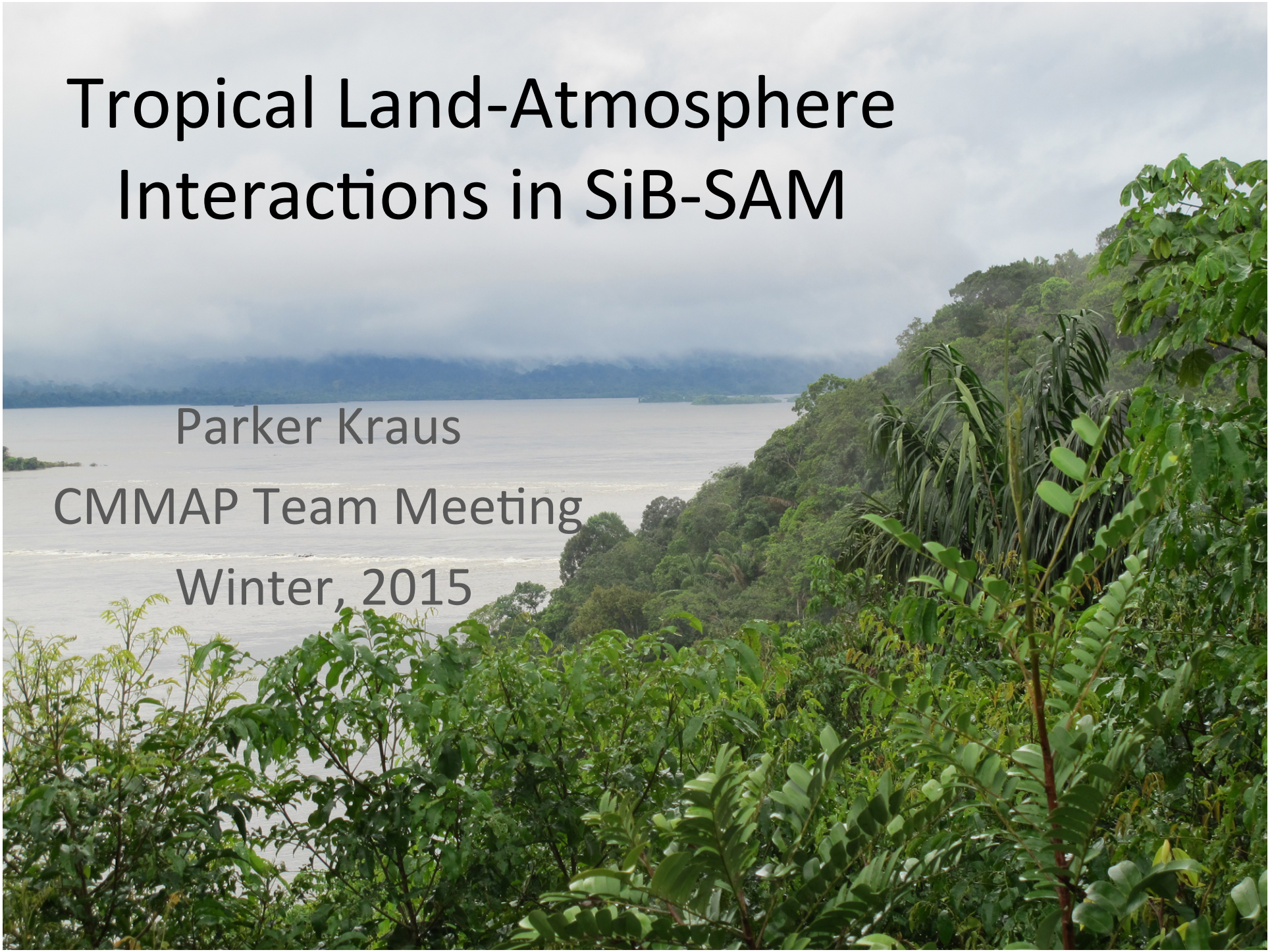


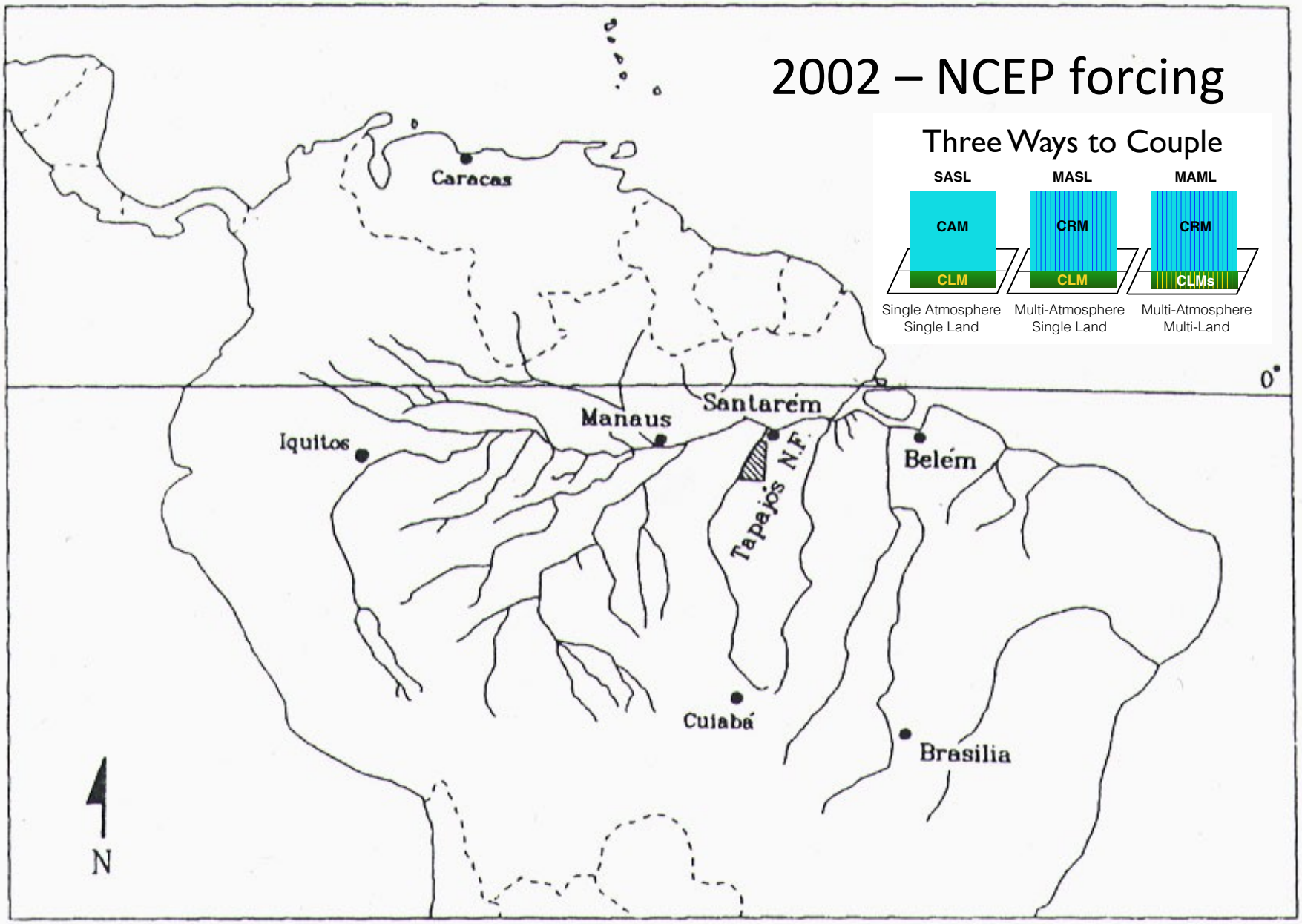
Tropical Land-Atmosphere Interactions in SiB-SAM

