JULES Global Configurations

from GL6 to GL10

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Need to document and assess global configurations

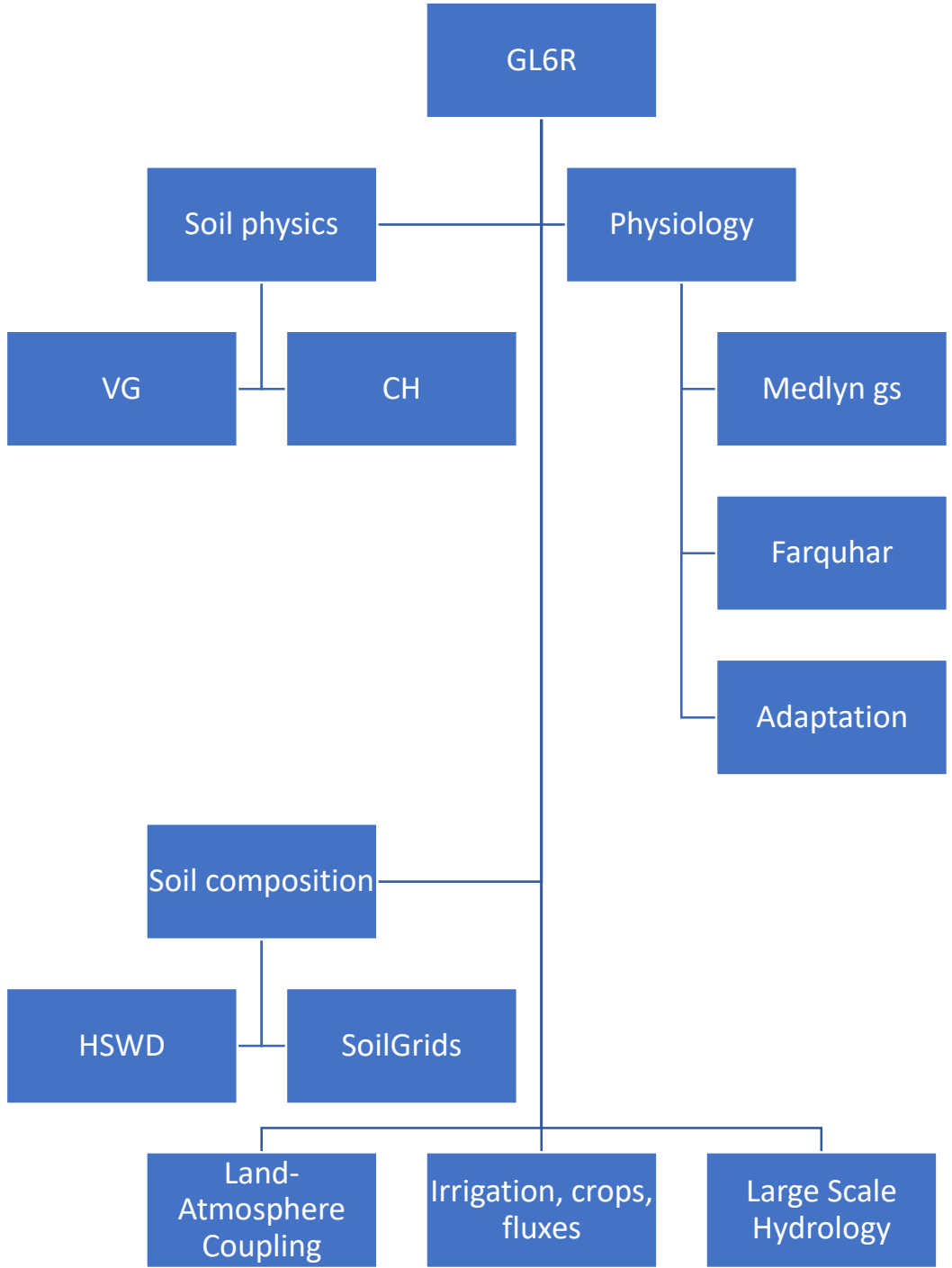
Motivation

- Global coupled (to GAx and GCx) and offline can be exploited in synergy, to understand the role of the land surface in the climate(or even Earth) system
- We can participate in international intercomparisons as one community
- We aim to develop and **insert science for GL10: deadline is November**
- Sharing resources is more efficient

Achievements: community managed to set up, run and assess GL6R and GL7

However…

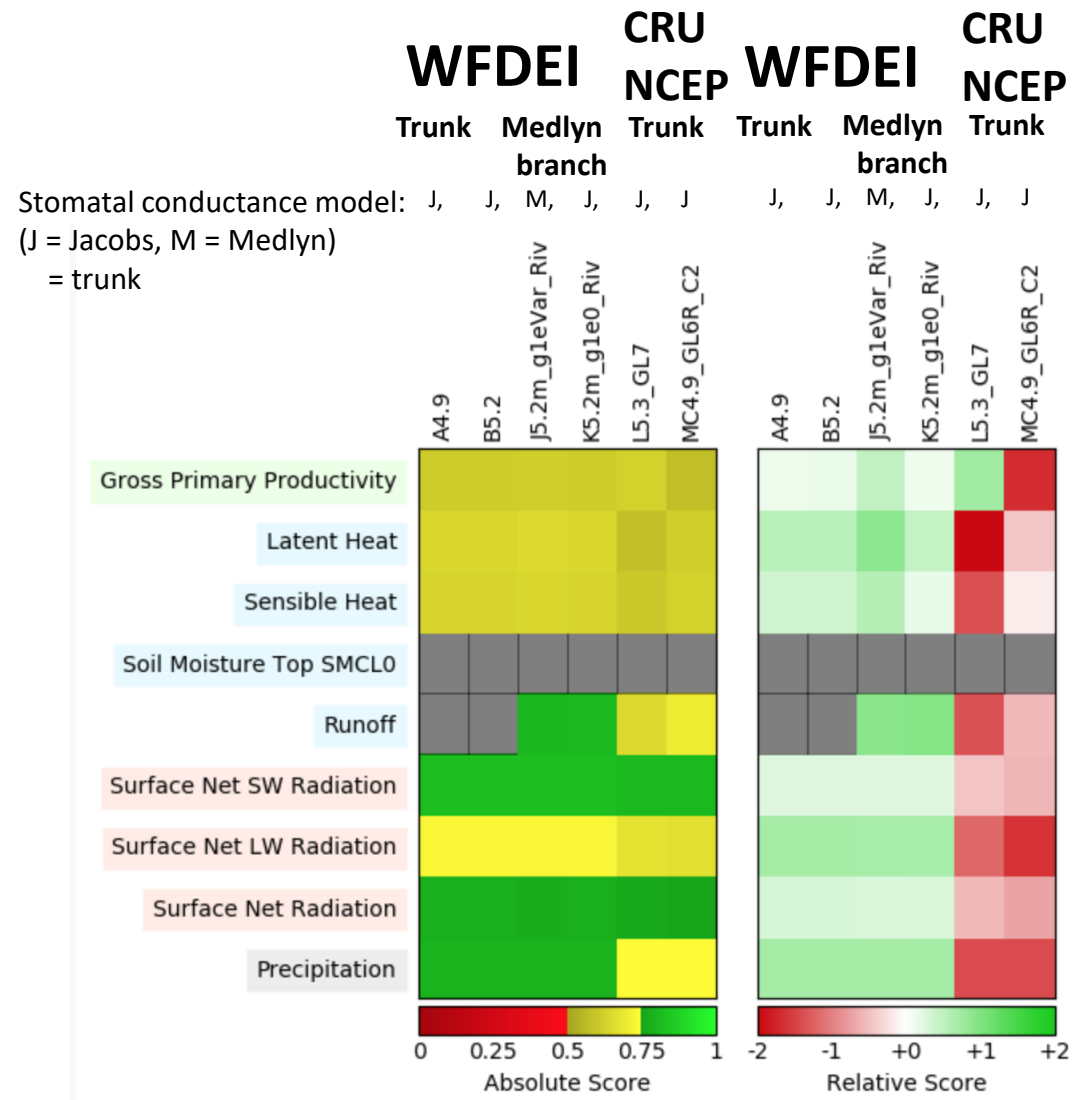
- We have yet to run the same experiment with GL6 and GL7: the forcings and grid are different…
- Loads of technical difficulties remain, but we are now progressing faster
- We are building new science for GL10 on top of GL6R



ILAMB comparisons of GL6R (WFDEI), GL7 (CRU-NCEP) and GL6R (CRU-NCEP)

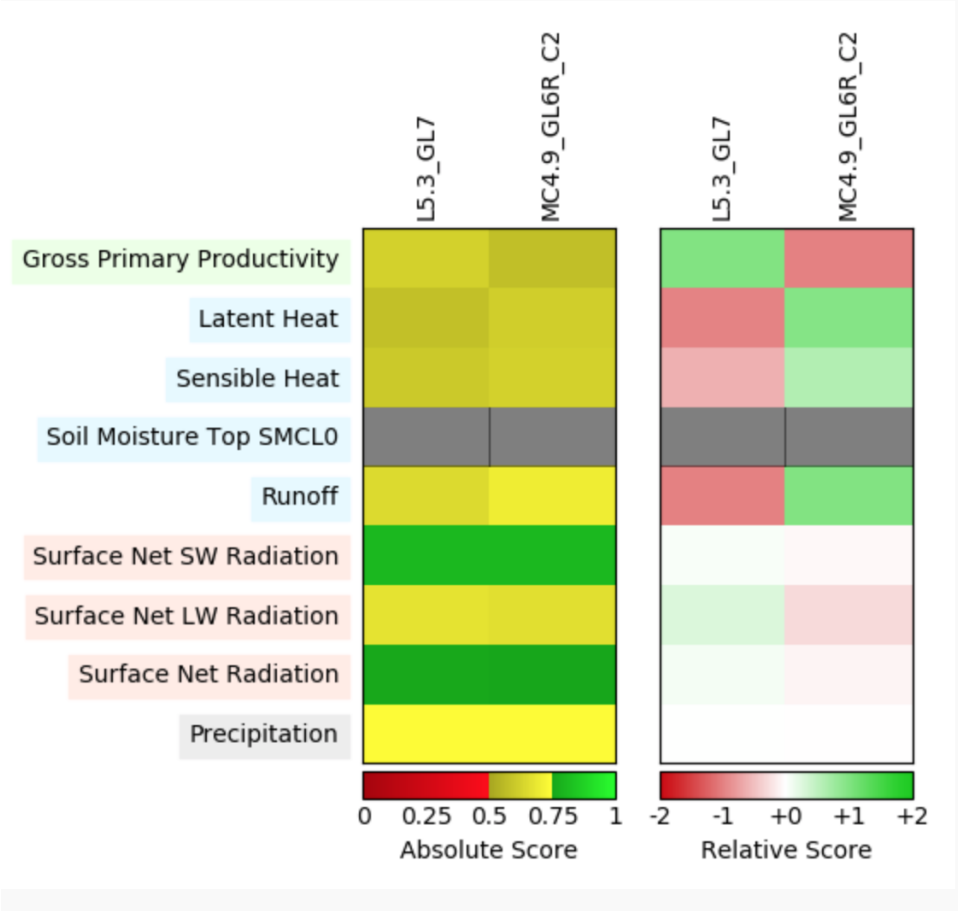
JULES runs and ILAMB analysis on CEDA JASMIN

