Biogeosciences Discuss., 8, C1548–C1549, 2011
www.biogeosciences-discuss.net/8/C1548/2011/

Biogeosciences Discussions

Interactive comment on "Assimilation of Soil Wetness Index and Leaf Area Index into the ISBA-A-gs land surface model: grassland case study" *by* A. L. Barbu et al.

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Received and published: 15 June 2011

The authors thank the anonymous reviewer #1 for his/her review of the manuscript and for the fruitful comments.

COMMENT 1.1: I have one comment that is relevant to the science and that is if the data being assimilated are incompatible with each other, for instance if the LAI is showing an increase and the model has reached a completely dry state. Could you add a comment about the possibility of conflicting information coming from these different data streams?

RESPONSE 1.1

The reviewer pointed out an important aspect of data assimilation that can be viewed as a bias issue.

Indeed, conflicting information coming from LAI and soil moisture data streams (e.g. increase in LAI while the model has reached a completely dry state) may occur. This will generate a bias between the model results and the observations. In this case, the filter can balance the influence of the opposing tendencies according to the assumed errors of each component of the assimilation, but it cannot correct for a systematic bias. Incompatible high observed LAI values and low modelled soil moisture values would result in positive LAI increments, but the model would not be able to maintain high LAI values. Conflicting model and observation trends may be caused by either observation or modelling errors. The latter may be related to model shortcomings in the representation of the soil moisture content distribution (e.g. a single soil moisture reservoir vs. a multi-layer model). The assimilation cannot correct such discrepancies.

Moreover, the examination of the dSWI/dLAI Jacobian term which controls the plant transpiration shows that it has generally negative values. Zero and low positive values (magnitude of 1/10000 or lower) have a frequency of 3,5%. We believe that this is caused by some numerical instabilities and not by an effect of LAI on soil moisture.

Interactive comment on Biogeosciences Discuss., 8, 1831, 2011.