Geophysical Research Abstracts,
Vol. 11, EGU2009-5312, 2009
EGU General Assembly 2009

Seasonal and spatial variation in broadleaf forest model parameters

M. Groenendijk, M. K. van der Molen, and A. J. Dolman
Hydrology and Geo-Environmental Sciences, VU University Amsterdam, the Netherlands (margriet.groenendijk@falw.vu.nl)

Process based, coupled ecosystem carbon, energy and water cycle models are used with the ultimate goal to project the effect of future climate change on the terrestrial carbon cycle. A typical dilemma in such exercises is how much detail the model must be given to describe the observations reasonably realistic while also be general. We use a simple vegetation model (5PM) with five model parameters to study the variability of the parameters. These parameters are derived from the observed carbon and water fluxes from the FLUXNET database.

For 15 broadleaf forests the model parameters were derived for different time resolutions. It appears that in general for all forests, the correlation coefficient between observed and simulated carbon and water fluxes improves with a higher parameter time resolution. The quality of the simulations is thus always better when a higher time resolution is used. These results show that annual parameters are not capable of properly describing weather effects on ecosystem fluxes, and that two day time resolution yields the best results. A first indication of the climate constraints can be found by the seasonal variation of the covariance between J_m, which describes the maximum electron transport for photosynthesis, and climate variables. A general seasonality we found is that during winter the covariance with all climate variables is zero. J_m increases rapidly after initial spring warming, resulting in a large covariance with air temperature and global radiation. During summer J_m is less variable, but co-varies negatively with air temperature and vapour pressure deficit and positively with soil water content. A temperature response appears during spring and autumn for broadleaf forests. This shows that an annual model parameter cannot be representative for the entire year. And relations with mean annual temperature are not possible. During summer the photosynthesis parameters are constrained by water availability, soil water content and vapour pressure deficit.