ILAMB suite: u-bb897



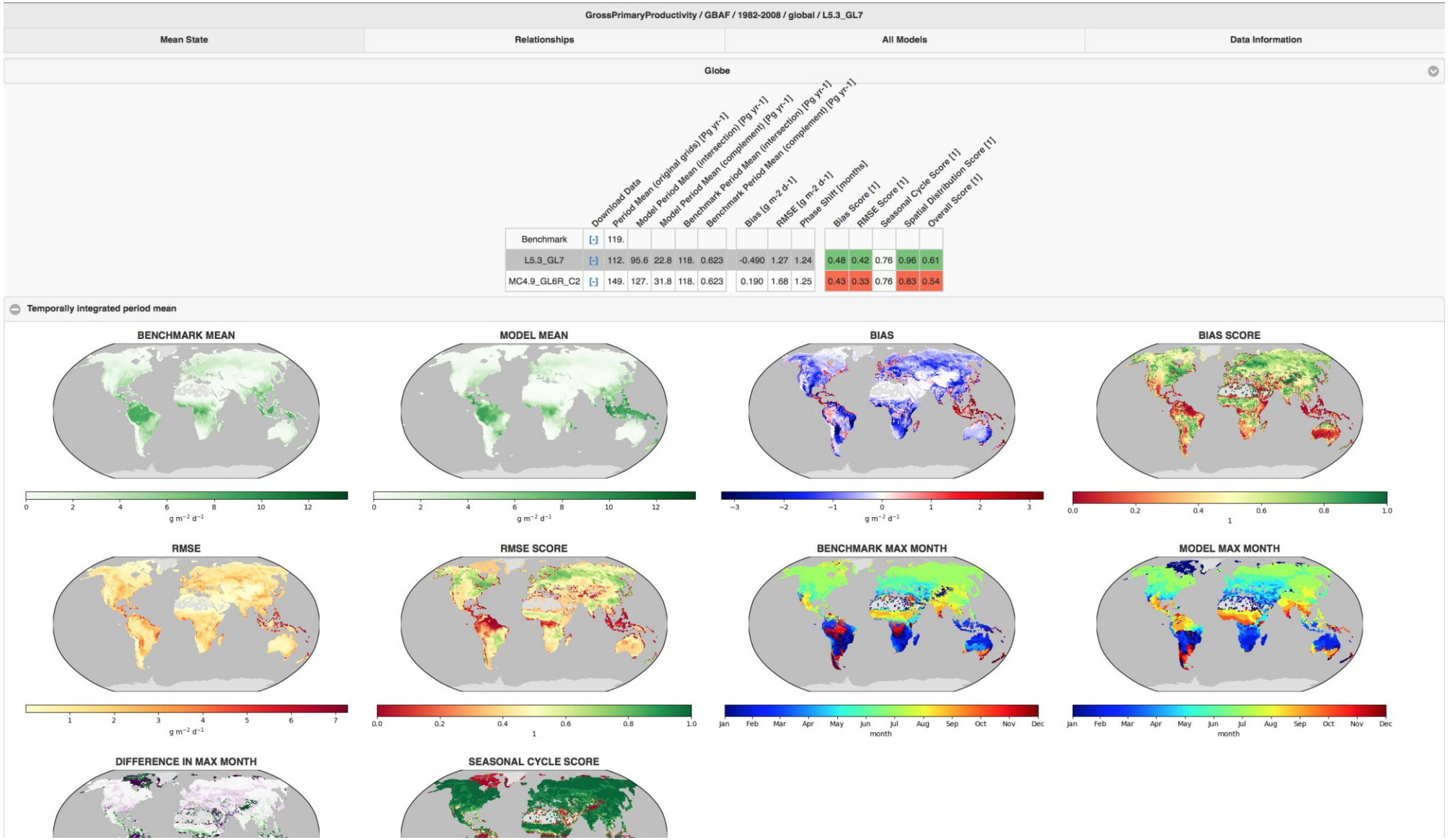
- Previously, we were working on the 0.5 degree WFDEI grid with WFDEI driving data and ancillaries (e.g. Medlyn branch=u-bb422)
- This is our first try (Rose/Cylc suite: u-aj577A7) at adding CRU/NCEP driving data and ancillary files to the GL6R simulation, in order to compare to the GL7 sim (u-bb316).
- The WFDEI runs had fixed CO2. The CRU/NCEP runs had time-varying CO2 ancillaries.
- Still working on GL7 with WFDEI.
- WFDEI is better here mainly due to the benchmarks also being at the same resolution.
- Next slide repeats the ILAMB run, but only for CRU/NCEP driving data and ancillaries.

ILAMB comparison of GL7 (CRU-NCEP) and GL6R (CRU-NCEP)

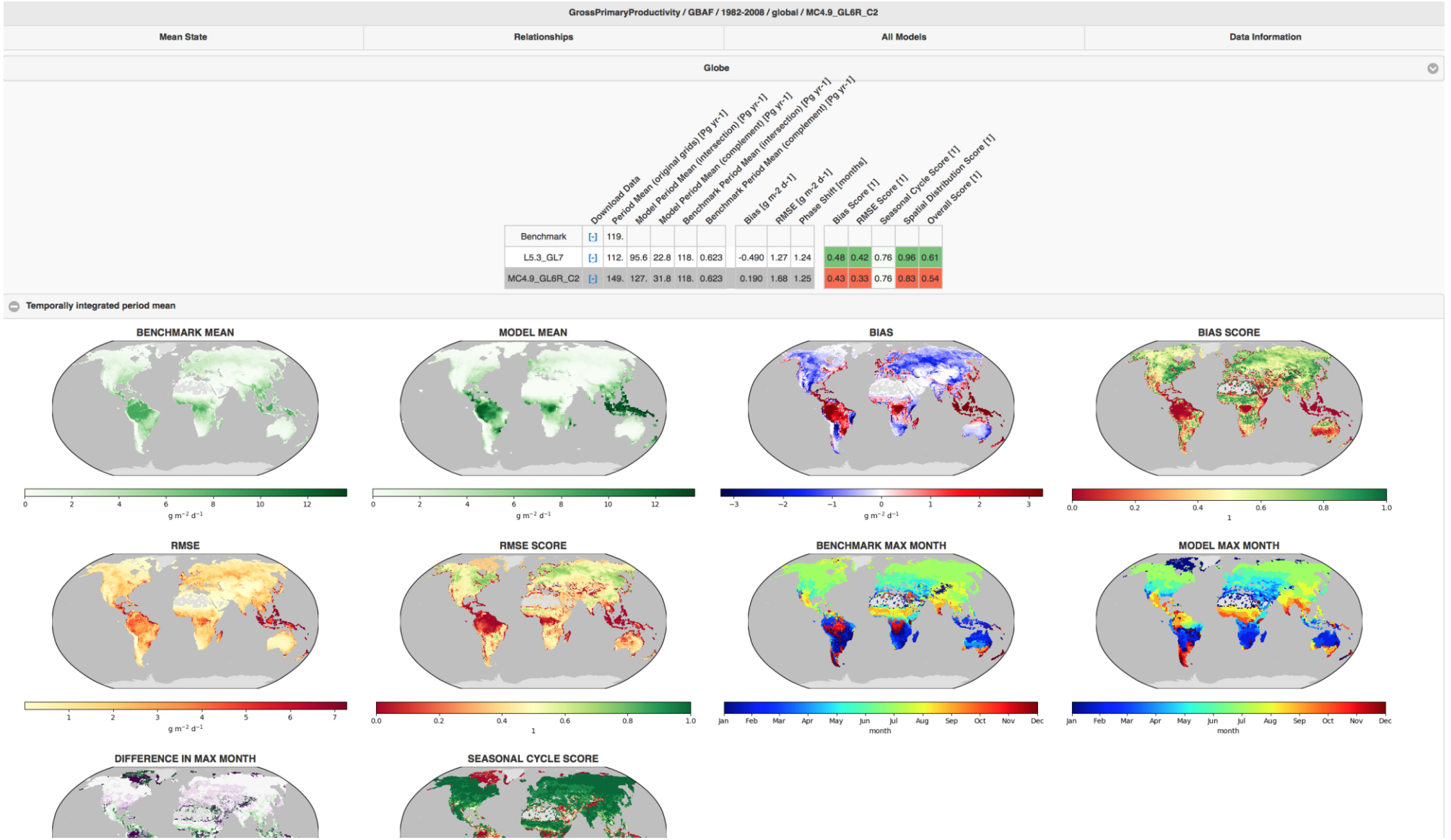


- GPP is better (in tropics) for GL7 than on GL6R
- Latent Heat Flux, Sensible Heat Flux, and Runoff are better in GL6R than in GL7
- Detailed geographic comparisons in the following pages

