

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 #1

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The aim of this paper is to investigate the soil moisture temporal variability in Mediterranean areas, which are characterized by a strong climatic seasonality, with a vegetation growing season occurring in the dry period, after the wet season. The specific aim of this paper is to explore how the probabilistic distribution of the soil moisture during the growing season is affected by the climatic seasonality and by the initial soil moisture conditions, as they are established at the end of the preceding wet season.

The analysis is carried out by employing a stochastic soil water budget model, which has been originally developed by Rodriguez-Iturbe et al. (1999a) and it has been ap-

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plied in many research works (e.g. Laio et al., 2001; Porporato et al. 2001). Laio et al. (1991), in particular, derived a probability distribution of the soil moisture by an analytical solution of the stochastic soil water budget equation, under the hypothesis of stationary climatic conditions.

Differently from previous works, the model is here applied under non-stationary conditions of the climatic forcing (namely rainfall and reference evapotranspiration), in order to simulate the effect of the climatic seasonality. Since it is not possible to derive an analytical solution under non-stationary climatic conditions, the authors solved numerically the soil water budget equation.

A large part of the paper (see sections 2.1, 2.2 and 2.4) illustrates model details and solutions that are already described in previous papers. The paper could be shortened in this part by simple citing the original papers.

A larger discussion should be devoted to the analysis of the numerical issues. According to what stated at page 281, lines 7-11, the numerical solution is sensitive to the computational time-step and that «satisfactory» solutions could be obtained by applying «2-4 steps per day». I believe that the authors should provide numerical evidences for this statement. What is the actual sensitivity of the numerical solution to the computational time step?

Since the model simulates the vertical processes at the local scale, it is not clear how the model «considers a river basin as a collection of elementary cells», as stated at page 2780 line 5-8. Also in the model application, it is not clear to what extent «the raster schematization with 23814 elementary cells (20mx20m)» could have been relevant for the model application. There is no connection of the model application to the catchment scale or to the catchment features. The model has been simply applied for three sets of model parameters, given by three soil types and one vegetation type, and for two schematizations of the temporal variability of the climatic conditions.

The paper does not provide any data that could validate the model conceptualizations

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or the model results in the studied area. How did the authors verify that «higher is the interannual discretization for rainfall and evapotranspiration parameters, more accurate is the resulting pdf» (page 2794, lines 20-23)? How is the accuracy measured? The model is applied with non-stationary climatic conditions, while keeping the vegetation cover (represented by the Leaf Area Index) stationary. To what extent a stationary vegetation cover could be assumed in a Mediterranean environment? Is the temporal variability of the vegetation cover masked into the variability of the reference evapotranspiration?

Specific comments The sentence at page 2778, lines 9-11, is not well connected to the previous part of the section. At page 2781, lines 12-14, what does it mean to «scale down» at the same «time-scale» the «saturated hydraulic conductivity»? References under tables 1 and 2 are not correct or at least they do not match with the references cited in the text. Since only one type of vegetation has been considered in the numerical application, the parameters concerning the shrub and the grass could be omitted from table 1.

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