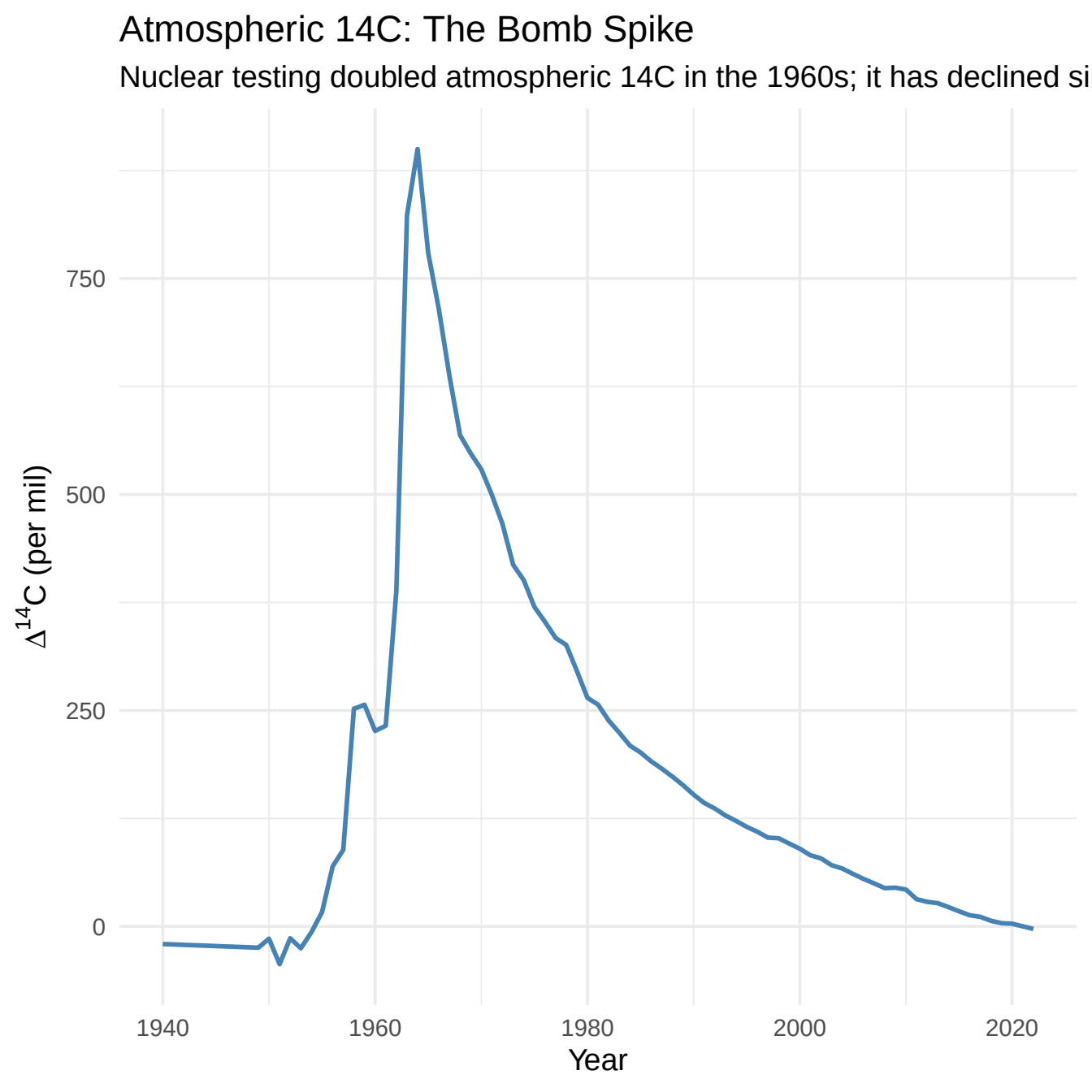