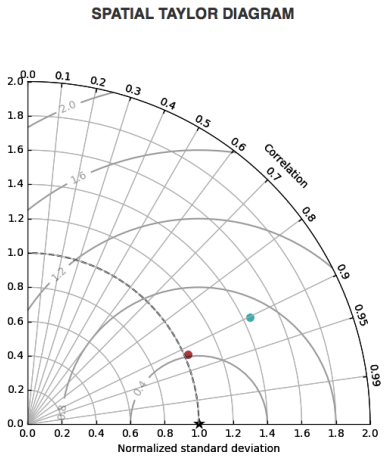
ILAMB: GPP: GL7

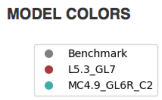


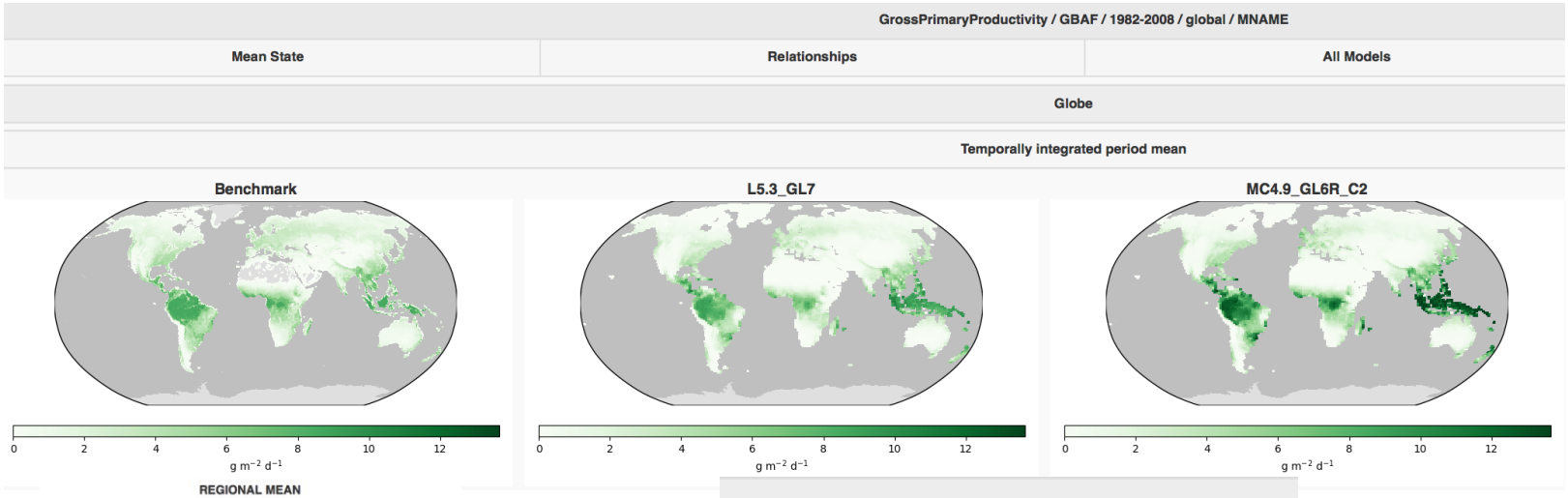
ILAMB: GPP: GL6R

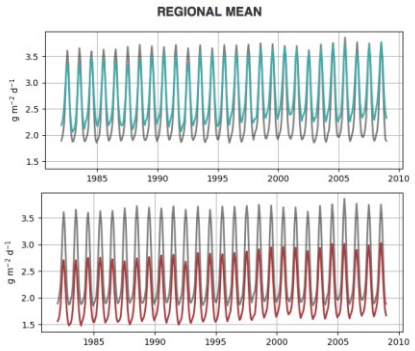


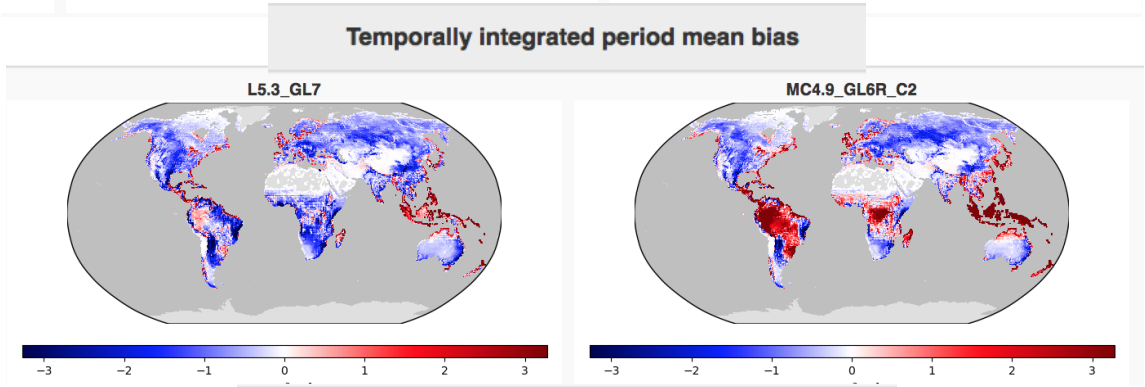
ILAMB:
GPP:
GL7 vs. GL6R

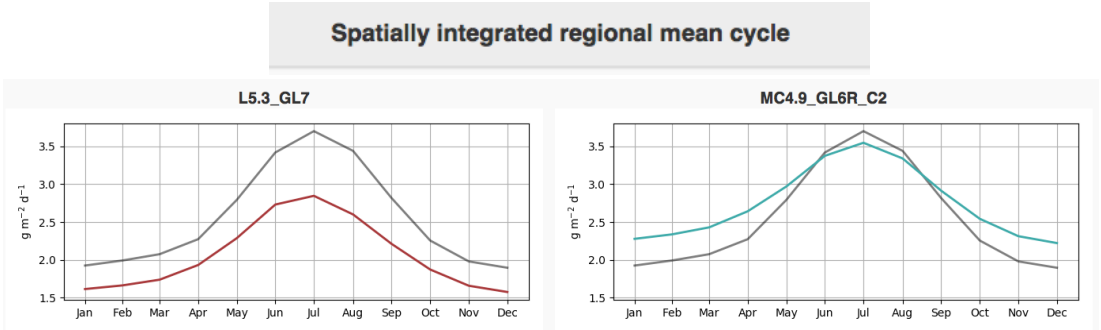


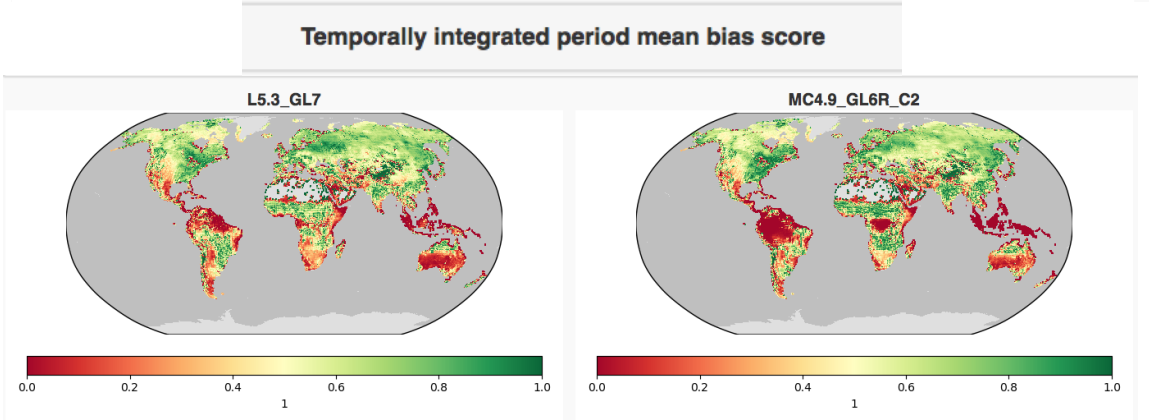




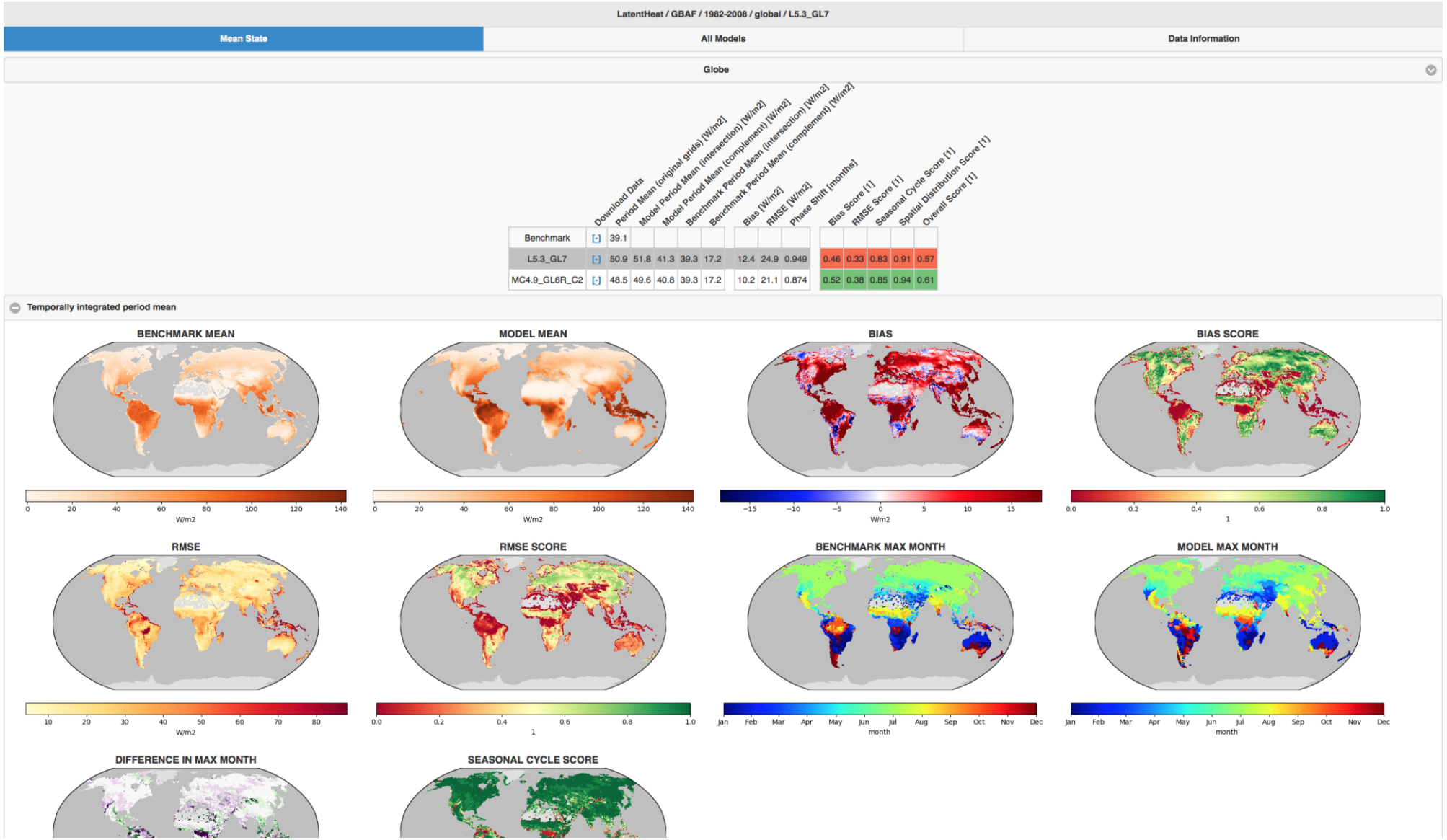




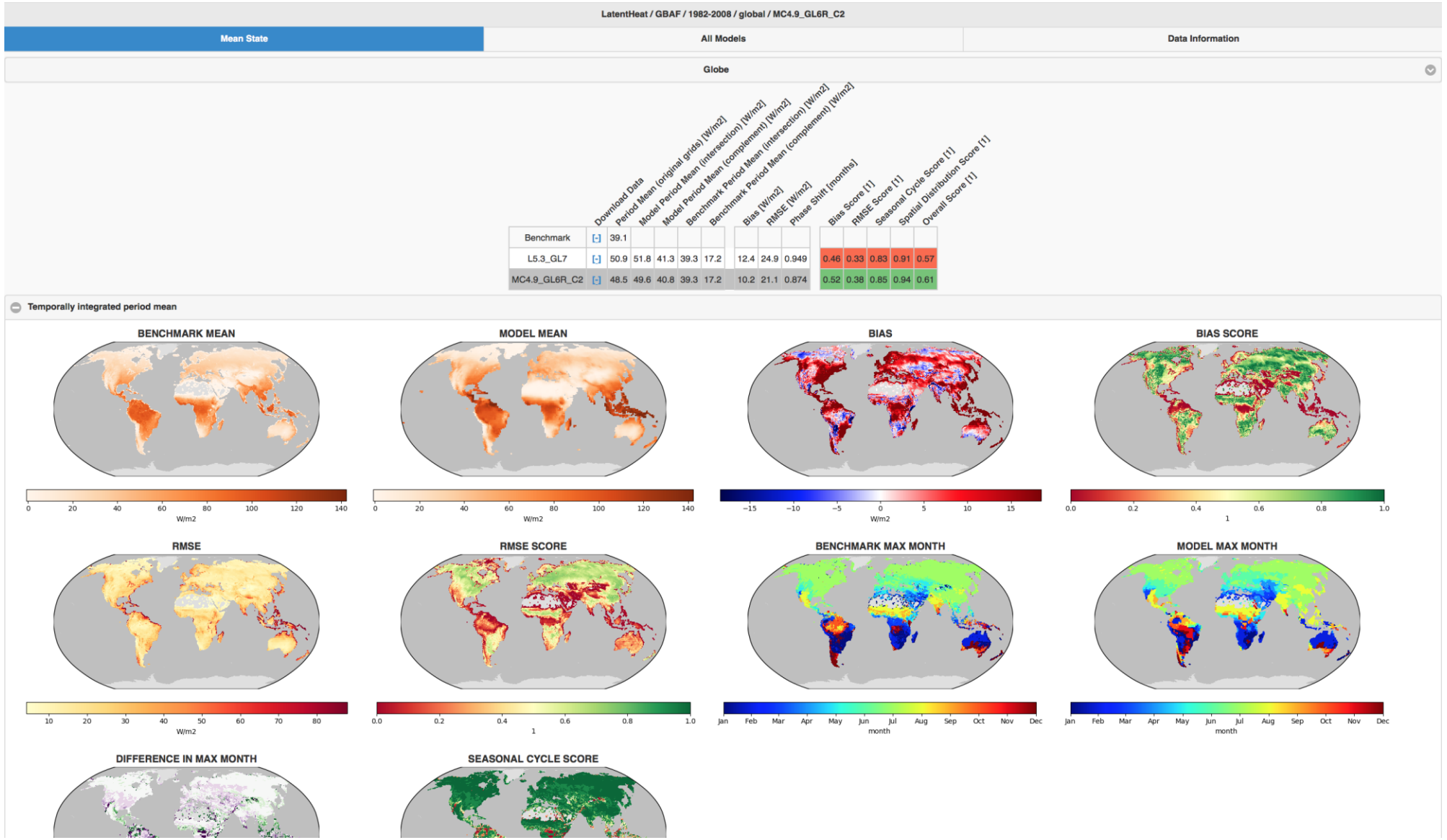




ILAMB: Latent Heat Flux: GL7



