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Biogeosciences Discussions

Interactive comment on "Topography induced spatial variations in diurnal cycles of assimilation and latent heat of Mediterranean forest" *by* C. van der Tol et al.

Anonymous Referee #1

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General comments

Van der Tol and colleagues have studied the effects of diurnal patterns of weather and the vegetation parameters to fluxes of carbon and water in terrain with different slopes and aspects. Four different sites were studied. Extensive field work and modeling was carried out. The current study is of general importance since it aims to better qualify the biochemical parameters that are widely used in modeling and provides information about effects of the heterogeneous terrain. For the modeling purpose the data used in parameterization included photosynthetic parameters from leaf chamber measurements, nitrogen content of leaves and isotopic carbon discrimination of leaves.

The model combined the biochemical Farquhar model with conductance obtained from Cowan and the energy balance closure and it was scaled from the leaf to the canopy level. The model was validated by independent data from sap flow measurements. Overall this study is well done and important but the conclusions made appear to me quite far-reaching on the basis of this data.

Specific comments

Page 1632, line 6: Adaptation and acclimation are mentioned here together without further clarification. In Introduction only adaptation is mentioned. Maybe they both could be better defined in the Introduction, in the third paragraph for example.

Page 1635: The Farquhar model parameters Jmax and Vc are strongly temperature dependent. Which temperature dependencies were used for them? And for leaf respiration Rd?

Page 1637: It is not stated clearly here or in the Appendix A that in the Farquhar model assimilation is the minimum of the Rubisco-limited and the electron-limited branch of the model.

Page 1641: Number of the samples in leaf chamber measurements could also be mentioned in text, not only in the figure legend. How many trees did you sample?

Page 1642: Leaf samples are collected at different time periods than the leaf chamber measurements were performed. The nitrogen content of the leaves is constant at these times? Kosugi et al. (2003) see some changes in Vcm according to seasonal changes.

Page 1643: It was Vcm, Rd and q that were estimated from the chamber measurements, not Jm. At least so I understood from the Results-section. I would not use the verb ‘calibrate’ in this context. In line 16 ‘each plot’ could be replaced by ‘two species’.

Page 1645: Are there any literature values for photosynthesis parameters of Quercus or Fraxinus that the measured ones could be compared to?

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Page 1646: The method used here feels optimistic. The equation given by Field and Mooney is based on maximum assimilation not on Vcm. You could argue its use better.

Did you make any comparison for Vcm -values obtained by the nitrogen content to the literature values? If this is possible to do, maybe it could justify the method more.

As for the points drawn in Figure 6 from the paper of Reich et al. (1999). Reich et al. had over 100 species in their paper, I do not see so many points here. Did you select them according to a certain criteria? What value for light use efficiency was used when you calculated these points?

Page 1654, eq. B2: if x=1, is epsilon2 zero and the latter equation is undefined? Typing error in the range of equation?

Technical corrections

When writing about enzyme- and electron-limited branches of the Farquhar model, I would recommend using a hyphen.

Page 1632, line 2: word 'variations' is in one sentence three times. Some replacing or '..variations in weather conditions and in the vegetation characteristics'? Page 1632, line 11: Contrasting slopes? Slope is 30 degrees in all of the sites. Page 1632, line 13: two leaf layer model, but in page 1635 line 1 two-leaf model. The name and typing should be consistent. Page 1638, line 13: lambda is defined here with temperature dependency. Same symbol is used for lambda in eq 20 without temperature dependency. Different symbol for equation 20? Page 1638, eq. 10: Is the definition of Ta given? Page 1639, line 5: Tl? Should it be Ts? Page 1640, line 21: two plots ARE predominantly.. Page 1646, eq 2: Definition of N? V-> Vcm in the equation Page 1650, line 20: replace 'are' with 'were' Page 1654, line 14: leave->leaf Page 1656, eq. B7: Is this equation right? Page 1656, line 10: Definition of Iio is given, but it is not shown in the previous equations. Page 1657, line 16: big-leave -> big-leaf Fig 7 text: circle Fig 9 and 10: in figures latent heat is marked with capital letter lambda*E, even though

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capital lambda in text is referencing to water cost of assimilation

References

Kosugi, Y., Shibata S. and S. Kobashi: Parameterization of the CO2 and H2O gas exchange of several temperate deciduous broad-leaved trees at the leaf scale considering seasonal changes, Plant Cell Environ., 26, 285-301, 20

Interactive comment on Biogeosciences Discuss., 3, 1631, 2006.