Biogeosciences Discuss., 3, S921–S924, 2006
www.biogeosciences-discuss.net/3/S921/2006/

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.

C. van der Tol et al.

Received and published: 22 December 2006

Start of the introduction \\ The first two paragraphs can be replaced by two paragraphs that describe the following:

1 The physical processes of photosynthesis and the exchange of water and carbon dioxide between vegetation and the atmosphere are now reasonably well understood. When applying this process knowledge in climate models, it is still difficult to find appropriate values for the parameters at the required temporal and spatial scales. Moreover, surface parameters change in response to climate, which makes extrapolations in a changing climate difficult.

2. Vegetation parameters adapt to climate. The fluxes can in principle be calculated if

long term adaptation and short term response are understood.

Page 1633: second aim of the study\\ I propose to replace '..the quantification... flux' with '...to estimate the relative contribution of long term (vegetation characteristics) and short term (weather conditions) effects of climate on the diurnal cycle of latent heat flux'

Page 1634: the novelty. \\ Instead of focusing on the independence of the data alone, it is better to emphasize also the suitability of the location of the study here: 'The novelty of the approach is in the data used for parametrization and validation of the model. Data were collected in natural broadleaf sub-Mediterranean forests, in which forest characteristics are related to contrasts in local hydrological and climate conditions and aspect. Contrary to studies which calibrate vegetation parameters from measured fluxes, independent measurements were used at leaf level for parametrization, and sap flux density measurements for validation.'

Page 1635 Conductance g\\ g = 1/(1/ga + 1/gc), i.e. the reciprocal of the total resistance.

The equation for Ga\\ I refer here to the reply to L. Montagnani. Aerodynamic conductance, and especially convection and advection, is important to explain differences among the plots in net precipitation (i.e. the difference between precipitation and evaporation of wet vegetation), temperature and humidity at the surface. This is, however, beyond the scope of the paper. In this study, temperature and humidity were measured close to the canopy, and stomatal resistance was relatively much more important than aerodynamic resistance.

Although the questions of aerodynamic conductance and the effects on the boundary layer are interesting, we could not address them because of logistical limitations to what could be measured in the terrain.

Measurement techniques\\ In the reply to the first reviewer L. Montagnani, I described the measurements of radiation, humidity and temperature. They should indeed be in-

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cluded in the material section. Radiation was measured with a Kipp CNR1 (Kipp and Zonen, Delft, Netherlands) instrument for long and shortwave incoming and outgoing radiation at the south plot, temperature and humitidy with asipiratied, shielded humicaps (Vaisala Instruments) at each plot at 2 m height.

Page 1645 line 21\\ A more accurate description is: 'Fig. 5 shows photosynthesis and the ratio of internal to ambient carbon dioxide concentration as a function of PAR irradiance, measured in a leaf chamber.' We should state that ambient carbon dioxide varied no more than 10 ppm during the experiment.

Page 1646 lines 5-7\\ It is realistic to assume that gas exchange does not stop entirely when stomata close (i.e. that a minimum stomatal conductance exists). This implies that the model of Cowan (1977) is incomplete for low C_i. The solid line in Fig. \ref{fig:photo} was derived by assuming a relation between assimilation and stomatal conductance as proposed by Leuning (1995). Although the model of Cowan (1977) does not work at low C_i, it is used in our model because parameter Λ has a conceptually clear meaning.

Page 1648 line 2\\ Assimilation at canopy level was not measured.

Page 1648 lines 17-18\\ 'For all plots, the squared correlation coefficients are above 0.90. Latent heat flux at the north plot is slightly underestimated, and maximum latent heat flux at the south and east plot overestimated. The model does not take into account a time lag between transpiration and sap flux. The data indicate that for some time after sunset, sap flow continues, and this causes a slight convex shape of modelled versus measured latent heat.' The word remarkable is perhaps over the top.

Page 1649 \\ The fact that T_s-T_a is wrong, is most probably due to a hotspot effect. The neglected soil heat flux may also have an effect. The reason to neglect soil heat flux was to avoid overparameterization.

Page 1651 \\ Whereas at other places in the text and in Table 5, we used the correct

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unit of hPa, we wrote kPa here by mistake.

Technical comments\\ Fig. 3 may be useful for the reader to have as a reference. We prefer to keep it. The information in Table 2 can be presented in the text.

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