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Regional variability evaluation of TRENDY Dynamic Vegetation Model Estimates of Dryland Productivity

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Introduction: Dryland regions cover ~40% of the terrestrial surface and support over a third of the world's population. Given dryland ecosystem is extremely sensitive to future changes in water availability, it is essential that the dynamic global vegetation models (DGVMs) that form the land component of earth system models used for climate change projections can accurately simulate dryland carbon fluxes. However, several local scale recent studies have documented that DGVMs underestimates in capturing dryland carbon dynamics (MacBean et al., 2021). Thus, a global scale assessment of model dryland productivity using a data product specifically developed for dryland ecosystems is needed.

Methodology: In this study, we evaluated the ability of 18 DGVMs from the TRENDY v11 intercomparison to capture global spatiotemporal patterns in dryland gr (GPP) over the period 2001 to 2016. We used the newly developed 'DryFlux'v1.0 GPP product (Barnes et al., 2021) that better captures spatiotemporal GPP patterns compared to existing, non-dryland focused upscaled flux tower products (e.g., FLUXCOM) or satellite derived GPP products (e.g., MODIS). Our primary goals are to: a) assess DGVM performance in capturing GPP temporal dynamics across different continents and aridity indices (e.g., arid vs semi-arid); and b) utilize this analysis to identify which processes or model configurations may help to explain poor DGVM performance in capturing dryland carbon uptake. We used a diverse set of statistical metrics to compare TRENDY DGVMs to DryFlux.

Preliminary Results: Figure 1 represents simple mean differences between 18 dynamic global vegetation models gross primary productivity (GPP) and observed data (DryFlux GPP).

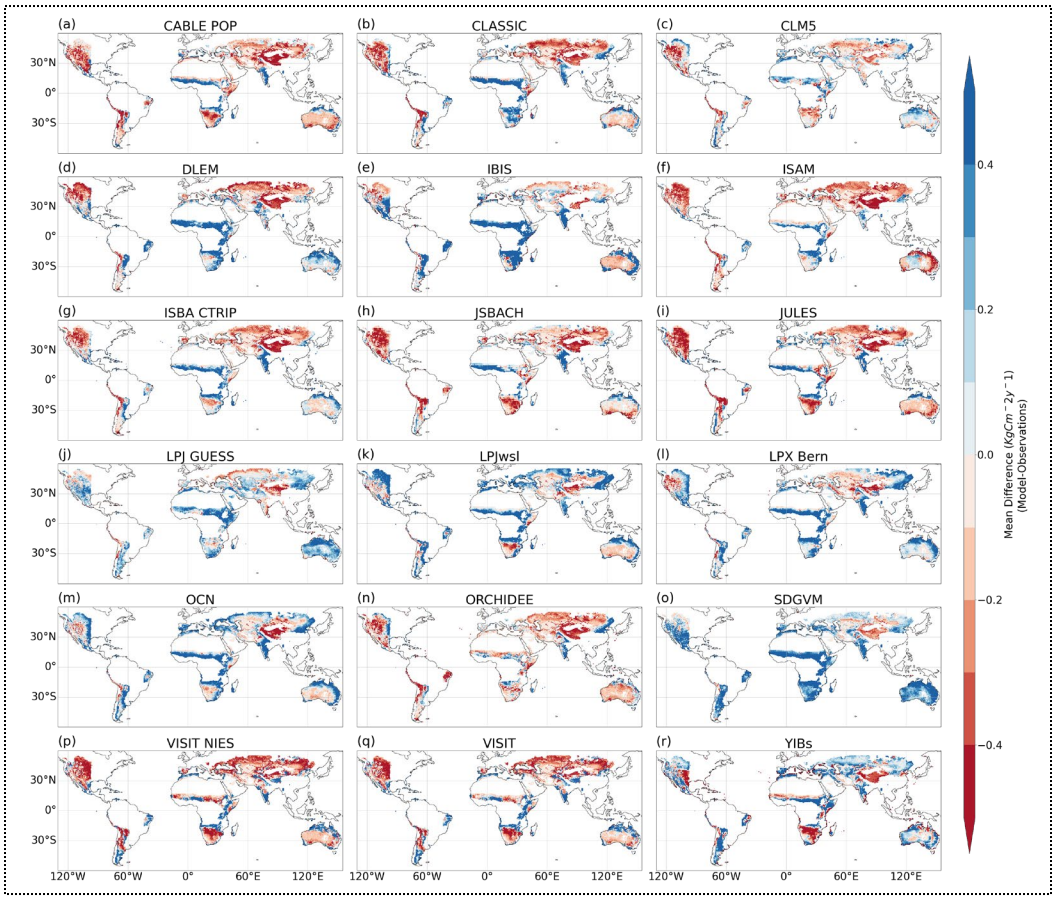

Figure 1. Mean difference between 18 dynamic global vegetation models gross primary productivity (GPP) and observed data (DryFlux GPP). Red colors indicate places where models underestimate, and blue colors indicate places where models overestimate.

- On a global scale, all dynamic vegetation models both underestimated and overestimated the mean vegetation productivity.
- In general, models underestimated mean GPP in arid regions and overestimated it in semi-arid regions.
- Most of the models overestimated mean GPP in sub-Saharan regions.

FOR FURTHER READING:

Barnes, M. L., et al., (2021) *Communications Earth and Environment*. https://doi.org/10.1038/s43247-021-00308-2

MacBean, N., et al., (2021) *Environmental Research Letters.* https://doi.org/10.1088/1748-9326/ac1a38