

## ***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 #2**

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The manuscript deals with a topic of great relevance to scope of HESS particularly for the special issue on CSV interactions. The aim of the paper is to investigate the soil moisture dynamics using a simple nonsteady numerical ecohydrological model to account for the strong seasonality of the Mediterranean climate which is quite different from the typical savannah context found in most scientific papers that make use of the analytical solution for the soil moisture pdf given by Laio et al. (2001). And in the outline of the work the application to a small catchment seems to be a focal point of the paper presentation.

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The scientific background is quite complete as well as the references to fundamental papers in the development of basic ecohydrology concepts. Consequently the description and explanation of literature concepts and findings such as the analytical solution of the stochastic differential equation for the soil moisture dynamics introduced by Rodriguez-Iturbe et al. (1999) and the water stress expression (Eq.1, Eq.5 and Eq.6) should be omitted and referenced through quotation of the specific original papers. This is also the case of the description of the loss function in Fig. 1. In a similar vein, it is not clear what is the use of Eq.2, Eq.3 and Eq.4 in the economy of the presentation. Again, the analytical solutions in Section 2.2 and Section 2.4 are well-known results from Laio et al. (2001) and Porporato et al. (2001) and therefore should be omitted at least in their intermediate analytical steps.

After a description of the numerical model developed for the soil moisture balance it is stated that an application to a real catchment was performed and this indeed is an interesting point in the paper. Nevertheless, such an application is reported limitedly to the climate and to some of the landscape featured in the proposed study catchment. But none of the water balance or hydrologic result refers to the hydrologic behaviour of the catchment. Neither is any clear why the catchment study was limited to one sole vegetation cover type.

Despite the comments above, the numerical solution of the soil moisture dynamics and the methodology for synthetic generation of rainfall records (both with Scheme A and B) are well developed and explained therefore represent a promising approach for the possible extension of the basic ecohydrological theory to the Mediterranean climate that is typically modulated by the interaction between soils and vegetation covers under out-of-phase climatic forcing. Nevertheless the peculiarity of simplified soil moisture simulation models makes any validation of results quite problematic. And this application is no exception. No validation of the conjectures arising from the model application is presented. The application to the catchment presented in Section 3 is somehow misleading as no reference to the basin scale is found in the results.

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In the comparison (between scheme A and B) of soil moisture time profiles in Section 3.4 it seems that the reported differences could not be related only to the different parameterization of rainfall generators since the 2 simulated years were randomly selected and therefore presumably they have different seasonal rainfall inputs (i.e. in terms of seasonal totals).

It is a relevant result in the paper that an adequate description of the soil moisture regime can be obtained from a synthetic simulation of the dormancy season (DS) and the following growing season (GS) with their respective rainfall statistics. Such simplification is well able to highlight the carry-over effect of soil moisture from the wet to the dry season.

Referencing in some of the tables does not match the guidelines for authors. The language should be improved through the entire paper and the paper length consistently reduced by focusing only on the original methodologies, application and results. The catchment application is doubtful to the effective results of the paper.

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