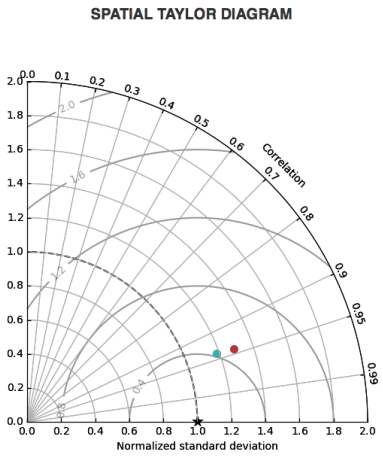
ILAMB: Latent Heat Flux: GL6R

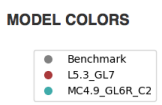


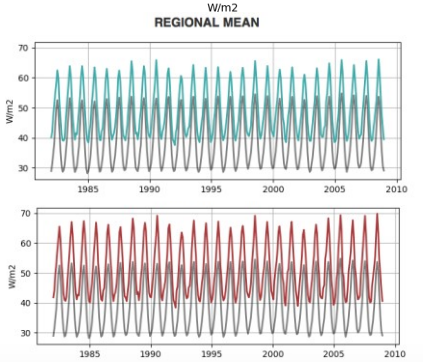
ILAMB:

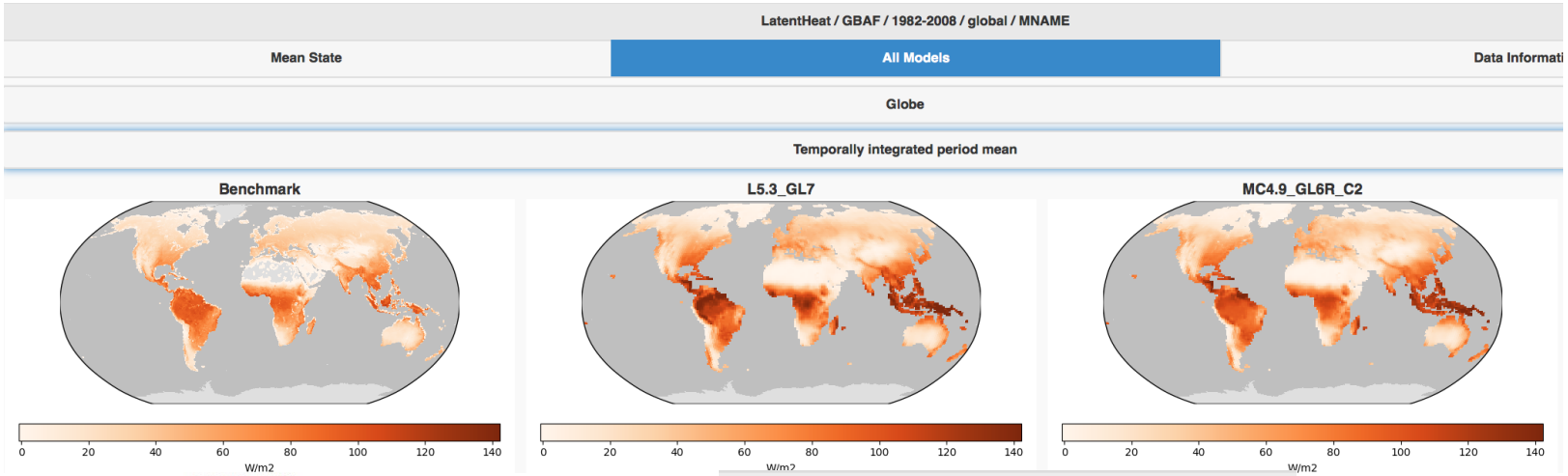
Latent Heat Flux:

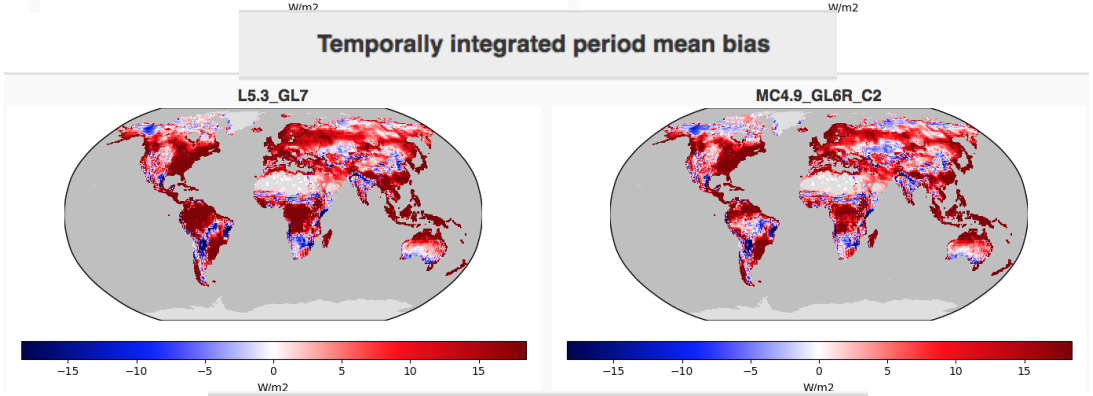
GL7 vs. GL6R

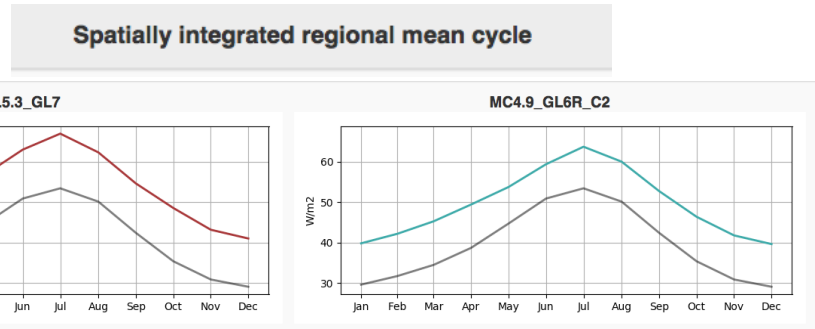


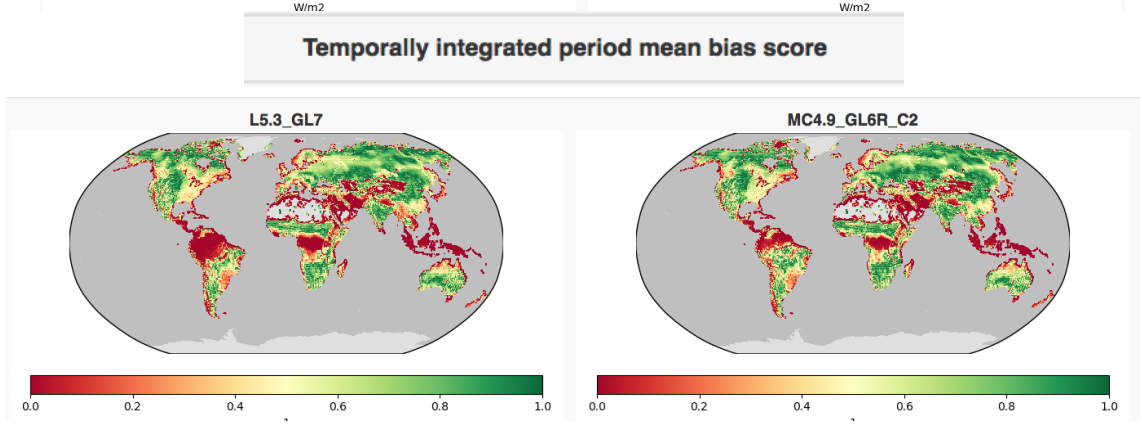










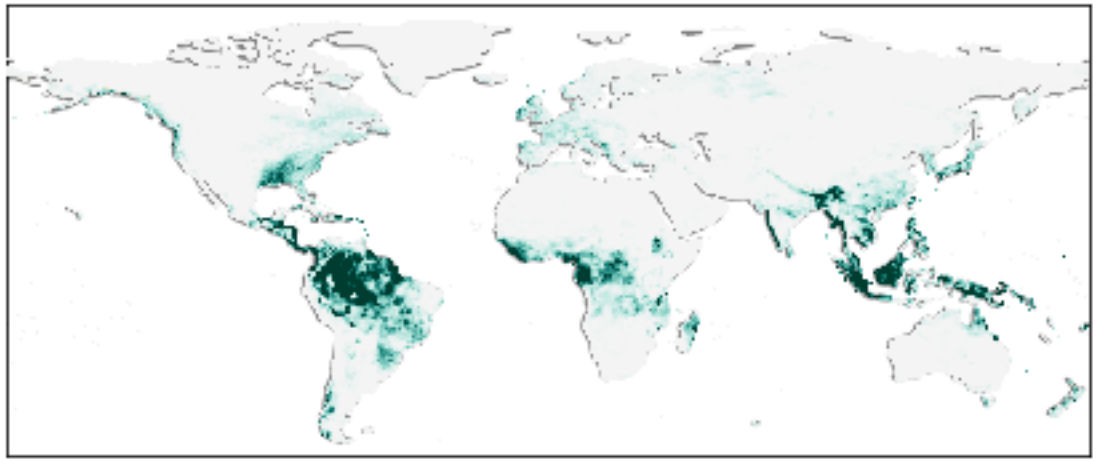


Work on understanding the role of TOPMODEL

Reasons:

