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The influence of temperature increase in meteorological drought projections

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Global drought projections are commonly based on Global Climate Models (GCMs), which can provide reliable prediction at medium or low spatial resolution. Instead, the use of Regional Climate Models (RCMs) and Empirical Statistical Downscaling (ESD), driven by GCMs, can provide information at higher spatial resolution, thus addressing the regional climate patterns, which can be very important especially over areas with complex orography. Using a large ensemble of 103 simulations (derived from the combination of 16 GCMs and 20 RCMs) at spatial resolution of 0.44°, we analyzed how drought frequency and severity is projected to change from 1981-2010 to the end of 21st century under two climate scenarios, the moderate RCP4.5 and the more extreme RCP8.5. Moreover, we focused on the probability of occurrence, in 2071-2100, of extreme drought events never recorded in the last decades. To obtain the drought metrics, we started from the Standardized Precipitation Index (SPI) and the Standardized Precipitation-Evapotranspiration Index (SPEI), both computed at 12-month accumulation scale. We identified the following drought hotspots, where the events are projected to become progressively more frequent and severe as the century passes: North Americas West Coast and the Dominican Republic, Chile and southwestern Argentina, the Mediterranean Region, parts of Congo, Angola, South Africa, Namibia and Madagascar, Southeastern China, Japan, southwestern Australia and Tasmania. We discuss on the importance of including (or not) temperature (and evapotranspiration) as climate driver of meteorological drought (and not only precipitation): in particular, the future drought tendency depends on this choice over large parts of North America, Amazonia, central Europe, central Asia, the Horn of Africa, and central Australia.