Leaf Area-Climate Interaction as a Functional Constraint Across CMIP5 Models

Community Land Model Workshop
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Vegetation Interaction: Multilinear Regression

\[ \%\Delta \text{LAI} = \beta_0 + T_{\text{MAT}} \beta_{\text{Temp}} + P_{\text{MAP}} \beta_{\text{Precip}} \]
Vegetation Interaction: Multilinear Regression

\[
\%\Delta \text{LAI} = \beta_0 + T_{\text{MAT}} \beta_{\text{Temp}} + P_{\text{MAP}} \beta_{\text{Precip}}
\]
%ΔLAI = β₀ + T_{MAT} β_{Temp} + P_{MAP} β_{Precip}

Observations

Leaf Area Index 3g
(Pizon and Tucker, 2014)

2 meter Temperature
ERA-Interim Reanalysis
(Dee et al, 2011)

Global Precipitation
Climatology Project (Rain)
(Adler et al, 2003)
Vegetation Interaction: Multilinear Regression

\[ \% \Delta \text{LAI} = \beta_o + T_{\text{MAT}} \beta_{\text{Temp}} + P_{\text{MAP}} \beta_{\text{Precip}} \]

Models - CMIP5

- CESM1-BGC
- NorESM1-ME
- CanESM2
- GFDL-ESM2M
- HadGEM2-ES
- IPSL-CM5A-LR
- MIROC-ESM
- MPI-ESM-LR
- BNU-ESM
- bcc-csm1-1
Aggregate in Whittaker style climate space

Whittaker 1970
Vegetation Interaction: Multilinear Regression

\[ \%\Delta \text{LAI} = \beta_o + T_{\text{MAT}} \beta_{\text{Temp}} + P_{\text{MAP}} \beta_{\text{Precip}} \]
Leafy when cooler

Leafy when warmer
Leafy when cooler

Leafy when warmer
Leafy when cooler

Leafy when warmer
Number of models representing climate

Model Counts in Climate Space

Precipitation [mm/year] vs. Temperature [°C]

Temperature [°C]

Precipitation [mm/year]

Number of Models

-20 -10 0 10 20 30
Number of models representing climate
Model Consensus in sign

\[ \beta_{\text{Temp}} \]

\[ \beta_{\text{Precip}} \]
Questions?
Change across temperature gradient
Change across precipitation gradient

![Graph showing the relationship between precipitation and temperature across a gradient. The graph includes a color scale indicating changes in a metric related to precipitation per unit area.](image-url)