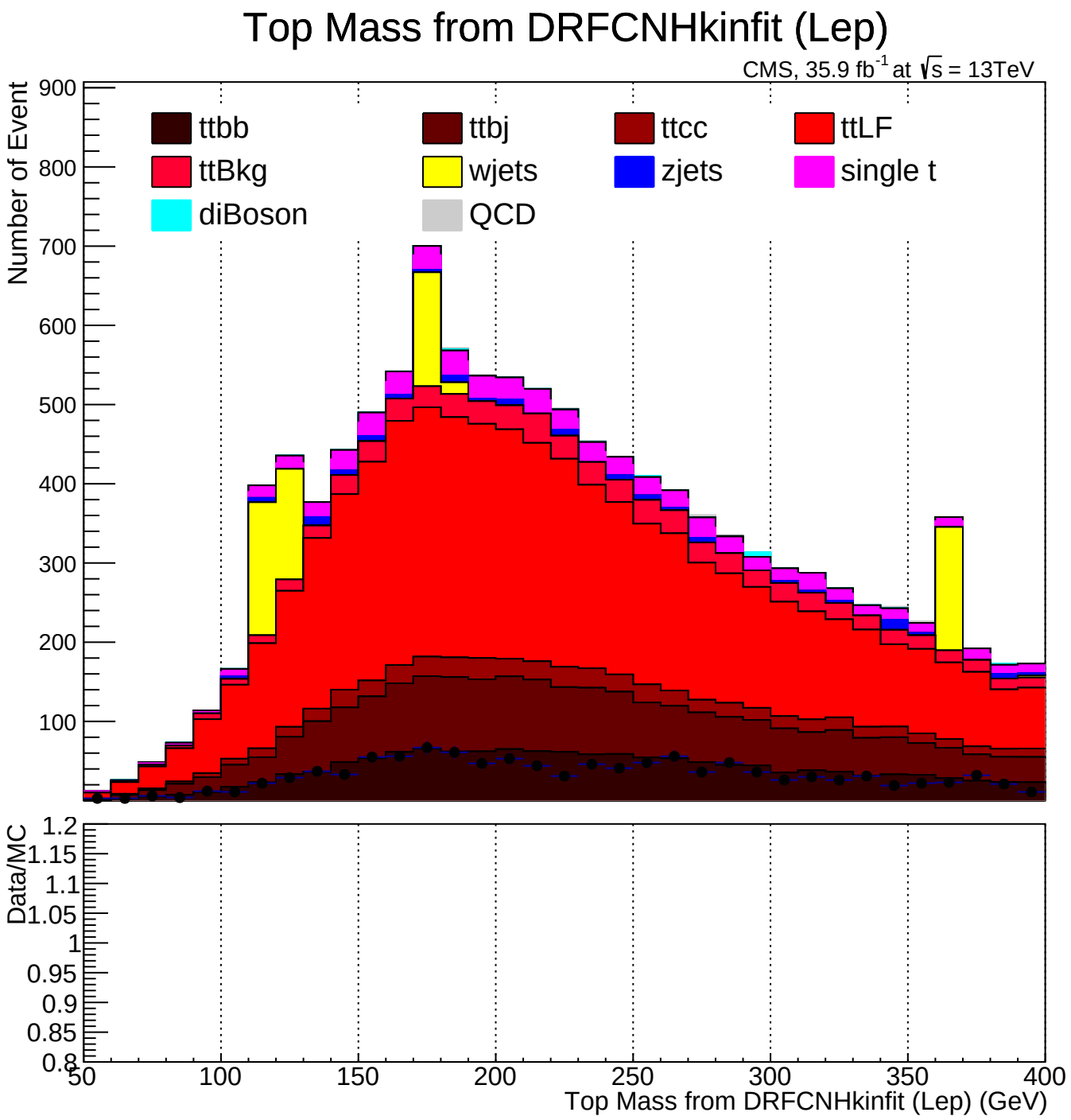

LepIsoQCD
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation (QCD)


W Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
W Mass from DRFCNHkinfit (Lep) (GeV)

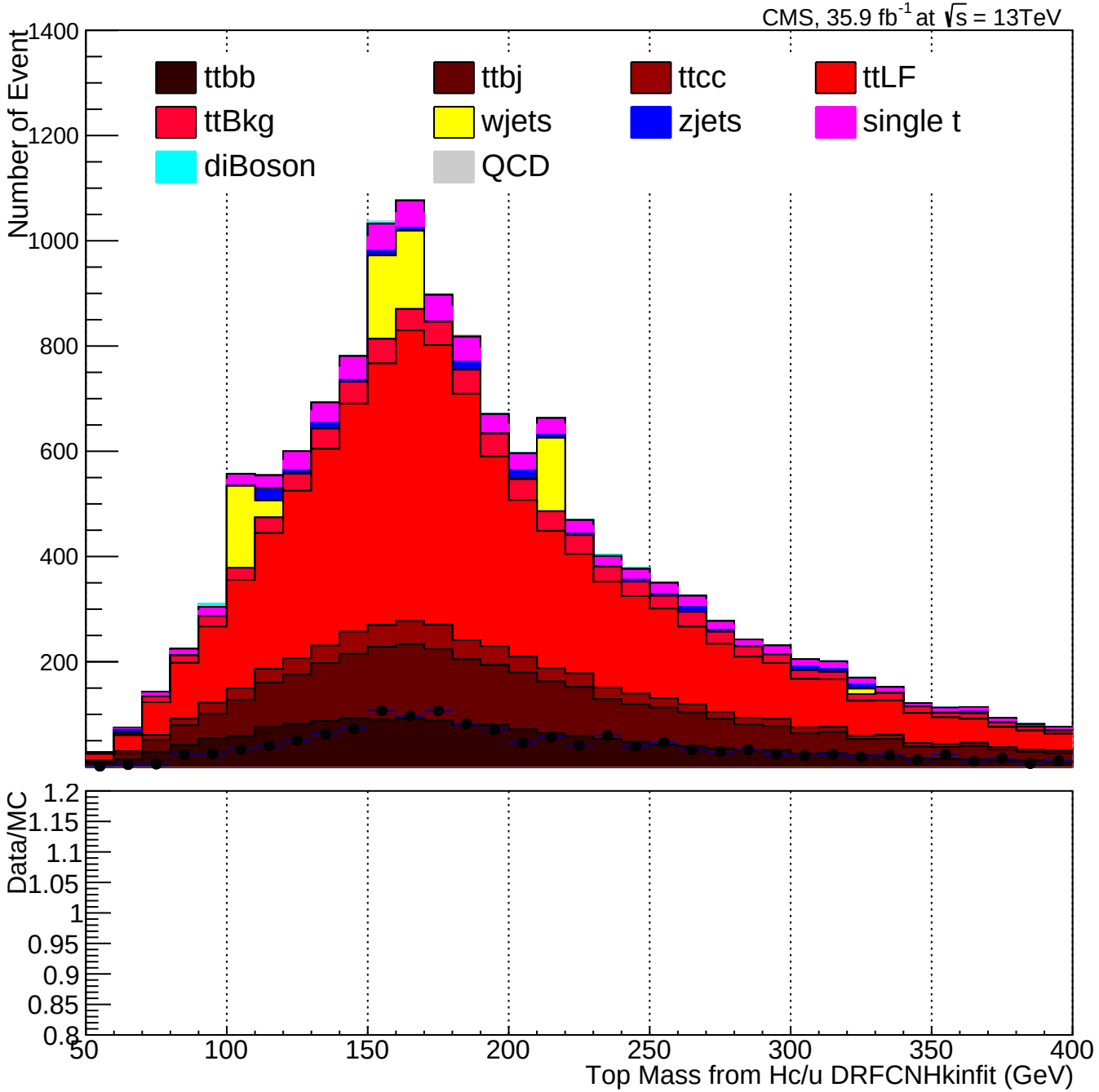

W Mass from DRFCNHkinfit (Had)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
W Mass from DRFCNHkinfit (Had) (GeV)

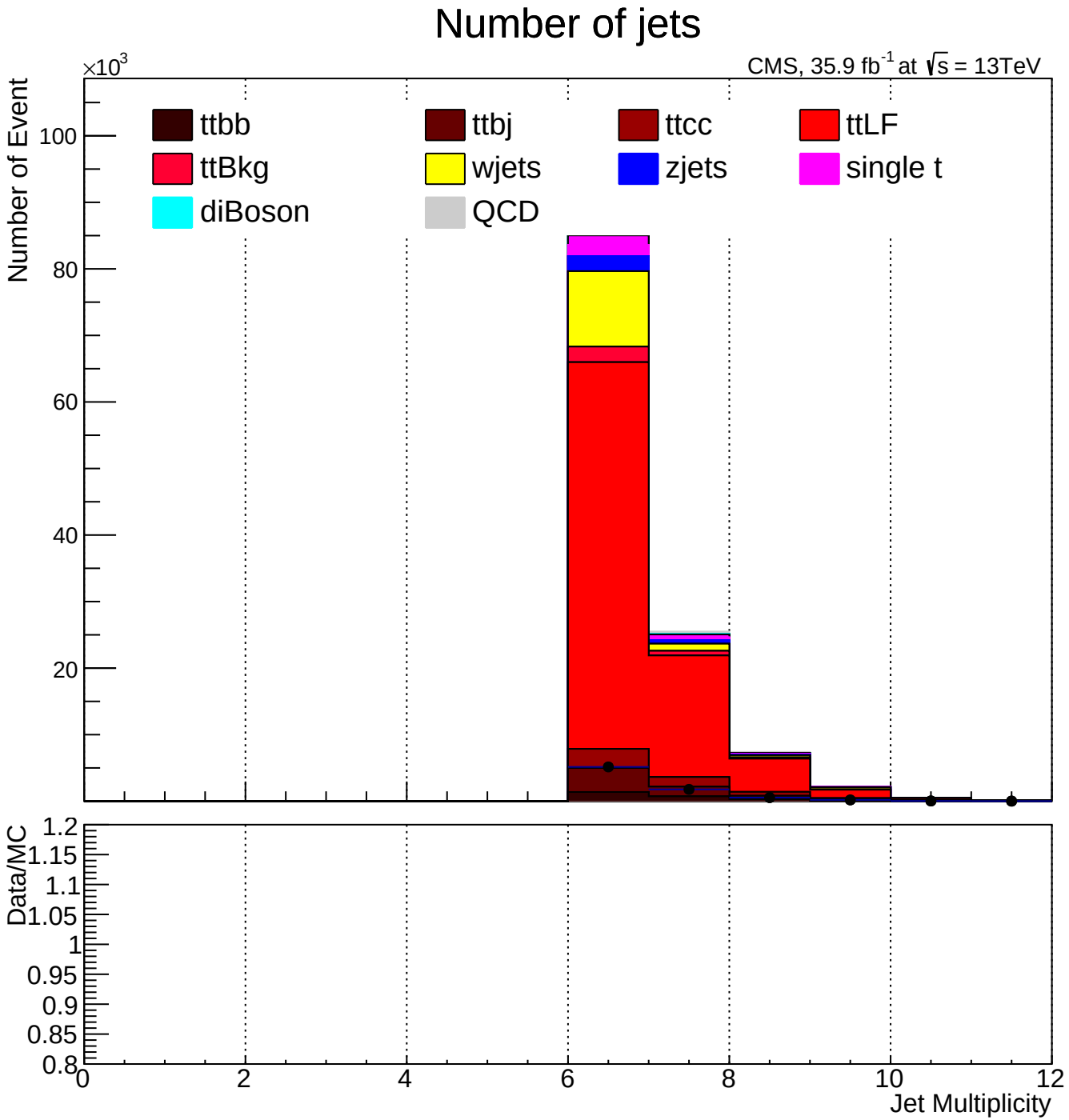

H Mass from DRFCNHkinfit (bb)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
H Mass from DRFCNHkinfit (bb)(GeV)

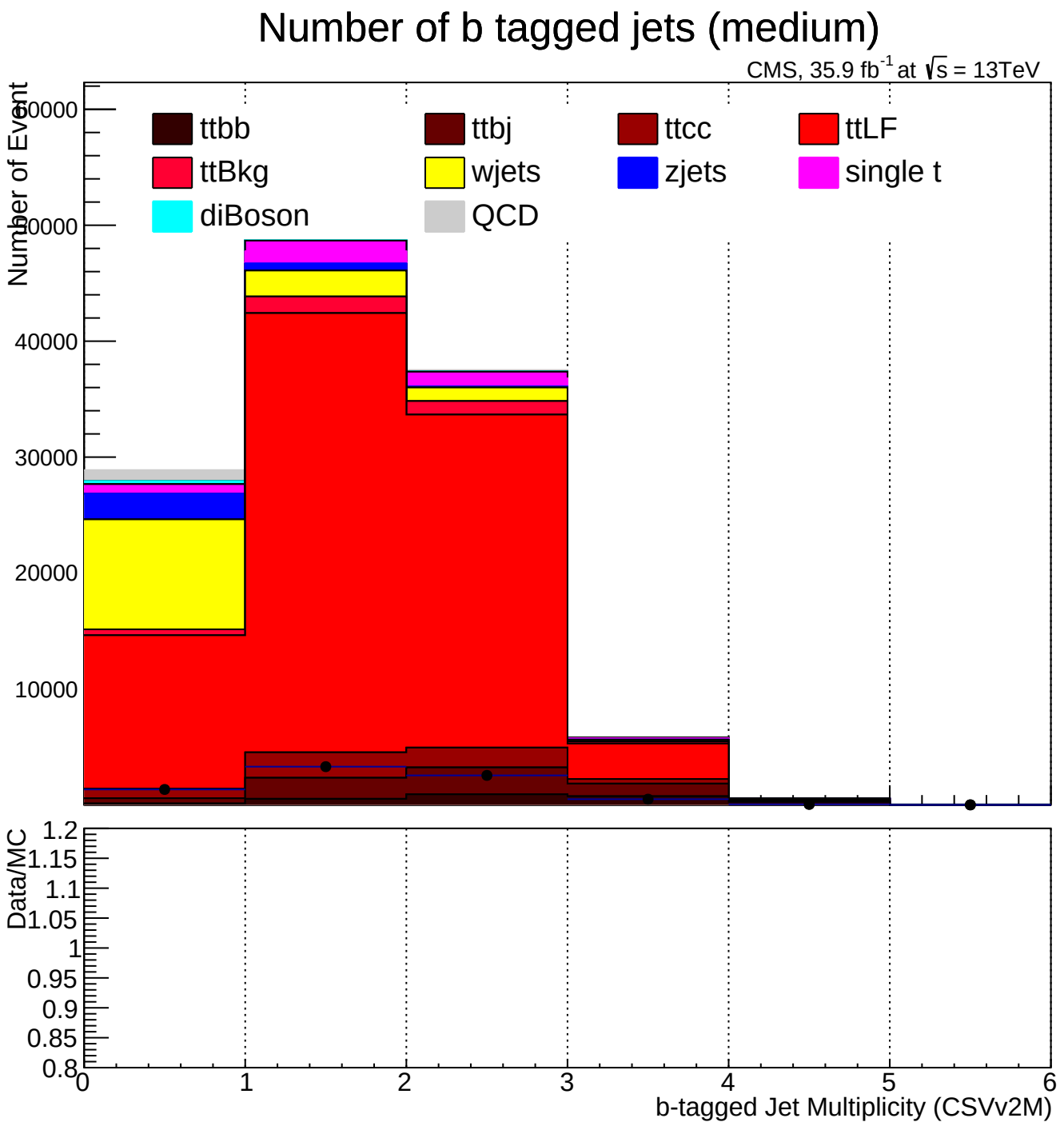

Delta R from DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Delta R from DRFCNHkinfit Higgs

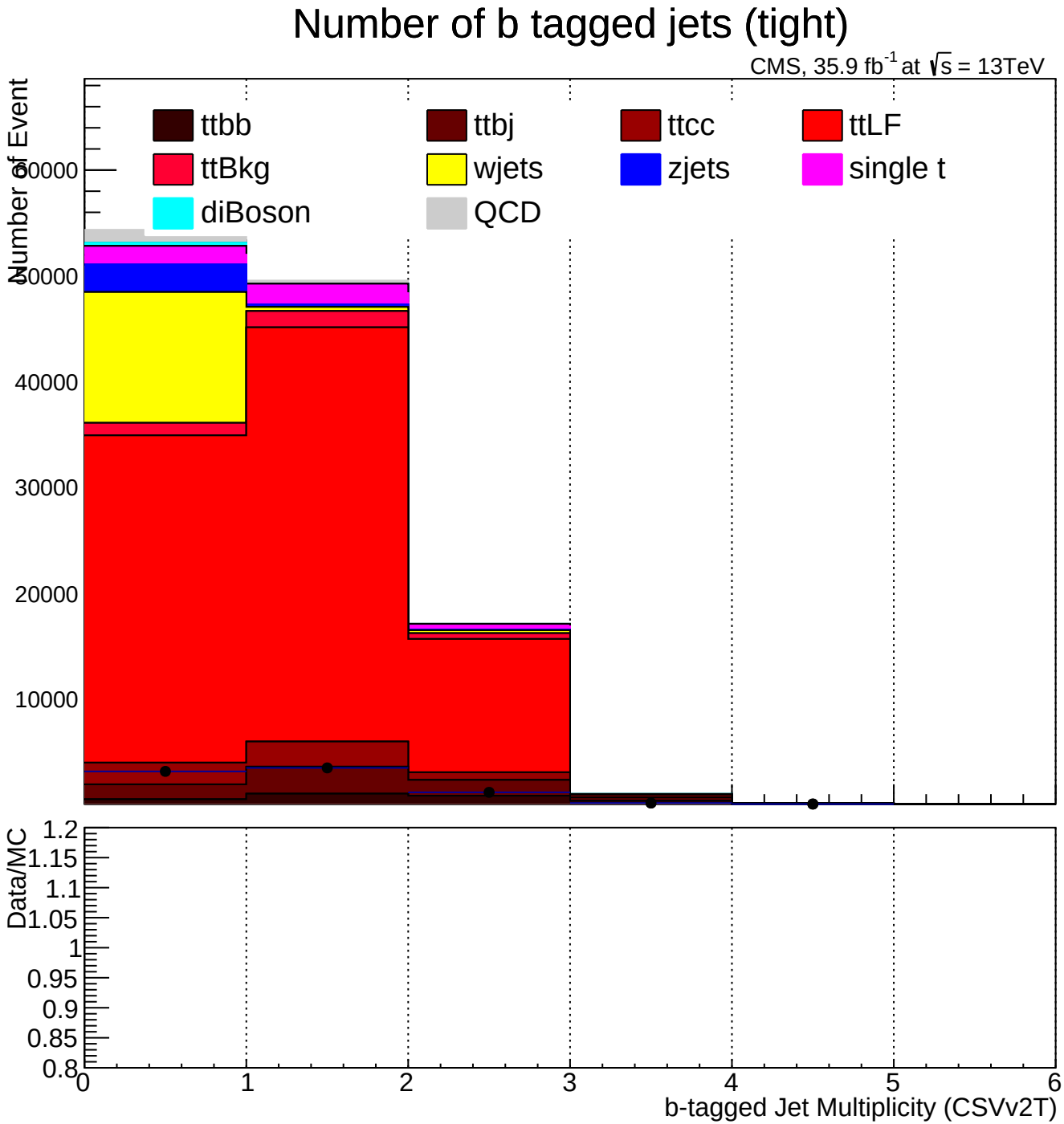

Top Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Top Mass from DRFCNHkinfit (Lep) (GeV)

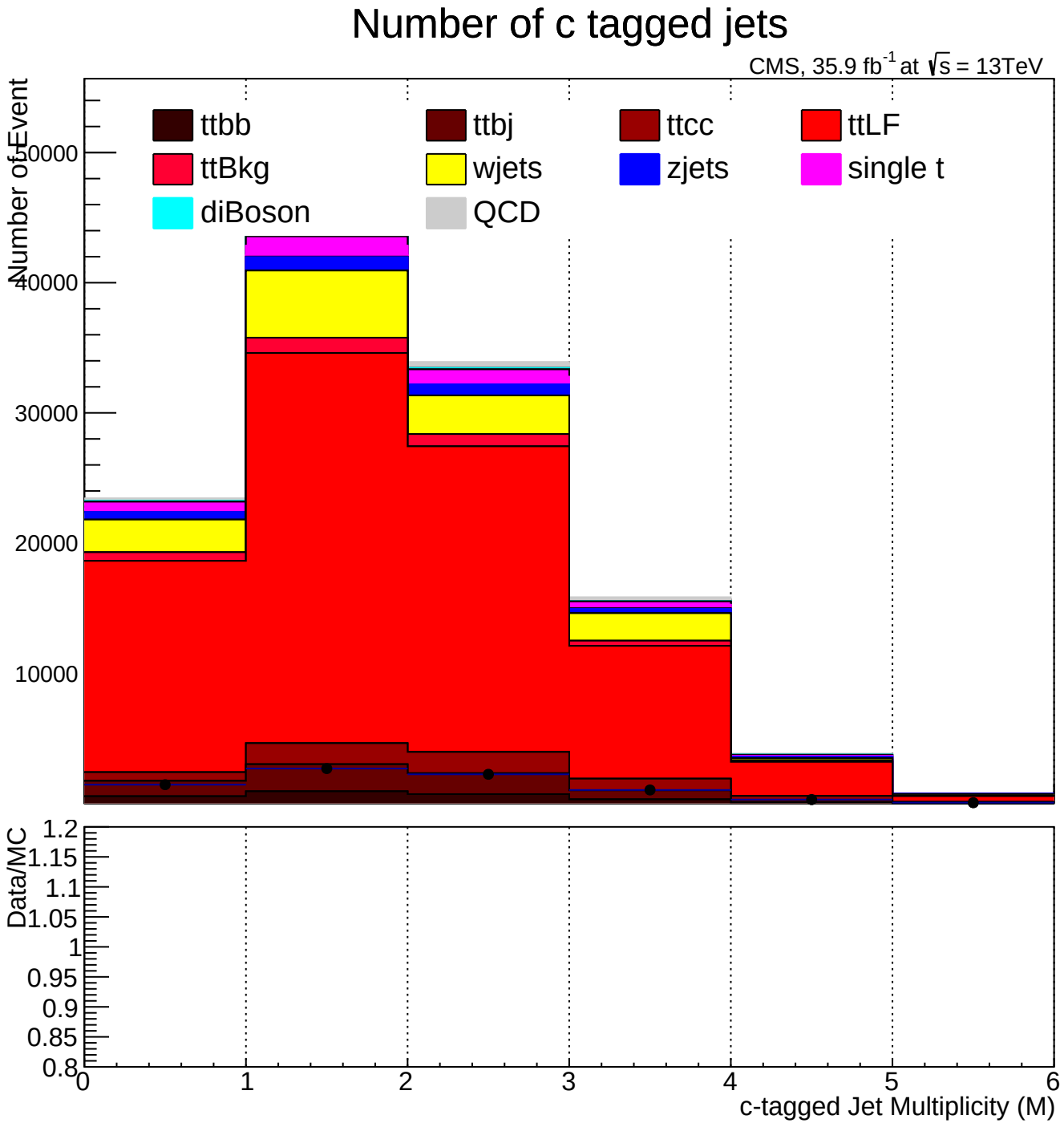
Top mass from Hc/u DRFCNHkinfit

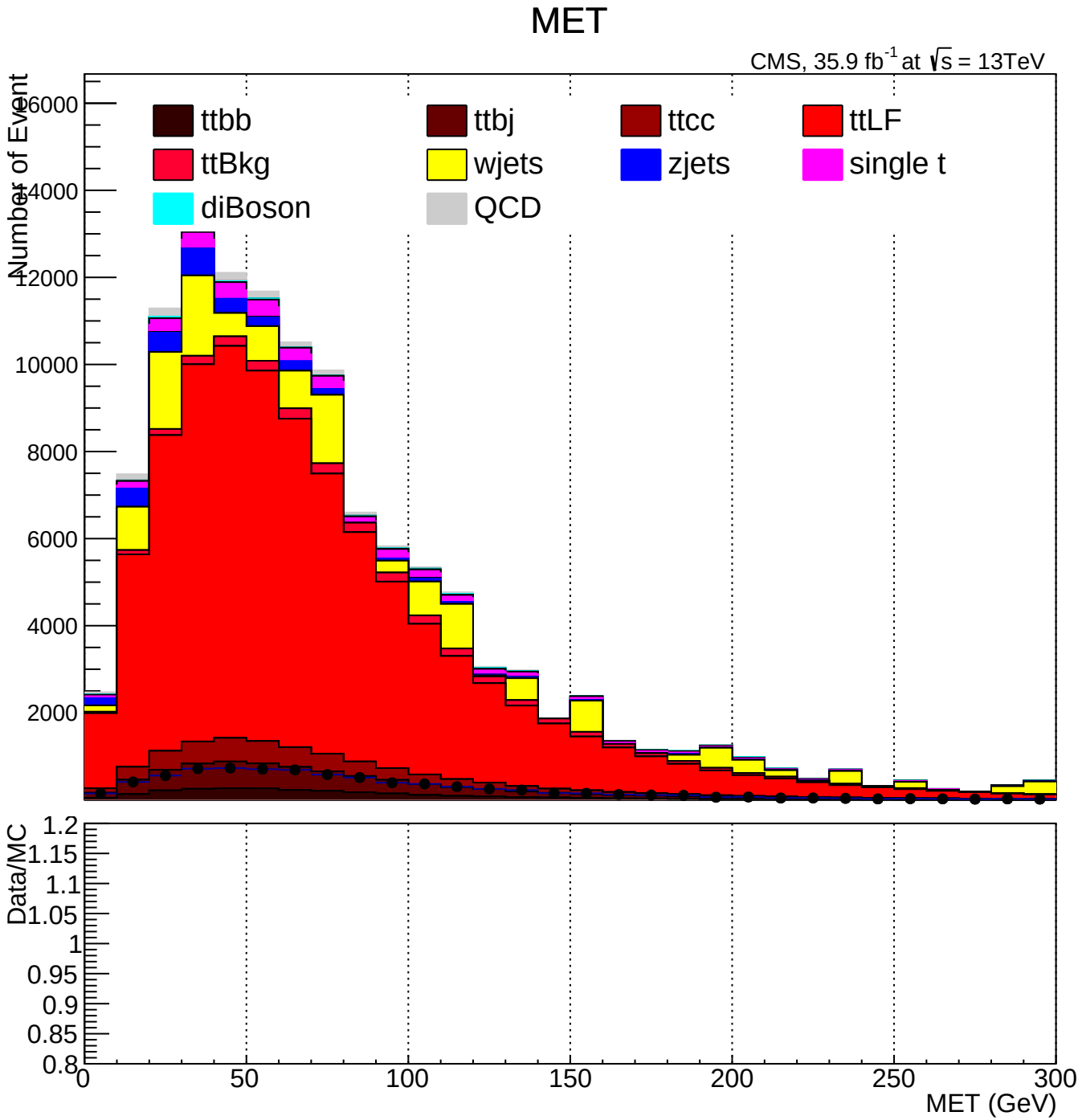


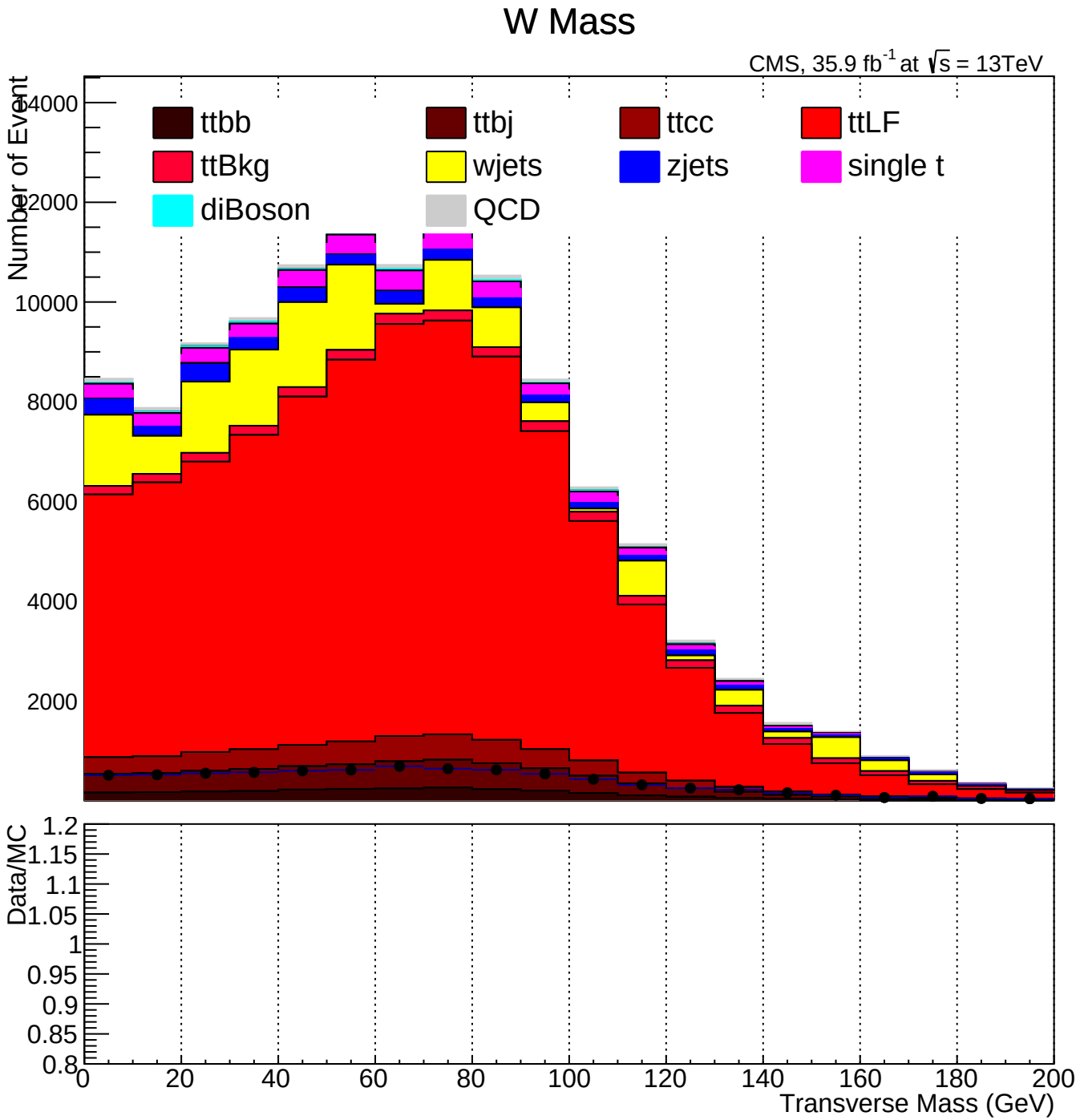

Number of jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
×10^3
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Jet Multiplicity

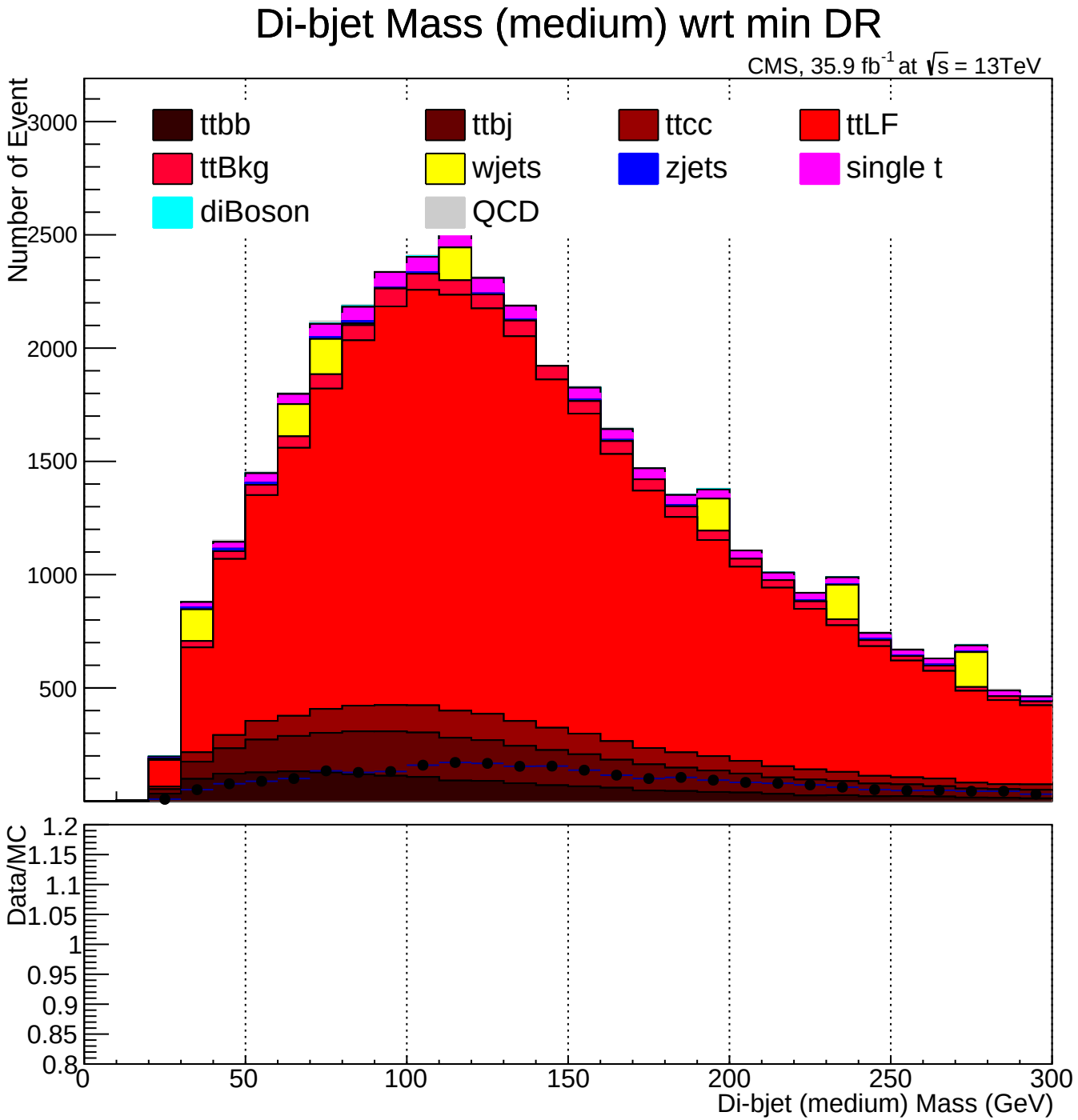

Number of b tagged jets (medium)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
50000
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2M)

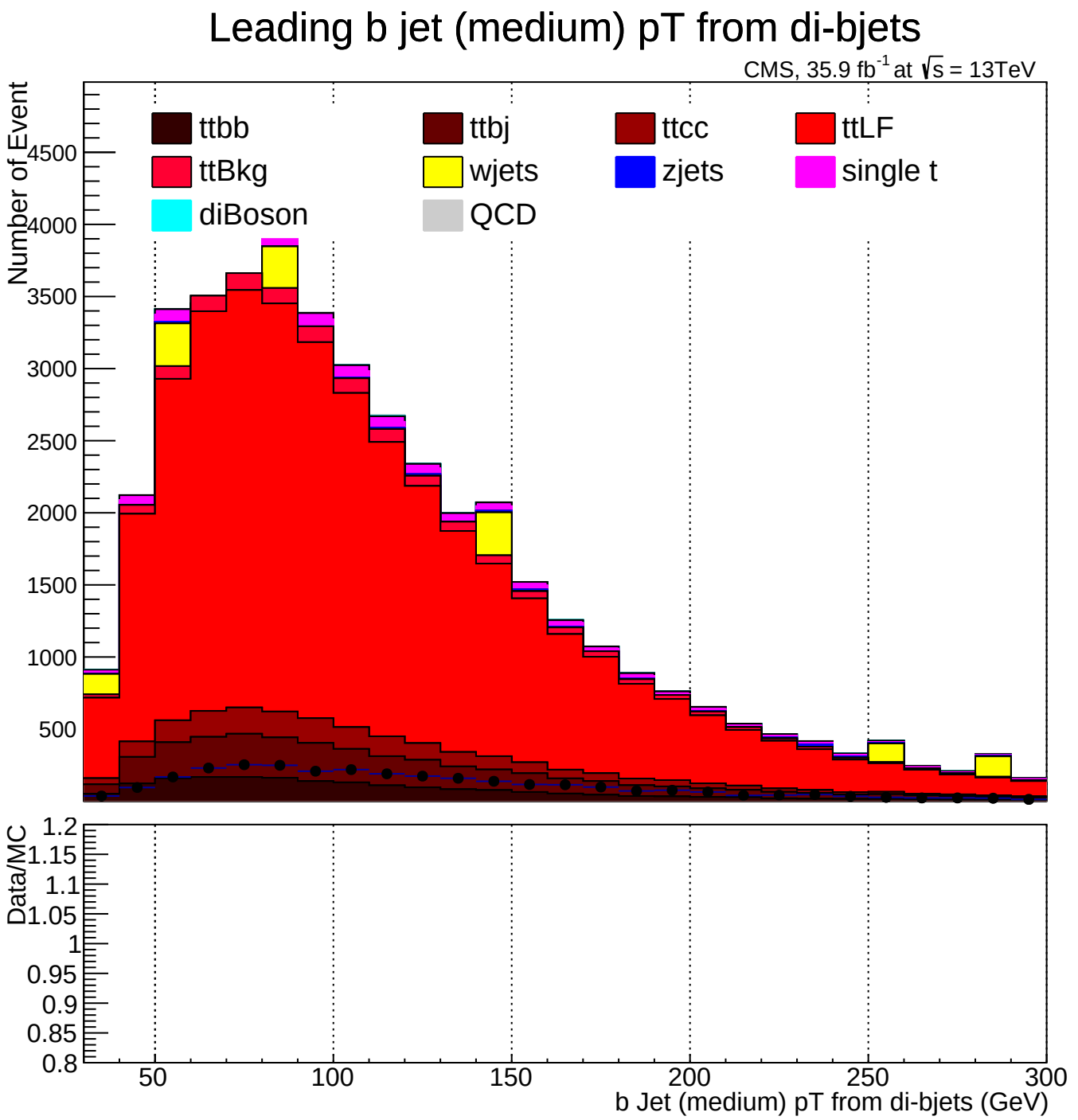

Number of b tagged jets (tight)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
50000
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2T)

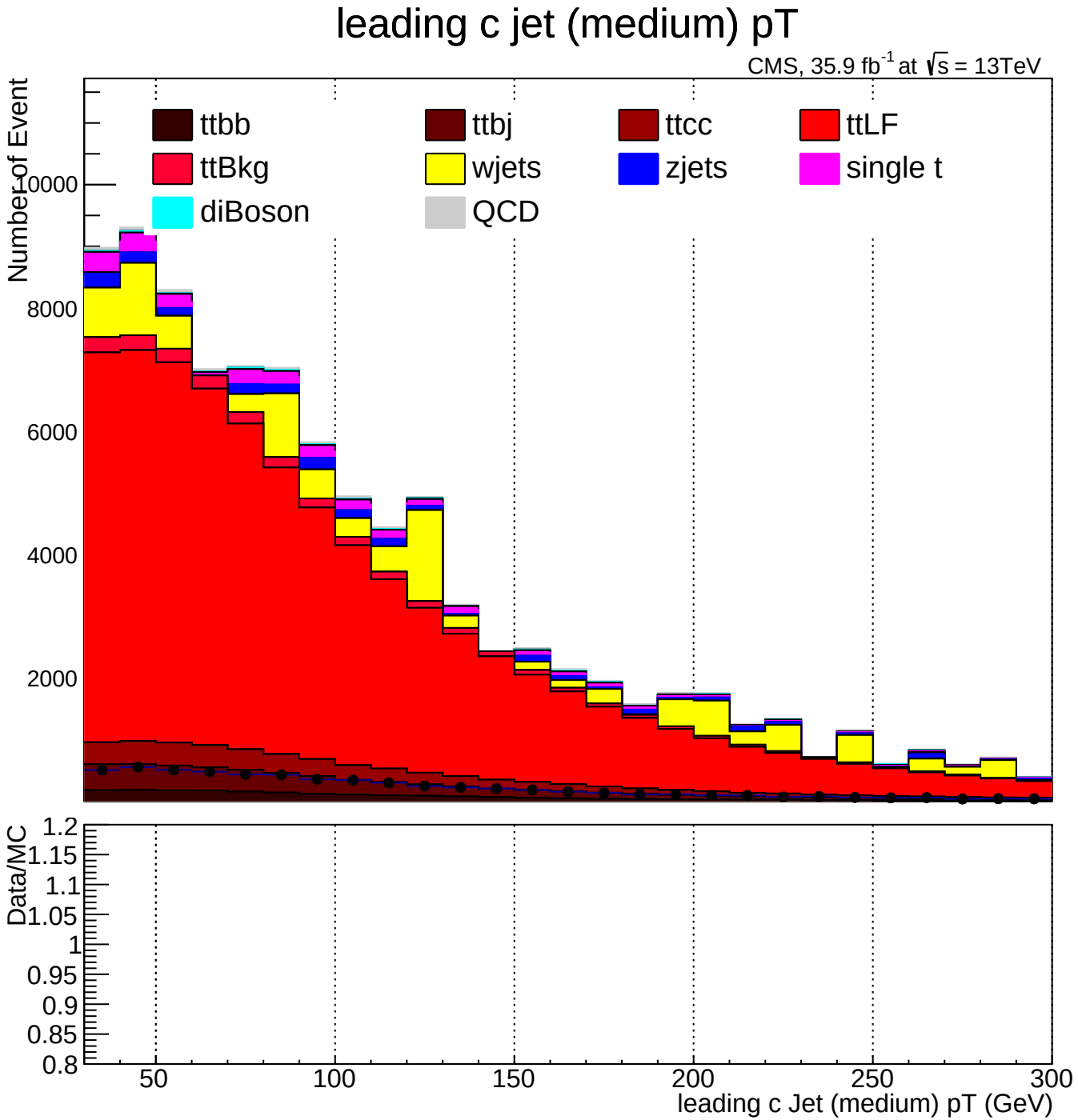

Number of c tagged jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
50000
40000
30000
20000
10000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
c-tagged Jet Multiplicity (M)

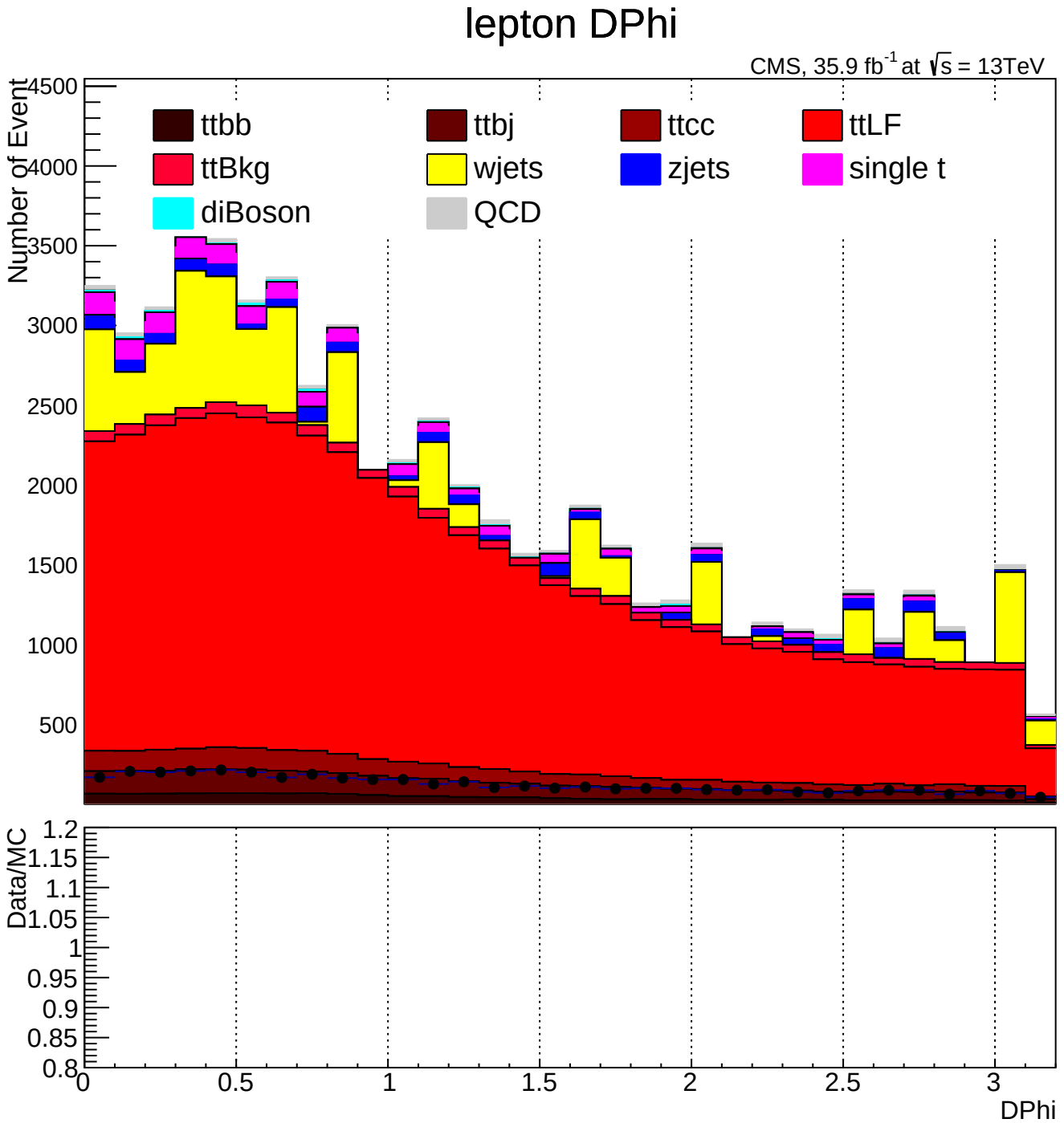

MET
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
16000
14000
12000
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
50
100
150
200
250
300
MET (GeV)

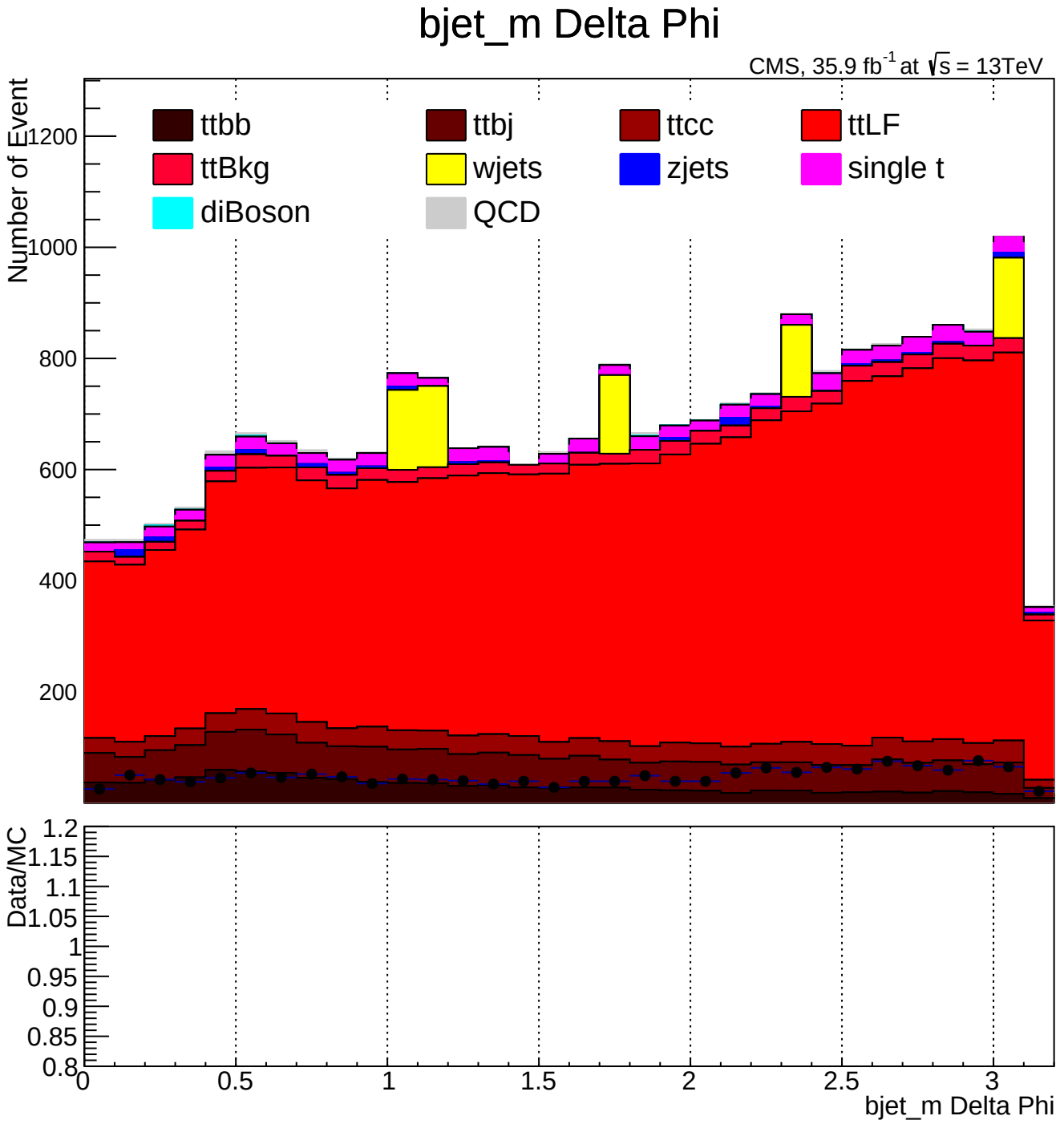

W Mass
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Transverse Mass (GeV)

