Submitted Abstract

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Abstract

The climate of Sierra Nevada (SN), located in southeastern Spain, affects many important features for the living systems that inhabit it as well as the water resources of a region with semi-arid characteristics. The climate change impacts in this region can be especially aggravated by its mountain condition in a Mediterranean area, which makes it a double climate change hotspot.
This work describes climate variability and recent trends as well as climate change projections for far future (2070-2100) for the main climate variables in SN. Precipitation is characterized by marked inter and intraannual variability, a typical condition of the Mediterranean climate. The North Atlantic Oscillation (NAO) mainly drives the variability over the western part; meanwhile the eastern part is more dominated by Mediterranean depressions, and particularly by the Western Mediterranean Oscillation (WeMO). On the other hand, the altitude has only a minor effect on rainfall distribution. The influence of altitude is clear for both maximum and minimum temperature, being, in general, lower for minimum temperature. Both temperatures show increasing trends during the last decades, although with a more generalized spatial pattern for minimum ones. According to this increase, significant positive trends are found for extreme event indices associated with warm days as well as a marked enhancement of potential evapotranspiration (ET0). There is a prevailing decrease in annual and winter precipitation for the whole area, related with significant negative trends over the west of SN. However, the Standardized Precipitation Index (SPI) shows an increase in drought events being the enhanced drought conditions related to increased atmospheric demand.
Climate projections from a set of Euro-CORDEX simulations show a clear warming and drier conditions over SN, especially for the RCP8.5 scenario. The ensemble mean reveals reductions in evapotranspiration for most of the SN, with only moderate increases at higher altitudes in winter and spring, probably related to an increase in ET0 and a rise in temperature. Soil moisture is expected to decrease across SN under RCP8.5. Drought events are likely to become longer and more frequent in the future throughout the entire region.

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