Geophysical Research Abstracts
Vol. 13, EGU2011-1910, 2011
EGU General Assembly 2011

Inverse Estimation of the Parameters of a Canopy Gross Photosynthesis Model

Christoph Irschick (1), Thomas Liener (1,2), Albin Hammerle (3), and Georg Wohlfahrt (1)

(1) Institute of Ecology, University of Innsbruck, Austria, (2) Institute of Computer Sciences, University of Innsbruck, Austria, (3) Institute of Plant, Animal and Agroecosystem Sciences, ETH Zürich, Switzerland

Inverse estimation of model parameters by Bayesian methods is a powerful means for deriving parameter values and their uncertainties from bulk measurements, in particular for parameters whose values are otherwise hard to quantify. Gross canopy photosynthesis is a key conceptual component of most carbon cycle models as it provides the carbon input available for growth and respiration. Here we employ DREAM (Differential Evolution Adaptive Algorithm; Vrugt et al., 2008) for estimating the parameters of a canopy gross photosynthesis model which is a combination of a modified version of the two-leaf big-leaf model of De Pury and Farquhar (1997) and the leaf-level light response curve model by Smith et al. (1937). Canopy gross photosynthesis was derived from eddy covariance CO_2 flux measurements above a managed temperate mountain grassland in Austria as described in Wohlfahrt et al. (2008). Further inputs to the model include total and diffuse photosynthetically active radiation and the green area index. All four model parameters, including two related to the phytoelement inclination distribution and optical properties, were well constrained by the available data, suggesting that measured canopy gross photosynthesis possesses enough information content for reliably estimating the parameters of this simple model. Parameter inversions were conducted at different time scales (sub-season, year, decade) and using different assumptions regarding the uncertainty of calibration and input data – these are discussed with respect to implications for modelling canopy gross photosynthesis of the investigated grassland.