- Simulation of irrigation, crops, adaptation routes (M Todt)
- Comparisons with GRACE data (M.E. Demory)
- Large-scale hydrology (Omar Müller)

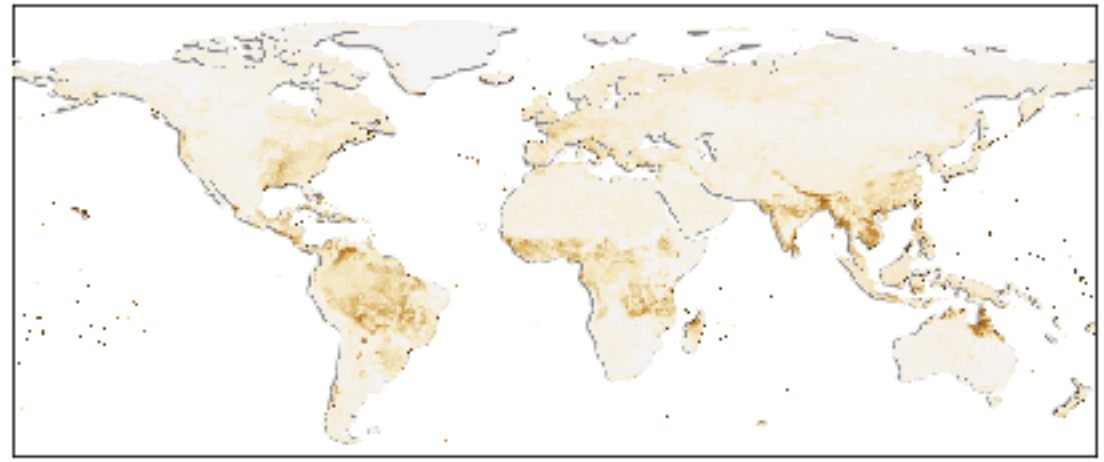
surface runoff diff (TOP MODEL on - TOP MODEL off)



−2.0 −1.5 −1.0 −0.5 0.0 0.5 1.0 1.5 2.0

R diff [mm/dy]

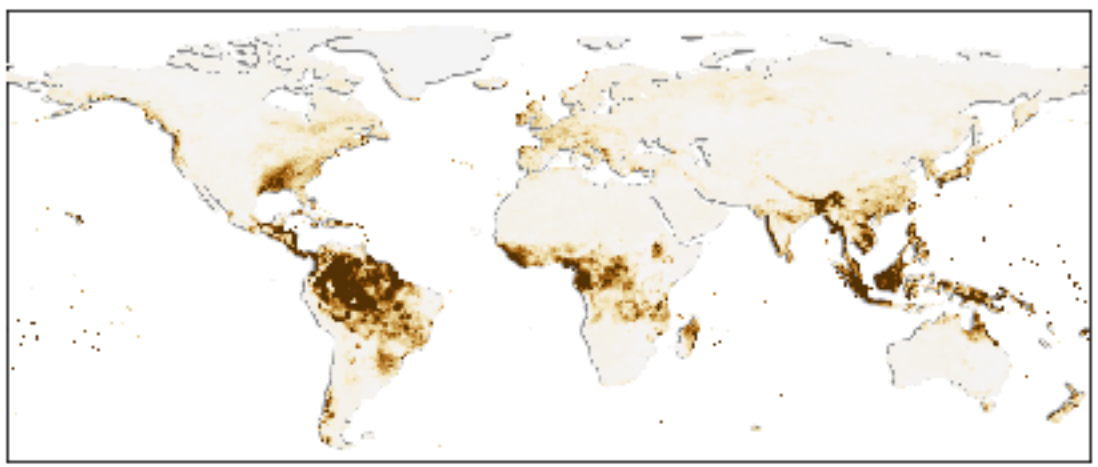
total runoff (TOP MODEL on - TOP MODEL off)



−1.00 −0.75 −0.50 −0.25 0.00 0.25 0.50 0.75 1.00

R+R_sb diff [mm/dy]

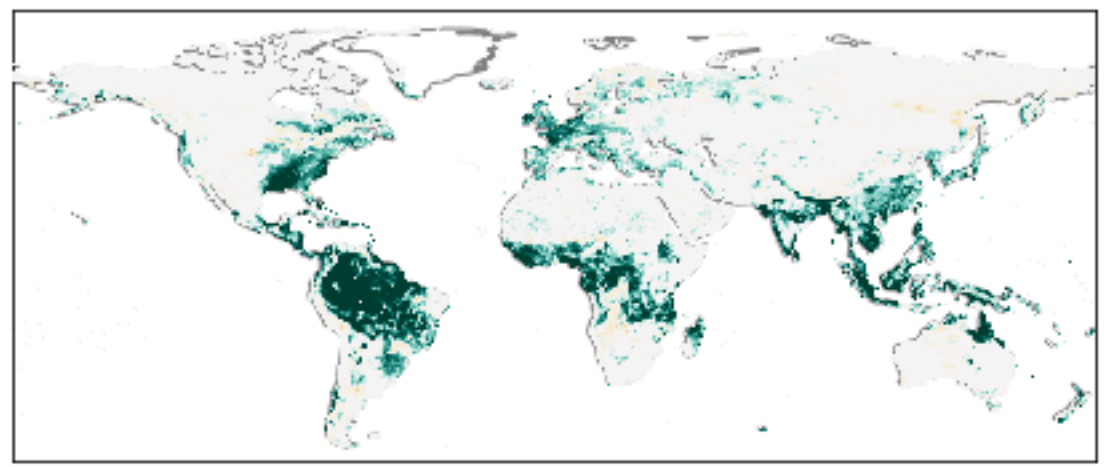
sub surface runoff diff (TOP MODEL on - TOP MODEL off)



−2.0 −1.5 −1.0 −0.5 0.0 0.5 1.0 1.5 2.0

R_sb diff [mm/dy]

avail SM 3m diff (TOP MODEL on - TOP MODEL off)



−40 −30 −20 −10 0 10 20 30 40

SM diff [%]

Omar Müller

Work on soil physics: minerals, parameters, parameterization

Reasons:

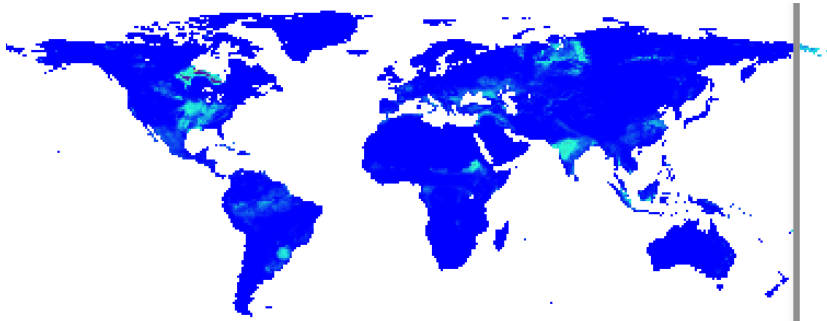
- Insufficient heterogeneity at high resolution
- Various errors in the past: log / ln, fitting of VG curves etc.
- Opportunities to insert uncertainty in terms of 3D distribution, as well as with a Stochastic Physics approach

Please talk to Patrick McGuire

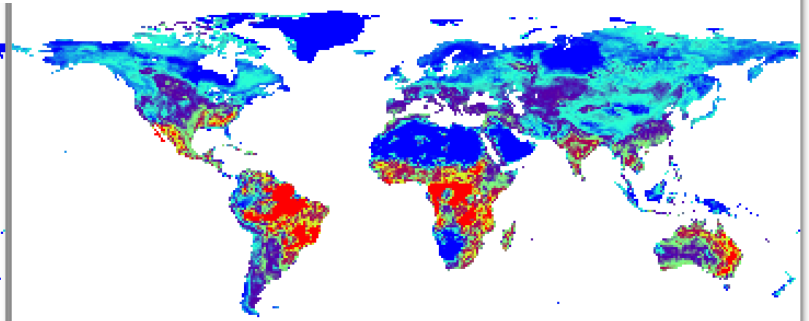
Preliminary results p1/6

Exponent: b (Brooks & Corey) **or** $\frac{1}{N-1}$ (Van Genuchten)

