

Team Land Report

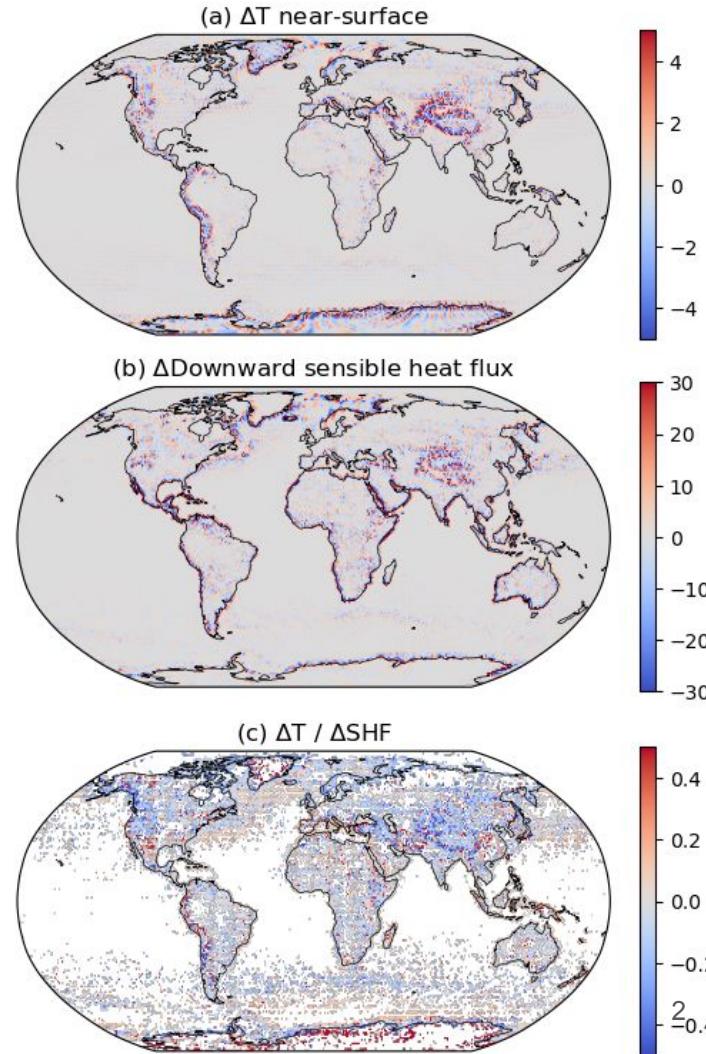
May 14 (Wed 2025)

Do Ngoc Khanh, Ching-Hung Shih, Kei Yoshimura, Shuping Li,
Ryotaro Omae, Chu-Yi Chang, Jie Hsu, Ren-Jie Wu, Yen-Ting Chou

Results - Thermal Process (Recap)

- March monthly mean result, zoom 5 vs 7 ⇒
- Little change on the ocean.
- On land, large ΔT and ΔSH around mountainous area (Andes, Himalayas, Rockies).
- $\Delta T / \Delta SH < 0$, in general.

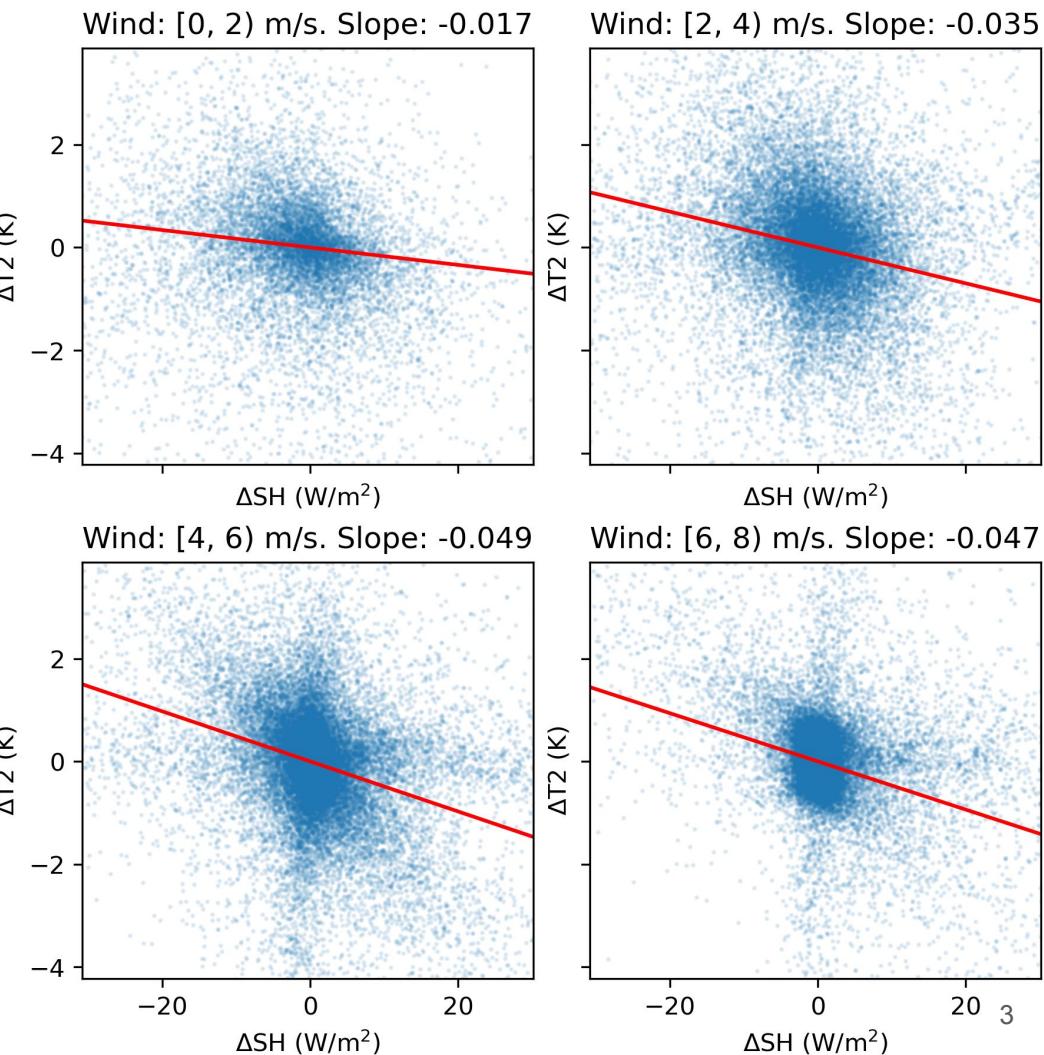
- Further questions:
 - Factors controlling $\Delta T / \Delta SH$ magnitude.
 - Seasonal variation.