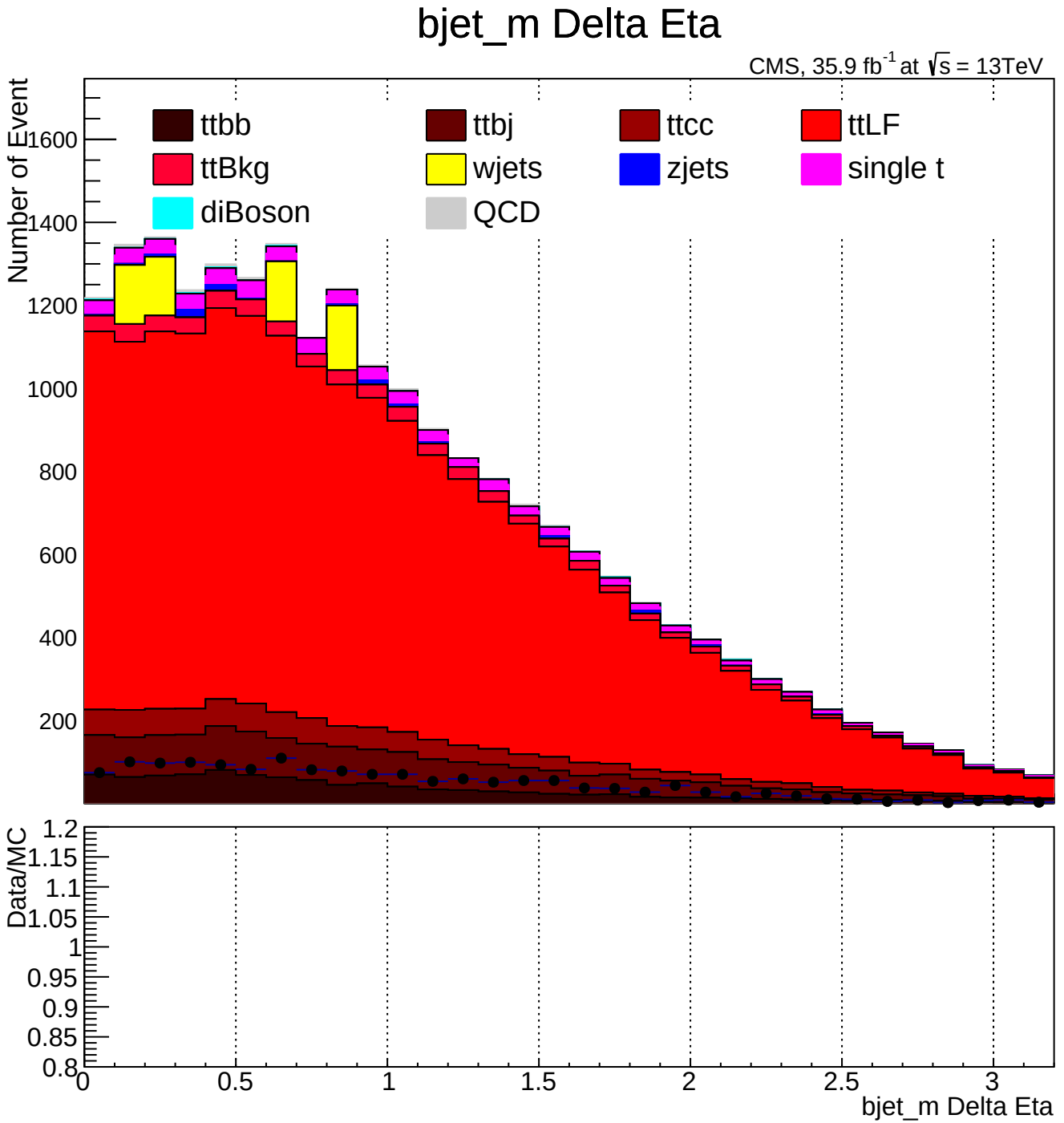

Di-bjet Mass (medium) wrt min DR
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Di-bjet (medium) Mass (GeV)

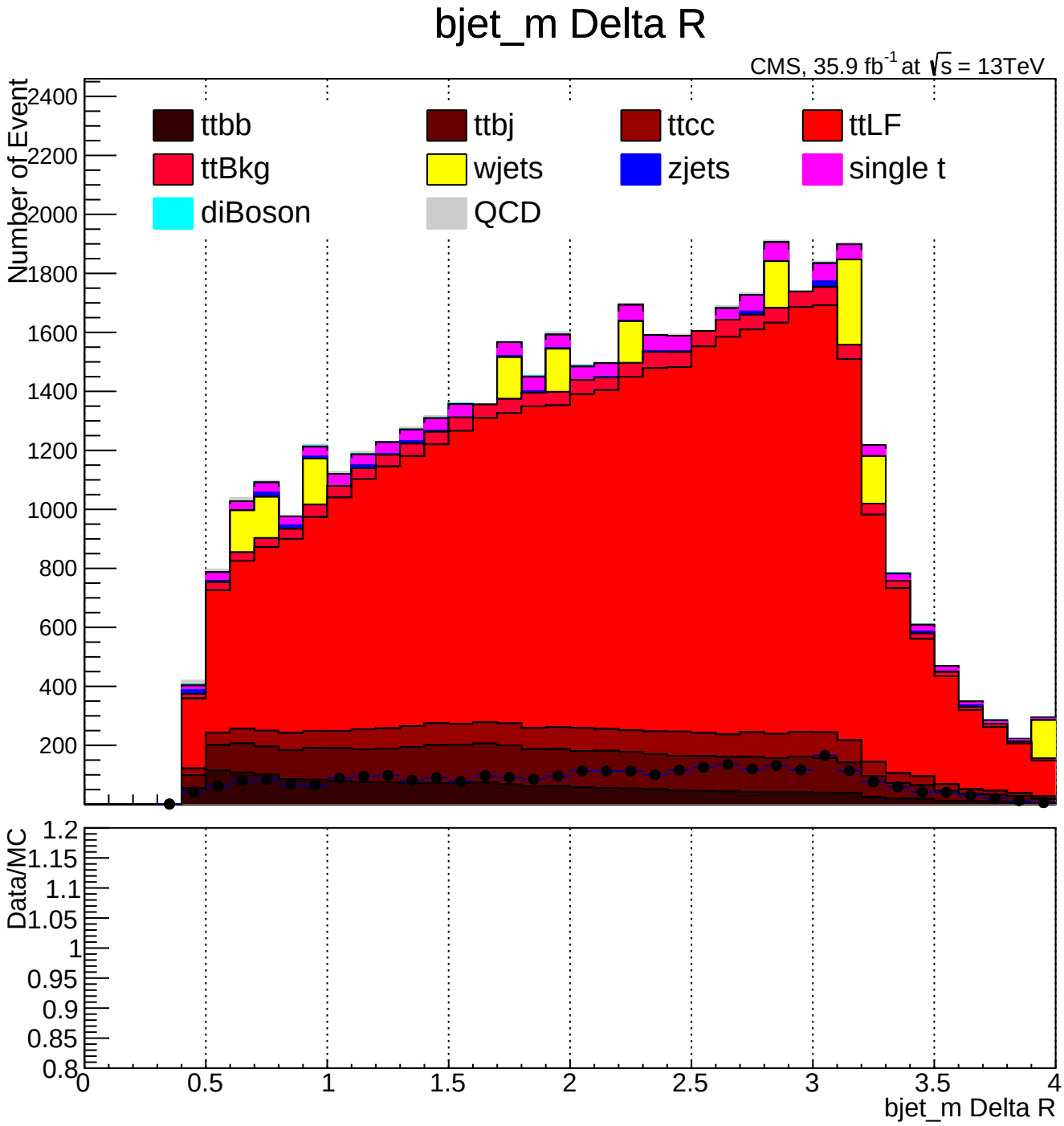

Leading b jet (medium) pT from di-bjets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
4500
4000
3500
3000
2500
2000
1500
1000
500
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
b Jet (medium) pT from di-bjets (GeV)

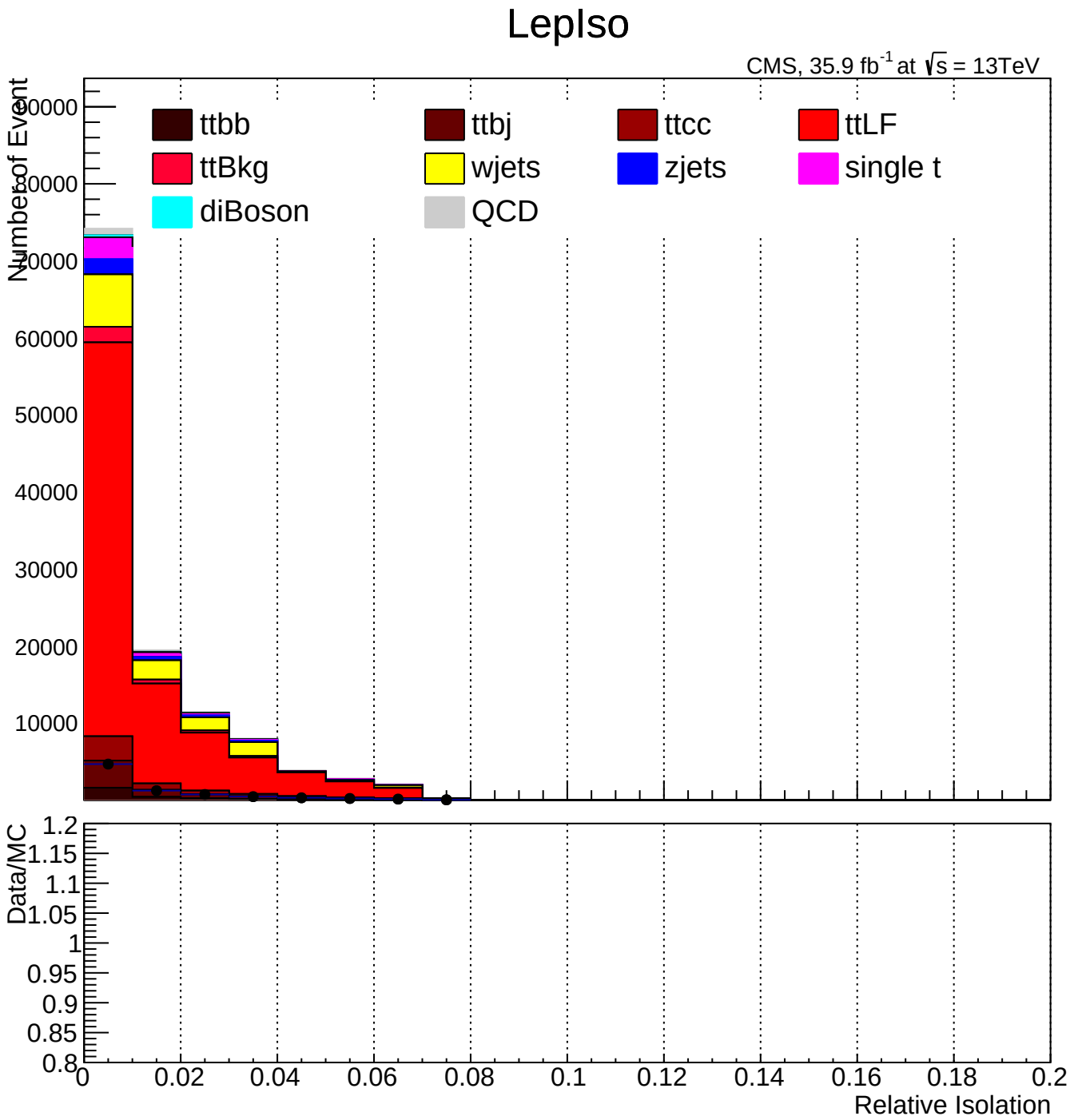

leading c jet (medium) pT
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
leading c Jet (medium) pT (GeV)

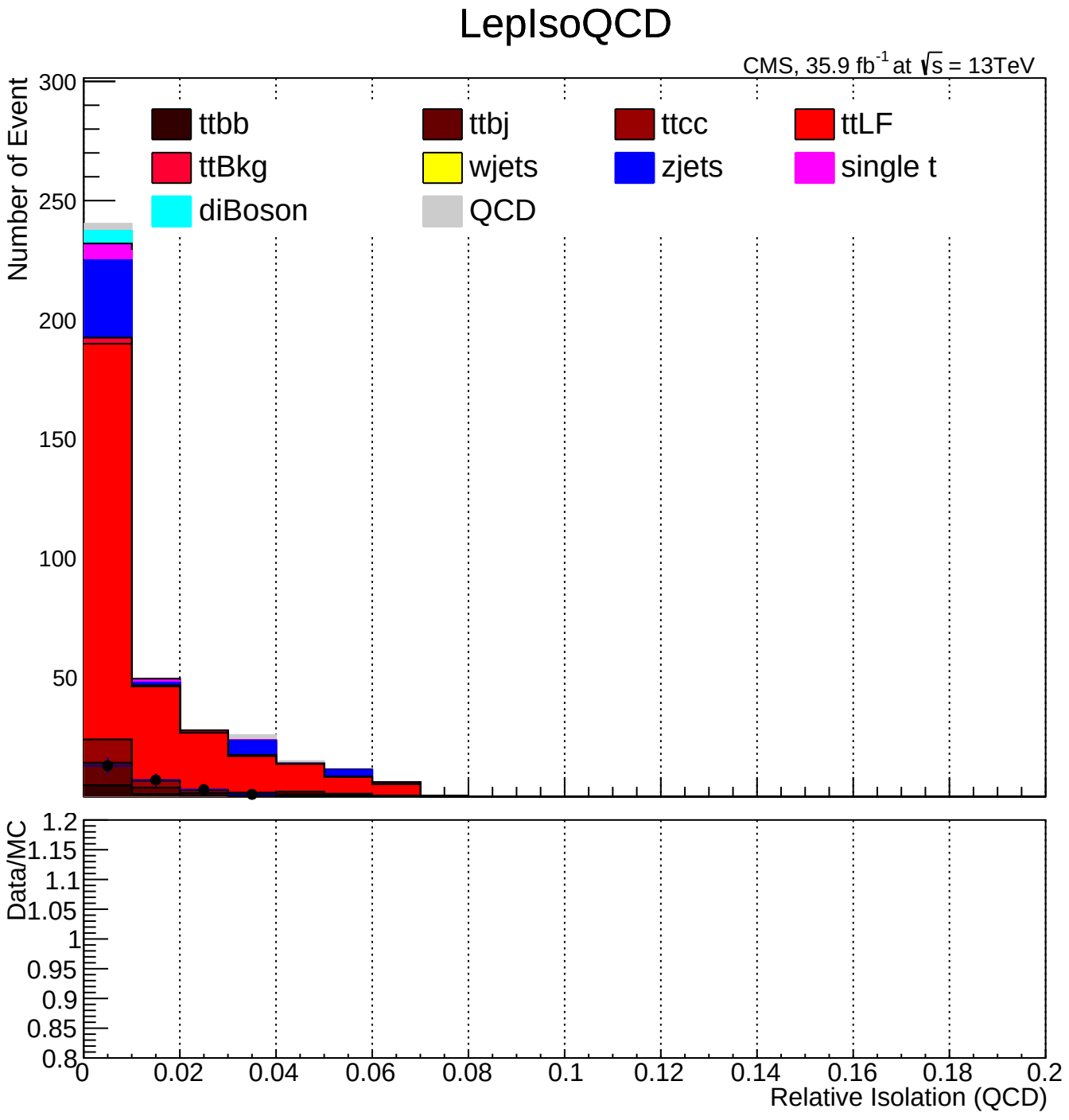

lepton DPhi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
DPhi

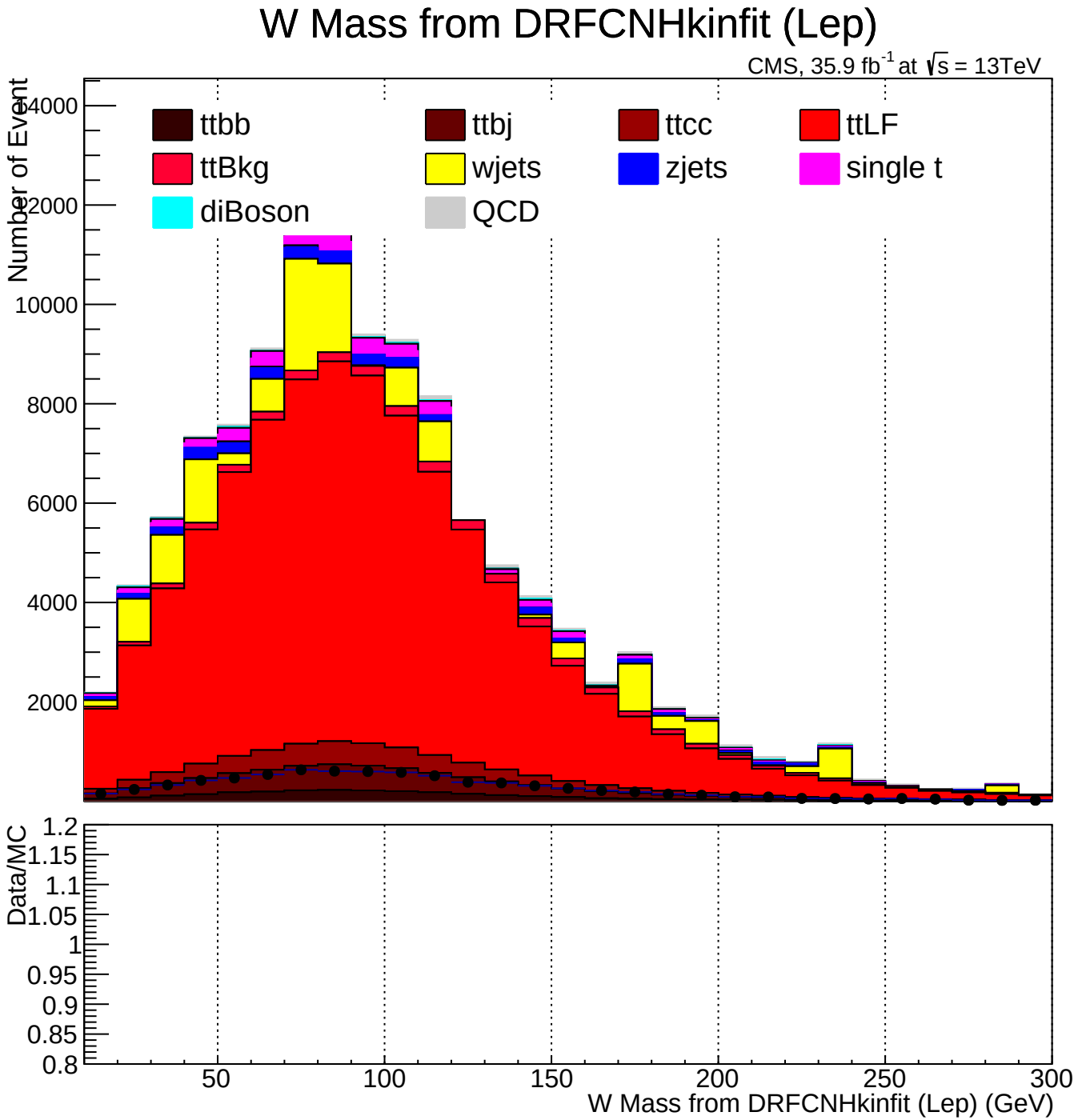

bjet_m Delta Phi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
1200
1000
800
600
400
200
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Phi

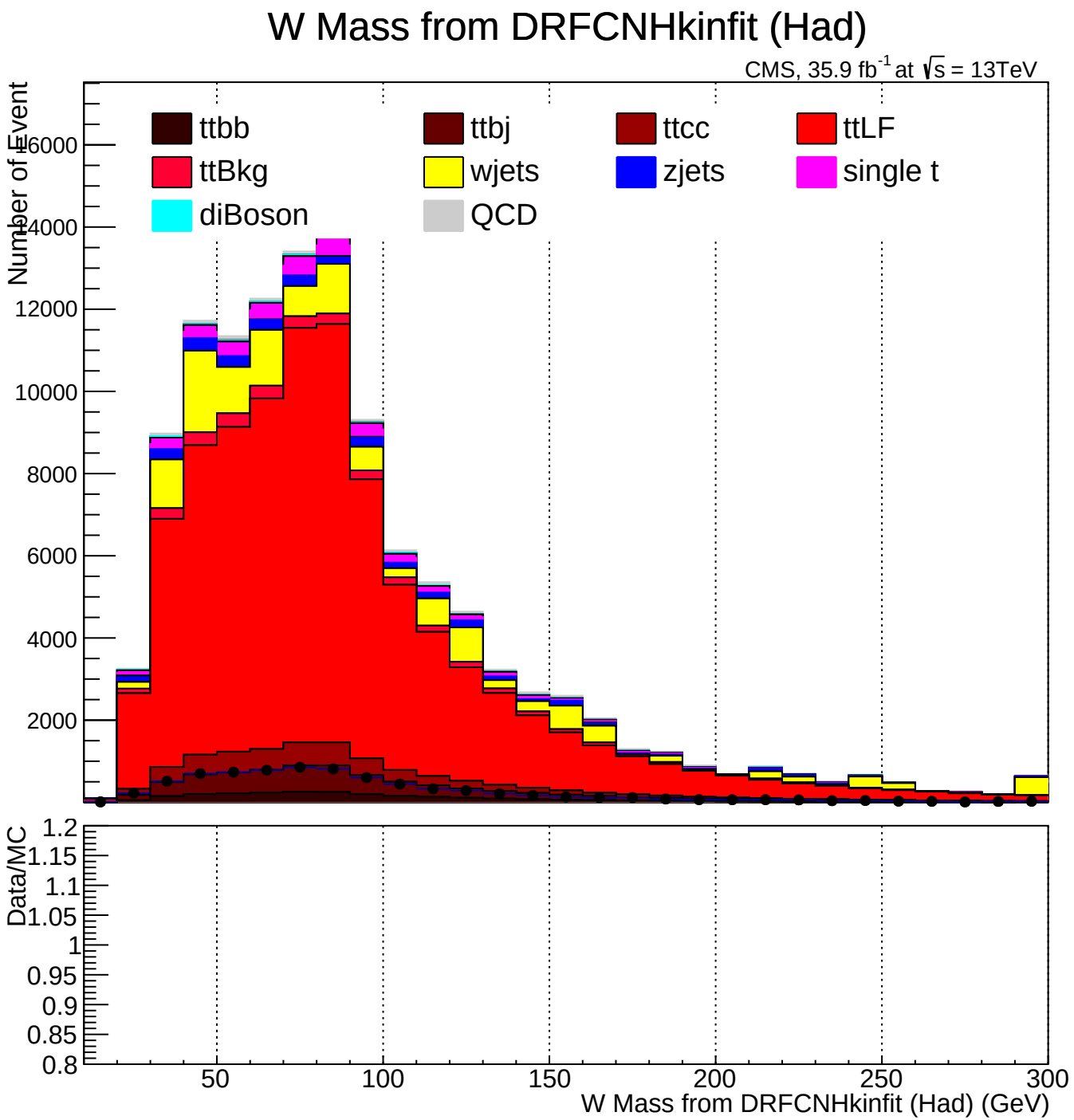

bjet_m Delta Eta
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
1600
1400
1200
1000
800
600
400
200
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Eta

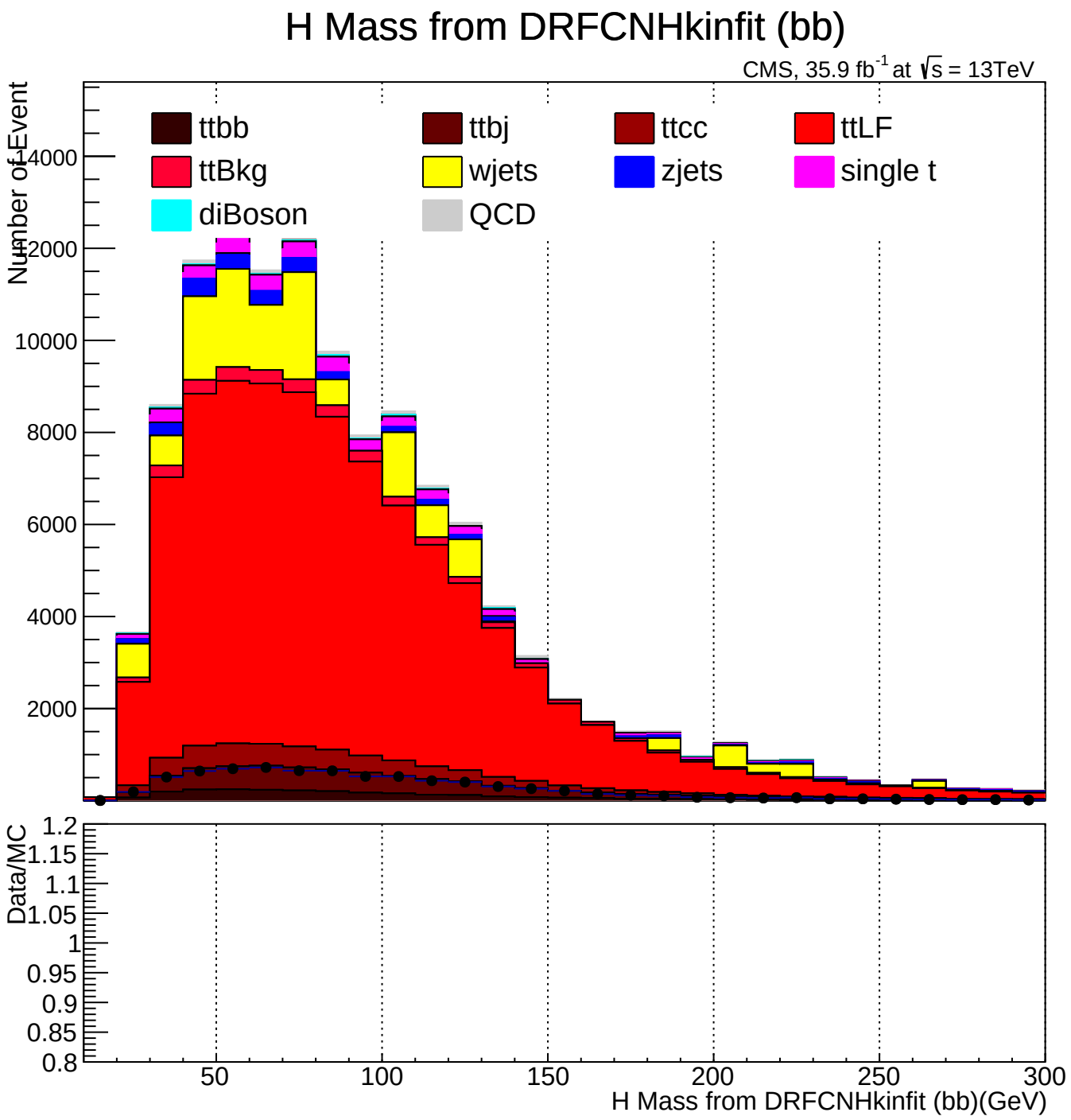

bjet_m Delta R
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
bjet_m Delta R

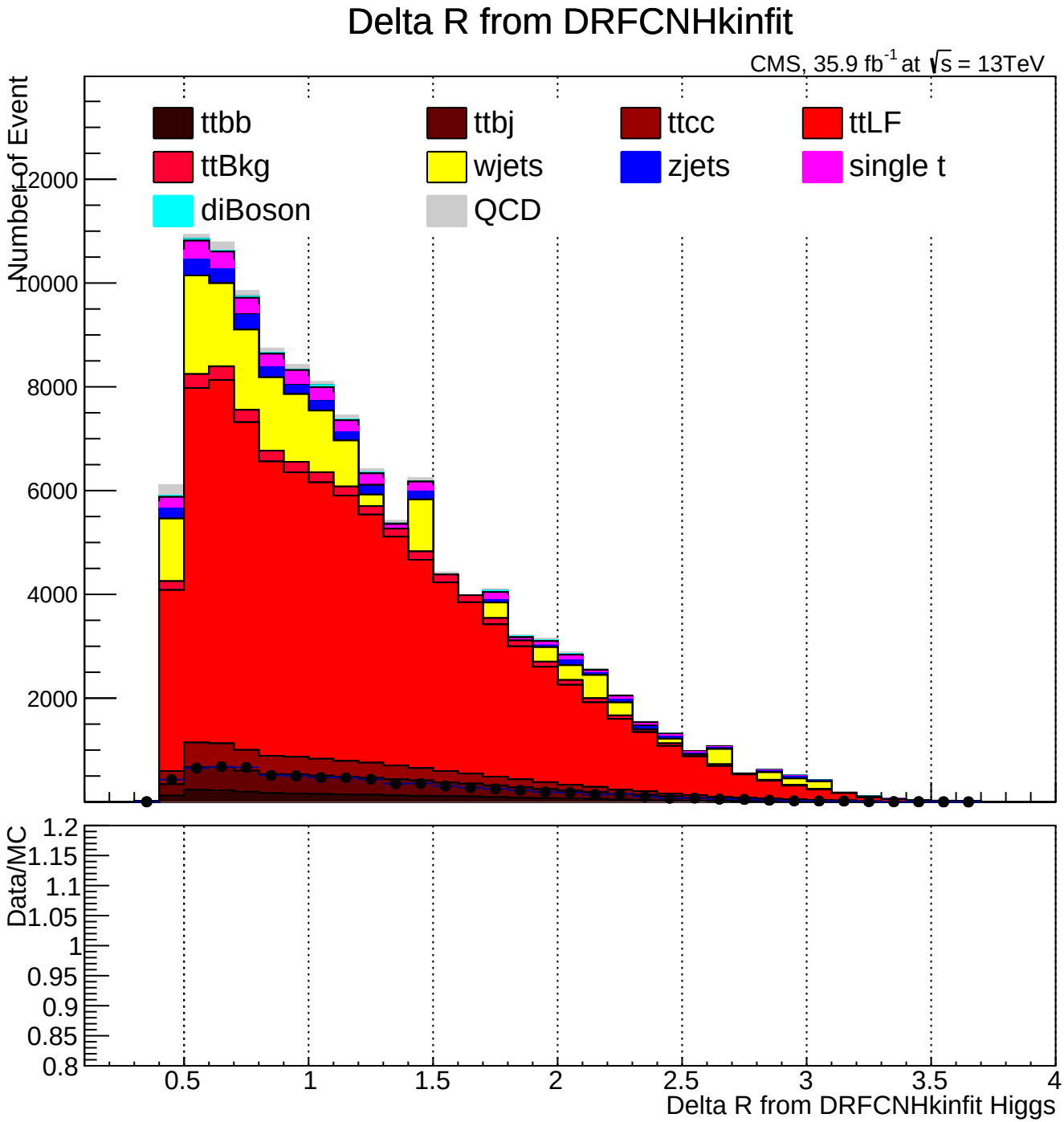

LepIso
CMS, 35.9 fb-1 at √s = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation

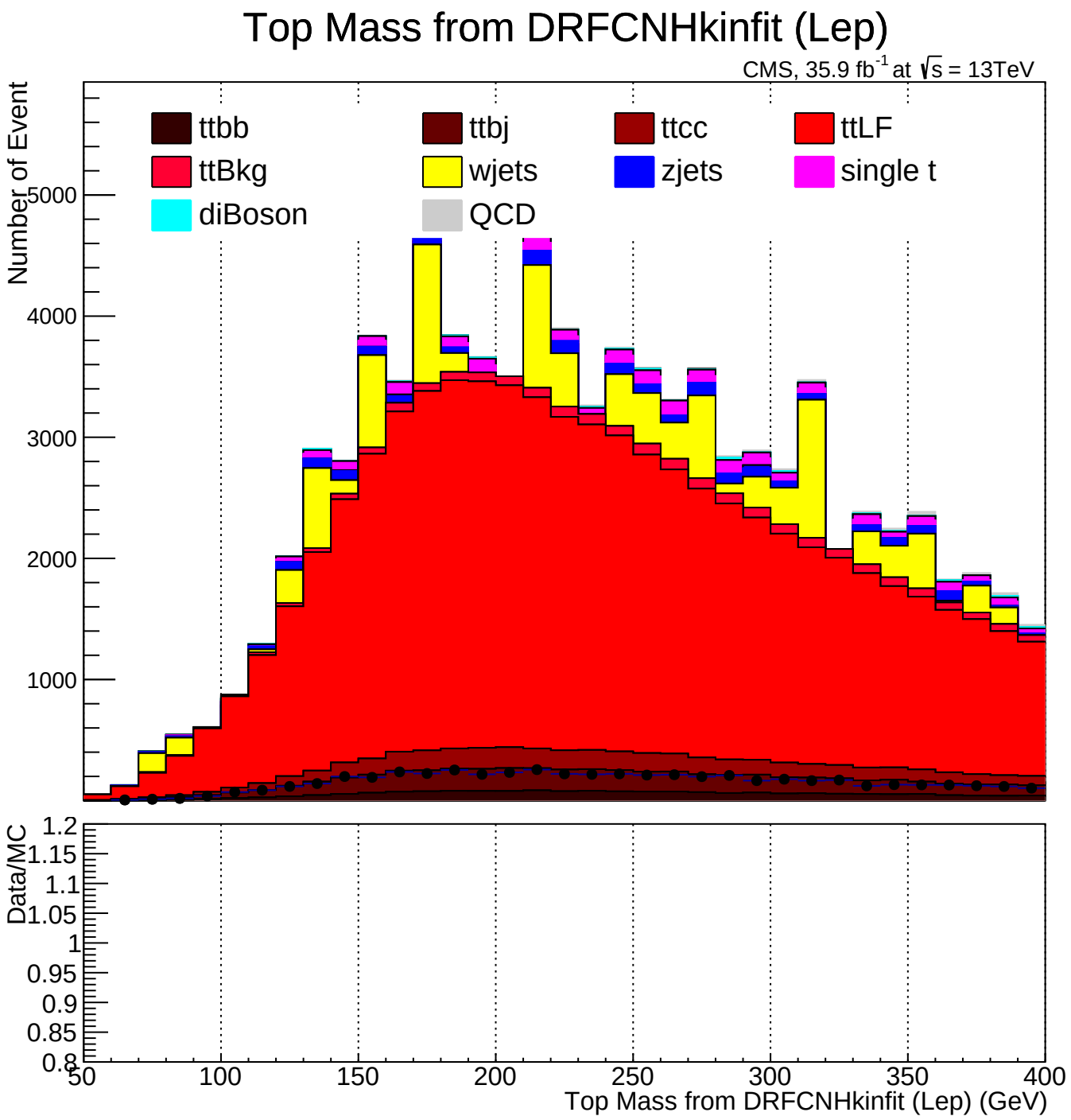

LepIsoQCD
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation (QCD)

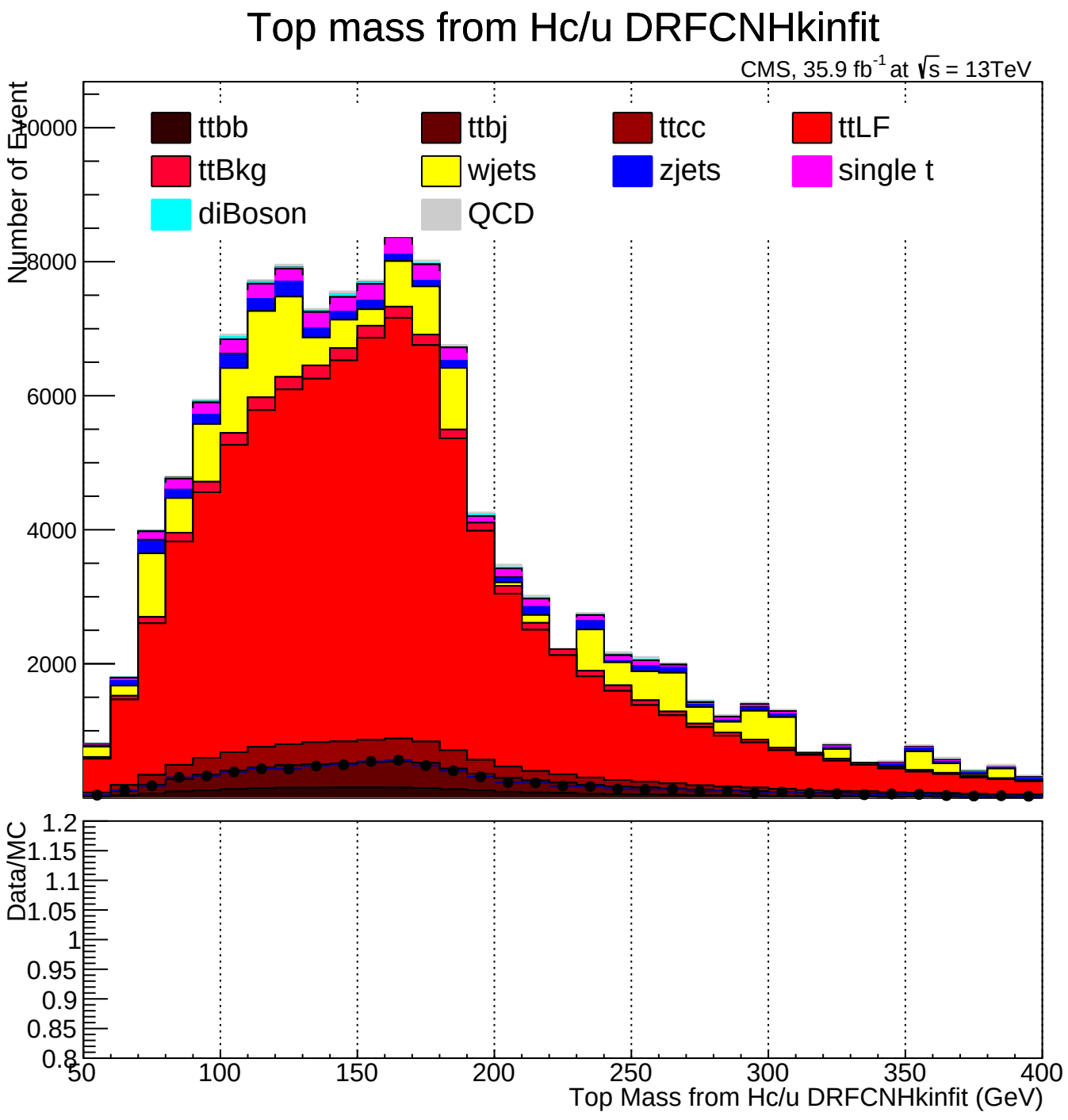

W Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
W Mass from DRFCNHkinfit (Lep) (GeV)

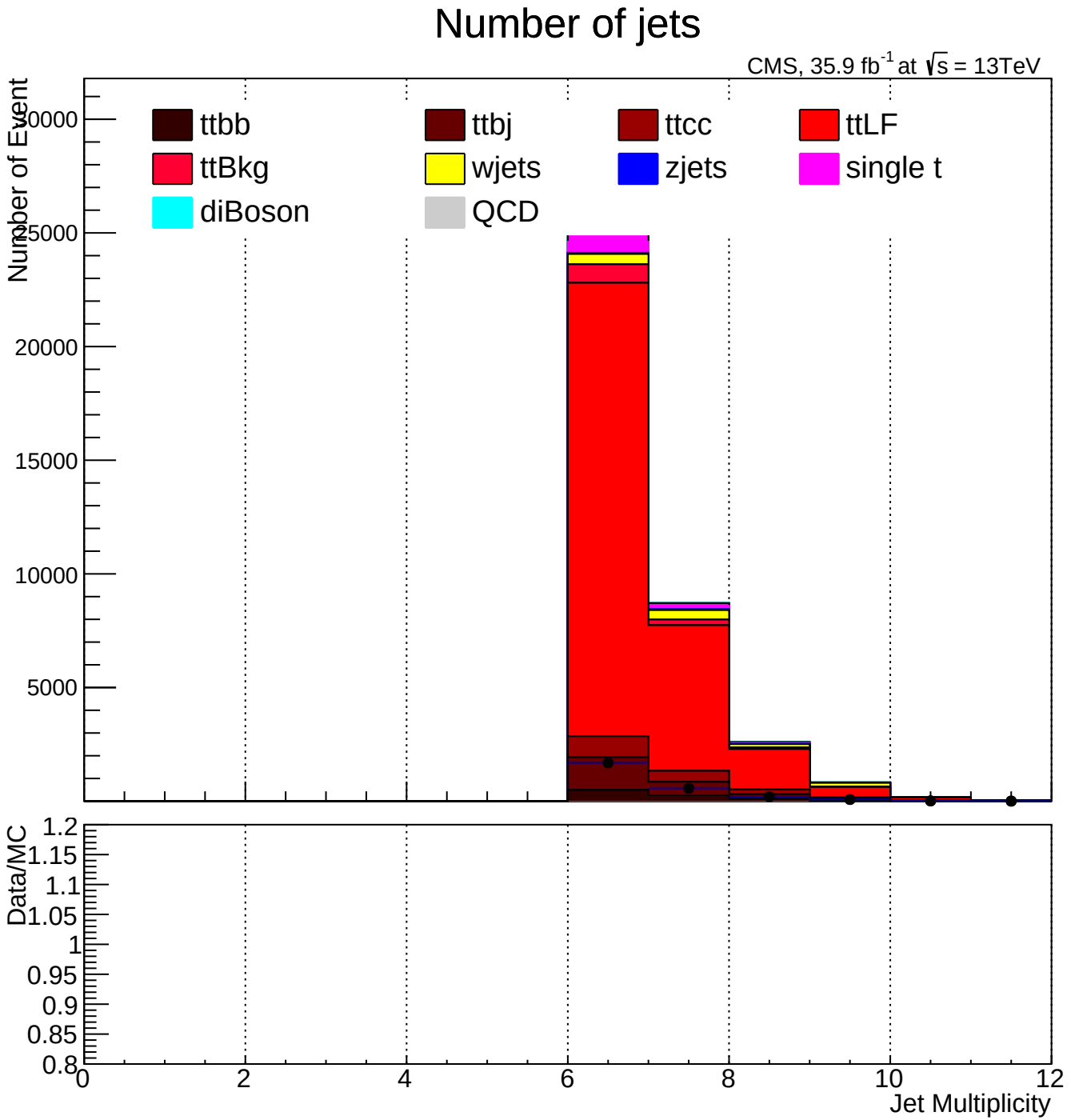

W Mass from DRFCNHkinfit (Had)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
16000
14000
12000
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
W Mass from DRFCNHkinfit (Had) (GeV)

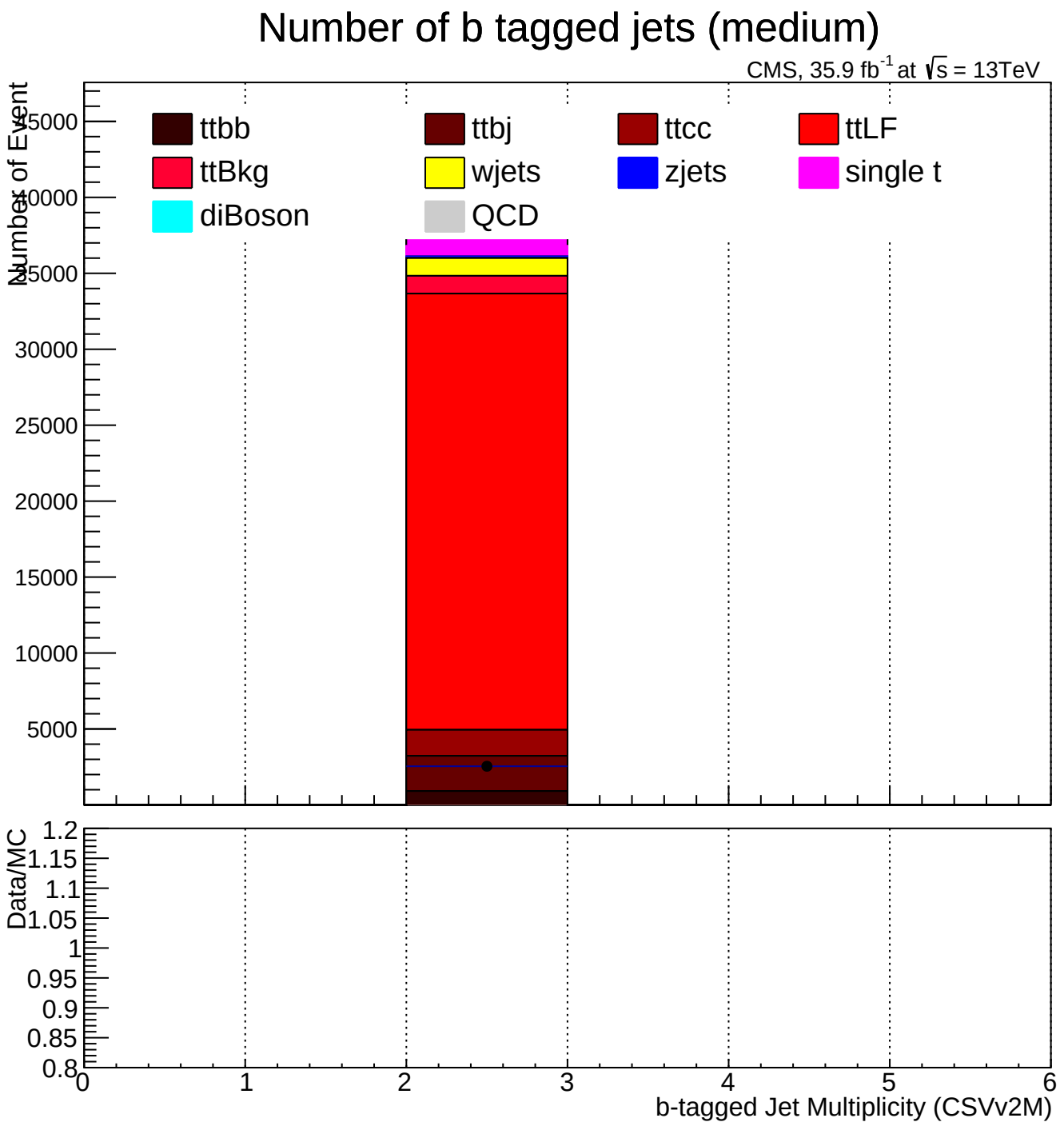

H Mass from DRFCNHkinfit (bb)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
H Mass from DRFCNHkinfit (bb)(GeV)

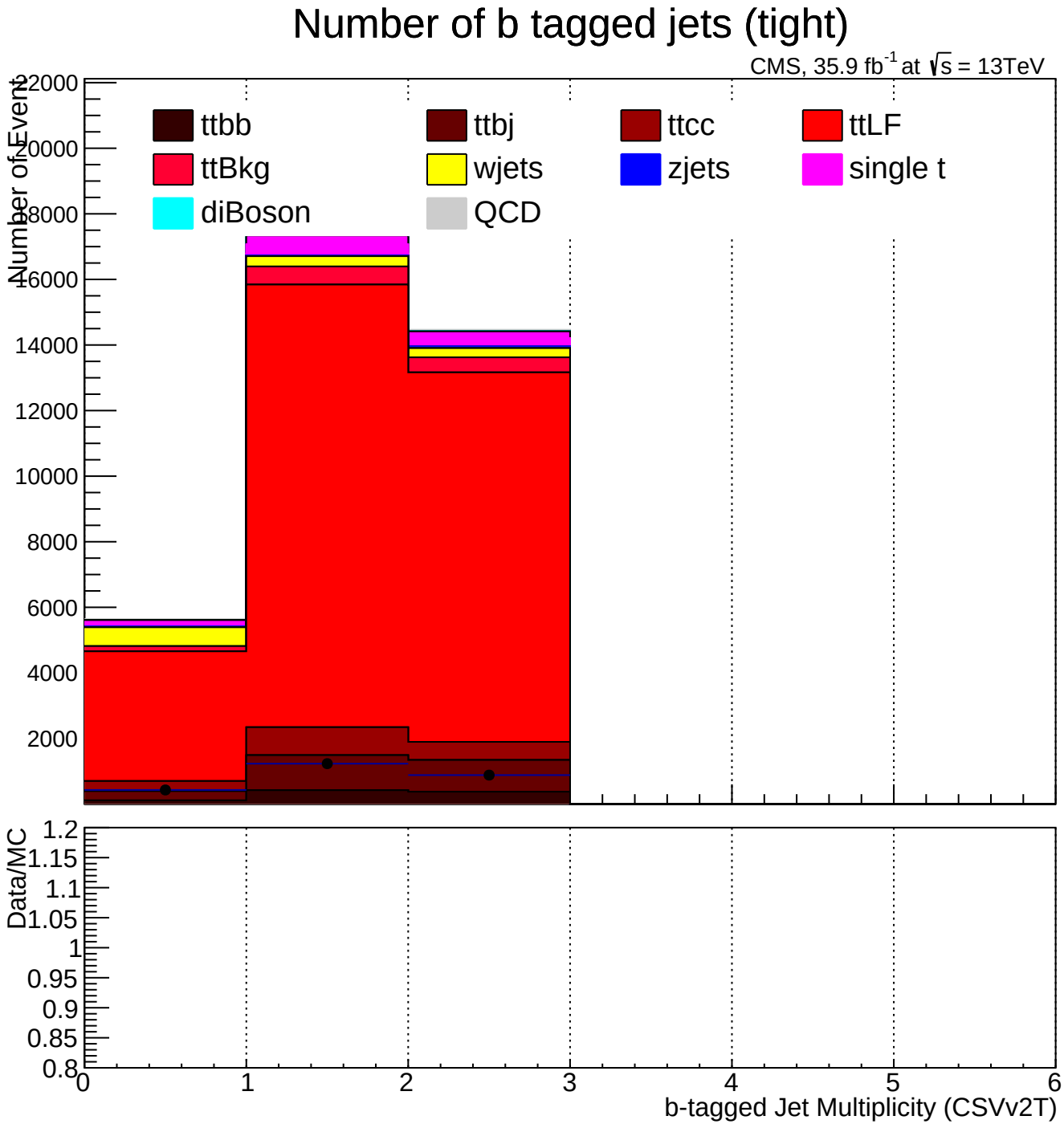

Delta R from DRFCNHkinfit
CMS, 35.9 fb-1 at √s = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
12000
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0.5
1
1.5
2
2.5
3
3.5
4
Delta R from DRFCNHkinfit Higgs

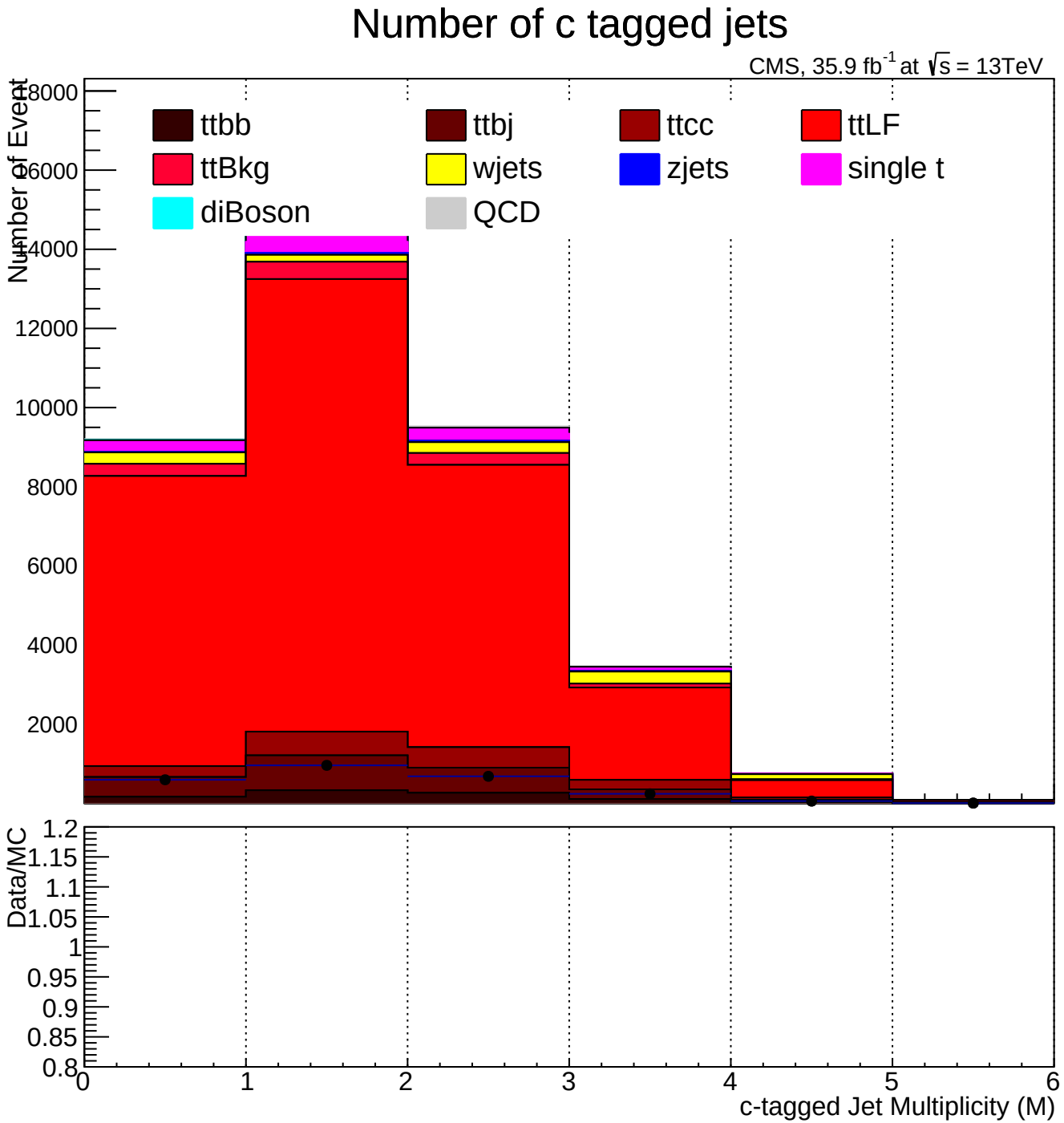

Top Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
350
400
Top Mass from DRFCNHkinfit (Lep) (GeV)

