B43G-2629: Aridity-zone differences in the ability of DGVMs to capture dryland GPP

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1 INTRODUCTION

Motivation: Drylands play a dominant role in global carbon cycle variability and are extremely sensitive to future changes in water availability. Therefore, it is essential that dynamic global vegetation models (DGVMs), which form the land component of earth system models used for climate change projections, can accurately simulate dryland carbon fluxes.

Research Opportunities: Evaluations of dryland DGVM performance have either used in situ CO2 flux data at a limited number of sites, or they have used satellite products that perform poorly in capturing dryland carbon flux dynamics. (Fawcett et al., 2022; MacBean et al., 2021; Teckentrup et al., 2021). Thus, in this study, we evaluated the ability of the TRENDY v11 suite of DGVMs in capturing spatiotemporal patterns in dryland gross CO_2 uptake (or gross primary productivity, GPP) using the newly developed dryland specific GPP product 'DryFlux' (Barnes et al., 2021).

2 DATA AND STUDY AREA

- Reference data: Monthly mean DryFlux GPP from 2001 -2016
- Yearly mean TRENDY v11 GPP from 1970 – 2020 from 18 models
- Global aridity index (AI) data were used for dryland masking

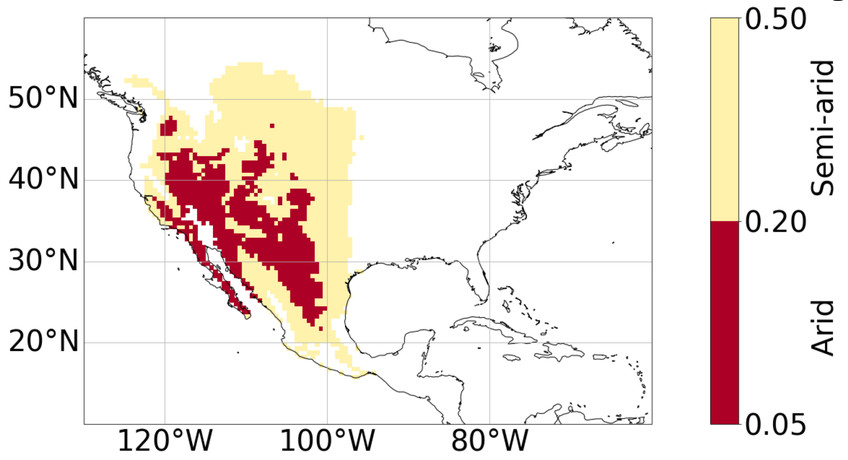

Fig 1: Dryland (arid vs semi-arid) regions in western North America

3 METHOD

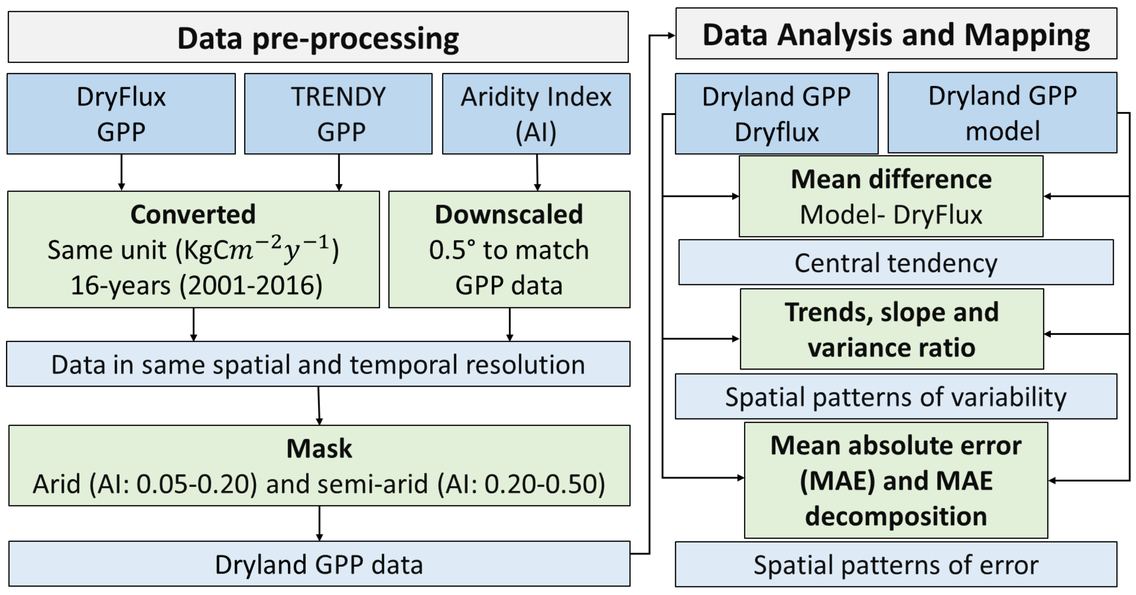

Fig 2: Data processing and analysis steps

4 RESULTS

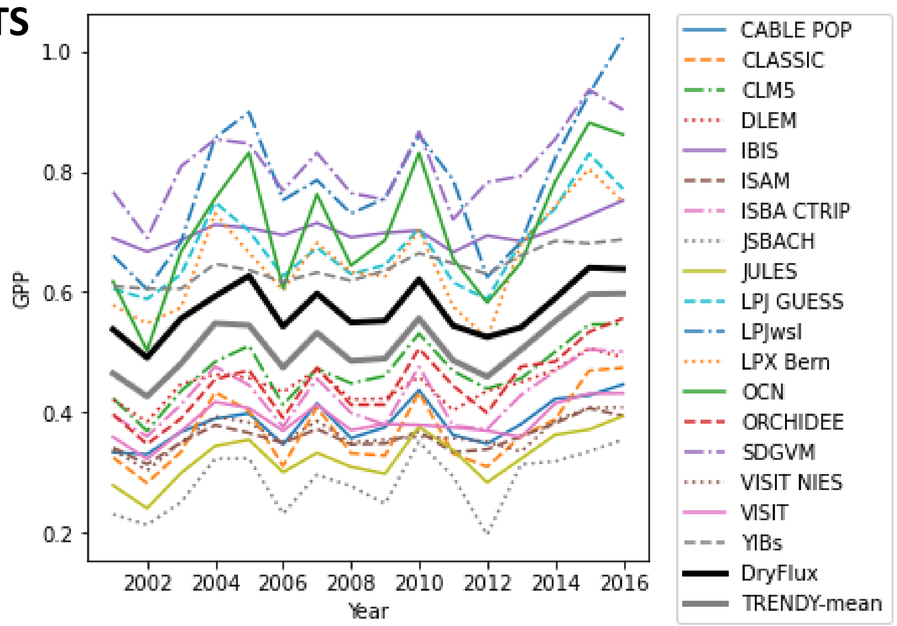

Fig 3: Time-series of mean annual GPP