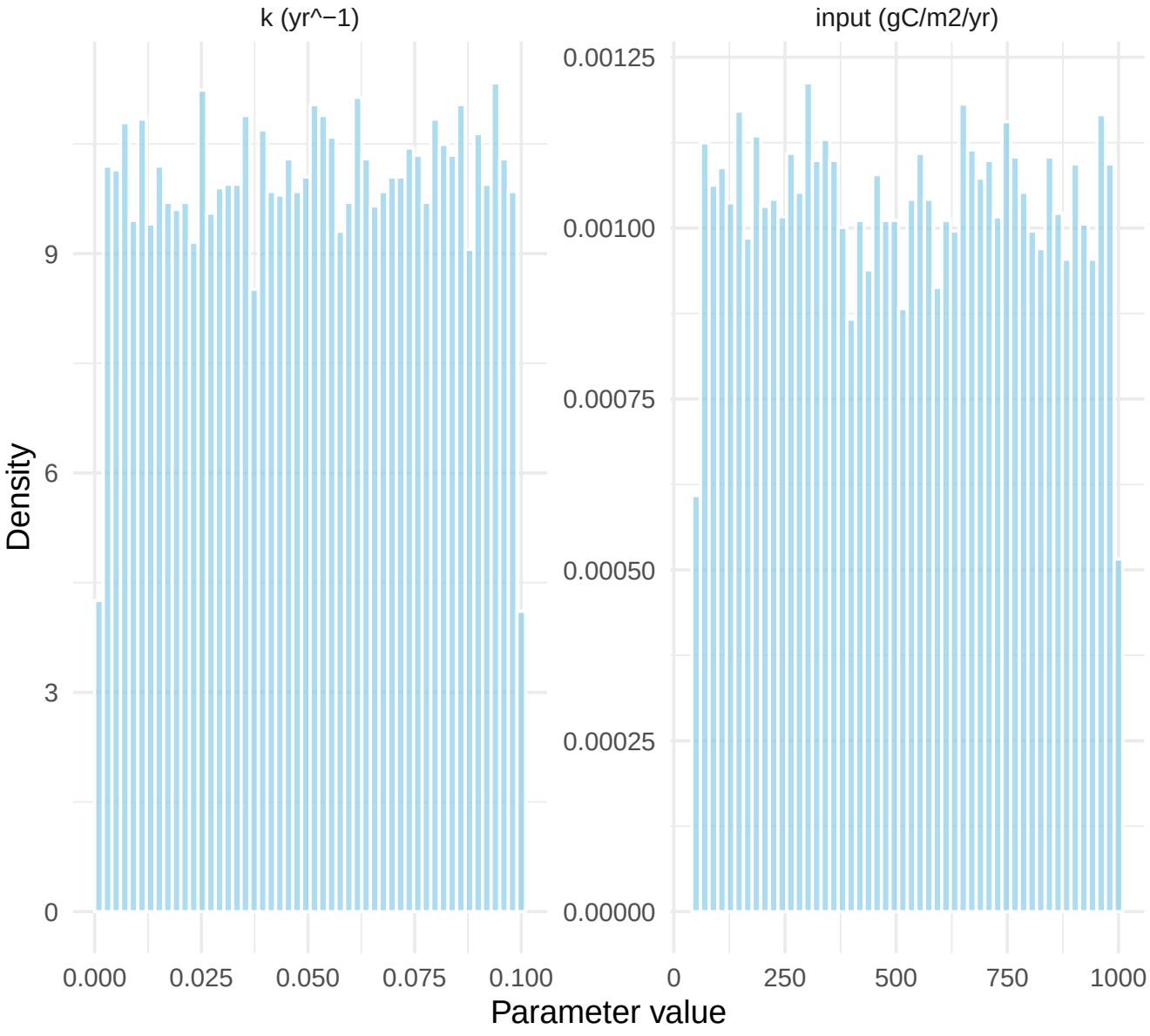
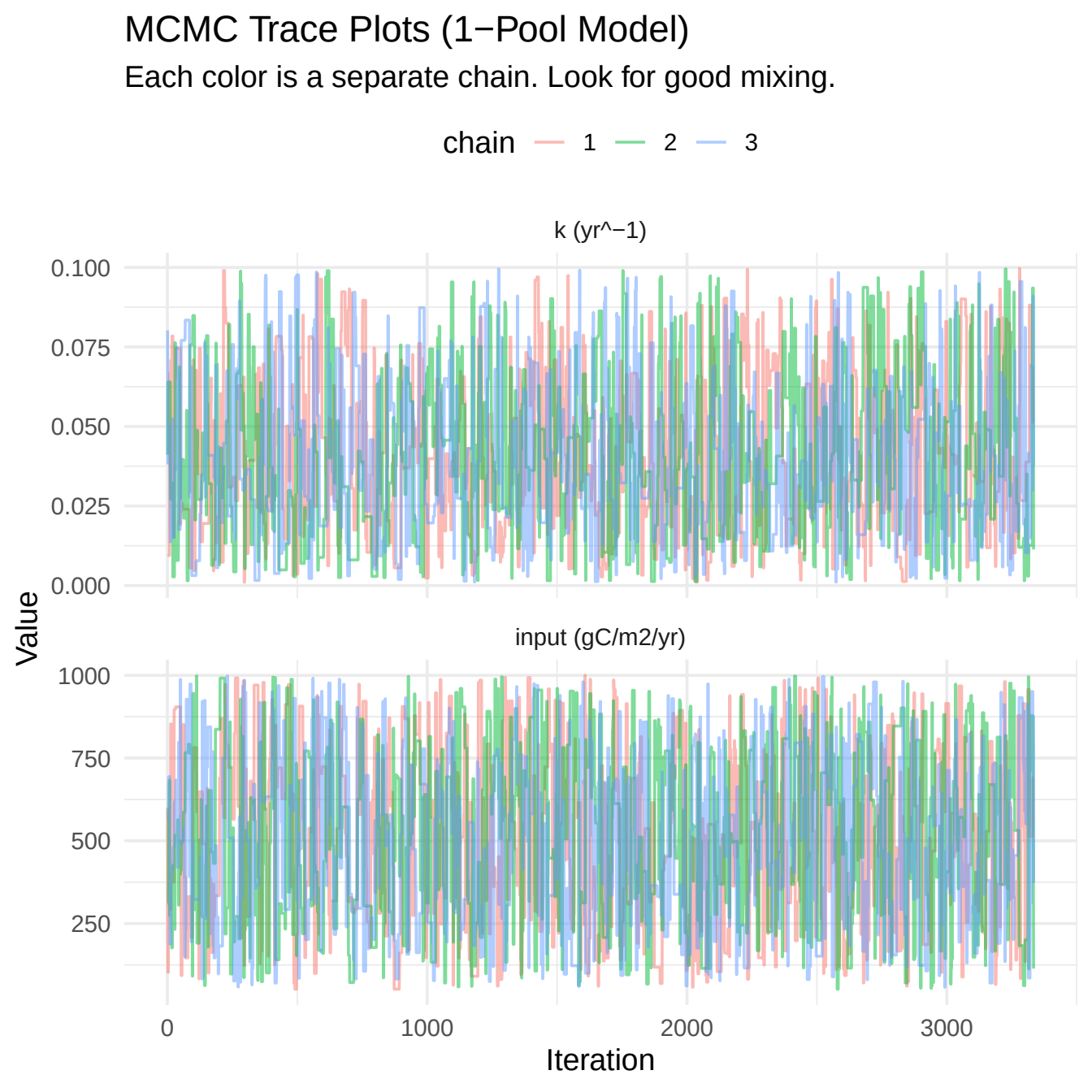