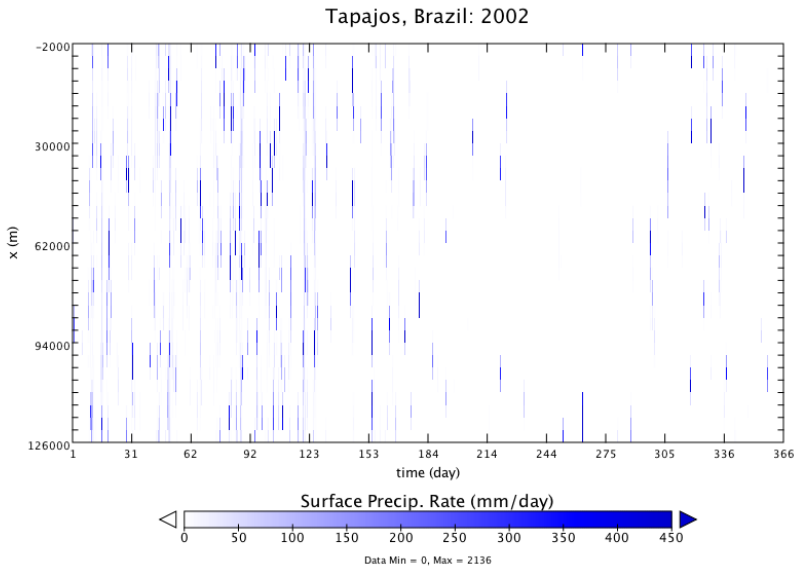
Parker Kraus

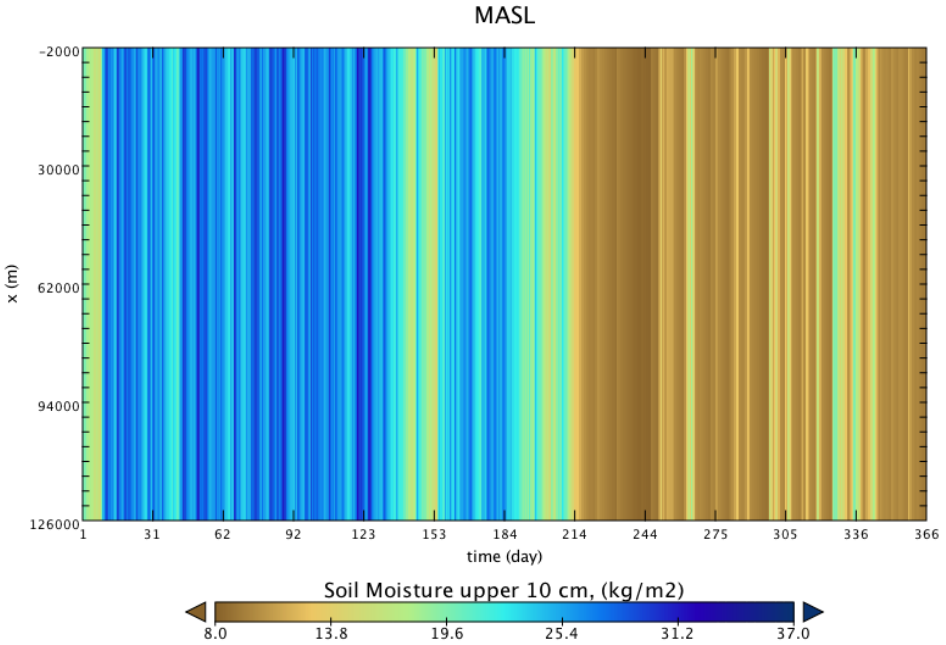
CMMAP Team Meeting

