SPATIOTEMPORAL VARIABILITY AND SEASONALITY OF THE DIFFERENCE BETWEEN MODIS LAND SURFACE TEMPERATURE AND NEAR-SURFACE AIR TEMPERATURE

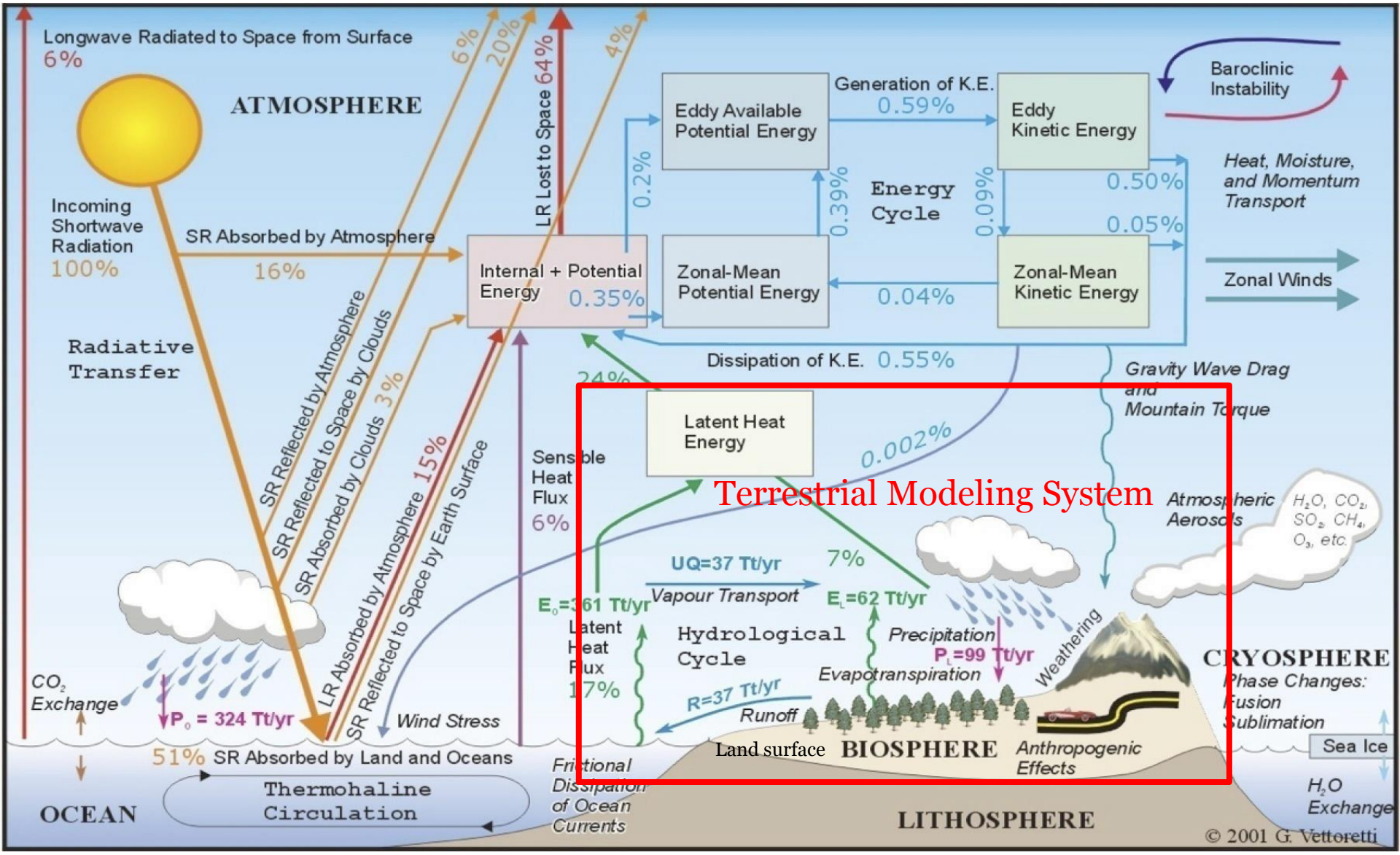
------To investigate the mechanisms for the spatial variability and interannual trends

Xu Lian

2015.9. 24

1. Introduction

1.1 Backgrounds and purpose



1. Introduction

1.2 Data sets and processing methods

Response variable

MODIS Aqua LST products(MYD11A2):

Day View Time:1:30pm

Night View Time:1:30am
Spatial resolution:1km
Temporal resolution:
eight days

Explanatory variables

EVI: MYD13A2 products from MODIS Aqua

Snow Cover: MOD10CM products from MODIS Terra

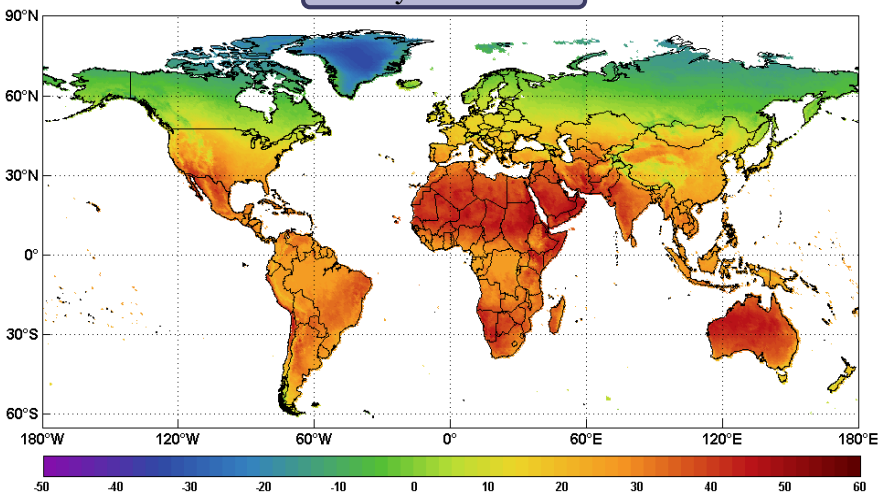
precipitation: CRU data
Incoming solar radiation: CRU-NCEP

