Weekly Report
NTUA
20/5/2020

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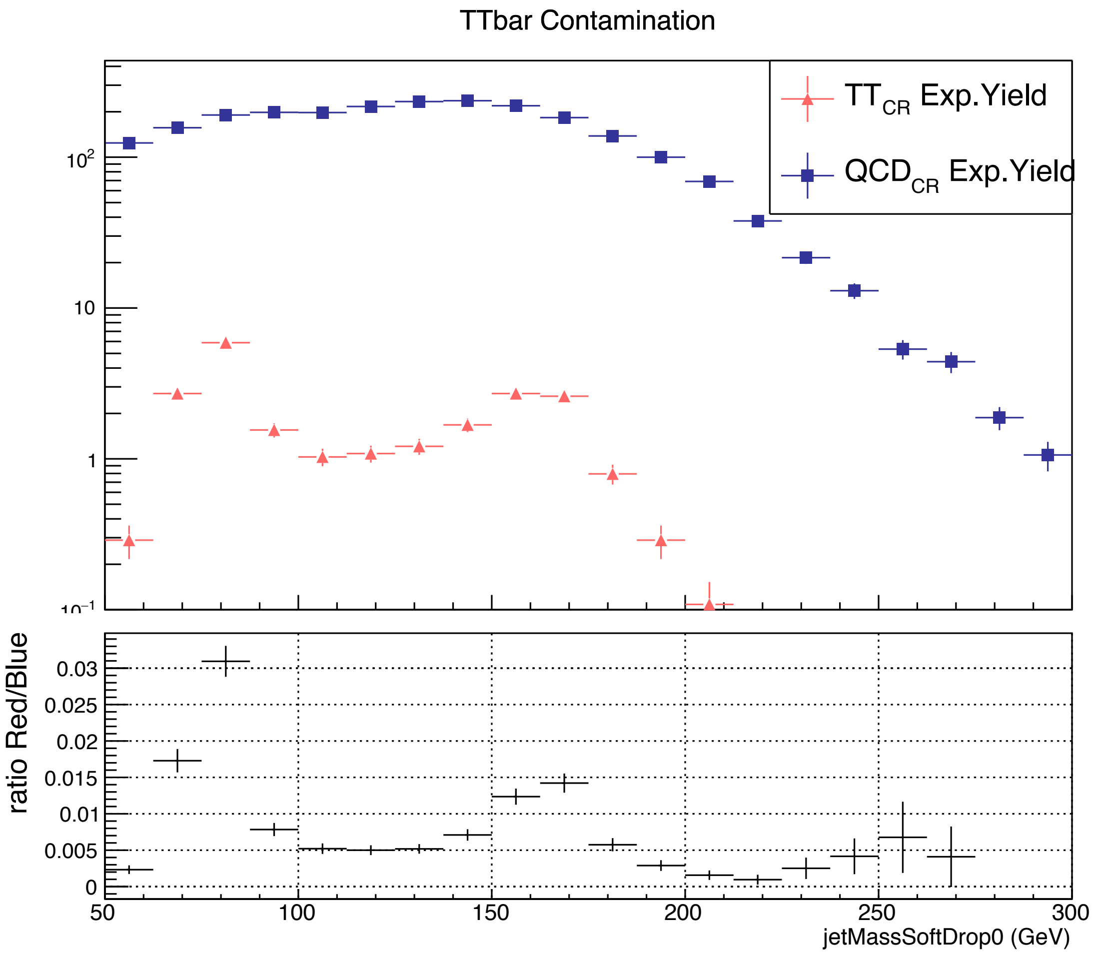
Status Report

