Geophysical Research Abstracts
Vol. 21, EGU2019-10554, 2019
EGU General Assembly 2019

Modelling streamflow in intermittent rivers: a case study in S-E Italy.

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Intermittent rivers and ephemeral streams (IRES) are the most common surface waters in the Mediterranean Region. In the past decades, due to their intermittency and to the limited water resource, IRES were considered less relevant than perennials rivers and for this reason, very limited economic resources were devoted to monitor and manage these river systems. Consequently, long time series of streamflow and water quality data are generally not available in IRES.
Streamflow data are fundamental for characterizing hydrological regime, for ecohydrological studies (i.e. environmental flow), and for water quality status assessment as required by the Water Framework Directive. In absence of streamflow data, hydrological models can be used for simulating streamflow in a number of river sections. Many hydrological models were developed able to simulate hydrological processes both in the large and in small watersheds. However, their applicability in the semiarid environment or in the regions with limited data availability could be difficult. Extreme low flow and flow intermittency could be a critical point in modelling streamflow.
The present work presents the results of a model application to Canale D'Aiedda (Puglia, Italy), an IRES under Mediterranean climate and with limited data availability. The Soil and Water Assessment Tool (SWAT), an eco-hydrological model widely used around the world, was applied. The aim of this study is to show the critical points in modelling streamflow in IRES. A particular focus was oriented to simulate extreme low flow and absence of flow and an attempt was done to overcome these crucial issues.
The results show that the SWAT model is able to simulate daily streamflow. The performances of the best simulation are good in two gauging stations within the basin (in section A: R2=0.56; NSE=0.53; PBIAS=4.41; and in section B R2=0.70; NSE=062; PBIAS=-9.74). However, the hydrograph of the best simulation does not show an absence of flow in the dry season when a minimum flow value simulated by the model was 0.008 m3s-1. It was found that the extremely low flows are affected by a large uncertainty. A procedure was identified to improve the extreme low flow simulations.