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Potential flow regime alterations under climate change in an intermittent river system

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The potential impact of climate change on the flow regime was analyzed for the Celone River, an intermittent river system in the Apulia Region (S_E, Italy). Rainfall and temperature recorded in the past century were analyzed. Flow regime under climate projections for the future (2030–2059) and for the recent conditions (1980–2009) were compared. The Soil and Water Assessment Tool, a hydrological model, was used to simulate daily streamflow in selected river sections.

Daily climate data used to simulate future scenarios were obtained by a combination of a global circulation model (GCM, ECHAM5) and different regional models (RACMO2; RCA; REMO). The impact on the hydrological regime was estimated as a deviation from the baseline (1980–2009) by using a number of indicators of hydrological alterations.

From 1919 to 2012, a slight reduction in total annual rainfall and a decrease of the number of rainy days was recorded, hence, an increase in extreme rainfall events. From 1954 to 2012, the minimum daily temperature in January and February increased reducing the snowfall.

Under future scenarios, an increase in mean temperature was predicted for all months between 0.5–2.4 °C and a reduction in precipitation (by 4–7%). As a consequence, the flow regime moves towards drier conditions and the divergence of the flow regime from the current conditions increases in future scenarios, especially for those reaches classified as IDD (ie, intermittent dry) and E (ephemeral).

Hydrological indicators showed an extension of the dry season and an exacerbation of the extreme low flow conditions with a decrease in both high flow and low flow magnitudes for various time durations. These changes are expected to have several implications for river ecosystems that have to be considered in River Basin Management and Planning.