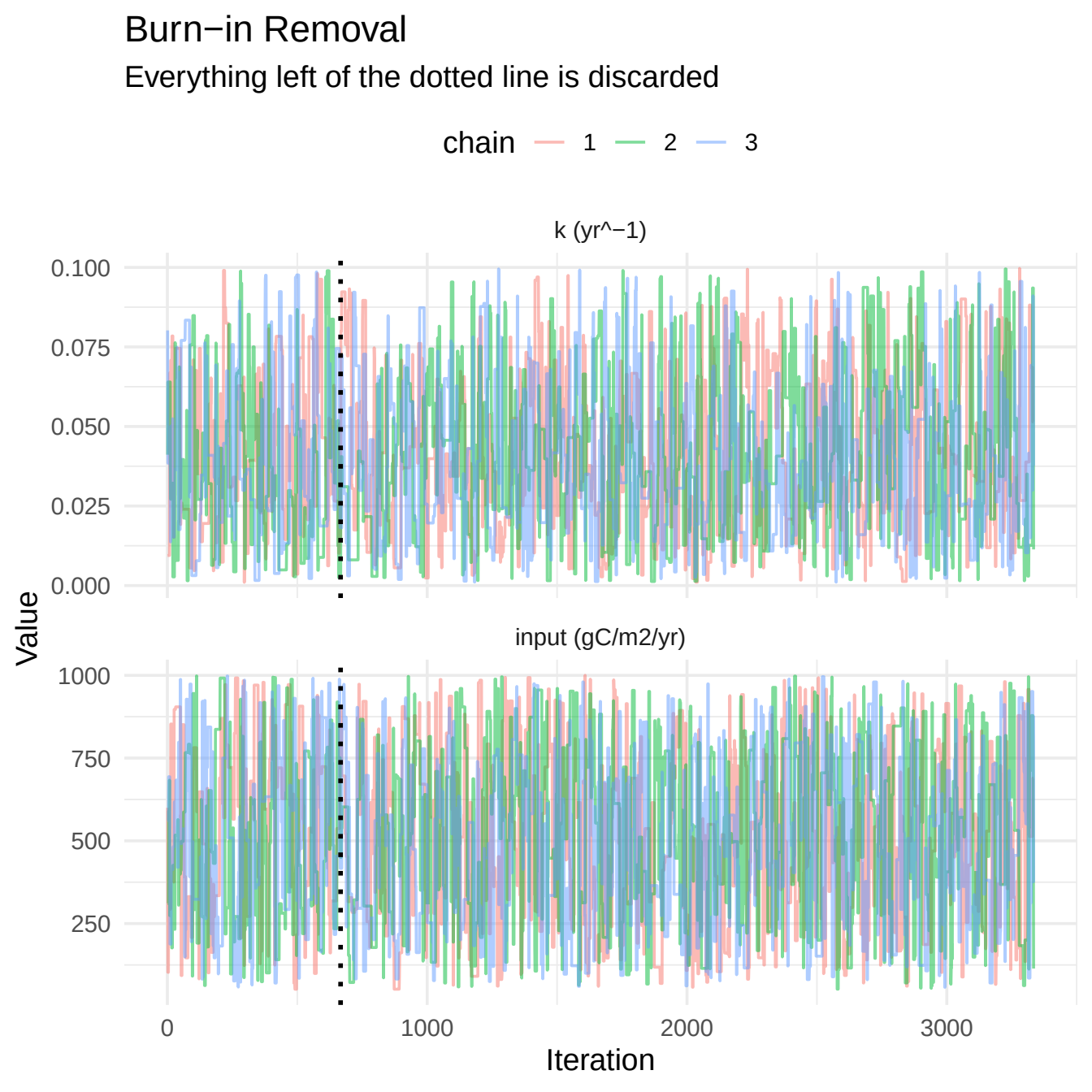

