Geophysical Research Abstracts
Vol. 18, EGU2016-16674, 2016
EGU General Assembly 2016

Soil moisture trends in mountainous areas: a 50-yr analysis of modelled soil moisture over Sierra Nevada Mountains (Spain).

María José Pérez-Palazón (1), Rafael Pimentel (1), Javier Herrero (2), and María José Polo (1)

(1) Fluvial Dynamics and Hydrology Research Group. Andalusian Institute for Earth System Research. University of Córdoba, Cordoba, Spain, (2) Fluvial Dynamics and Hydrology Research Group. Andalusian Institute for Earth System Research. University of Granada. Granada, Spain

Soil moisture conditions the energy and water fluxes through the ground surface and constitutes a major hydrological state variable in the analysis of environmental processes. Detecting potential changes in soil moisture and analyzing their trend over a long period of study can help to understand its evolution in other similar areas and to estimate its future role. In mountainous areas, the snow distribution highly conditions soil water content and its implications on the local water cycle. Sierra Nevada, Southern Spain, is a linear mountain range, with altitude higher than 3000 m.a.s.l., where Mediterranean and alpine climates coexist. The snow dynamics dominates the hydrological regime, and the medium and long term trends observed in the snow persistence constitute one of the main potential drivers for soil moisture changes both on a seasonal and annual basis.

This work presents a 50-yr study of the soil moisture trends in Sierra Nevada (SN); the distributed monthly mean soil moisture evolution during the recent past (1960-2010) is simulated and its relationship with meteorological variables (precipitation and temperature) analyzed in the five head river basins that the SN area comprises. For this, soil water content is simulated throughout the area by means of WiMMed, a distributed and physically based hydrological model developed for Mediterranean regions that includes snow modelling, which had been previously calibrated and validated in the study area. The analysis of soil moisture shows a globally decreasing annual rate, with a mean value of 0.0011 $mm \cdot mm^{-1} \cdot year^{-1}$ during the study period averaged over the whole study area, which locally ranges between 0.174 $mm \cdot mm^{-1} \cdot year^{-1}$ and 0.0014 $mm \cdot mm^{-1} \cdot year^{-1}$.

As previous studies reported, the observed trend in precipitation is more influent than temperature on the snowfall regime change; therefore, as expected, the estimated trends of soil moisture are more related to this variable. Moreover, an increase of the occurrence of torrential events was found in the monthly analysis. The results allow to identify singular zones within area to monitor the potential significant changes in the soil moisture pattern due to the shifts in snow regime.