Analysis of future climate change impacts on drought in Sicily and Calabria based on Standardized indices

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Many studies claim that climate change may increase the frequency and severity of extreme hydrological phenomena. Regional Climate Models (RCMs) are the most advanced tool for assessing potential future impacts of climate change on the water cycle. In this study, capitalizing on a previous work where the reliability of Euro-CORDEX regional climate models in reproducing drought characteristics in the past was evaluated, we analyze how these characteristics may change in the future according to different climate scenarios – specifically the Representative concentration pathways (RCP) 4.5 and 8.5. We assume the control period 1971-2000 and consider future periods 2021-2050 and 2041-2070. We use the five most reliable RCMs and their weighted ensemble average to assess the changes in precipitation, temperature, and potential evapotranspiration at the monthly timescale. Then we compute the Standardized Precipitation Index (SPI) and the Standardized Precipitation-Evapotranspiration Index (SPEI) and evaluate how the index choice affects the assessment of the climate change signal. The proposed methodology is applied to the drought-prone regions of Sicily and Calabria in southern Italy. Results indicate that the SPI may be quite insensitive to climate change, while the SPEI is more appropriate for spotting the potential impacts on the frequency and severity of drought phenomena. SPEI's higher sensitivity is closely connected to the clear increase of projected temperature compared to the projected precipitation, suggesting minor changes in meteorological drought occurrences and a significant increase in agricultural droughts.