

Interactive comment on “Ecohydrology in Mediterranean areas: a numerical model to describe growing seasons out of phase with precipitations” by D. Pumo et al.

Anonymous Referee #3

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General Comments

The paper presents the results of the application of a variant of the analytical model proposed by Laio et al. (2001a) in the forested river basin of the Eleuterio in Sicily; the numerical model presented, taking into account the soil moisture condition at the beginning of the growing season, aims to evaluate the effects of the transient condition in a river basin belonging to mediterranean climate where the steady-state hypothesis is not applicable because the transient effects governed by the initial conditions at the beginning of the growing season are not negligible. The model works using an

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opportune time-scale (lower than daily), through a finite differences method, and it computes the soil moisture temporal evolution. The static water stress is numerically computed from the soil moisture traces; moreover, the authors calculate the mean duration and frequency of water stress periods and hence a dynamic water stress index according to Porporato et al. (2001). Interesting is the comparison between the analytical pdf proposed by Laio et al. (2001a) and the soil moisture pdf during the growing season calculated exploiting the numerical model which analyse the effect of two different interannual discretization for rainfall and evapotranspiration parameters. Further interesting results concern the comparison between the two schemes, obtained adopting the two different interannual discretizations, regarding to the soil moisture and water stress variables during growing season.

Specific Comments

The paper gives a small contribution to the study of climate soil vegetation interaction in Mediterranean areas; its abstract is accurate and informative, the tables of data and the figures are sufficient for understanding the research conducted, but the work presented doesn't contains enough new material to warrant regular research so, it is acceptable for a short communication. I believe that the paper is quite interesting and warrants publication with more additional modifications.

In my opinion the paper is incomplete; a model which consider the transient effects of the soil moisture for application in Mediterranean river basins is a good idea, but not enough information are provided; it needs further investigations to determine if the proposed approach advances the state of the art. For example major attentions have to be dedicated to the comparison between numerical and analytical model; further analysis of the influence that the main physical factors role on the soil moisture pdf's are required; for instance the model should be applied not only for different soil type but also for different vegetation cover type; it is interesting to see what happens for different soil depth.

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The paper contains several unnecessary pieces which should be deleted:

the concepts about the interception and the soil balance equation explained in section 2 from page 2774 line 14 to page 2775 line 8, should be contracted being already explained in recent research; the equation (5) and (6) and fig. 1 are unnecessary because already presents in Laio et al. (2001 b); the page 2776 may be contracted reporting only the innovative information; just a few lines with an adequate reference can be introduced instead of the section 2.2 which contains concepts already explained by Laio et al 2001 b; at page 2779 from line 16 to 22 the parameters of the rainfall model have been previously described; page 2780 from line 10 to line 15, the resume of all the input model is not necessary because the parameters have been widely described previously; section 2.4 may be reduced, in fact the description of plant water stress is already done in Porporato et al. (2001); the concepts expressed in the section 3.2 pages 2789 - 2790, are similar to those explained by Caylor et al. (2005).

The conclusion of the section 3.4 is obvious and it is not in phase with the concluding remarks at lines 21-22; it seems rather strange that the differences between the results obtained with the two proposed schemes are minimal; this would implies that to consider the interannual discretization for rainfall and evapotranspiration parameters, is unnecessary; so i suggest to better explain this concept.

Technical Corrections

In fig 5a the units of measurement of the vertical axis should be introduced; In figure 6, it is not clear the meaning of the x-axis description; In fig 7, in the box of each plot it is preferable to introduce colored lines for legend; Page 2792, line 17 the figure should be 5b instead of 5a; Page 2793 line 11 the equation should be 23 instead 17.

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