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Remote sensing data assimilation for a prognostic model of vegetation phenology

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Since vegetation and climate interact dynamically, a two-way coupling of vegetation phenology and physiology will lead to a better representation of the terrestrial water and carbon cycle in weather forecasts and climate predictions.

Our aim is to provide a realistic vegetation phenology model which can prognose changing distributions of transpiring leaves in response to seasonal and interannual climatic forcings on a global scale. To achieve this goal, satellite-derived phenological parameters and tower-based ecosystem fluxes are assimilated into existing land surface models. This allows a simultaneous estimation of phenological states and parameters.

We compared four existing prognostic phenology models with MODIS-derived LAI and tower fluxes: The C/N and DGVM scheme as part of the Community Land Model Version 3 (NCAR), the GSI scheme as part of the Simple Biosphere Model Version 2.5 (CSU/ETH), and the Joint UK Land Environment Simulator (UK Metoffice).

Next we show how to improve the prediction of global phenology in the above models by assimilating satellite-derived phenological observations from MODIS. This step involves the careful quantification of observation uncertainties in the satellite data for their applicaton within the used Ensemble Kalman Filter.

The data assimilation experiment will be performed for the global range of ecosystem types and climate zones. Upon completion of this NASA Energy and Water Cycle sponsored research project a generally-applicable prognostic phenology scheme will be provided to the climate modeling community.