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# Evaluation of a land surface solar radiation partitioning scheme using remote sensing and FLUXNET FPAR datasets

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This study examines a land surface solar radiation partitioning scheme (Community Land Model version 4.0, CLM4 for abbreviation). The Fraction of Absorbed Photosynthetically Active Radiation (FPAR), as the fraction of the incoming solar radiation in the Photosynthetically Active Radiation spectral region that is absorbed by the canopy layer, would be employed as the diagnostic parameter in this study. Taking advantage of multiple remote sensing FPAR datasets, site level FPAR observations and a unique 28-year FPAR dataset derived from GIMMS-NDVI3g, we evaluated the CLM4 FPAR's seasonal cycle, diurnal cycle, long-term trends and spatial patterns.

Our findings show that the model roughly agrees with observations in the seasonal cycle and in spatial patterns but does not reproduce the diurnal cycle or long-term trends. Discrepancies also exist in seasonality magnitudes, peak value months and spatial heterogeneity. Though FPAR is a key representative parameter for the solar radiation partitioning scheme, its accuracy is also decided by input data such as LAI and other conditions. Therefore we generally analyzed possible reasons for disagreements and then focused on those potentially related to the land surface solar radiation partitioning scheme (i.e., diurnal cycle and spatial patterns of FPAR peak months in the Amazon).

We identified that the discrepancy in the diurnal cycle is due to the absences of an angular effect in the model. Implementation of an angular effect in a 1-D model is proposed. The need for a dynamic land cover type in the model indicated by long-term trends is also noted. Evaluation of the CLM4 land surface solar radiation partitioning scheme using remote sensing and Fluxnet FPAR datasets provides targets for future development in its representation of this naturally complicated process.

**Keywords:** land surface, solar radiation partitioning, climate modeling, evaluation