- LHCtopWG
  - TOP-18-013 presentation

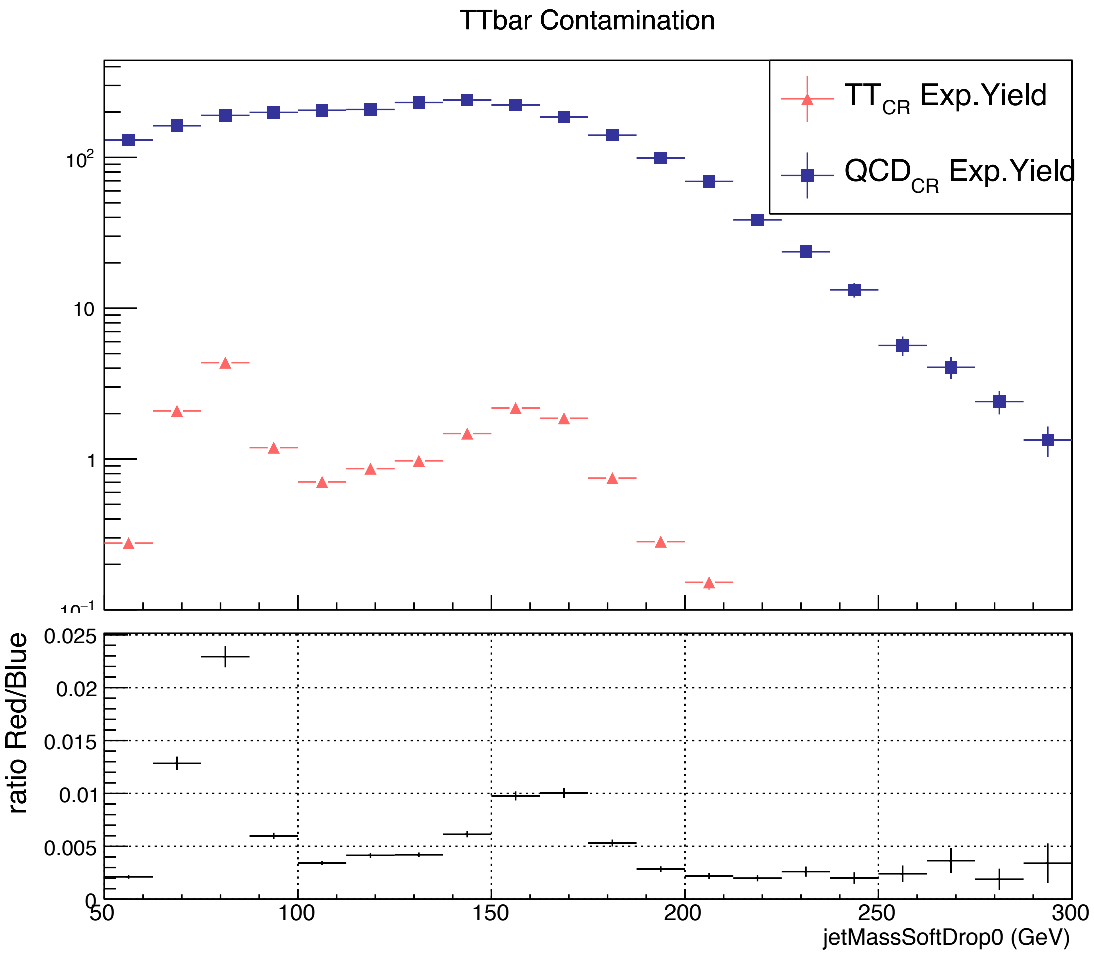
- Analysis:
  - Training with Mass Cut (50,300)GeV @ preselection
    - Larger ttbar contamination vs the previous BDT that has no mass selection criteria
  - Unfolding Techniques
    - Giannis found a way to implement the Minimum Global Correlation method using the TUnfoldDensity class
    - Cross checking results
    - Error propagation with different methods
    - Parton and Particle levels
  - Mass Fit
    - Cannot understand why the k_{slope} is so big when we implement the fit
      - Can it be due to statistics??
    - Simultaneous fit seems to have better results (qcd params are frozen)

New training with mass cut: 50 < m_{top} <300 GeV

With mass cut



Without mass cut



Minimum of global Correlation

Trying to solve the inverse problem of $y = Ax \rightarrow x = A^{-1} y$ where:

- x: Extrapolated to Parton
- A is the response matrix
- y: reco input
- V_x is the covariance matrix of x

