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Analysis of soil and vegetation patterns in semi-arid Mediterranean landscapes by way of a conceptual water balance model

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Abstract. This paper investigates the impact of various vegetation types on water balance variability in semi-arid Mediterranean landscapes, and the different strategies they may have developed to succeed in such water-limited environments. The existence of preferential associations between soil water holding capacity and vegetation species is assessed through an extensive soil geo-database focused on a study region in Southern Italy. Water balance constraints that dominate the organization of landscapes are investigated by a conceptual bucket approach. The temporal water balance dynamics are modelled, with vegetation water use efficiency being parameterized through the use of empirically obtained crop coefficients as surrogates of vegetation behavior in various developmental stages. Sensitivity analyses with respect to the root zone depth and soil water holding capacity are carried out with the aim of explaining the existence of preferential soil-vegetation associations and, hence, the spatial distribution of vegetation types within the study region. Based on these sensitivity analyses the degrees of suitability and adaptability of each vegetation type to parts of the study region are explored with respect of the soil water holding capacity, and the model results were found consistent with the observed affinity patterns.

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