Atmospheric 14C: The Bomb Spike
Nuclear testing doubled atmospheric 14C in the 1960s; it has declined si
750
500
250
0
Δ14C (per mil)
1940
1960
1980
2000
2020
Year

Prior Distributions (1−Pool Model)

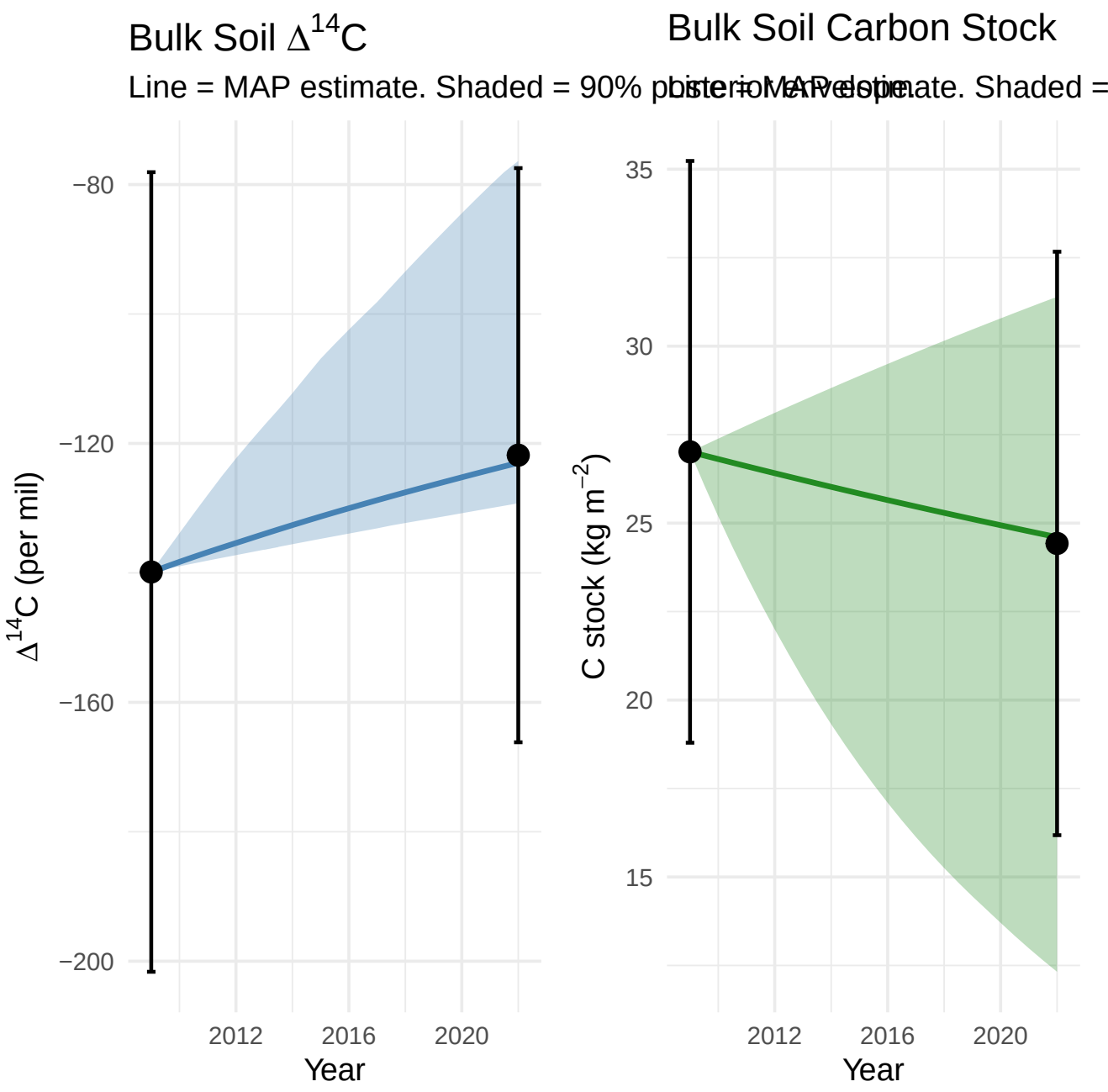
Uniform priors −−every value in the range is equally likely a priori