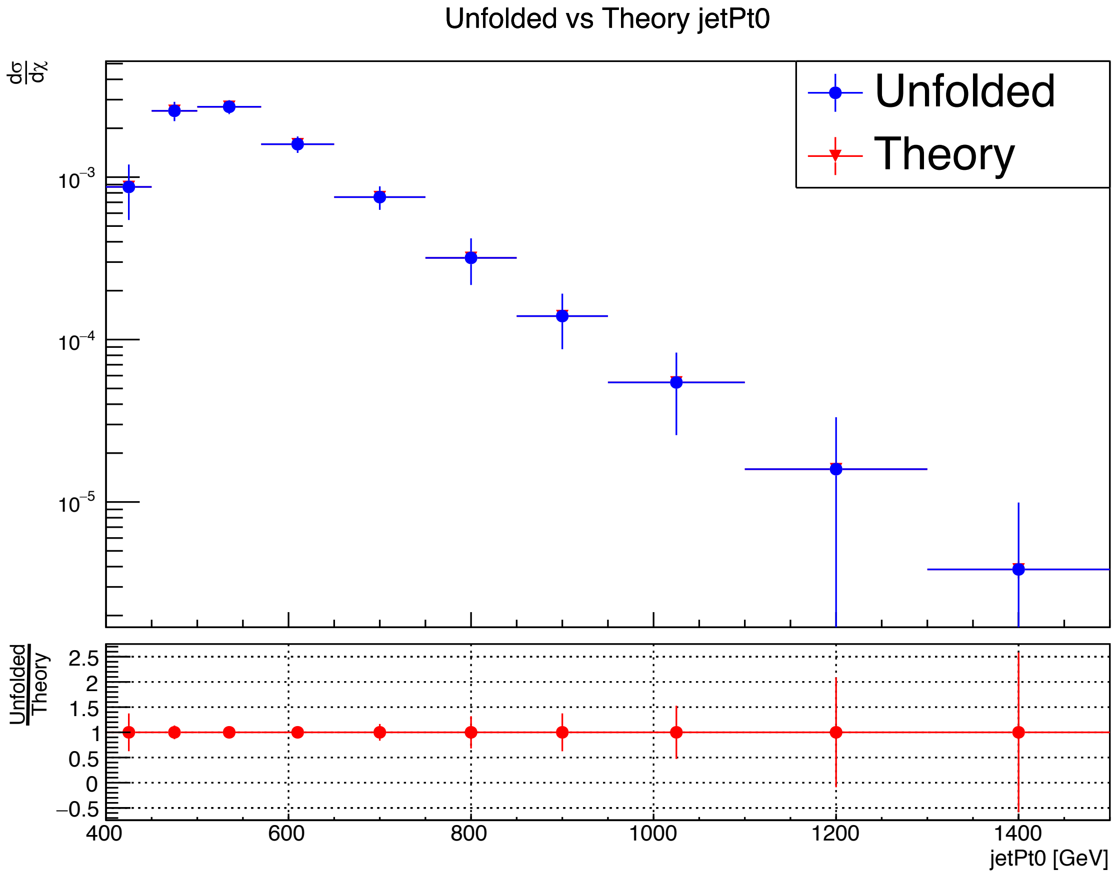
This method finds the minimum mean value of global correlation coefficients (ρ_j):
Where ρ_j is defined as:

$$\rho_j = \sqrt{1 - [(V_x)_{jj} \cdot (V_x^{-1})_{jj}]^{-1}}\ , \quad where\ \ 0 \le \rho_j \le 1$$

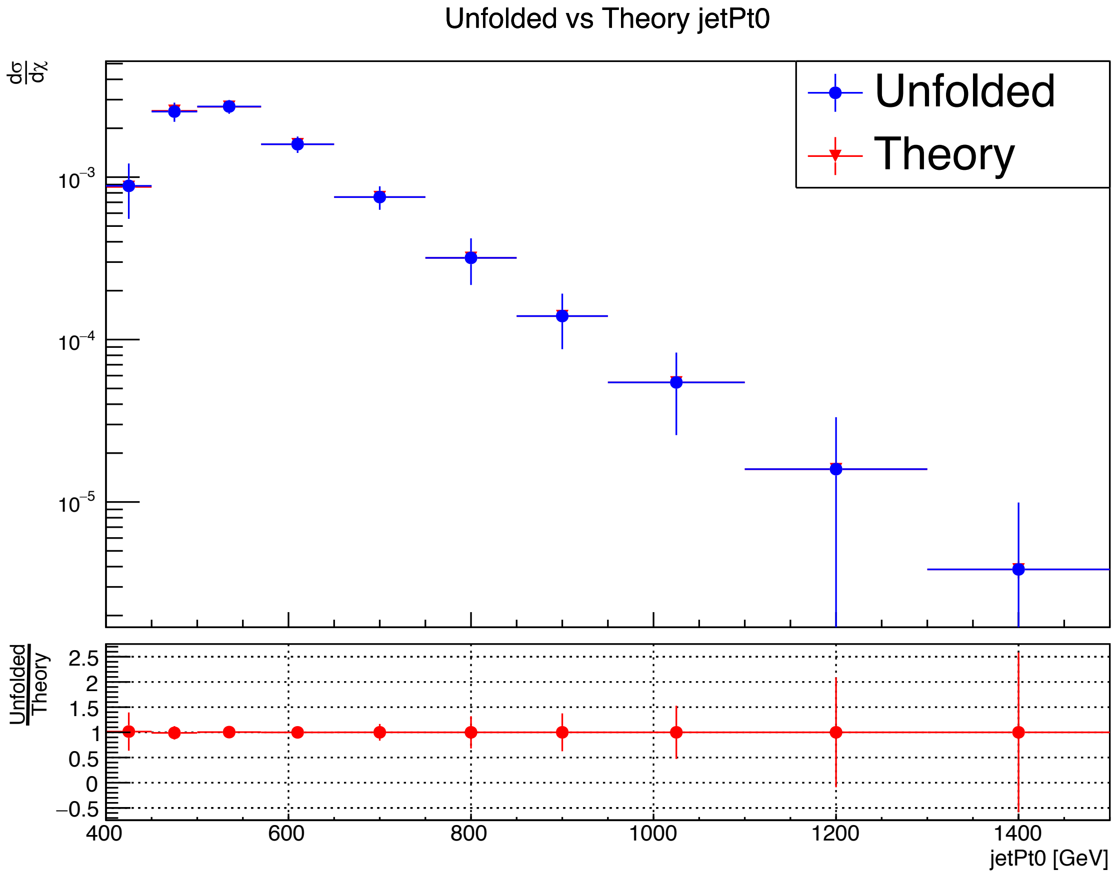
1. The global correlation coefficient is a measure of the total amount of correlation between element j of x and all other elements.
2. The arithmetic and the geometric mean of all n global correlation coefficients is determined for a large range of τ-values
3. The τ-value with the smallest mean value is accepted.

