**Hydrology and
Earth System
Sciences
Discussions**

Interactive
Comment

Interactive comment on "Vegetation dynamics and soil water balance in a water-limited Mediterraneanecosystem on Sardinia, Italy" *by* N. Montaldo et al.

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General comments

As this paper of Montaldo et al. clearly demonstrate, modern hydrology is paying more and more attention to the influence of vegetation dynamics on land surface processes. The methodology proposed in this paper and tested in a typical Mediterranean ecosystem is appealing for its simplicity and the relatively limited number of parameters needed. It is also appreciable the inclusion of remotely-sensed input to infer the spatial distribution of vegetation over the area of interest. The coupled LSM-VDM model includes algorithms and relationships described in cited papers; as such, it sometimes

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difficult to trace the whole structure of the coupled model without carefully reading the cited references. For example, the equations for the energy balance components are taken from a simplified schematisation not widely acknowledged or simply not easily available, i.e. Noilhan and Planton (1989).

Specific comments

Section 1:
Par.25 pag. 221: the sentence seems inconclusive; the approach proposed in this paper is highly empirical; explain main differences and advantages of proposed methodology compared to previous ones.

Section 2.3
It is not clear the usage of remotely sensed images in the context of the present application: is it really needed only to determine the fractional vegetation cover in the footprint area of the EC tower, or it was meant for other purposes ? Please, specify.

Section 3.1:
1) it is not straightforward to identify the input variables; add a table, similar to Tab.1, indicating which are the input variables needed;

2) the bottom boundary condition, represented by qD in Eq.(1), is considered as a unit gradient; justify this assumption, considering that the soil has been described of limited depth (thin, paragraph 15, pag.229); according to my experience, very often in presence of thin soils, the bottom layer is impervious (rock or compact clay);

3) the LSM consider 3 different sources of water vapour fluxes from the surface (bare soil; grass and vegetation); in this case, it appears quite troublesome to consider the Penman-Monteith schematisation of a "big-leaf" for estimating the transpiration, especially if the resistance terms are calculated as described in Appendix A. Authors should have considered here a two-source approach (i.e. Shuttleworth and Wallace); justify the underlying assumptions.

4) The LSM model runs with an half-hour time step, while the VDM model runs with daily steps. Considering that during night hours the shortwave radiation is null, the effect of step-wise change in vegetation parameters like LAI should not affect the numerical integration; however, some clarification might be needed to explain the choice of different time steps in the two models and their implications.

Section 4:
Par.5, pag.233: Again, here it is claimed that the coupled LSM-VDM model outputs energy balance terms, but no description is given about the way the algorithm proposed by Noilhan and Planton (1989) has been implemented.

Par.15, pag.235: it is not clear in the last sentence the link between the potential evaporation Ep (which only depends on canopy and atmospheric conditions) and soil moisture conditions.

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