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Future global drought conditions in terms of the Palmer drought indices

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We use two Palmer Drought Indices (the PDSI and Z-index) to assess the drought conditions in future climates as projected by seven Global Climate Models (GCMs). Both indices are based on a soil moisture/water balance model, which use (as an input) precipitation and temperature series and available soil water content (single parameter); this makes these indices more suitable for climate change impact studies compared to the Standardized Precipitation Index, which is based only on precipitation. In contrast to the PDSI, the Z-index does not account for any persistence within the climate; rather, it characterizes the immediate (for a given week or month) conditions.

The indices are calculated by computer programs available from the National Drought Mitigation Center and the Computer Science and Engineering Department, both located at the University of Nebraska-Lincoln. To allow for the assessment of climate change impacts, we modified the original computer code: the indices (which we named "relative" drought indices) are now calibrated using the present climate weather series and then applied to the future climate weather series. The resultant time series thus displays the drought conditions in terms of the present climate.

The relative drought indices are applied to gridded (whole globe) GCM-simulated surface monthly weather series (available from the IPCC database), and the available water content is based on soil-texture-based water holding capacity global data devel-

oped by Webb et al. (1993, Global Biogeochem. Cycles 7: 97-108). The indices are calibrated with 1991-2020 period (considered to be the present climate) and then applied to two future periods: 2031-2060 and 2060-2099. To quantify impacts of climate change on the drought conditions, we analyze changes in the grid specific means of the two drought indices.

In the present contribution, the emphasis will be put on aggregating results from the set of seven GCMs. We will identify (i) regions where the drought conditions (when averaged over all 7 GCMs) will change most significantly, and (ii) regions where the between GCMs concordance in projected drought change is the greatest thus indicating the highest reliability of the projection.

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