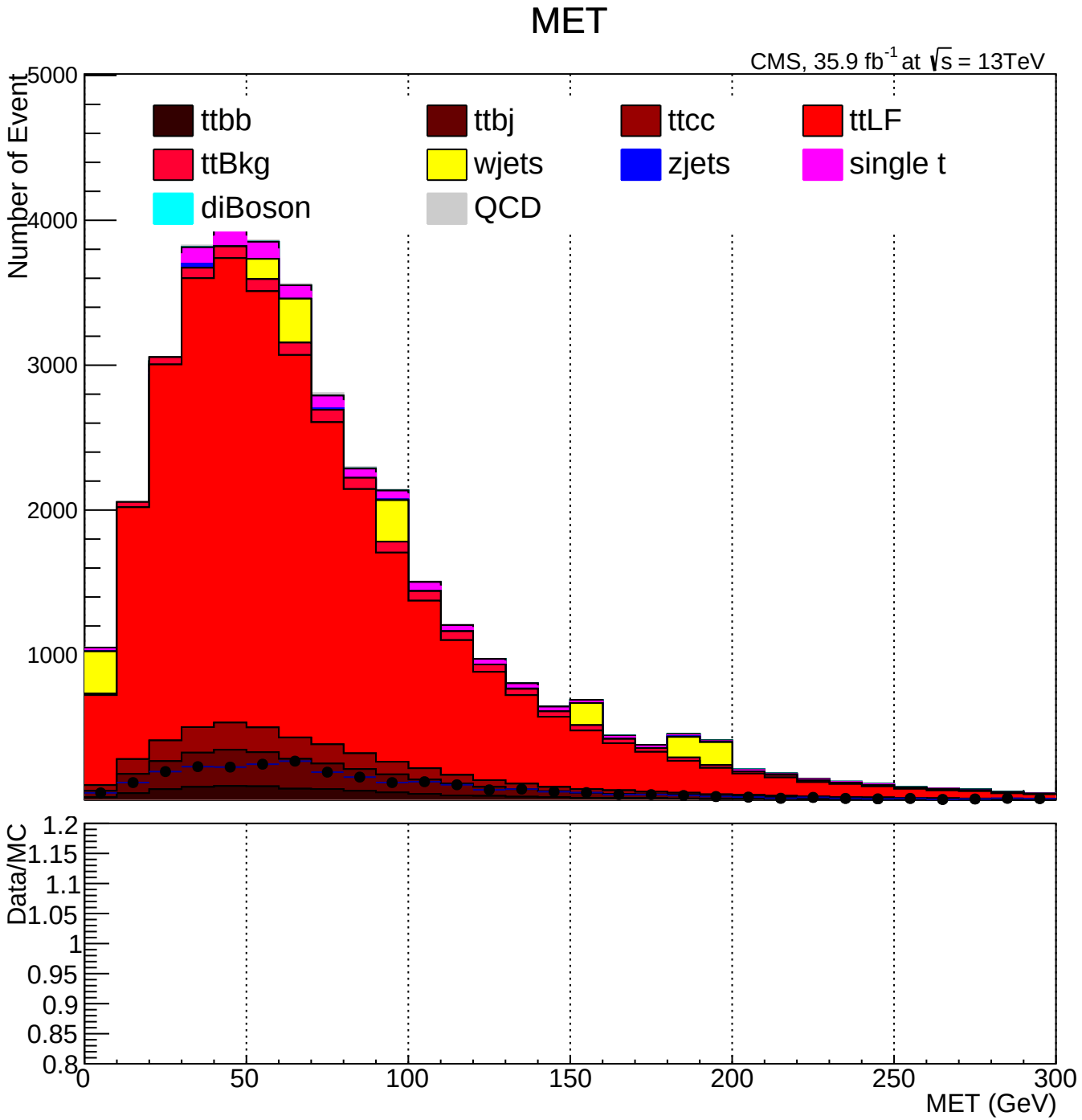

Top mass from Hc/u DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
350
400
Top Mass from Hc/u DRFCNHkinfit (GeV)

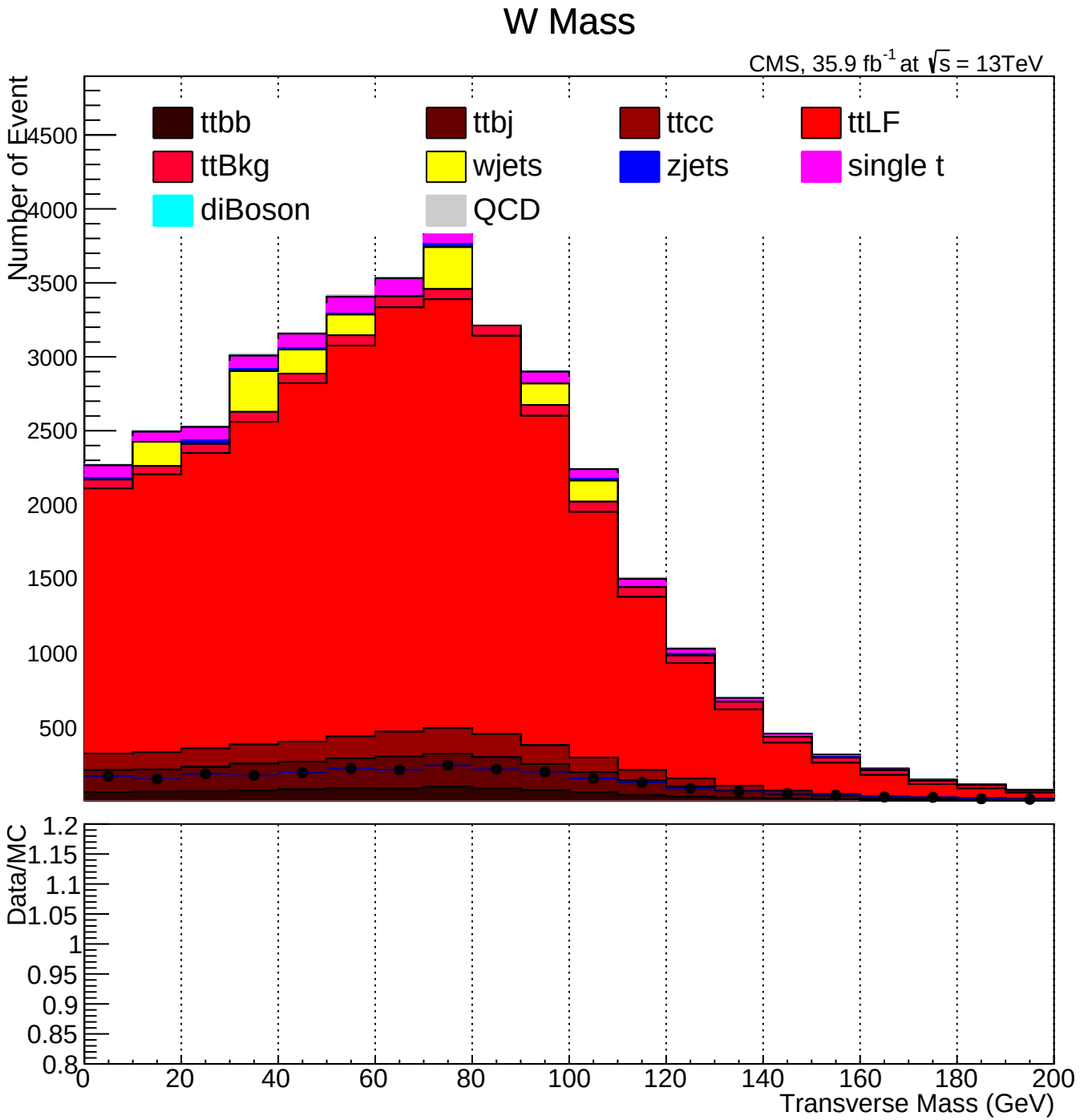

Number of jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
30000
25000
20000
15000
10000
5000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
2
4
6
8
10
12
Jet Multiplicity


Number of b tagged jets (medium)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
35000
30000
25000
20000
15000
10000
5000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2M)

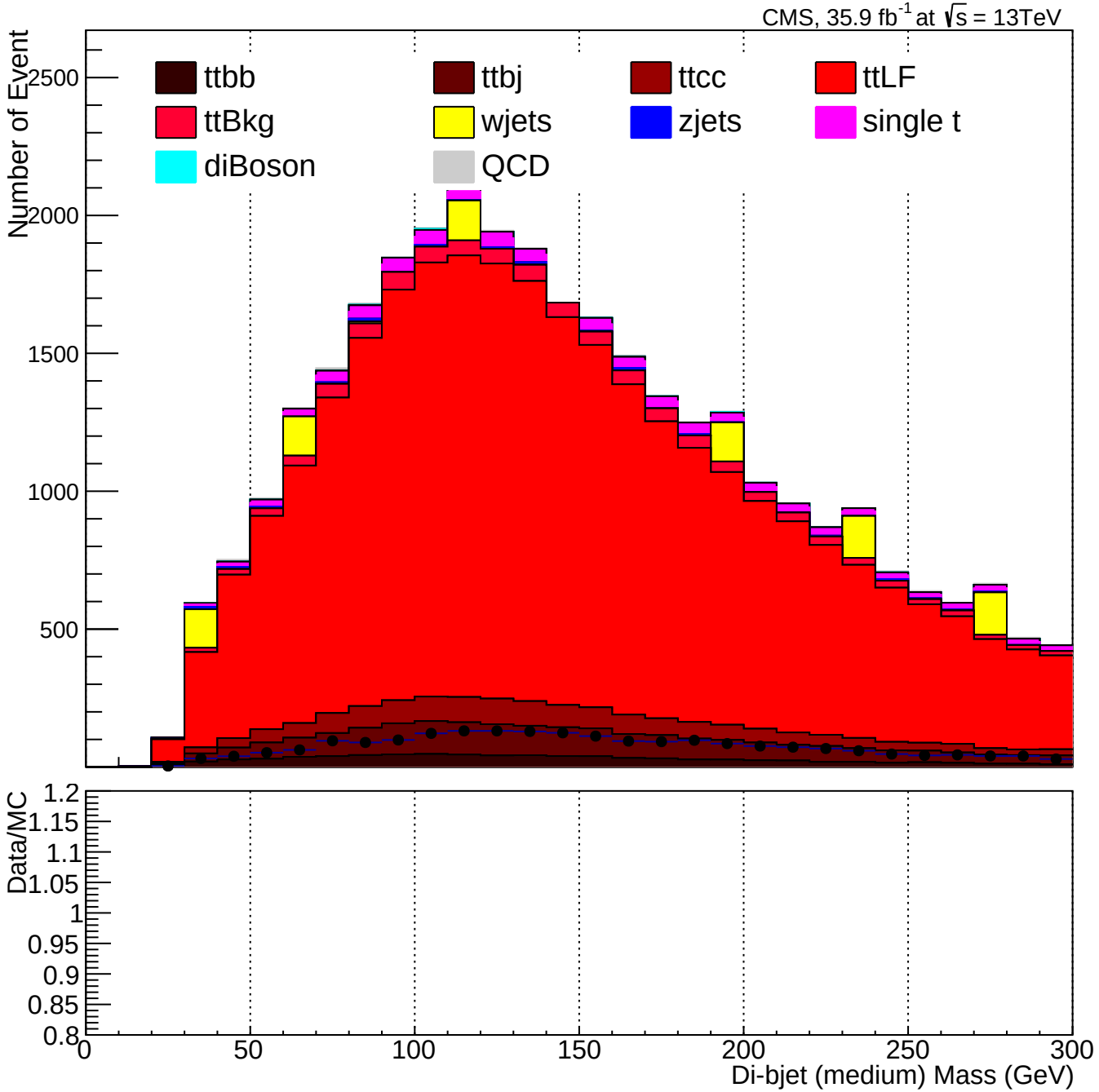

Number of b tagged jets (tight)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b-tagged Jet Multiplicity (CSVv2T)

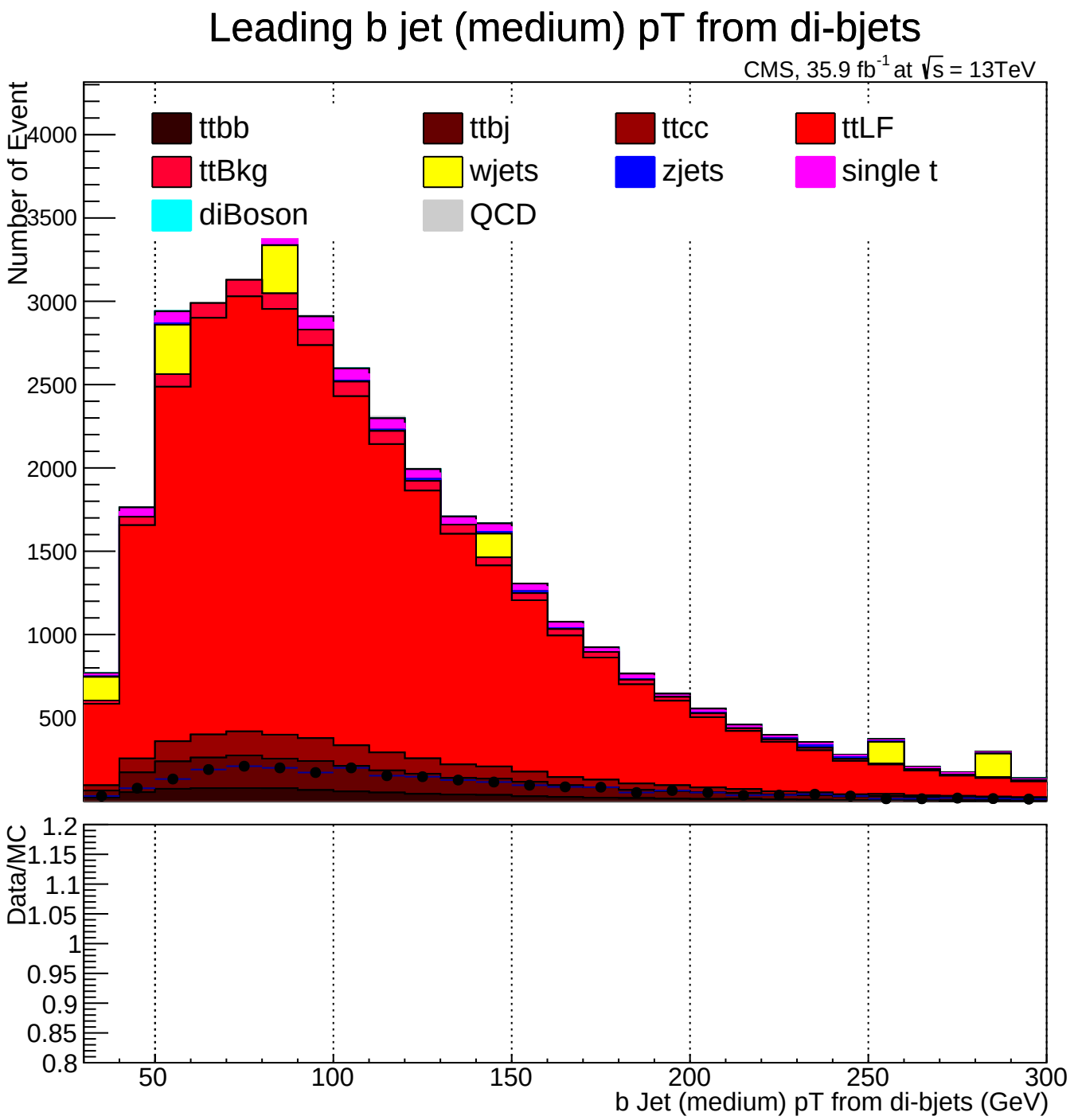

Number of c tagged jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
c-tagged Jet Multiplicity (M)

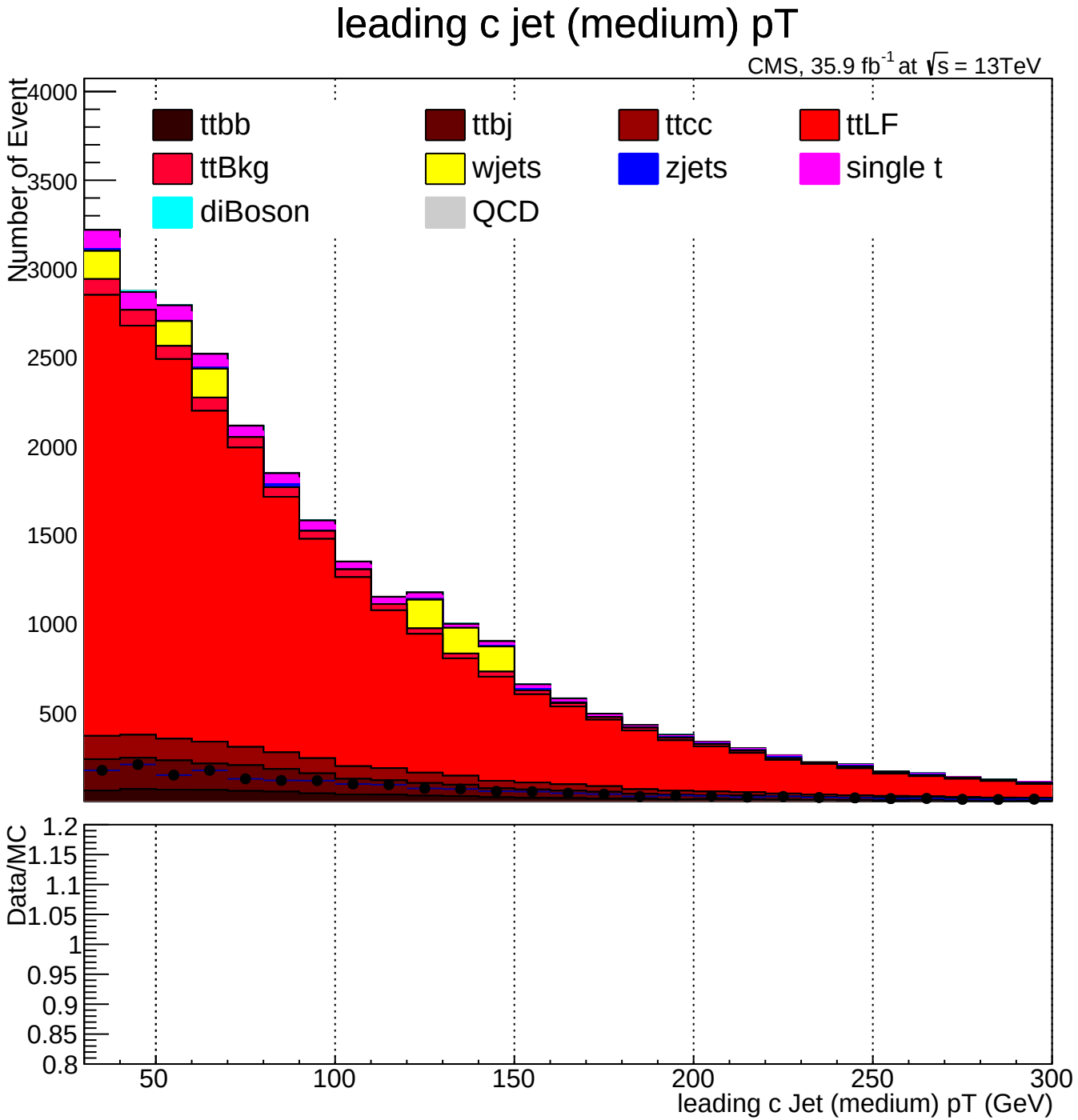

MET
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
50
100
150
200
250
300
MET (GeV)

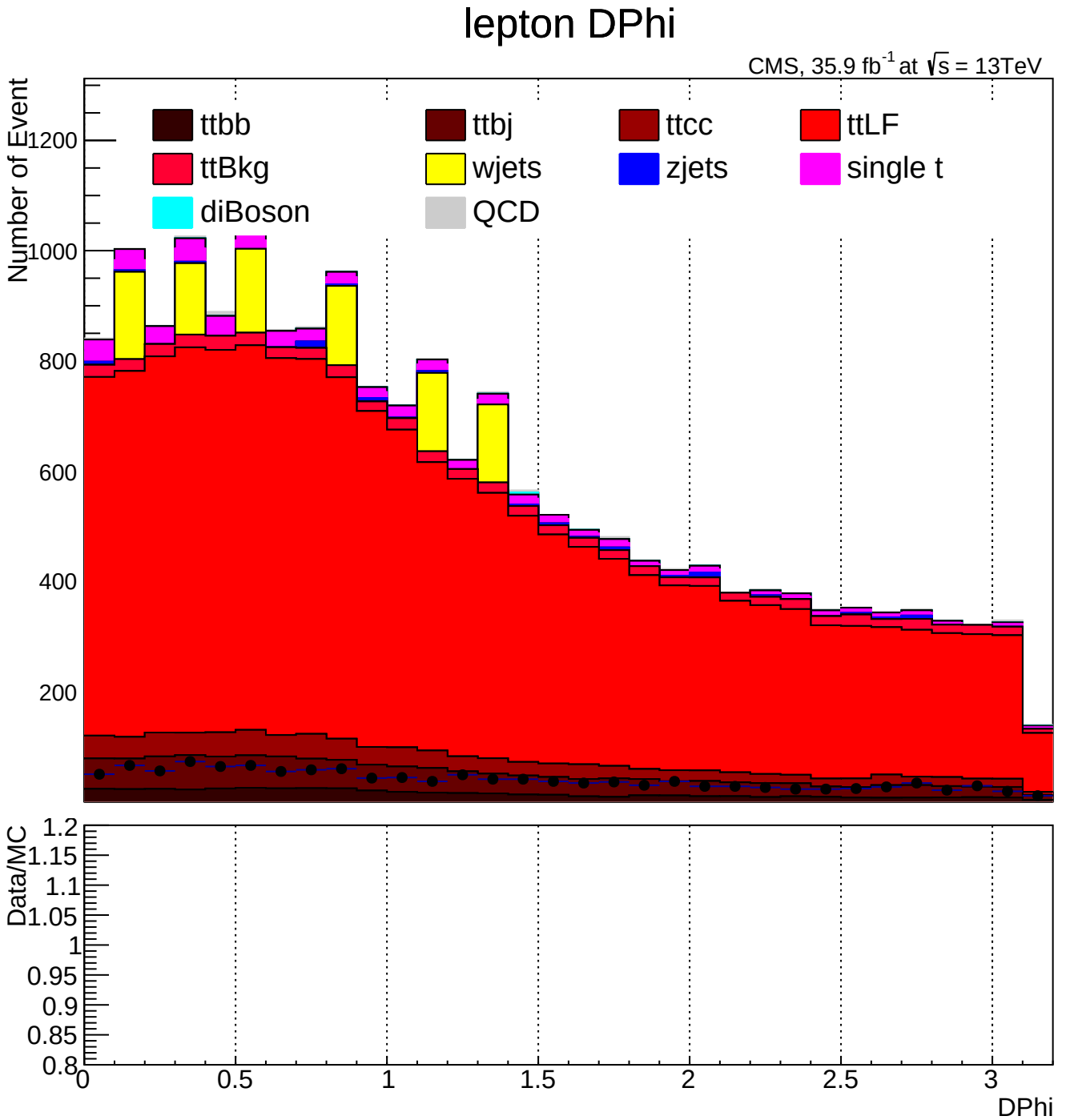

W Mass
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
4500
4000
3500
3000
2500
2000
1500
1000
500
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
20
40
60
80
100
120
140
160
180
200
Transverse Mass (GeV)

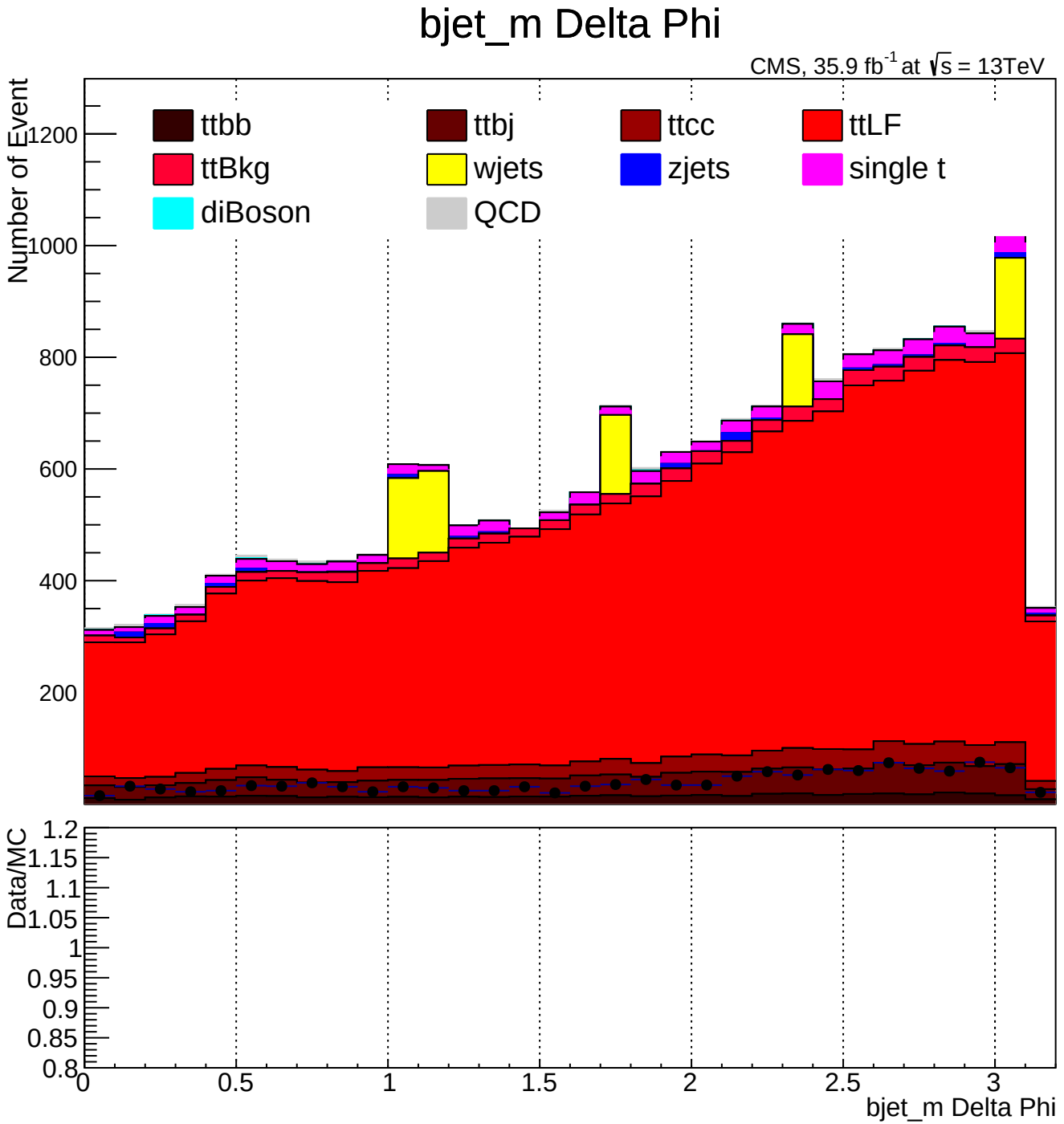
Di-bjet Mass (medium) wrt min DR

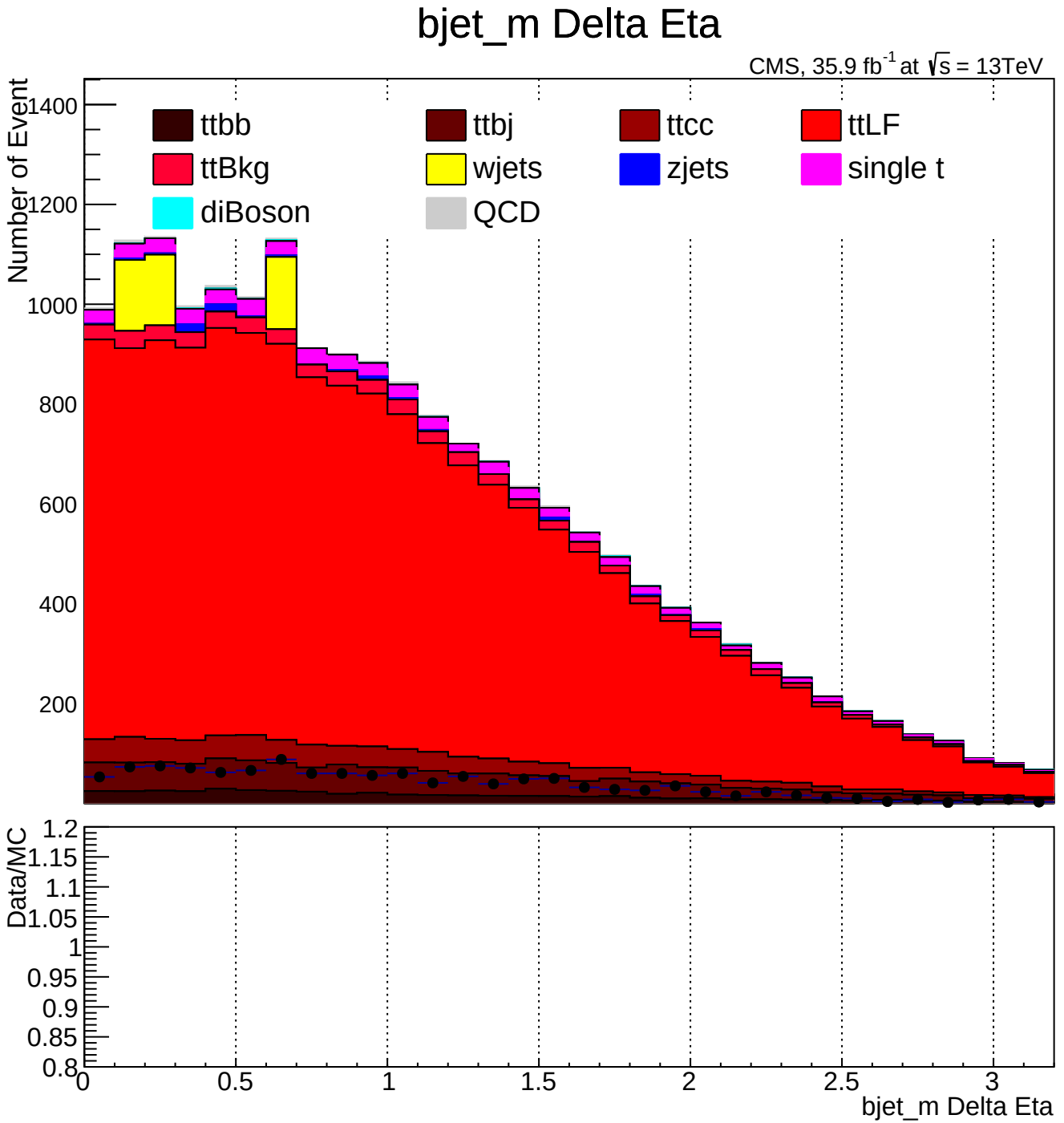


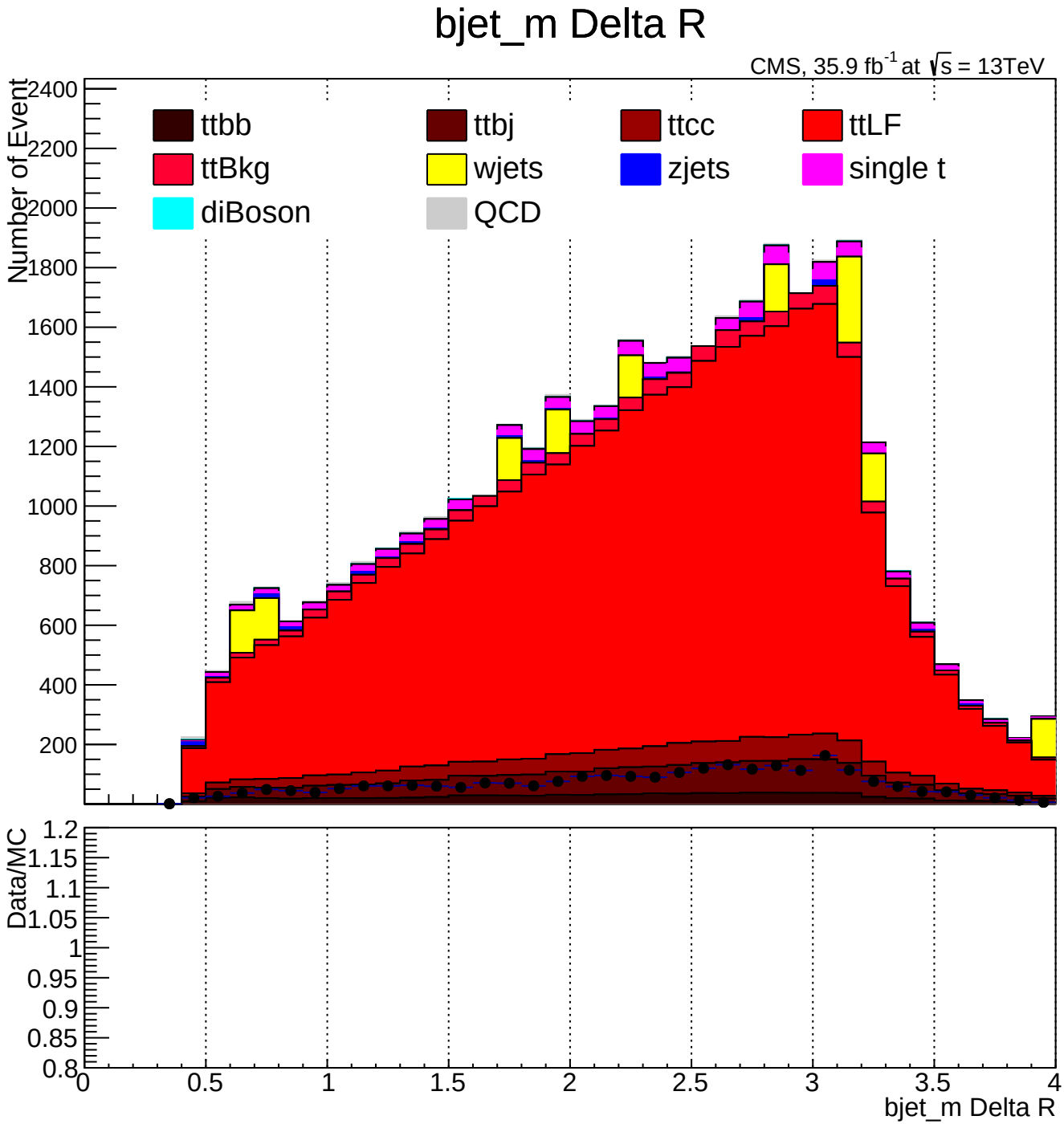

Leading b jet (medium) pT from di-bjets
CMS, 35.9 fb-1 at √s = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
4000
3500
3000
2500
2000
1500
1000
500
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
b Jet (medium) pT from di-bjets (GeV)

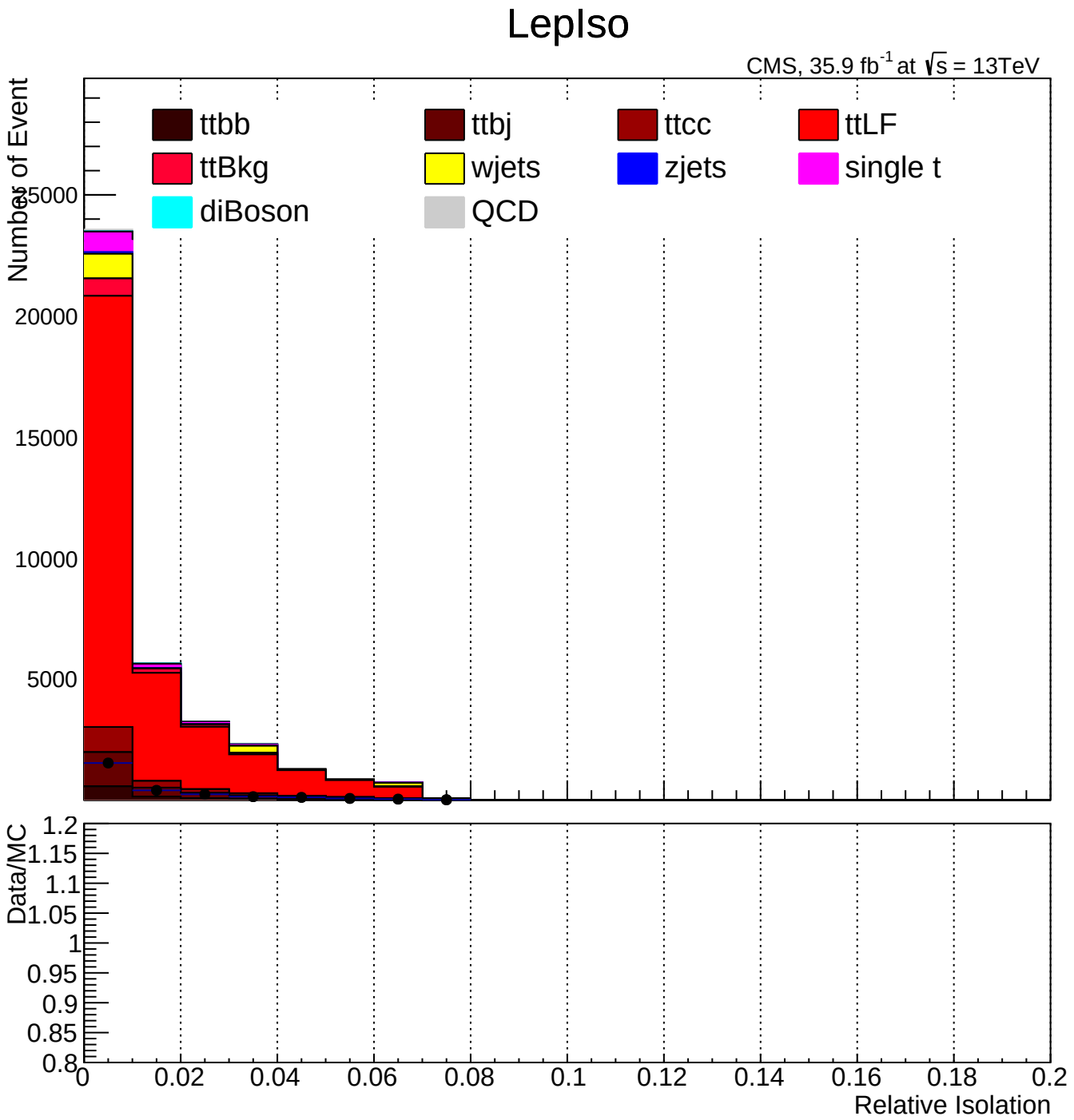

leading c jet (medium) pT
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
leading c Jet (medium) pT (GeV)

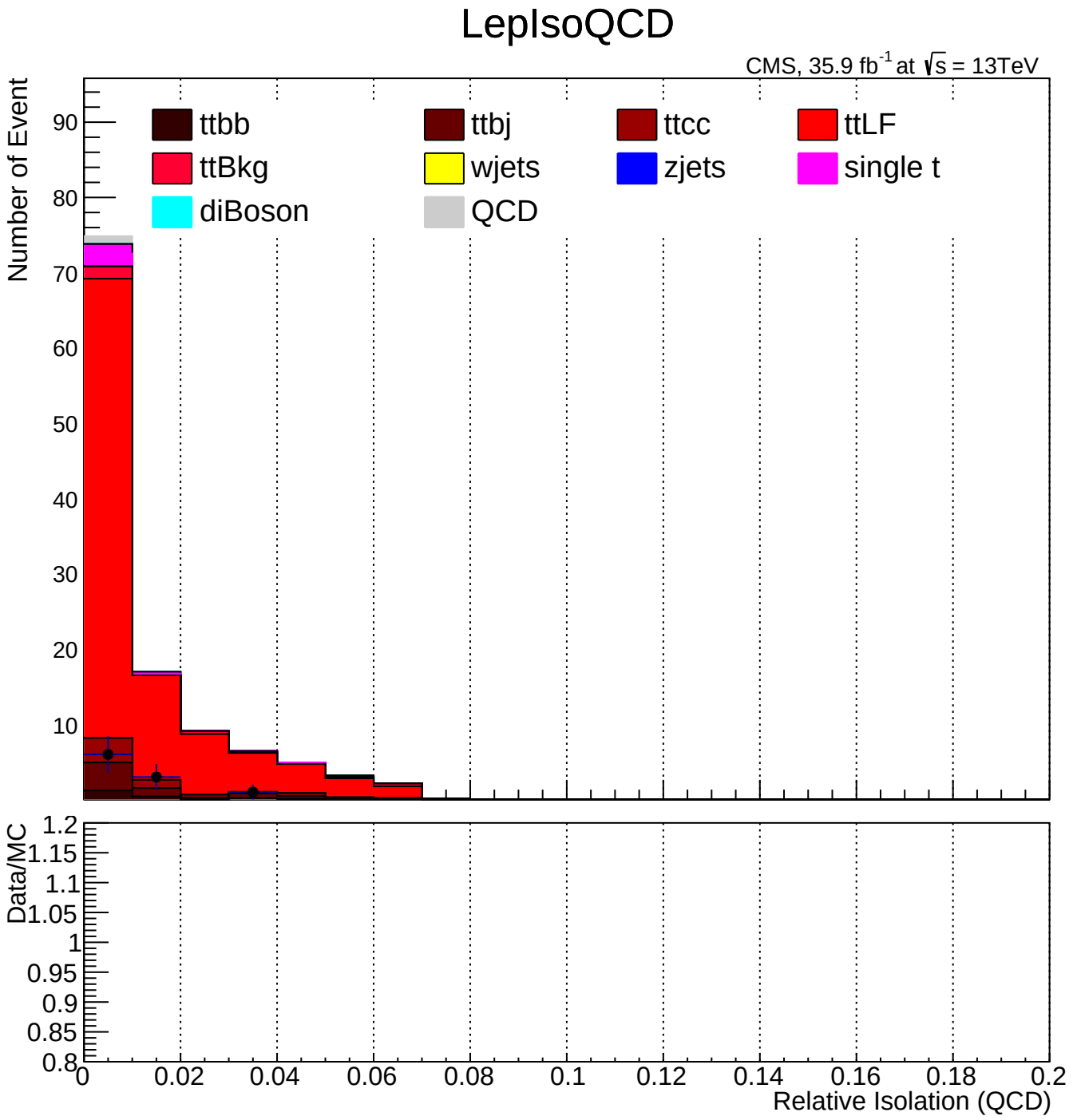

lepton DPhi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
1200
1000
800
600
400
200
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
DPhi

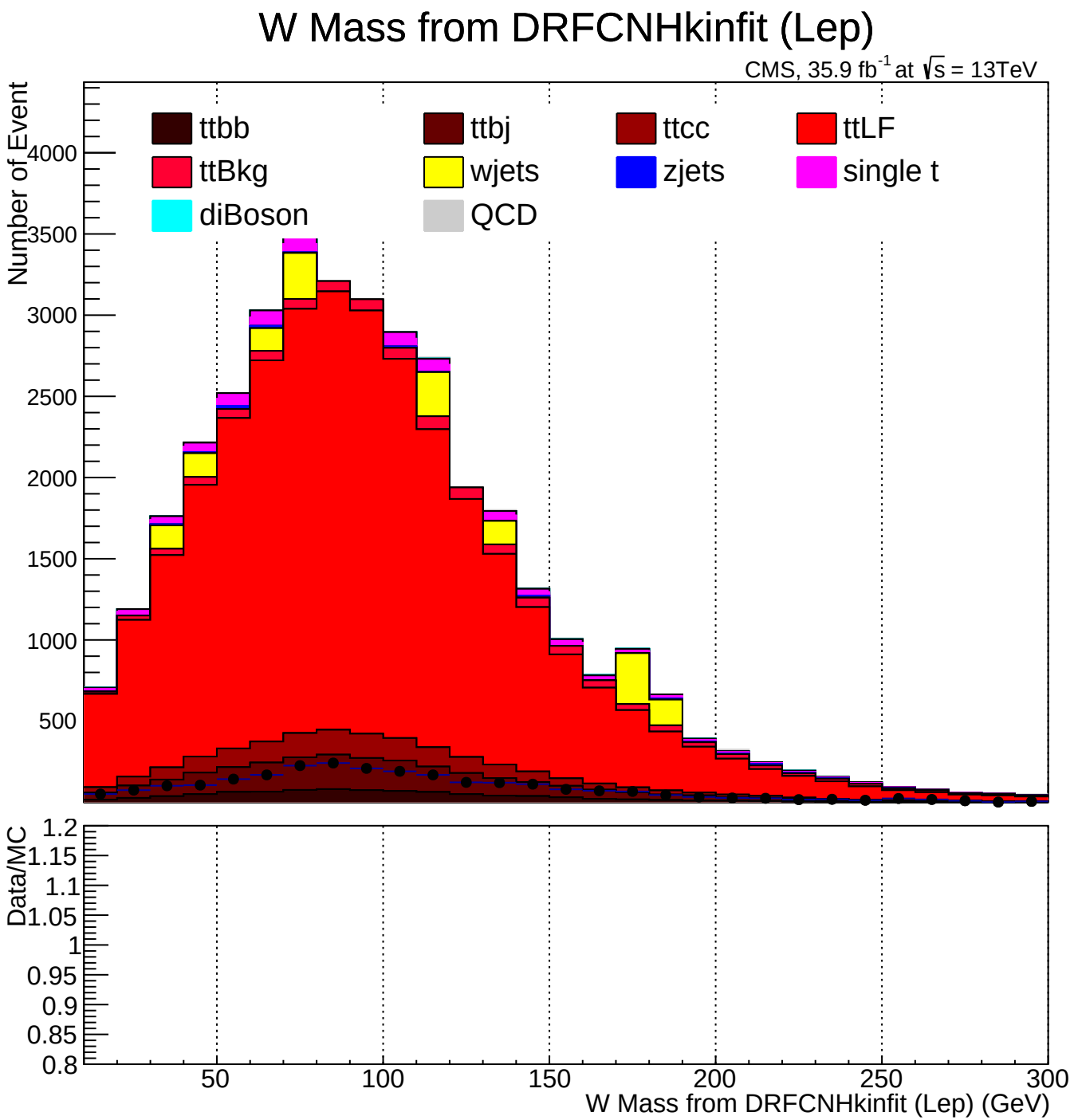

bjet_m Delta Phi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
1200
1000
800
600
400
200
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Phi

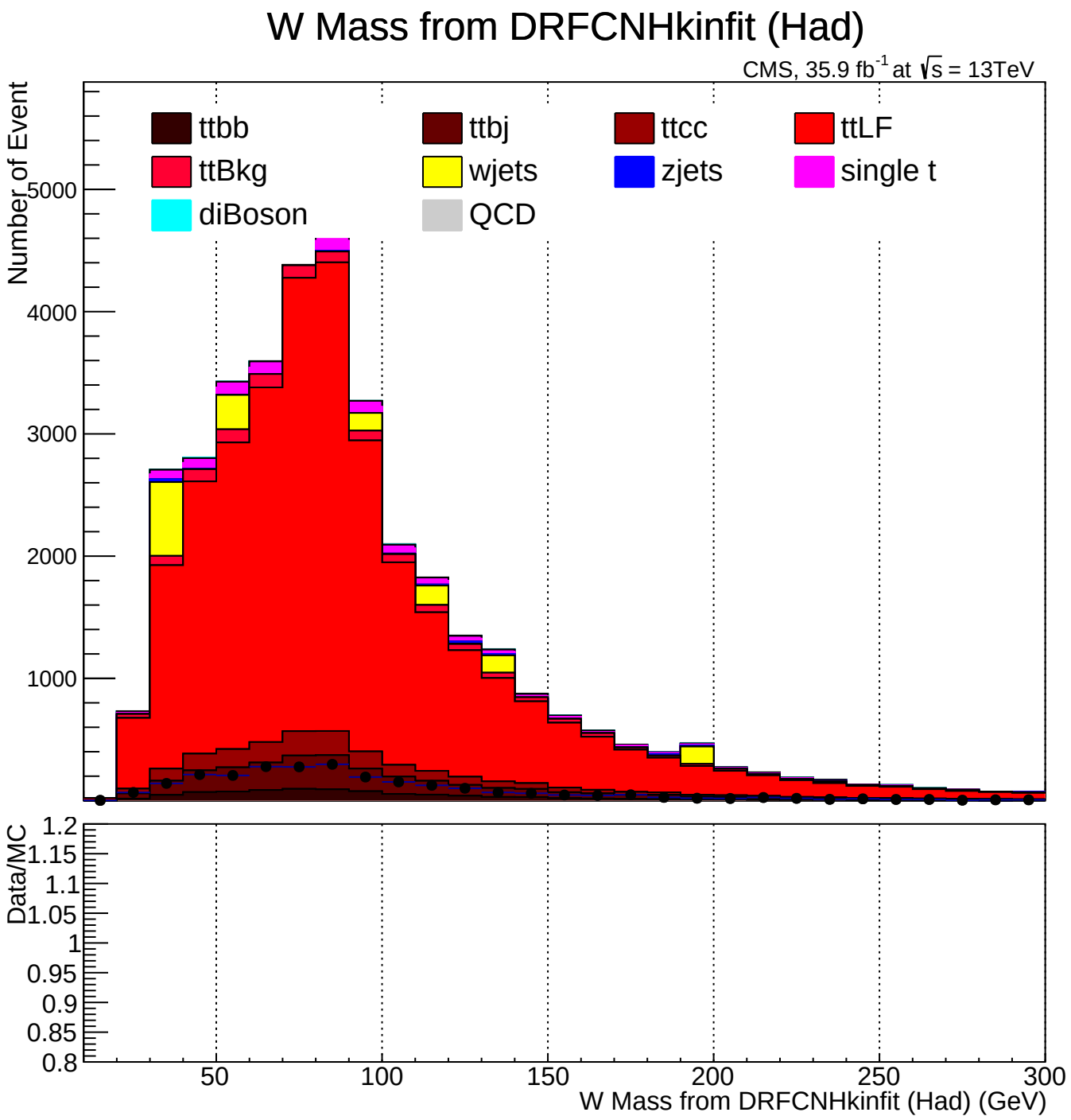

bjet_m Delta Eta
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
1400
1200
1000
800
600
400
200
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Eta

