Using FLUXNET data to constrain SVAT model parameterization

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Most land surface schemes in Global Climate Models (GCMs) use lookup tables to assign parameter values for various plant functional types (PFTs), with the implicit null hypothesis that there is little variation in parameter values within PFTs. We will test this hypothesis by using the FLUXNET dataset, in conjunction with non-linear parameter optimization techniques, to estimate key parameters for each plant functional type in several SVAT models used in current GCMs.

Specific objectives will include:
1. Evaluation of parameter distributions for each PFT to determine parameter ranges, means and variances/covariances.
2. Comparison of parameter values from model inversions with default values used in current GCM look-up tables.
3. Run models in forward direction using optimized parameter values (in a Monte Carlo type setting) to examine consequences of parameter uncertainties on predicted fluxes of CO_2, water vapor and sensible heat. Results will be compared with models run using default parameter values. The initial forward model runs will be done off-line, followed by a small number of runs with fully coupled with the GCMs. The latter is a very big task and will require collaboration with major modeling groups.

We will focus on the following land surface models: SiB2.5/3 (CSU), CLM 3/3.5 (NCAR), JULES (UK Met Office) and CABLE (CSIRO and Bureau of Meteorology, Australia), and emphasize the following parameters: V_{cmax} response curves to diffuse and direct light; aerodynamic canopy turbulence parameters; atmospheric stability parameters; seasonal courses in LAI ; soil respiration parameters (Q10, soil moisture); soil water potential for ½ and full stomatal closure; temperature-, VPD-, and light-response curves for net assimilation.

We will use data from a range of different ecosystem types (tropics to tundra), and will focus on sites with a minimum of 5 years of data.

We will invite all PIs who provide data to make an intellectual contribution to the project. Data providers who make such a contribution will be included as coauthors on resulting manuscript. Other data providers will be acknowledged as "group authors", e.g. "the FLUXNET parameter estimation group" and will be identified by name in the manuscript acknowledgements.