PROPOSAL FOR FLUXNET SYNTHESIS PUBLICATION

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DATASET PROPOSED

LaThuile

TITLE OF PAPER AND OUTLINE

Optimizing the assimilation of eddy-covariance flux data into a regional scale atmospheric inverse modeling framework

Recent advances in atmospheric CO_2 inverse modeling have highlighted the potential to use this technique for analyzing mechanisms driving biosphere-climate feedbacks at high spatial resolution (disturbance scale), and for monitoring compliance with regional greenhouse gas emissions reduction policies. Because atmospheric inverse modeling generally estimates a large number of fluxes based on comparatively few atmospheric observations, a common approach to better constrain modeling output is to start with prior estimates of flux fields and their associated uncertainties. This technique makes it possible to assimilate large additional databases into the framework, such as eddy-covariance fluxes from the FLUXNET database. At the same time, however, each piece of prior information limits the ability of the inverse model to characterize the carbon cycle from the perspective of the atmospheric observations themselves.

We will develop and evaluate an approach to incorporate multiple site years of eddy-covariance data to optimize a regional-scale atmospheric inverse modeling framework. Assimilation of FLUXNET data will focus on sites located in the U.S. West Coast region. Our objective is to enhance the ability to assimilate high-quality datasets of CO_2 fluxes and concentrations to reduce uncertainties in simulated spatial CO_2 flux products. To balance the benefits of additional pieces of prior information with the limitations they impose on the top-down modeling, we will evaluate results against geostatistical inverse modeling (GIM) simulations. GIM replaces prescribed patterns of prior fluxes with information on how flux fields are correlated across time and space, as well as ancillary environmental data related to the carbon fluxes. Results will be compared against independent flux estimates for the region from inventory studies and existing modeling results. The proposed study will suggest strategies to synthesize the strengths of prior information and GIM to maximize the ability to assimilate existing databases without imposing too many constraints on the inverse model.

PROPOSED SITES TO BE INVOLVED

The proposed study will focus on assimilating data from sites located in the Western part of the North American continent (using 102˚W as the eastern border of the domain). Selected sites outside this domain, but within the North American continent, may be used to fill in information for biome types not covered within the target domain (e.g. cropland systems).

PROPOSED RULES FOR CO-AUTHORSHIP

Contribution of data and intellectual input to analysis and writing, with a maximum of two people per site.