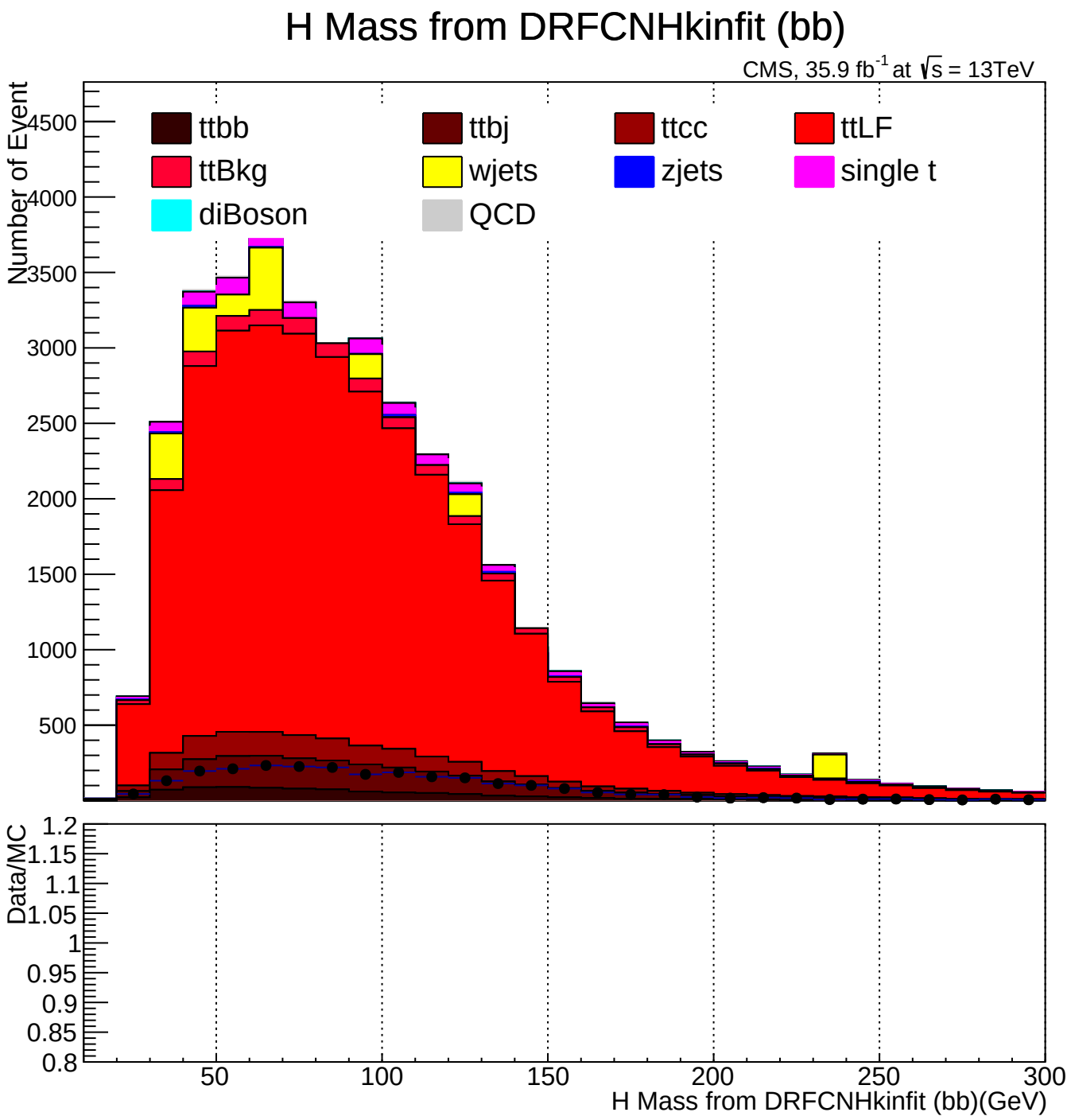

bjet_m Delta R
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta R

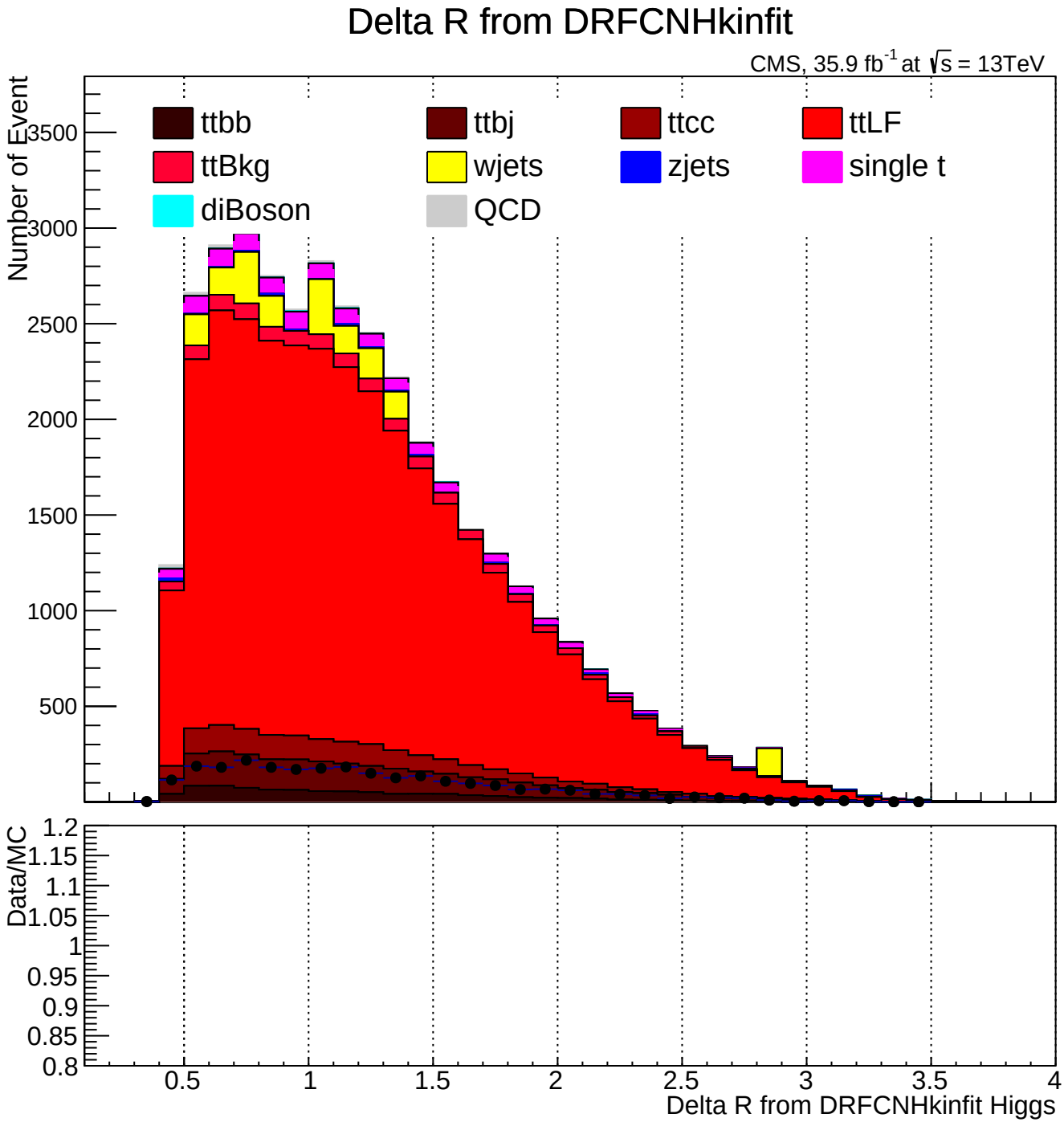

LepIso
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
25000
20000
15000
10000
5000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation

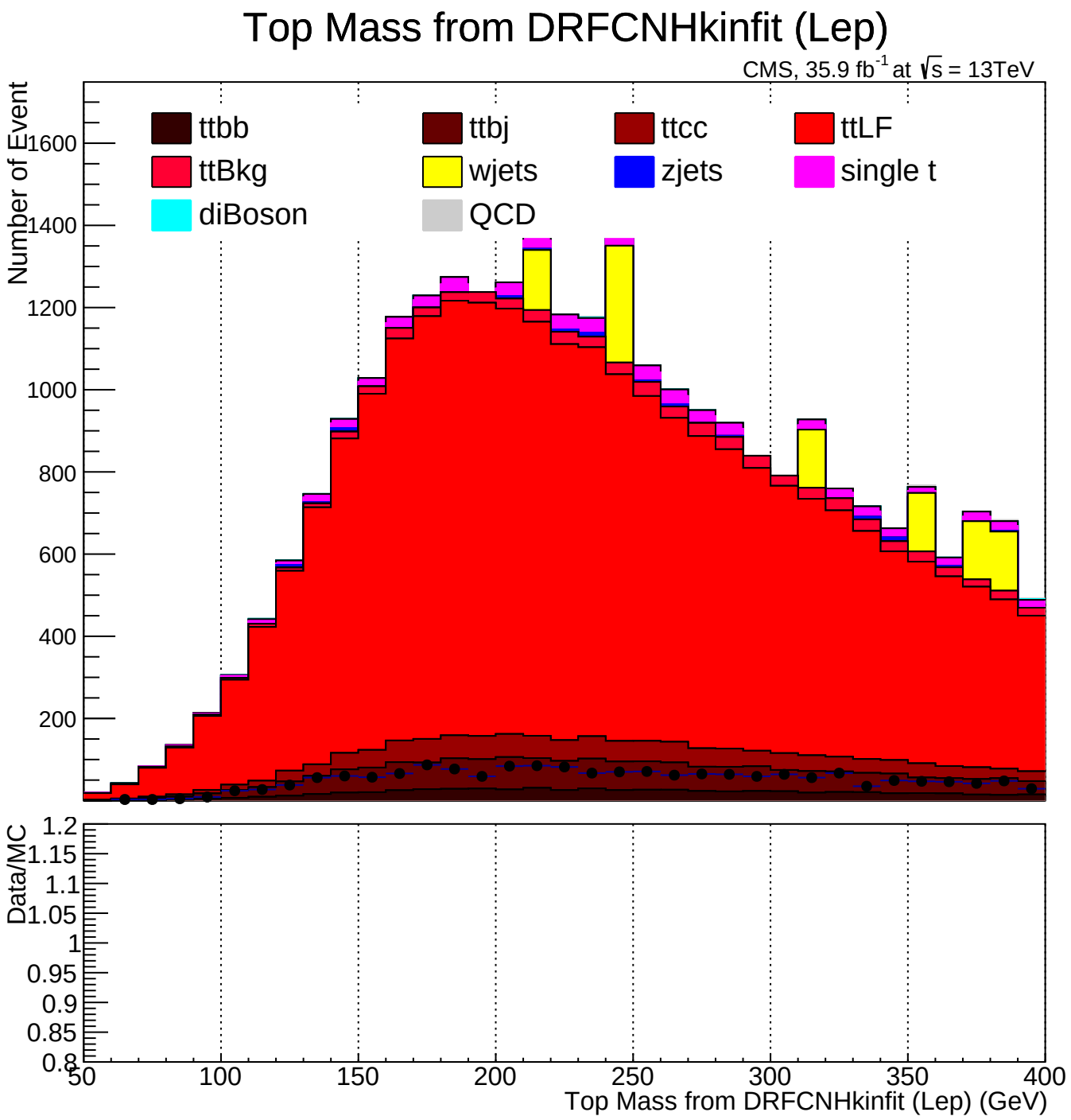

LepIsoQCD
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation (QCD)

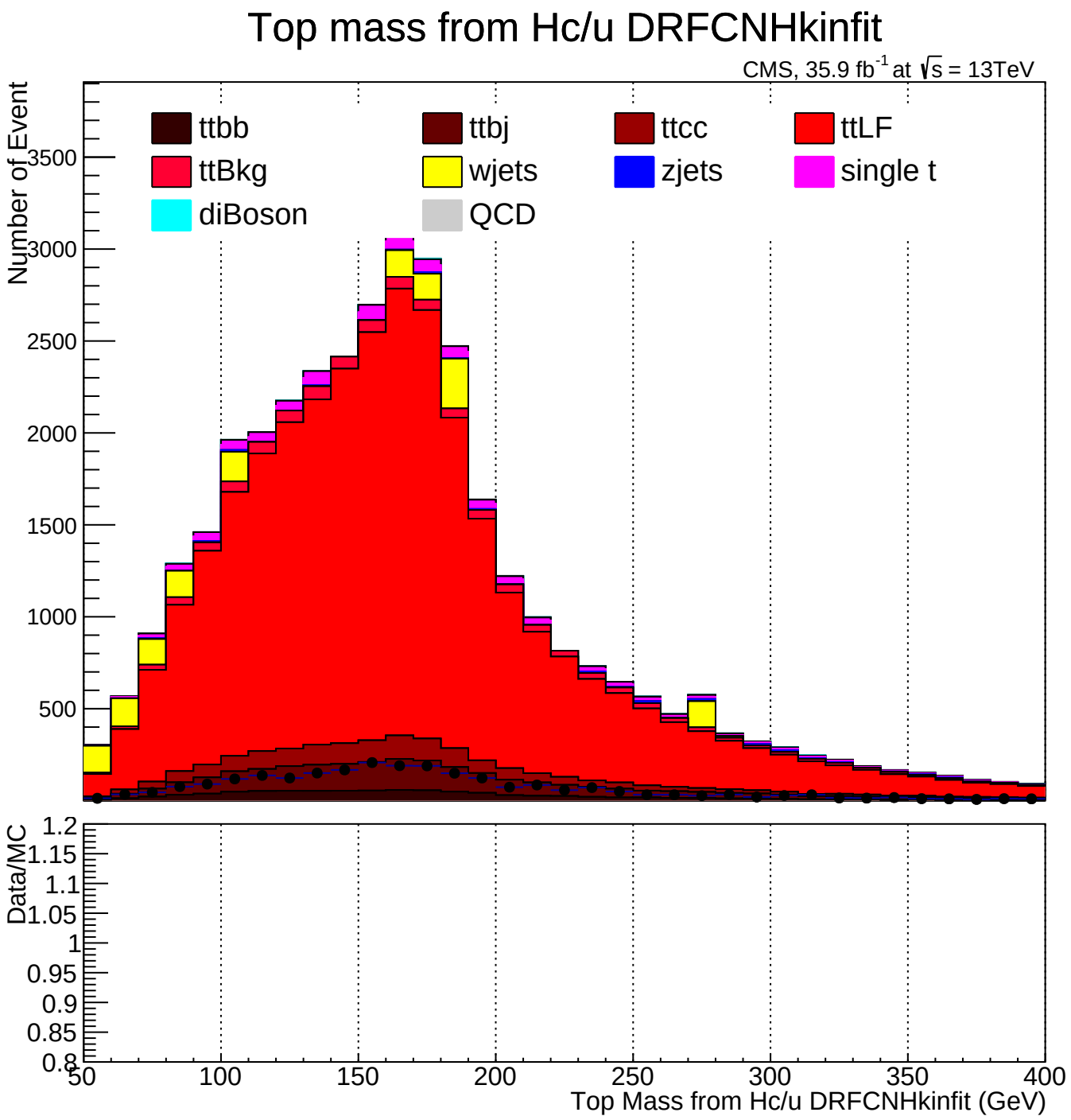

W Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb-1 at √s = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
4000
3500
3000
2500
2000
1500
1000
500
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
W Mass from DRFCNHkinfit (Lep) (GeV)

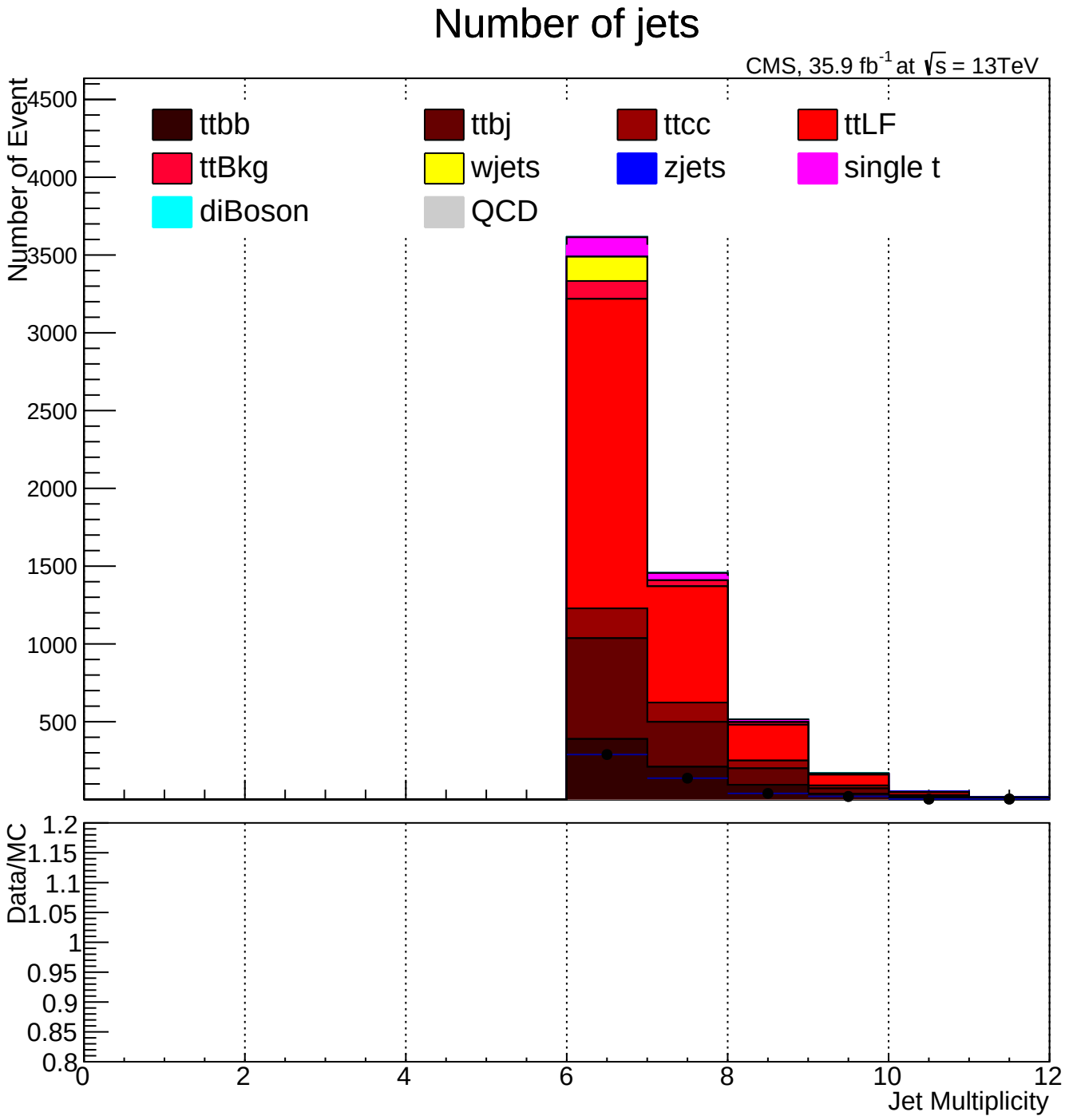

W Mass from DRFCNHkinfit (Had)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
W Mass from DRFCNHkinfit (Had) (GeV)

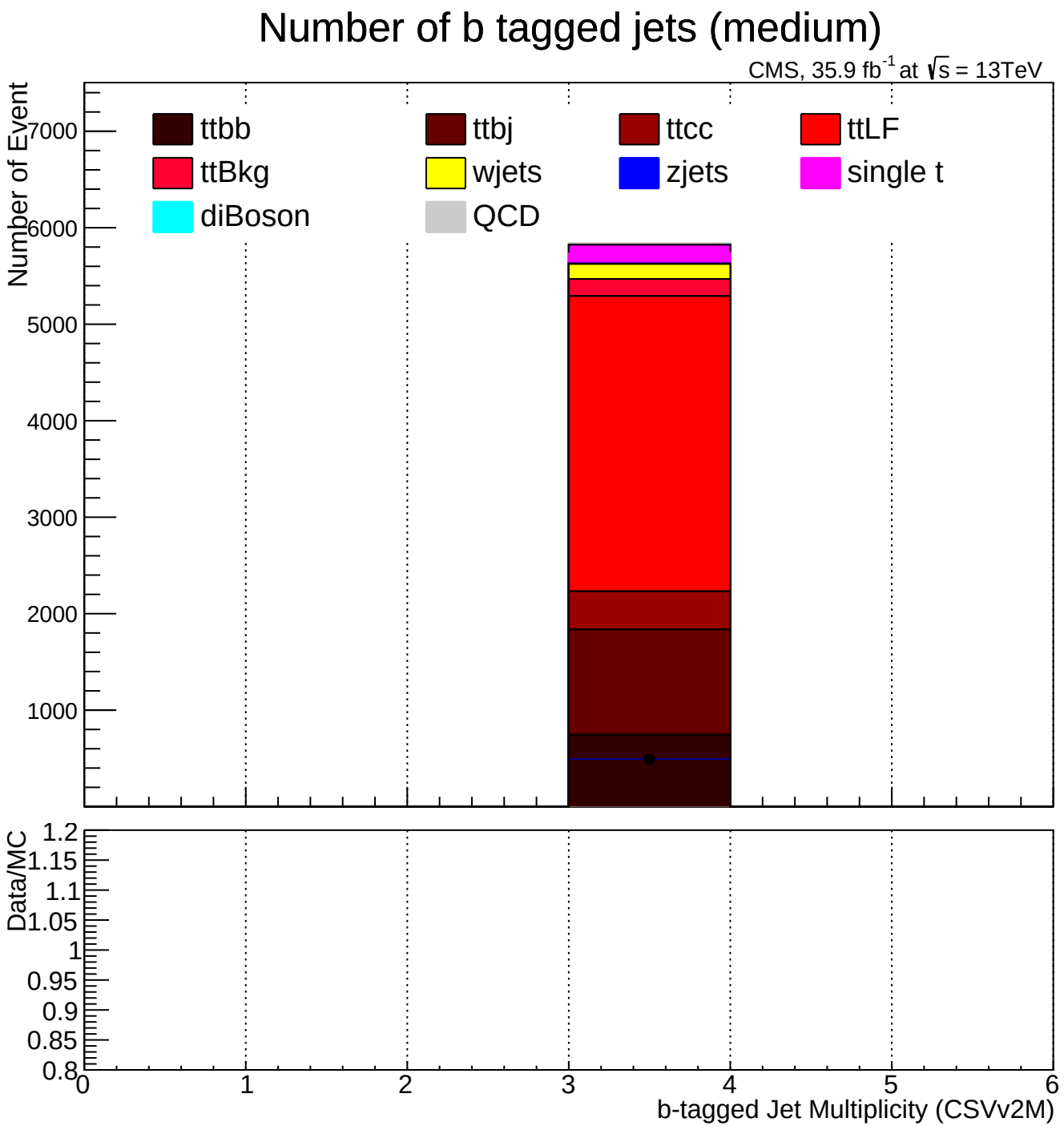

H Mass from DRFCNHkinfit (bb)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
H Mass from DRFCNHkinfit (bb)(GeV)

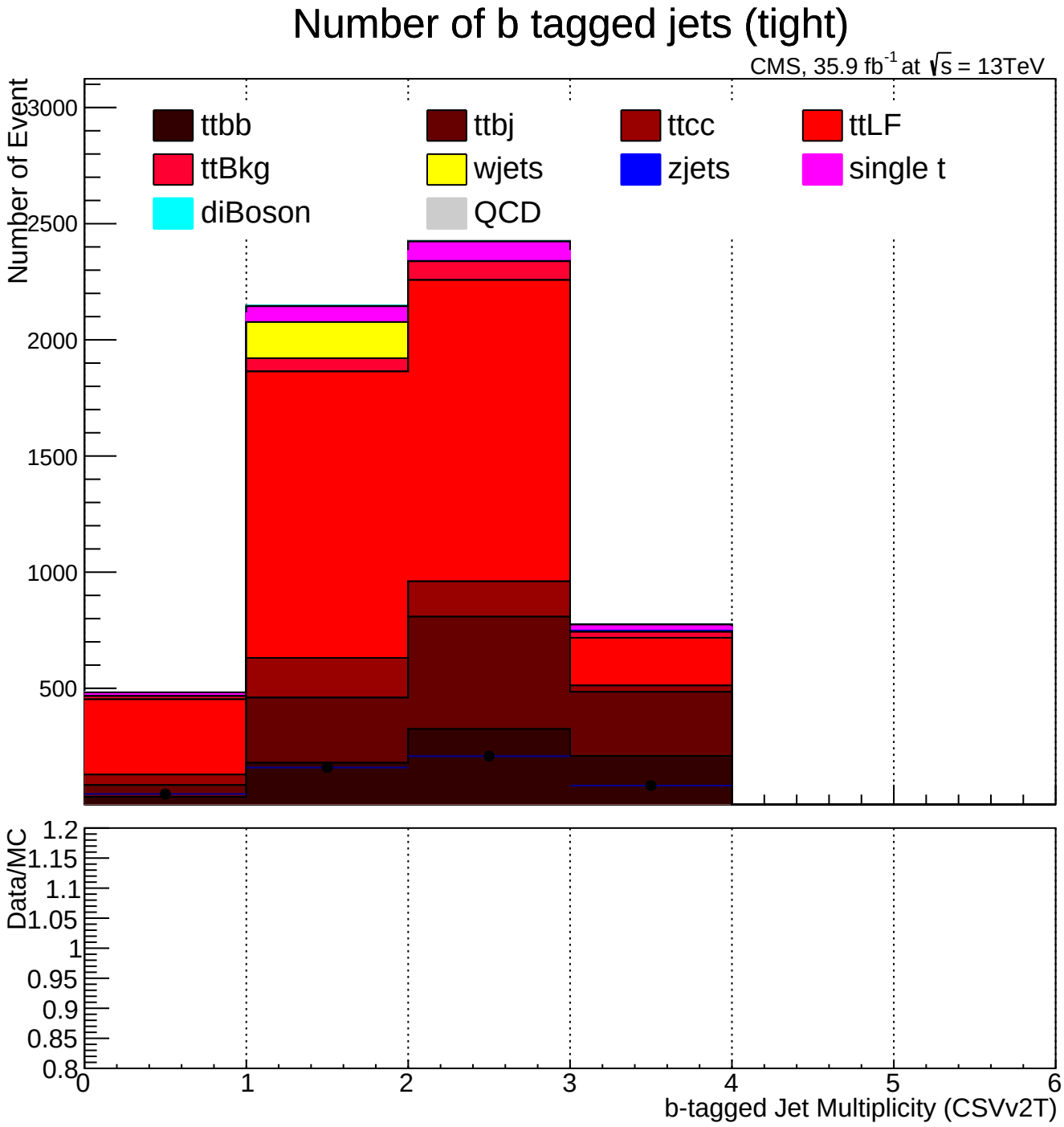

Delta R from DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
3500
3000
2500
2000
1500
1000
500
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0.5
1
1.5
2
2.5
3
3.5
4
Delta R from DRFCNHkinfit Higgs

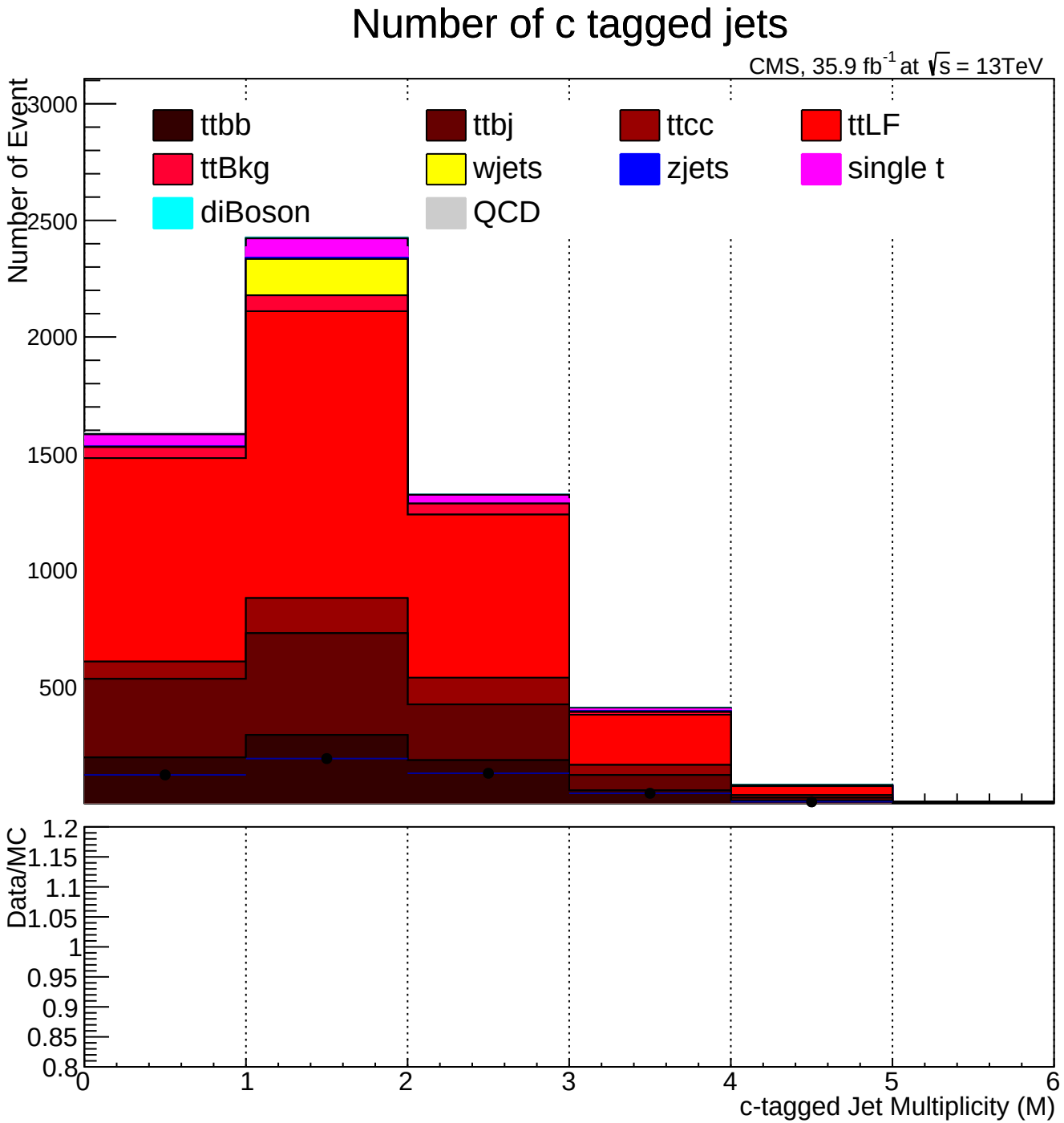

Top Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
Top Mass from DRFCNHkinfit (Lep) (GeV)

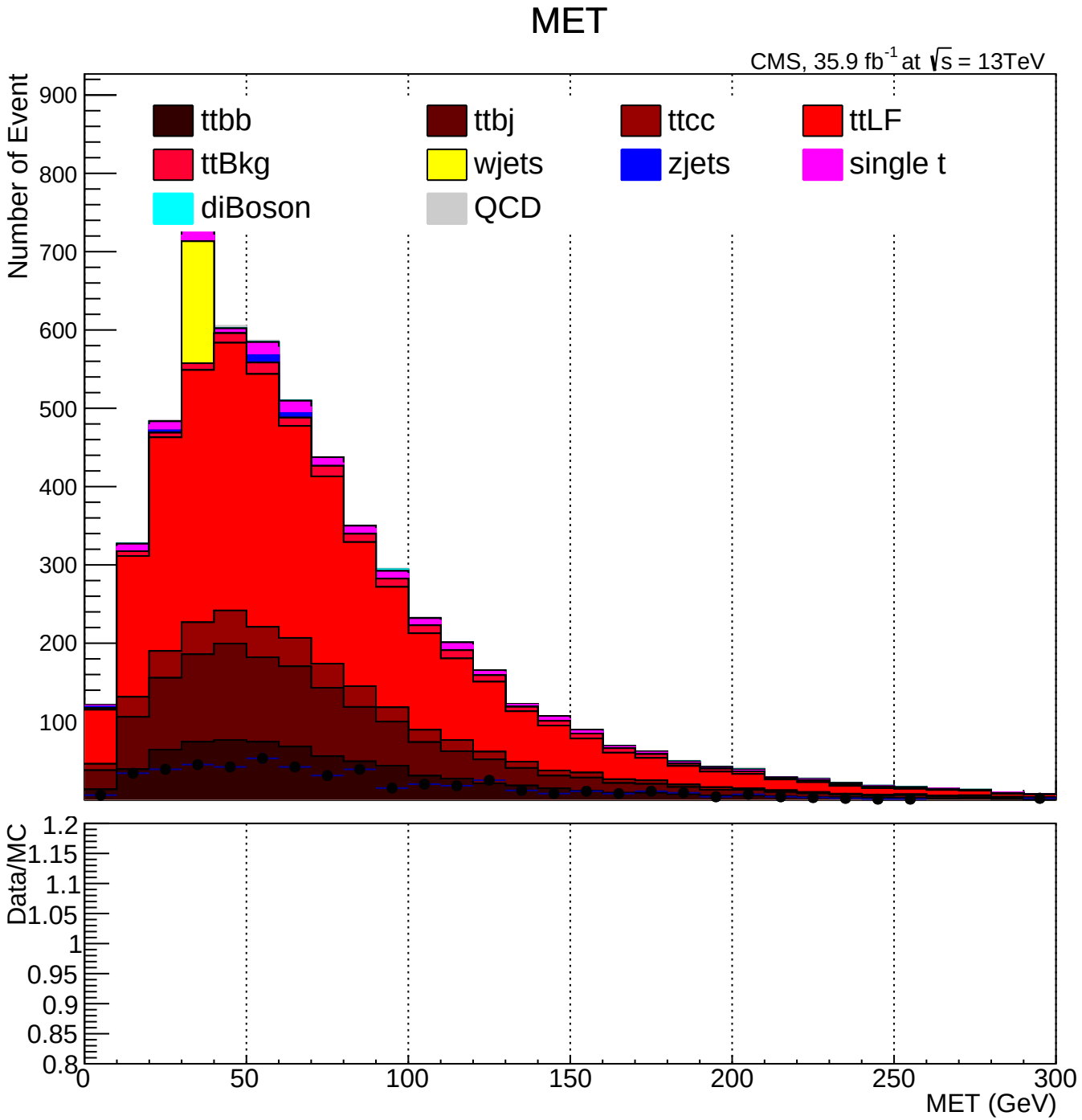

Top mass from Hc/u DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
Top Mass from Hc/u DRFCNHkinfit (GeV)

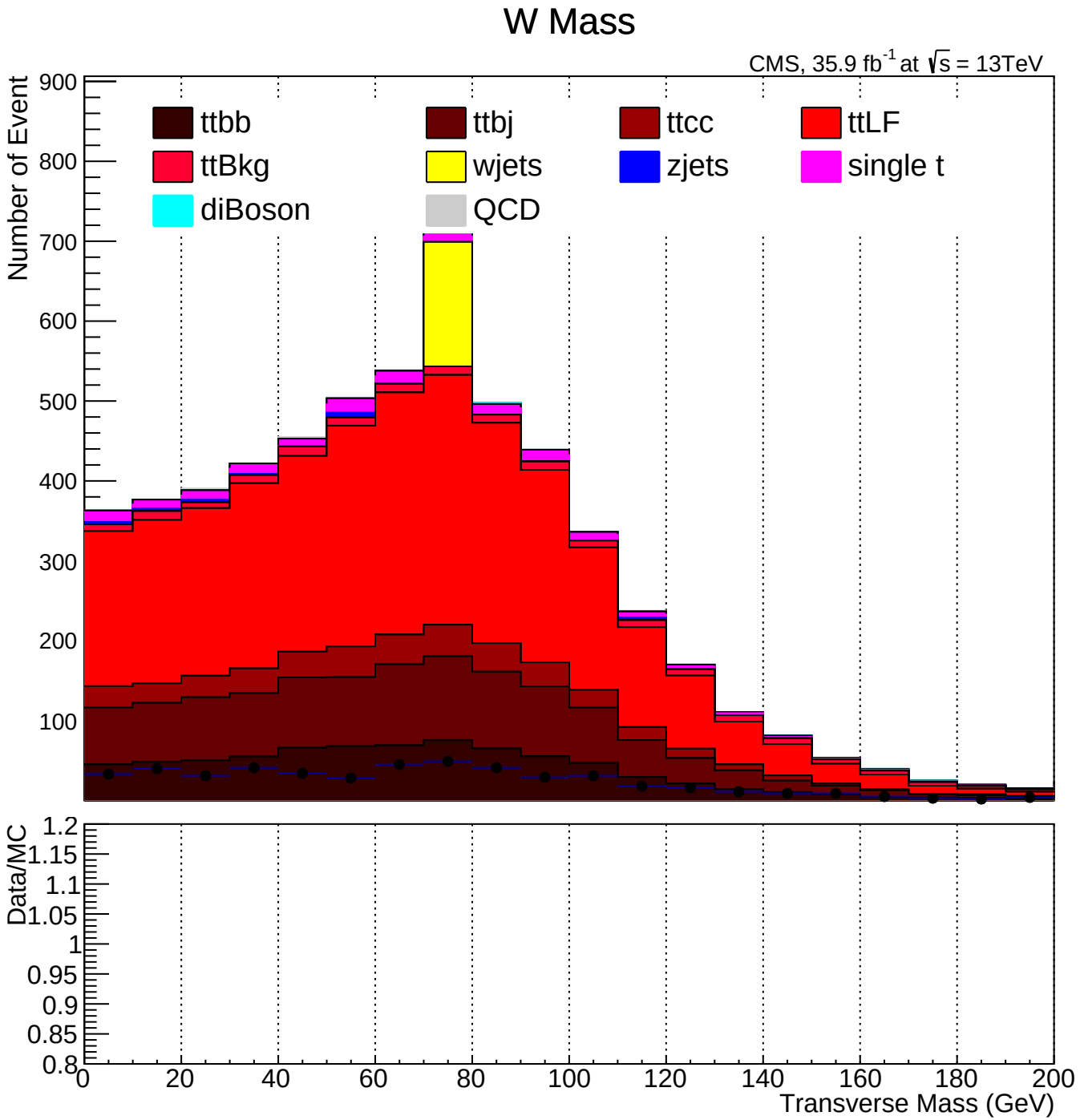

Number of jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Jet Multiplicity

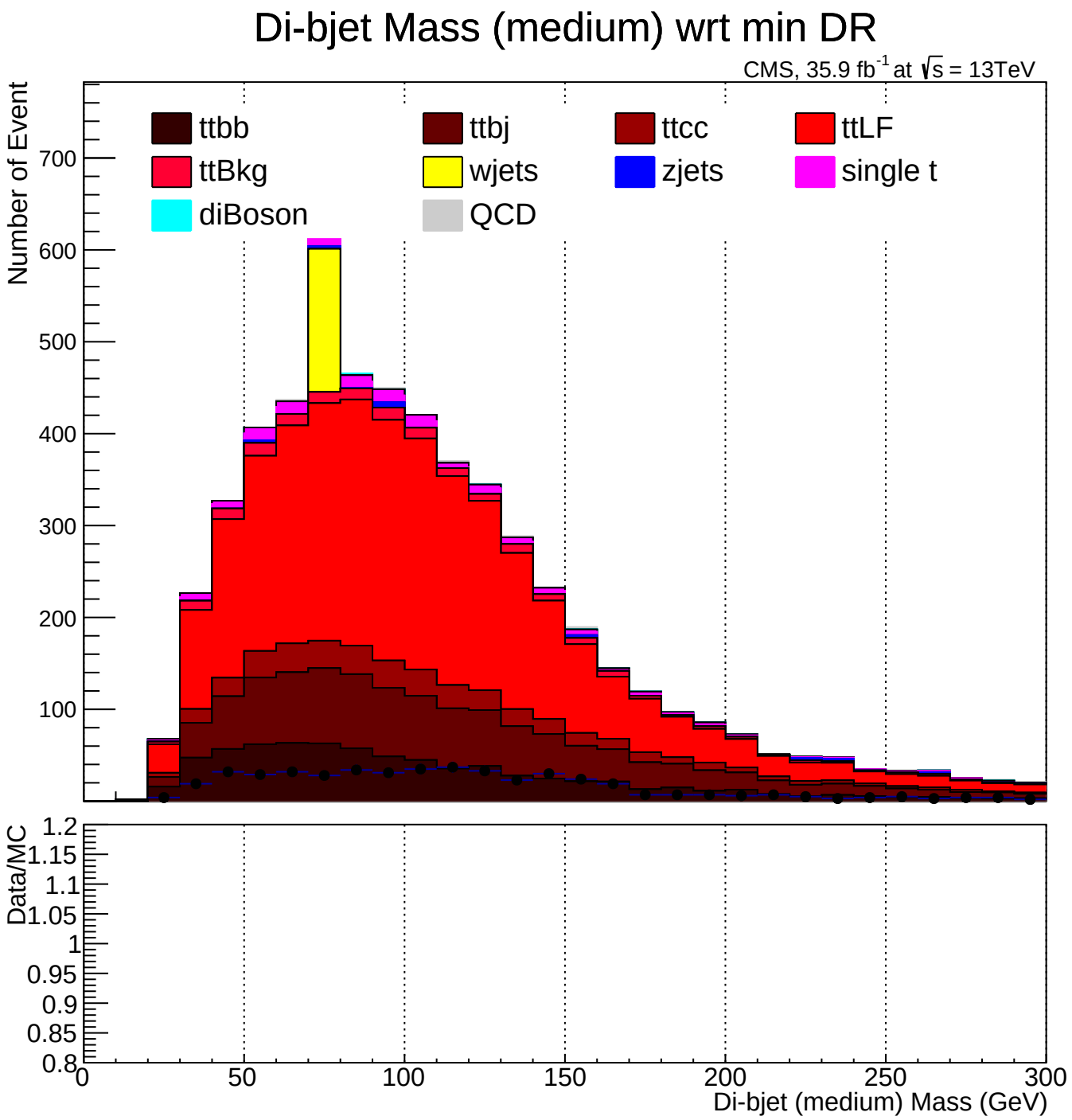

Number of b tagged jets (medium)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
7000
6000
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2M)

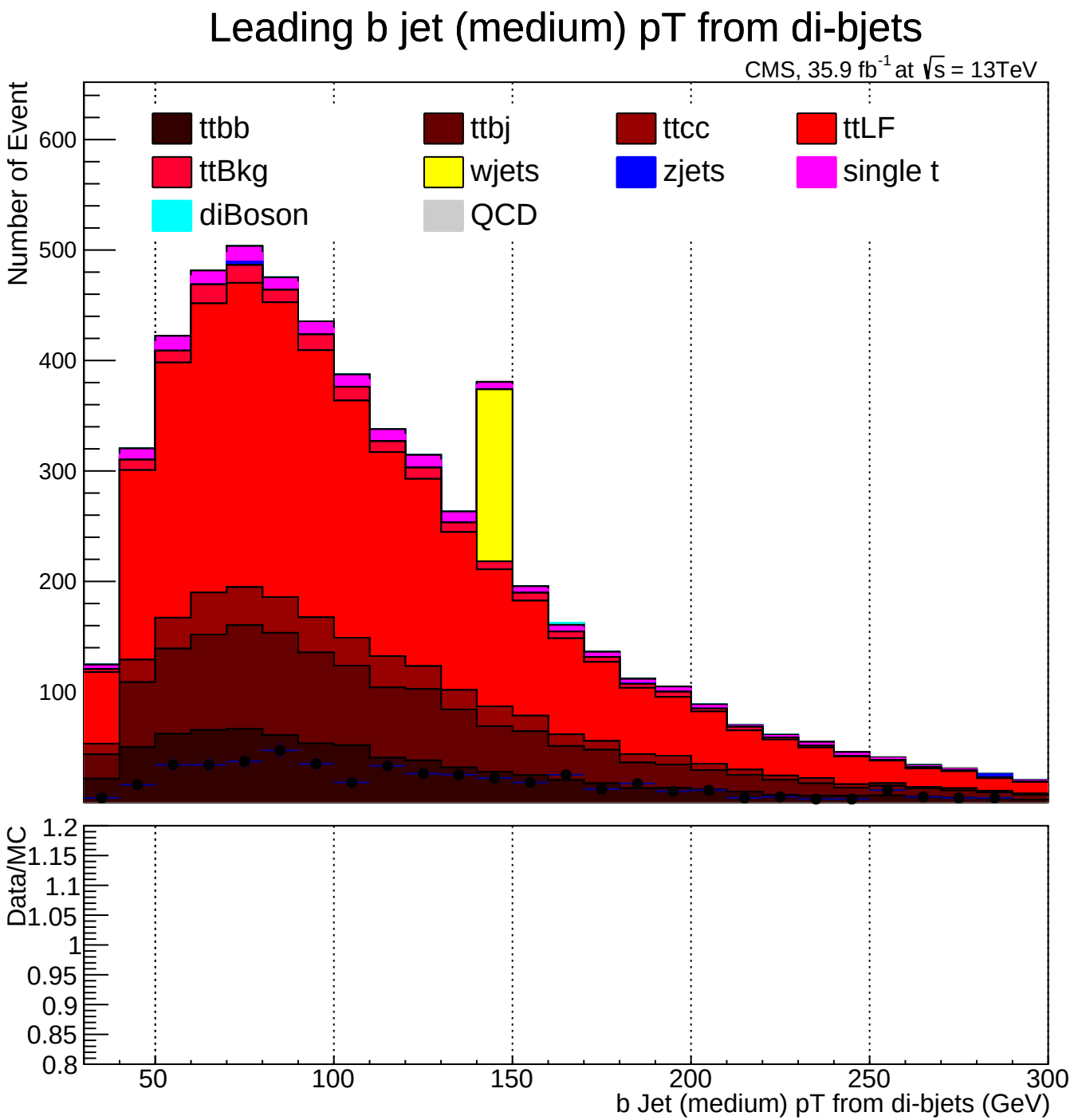

Number of b tagged jets (tight)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
3000
2500
2000
1500
1000
500
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2T)

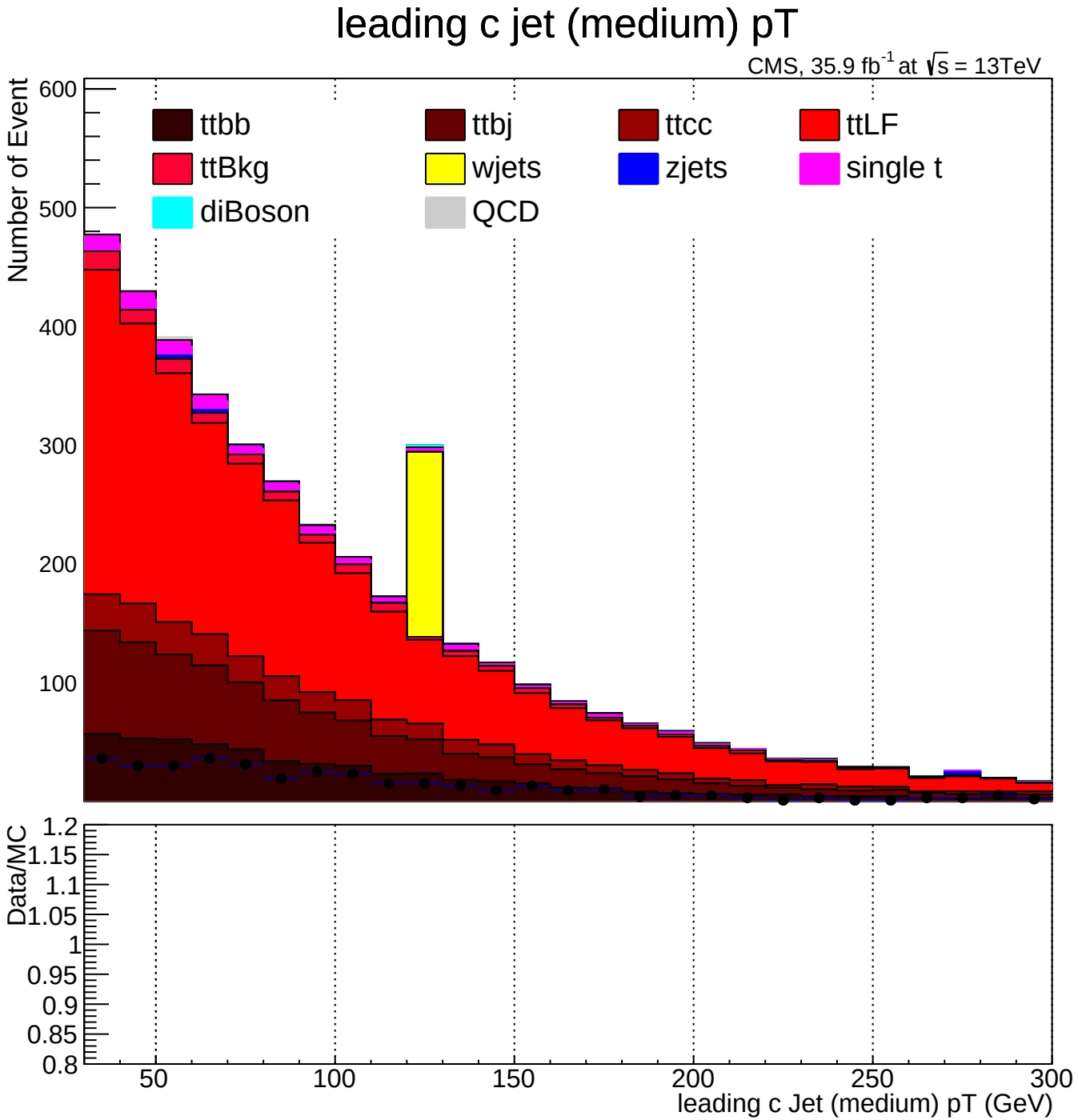

Number of c tagged jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
3000
2500
2000
1500
1000
500
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
c-tagged Jet Multiplicity (M)

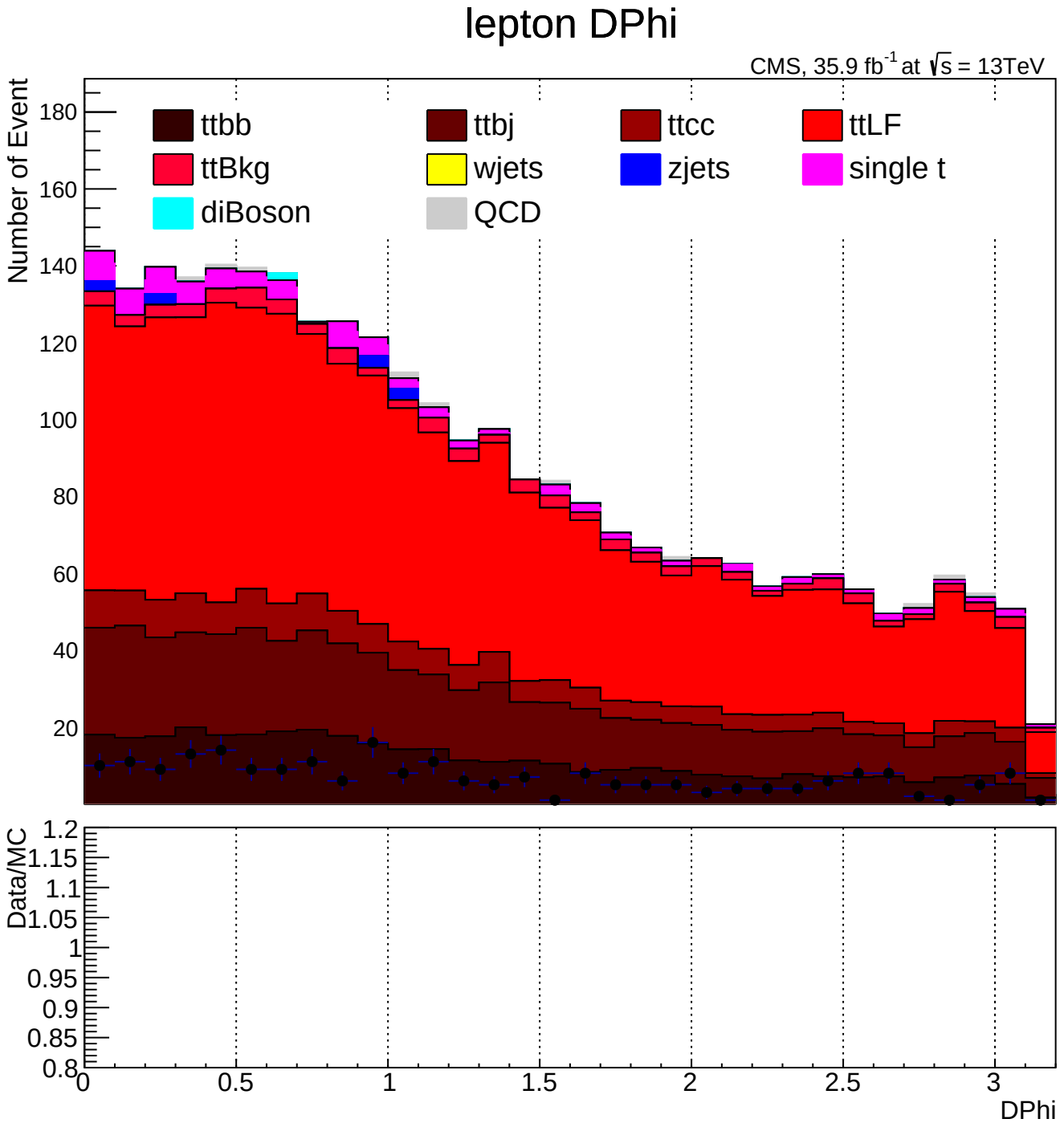

MET
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
MET (GeV)

