

PROPOSAL FOR FLUXNET SYNTHESIS PUBLICATION



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DATASET PROPOSED

LaThuile Dataset

TITLE OF PAPER AND OUTLINE

Parameter estimation in a complex land surface model

Research Questions:

- How much better are land surface models when they are calibrated against eddy flux tower sites compared to a-priori model configurations?
- Is it possible to reduce the parameter space of complex land surface model for parameter estimation, while taking into account the full correlation structure between the parameters?

Background: The use of eddy covariance data is noticed to be a strong tool in model development (e.g. *Alton et al. 2010, Stöckli et al. 2008*) parameter estimation (e.g. *Groenendijk et al. 2010, Prihodko et al. 2008, Wang et al. 2006*) and uncertainty identification (e.g. *Baldocci et al. 2001*) in land-surface schemes. But land surface models (LSM), where the vegetation is represented as plant functional types (PFT), have a large number of parameters. This limits the efficiency and robustness of parameter optimization algorithms. Less important or co-varying parameters are therefore frequently fixed during parameter estimations in order to limit the number of degrees of freedom. This neglects co-variances between parameters. For example maximum electron transport capacity (J_{max}) correlates with maximum carboxylation capacity ($V_{c,max}$). If one fixes J_{max} during optimization and optimizes only $V_{c,max}$, the resulting $V_{c,max}$ is not correlated with J_{max} anymore.

Aim: We propose to estimate mean model parameters of the Community Land Model (CLM) from the National Center of Atmospheric Research NCAR, Boulder, CO. We aim to develop an estimation procedure that reduces the optimization space while taking into account the full co-variance structure between model parameters.

Method: In order to take the whole co-variance between parameters into account, we will use the eigenvalues of the covariance matrix during the optimization procedure. This is different to the methods where the parameters are optimized directly. The use of the eigenvalues instead of the parameters helps to search for an optimal solution with a feasible amount of model runs. We will use Simulated Annealing (Metropolis) as optimizing algorithm.

PROPOSED SITES TO BE INVOLVED

The proposal focuses on global distributed sites (**LaThuile** data set, 251 sites). All sites with more than one year observations of meteorological variables needed by the model and observations of latent heat, sensible heat and GPP will be considered.

PROPOSED RULES FOR CO-AUTHORSHIP

The rules as proposed in the disclaimer for the FLUXNET2007 synthesis will be applied.

REFERENCES

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