Elevation: USGS-DEM

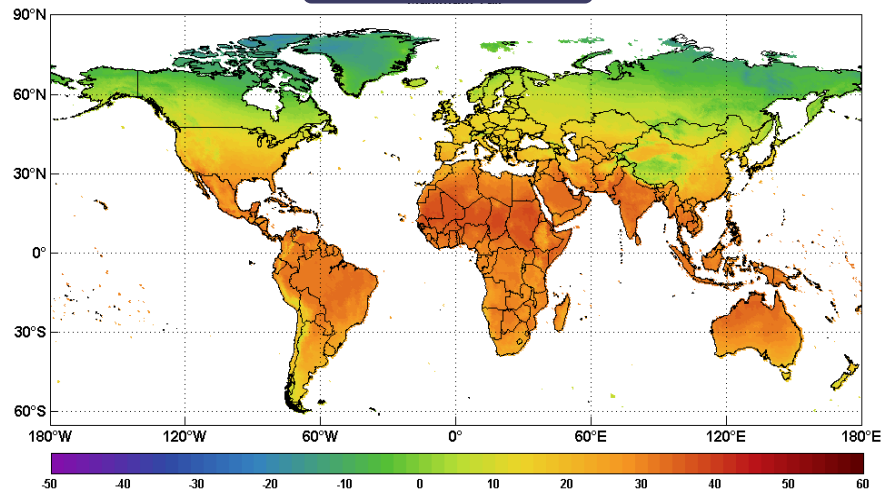
2. Multiyear-Averaged Difference Between LST and Tair