ΔSH , $\Delta T2$ and $U10$

Stronger slope in windier places.

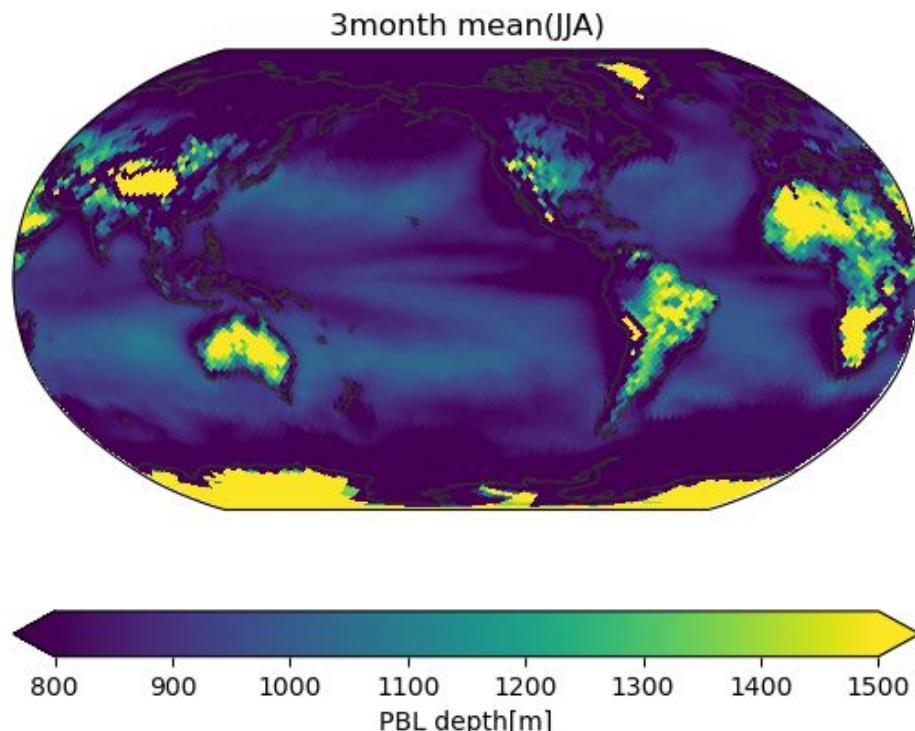
Why? ...Now thinking



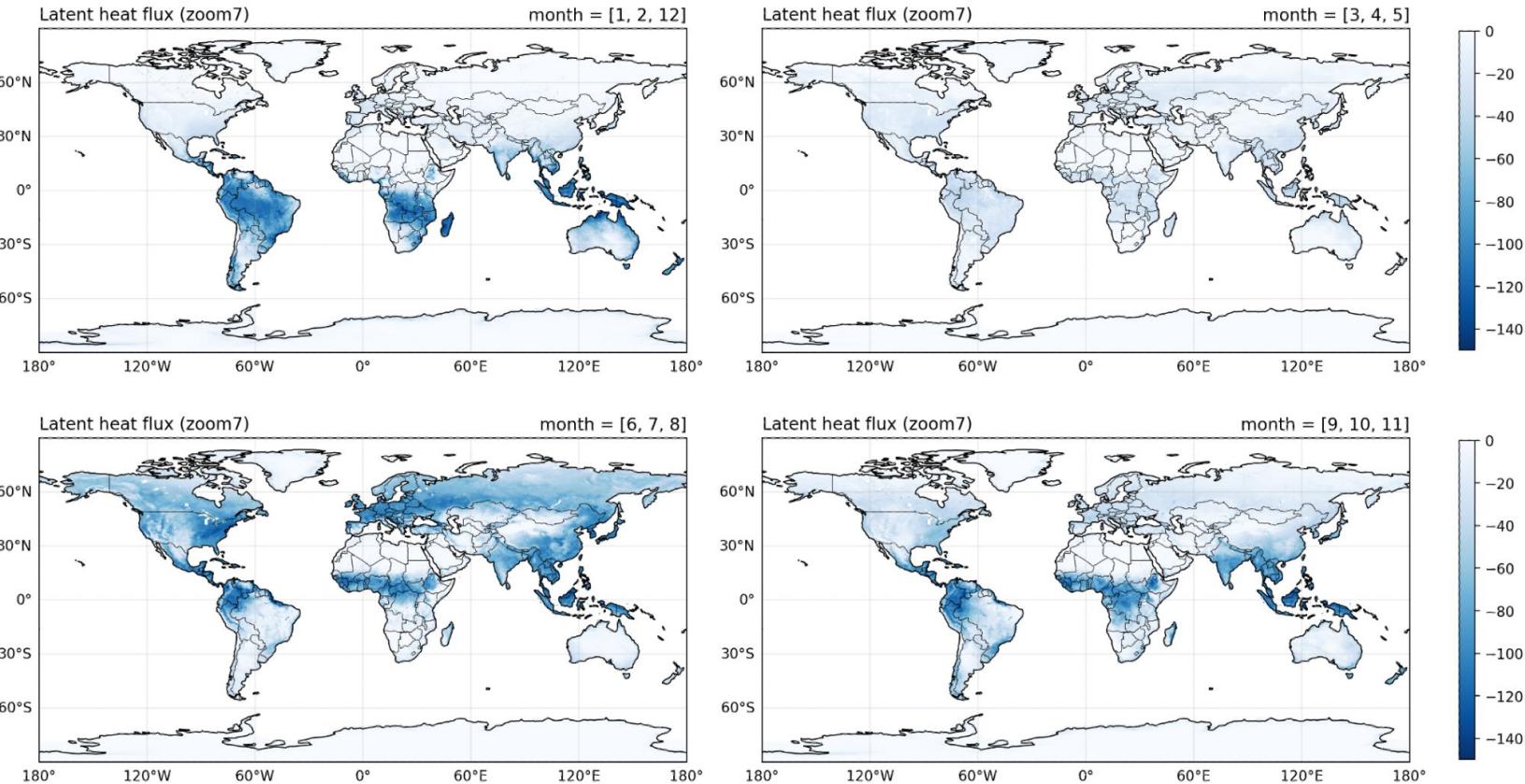
Preliminary Results - Diagnostic PBLH