Winter, 2015

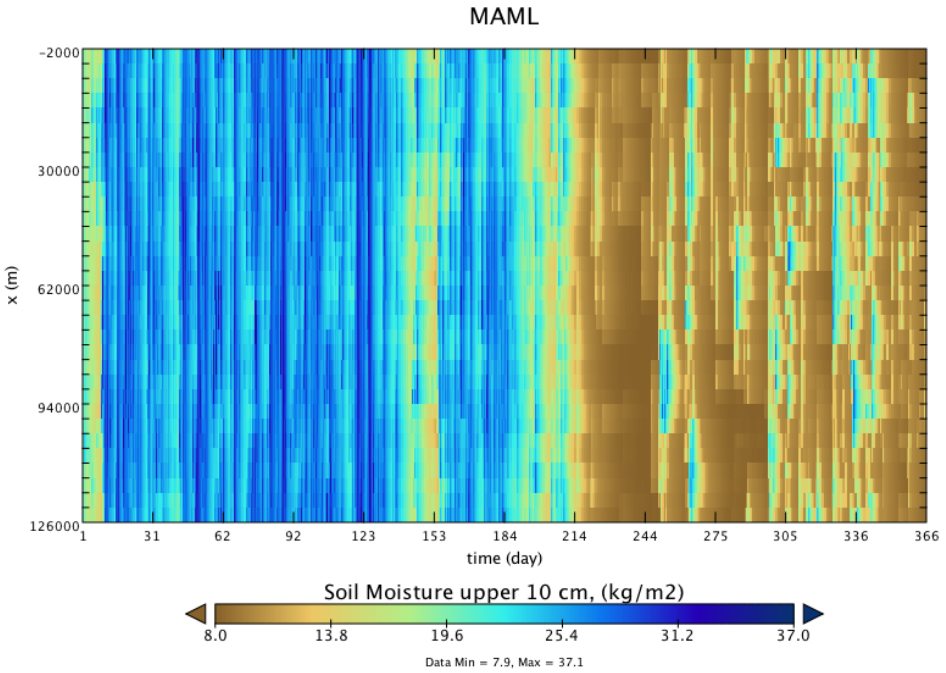
2002 – NCEP forcing



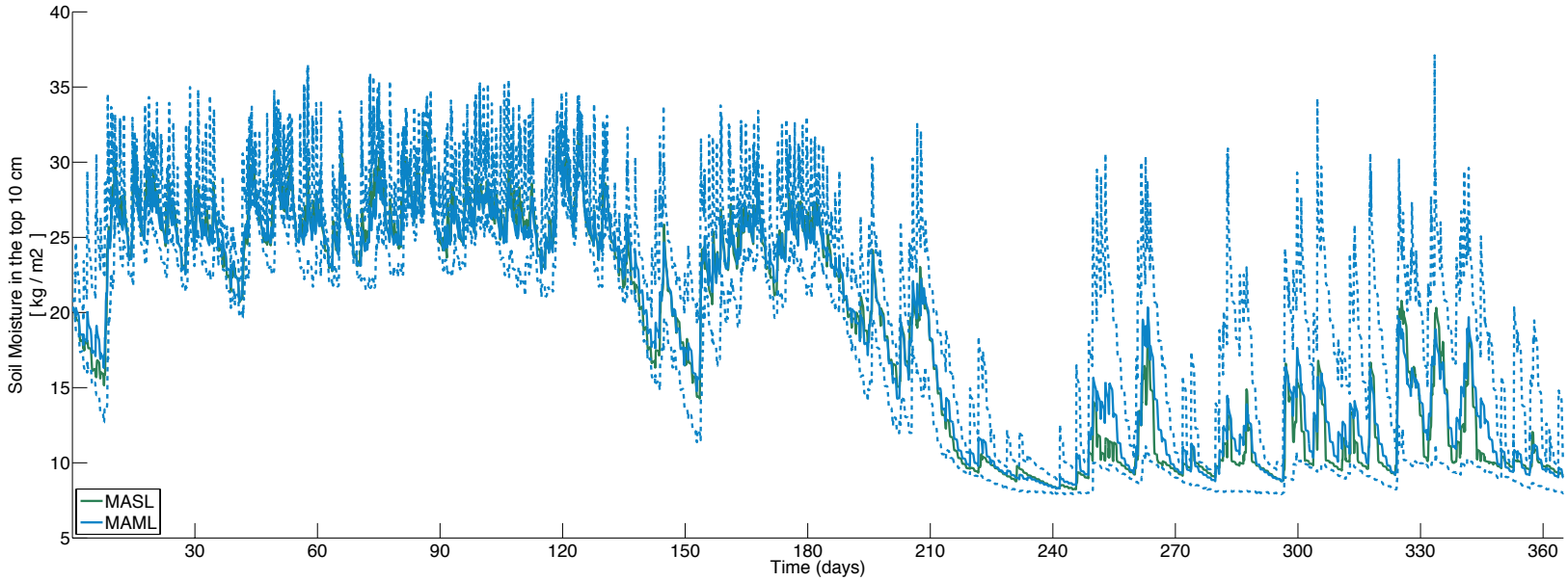