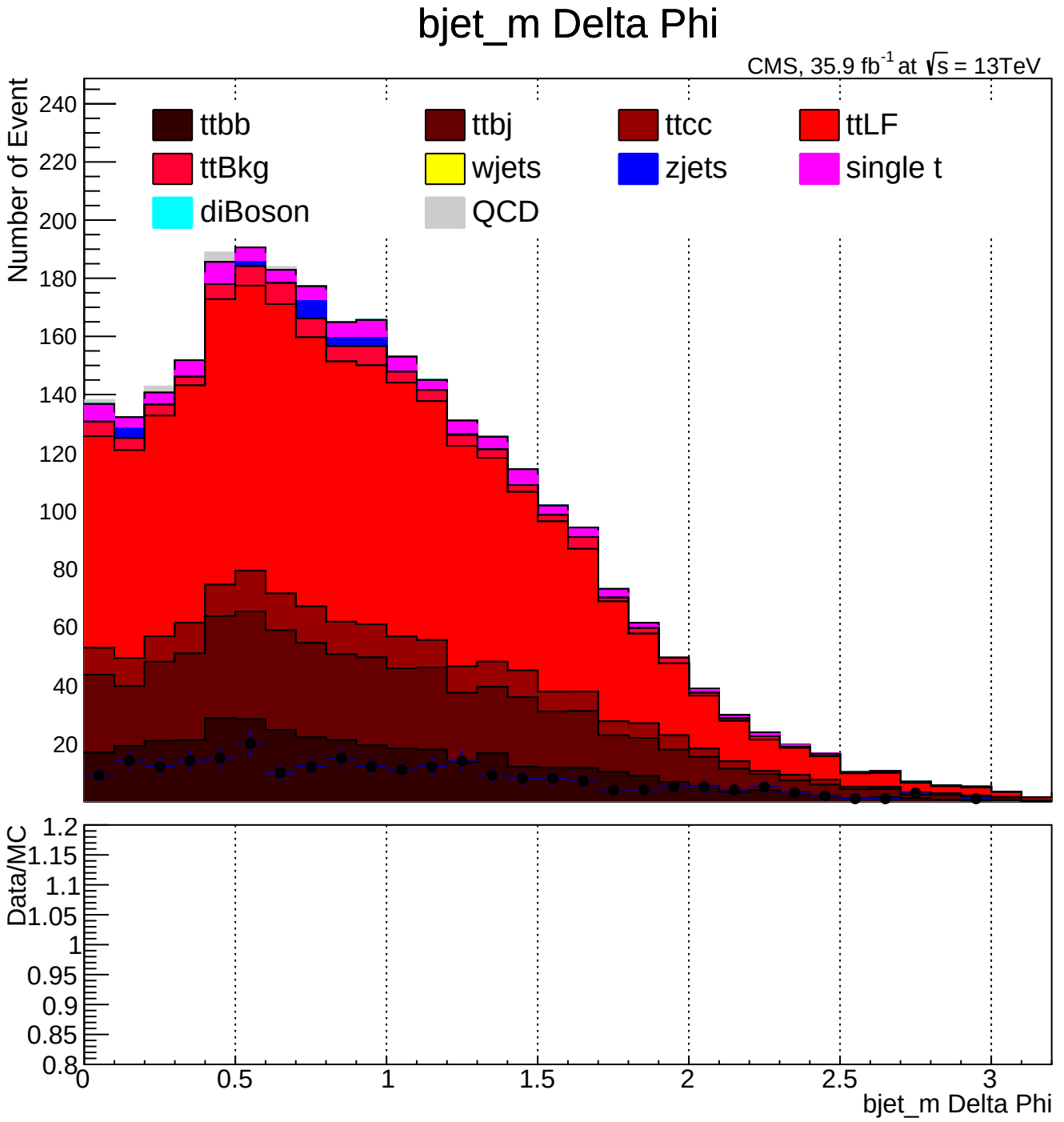

W Mass
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Transverse Mass (GeV)

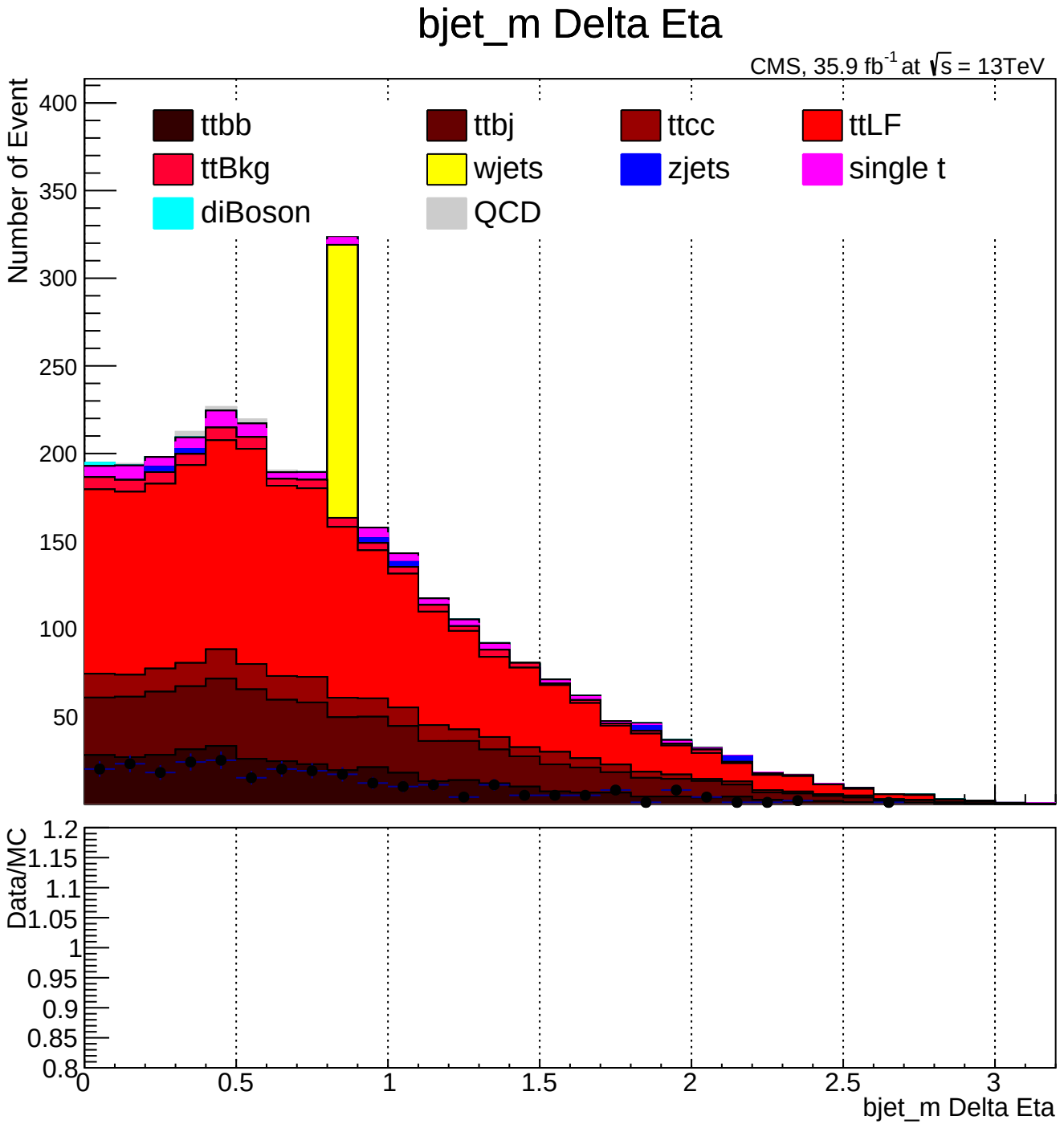

Di-bjet Mass (medium) wrt min DR
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
Di-bjet (medium) Mass (GeV)

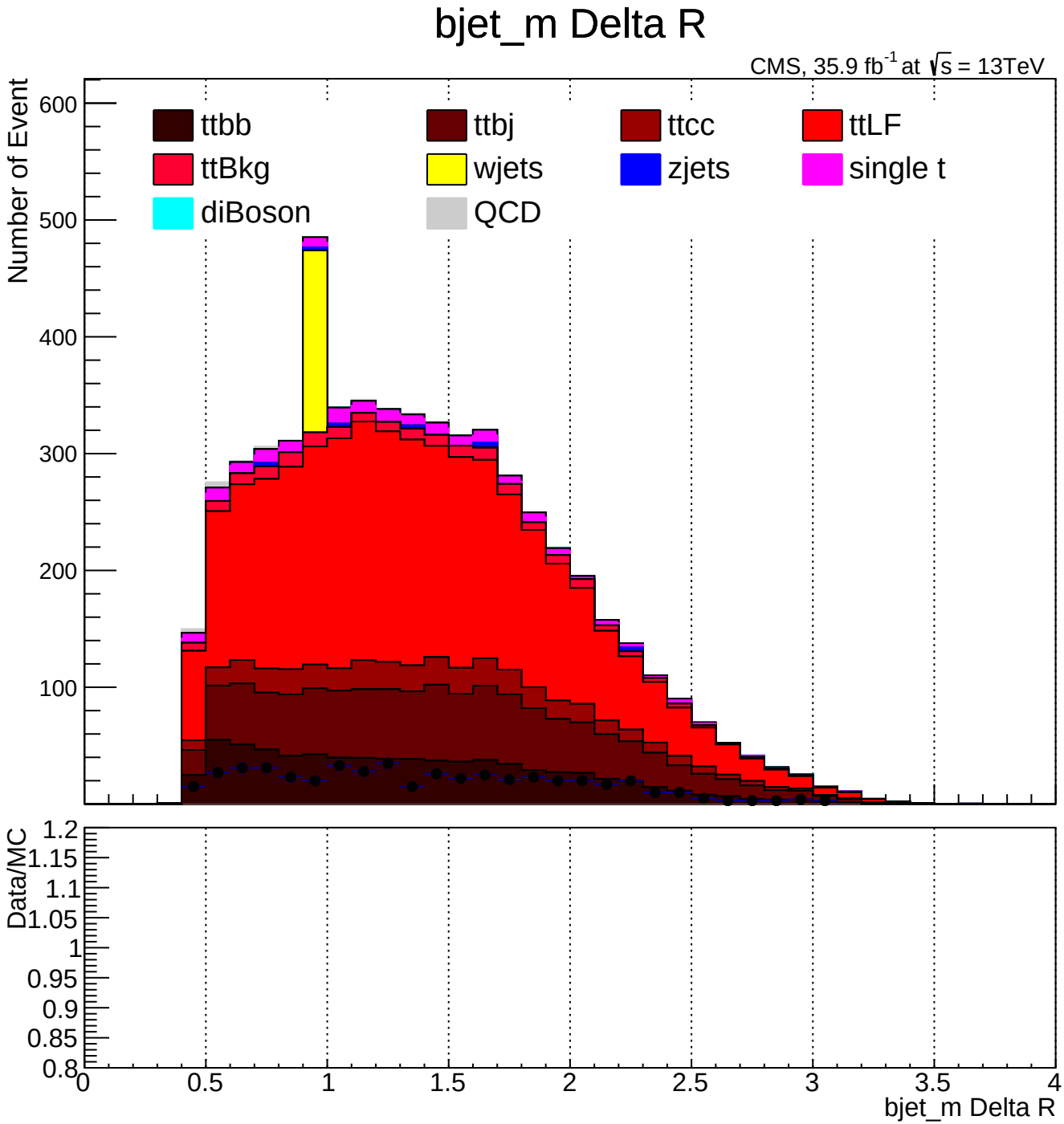

Leading b jet (medium) pT from di-bjets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b Jet (medium) pT from di-bjets (GeV)

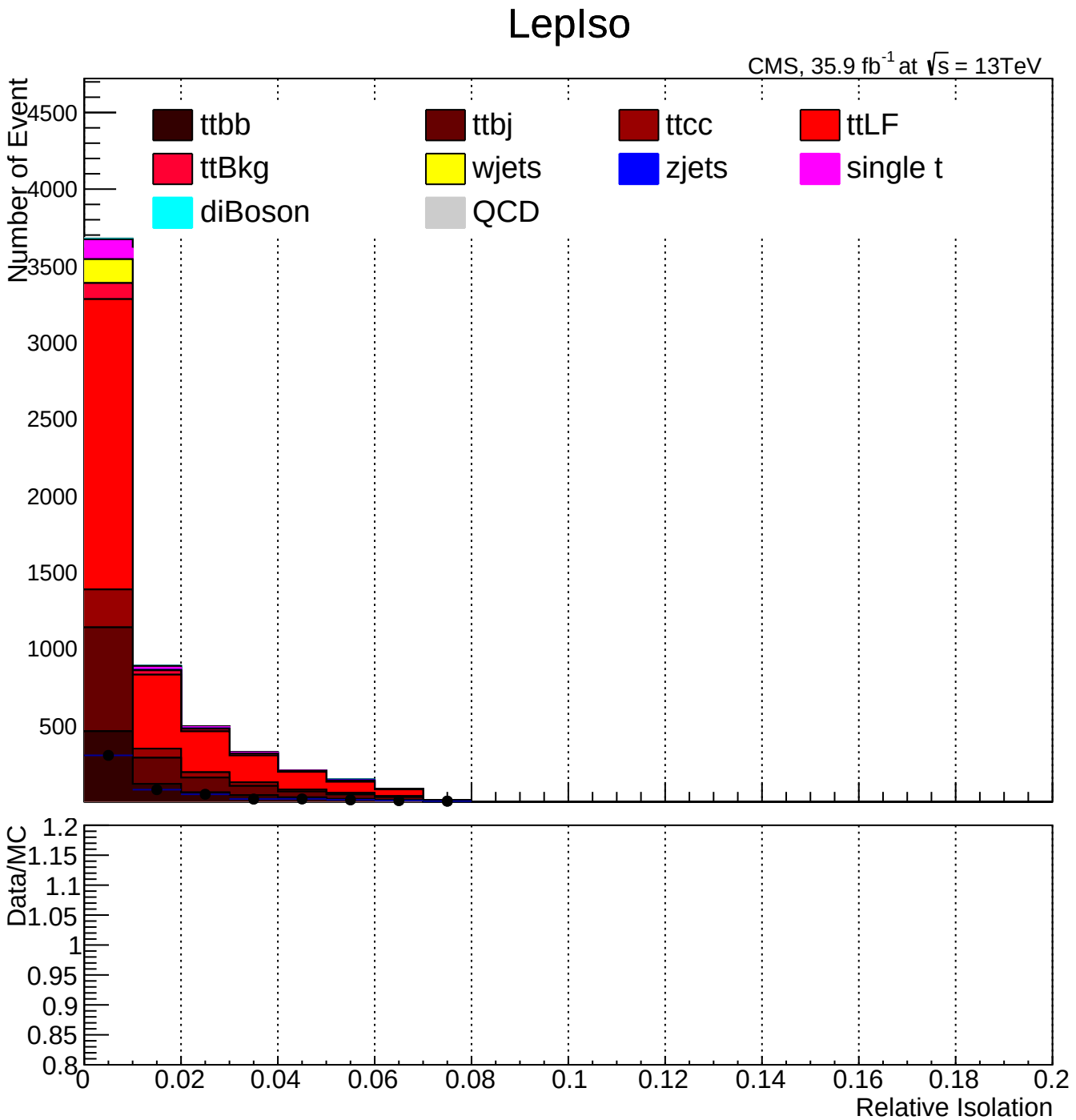

leading c jet (medium) pT
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
leading c Jet (medium) pT (GeV)

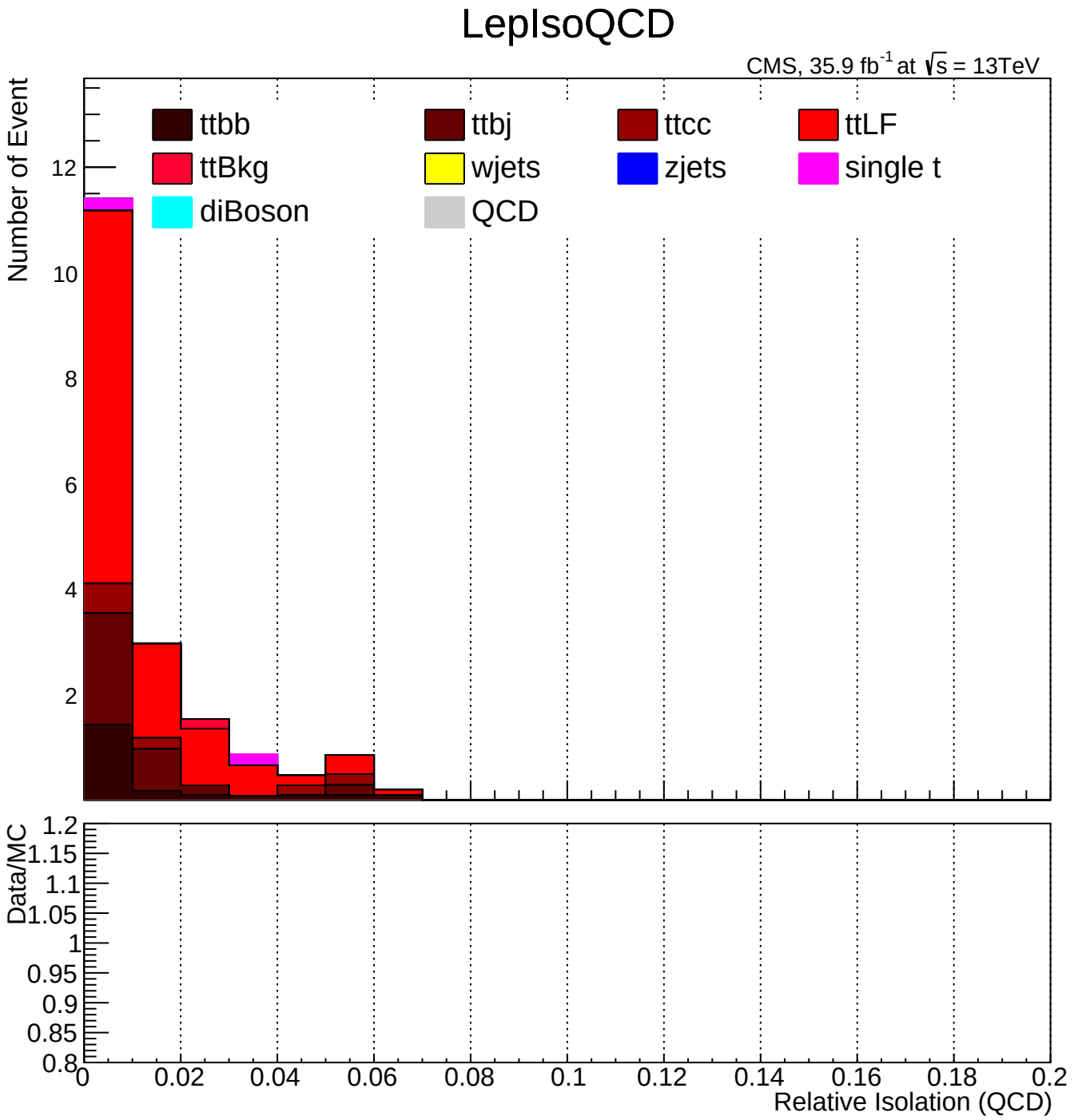

lepton DPhi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
DPhi

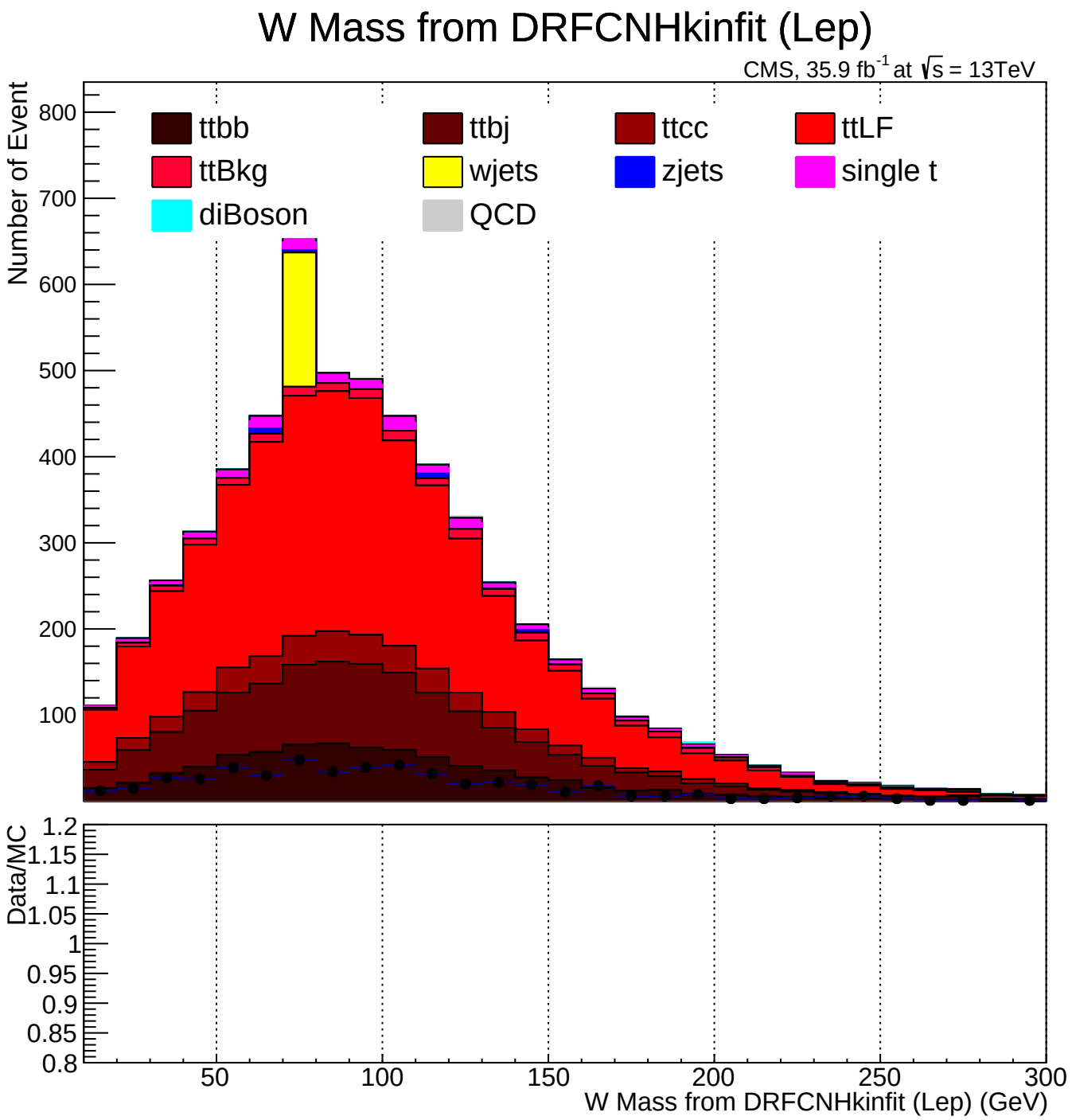

bjet_m Delta Phi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta Phi

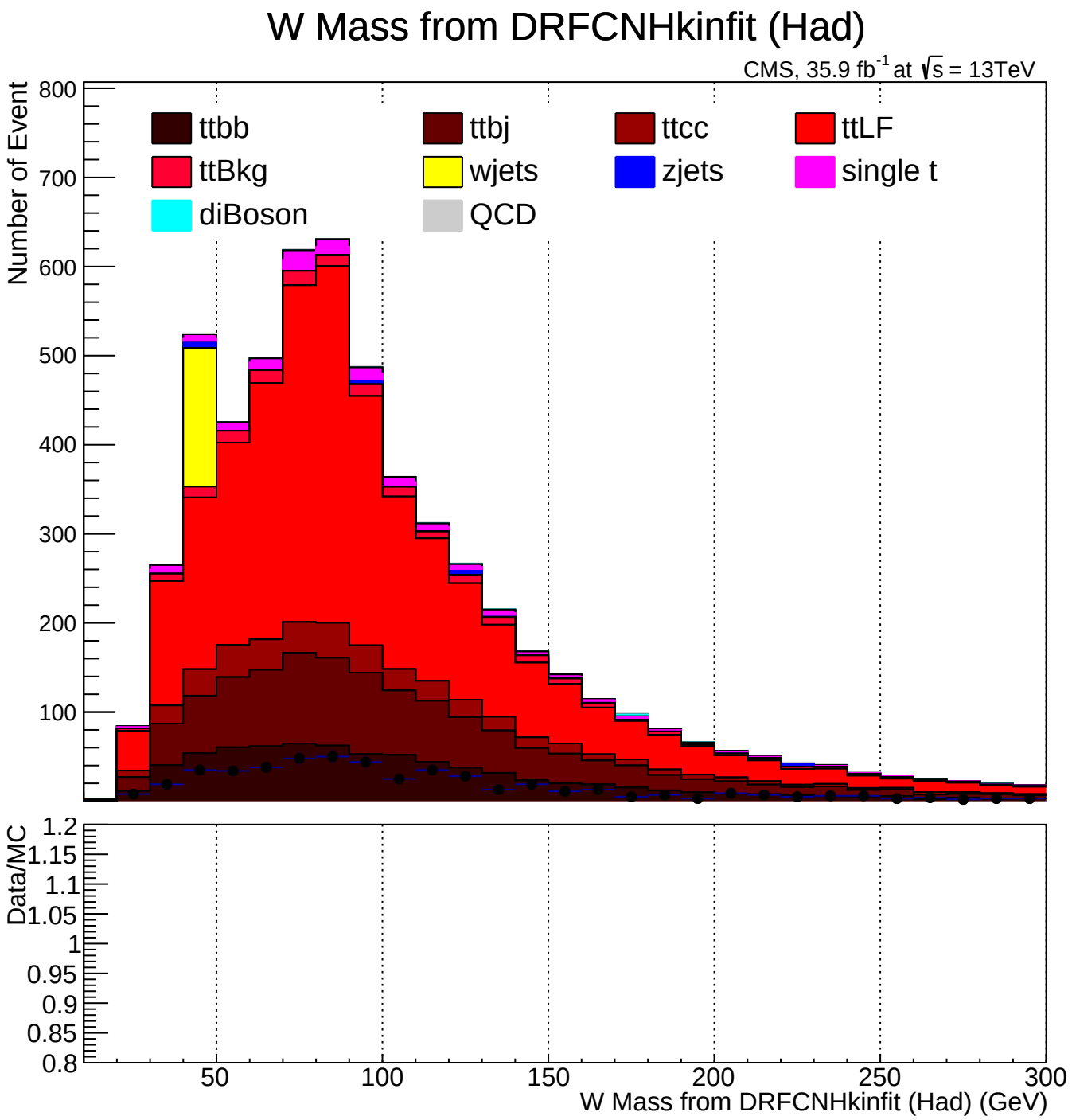

bjet_m Delta Eta
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta Eta

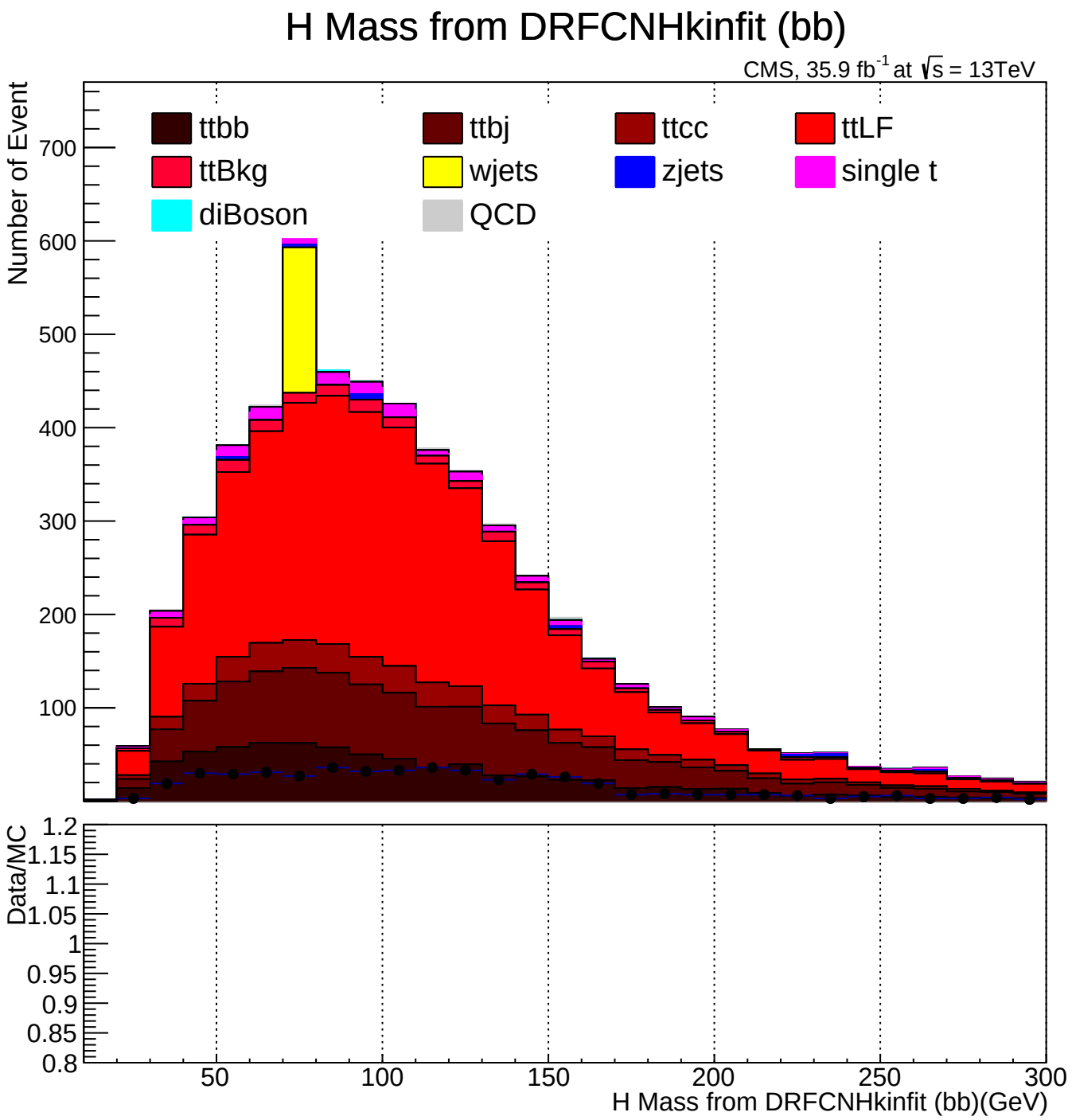

bjet_m Delta R
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
bjet_m Delta R

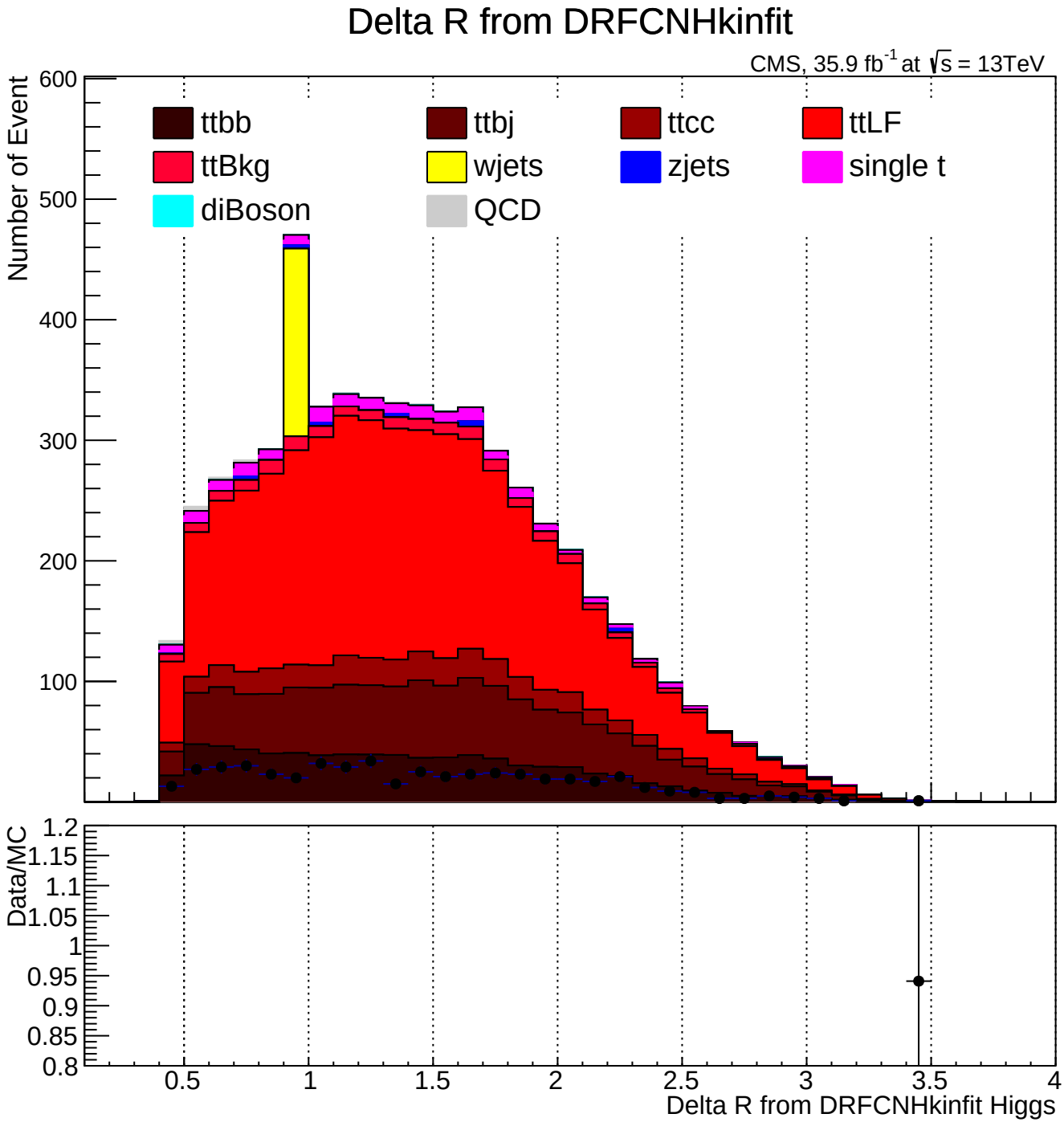

LepIso
CMS, 35.9 fb-1 at √s = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation

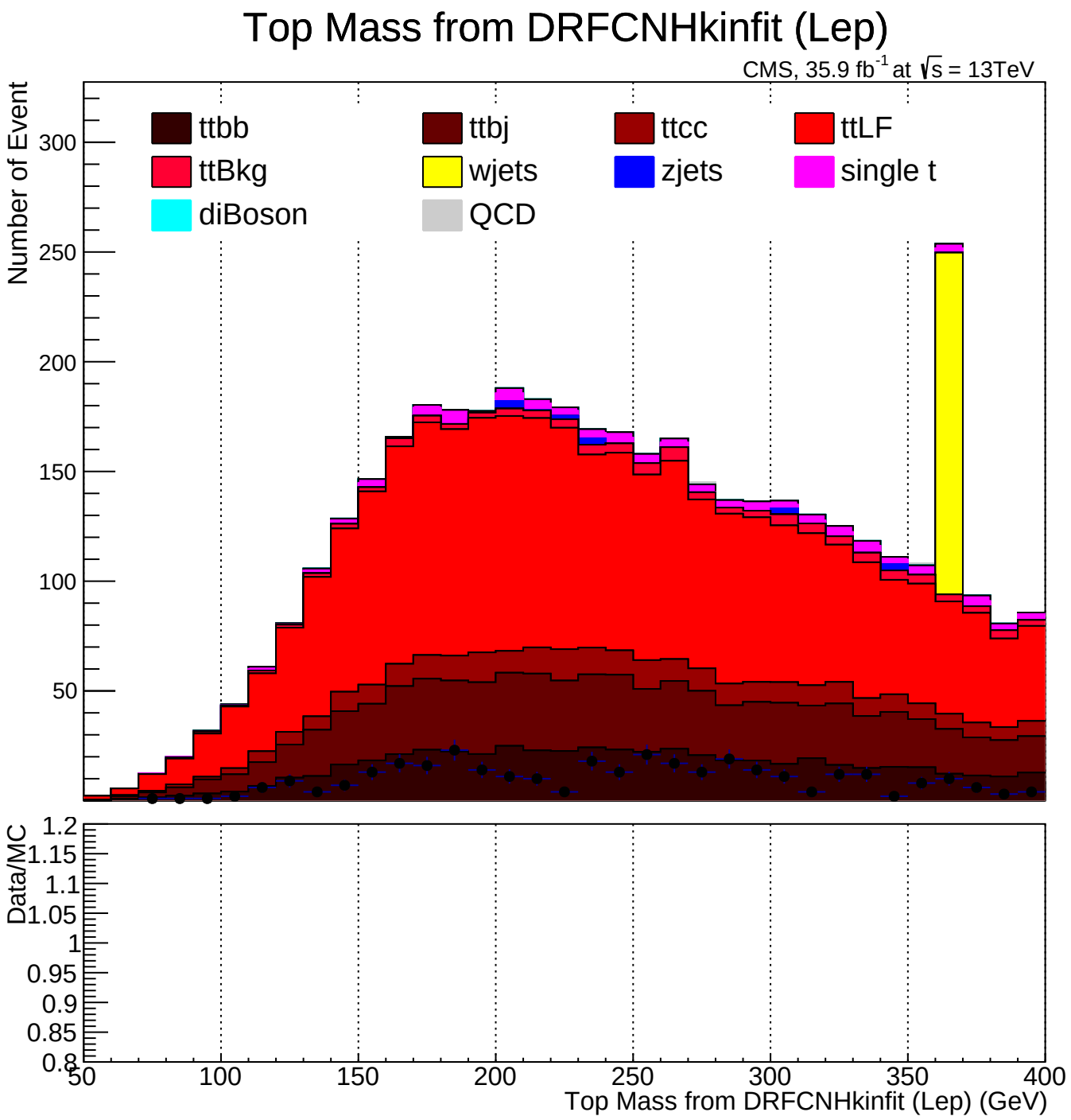

LepIsoQCD
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation (QCD)

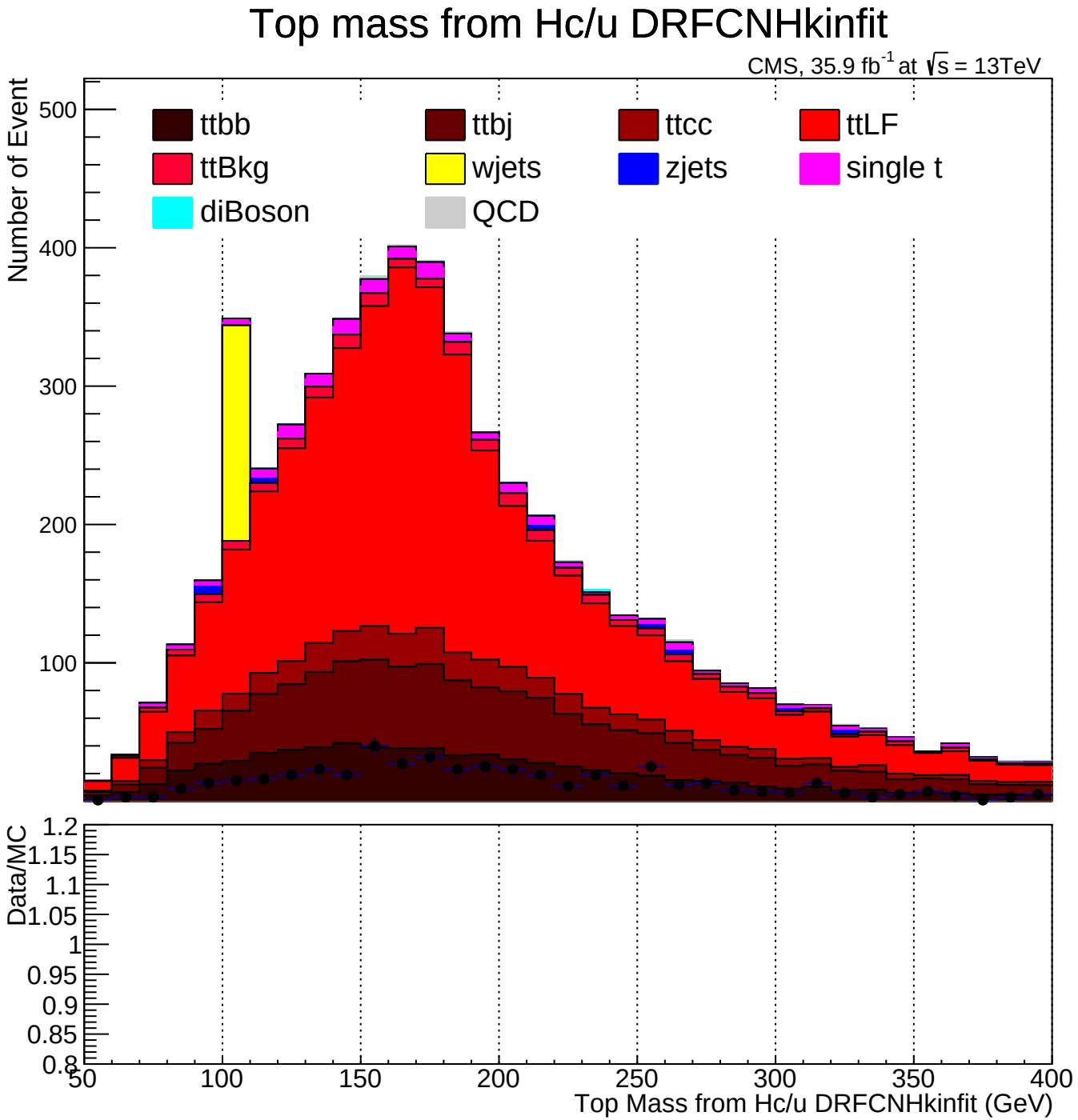

W Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
W Mass from DRFCNHkinfit (Lep) (GeV)

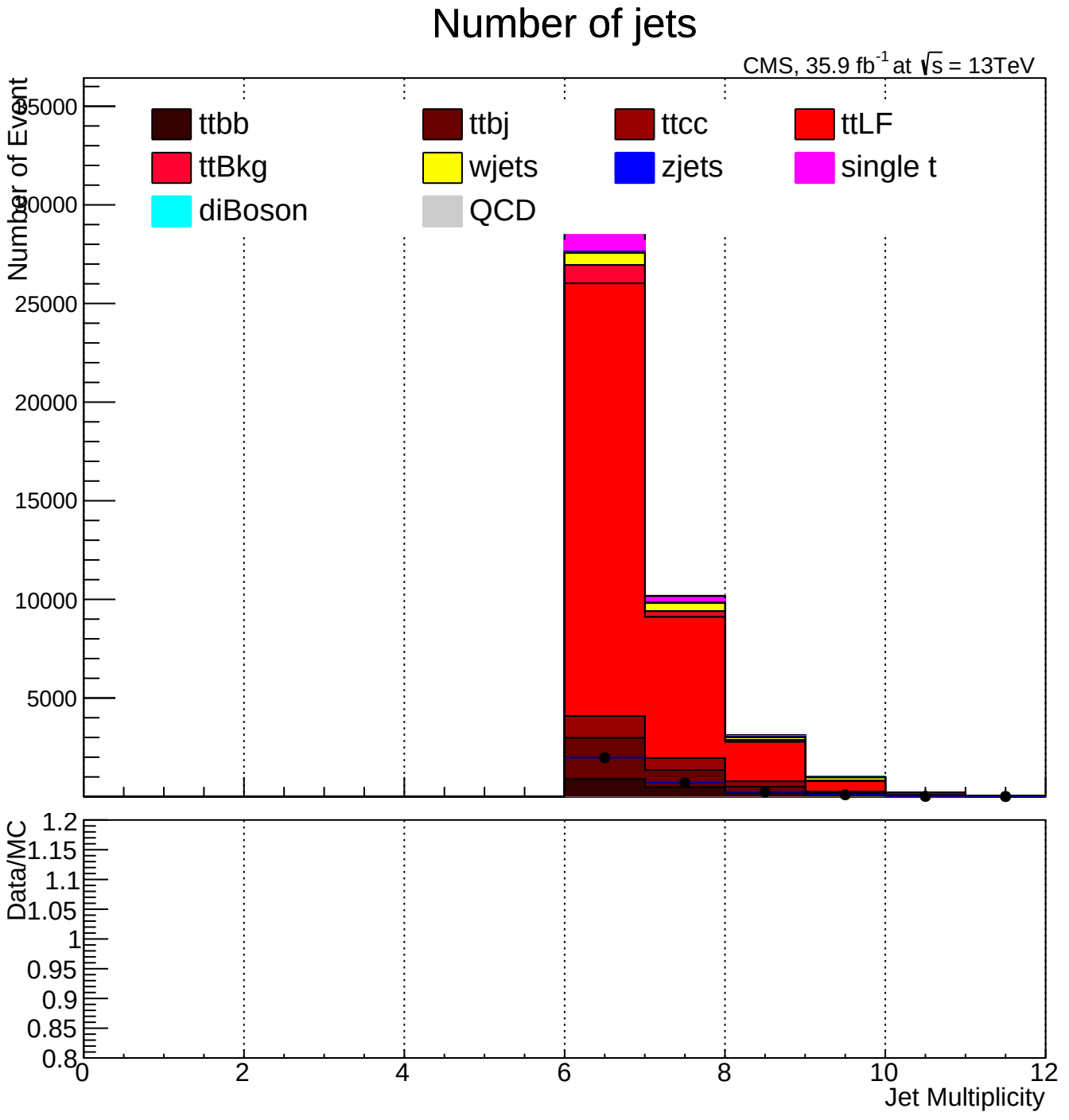

W Mass from DRFCNHkinfit (Had)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
W Mass from DRFCNHkinfit (Had) (GeV)

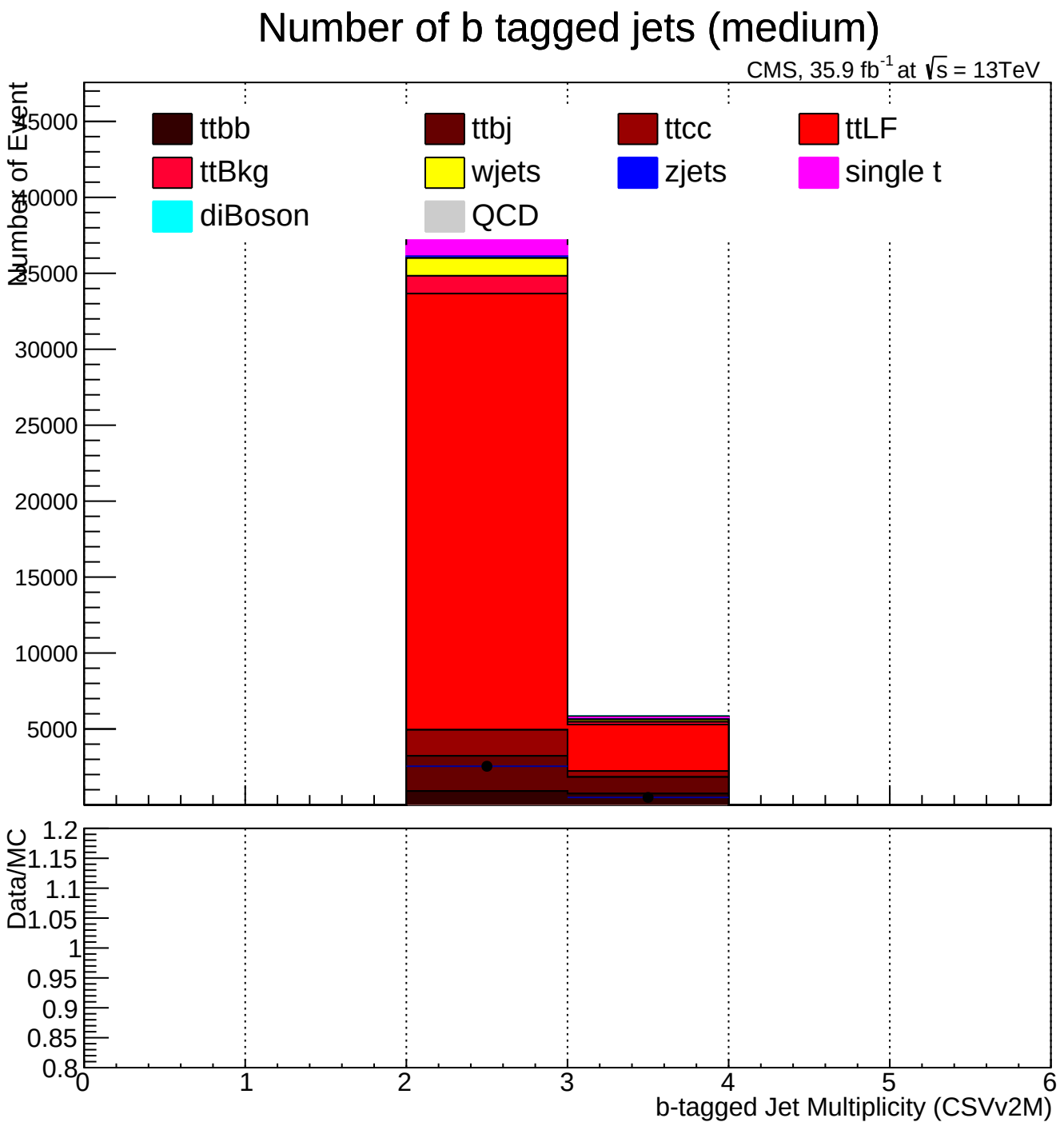

H Mass from DRFCNHkinfit (bb)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
H Mass from DRFCNHkinfit (bb)(GeV)