Update of diagnosis of boundary layer depth

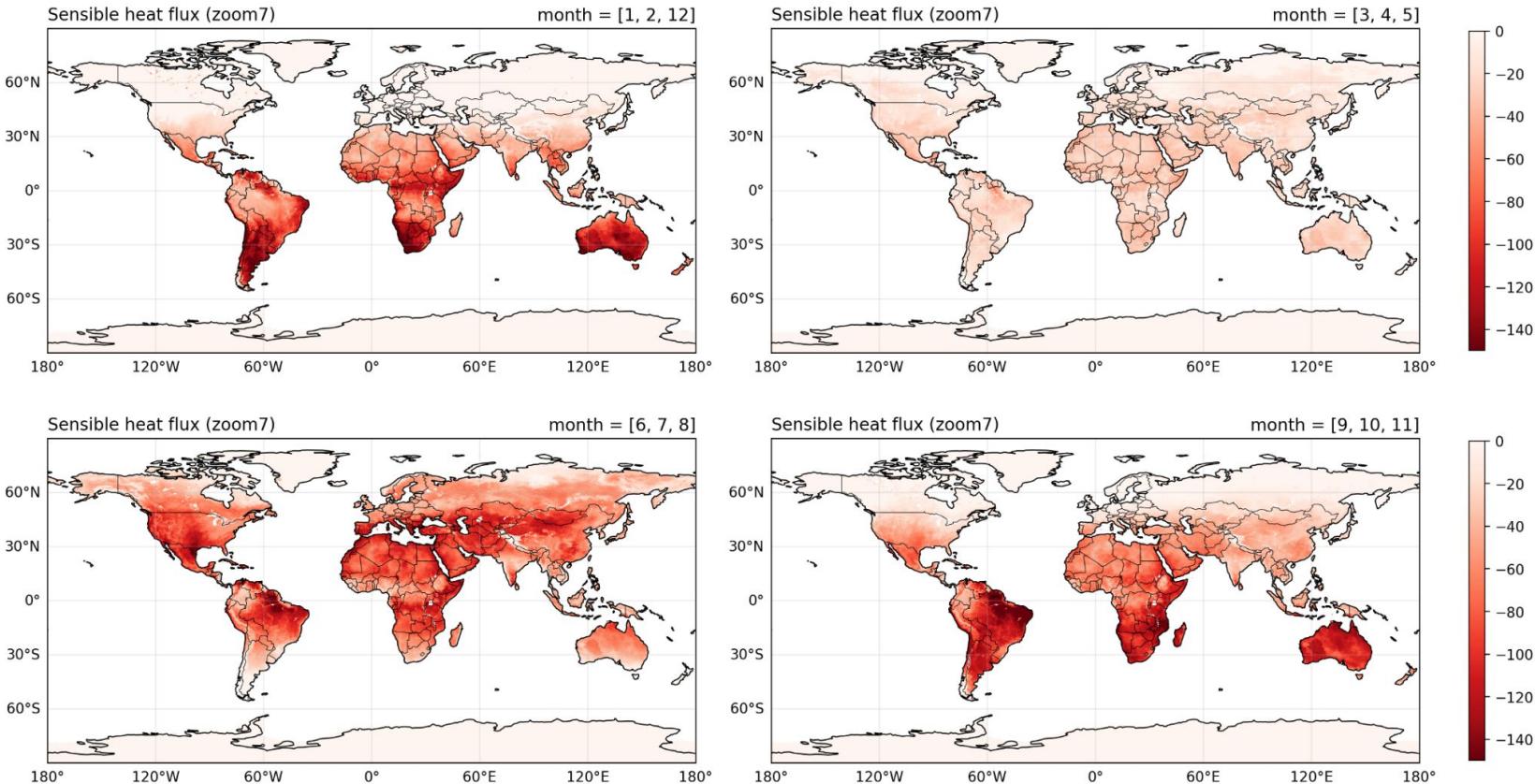
- Fixed yesterday's problem near high mountains.
- Reasonably reproduced the large depths in China, Africa and so on.
- Problem: Too large depth in Antarctica