Unfolding in Particle Level

L-Curve

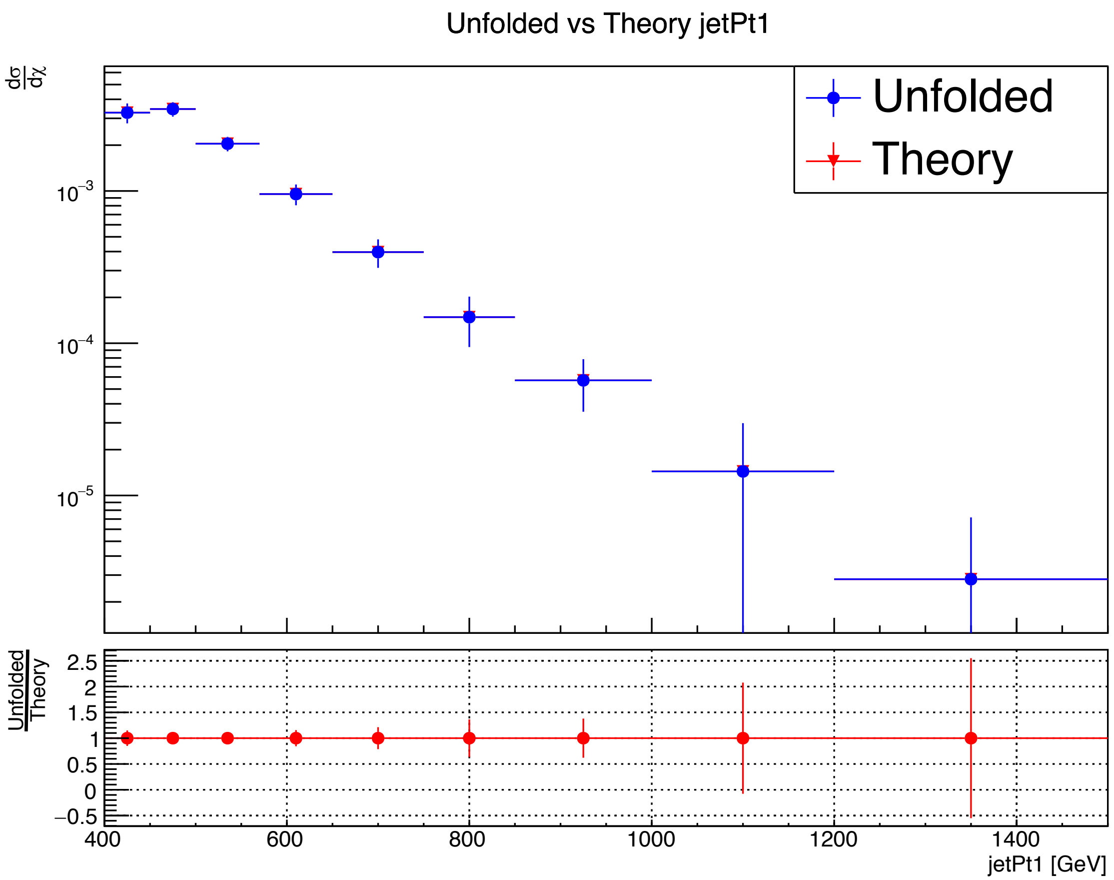


Global Corr

