Review of Wu et al

In this paper, the authors analyse 13 years of eddy flux data from a beech forest in Denmark using a very simple model for GPP, TER and NEE (Eq. 4). At line 203 (L203) it is stated that parameters of the model are allowed to vary every two days and are estimated by minimizing a least squares cost function. Unfortunately, this is just curve fitting not modelling, so it is no surprise that the 'model' with variable parameters accounts for 83% of the variance in the annual half-hourly measured NEE (L313). True model parameters should be constants, but this ideal is difficult to achieve when modelling complex biological systems. Nevertheless, careful choice of model can help approach the ideal by using additional algorithms that account for the variability in parameters. An obvious example in the present study is the 'parameter' β which is identified as the 'maximum photosynthetic capacity at light saturation'. This cannot be correct because seasonal variation in GPP depends on variation in leaf area index in concert with any changes in the true physiological photosynthetic capacity during the life cycle of a leaf. By including LAI into a revised Eq 5 may improve model performance and consequently improve our understanding of the true biological responses of the forest to variable climate.

The authors follow Richardson et al (2007) in combining their model and statistical techniques to distinguish between the direct response of GPP, TER and NEE to climate variability and to indirect biotic changes. This analysis is not generally useful for other scientists because the partitioning between these is totally model-dependent. As stated earlier, the model used in this study has significant flaws and hence the analysis is flawed.

Because of these deficiencies, I recommend that the paper not be accepted for publication.

Other comments

L39. It is not clear what is meant by 'strong influence of functional change'

L142 How is it possible to separate cause and effect in variations in GPP, TER and NEE due to vegetation and climate variability (temperature, radiation, rainfall etc.)? Climate is the key driver of ecosystem carbon dynamics as can be seen in vegetation gradients across the globe (wet-dry, hot-cold etc).

L159 The measurements were made at 43 m above ground, not 43 m above the canopy.

L208 ...By application of the parameter ..

L269 ...'when soil water content controlled the interannual variability' This statement is not correct. Correlation does not mean causation. Temperature and soil moisture are negatively correlated during the period being discussed, so you cannot say which factor is controlling GPP.

L280 – 284. I agree with this statement. See above comment

L285-297 This paragraph is long-winded. It can be summarized by stating that, relative to the average, in 1998: Low T & R_g are correlated with low GPP, and high SWC is correlated with

high TER. In 2008, High T & R_g are correlated with high GPP, and low SWC is weakly correlated to TER.

L310 ... lower (than what?)

L330 – 333 Including the parameter time series will improve the results because β depends on LAI and this changes during the year. As stated earlier, the modelling approach adopted in this paper is largely curve-fitting.

No further comments are offered because, unfortunately, the paper is not of sufficiently high standard to be published.