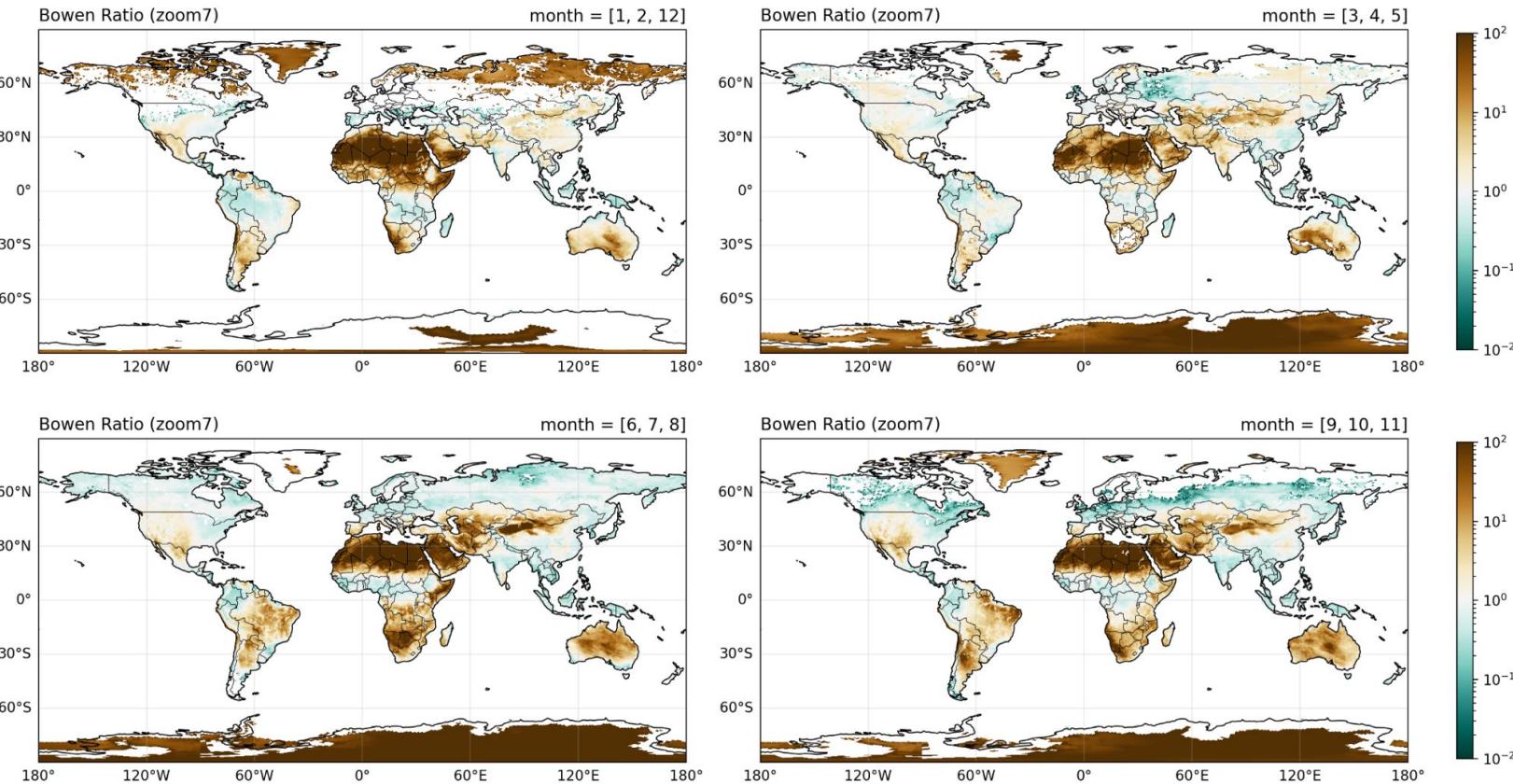
- Latent heat flux seasonality in healpix, zoom = 7



- Sensible heat flux seasonality in healpix, zoom = 7



- Bowen Ratio seasonality in healpix, zoom = 7



Recap

Correlation between SM and subsequent P

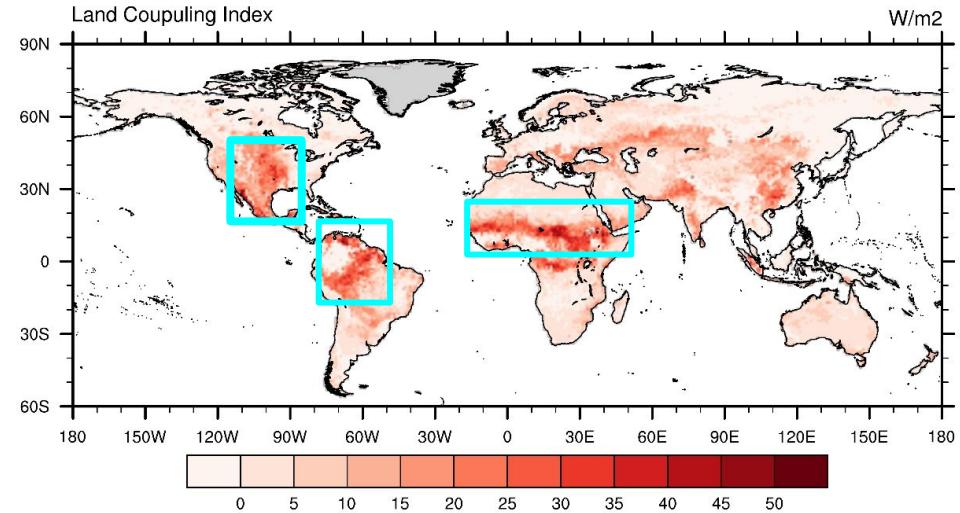
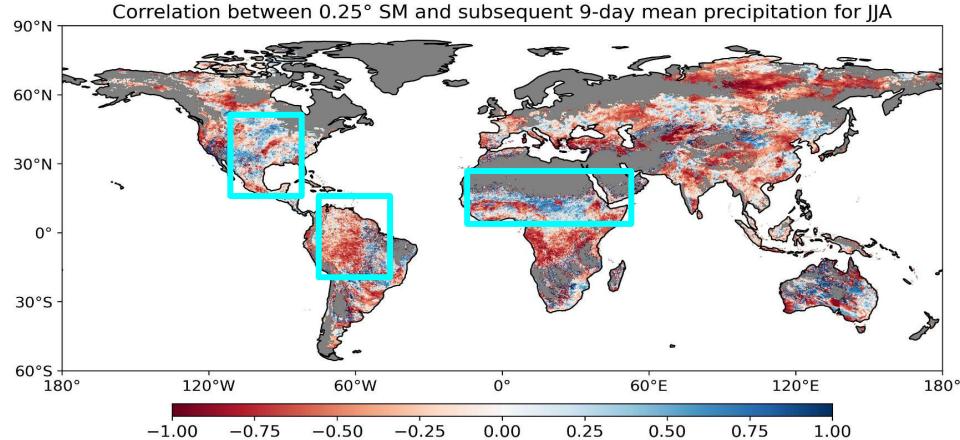
- Most of land area have negative correlation, which is quite different to many previous GCM results