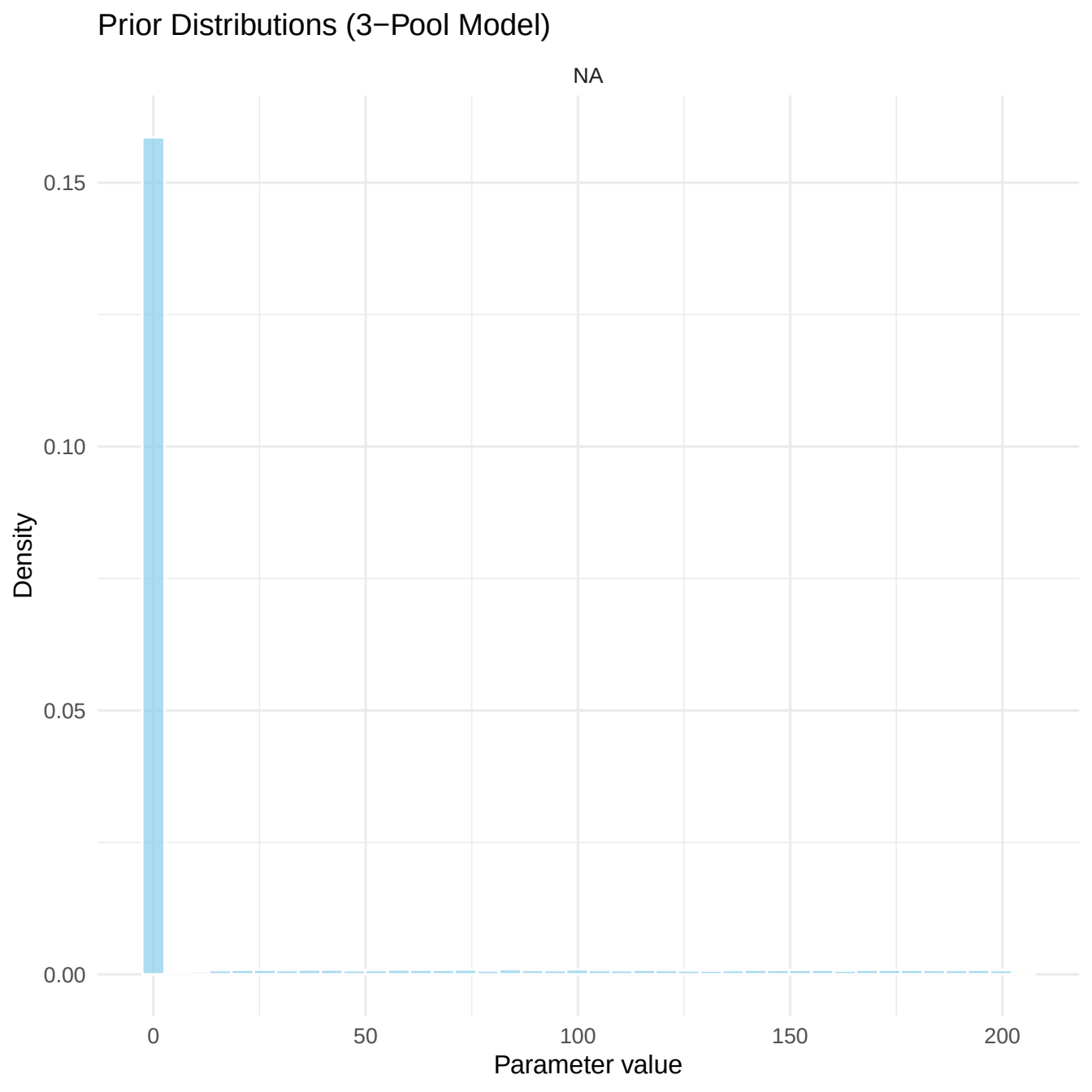


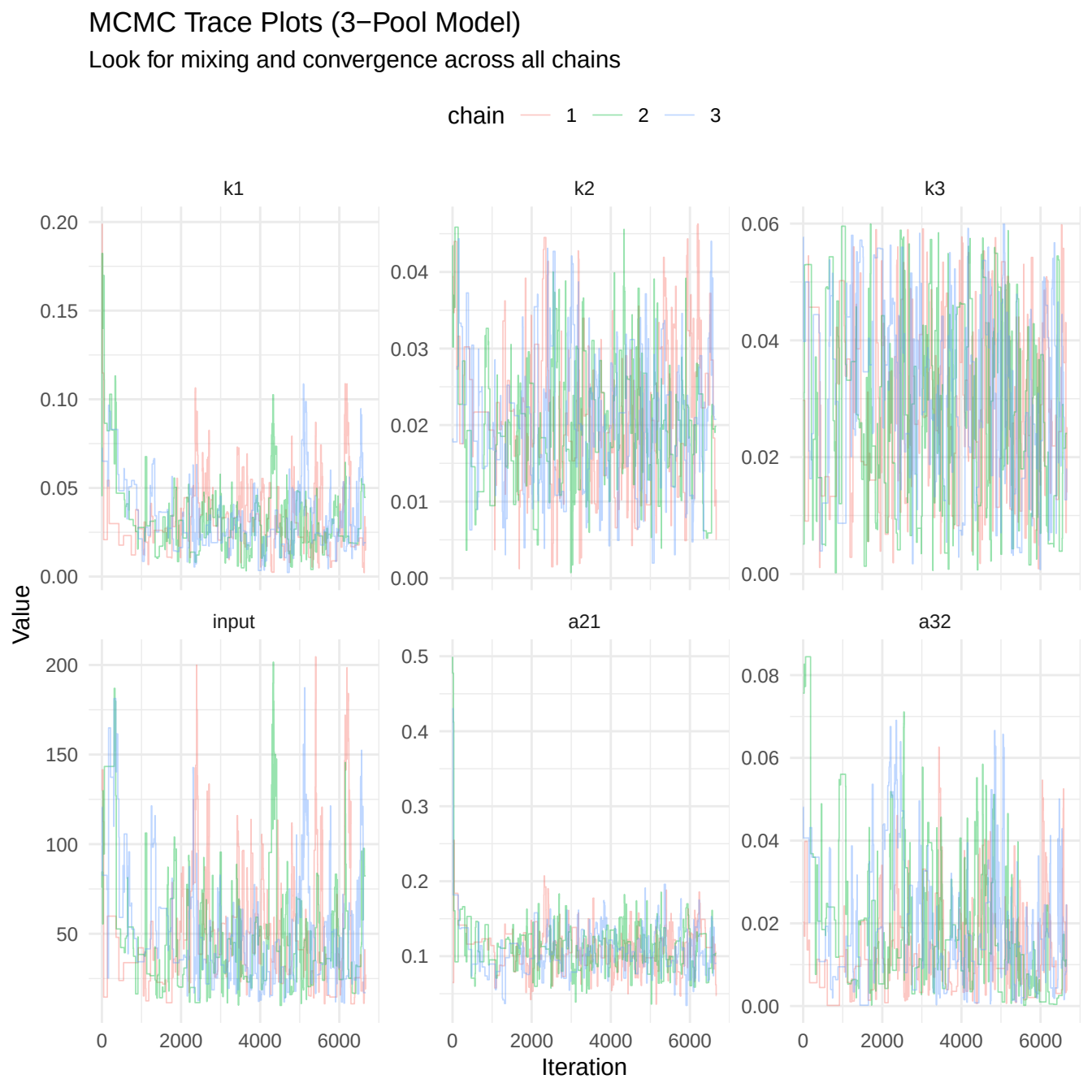

MCMC Trace Plots (1−Pool Model)
Each color is a separate chain. Look for good mixing.
chain
1
2
3
k (yr^−1)
0.100
0.075
0.050
0.025
0.000
input (gC/m2/yr)
1000
750
500
250