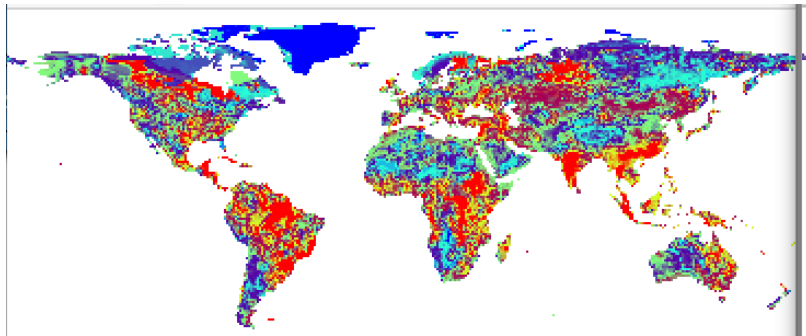
Van Genuchten, Toth Continuous PTF21



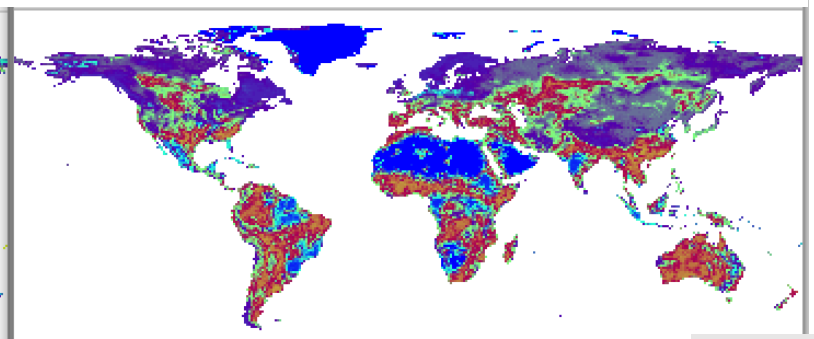
Van Genuchten, Toth Continuous PTF20



Brooks & Corey, Rawls & Brakensiek PTF



Van Genuchten, Toth Discrete PTF19



No units

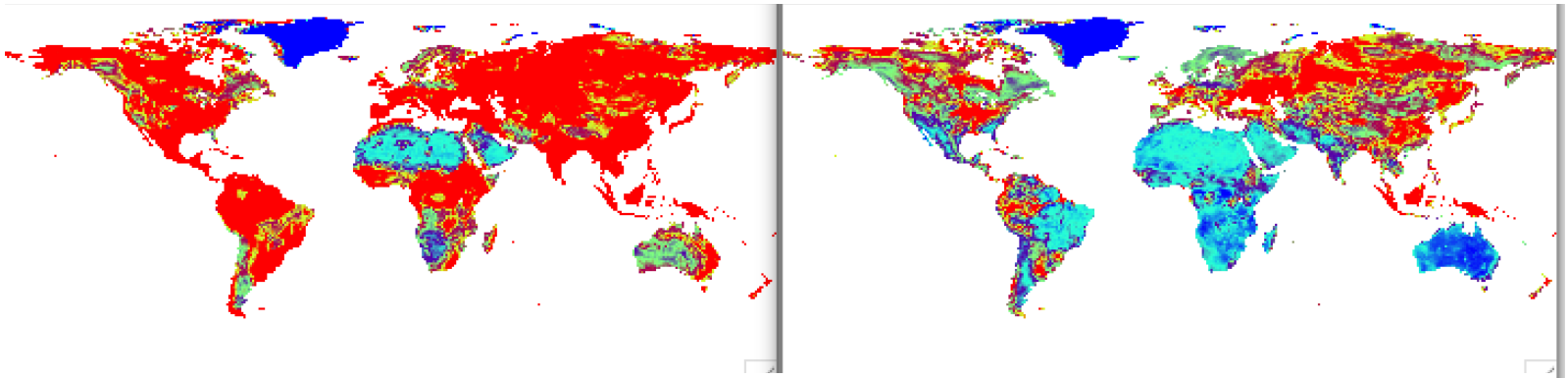
Patrick McGuire

Preliminary results p2/6

Soil Suction at saturation: ψ_b (B & C) **or** $\frac{1}{\alpha}$ (VG)

