Title:
Integrating Seasonal Climate Forecasts with an EnKF-DSSAT-CSM Data Assimilation System for Crop Yield Forecasting

Amor Ines¹, James Hansen¹, Narendra Das² and Walter Baethgen¹
¹International Research Institute for Climate and Society, The Earth Institute at Columbia University, NY.
²NASA-JPL, California Institute of Technology, CA.

Presenter:
Amor Ines, Assoc. Research Scientist, International Research Institute for Climate and Society, The Earth Institute at Columbia University, NY, ines@iri.columbia.edu

Abstract:
We have been developing an integrated modeling framework for predicting crop response that can assimilate remotely sensed vegetation and soil moisture data within the growing season using an ensemble Kalman filter (EnKF). This approach was done with the aim of improving crop model performance to simulate yields at reasonable lead-time before the end of the growing season. Apparently, crop models are very useful for forecasting crop yields because of their ability to simulate crop response as a function of climate, soil, crop characteristics, and management practices. But because of model structure and input and forcing data errors, they are imperfect in simulating the truth. Improving the performance of a crop model without altering its internal model structure can be achieved by updating state-variables periodically with observations, so-called data assimilation. Remotely sensed data e.g., vegetation and soil moisture are potentially useful to be integrated because of their spatial and temporal extents allowing crop predictions over larger regions. Key to data assimilation is the concept of errors, error modeling and error estimation. Data assimilation melds the relative errors in dynamical models and observations. The melded estimates do not degrade the valuable information from a dynamic model but tend to enhance its information content. By assimilating remotely sensed data into a crop model, the accuracy of results will improve, and consequently reduce crop forecast variance. The integrated modeling framework has been developed with DSSAT crop models. Here, we aim to present the methodology, case studies, and its potential to be integrated with seasonal climate forecasts to be able to forecasts crop yields conditioned on advanced climate information.