

Analyzing Model Biases in Terrestrial Carbon Cycle Submodels in Earth System Models and Offline Models

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Improvement of terrestrial models in earth system models (ESMs) is important to reduce uncertainties in future projections of global carbon cycle and climate. Toward an improvement of ESMs, we need to evaluate current performance of terrestrial components in current ESMs and analyze their causes of biases. Therefore, using available observation based products (e.g. satellite-based products), offline ecosystem model outputs, and CMIP-5 ESM outputs, we attempted to characterize causes of biases of modeled terrestrial carbon flux and pools. We found that key climate variables, such as precipitation, is one of the causes of biases in ESM-based carbon fluxes. For example, positive precipitation biases in Africa and Oceania results in positive biases of gross primary productivity (GPP), biomass, and net biome productivity (NBP). Negative precipitation bias in tropical South America leads to negative GPP, biomass and NBP biases. Therefore, improvement of spatial patterns are one of the important next step toward ESM, in particular toward realistic simulations of sub-continental scale terrestrial variations.

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