2.1 Spatial Pattern of LST-Tair difference

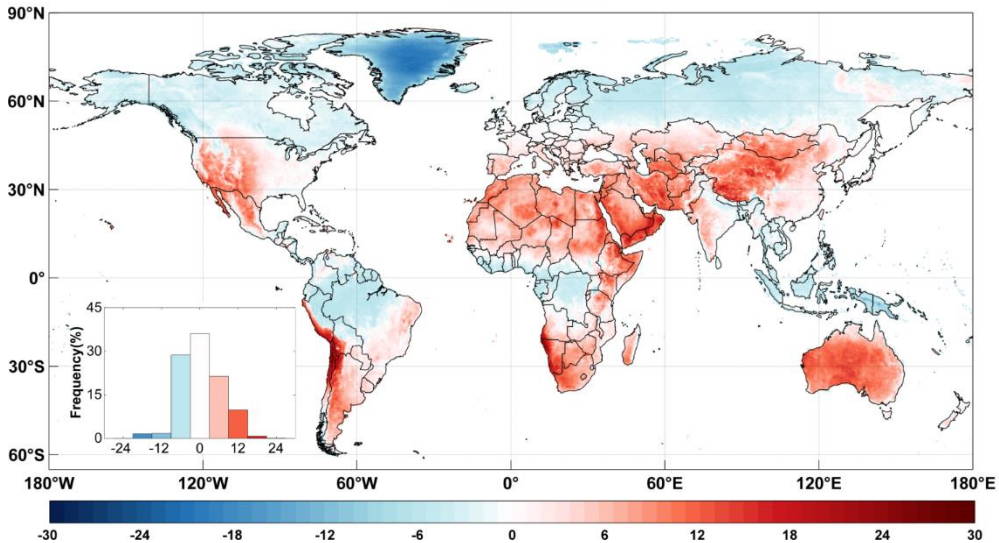
Daytime LST

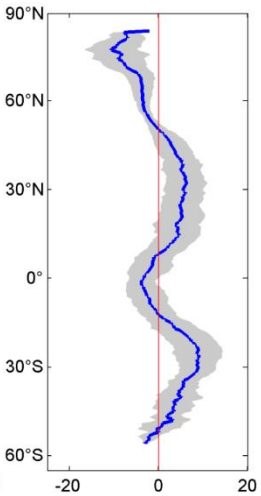


Maximum Tair

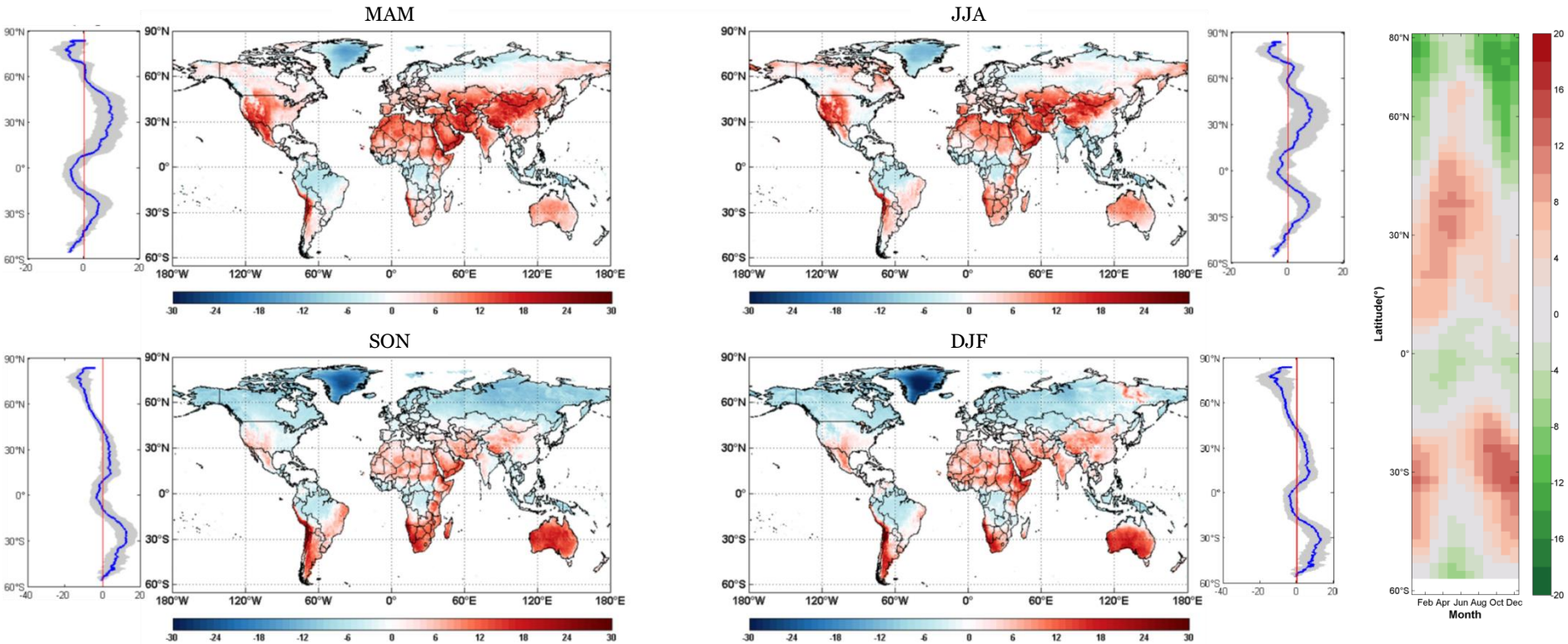


LST-Tair



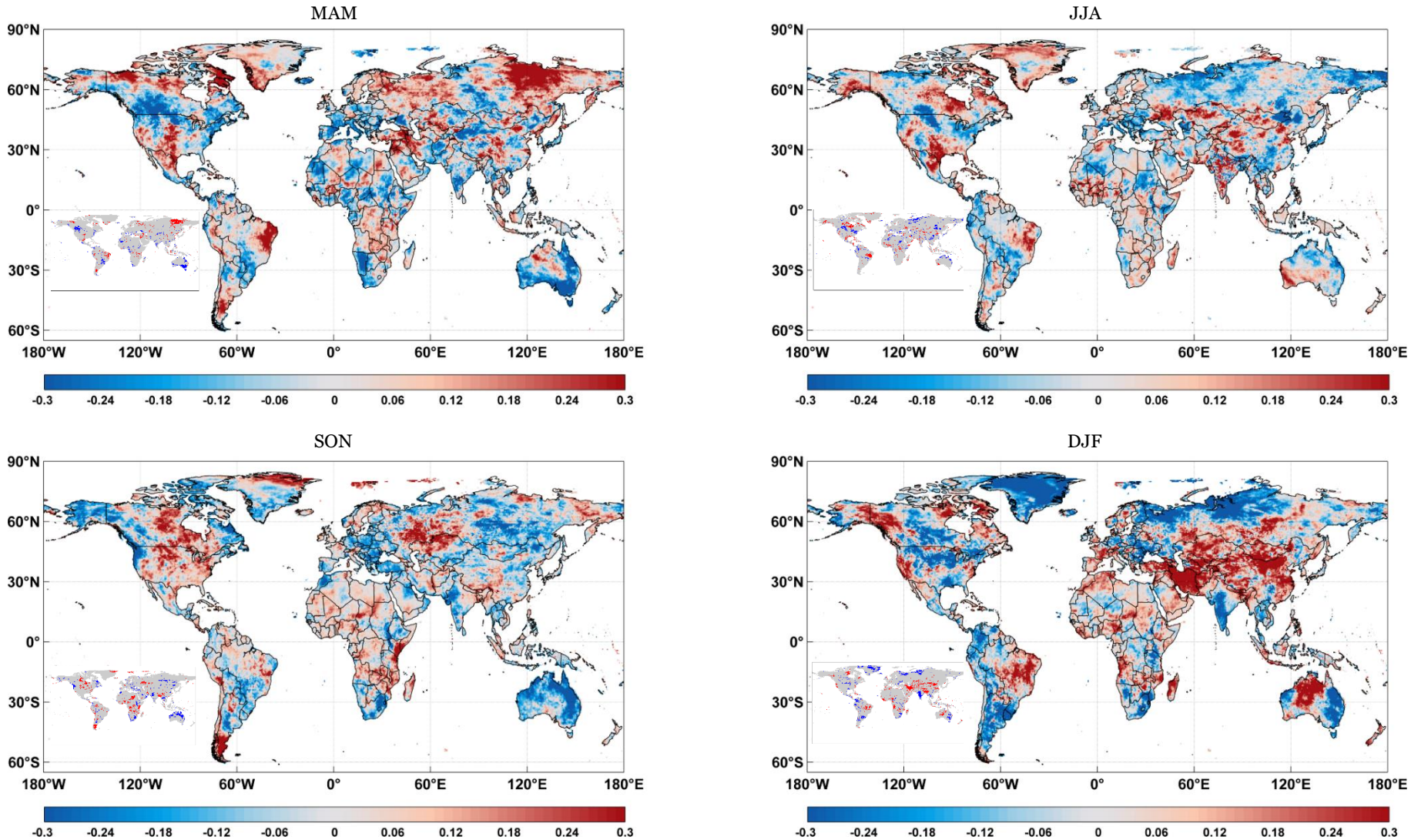


2.2 Seasonal Variability of LST-Tair Difference



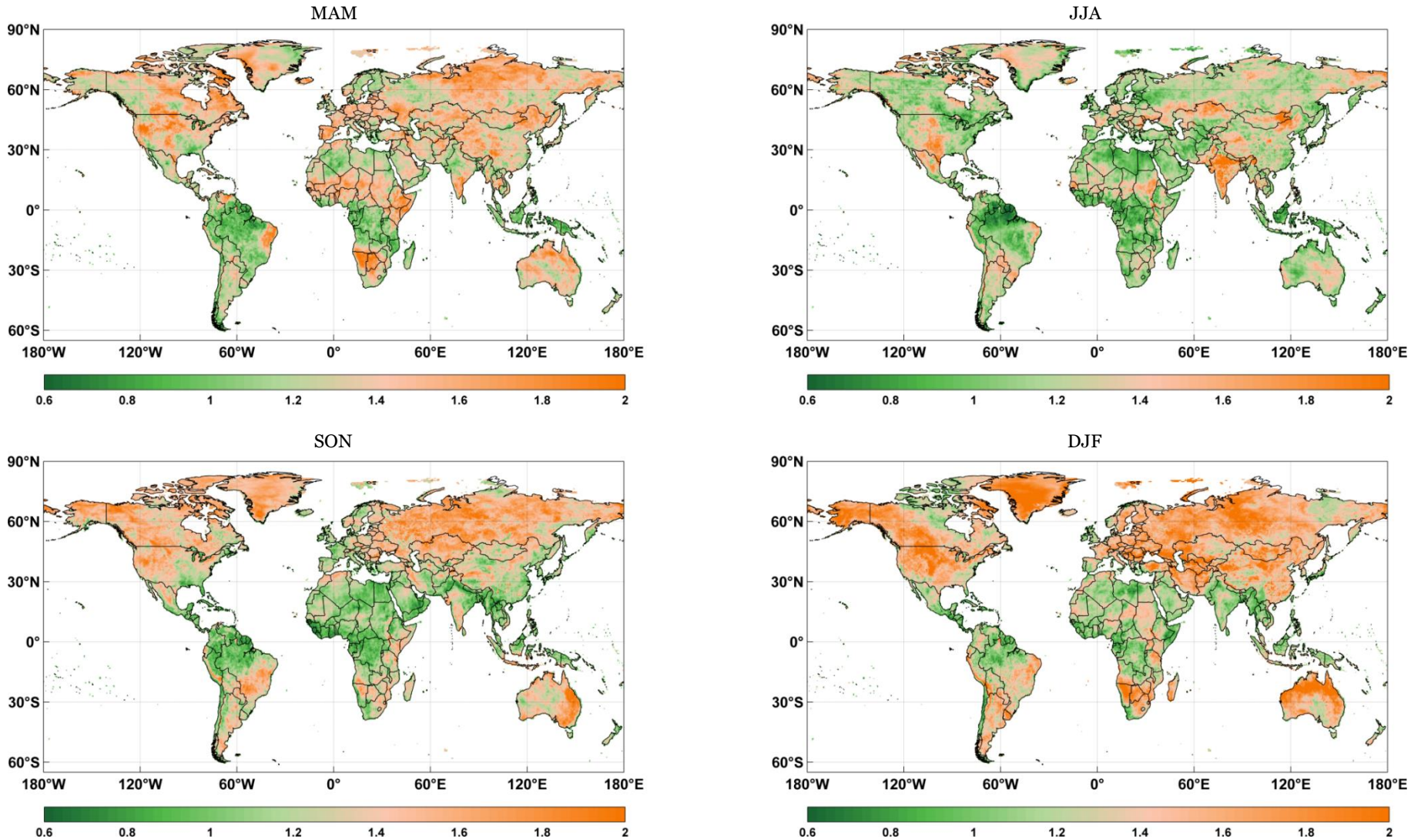
Seasonality of LST- Tair Difference

3. Inter-annual trends of LST-Tair difference



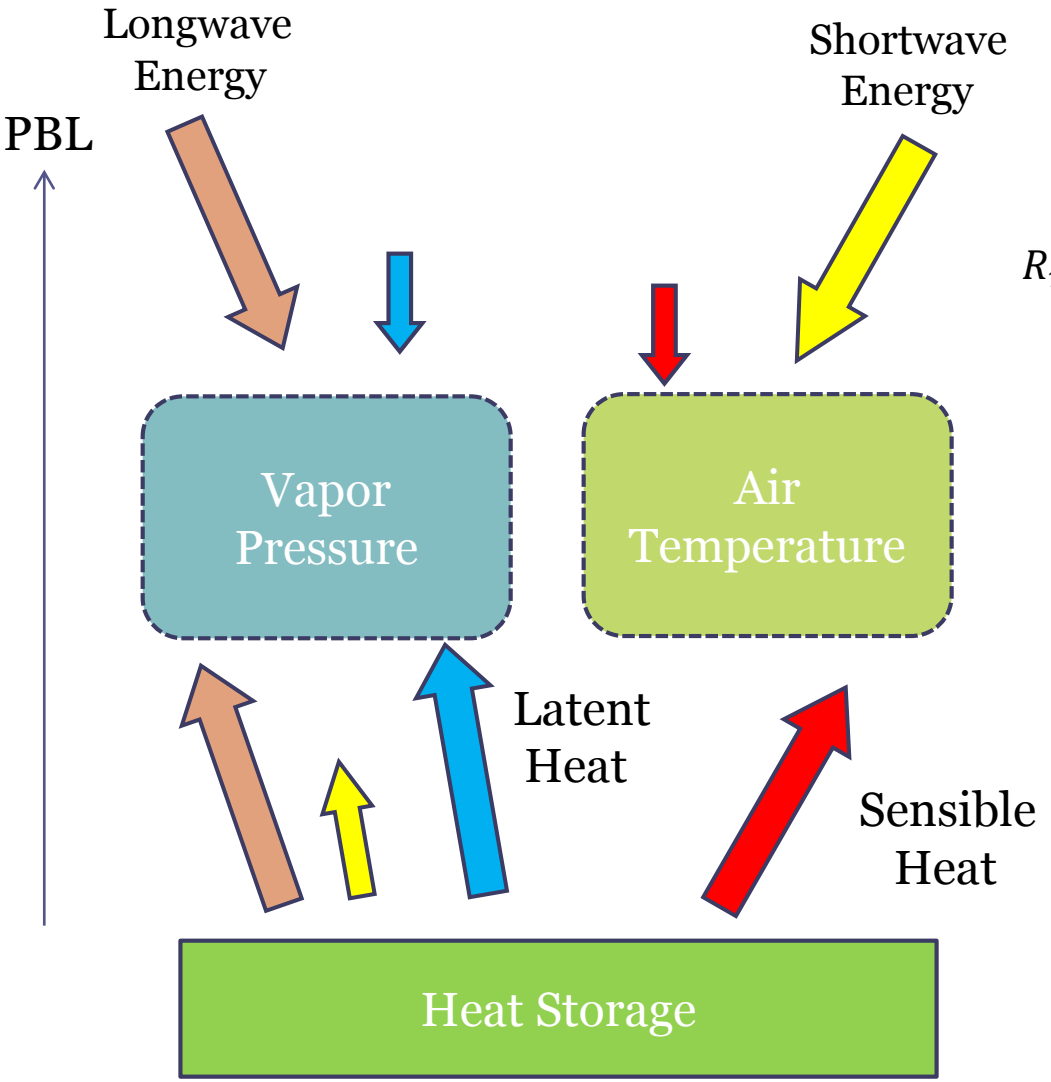
Seasonality of variation tendency

