

Interactive comment on “Analysis of soil and vegetation patterns in semi-arid Mediterranean landscapes by way of a conceptual water balance model” by I. Portoghese et al.

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We are grateful to the reviewer for his prompt comments to our manuscript. The referee's expert opinion, can be accounted in a revision of our paper for some improvements, nevertheless we believe it is helpful to better explain, in this first reply, some of our reasoning and results that, it seems, have been misleading with respect to the main objectives of the work. First, we believe it is worth stating what are the research questions that inspired our work and the undertaken investigation approach, as reported in the following points: 1) A primary motivation for this study is the development

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and implementation of a simple water balance model for regional applications in semi-arid Mediterranean landscapes, suitable to investigate the impact of climate change on regional water budget, and identify critical climatic and landscape controls over large spatial domains. 2) The testing hypothesis is that the analysis and detection of CSV interactions may provide a priori information which can be easily exploited, in large-scale water balance studies helping to reduce parameter uncertainties that arise in absence of accurate soil databases. 3) As a validation of such kind of reasoning, we provide evidence that the landscape feature (vegetation, soils, topography etc.) prevalent in the study region being the outcome of an evolutionary adaptation to the multi-scale climate variability, could be considered as keys to understanding the underlying water balance regimes at regional scale. Then, keeping such a perspective, in the following we have sought to respond to the Referee#1's comments also trying to stimulate a constructive discussion on the specific targets addressed in the paper.

A- Referee Comment: We may acknowledge that the paper could be shortened. The referee's comment is quite general and un-specific, thus it is not much constructive. Nevertheless some model output representations (example: figures 3 and 5) could be removed in a revised manuscript, for the sake of brevity.

B- Referee Comment: We believe this point is not much pertinent to the paper results. In fact we mostly adopted basic statistics to describe the average hydrological behaviour and its dispersion at the annual and monthly timescale. No inference on the stochastic behaviour of the involved quantities is actually invoked except for the pdf of the soil water holding capacity that is assumed to be Gamma-distributed according the referenced literature.

C - Referee Comment Simplifications (e.g. grape plants are known to be able to extend their roots as deep as 30 m and citrus trees are commonly irrigated in semiarid areas) are necessary in most model applications and particularly they are here introduced because we want to focus on (quite commonly experienced) conditions of absence of accurate soil databases (see point 2 here-above). Conceptual and physically based

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models almost always face with data scarcity. Our assumptions on root depth ranges are taken from the reference literature and refer to the equivalent soil depth containing most part of below ground biomass. Deep-growing roots are considered as a response to anomalous environmental conditions (shallow soils over fractured rocks). In this sense, the lower AWC values in the experimental soil samples in Fig. 10 can be justified. Referring to the citrus trees, we notice that this should not be considered among the typical naturally adapted vegetation as it is not suitable for rain-fed farming. As a proof of that, in the considered soil samples, less than 0.5% corresponds to citrus plantations in the study region.

D - Referee Comment It obviously appears that the referee did not caught the motivation of the paper. We do not aim to provide instructions for farmer's practice neither we aim to assess the hydrologic performance of such a simple model that has been widely performed in the hydrologic literature. We firstly observe that, despite human efforts and technologies, the natural balance of the observed ecosystems, also for cultivated species, results to be mainly controlled by natural factors that are not merely climatic but are strongly affected by climate-soil-vegetation interactions. This is not obvious and it is not un-useful. It is particularly useful since our goal is the reduction of uncertainty of water balance model at regional scale in conditions of absence or scarcity of soil-related information. In such a case the respect of eco-hydrological principles may provide useful and non-conventional information which is today mostly not exploited in hydrology.

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