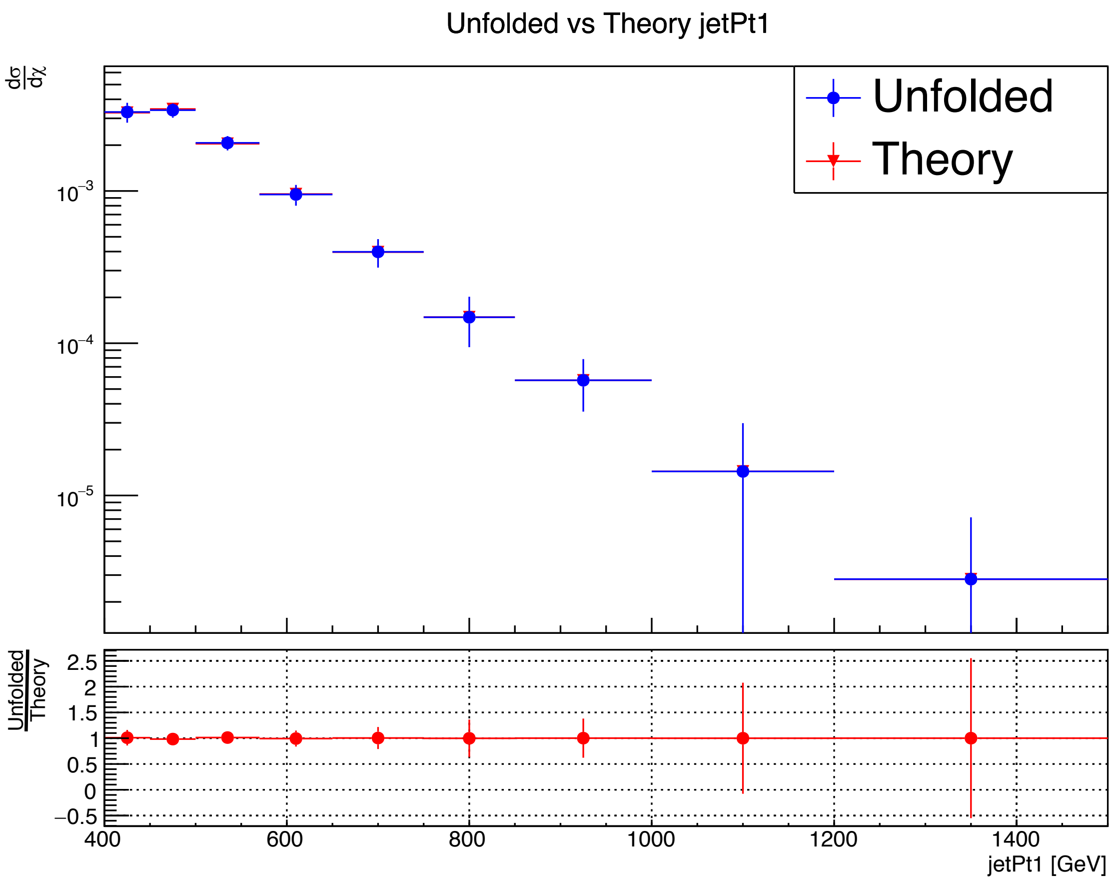


Unfolding in Particle Level