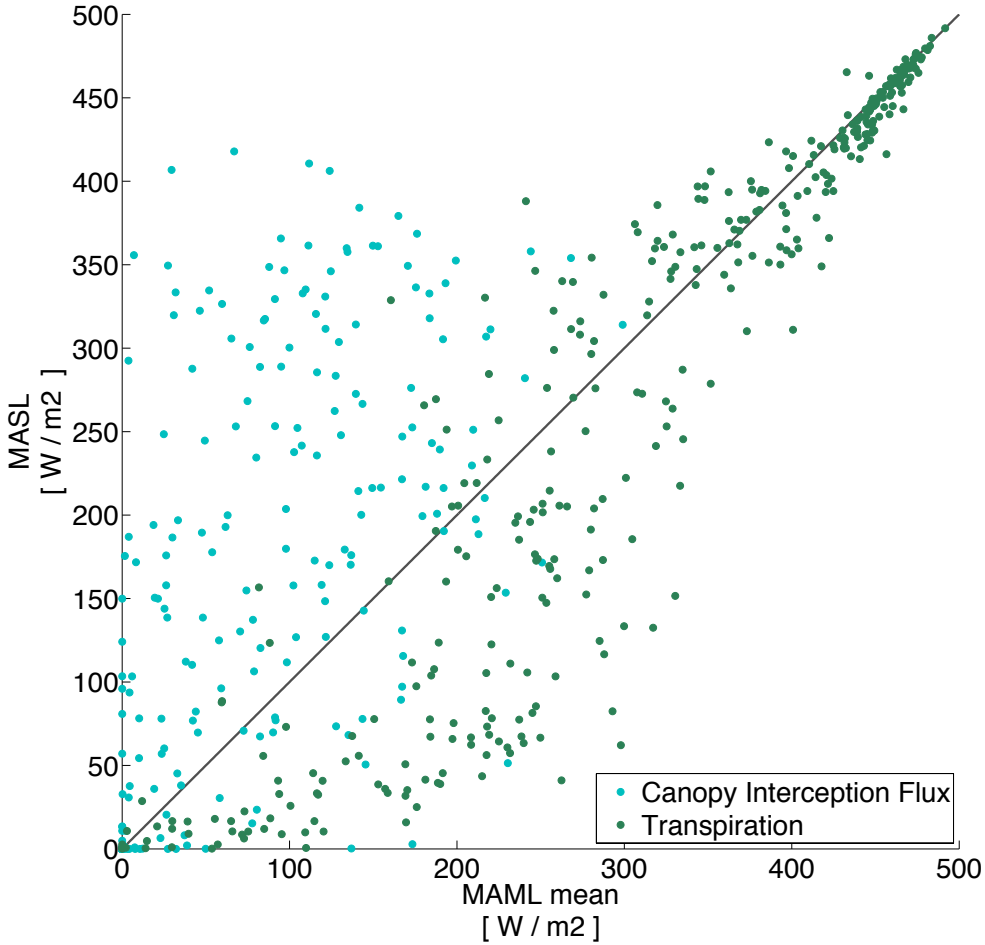
Precipitation & Soil Moisture



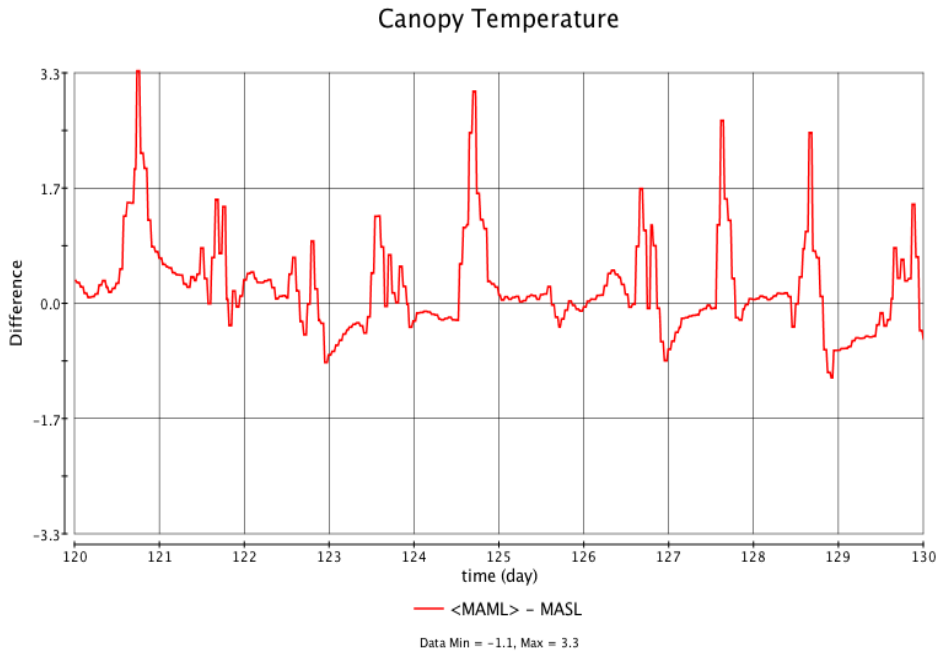
Soil Moisture