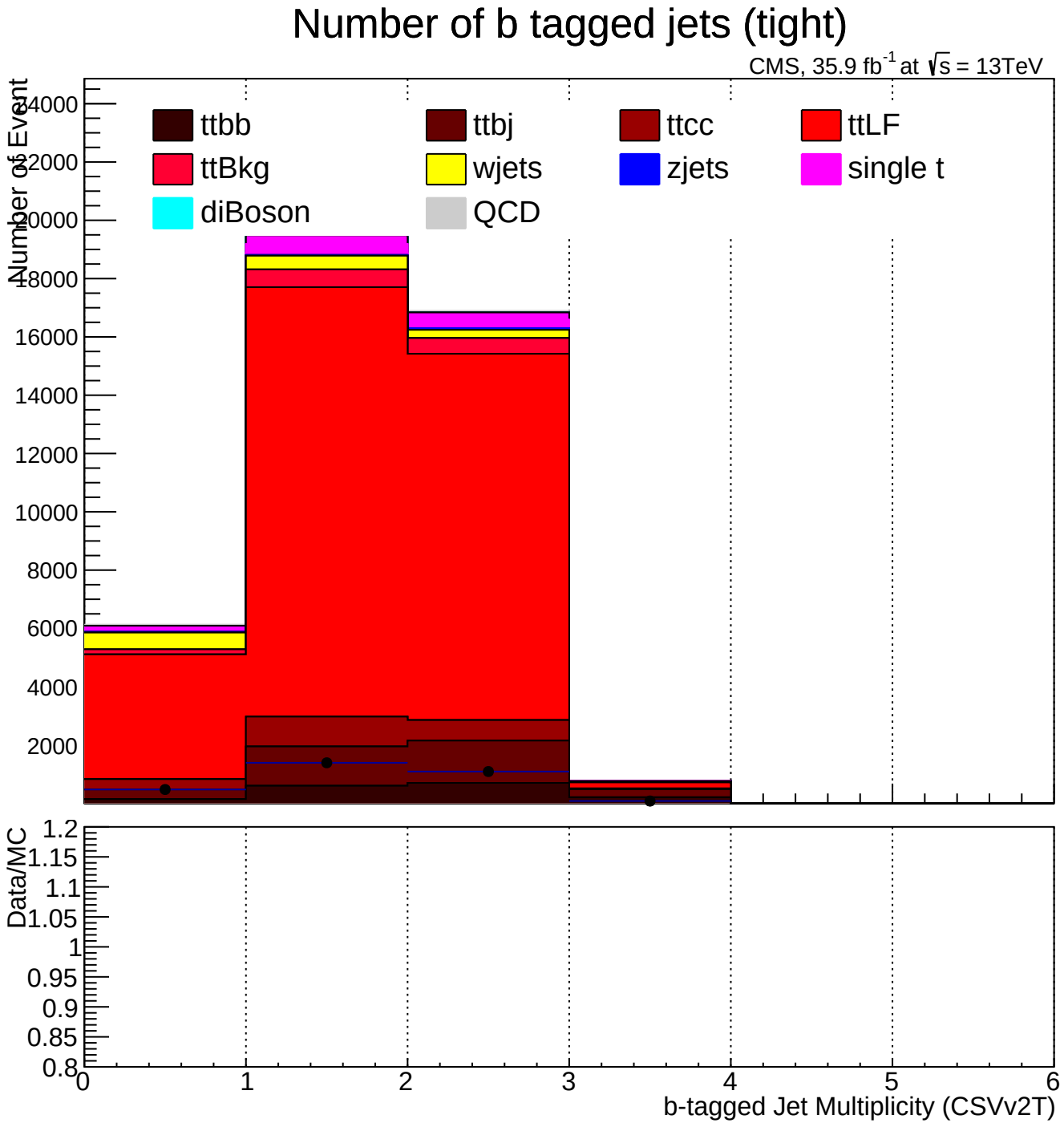

Delta R from DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Delta R from DRFCNHkinfit Higgs

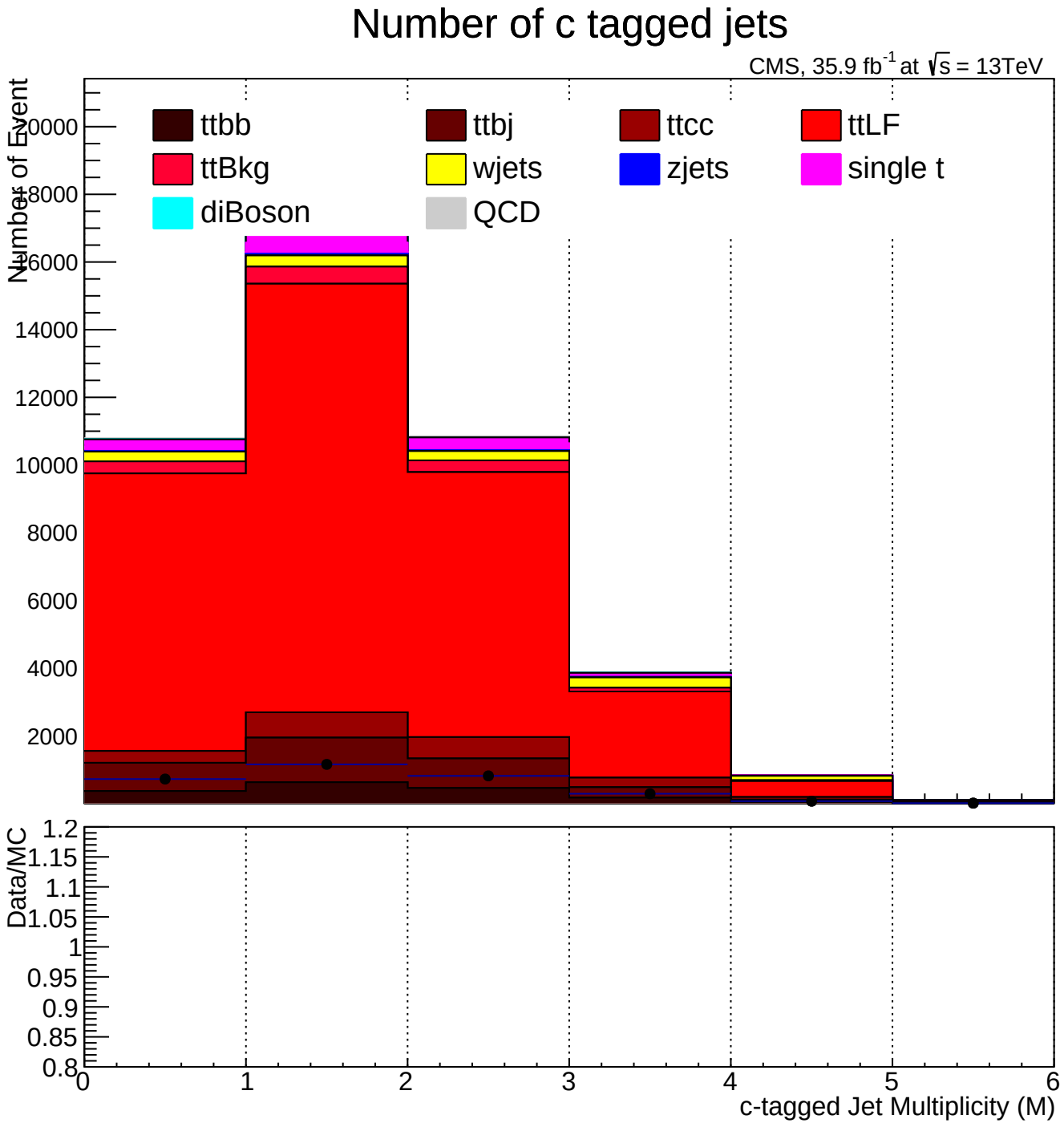

Top Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Top Mass from DRFCNHkinfit (Lep) (GeV)

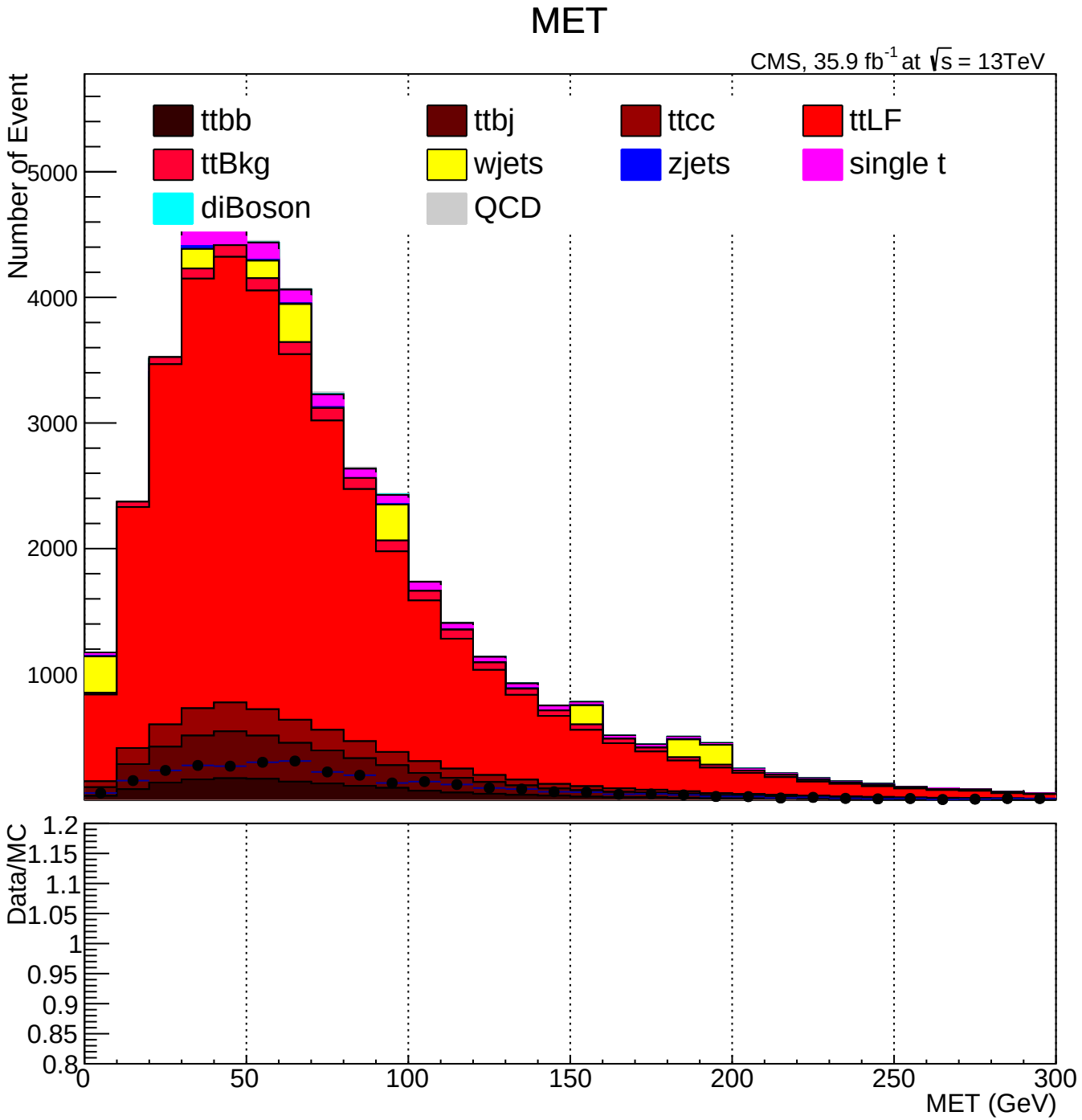

Top mass from Hc/u DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Top Mass from Hc/u DRFCNHkinfit (GeV)

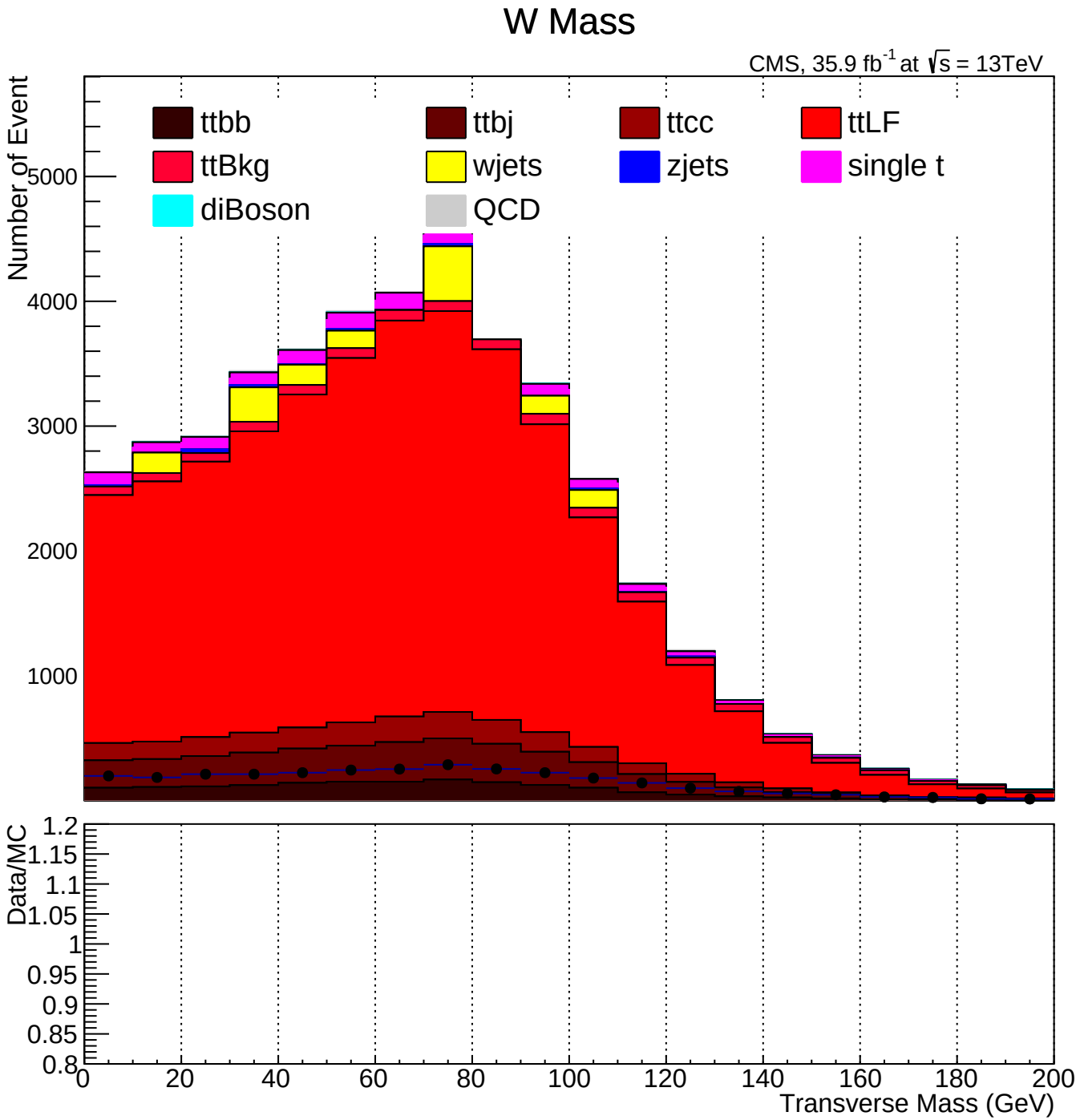

Number of jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
35000
30000
25000
20000
15000
10000
5000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
2
4
6
8
10
12
Jet Multiplicity

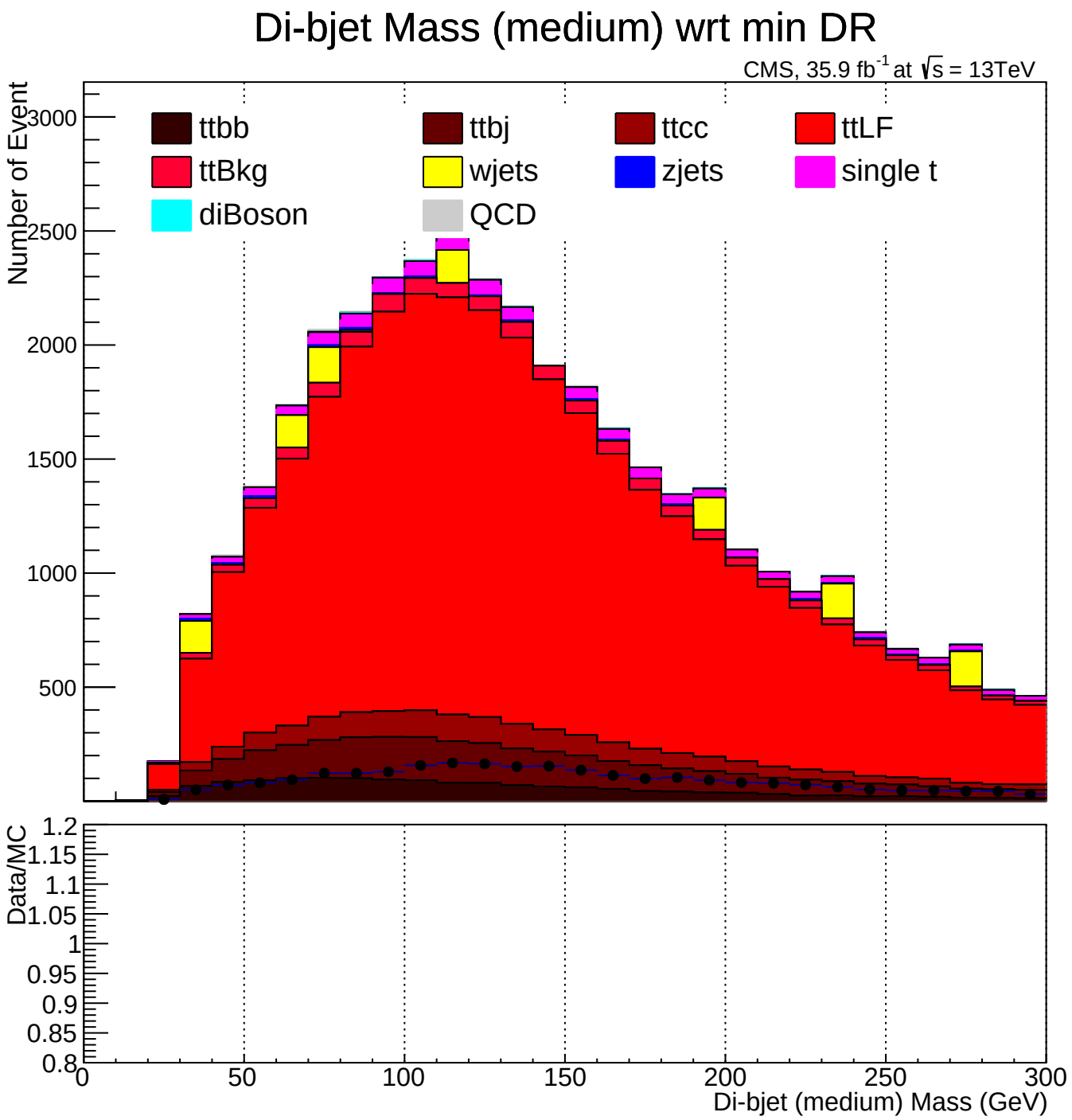

Number of b tagged jets (medium)
CMS, 35.9 fb-1 at √s = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
35000
30000
25000
20000
15000
10000
5000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2M)

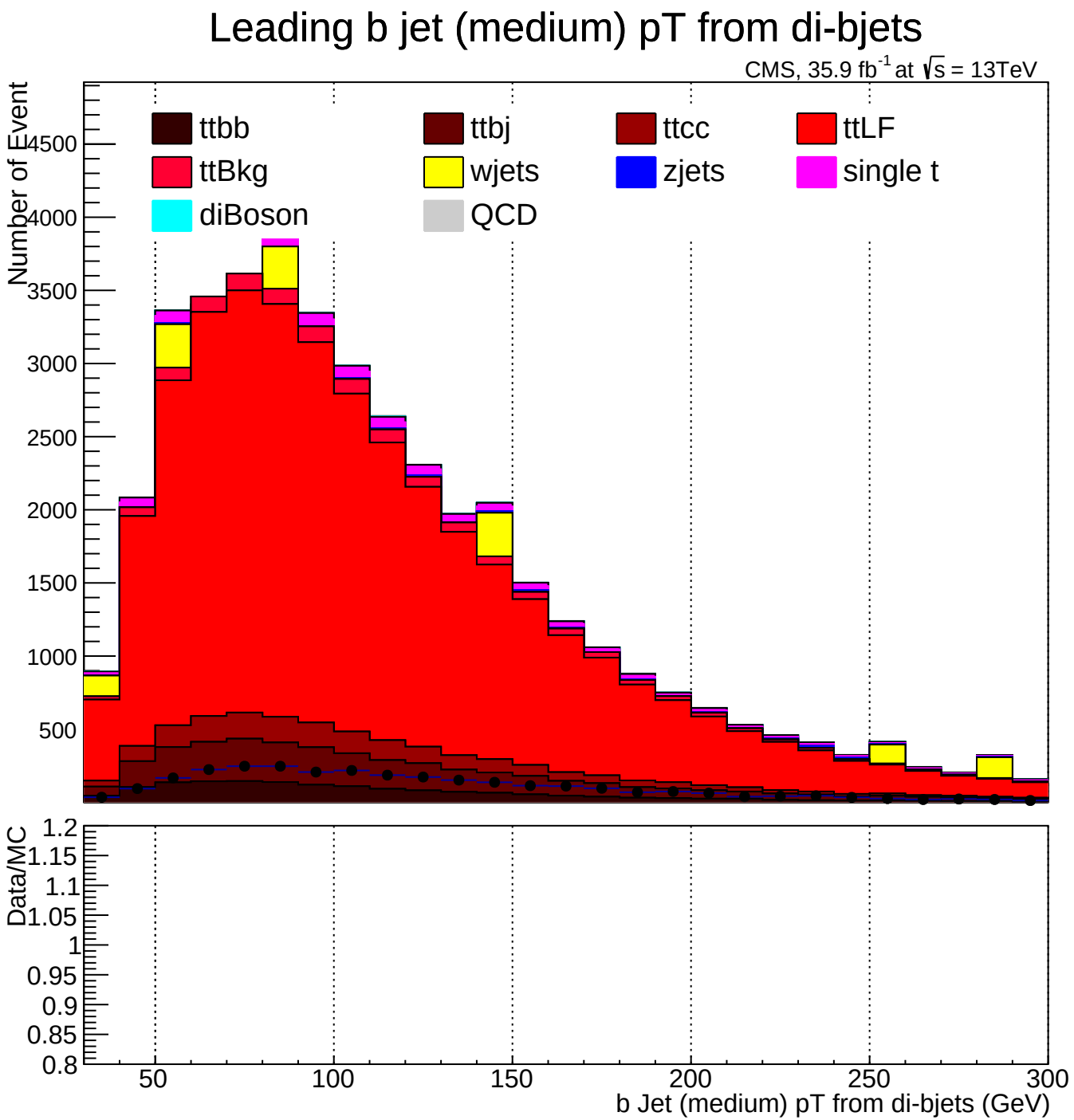

Number of b tagged jets (tight)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b-tagged Jet Multiplicity (CSVv2T)

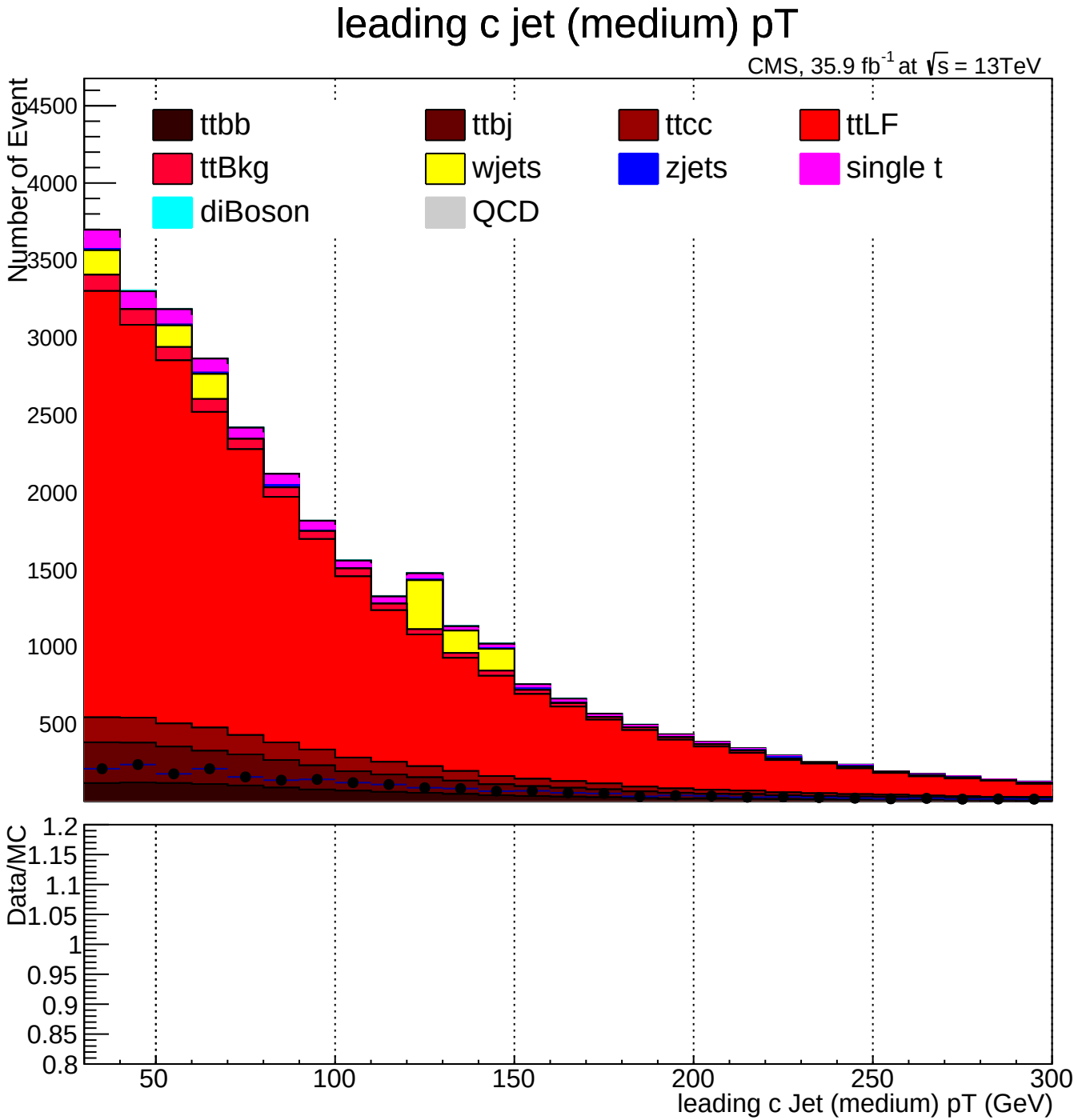

Number of c tagged jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
c-tagged Jet Multiplicity (M)

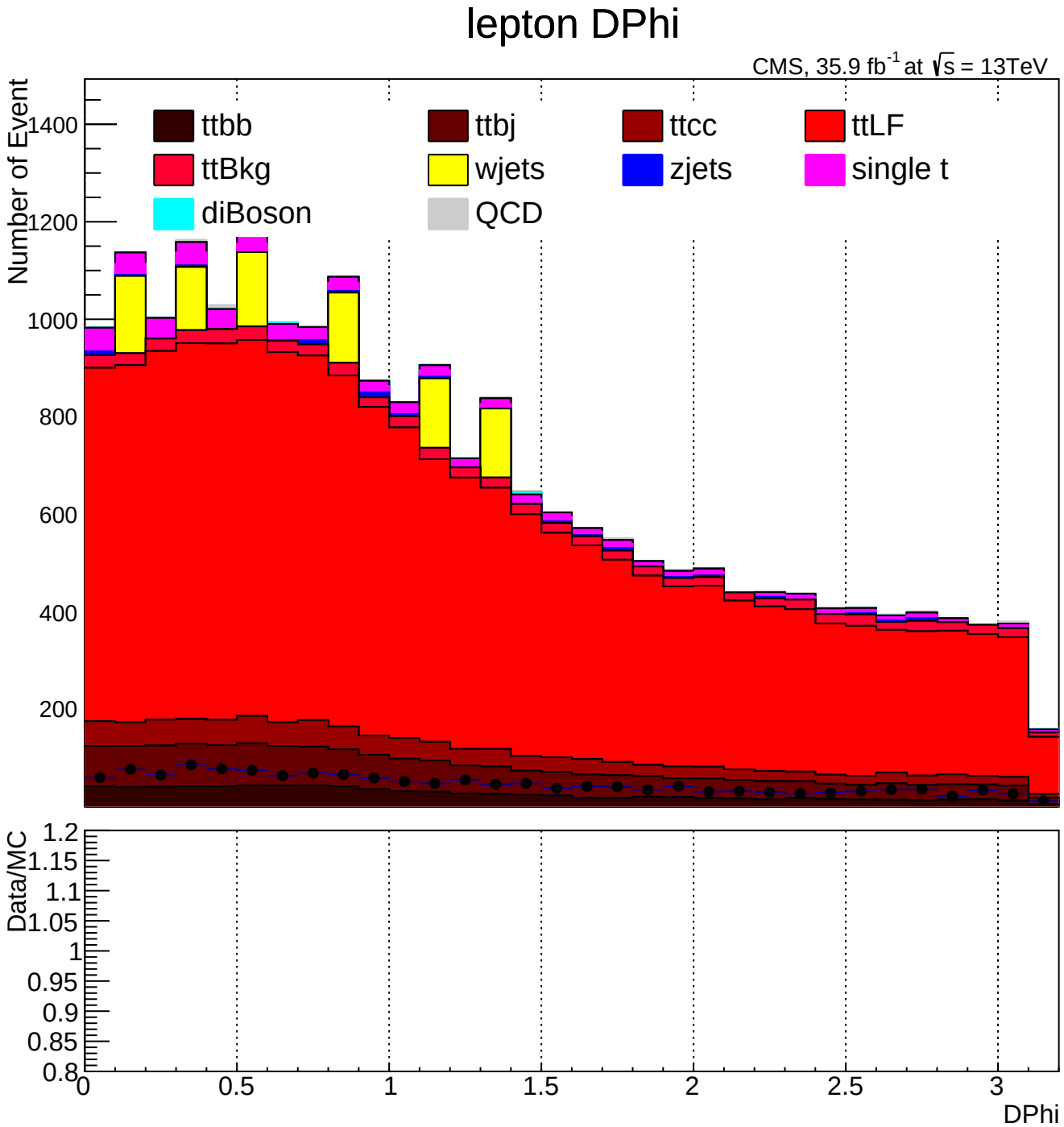

MET
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
50
100
150
200
250
300
MET (GeV)

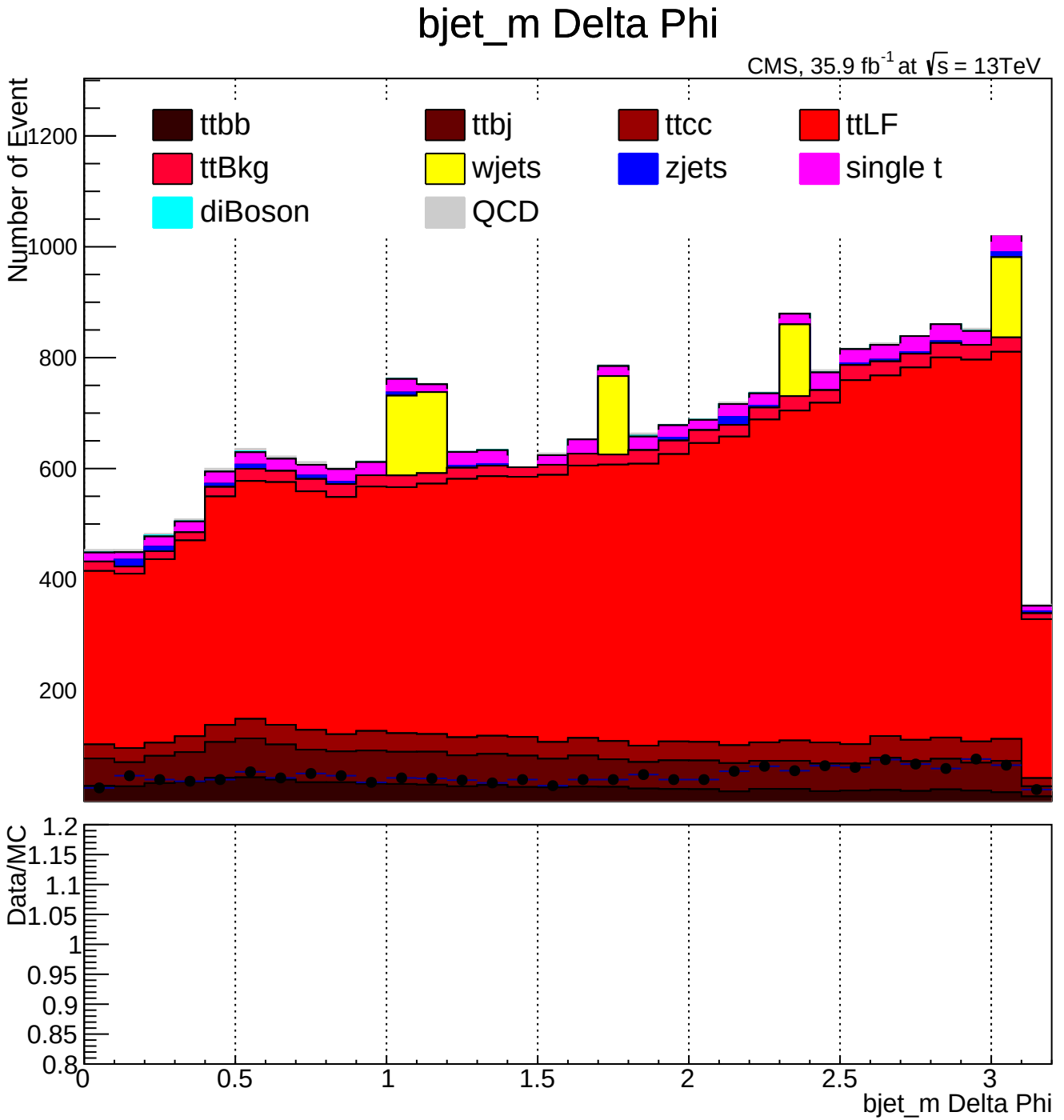

W Mass
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
20
40
60
80
100
120
140
160
180
200
Transverse Mass (GeV)

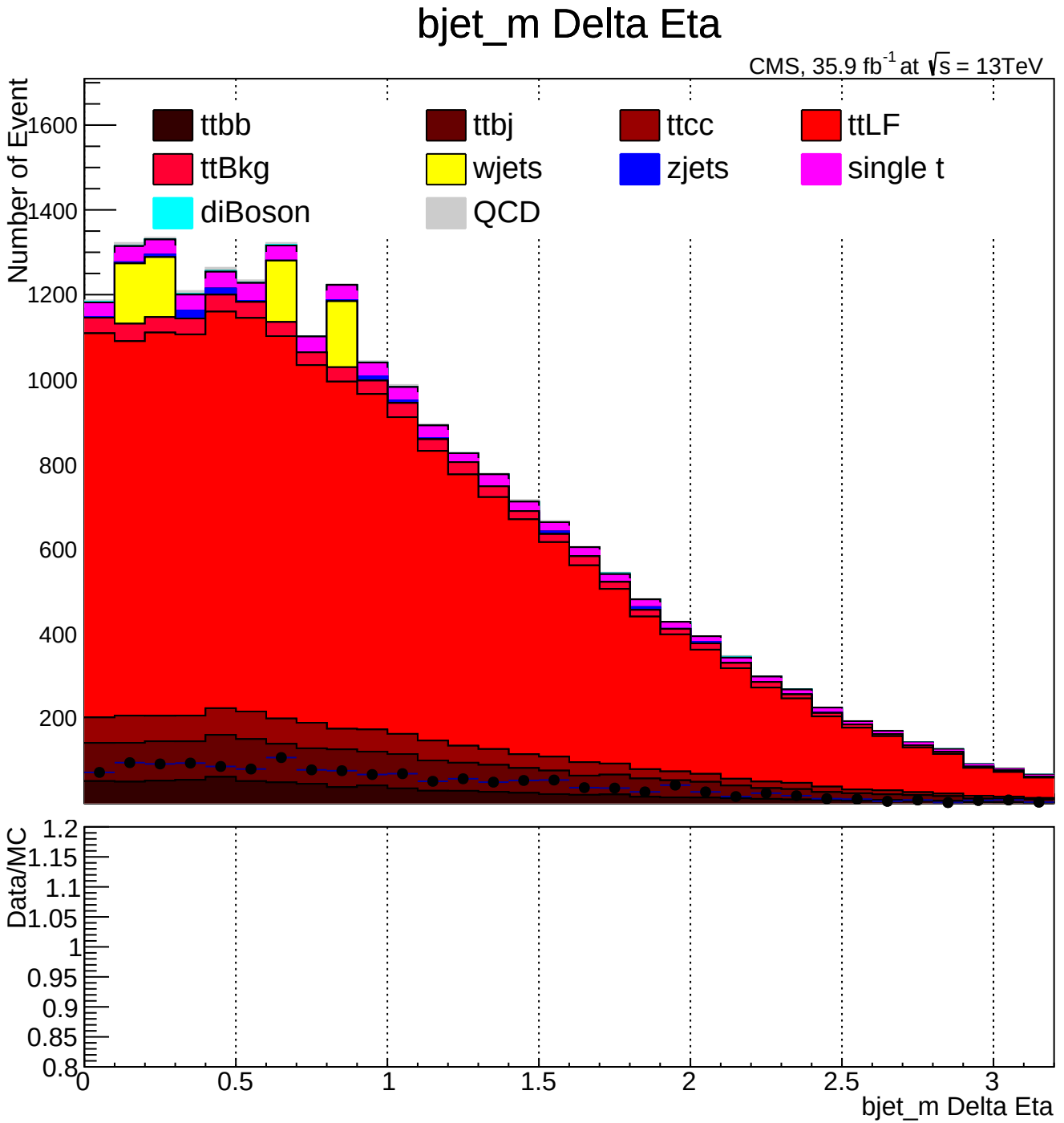

Di-bjet Mass (medium) wrt min DR
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Di-bjet (medium) Mass (GeV)

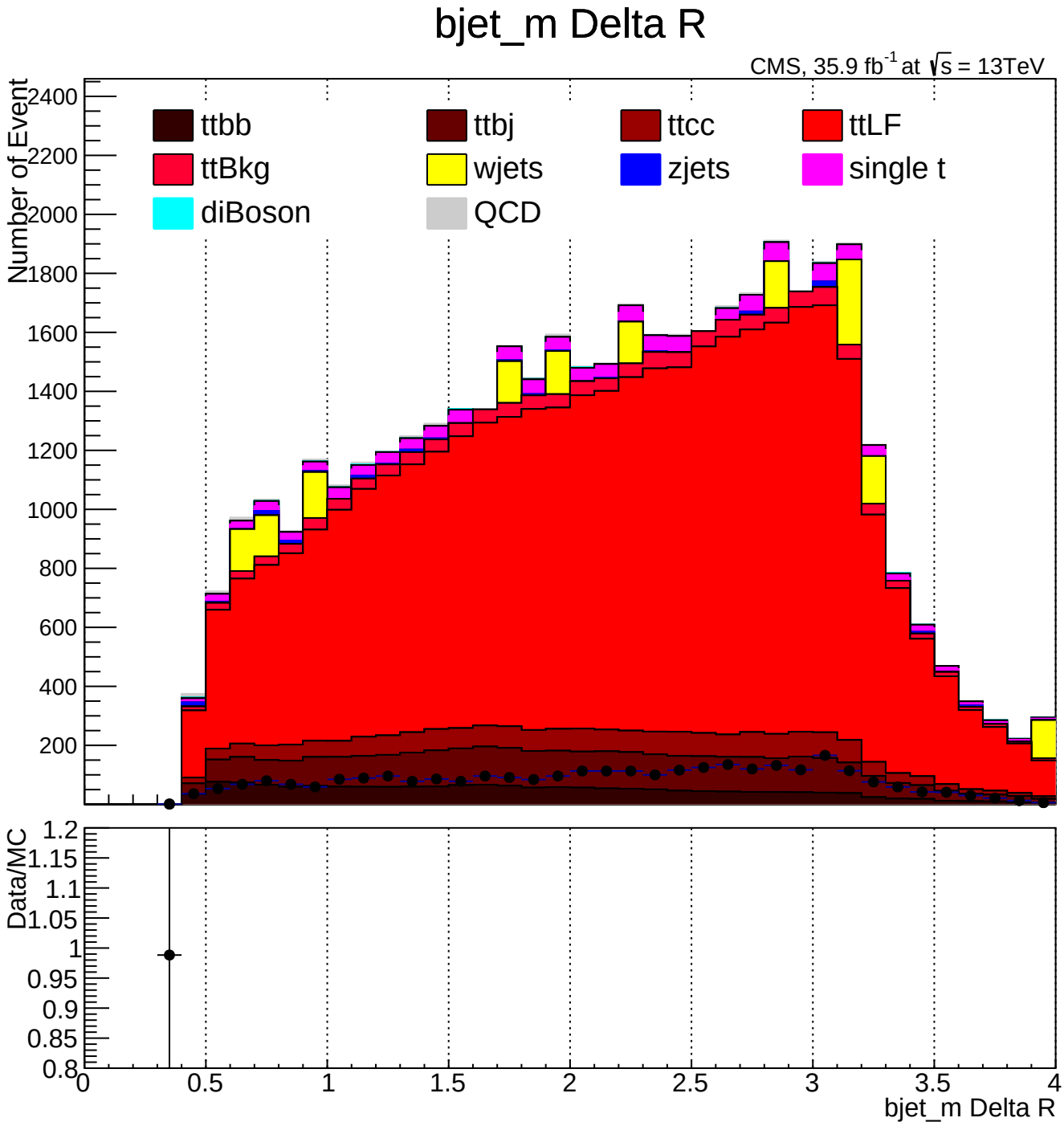

Leading b jet (medium) pT from di-bjets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
4500
4000
3500
3000
2500
2000
1500
1000
500
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
b Jet (medium) pT from di-bjets (GeV)

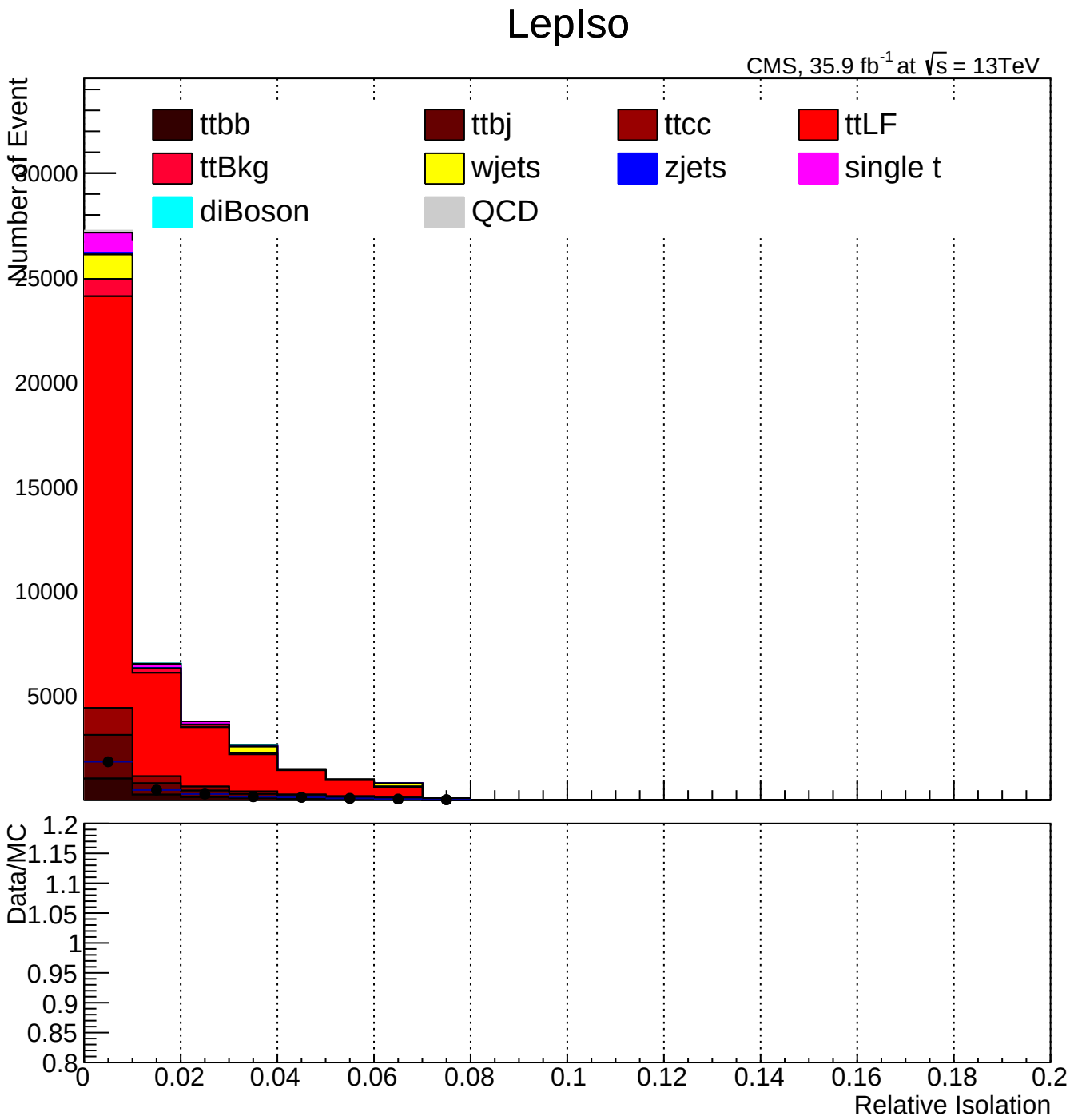

leading c jet (medium) pT
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
leading c Jet (medium) pT (GeV)

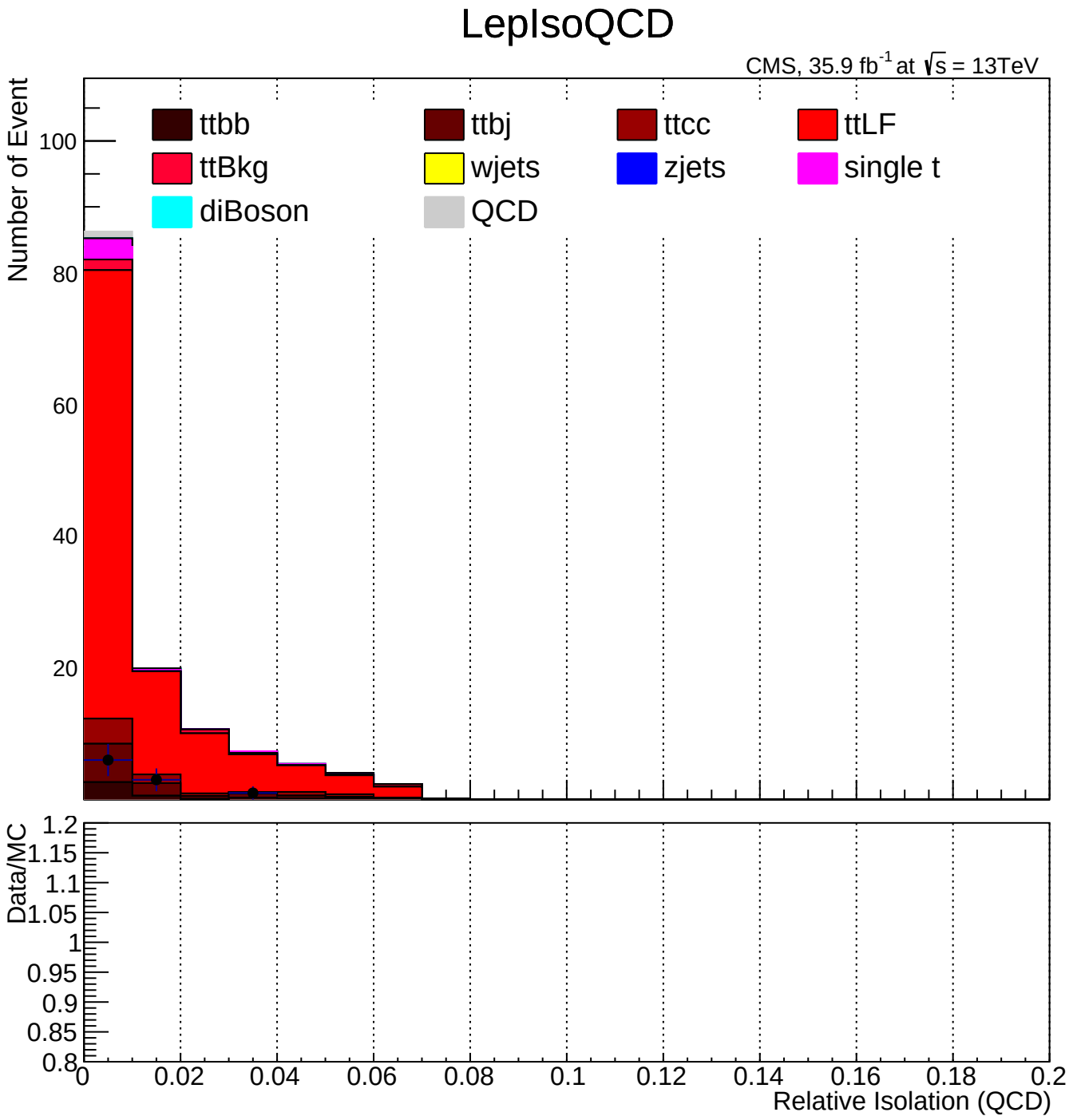

lepton DPhi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
1400
1200
1000
800
600
400
200
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
DPhi