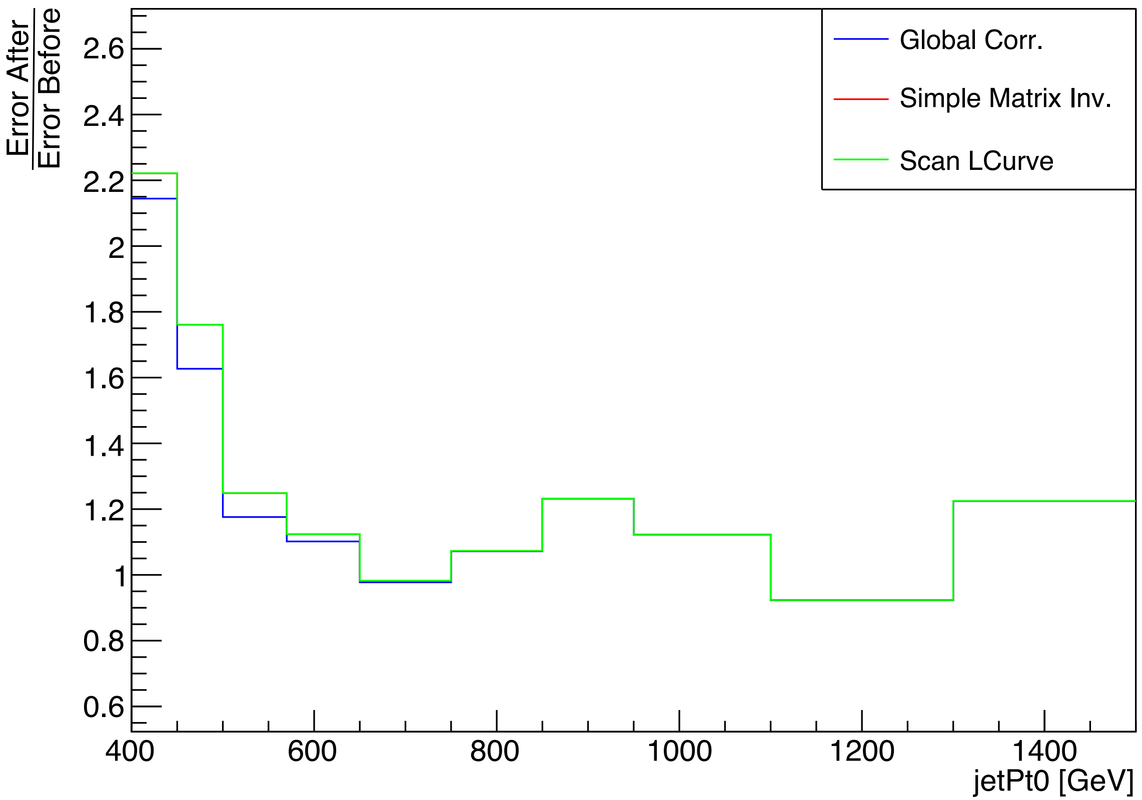
L-Curve

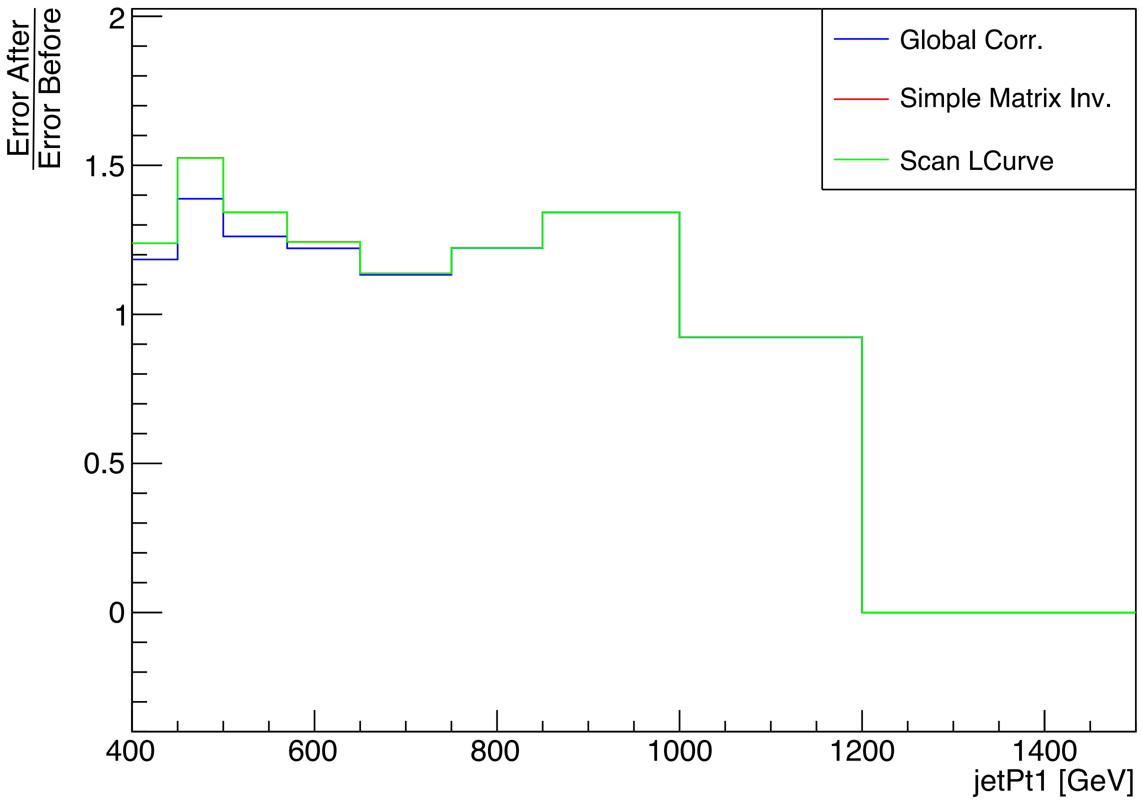


Global Corr