3. Inter-annual trends of LST-Tair difference



Magnitude of inter-annual fluctuation

4. Environmental and Climatic Mechanism of the Differences

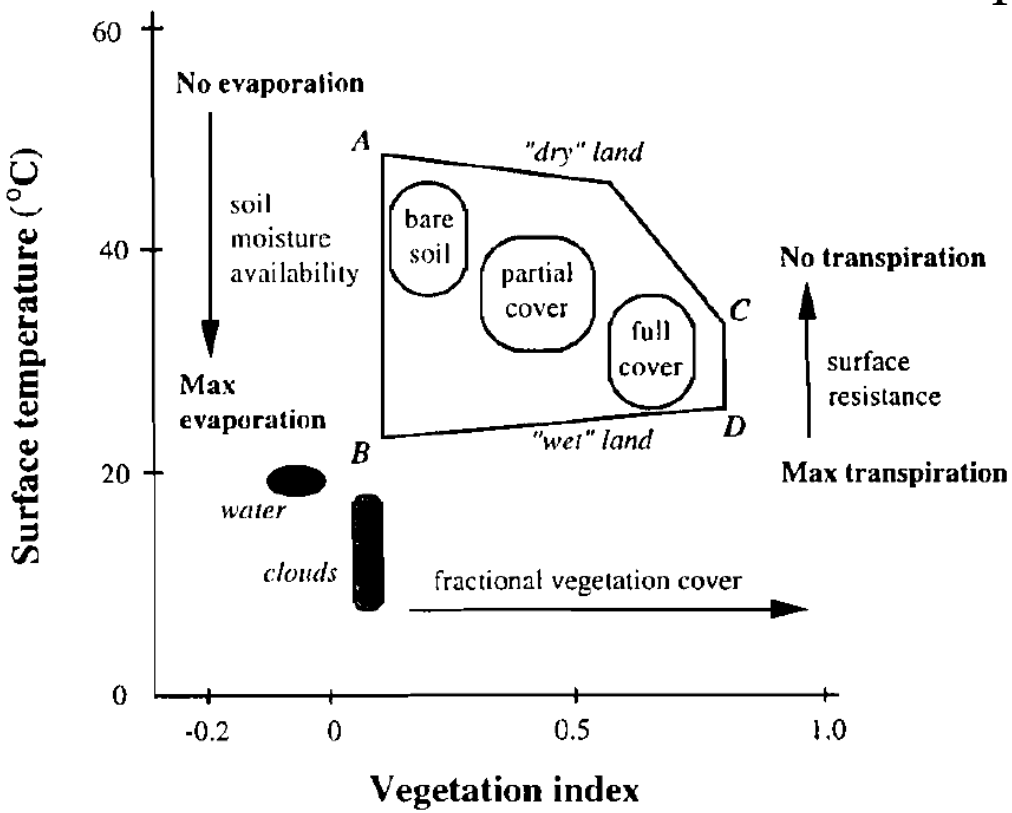


Surface energy balance equation:

$$(1-\mathrm{r})S_{\downarrow} + L_{\downarrow} = L_{\uparrow} + SH + LH + G$$
$$R_n = (1-\mathrm{r})S_{\downarrow} + (L_{\downarrow} - L_{\uparrow}) = SH + LH + G$$
$$L_{\uparrow} = \varepsilon\sigma(T_s + 273.15)s^4$$
$$SH = \rho C_p C_H U(T_s - T_a)$$
$$LH = L\rho C_Q U(q_s - q_a)$$

$S_{\downarrow}$: incoming solar radiation
G: stored thermal energy
SH: sensible heat fluxes
LH: latent heat fluxes
$F_{\downarrow}$: shortwave downwelling radiation
$F_{\uparrow}$: longwave upwelling radiation
ε: emissivity
r: albedo
σ: Steven-Boltzmann constant
U: surface wind speed
C_H: drag coefficients for sensible heat fluxes
C_Q: drag coefficients for latent heat fluxes
q_{a,q_s}: saturation mixing ratio
ρ: air density

4. Environmental and Climatic Mechanism of the Differences



The LST-VI space
E. F. LAMBIN et al. (2007)