Value
0
1000
2000
3000
Iteration

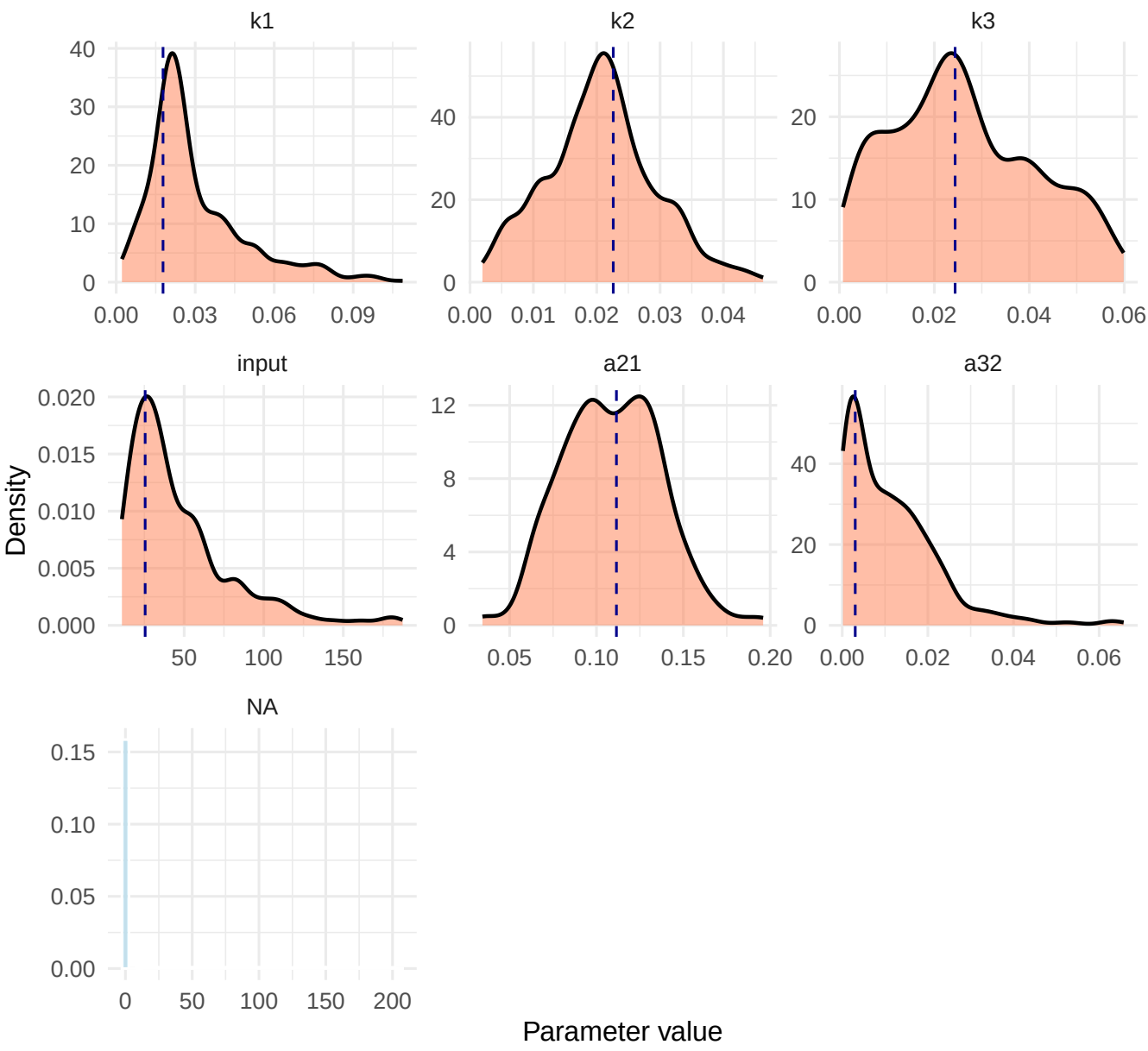

Burn−in Removal
Everything left of the dotted line is discarded
chain
1
2
3
k (yr^−1)
0.100
0.075
0.050
0.025
0.000
input (gC/m2/yr)
1000
750
500
250
Value
0
1000
2000
3000
Iteration

