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Comparison of the Performance of two Land-Surface Models in Southern Spain

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Land-Surface Models (LSMs) are designed to be coupled to Global Circulation Models (GCMs) and Regional Circulation Models (RCMs), such as the Weather Research and Forecasting (WRF) model, in order to properly represent the land-atmosphere interaction in terms of hydrological processes and energy fluxes. The fact that the soil moisture strongly affects the atmospheric processes has led to an increasing interest of this variable by climate modelers and hydrologists. The Variable Infiltration Capacity (VIC) hydrological model and the Noah LSM are widely used and they have demonstrated that effectively reproduce the interaction between the atmosphere and the land surface in many regions.

This study focuses on the comparison of the hydrological response of the Guadalquivir River Basin applying the VIC model and the WRF/Noah LSM Coupled system. The VIC model was previously calibrated and validated for this basin, defining thus the set of parameters that best fit to the observed streamflow in the different sub-watersheds of the Guadalquivir River Basin. On the other hand, the WRF/Noah LSM Coupled system was run for the entire Iberian Peninsula, for present and future climate. Various time periods have been contemplated in this study: the present climate is represented by the period 1980-2014, and the future climate by two periods, 2021-2050 as near future and 2071-2100 as far future. The future projections have been driven under two different Representative Concentration Pathway (RCP) scenarios, RCP4.5 and RCP8.5.

The results of this work reflect the similarities and the differences between the outputs from the VIC model and the WRF/Noah LSM Coupled System for the study site. Efforts must be focused on the water balance components of both models in order to evaluate their performances for the present climate and for the future under different scenarios.

Keywords: Land-Surface Model, VIC model, WRF/Noah LSM Coupled system, Guadalquivir River Basin, hydrological response.

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