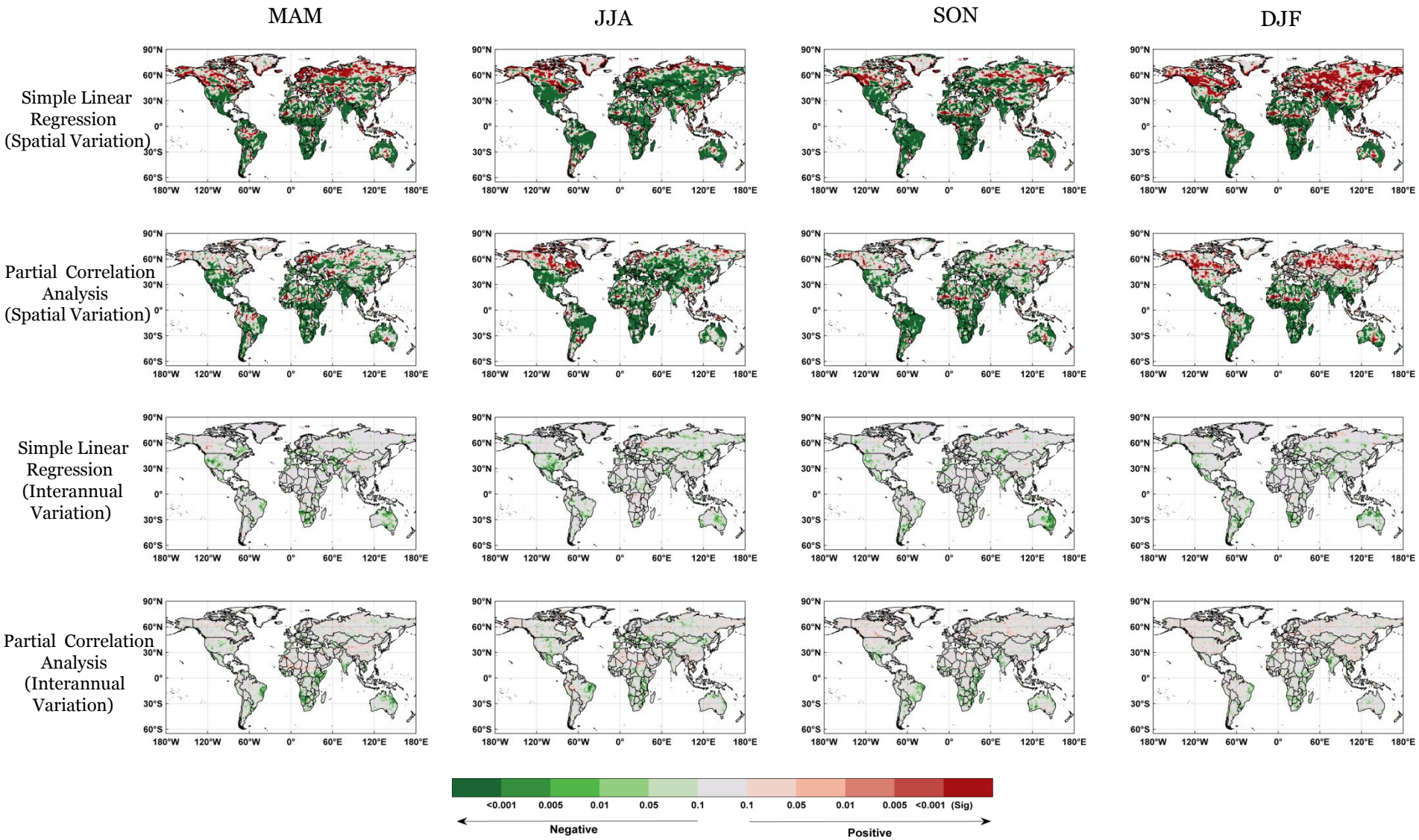
Potential Factors:

- Vegetation Abundance
- Solar Radiation
- Soil Moisture (Precipitation)
- Snow Cover
- Elevation
- Cloud Cover
- .....

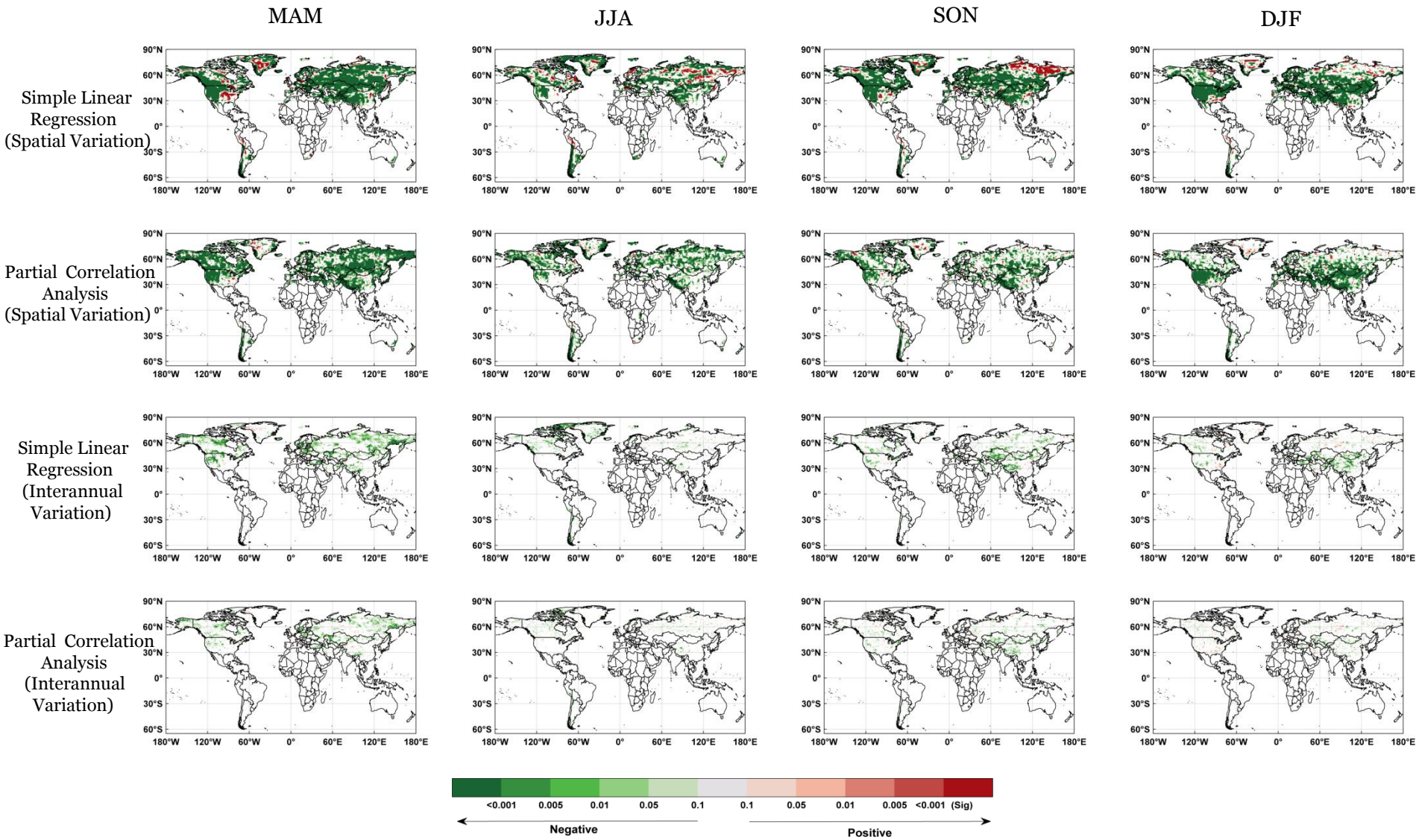
Affected Surface Properties:

- Albedo
- Aerodynamic Roughness
- Bowen Ratio
- Heat Capacity
- Thermal Conductivity
- Thermal Inertia
- .....

