Improving CLM5.0 Biomass and Carbon Exchange across the Western US Using a Data Assimilation System

Raczka, Hoar, Duarte, Fox, Anderson, Bowling, Lin, (2021). JAMES. DOI: 10.1029/2020MS002421

Background: Monitoring biomass and carbon fluxes is important in the Western US given susceptibility to drought, fire and mortality. Carbon monitoring techniques are challenged by complex terrain.

Methods: We combine remotely sensed observations of above-ground biomass (Liu et al., 2015) and leaf area (GIMMS LAI3g) with a prior modeling estimate through an EnKF (CLM5-DART) to provide an improved estimate of biomass and carbon flux (1998-2011).

Results:

- Assimilating observations of biomass and leaf area reduces simulated biomass and projects a weak land carbon sink across the Western US.
- This estimate of carbon exchange contrasts with an independent FLUXCOM estimate that shows a significant carbon sink in the Western US.
- Water cycle observations should be used to complement biomass observations to improve the spatial pattern of modeled carbon fluxes.

Significance: Whereas observations of biomass significantly reduced both simulated ER and GPP, net carbon exchange remained nearly the same. This weak carbon uptake could reflect low simulated snowpack as well as legacy of disturbance and LULC change that machine learning (ML) techniques cannot capture. New data streams related to land cover and soil moisture will be help provide more precise adjustments to plant functional types, and water-carbon coupling processes.

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