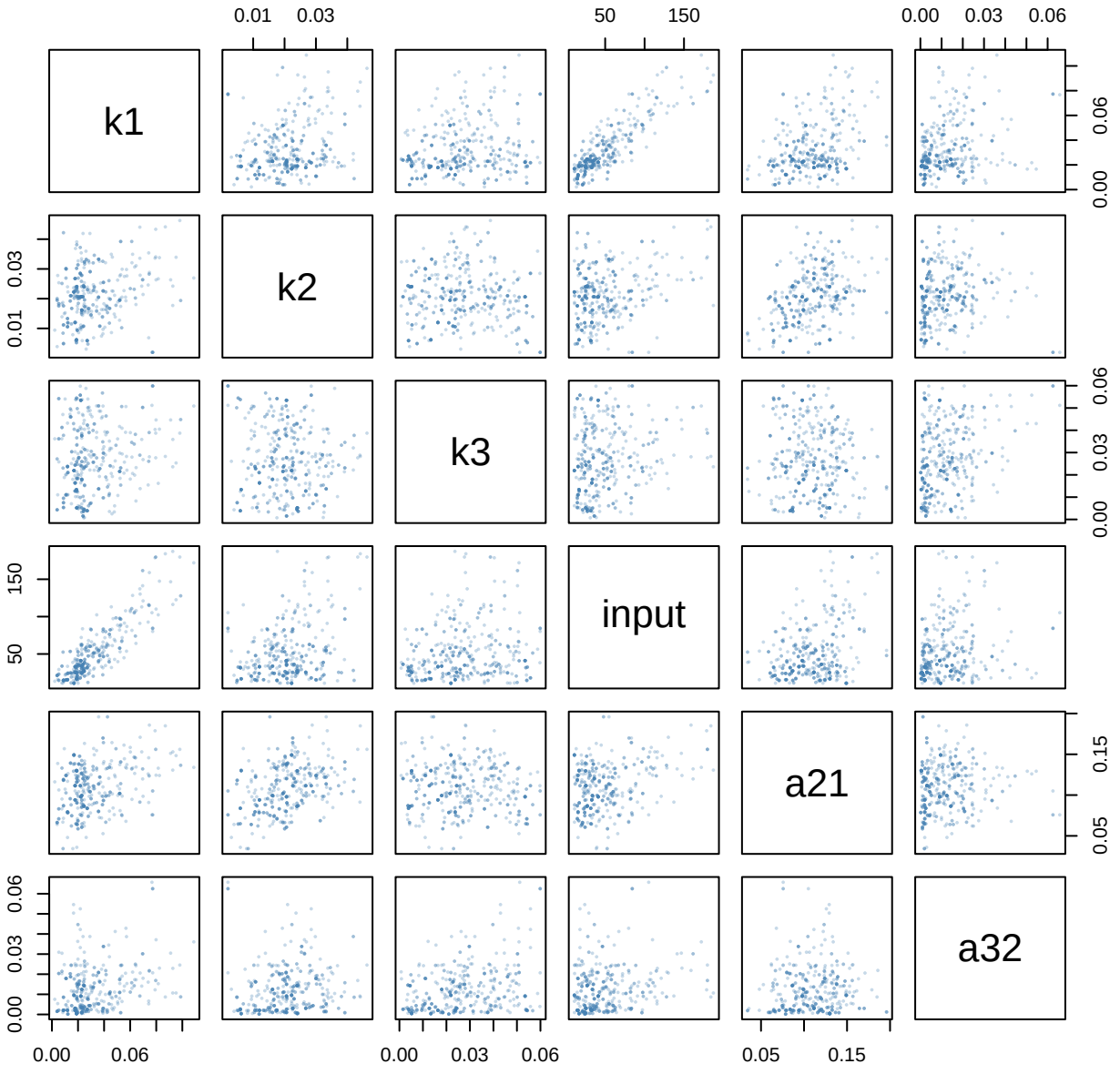

Prior (blue) vs. Posterior (coral) −−1−Pool Model
How much did the data narrow down our parameter estimates?
k (yr^−1)
input (gC/m2/yr)
Density
15
10
5
0
1e−03
5e−04
0e+00
0.000
0.025
0.050
0.075
0.100
0
250
500
750
1000
Parameter value

