

Interactive comment on “Physical based retrieval of crop characteristics for improved water use estimates” by K. Richter and W. J. Timmermans

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Received and published: 20 May 2009

Dear Referee,

thank you very much for your comments to our study “Physically based retrieval of crop characteristics for improved water use estimates”.

We will answer your specific comments as clear as possible.

Comment 1 (‘..could you please explain what RTM stands for?’):

RTM stands for the general term “radiative transfer model”. In the revised manuscript version, we will rename section 2.1.2 to “Radiative transfer model” and explain also this term in the introduction (p. 1976 line 5/6: “In these radiative transfer models (RTM),

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the complexity...”)

Comment 2 (‘I think it is better to add a brief introduction of TSEB’)

This brief introduction is provided in section 2.2., where a description of relevant characteristics of the model is given as well as the references to the original work, where a full description of the model can be found. To make this more clear, and also to avoid misunderstanding/mixing with section 3.2, we have renamed section 2.2 into “TSEB model”.

Comment 3 (‘could you please explain what cause the lower-estimations possibly?’): For certain crops, depending on canopy geometry / leaf clumping, the model tends to underestimate high LAI values. This behavior probably results from the nonlinearity of the LAI-reflectance relationship, leading to saturation effects (Bacour et al., 2006; Baret et al., 2007). However, for NDVI-based LAI estimations, the saturation effect is also well-known and even more pronounced. On the other hand, even the measurements could cause an overestimation of LAI, since the LAI-2000 can not separate between photosynthetic and non-photosynthetic canopy components. This may occur whenever the built-in assumption of randomly distributed plant elements holds true. Thus, non-green elements (such as stems or senescent leaves) reduce the measured gap fractions of the instrument. However, in our study we used the ‘effective plant area index’ (PAI_{eff}), which is not corrected for both effects (see sect. 2.3.3). Explanations will be included in the revised manuscript in sect. 3.1 (results & discussion).

The title will be renamed into: “Physically based retrieval of crop characteristics for improved water use estimates”.

Technical corrections will be included in the revised version, with the following exceptions: P1974 L5: There are more inputs into the two-source model than only LAI and fCover, but here we mean only the inputs of LAI and fCover, hence the construction we use is correct. P1974 L20: “years describing their interactions between” is changed to “years that describe this interaction between” P1976 L14 “estimation” is correct. P1978

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L25: parameterization load is changed to “complex parameterization schemes”

References not cited in the manuscript:

- C. Bacour, F. Baret, D. Béal, M. Weiss, K. Pavageau, “Neural network estimation of LAI, fAPAR, fCover and LAI×Cab, from top of canopy MERIS reflectance data: Principles and validation, “Remote Sens. Environ., vol. 105, no. 4, pp. 313-325, 2006.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 1973, 2009.