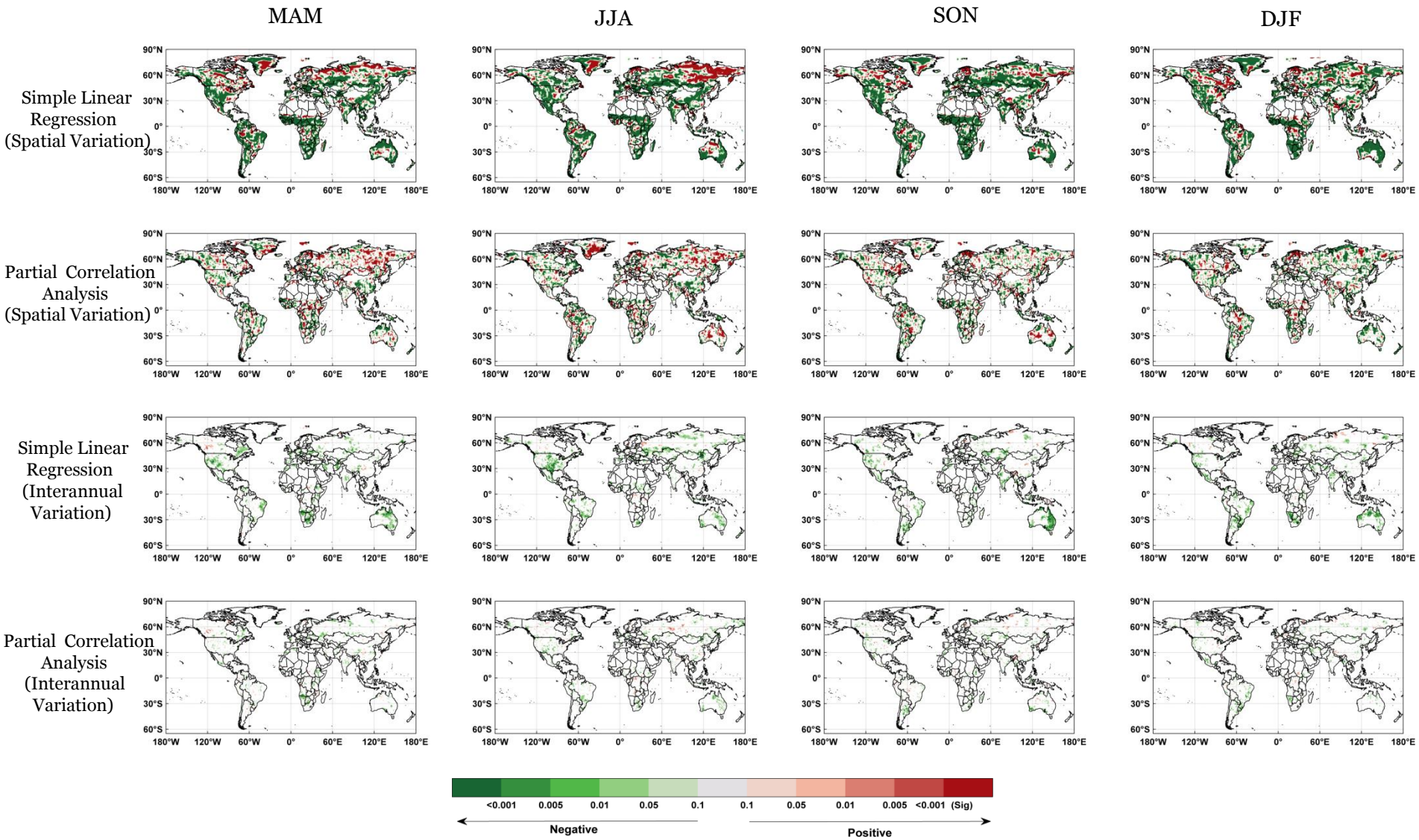
4.1 Enhanced Vegetation Index (EVI)