Land Coupling Index = $\text{corr}(\text{SM}, \text{ET}) * \text{std}(\text{SM})$

- Strong land coupling in Mid-US, Mid-Africa, and Amazon
- May have strong SM-LH-P feedback

Interesting finding

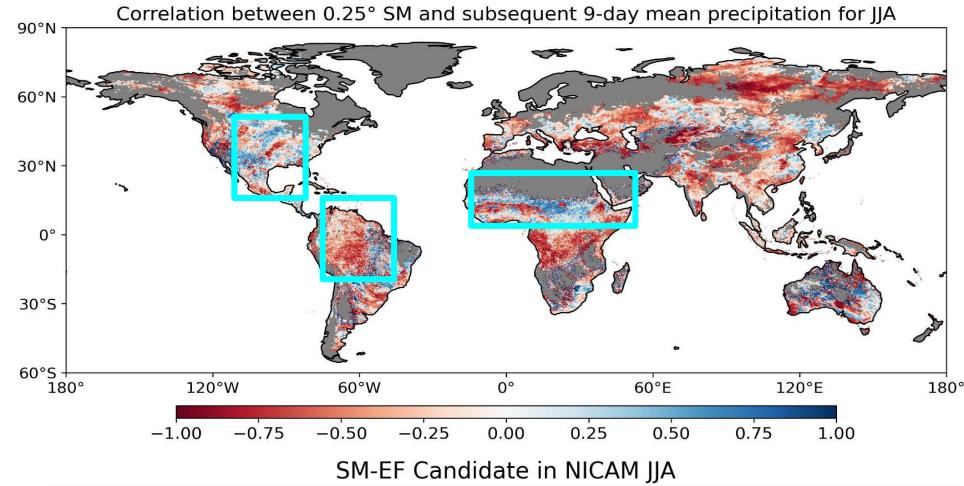
- negative SM-P: Amazon
- positive SM-P: Mid-US and Mid-Africa



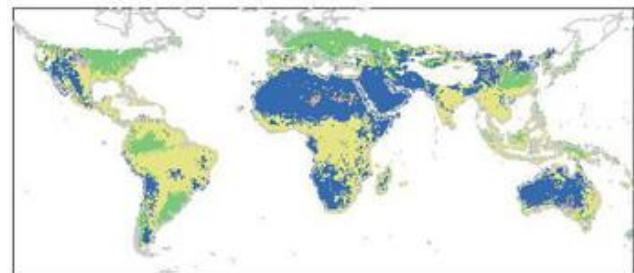
Preliminary Results

SM-EF candidate

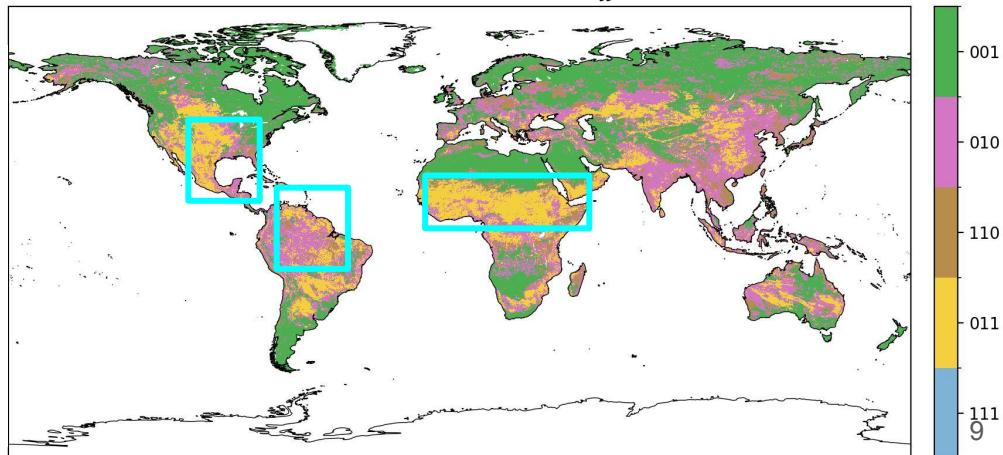
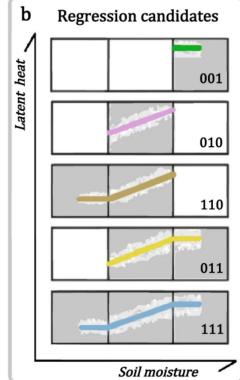
- C010: negative SM-P feedback (Amazon)
- C011: positive SM-P feedback (Mid-US and Mid-Africa)
- NICAM high-resolution simulation is different from ERA5



ERA5



Hsu and Dirmeyer (2022)