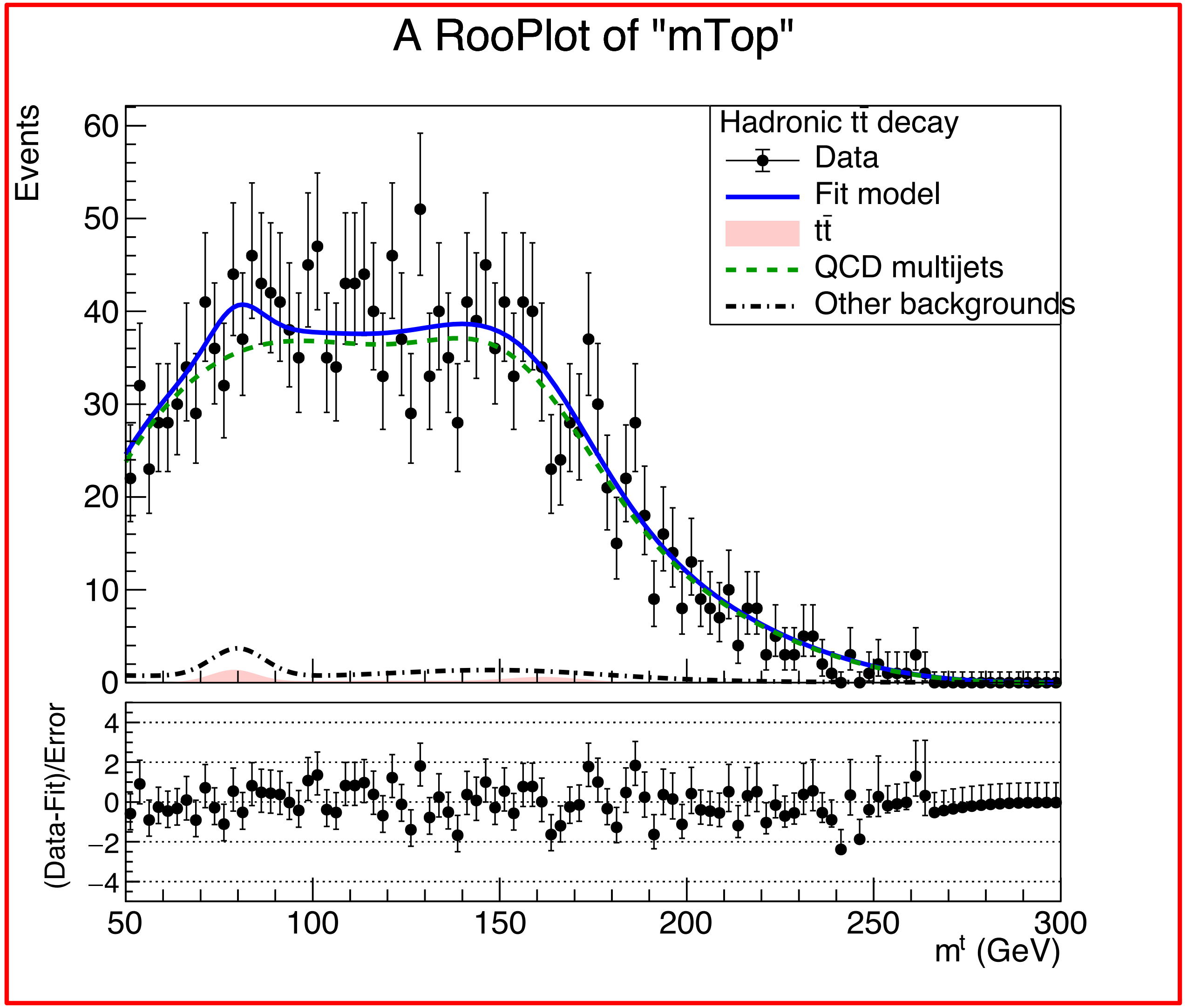
Unfolding in Particle - Error Propagation