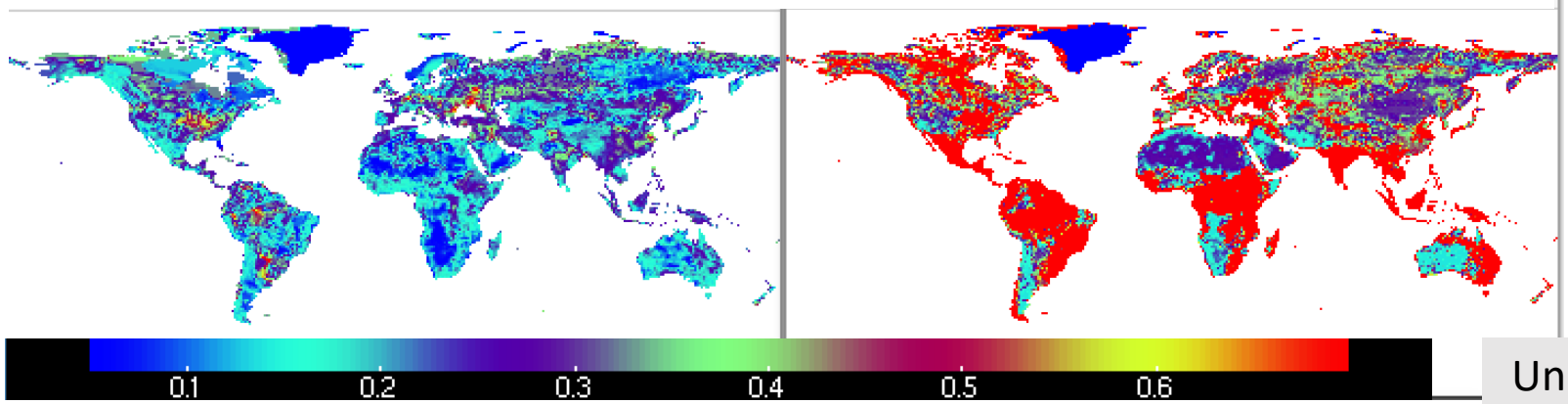
Van Genuchten, Toth Continuous PTF21

Van Genuchten, Toth Continuous PTF20



Brooks & Corey, Rawls & Brakensiek PTF

Van Genuchten, Toth Discrete PTF19



Units = m

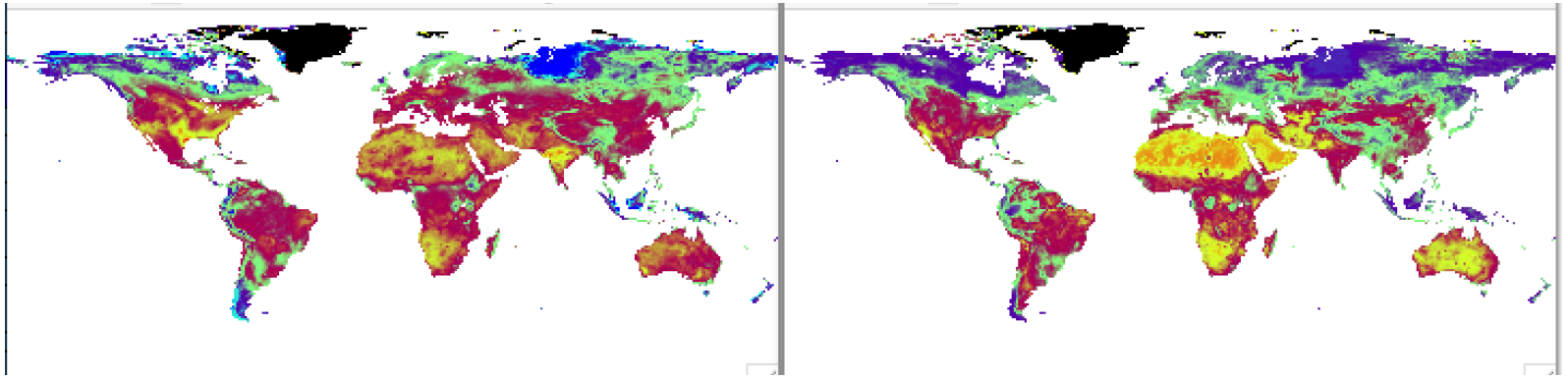
Patrick McGuire

Preliminary results p3/6

Soil Moisture at saturation – Residual Soil Moisture

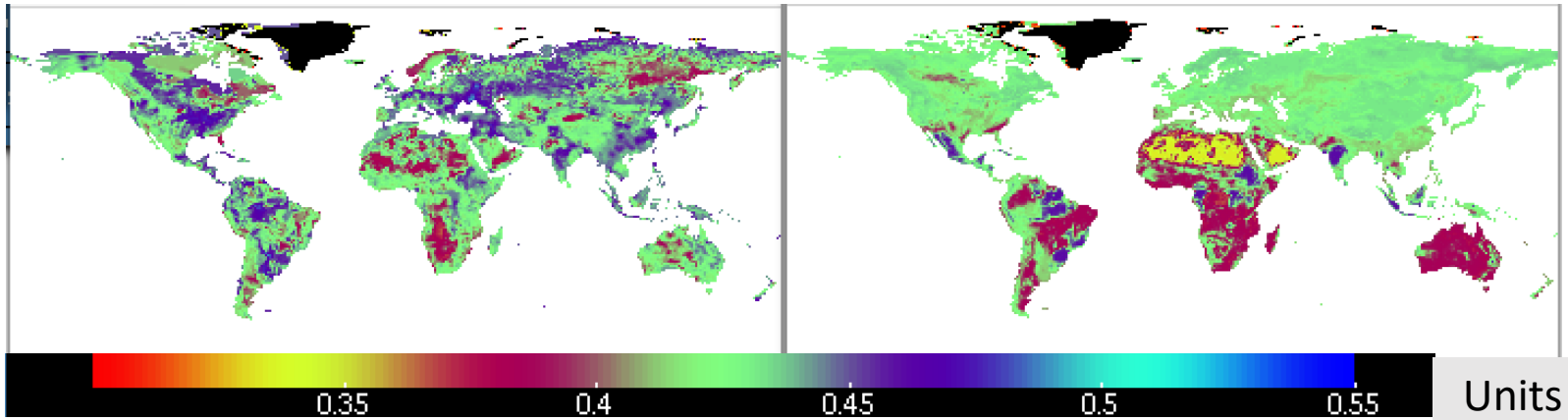
Van Genuchten, Toth Continuous PTF21

Van Genuchten, Toth Continuous PTF20



Brooks & Corey, Rawls & Brakensiek PTF

Van Genuchten, Toth Discrete PTF19



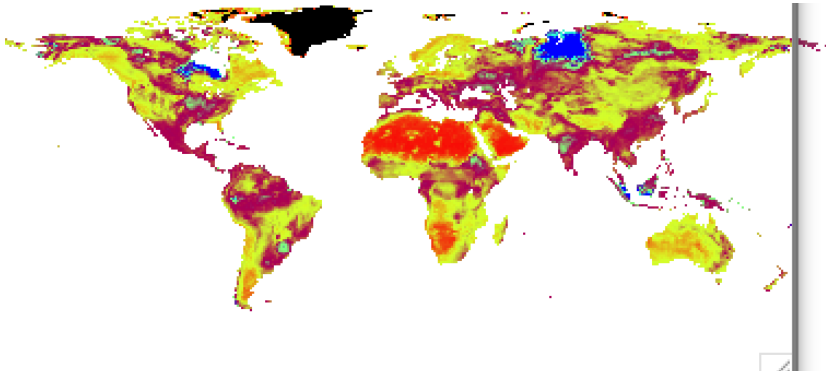
Units = m^3/m^3

Patrick McGuire

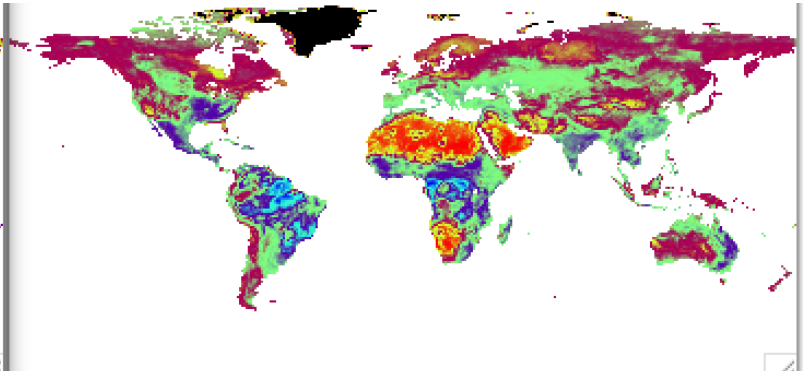
Preliminary results p4/6

Soil Moisture at wilting point – Residual Soil Moisture

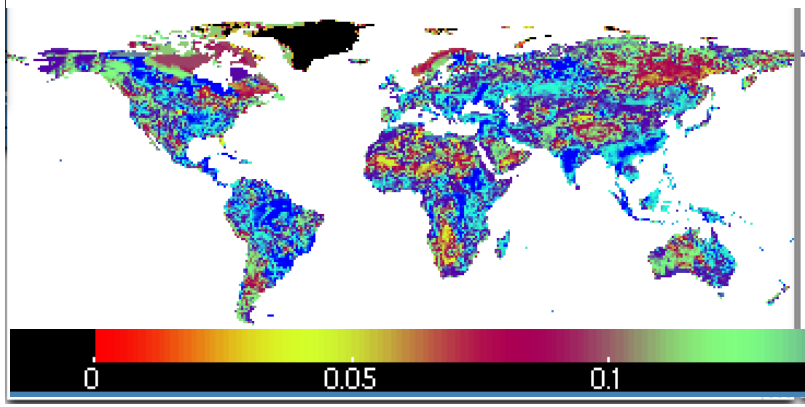
Van Genuchten, Toth Continuous PTF21



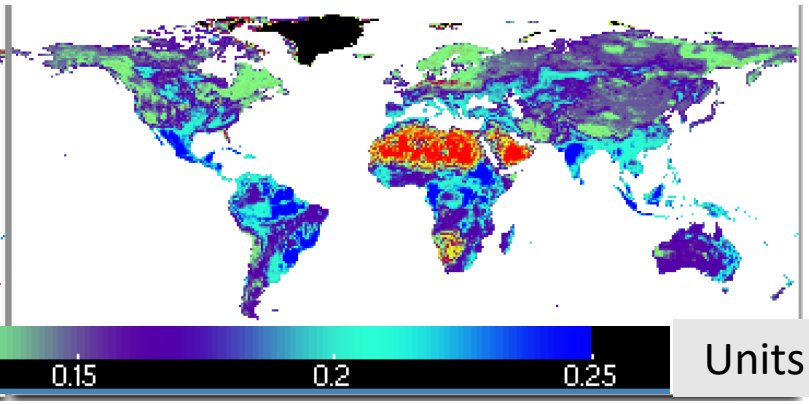
Van Genuchten, Toth Continuous PTF20



Brooks & Corey, Rawls & Brakensiek PTF



Van Genuchten, Toth Discrete PTF19



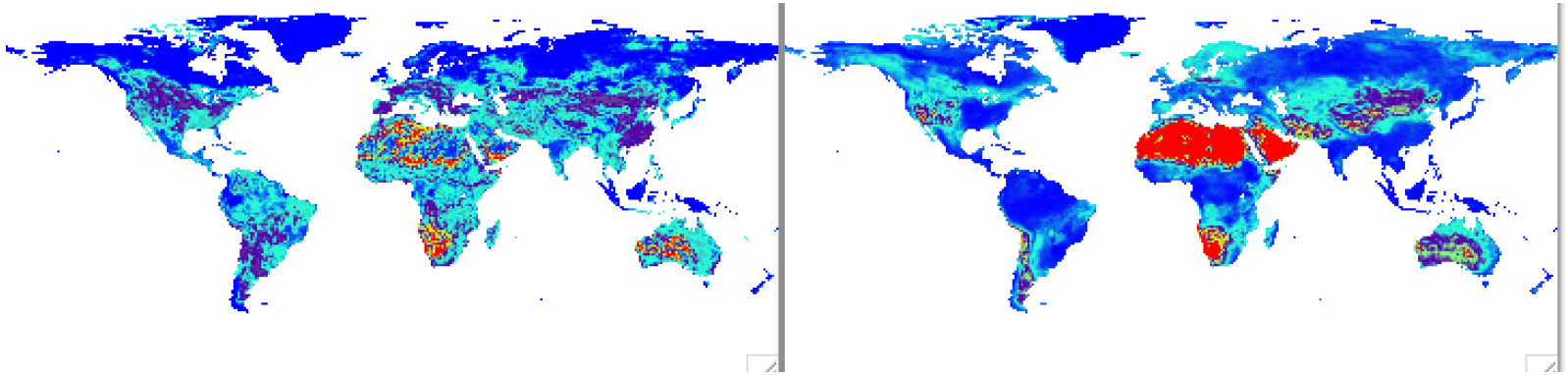
Units = m^3/m^3

Preliminary results p5/6

Hydraulic Conductivity at saturation (K_{sat})