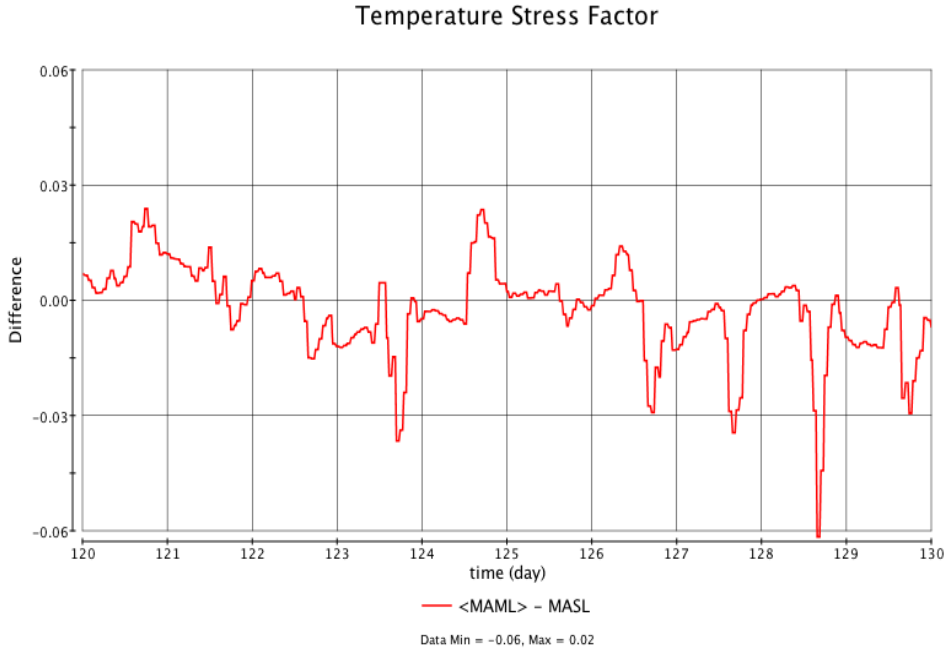


Structural response:
Surface fluxes of latent heat

