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# Coupling study of the Variable Infiltration Capacity (VIC) model with WRF model to simulate the streamflow in the Guadalquivir Basin

Matilde García-Valdecasas Ojeda, Sebastiano De Franciscis, Sonia Raquel Gámiz-Fortis, Yolanda Castro-Díez, and María Jesus Esteban-Parra

Universidad de Granada, Física Aplicada, Granada, Spain (mgvaldecasas@ugr.es)

Variable Infiltration Capacity (VIC) model is a large-scale, semi-distributed hydrologic model [1]. Its most important properties are related to the land surface, modeled as a grid of large and uniform cells with sub-grid heterogeneity (e.g. land cover), as well as to the local water influx (i.e. water can only enter a grid cell via the atmosphere and the channel flow between grid cells is ignored). The portions of surface and subsurface water runoff that reach the local channel network, are assumed to stay in the channel, and cannot flow back into the soil. In a second step, routing of streamflow is performed separately from the land surface simulation, using a separate model, the Routing Model, described in [2].

The final goal of our research consists into set an optimal hydrological and climate model to study the evolution of the streamflow of Guadalquivir Basin with different future land use, land cover and climate scenarios.

In this work we study the coupling between VIC model, Routing model and Weather Research and Forecasting (WRF) model in order to perform the evolution of the streamflow for the Guadalquivir Basin (Spain). For this end, a calibration of the most relevant VIC model parameters using real streamflow daily time series, obtained from CEDEX (Centro de Estudios y Experimentación de Obras Públicas, Spain) database [3] was performed. In the time period under study, i.e. the decades 1988-1997 (calibration step) and 1998-2007 (verification step), the VIC model has been coupled with observational climate data, obtained from SPAIN02 database [4].

Additionally, we carried out a sensitivity analysis of WRF model to different parameterizations using different cumulus, microphysics and surface/planetary boundary layer schemes for the period 1995-1996. WRF runs were carried over a domain encompassing the Iberian Peninsula and nested in the coarser EURO-CORDEX domain [5]. The optimal parameters set resulting from such analysis have been used to obtain a high-resolution 35 yr period (1980-2014) dataset, driven by Interim ECMWF Re-Analysis (ERA-Interim) data [6].

Finally, the real streamflow daily time series were compared with the ones obtained by the previously calibrated VIC with SPAIN02 dataset and with WRF dataset, using different groups of meteorological variables. This last analysis allows us to check the robustness of VIC and WRF coupling, and to find the most relevant meteorological inputs for Guadalquivir streamflow system.

Key words: Regional Climate Models, VIC, WRF, calibration, meteorological variables

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