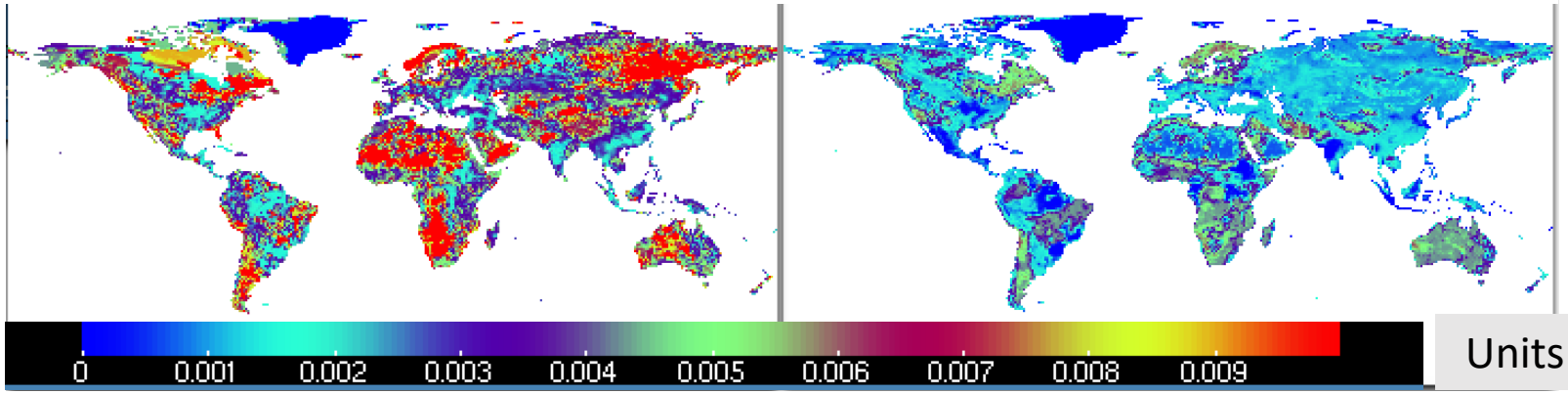
Van Genuchten, Toth Continuous PTF21

Van Genuchten, Toth Continuous PTF20



Brooks & Corey, Rawls & Brakensiek PTF

Van Genuchten, Toth Discrete PTF19

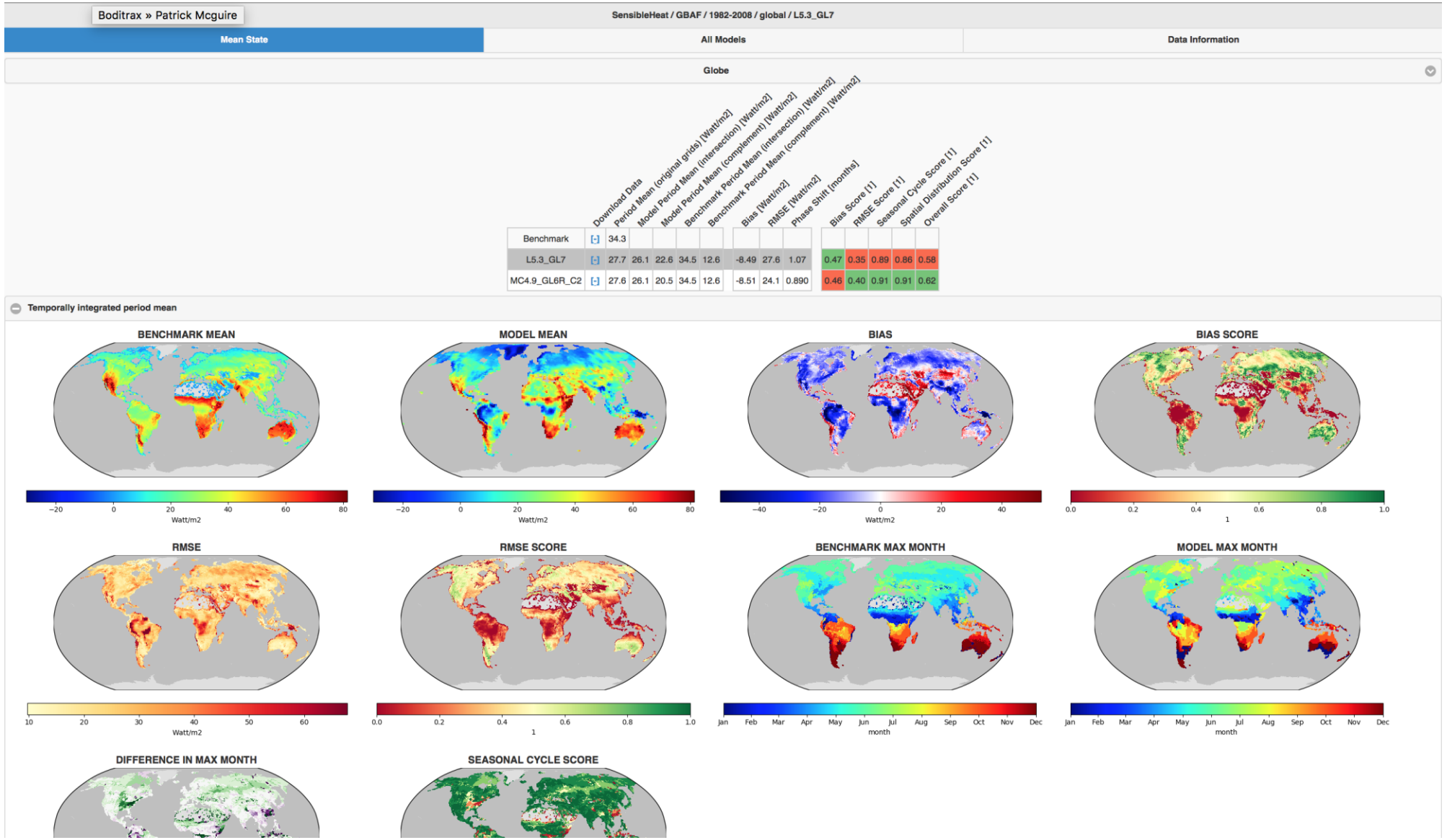


Units = mm/s

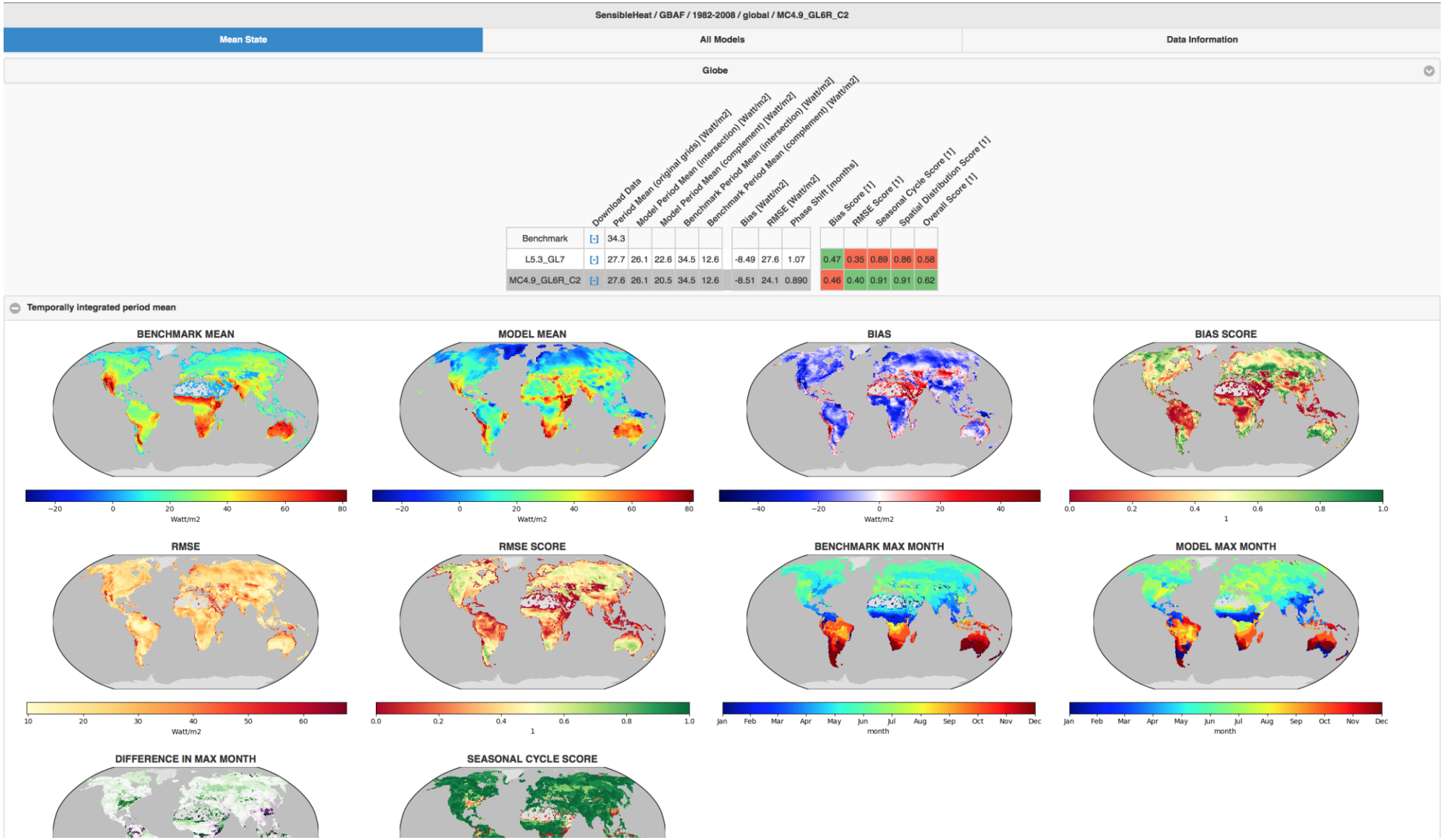
Where next

- We need to consolidate our efforts if we aim to influence GL10
  - Example: agree grid and forcing meteo; agree radiative forcing
  - **Basically we need a protocol for GL development**
- Inserting new soils parameters and maps in GL10 will require a pragmatic approach: it will not be the final product first time around, but it is a start, to engage the soils community
- We need to go beyond (and deeper than) iLAMB / LVT, and again we must work together

ILAMB: Sensible Heat Flux: GL7



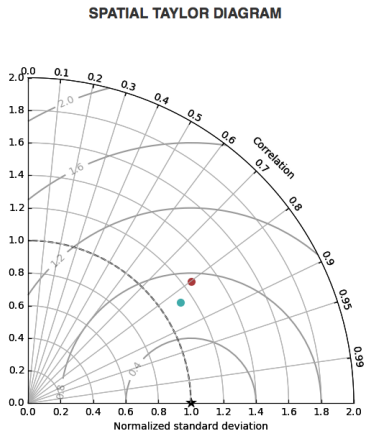
ILAMB: Sensible Heat Flux: GL6R

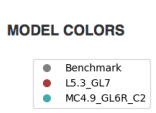


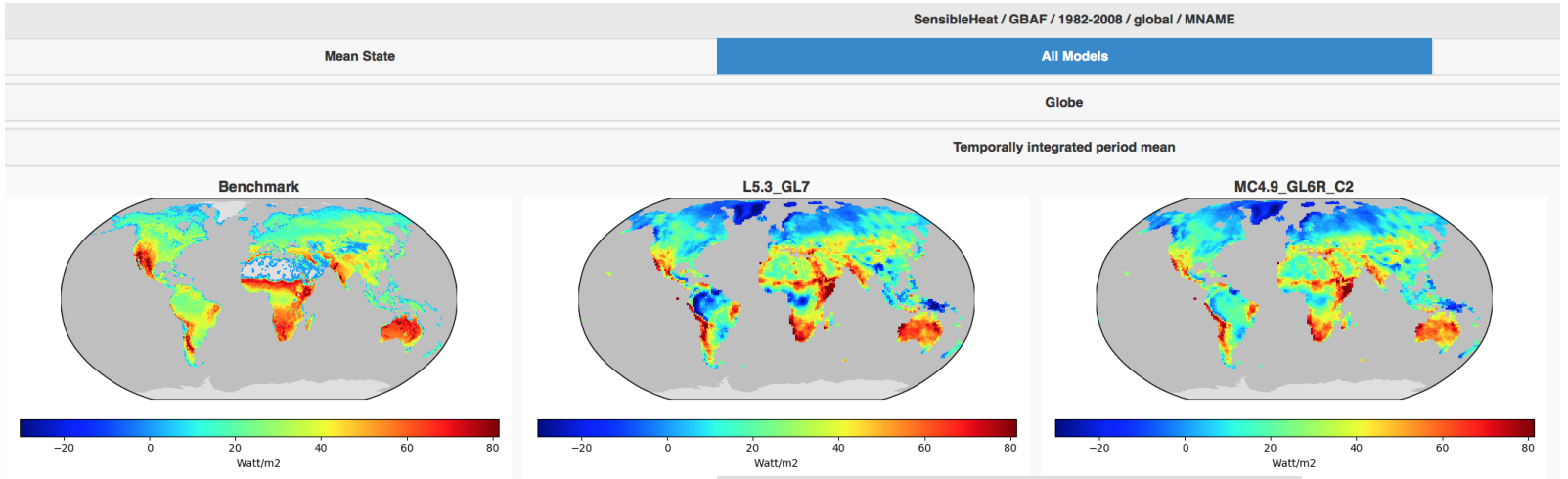
ILAMB:

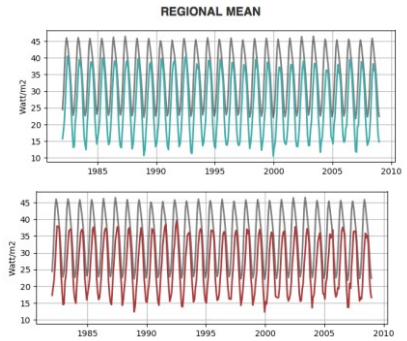
Sensible Heat Flux:

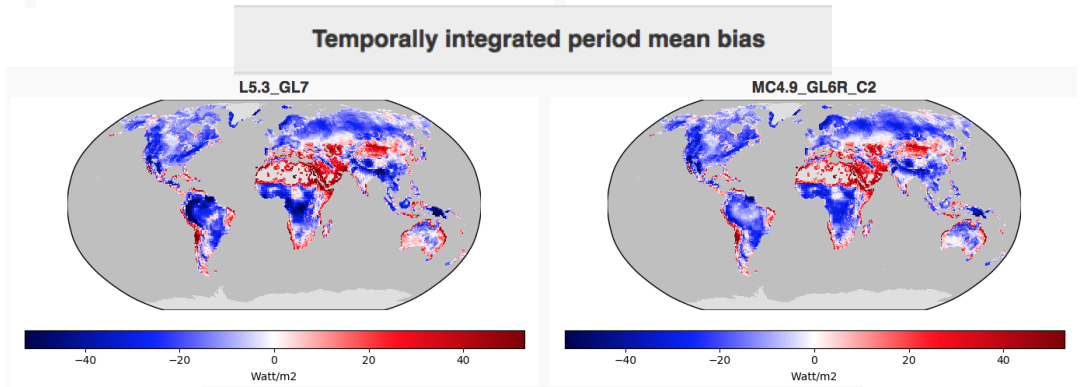
GL7 vs. GL6R

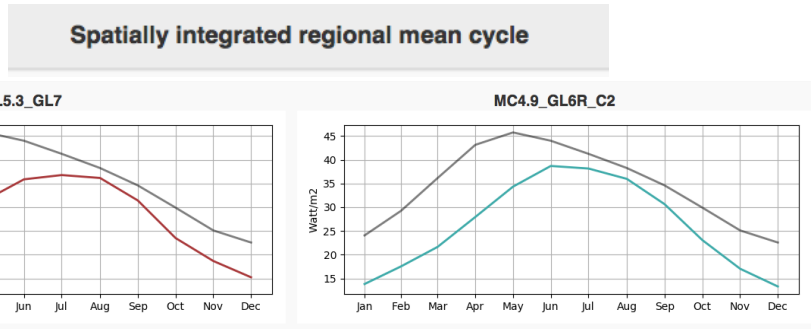


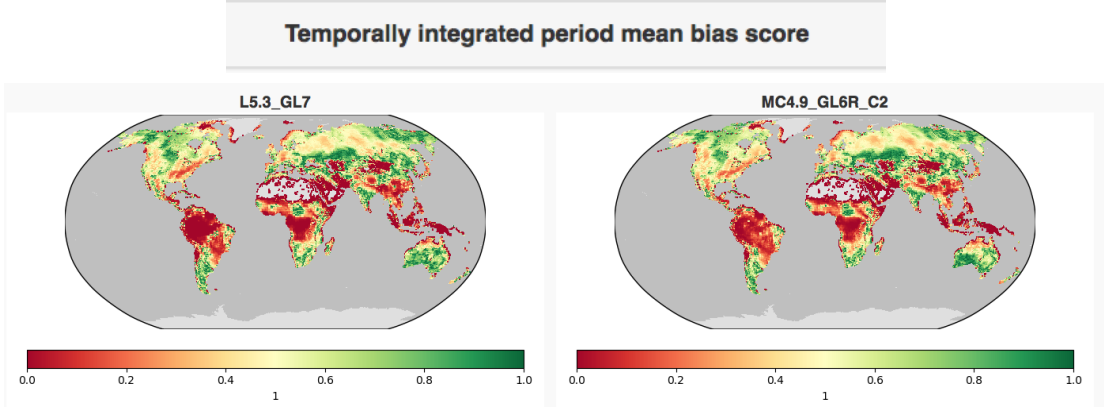












ILAMB comparison of GL7 (CRU-NCEP) and GL6R (CRU-NCEP)

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