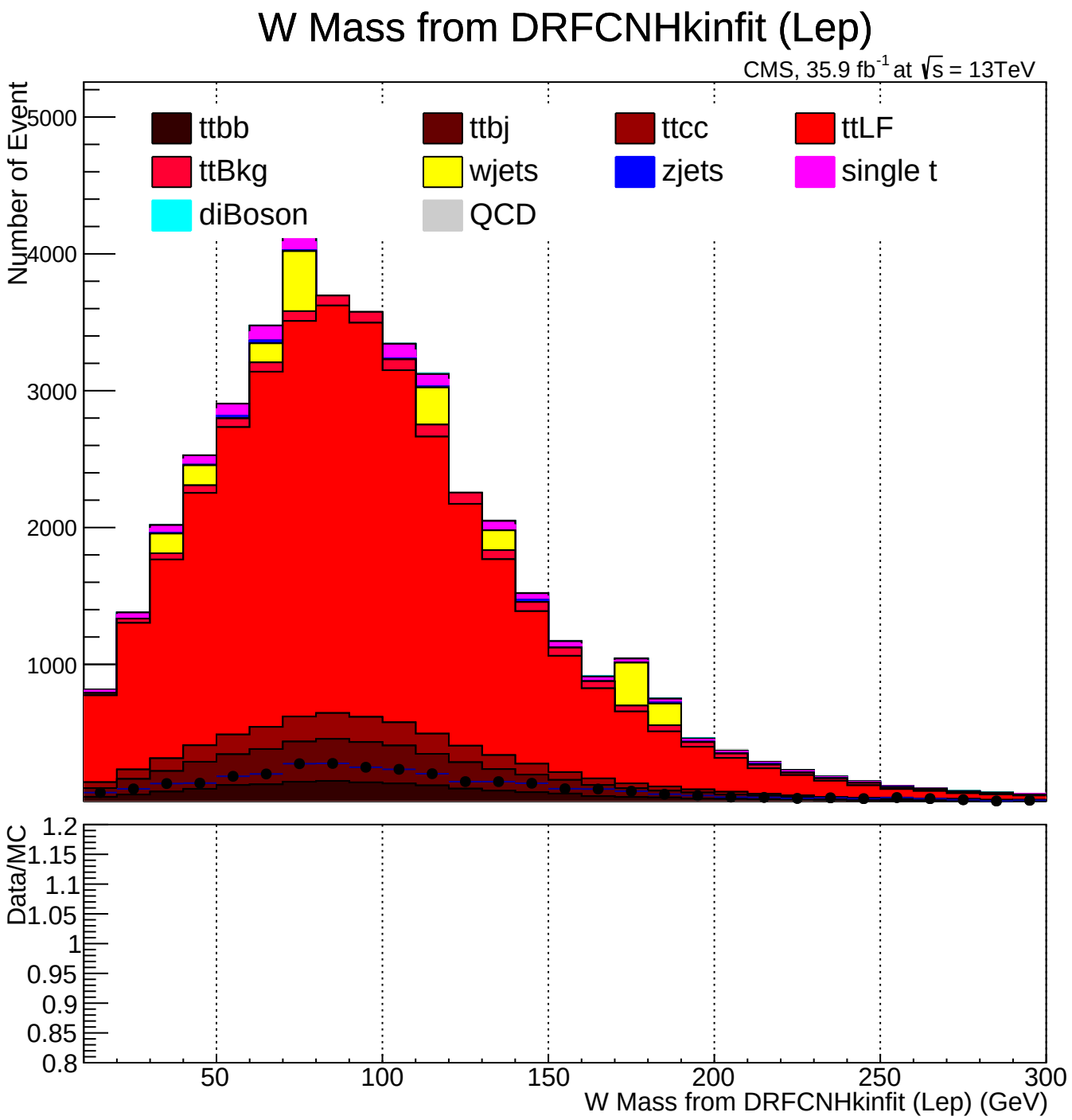

bjet_m Delta Phi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
1200
1000
800
600
400
200
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Phi

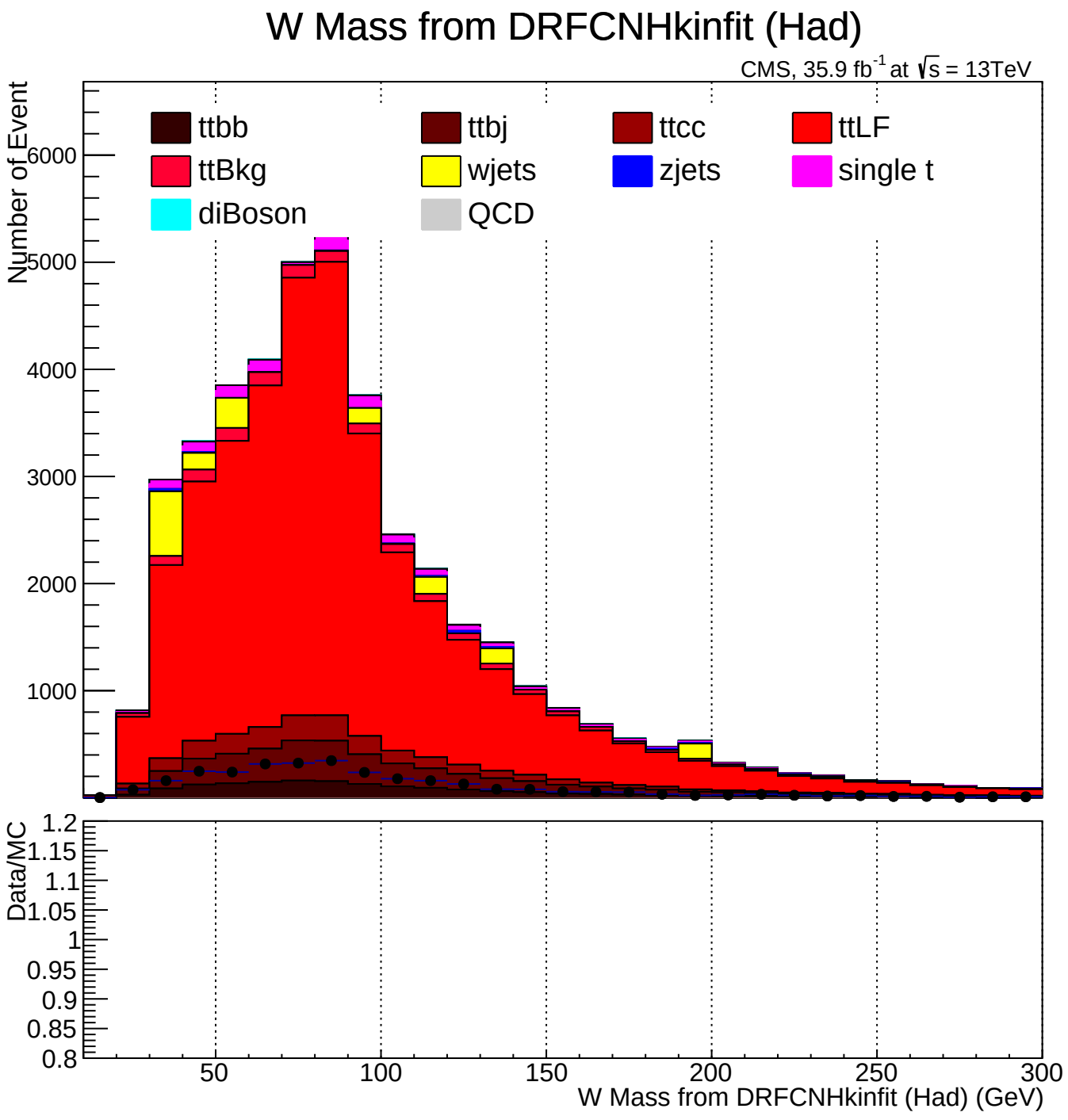

bjet_m Delta Eta
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
1600
1400
1200
1000
800
600
400
200
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Eta

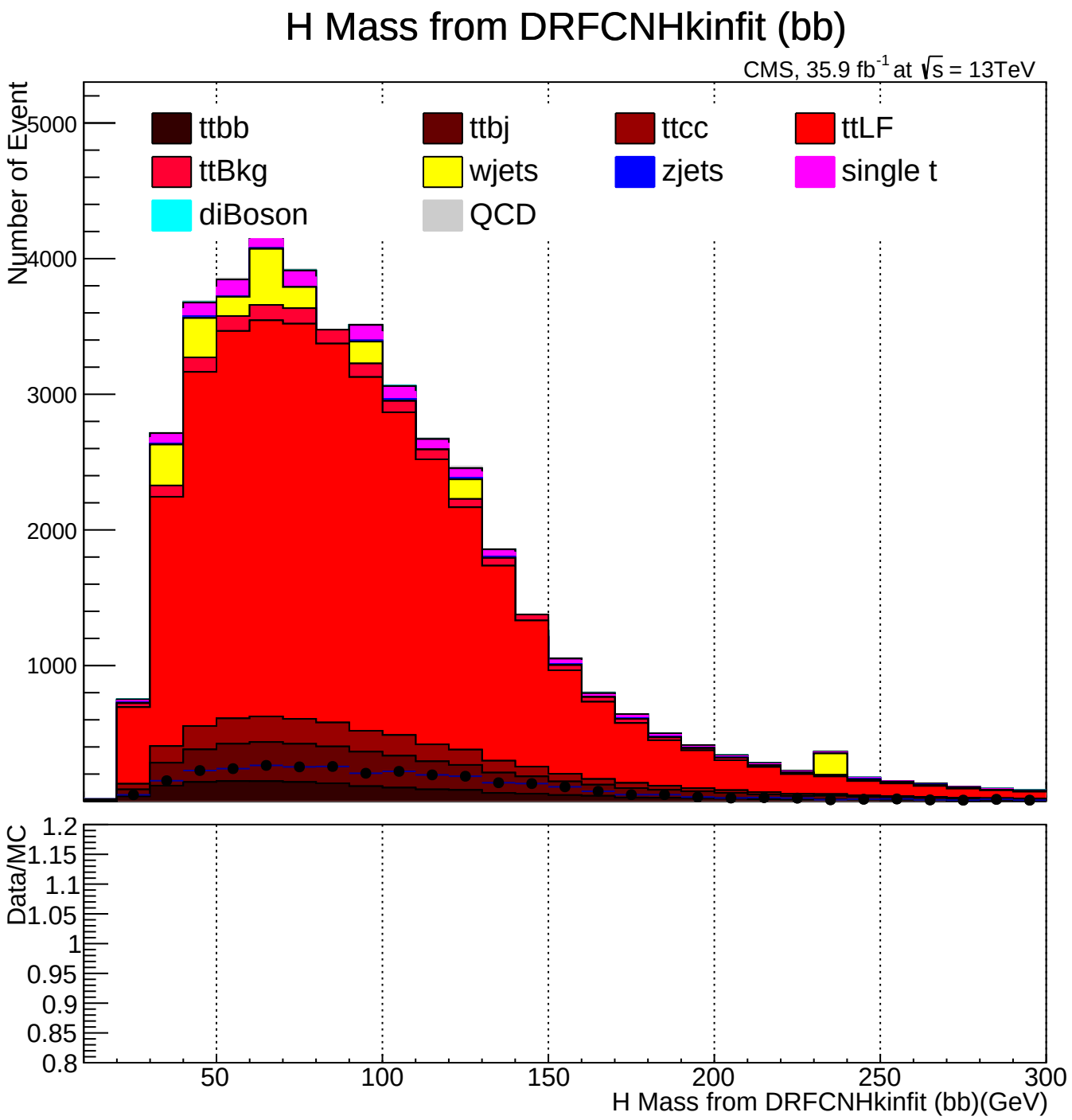

bjet_m Delta R
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
bjet_m Delta R

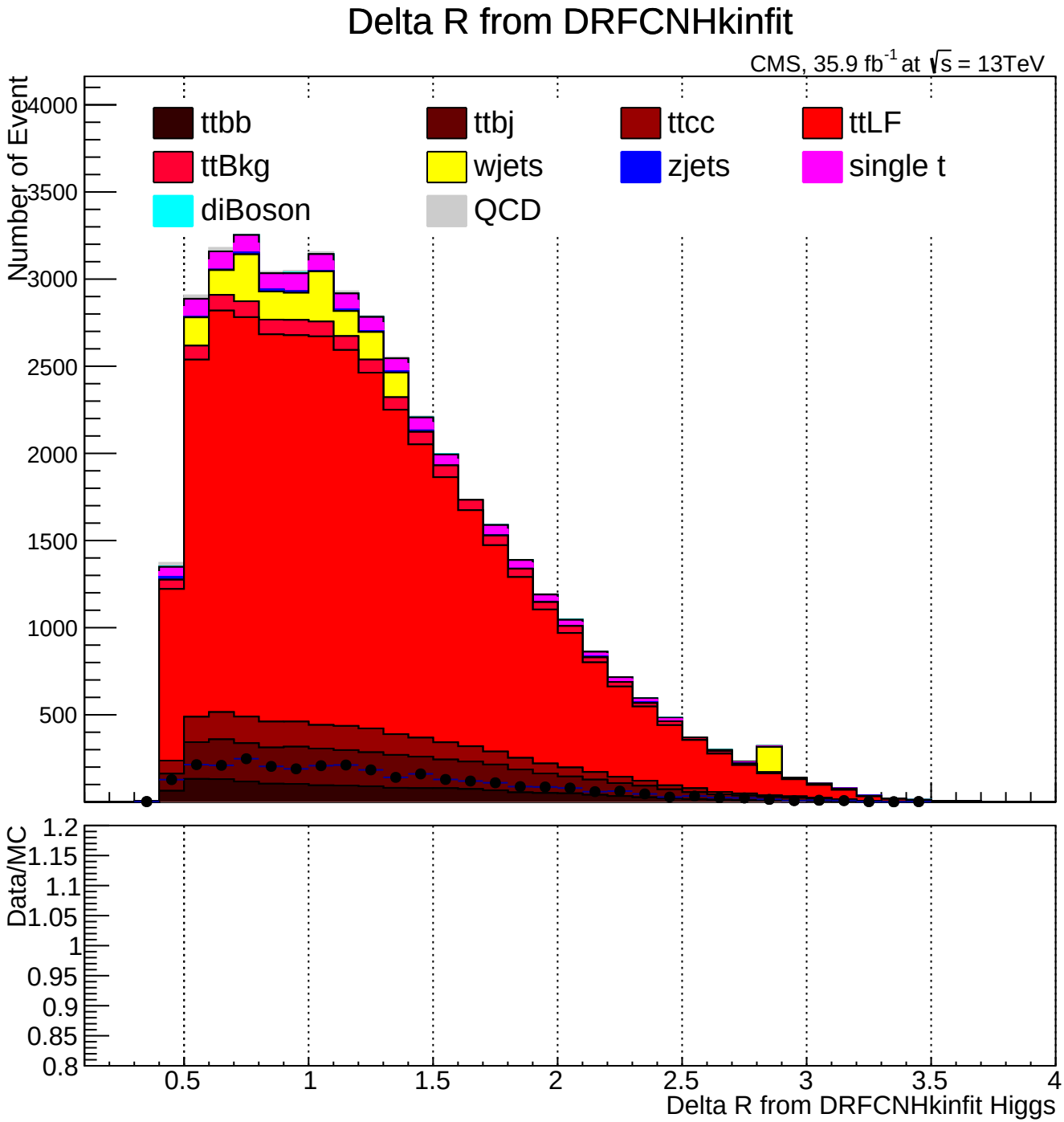

LepIso
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
30000
25000
20000
15000
10000
5000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation

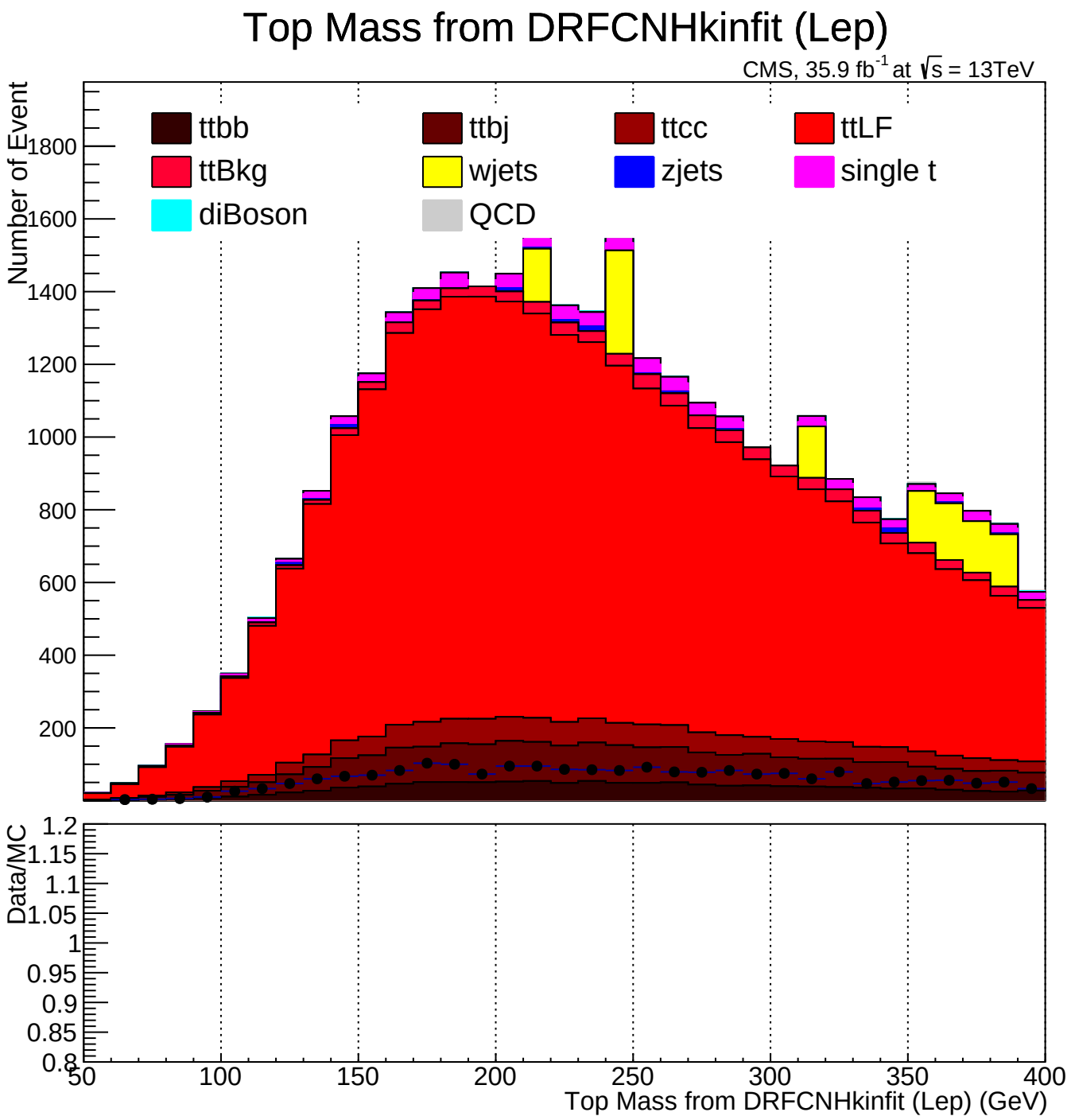

LepIsoQCD
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
100
80
60
40
20
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation (QCD)

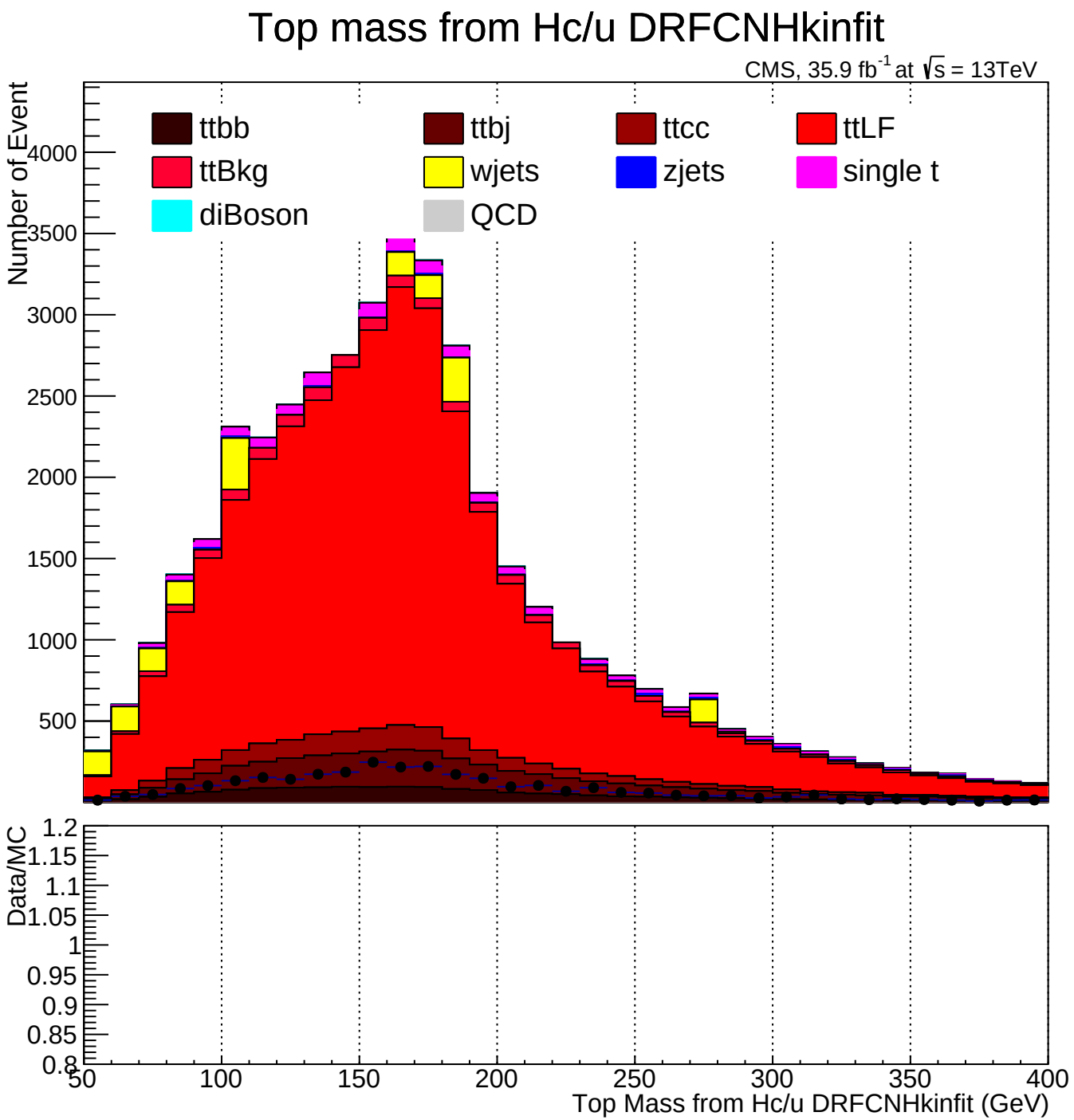

W Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
W Mass from DRFCNHkinfit (Lep) (GeV)

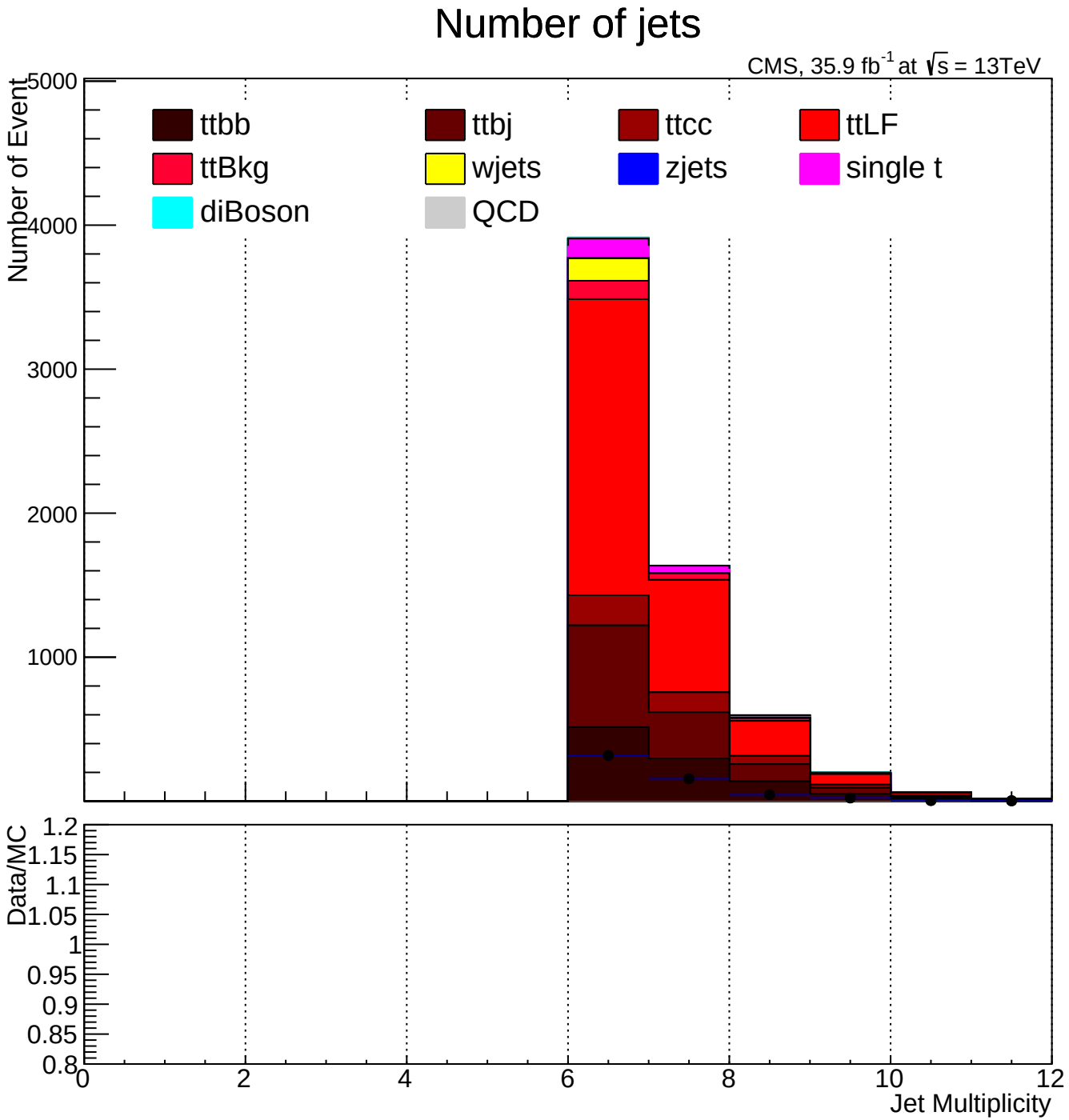

W Mass from DRFCNHkinfit (Had)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
6000
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
W Mass from DRFCNHkinfit (Had) (GeV)

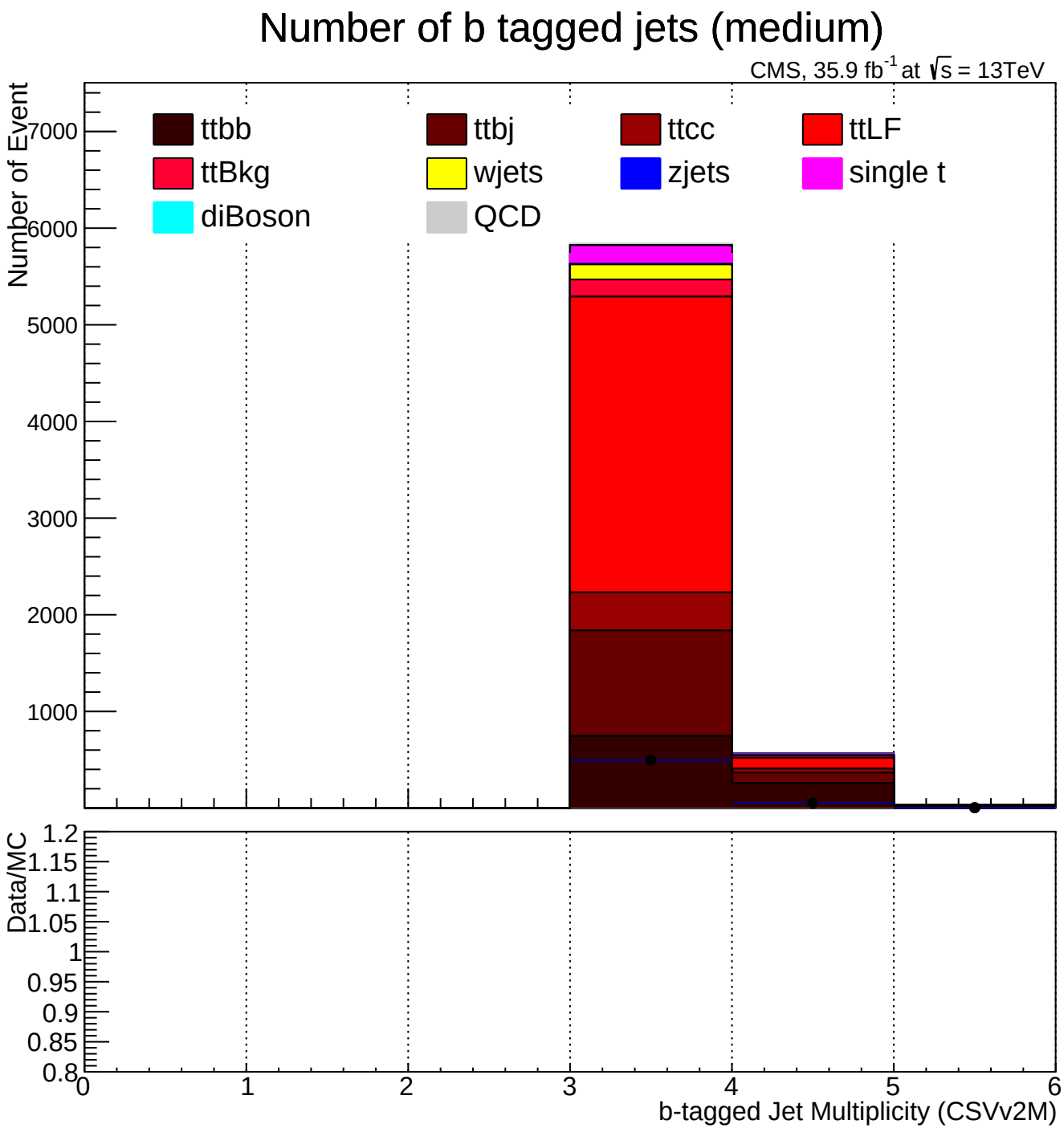

H Mass from DRFCNHkinfit (bb)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
H Mass from DRFCNHkinfit (bb)(GeV)

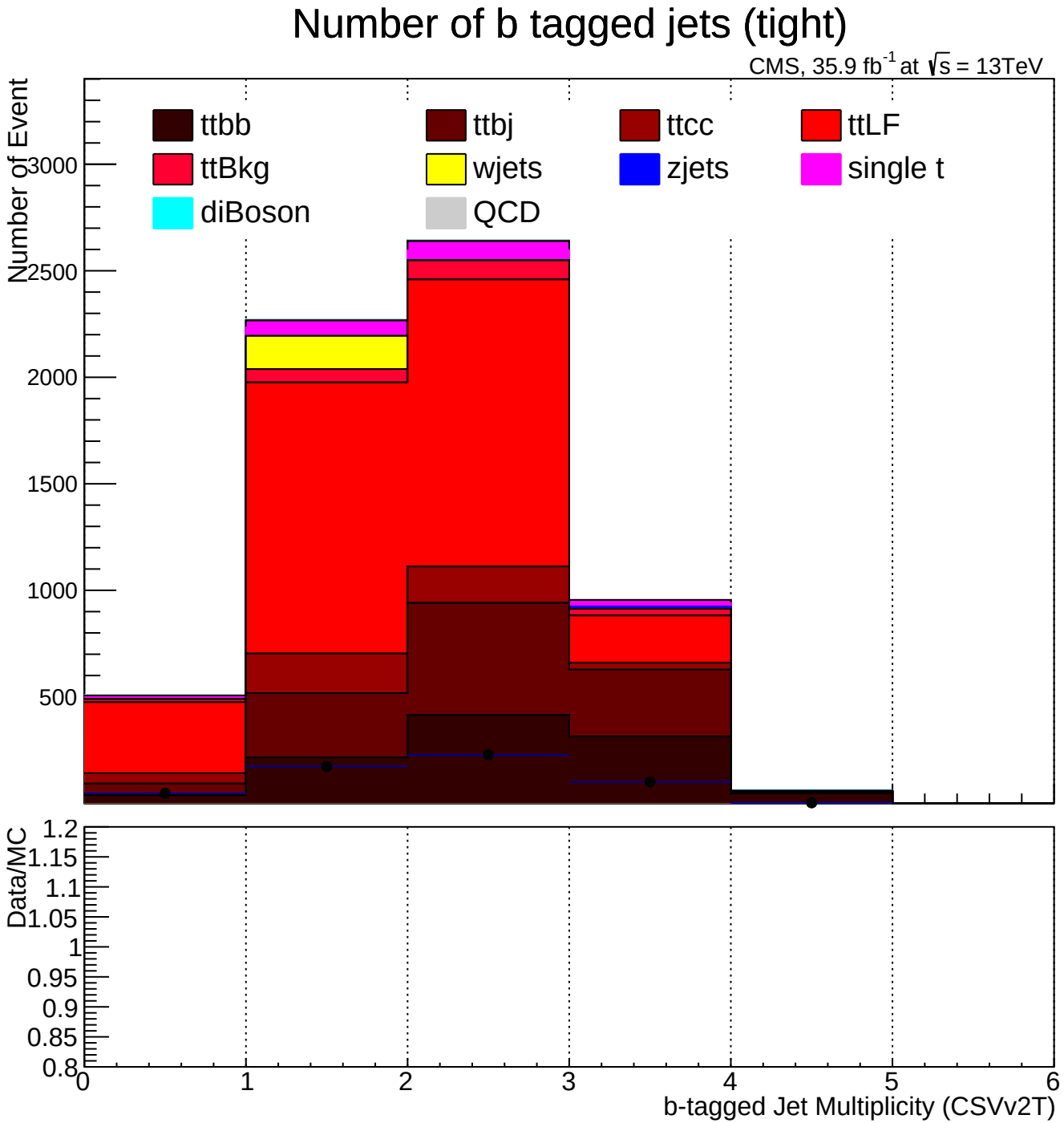

Delta R from DRFCNHkinfit
CMS, 35.9 fb-1 at √s = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Delta R from DRFCNHkinfit Higgs

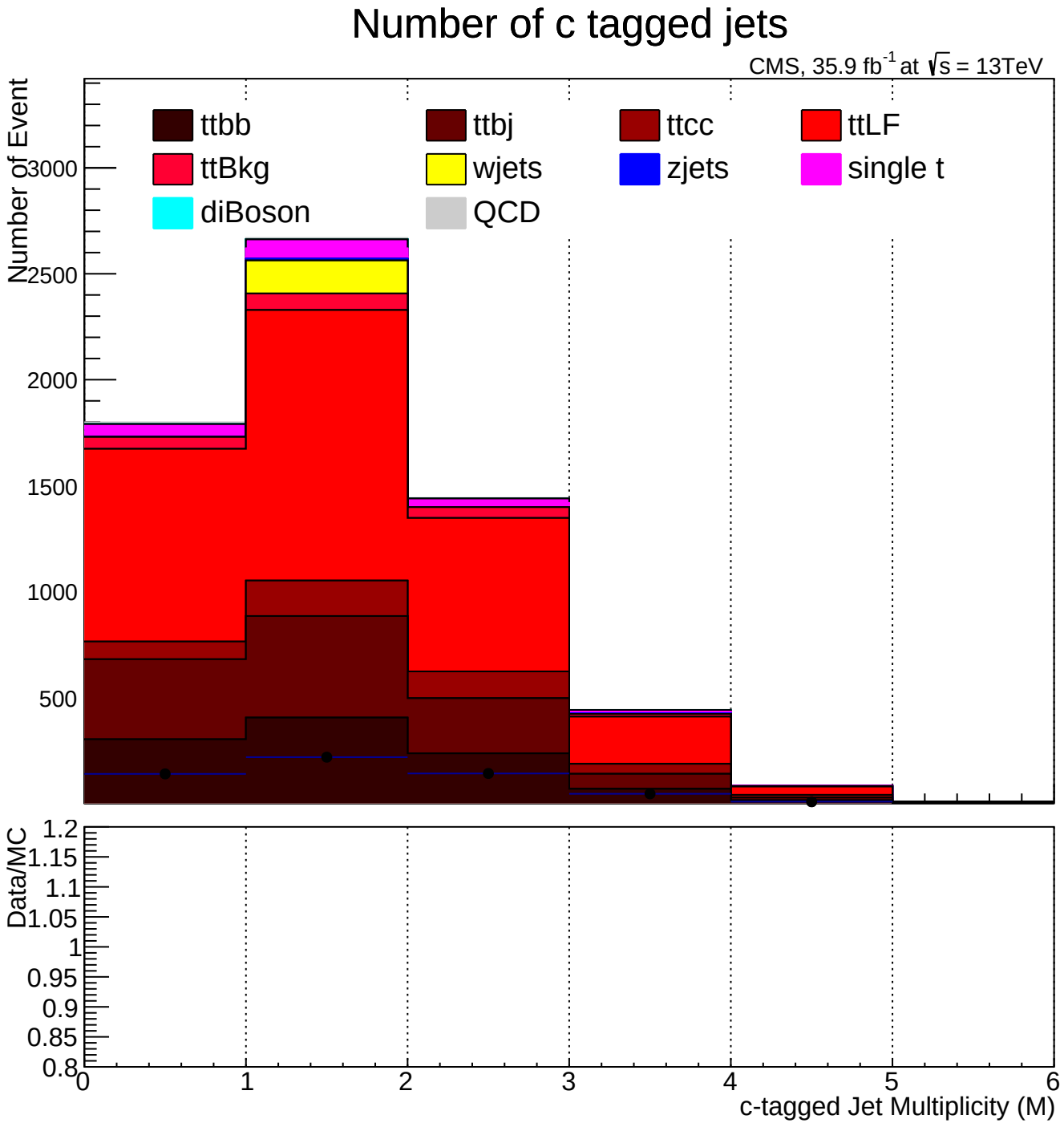

Top Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
Top Mass from DRFCNHkinfit (Lep) (GeV)

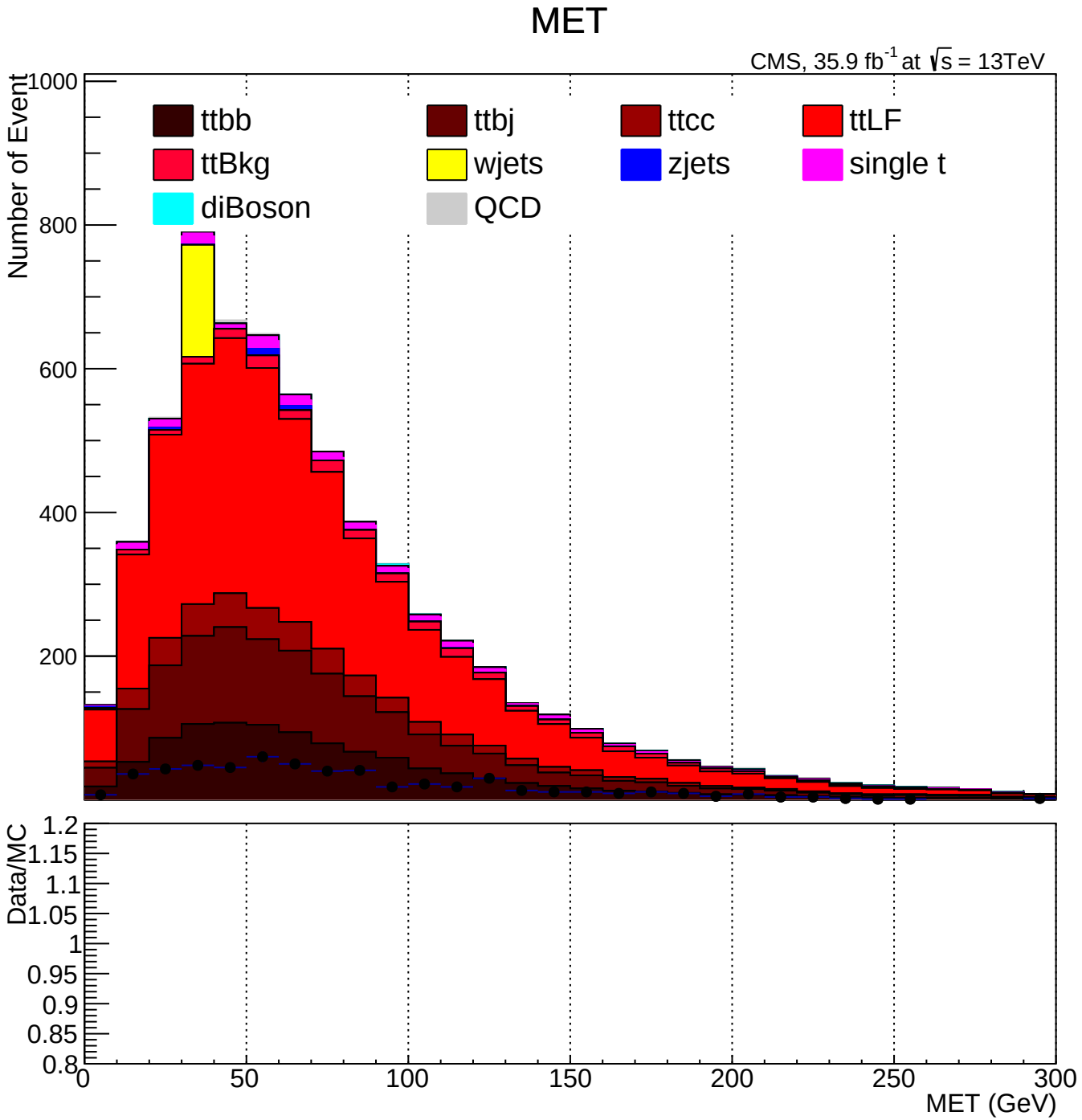

Top mass from Hc/u DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
Top Mass from Hc/u DRFCNHkinfit (GeV)

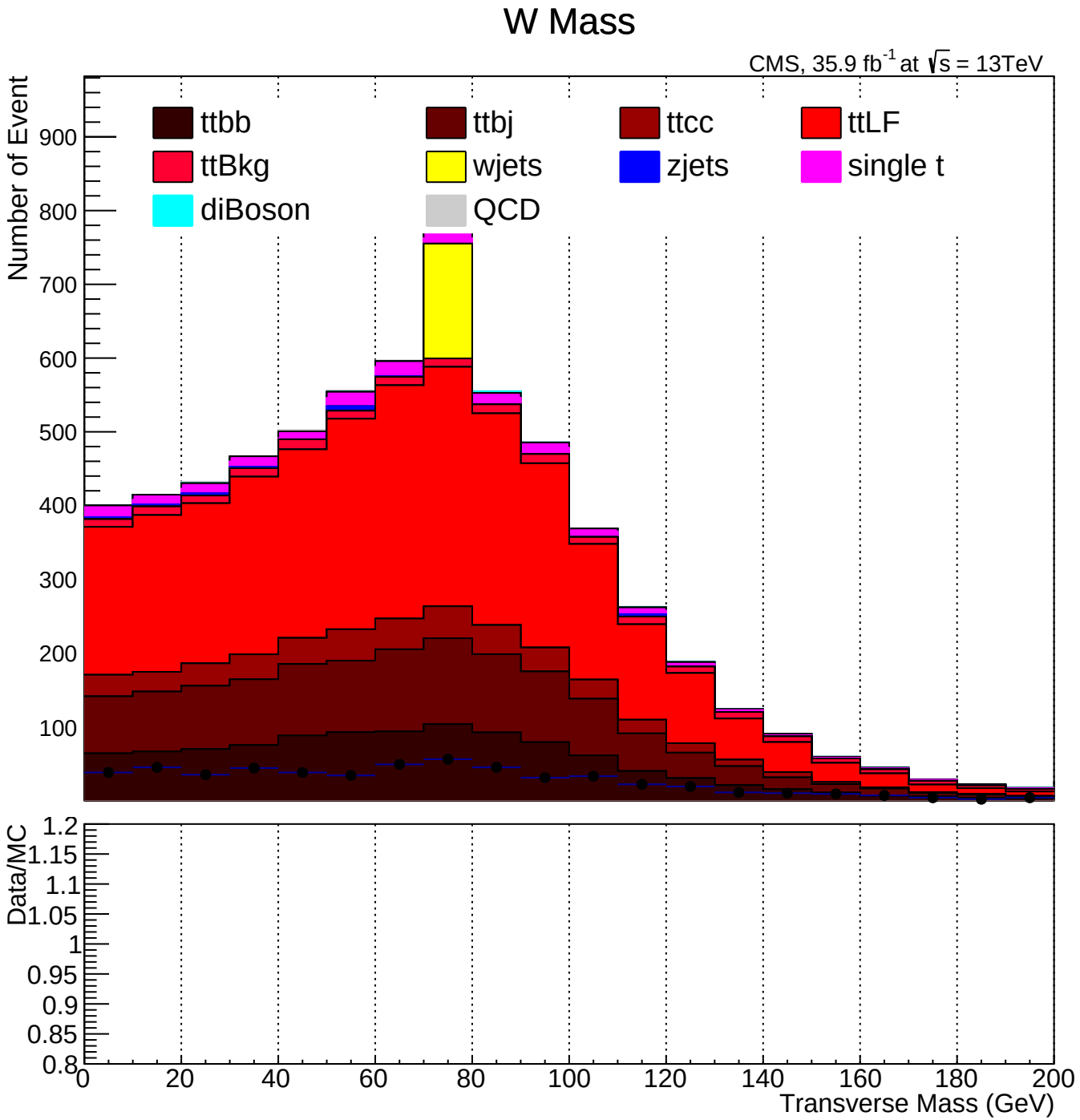

Number of jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
2
4
6
8
10
12
Jet Multiplicity

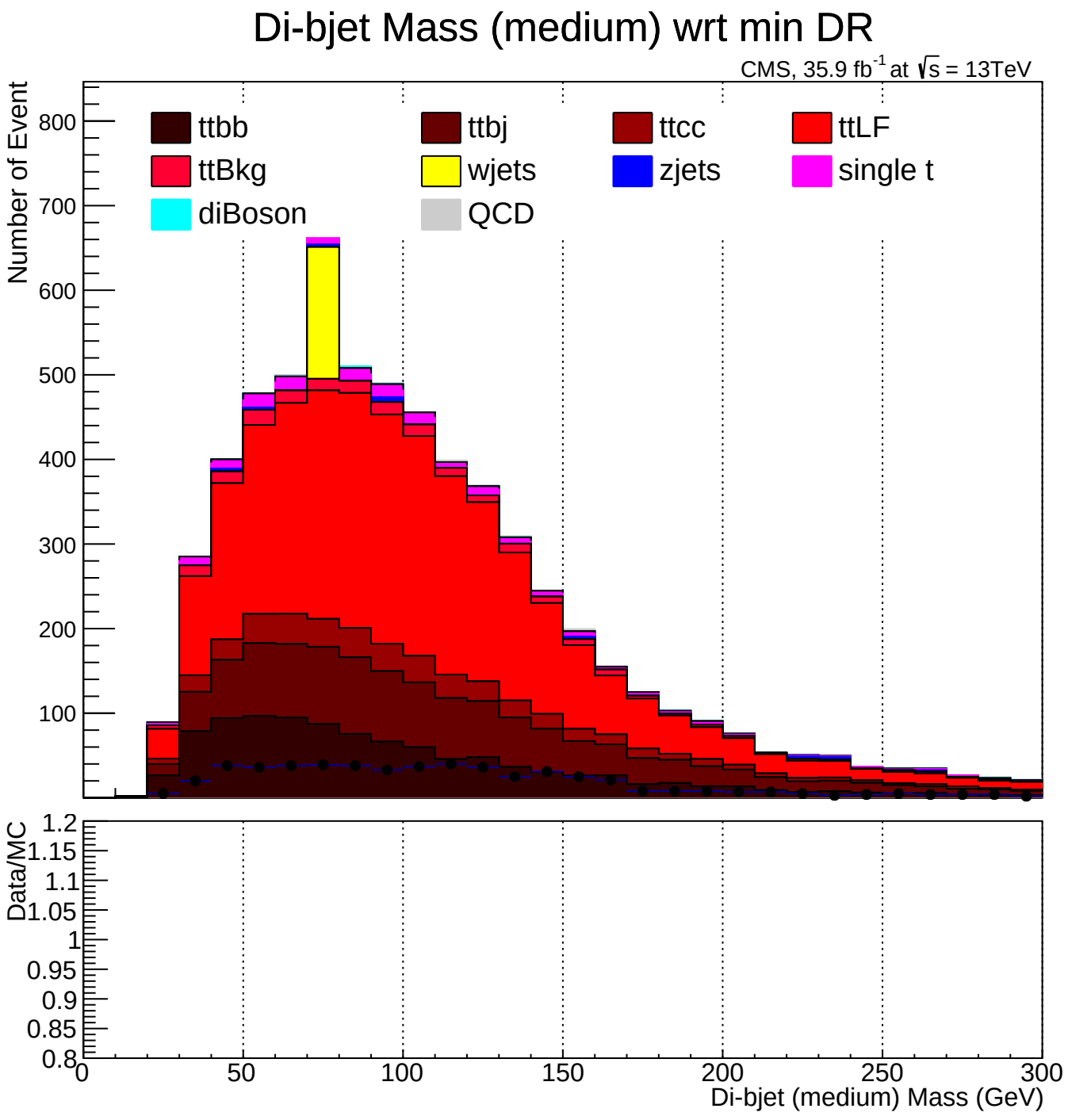

Number of b tagged jets (medium)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
7000
6000
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2M)

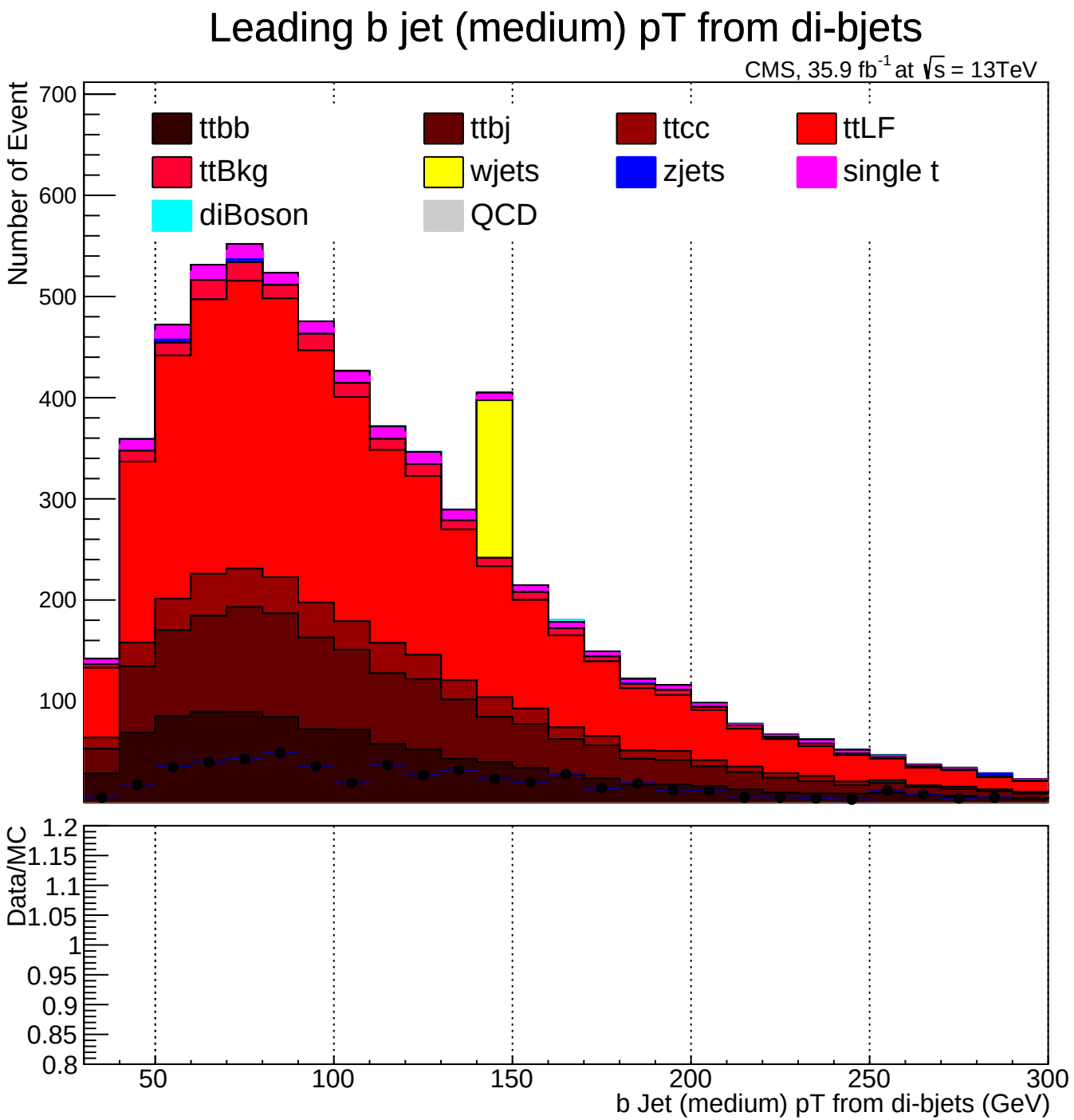

Number of b tagged jets (tight)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
3000
2500
2000
1500
1000
500
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
b-tagged Jet Multiplicity (CSVv2T)