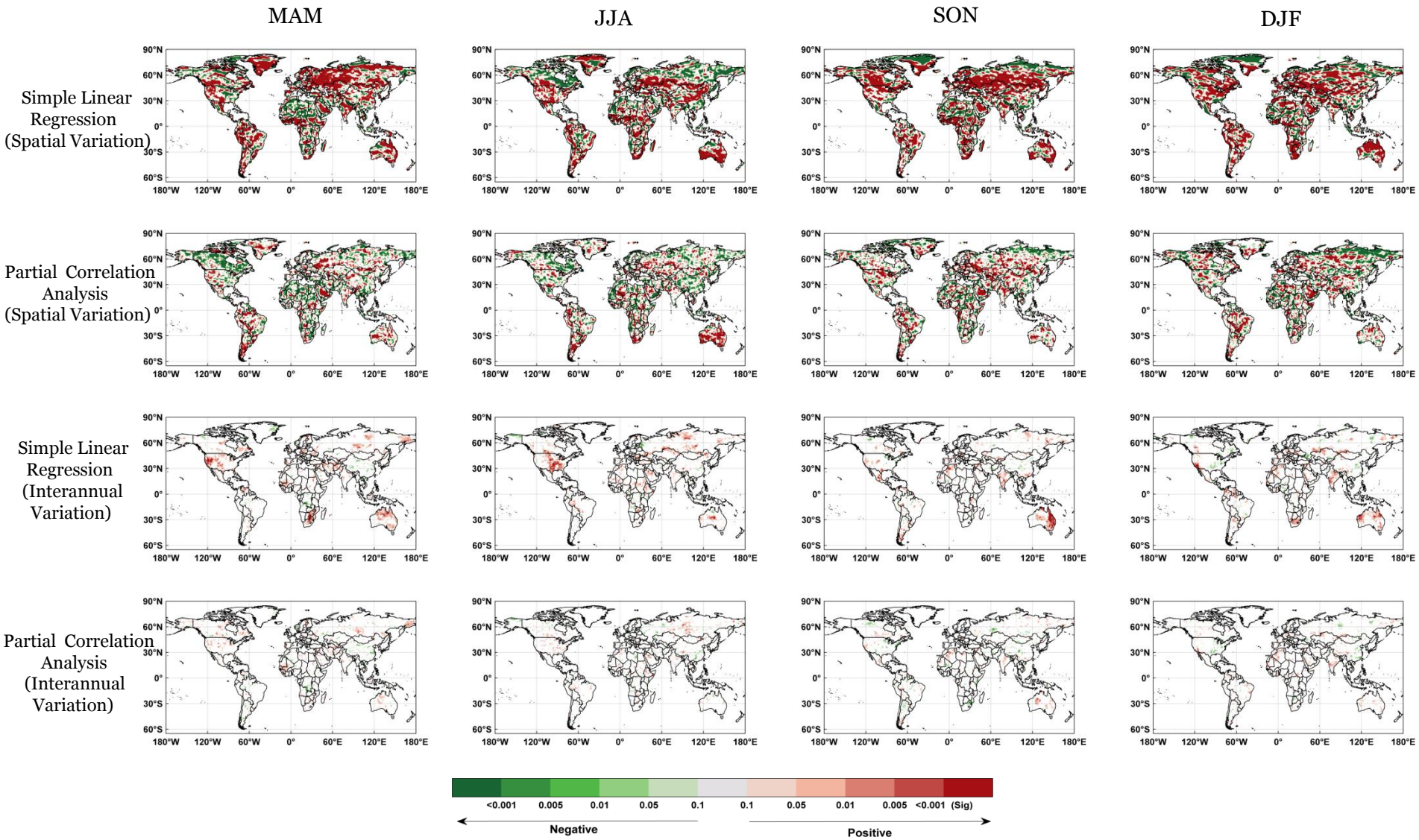
4.2 snow cover



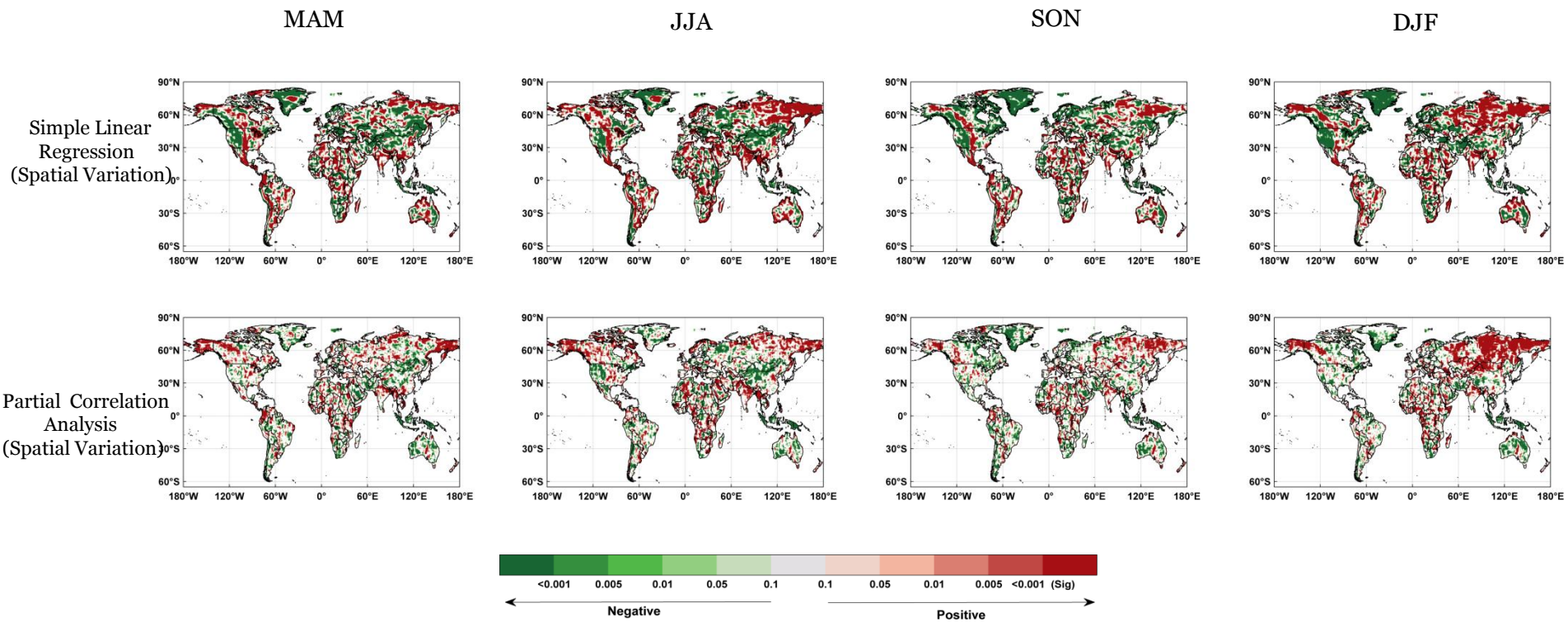
4.3 Annual mean Precipitation (as a proxy for soil moisture)



4.4 Incoming solar radiation



4.5 Elevation



THANK YOU.

@Xu Lian
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