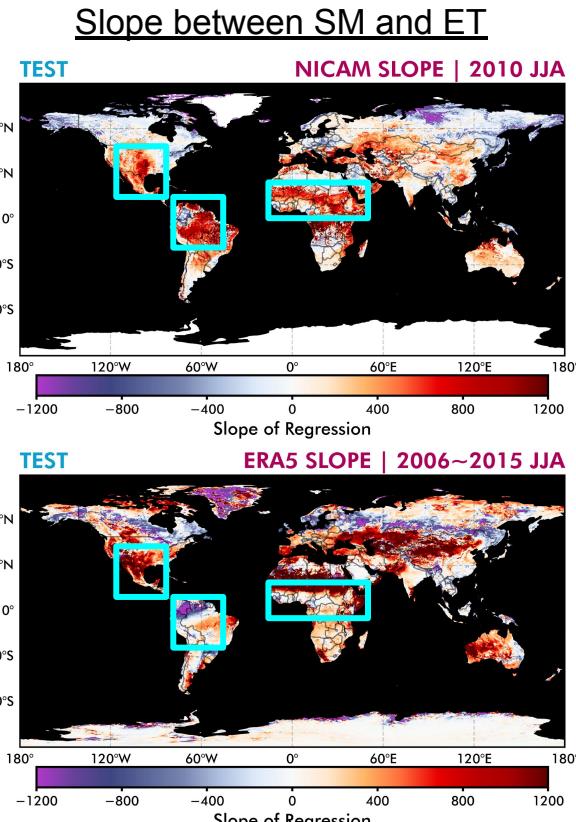
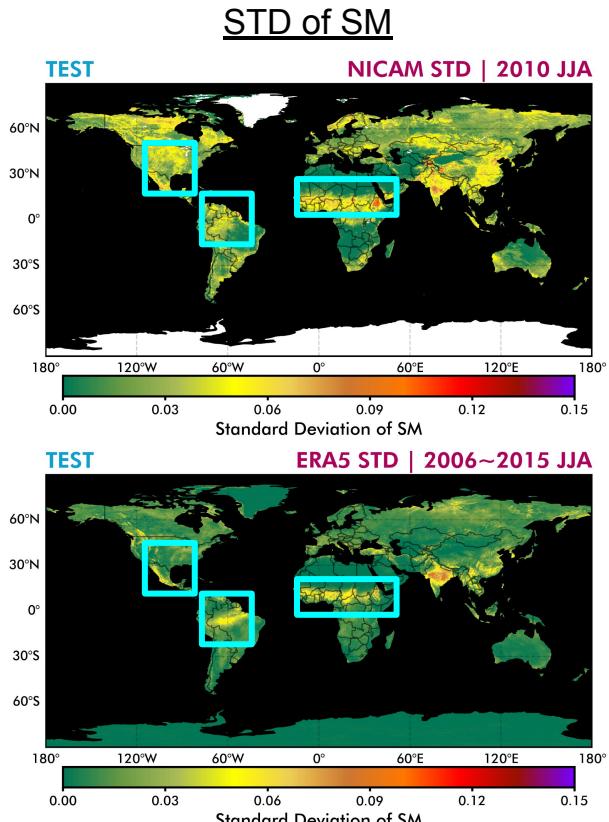
Preliminary Results

Reason for difference in regions in NICAM

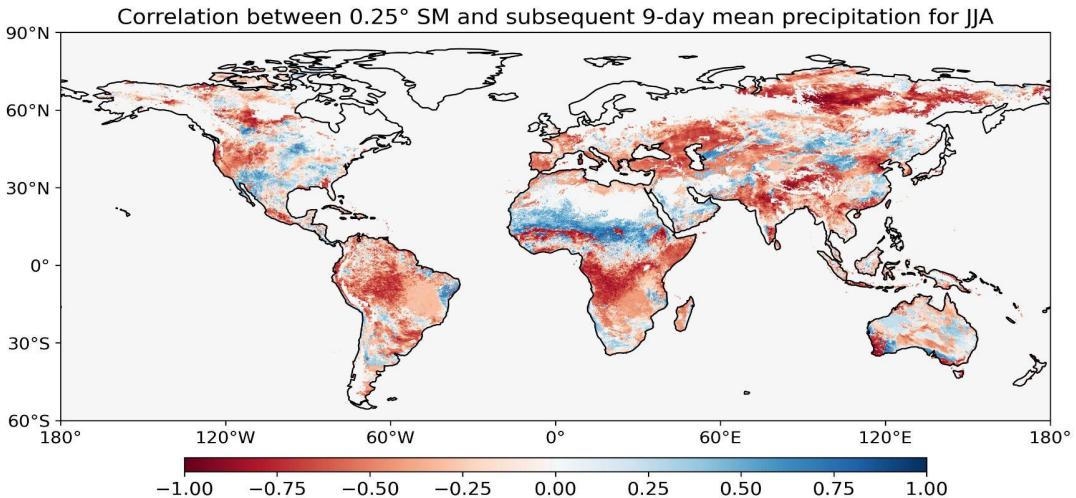
- Small temporal variability of soil moisture in Amazon

Reason for difference compared to ERA5

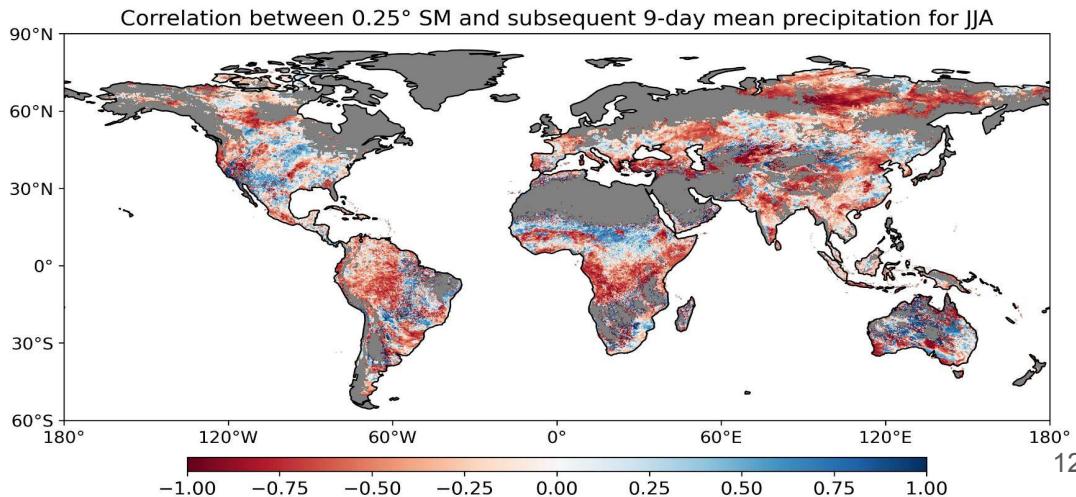
- Both std of SM and slope of SM and ET are different
- Only one year of data