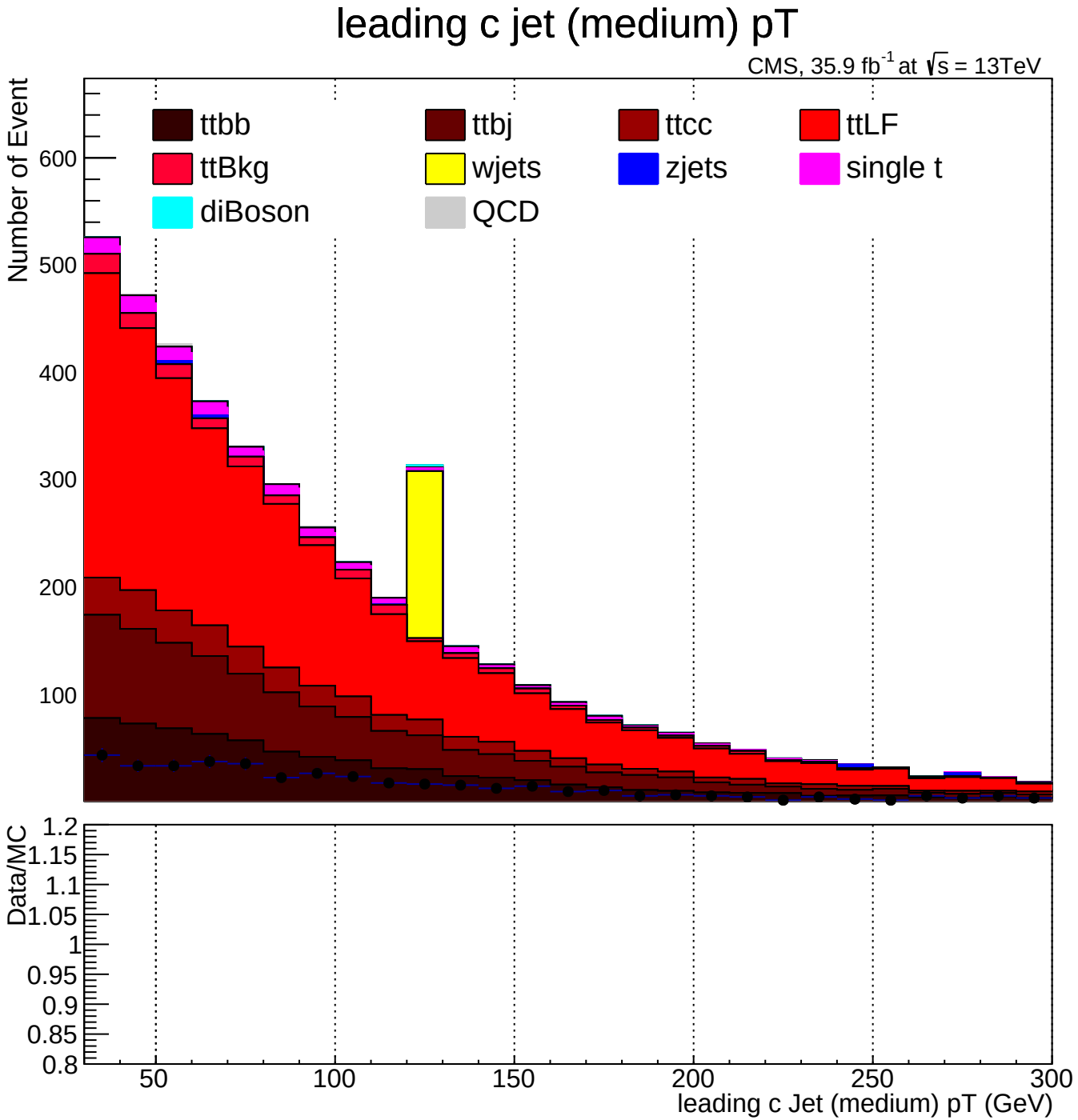

Number of c tagged jets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
3000
2500
2000
1500
1000
500
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
1
2
3
4
5
6
c-tagged Jet Multiplicity (M)

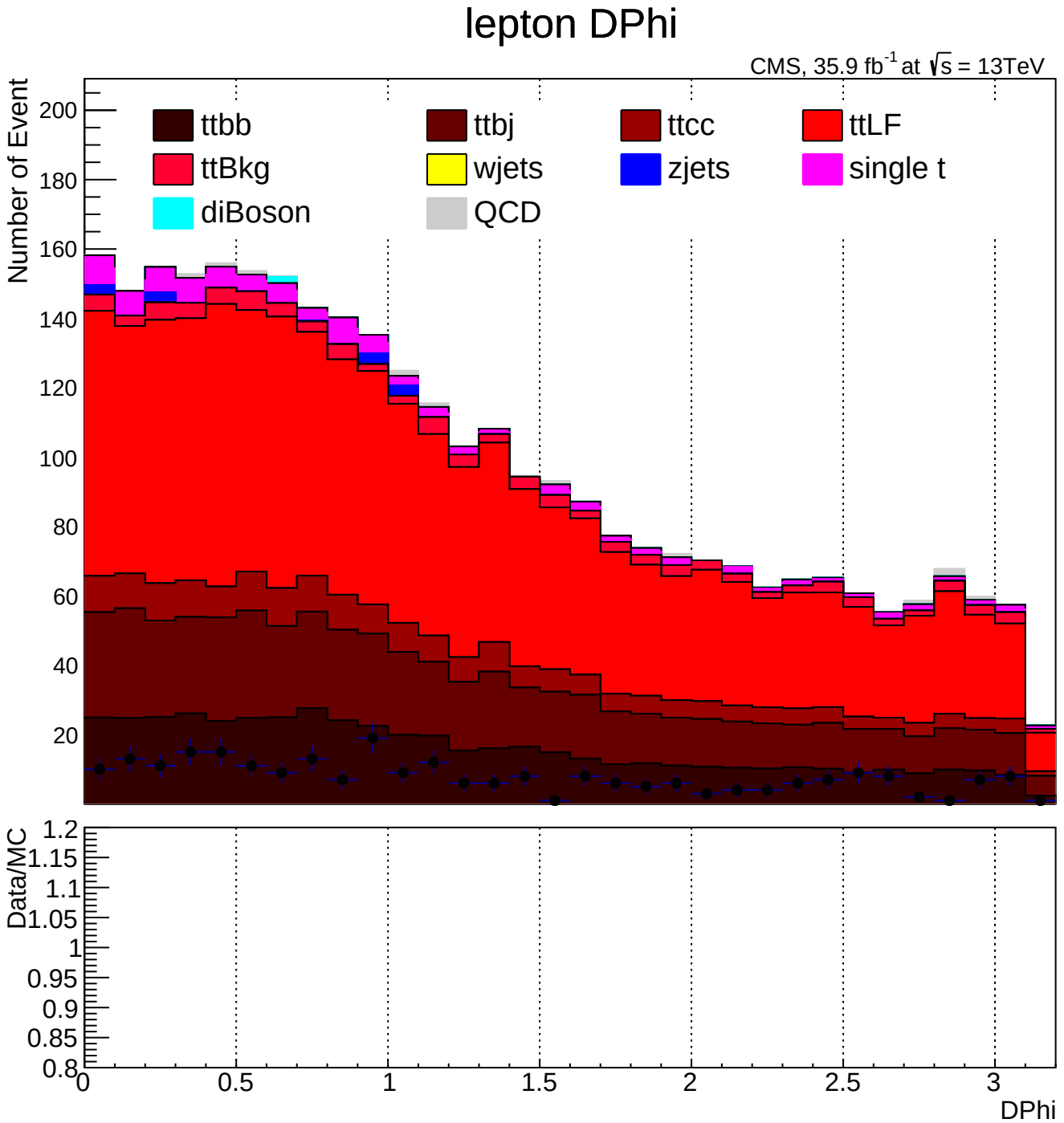

MET
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
MET (GeV)

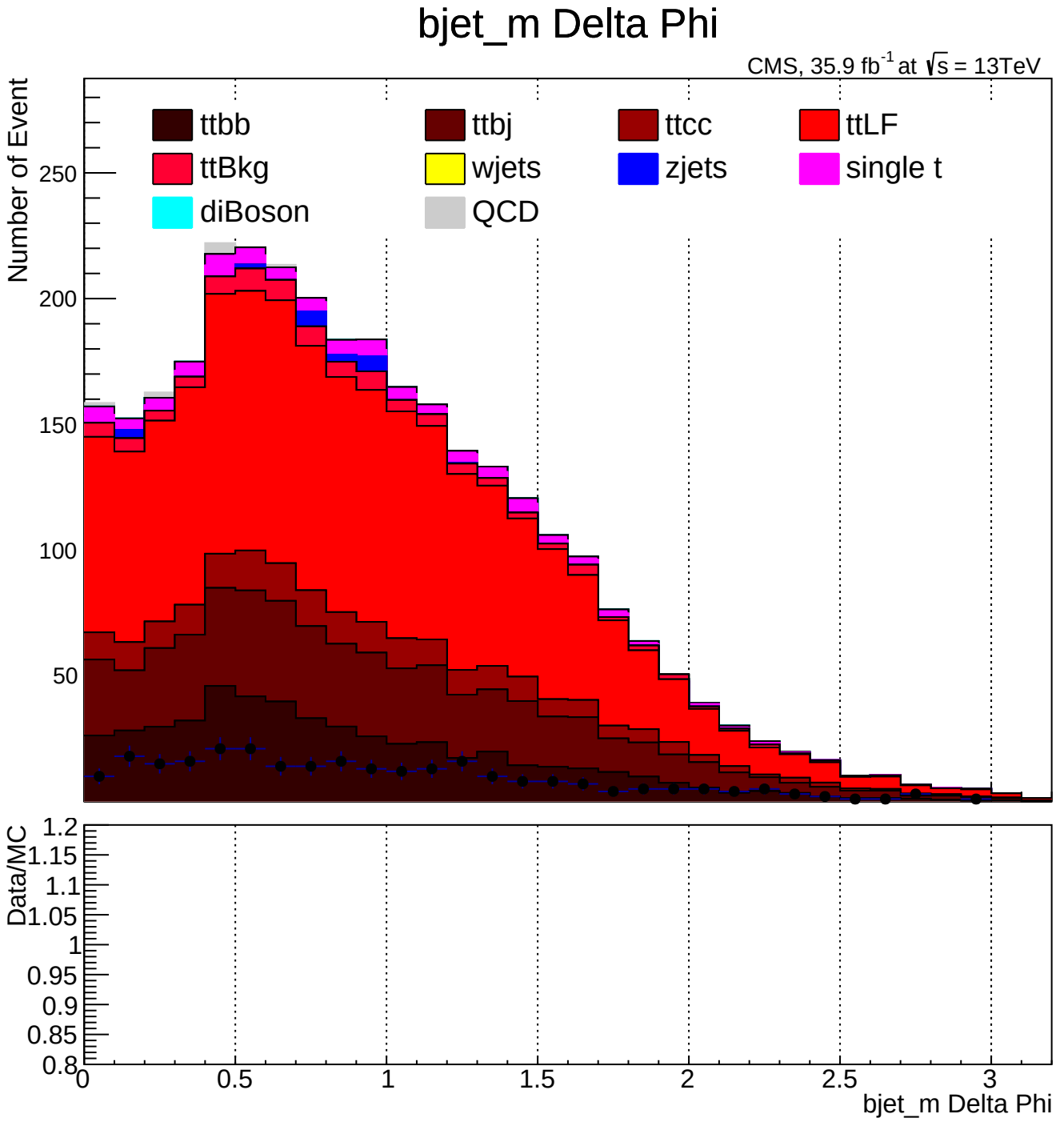

W Mass
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
900
800
700
600
500
400
300
200
100
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
20
40
60
80
100
120
140
160
180
200
Transverse Mass (GeV)

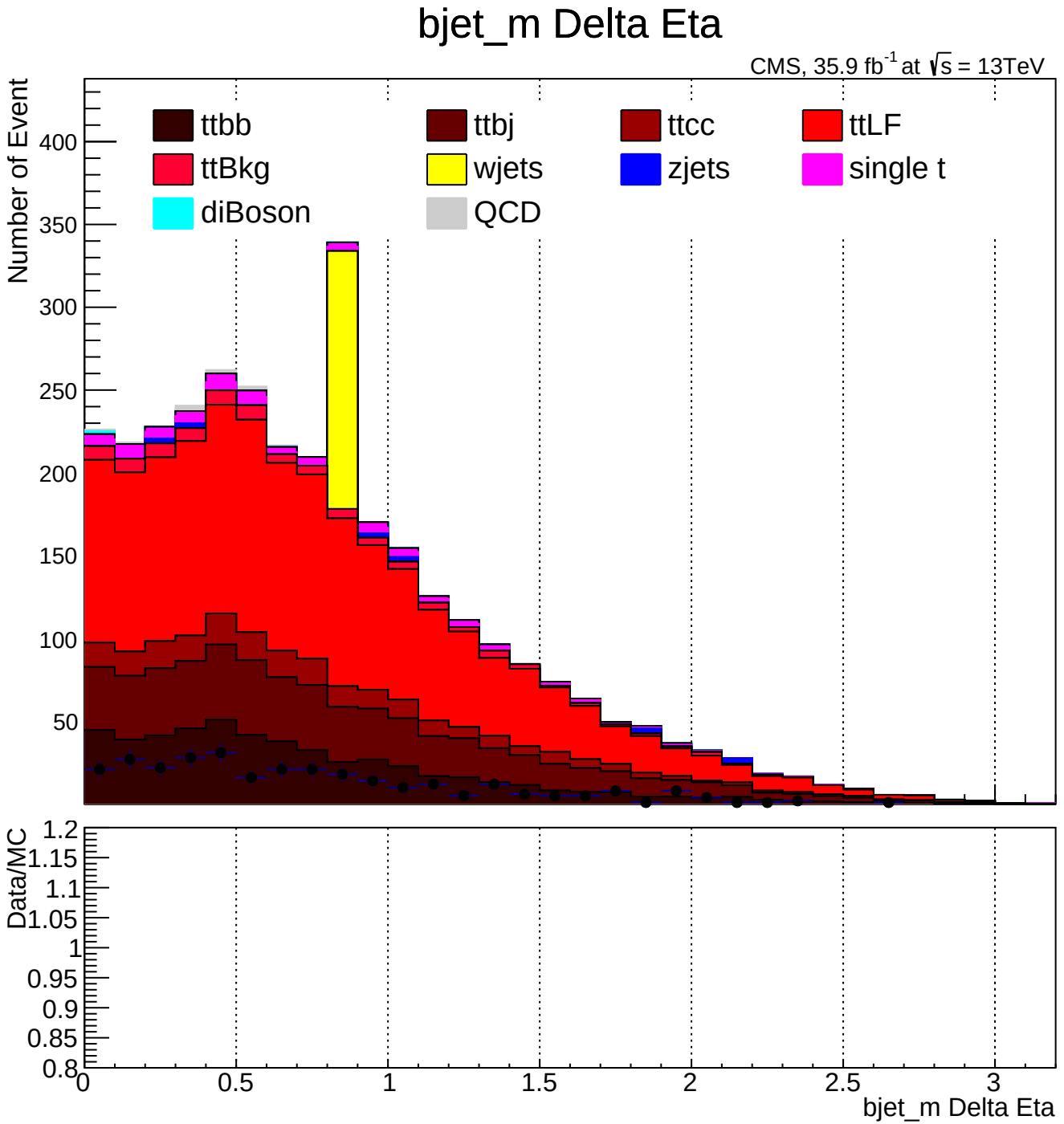

Di-bjet Mass (medium) wrt min DR
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Di-bjet (medium) Mass (GeV)

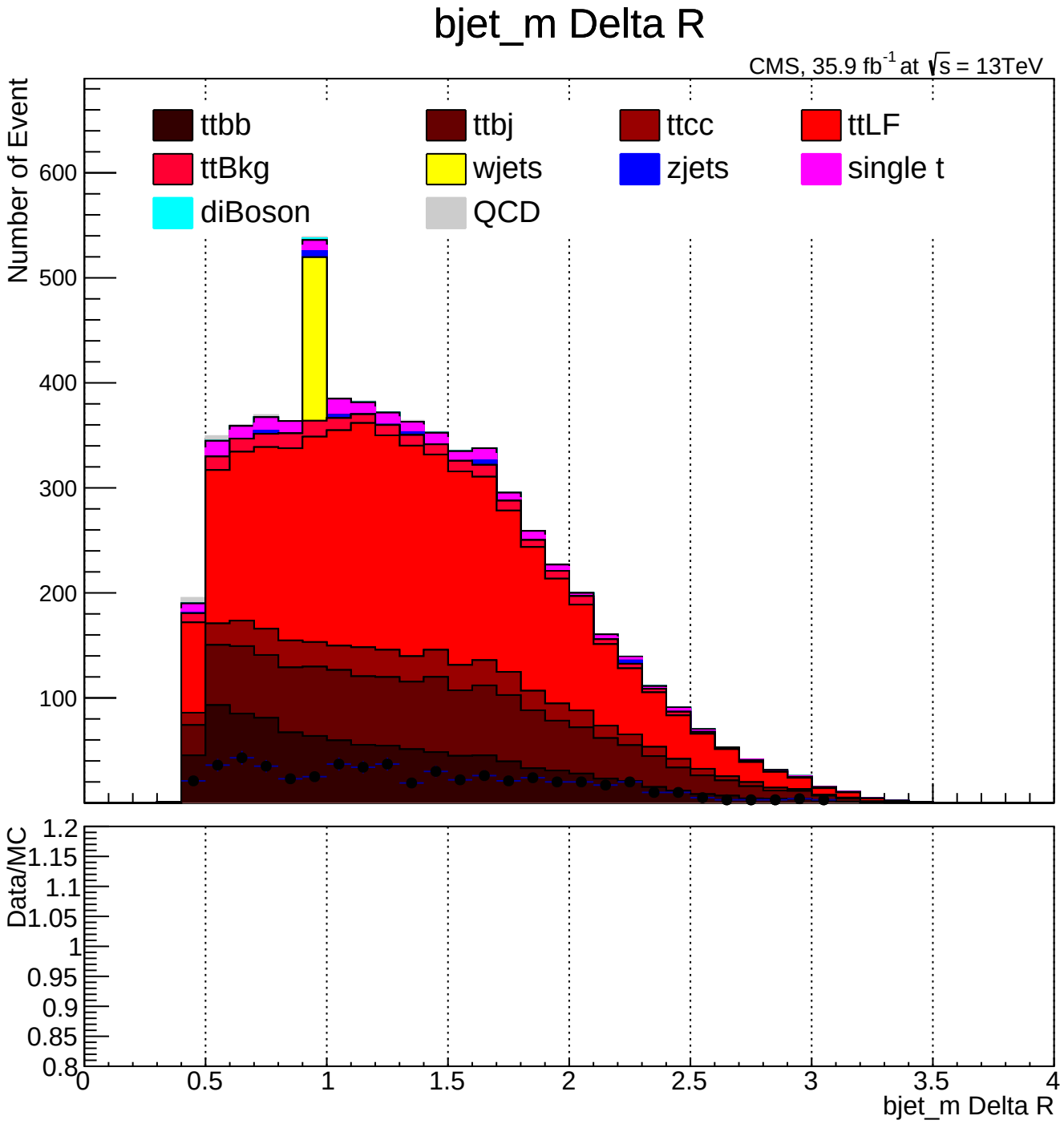

Leading b jet (medium) pT from di-bjets
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
b Jet (medium) pT from di-bjets (GeV)

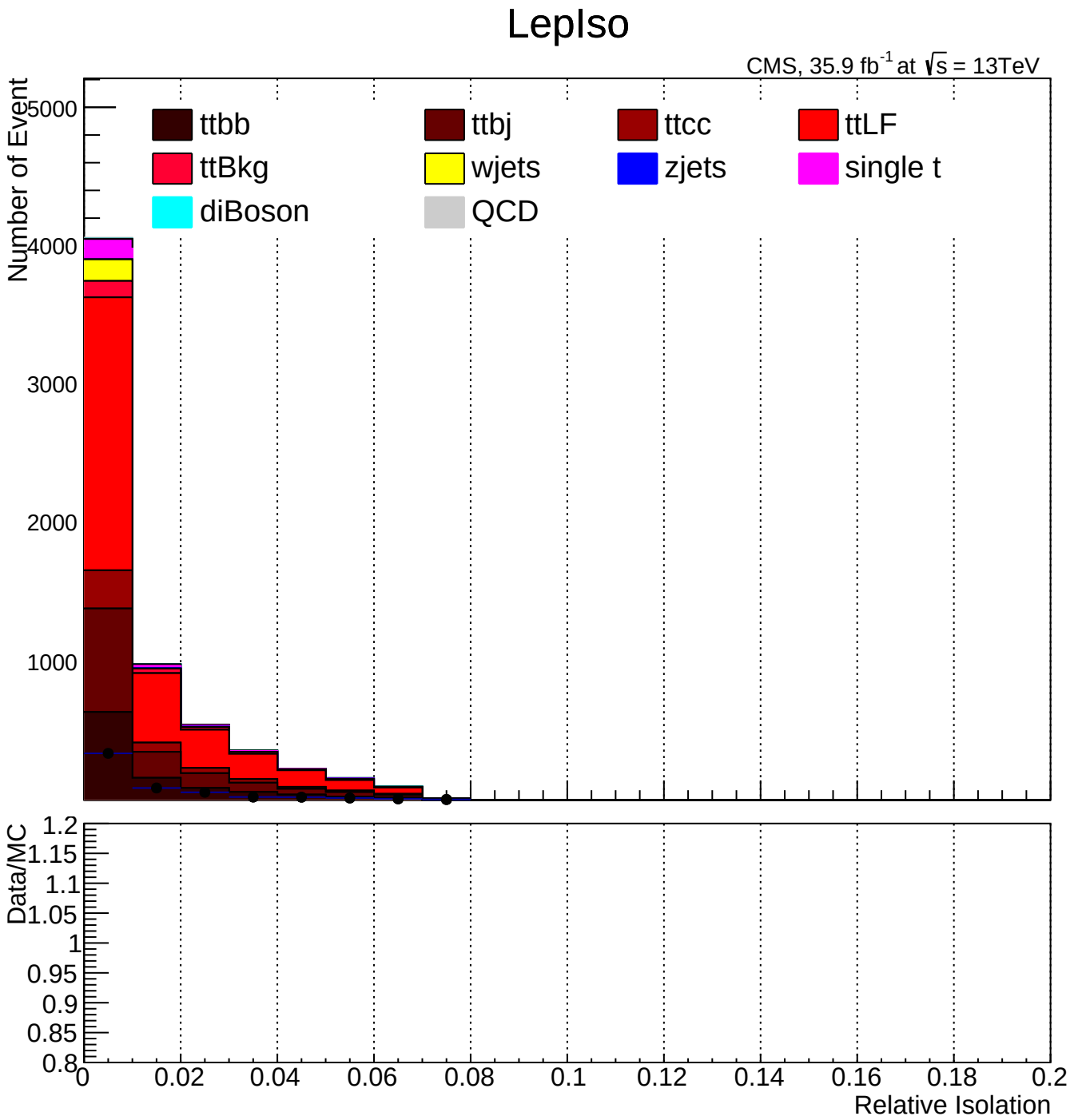

leading c jet (medium) pT
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
600
500
400
300
200
100
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
leading c Jet (medium) pT (GeV)

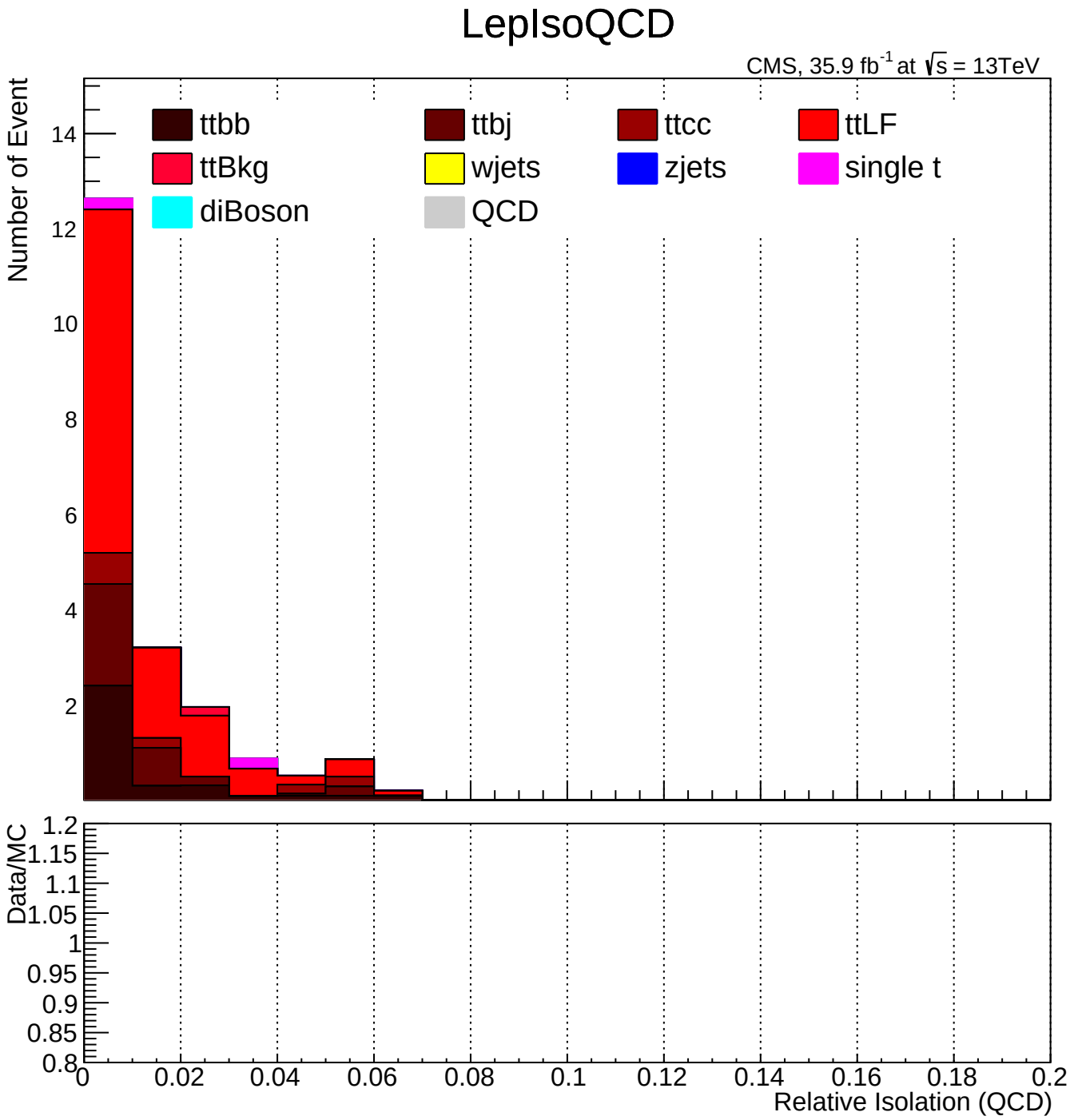

lepton DPhi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
DPhi

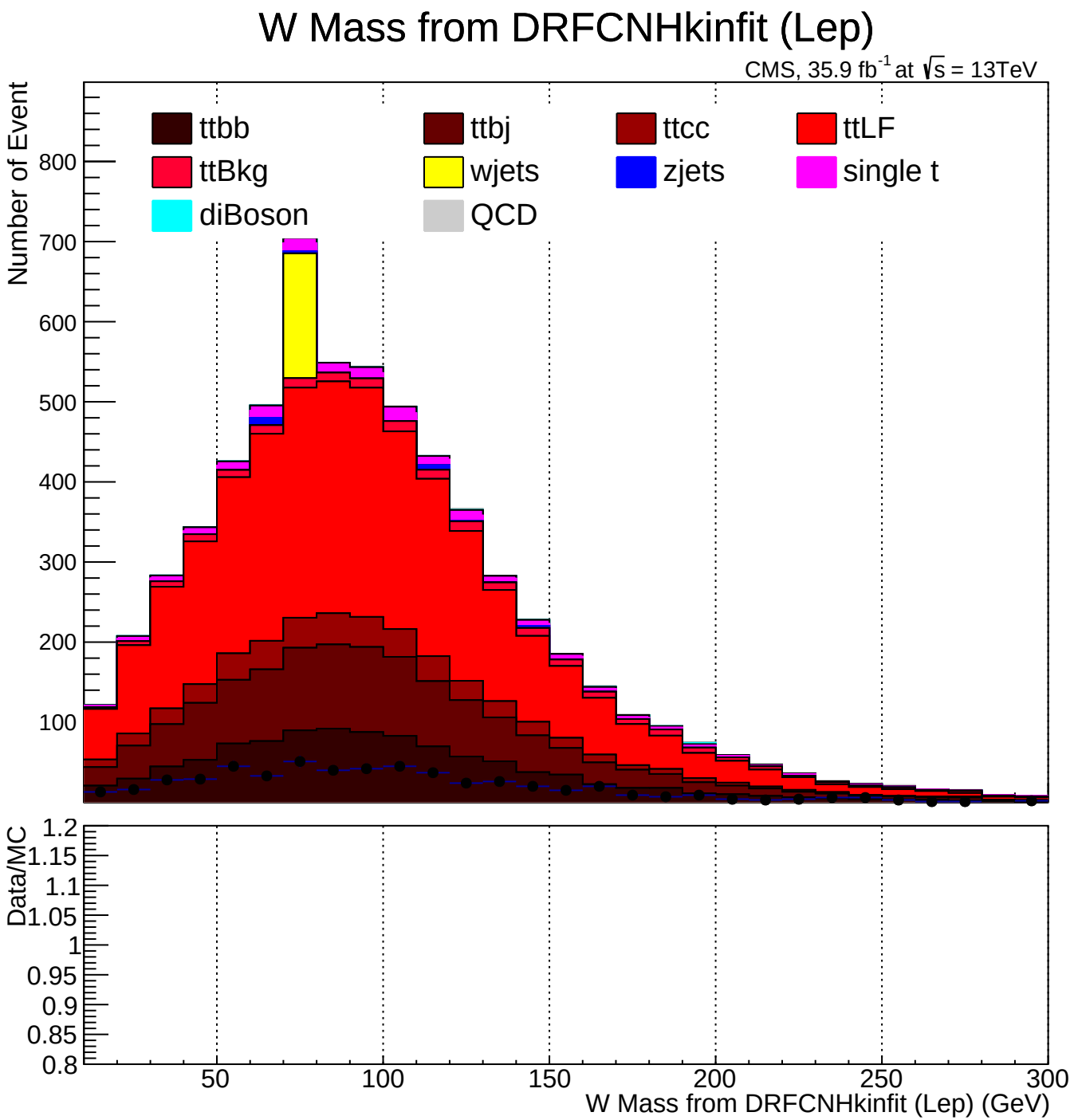

bjet_m Delta Phi
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
250
200
150
100
50
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Phi

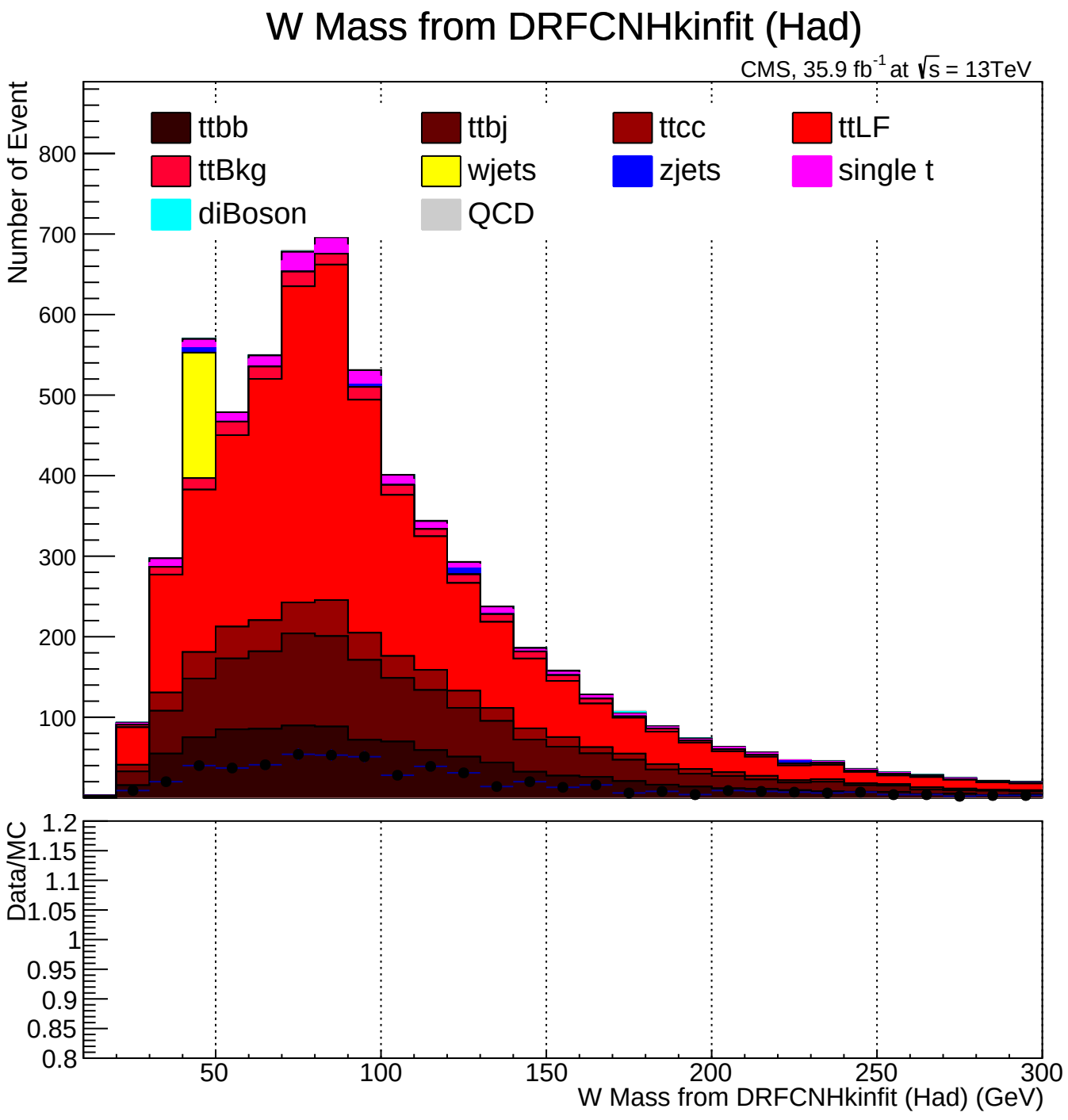

bjet_m Delta Eta
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
400
350
300
250
200
150
100
50
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
bjet_m Delta Eta

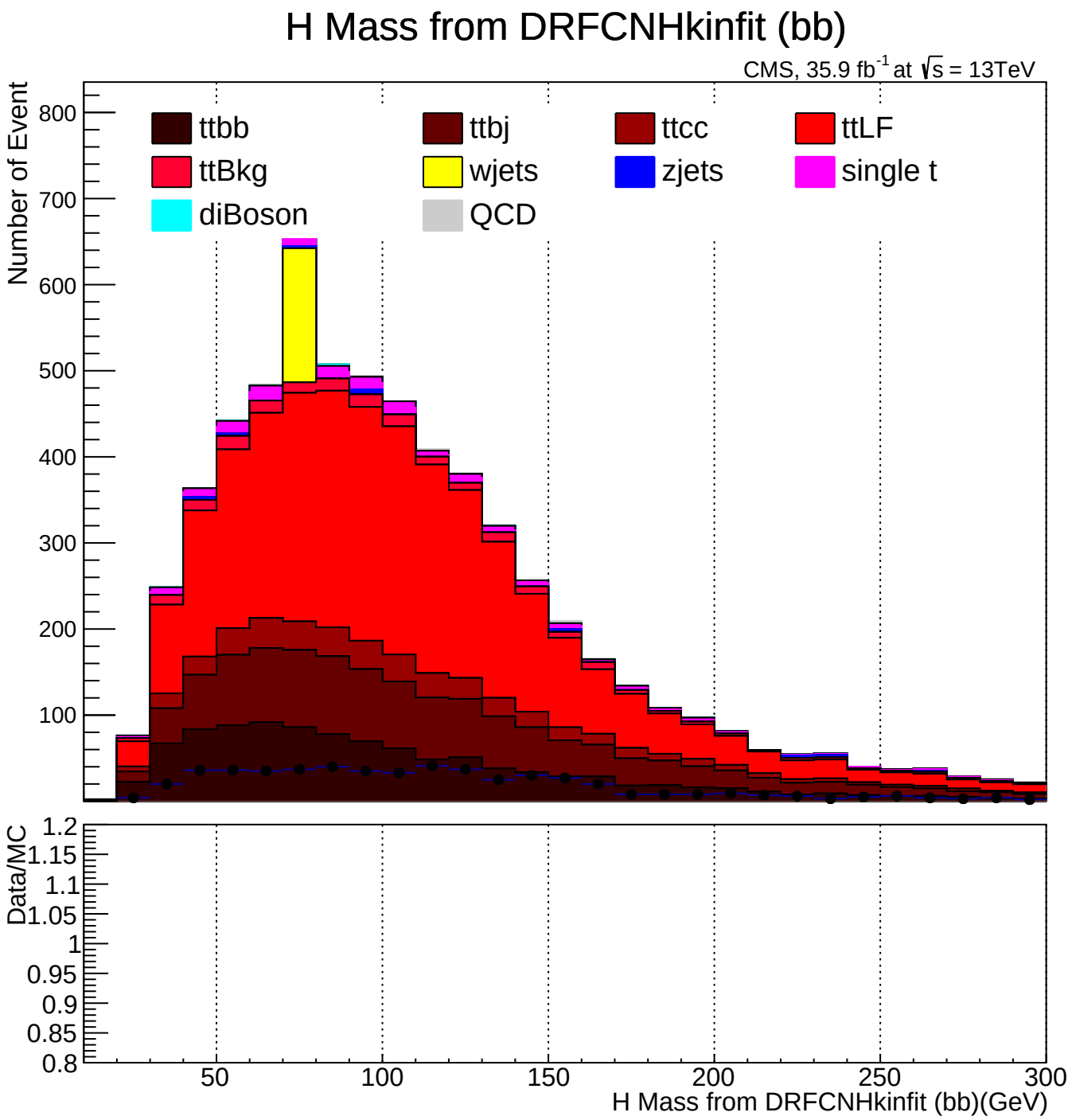

bjet_m Delta R
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
600
500
400
300
200
100
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.5
1
1.5
2
2.5
3
3.5
4
bjet_m Delta R

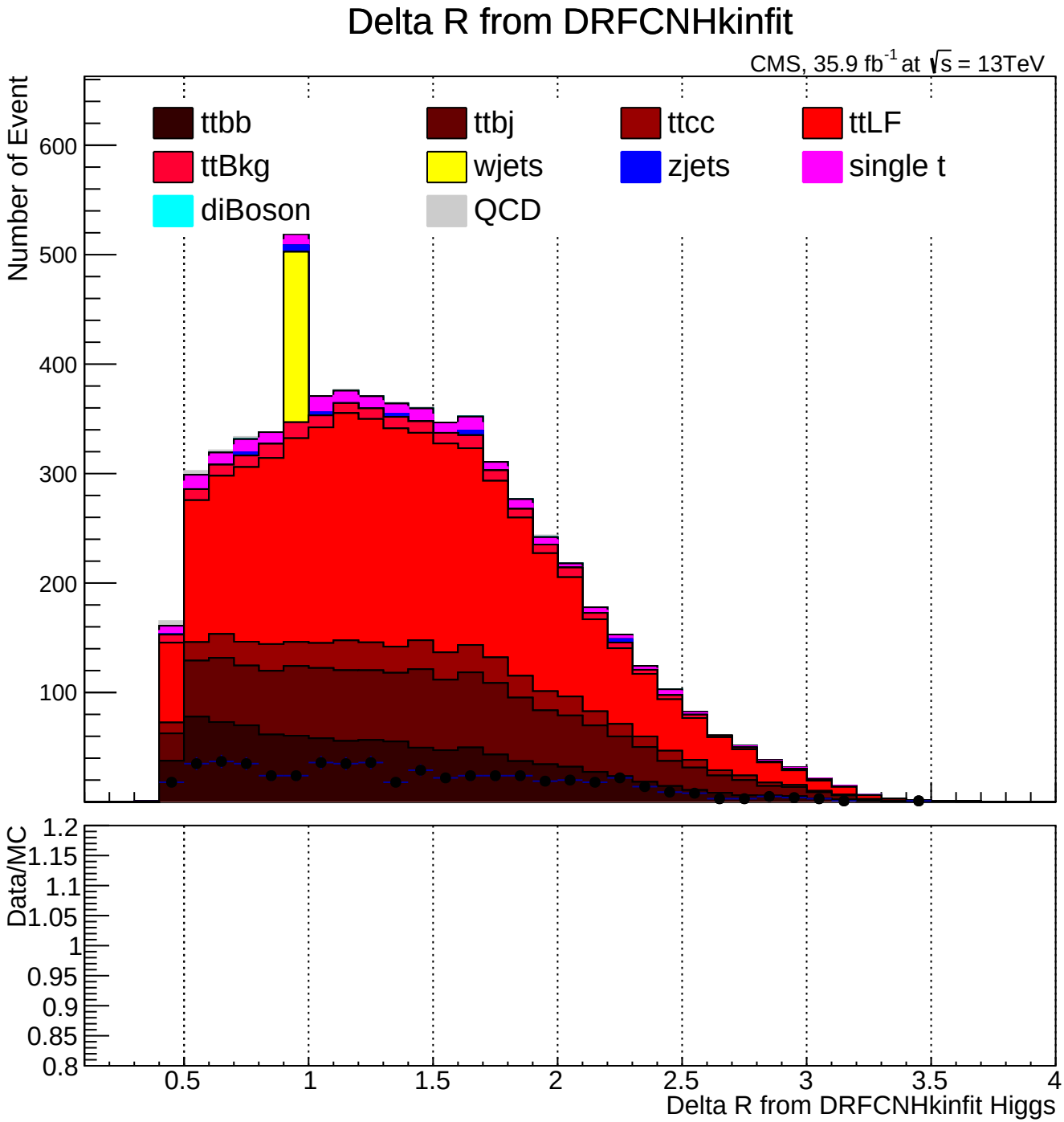

LepIso
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
5000
4000
3000
2000
1000
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Relative Isolation

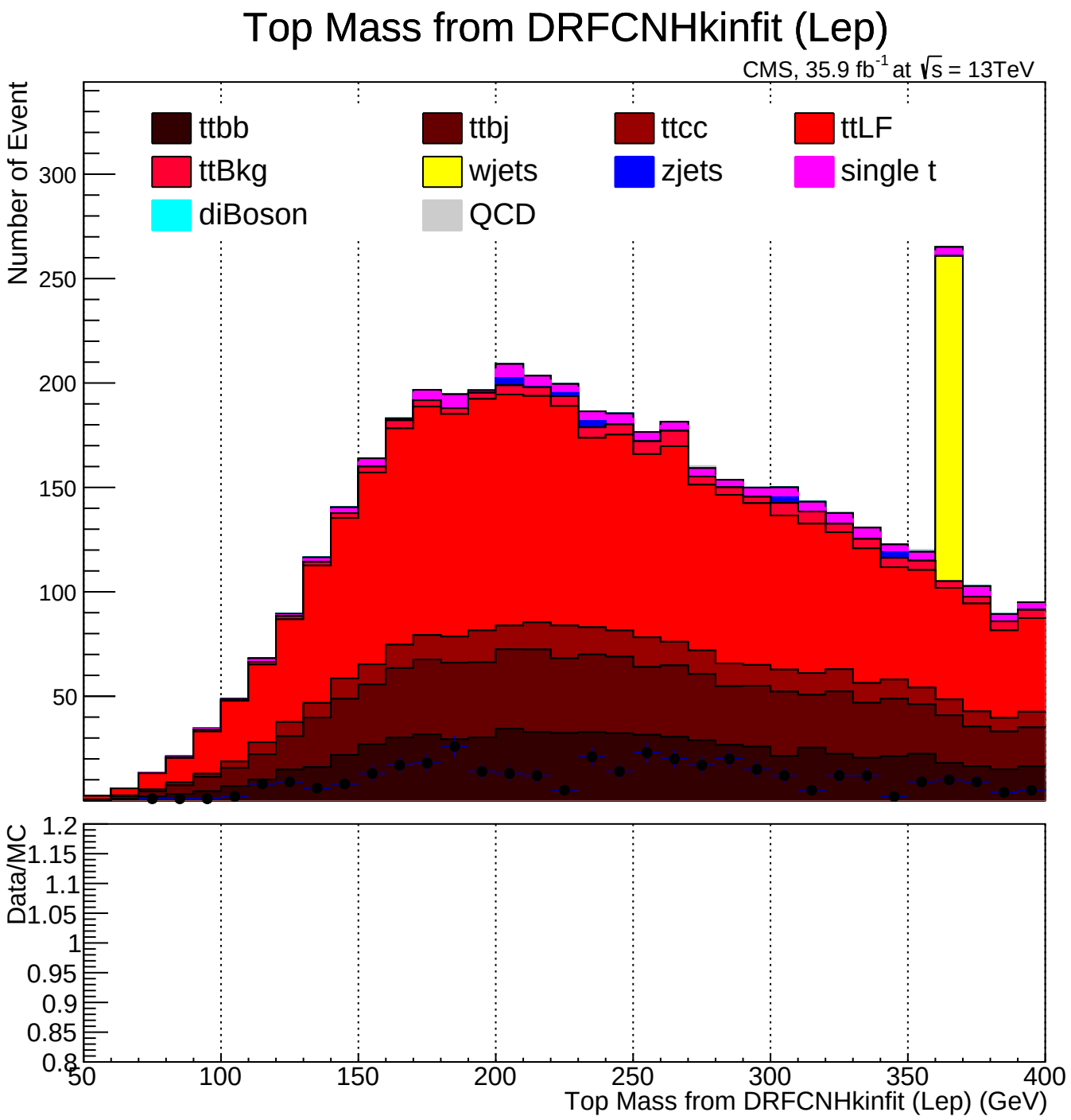

LepIsoQCD
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
Relative Isolation (QCD)

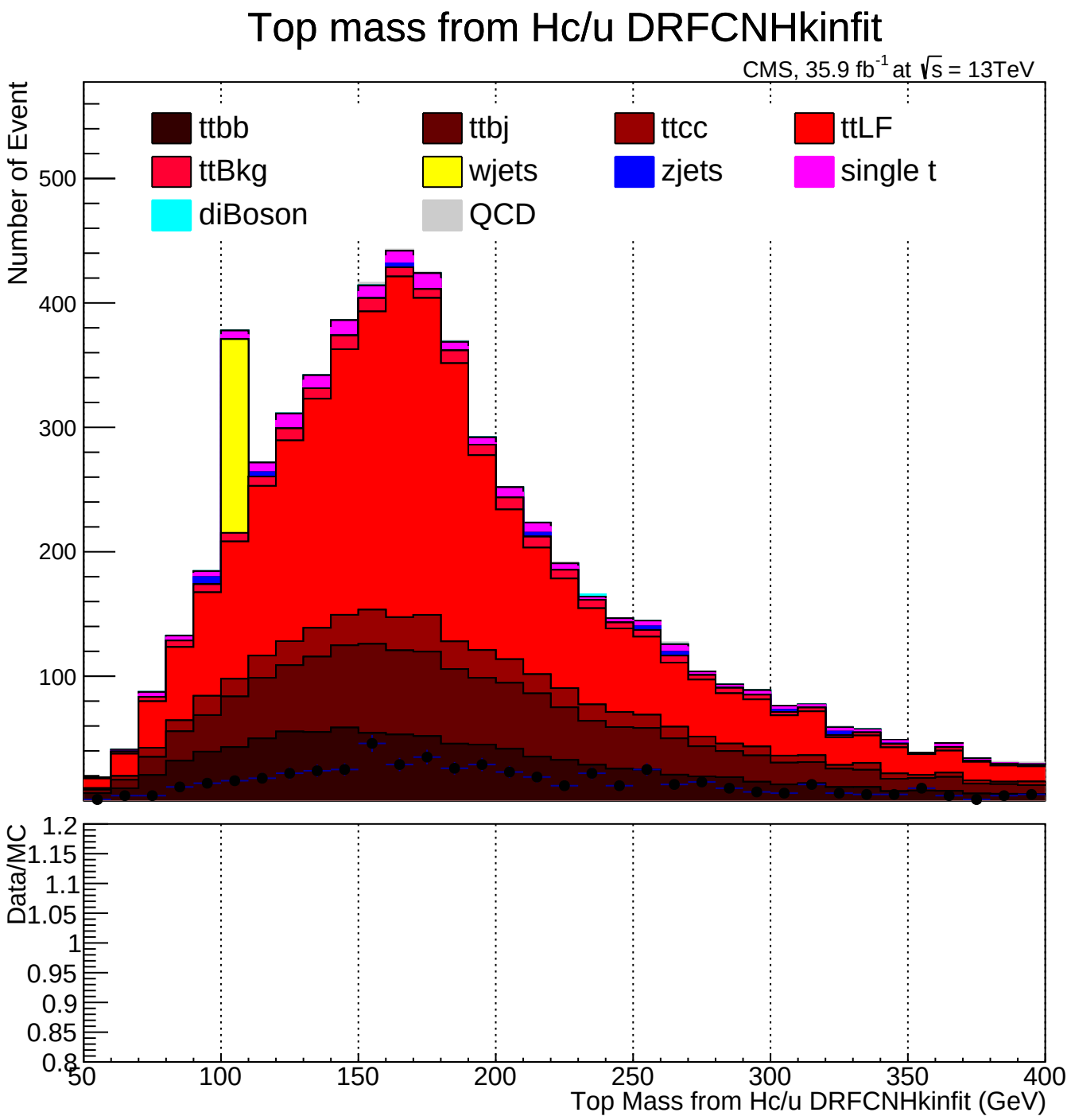

W Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
W Mass from DRFCNHkinfit (Lep) (GeV)


W Mass from DRFCNHkinfit (Had)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
800
700
600
500
400
300
200
100
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
W Mass from DRFCNHkinfit (Had) (GeV)


H Mass from DRFCNHkinfit (bb)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Data/MC
H Mass from DRFCNHkinfit (bb)(GeV)


Delta R from DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
600
500
400
300
200
100
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0.5
1
1.5
2
2.5
3
3.5
4
Delta R from DRFCNHkinfit Higgs


Top Mass from DRFCNHkinfit (Lep)
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
Number of Event
Data/MC
Top Mass from DRFCNHkinfit (Lep) (GeV)


Top mass from Hc/u DRFCNHkinfit
CMS, 35.9 fb^{-1} at $\sqrt{s}$ = 13TeV
Number of Event
ttbb
ttbj
ttcc
ttLF
ttBkg
wjets
zjets
single t
diBoson
QCD
500
400
300
200
100
Data/MC
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
50
100
150
200
250
300
350
400
Top Mass from Hc/u DRFCNHkinfit (GeV)