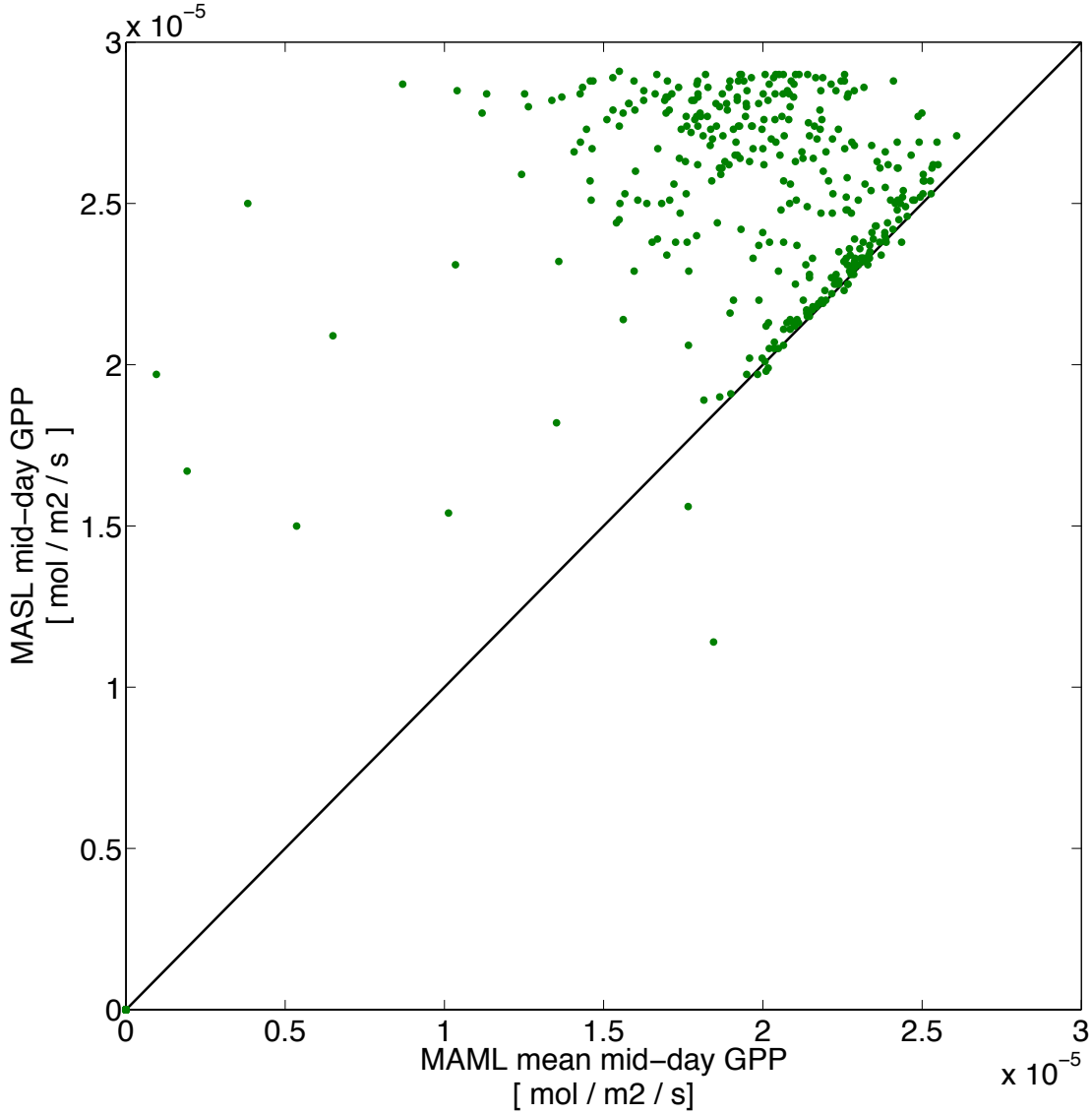


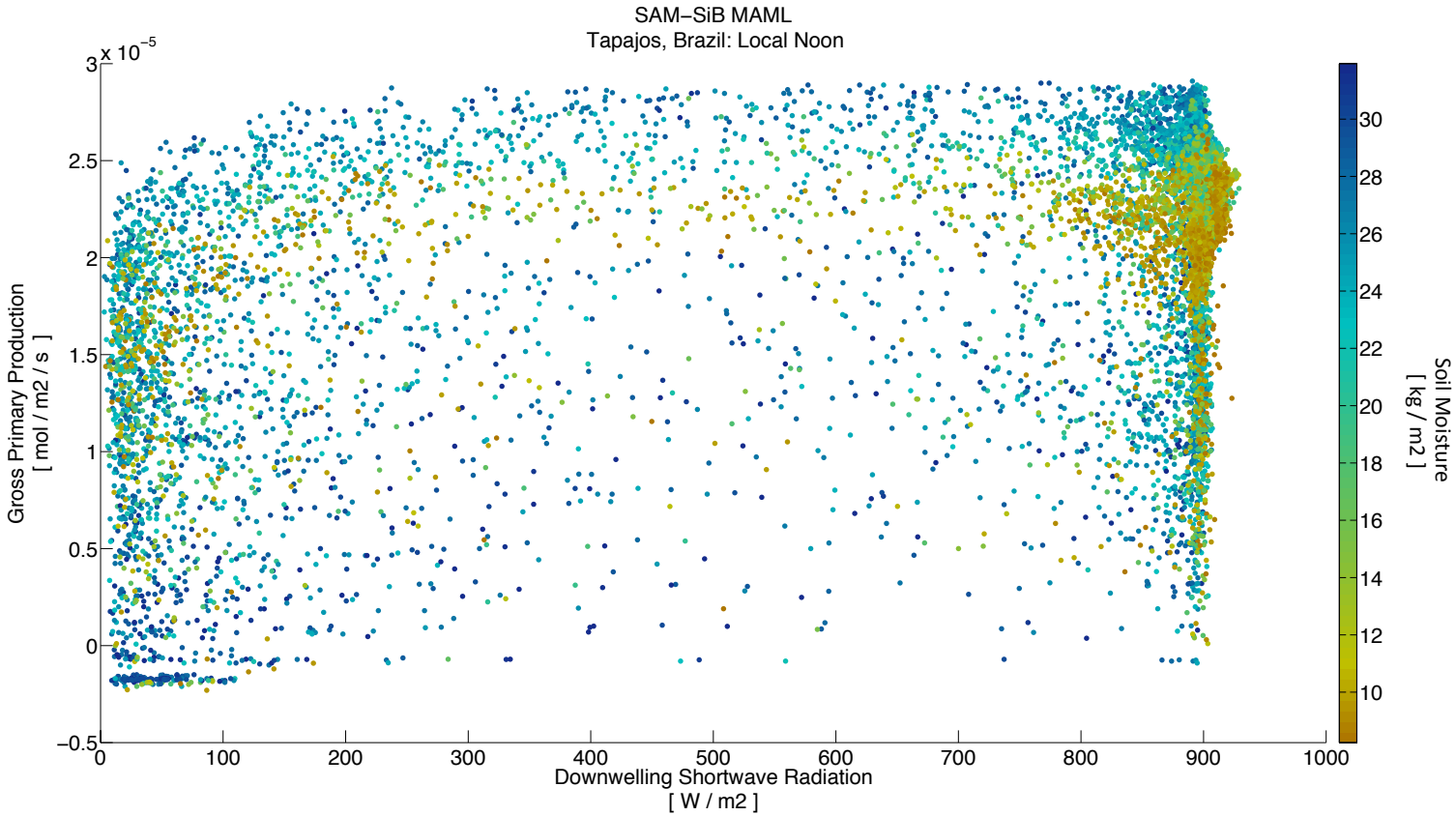
Functional response: Temperature and temperature stress

