



Land surface models successfully represent some, but not all, satellite-observed processes in a temperate ecosystem

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Science Question

Human impacts are important components of the Earth system, yet much of Earth system model (ESM) development focuses on 'natural' systems. In a social-environmental system (agriculture + forest + urban) and among multiple cycles (carbon, water, energy), which processes are successfully represented in a common ESM, and which are not?

Analysis

We compared model inputs (land cover, meteorology) and outputs (carbon, soil moisture, reflectance) of the Community Land Model (CLM) to observations from weather stations and NASA remote sensing (RS) products, including from MODIS, SMAP, and Landsat, in a single watershed in southwestern Michigan.

Results

- CLM overestimates leaf area index (LAI) and underestimates forest cover in this area, which is a surprising contradiction.
- Estimates for Gross Primary Production (GPP) and albedo are reasonable compared to RS and field estimates.

Significance

- To improve ESMs, we need to consider multiple connected cycles, instead of disciplinary processes.
- Improving communication between ESM developers and RS scientists could lead to models that are easier to evaluate against observations and RS products that better address modelers' needs.

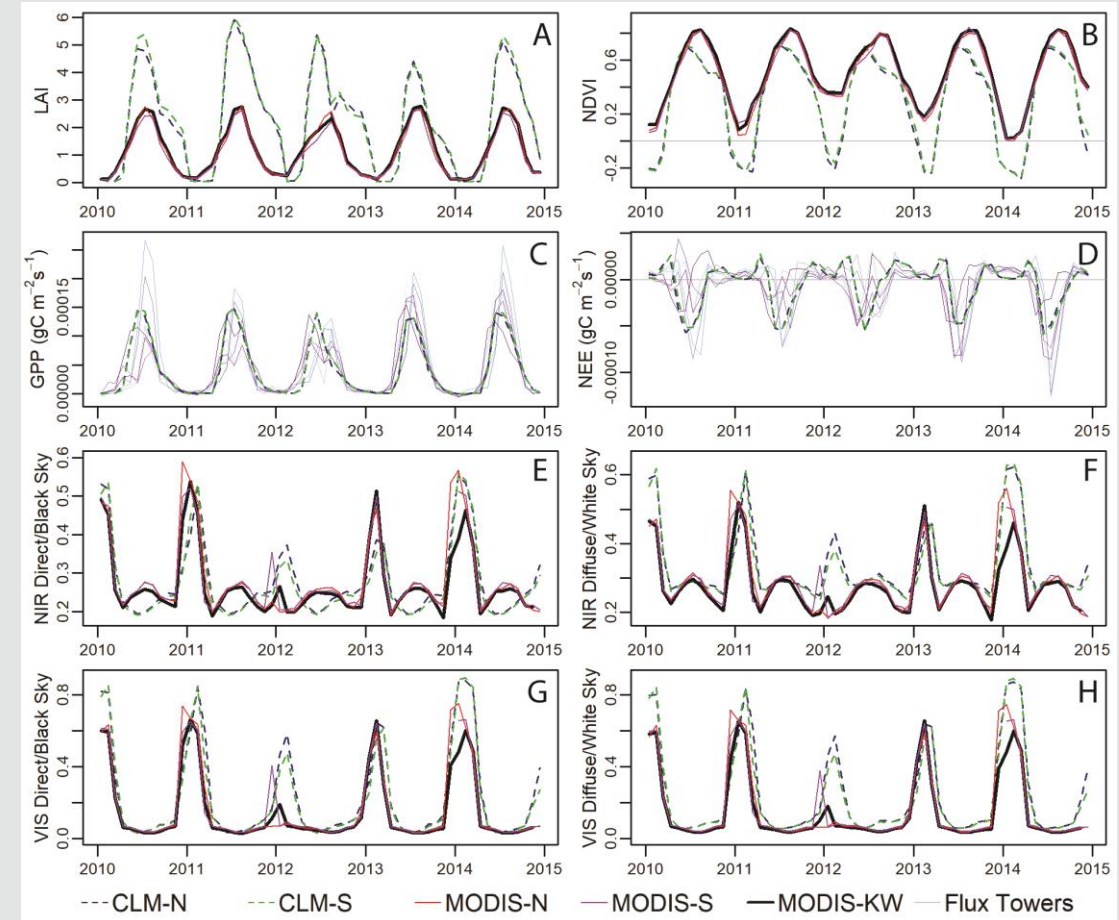


Figure 9. CLM values (dashed lines) sometimes match observations (solid lines) well (e.g., albedo, NEE & GPP), but not with others (e.g., LAI, NDVI).

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