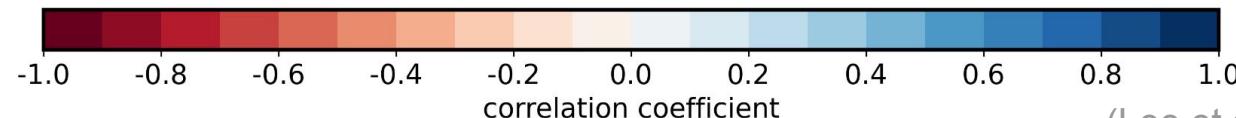
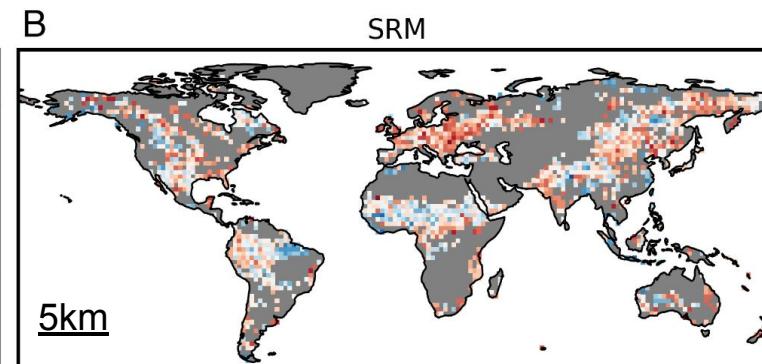
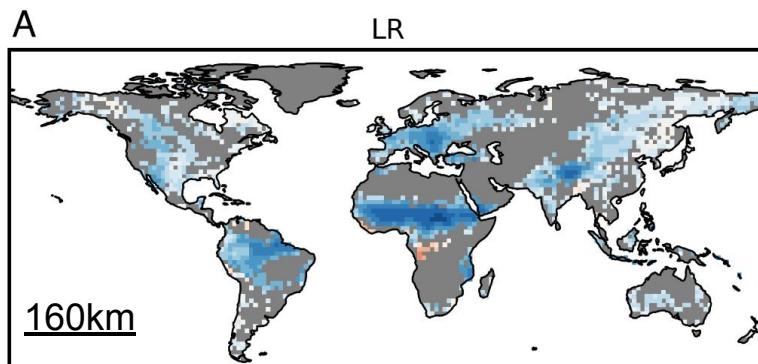
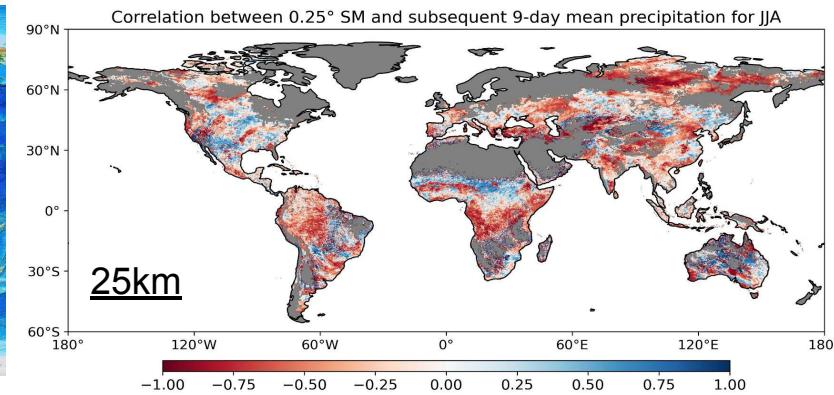
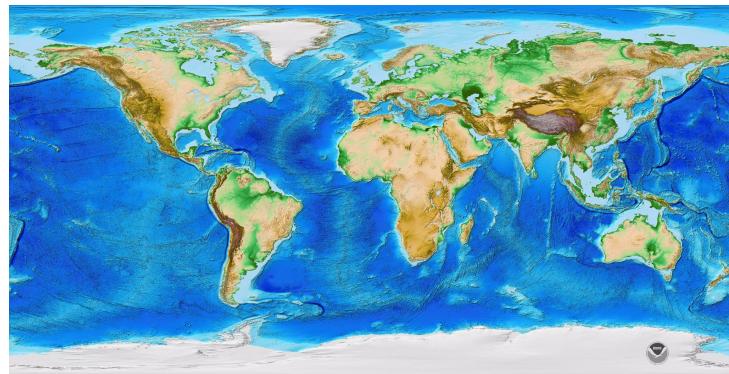
- Correlation with raw data



- Correlation excluding areas where prcp is smaller than 0.1 mm/d (grey).