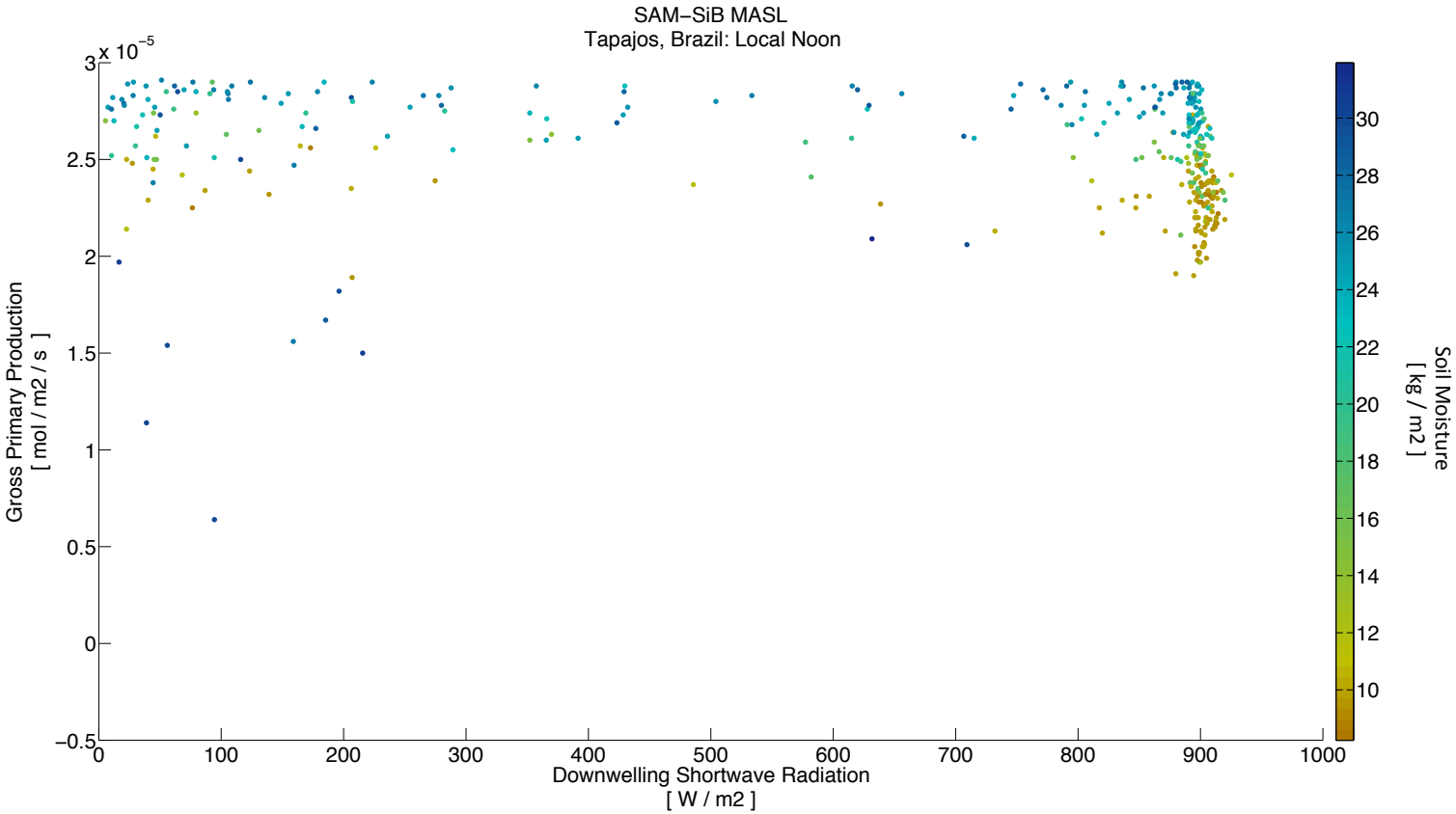


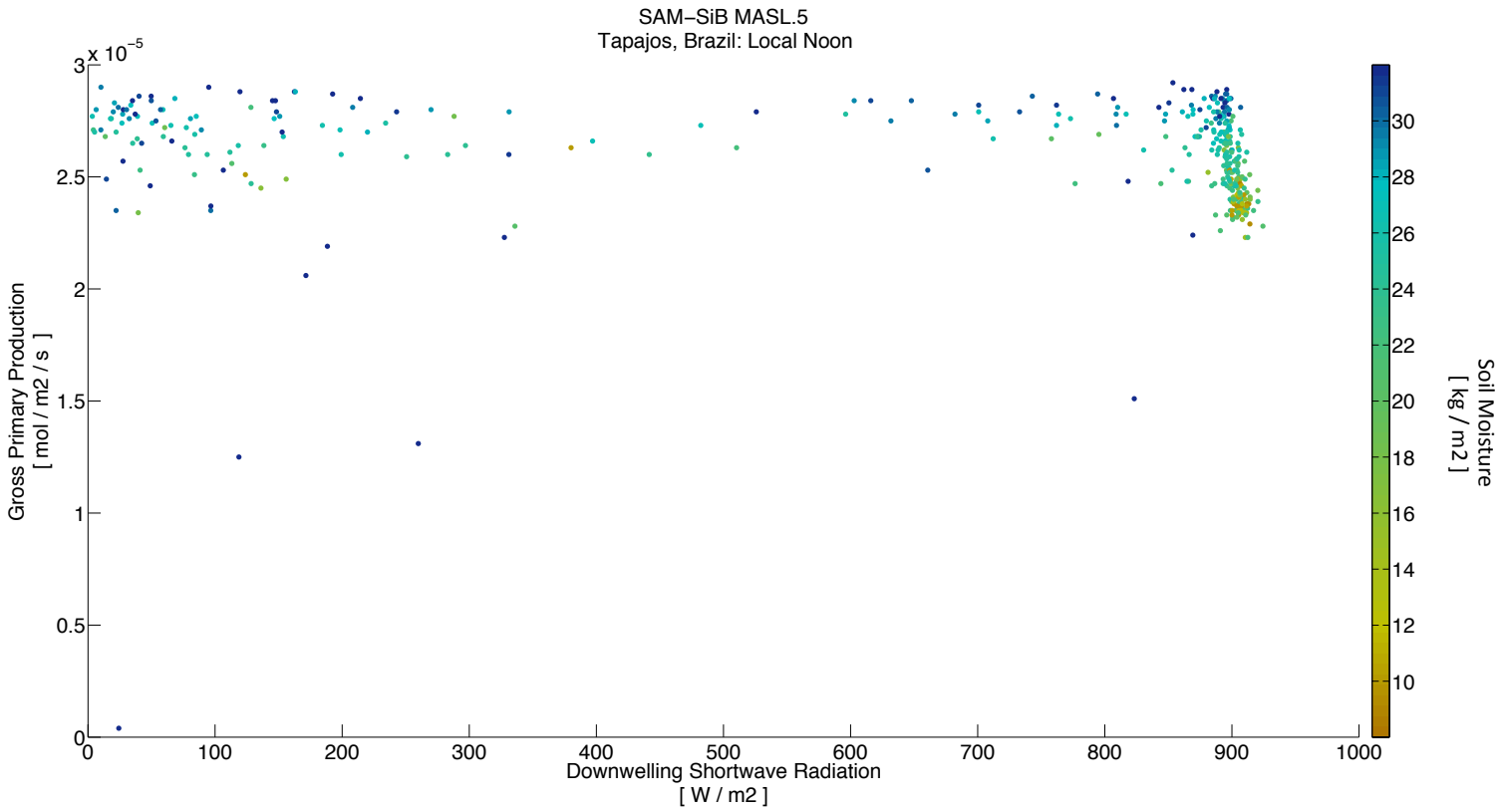


Carbon assimilation




SAM–SiB MAML
Tapajos, Brazil: Local Noon
x 10^-5
3
2.5
2
1.5
1
0.5
0
−0.5
Gross Primary Production
[mol / m2 / s]
0
100
200
300
400
500
600
700
800
900
1000
Downwelling Shortwave Radiation
[W / m2]
30
28
26
24
22
20
18
16
14
12
10
Soil Moisture
[kg / m2]


SAM−SiB MASL
Tapajos, Brazil: Local Noon
x 10^−5
3
2.5
2
1.5
1
0.5
0
−0.5
Gross Primary Production
[mol / m2 / s]
0
100
200
300
400
500
600
700
800
900
1000
Downwelling Shortwave Radiation
[W / m2]
30
28
26
24
22
20
18
16
14
12
10
Soil Moisture
[kg / m2]


SAM−SiB MASL.5
Tapajos, Brazil: Local Noon
x 10^−5
3
2.5
2
1.5
1
0.5
0
Gross Primary Production
[mol / m2 / s]
0
100
200
300
400
500
600
700
800
900
1000
Downwelling Shortwave Radiation
[W / m2]
30
28
26
24
22
20
18
16
14
12
10
Soil Moisture
[kg / m2]

Conclusions

- Averaging CRM modeled rain rates is a waste, the explicit precipitation intensities can replace a parameterization in LSMs.
- High rain rates at small spatial scales may produce sufficient canopy throughfall to moisten tropical soils in the dry season, enabling plant productivity throughout the year.
- Single column radiation has become problematically unrealistic at these scales, but there are some easy fixes.

Future Work

- “Binned” approaches to representing soil moisture heterogeneity are a natural fit for the super-parameterization; in MASL it could allow representation of the effects of spatial heterogeneity in the soil column, in MAML it could abstract spatial heterogeneity.