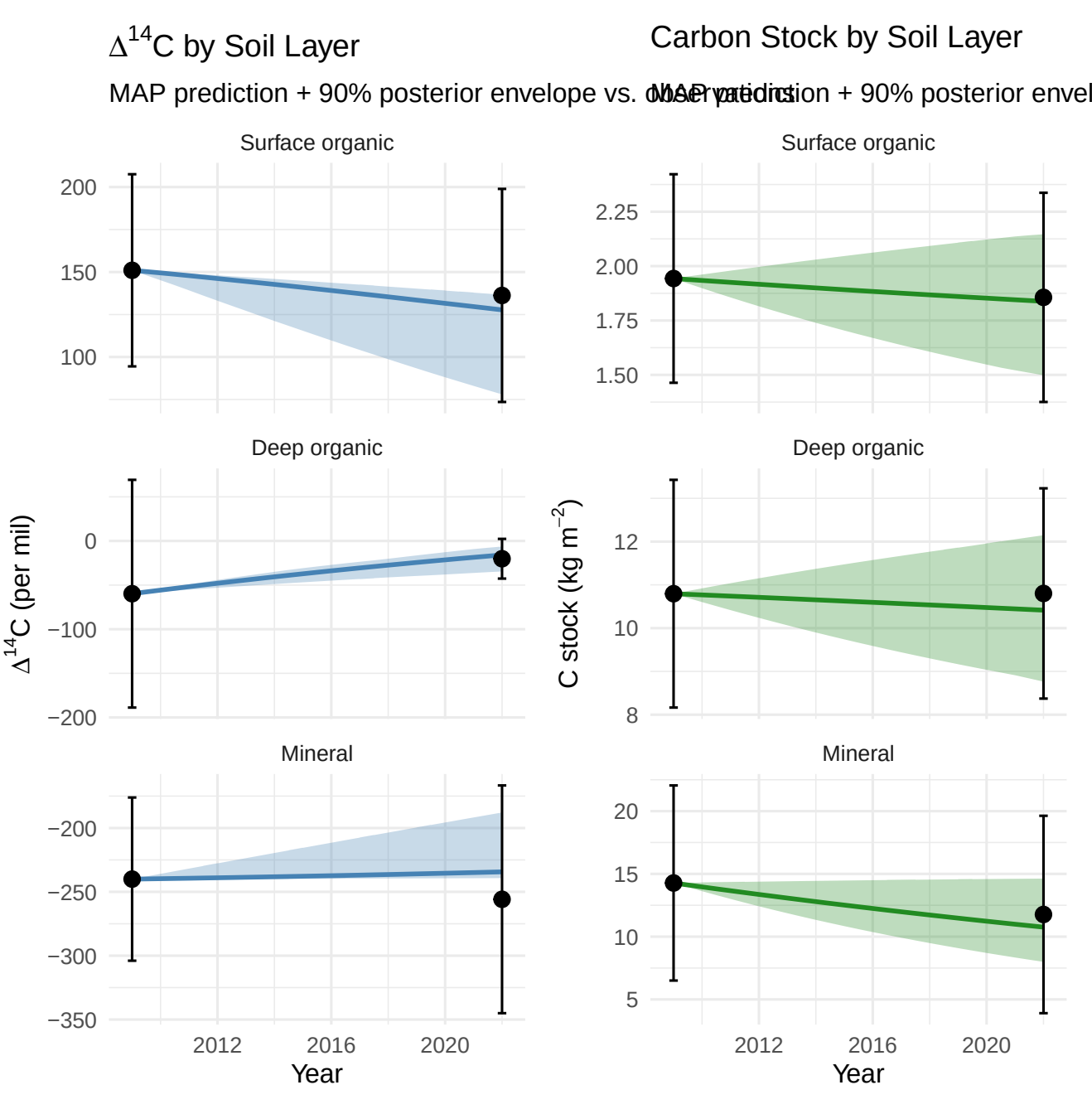

Bulk Soil $\Delta^{14}C$
Line = MAP estimate. Shaded = 90% posterior envelope.
$\Delta^{14}C$ (per mil)
−80
−120
−160
−200
2012
2016
2020
Year
Bulk Soil Carbon Stock
Line = MAP estimate. Shaded =
C stock (kg m^{-2})
35
30
25
20
15
2012
2016
2020
Year


Prior Distributions (3−Pool Model)
NA
0.15
0.10
0.05
0.00
Density
0
50
100
150
200
Parameter value


MCMC Trace Plots (3−Pool Model)
Look for mixing and convergence across all chains
chain 1 2 3
k1
k2
k3
input
a21
a32
Value
Iteration
0.20
0.15
0.10
0.05
0.00
0.04
0.03
0.02
0.01
0.06
200
150
100
50
0.5
0.4
0.3
0.2
0.1
0.08
0.06
0.04
0.02
0
2000
4000
6000


Prior (blue) vs. Posterior (coral) −−3−Pool Model
Dashed blue = MAP estimate. Narrow posteriors = well−constrained parameters.
k1
k2
k3
input
a21
a32
NA
Density
Parameter value


Posterior Pairwise Correlations (3−Pool Model)
k1
k2
k3
input
a21
a32
0.01
0.03
50
150
0.00
0.03
0.06
0.05
0.15


Δ14C by Soil Layer
MAP prediction + 90% posterior envelope vs. observations
Carbon Stock by Soil Layer
MAP prediction + 90% posterior envel
Surface organic
Deep organic
Mineral
Δ14C (per mil)
C stock (kg m−2)
200
150
100
0
−100
−200
−250
−300
−350
2.25
2.00
1.75
1.50
12
10
8
20
15
10
5
2012
2016
2020
Year