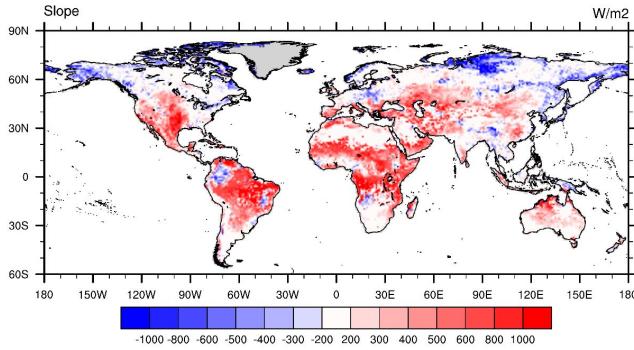
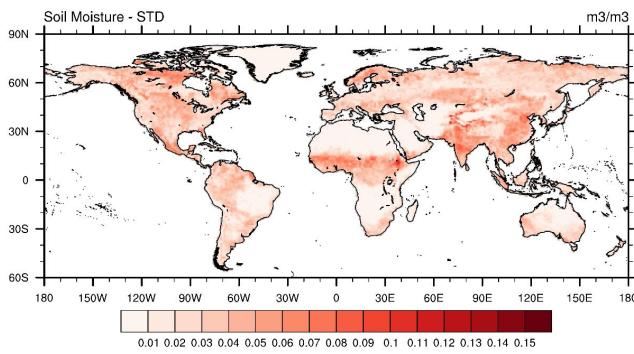
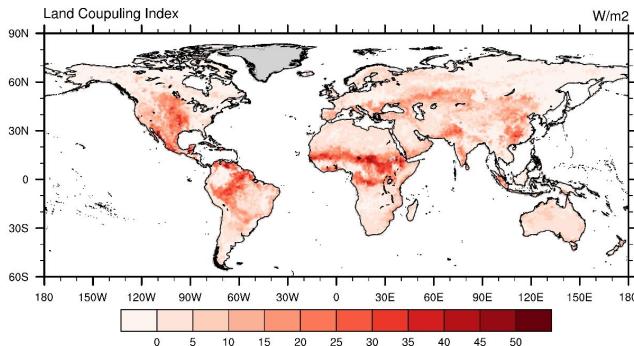


NOAA global topography map

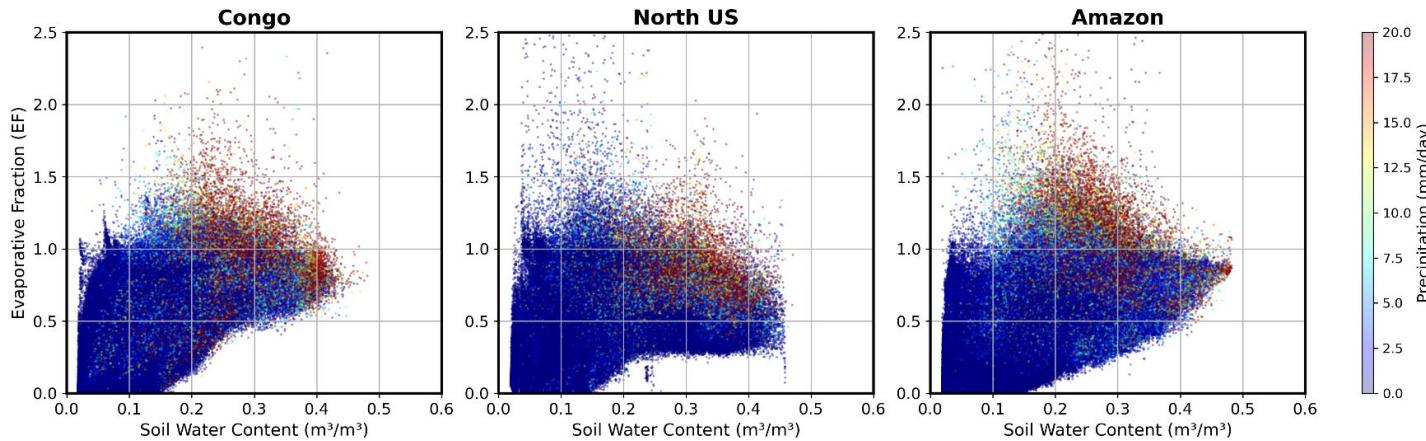


(Lee et al., 2024)

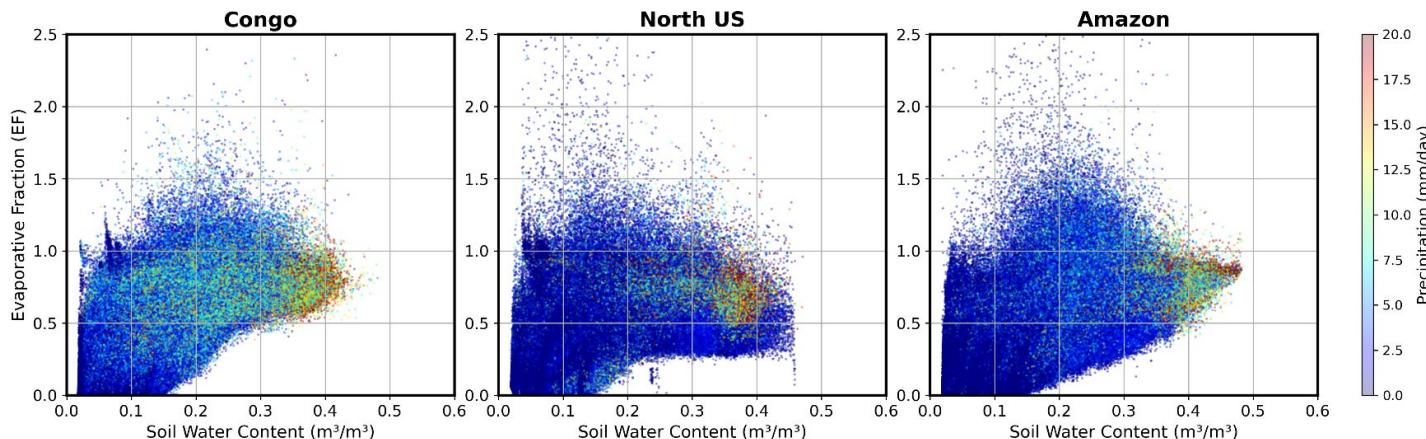
LCI (ET, SM)



Daily Precip.



Subsequent 9-day mean Precip.



Technical Problem

- Opposite SH direction in zoom = 9