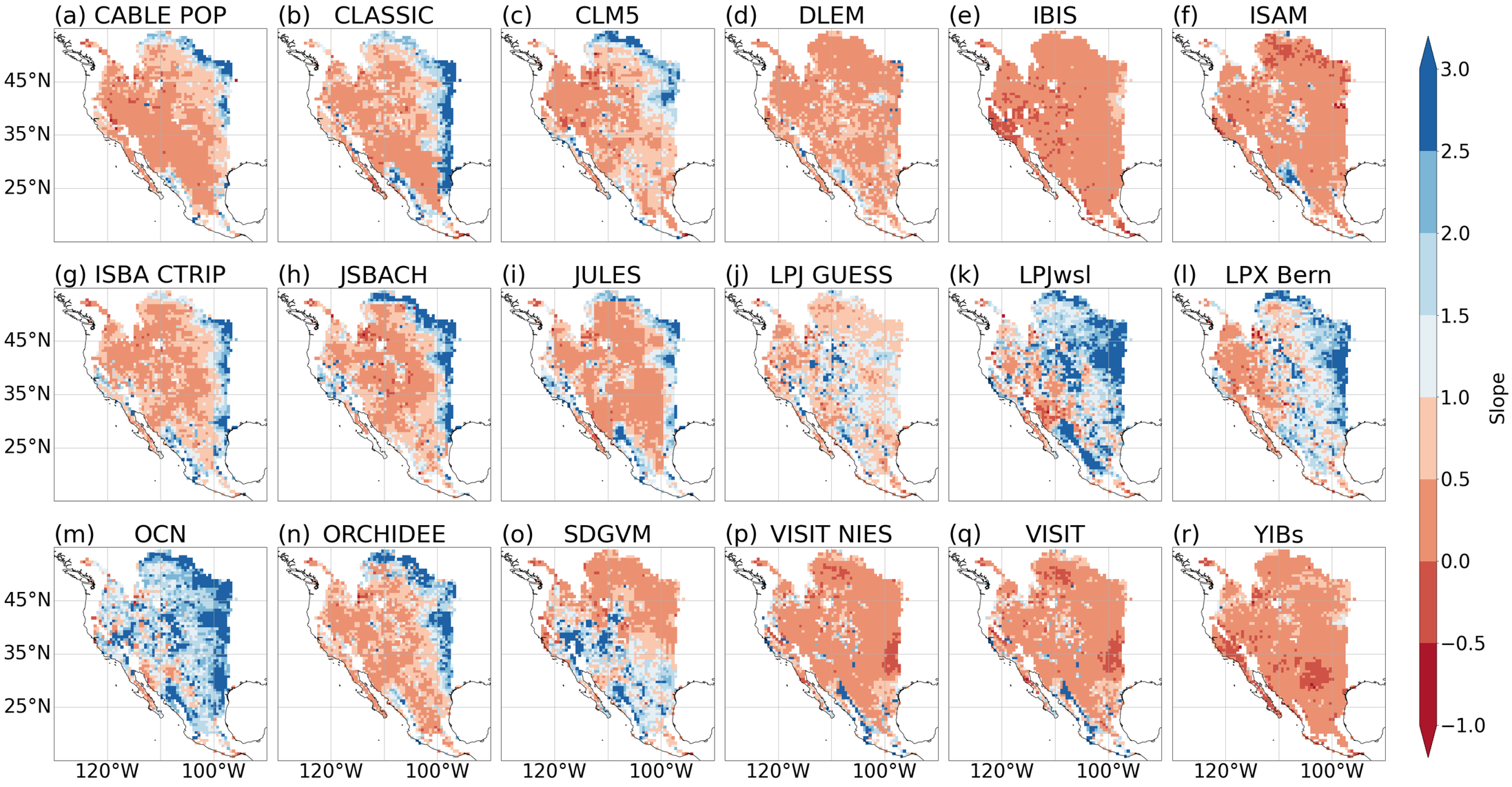

Figure 4: Evaluation of annual GPP of 18 TRENDY models in comparison with DruFlux annual GPP

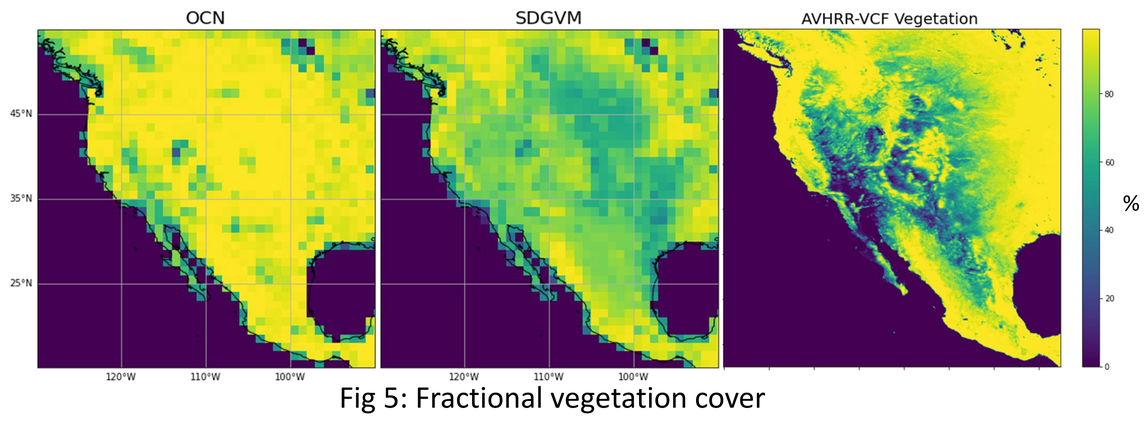

Fig 5: Fractional vegetation cover

5 SUMMARY

- In arid regions most models are underestimating the DryFlux GPP. However, in semi arid regions models are both underestimating and overestimating the Druflux GPP.
- Vegetation fractional cover maps used in the models could be at fault
- However, further research is needed to answer why some models are performing better or worse in capturing spatial patterns of interannual variability in GPP.

References: Fawcett et al., (2022); Barnes et al., (2021); MacBean et al. (2021); Teckentrup et al., (2021).

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