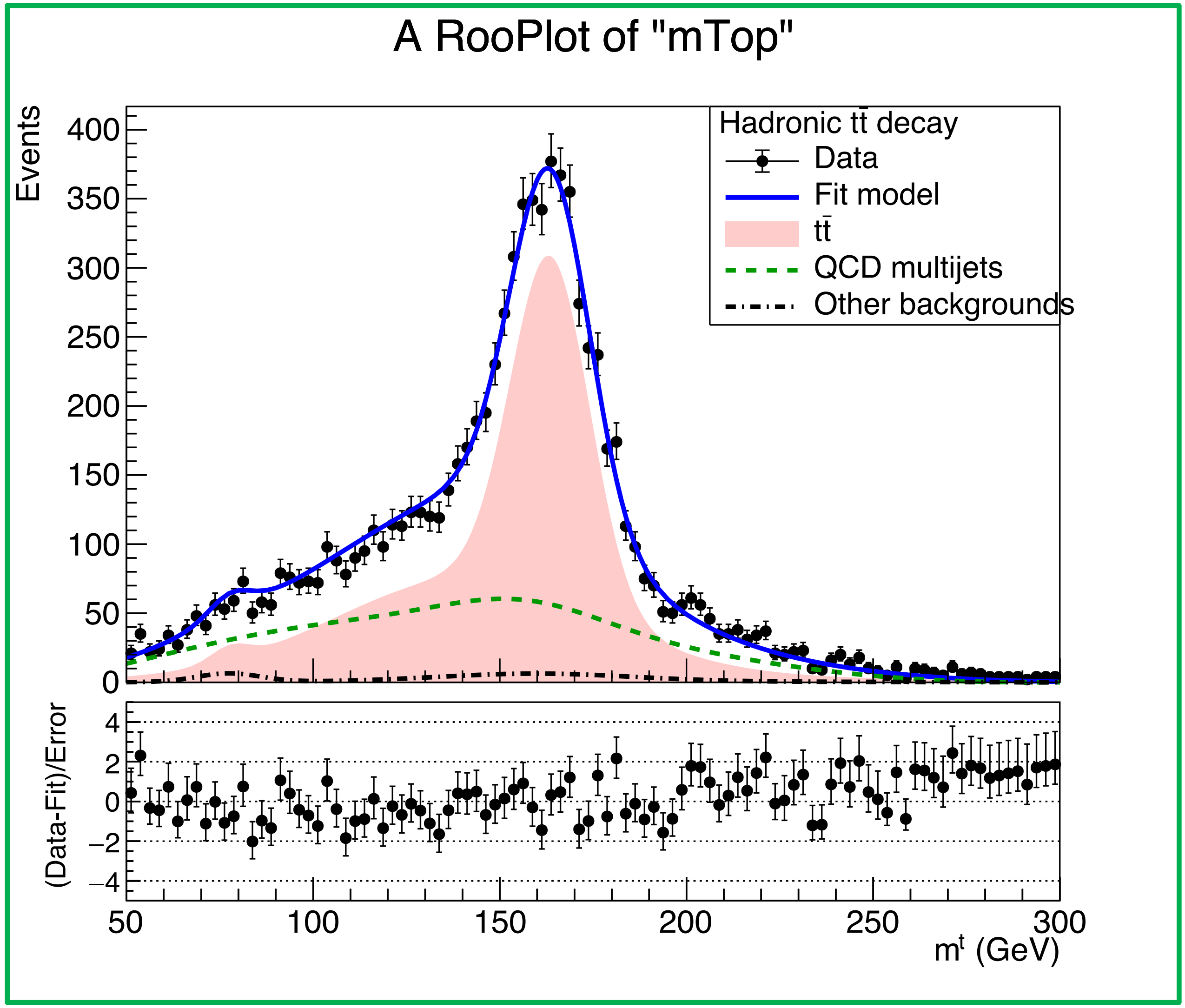


Simultaneous Mass Fit

0-btag



2-btag



Simultaneous Mass Fit Result

Floating Parameter	FinalValue +/- Error
btagEff	9.4203e-01 +/- 7.36e-02
kMassResol	9.5275e-01 +/- 2.75e-02
kMassScale	1.0003e+00 +/- 2.02e-03
kQCD_2b	6.8738e-01 +/- 5.82e-01
nFitBkg_0b	7.9304e+01 +/- 1.27e+01
nFitBkg_2b	2.3702e+02 +/- 2.19e+01
nFitQCD_0b	2.0014e+03 +/- 7.22e+01
nFitQCD_2b	2.8167e+03 +/- 1.50e+02
nFitSig	6.1479e+03 +/- 9.94e+02

N0_observed = 20.663, N2_observed = 5455.7
Ntt expected: 7872.02
Ntt observed: 5476.36
Signal strength r: 0.695675
Singal strength r in 2btag: 0.694978
Singal strength r in 0btag: 0.945919

To be investigated:

- We define btag efficiency such as that:

$$N_{sig}^{(0)} = \left(1 - e_{btag}\right)^2 N_{sig} \quad \text{and} \quad N_{sig}^{(2)} = e_{btag}^2 N_{sig}$$

- Now we are using two different b-tagging WP's. Should be have different btagEfficiency for every WP?
- $e_{btag}^{(0)}$ and $e_{btag}^{(2)}$??