



Spatio-temporal Variation of Soil Moisture Drought Propensity at the Continental Scale over the 21st century

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This study investigates the spatio-temporal variation of soil moisture drought propensity at the continental scale in the context of a changing climate in the 21st century. Global gridded monthly soil moisture data are obtained from a number of General Circulation Model (GCM) outputs for Representative Concentration Pathway (RCP) 8.5 and these are bias corrected through suitable statistical techniques. Soil moisture droughts are characterized in terms of Drought Management Index (DMI), which is a probabilistic index ranging from 0 to 1 (the latter indicating highest drought propensity) and is suitable for assessing slowly varying changes in drought propensity of a region. DMI is computed from the joint probability distribution of resilience and vulnerability of bias corrected soil moisture series at all grid intersection points across the globe using a 5-year temporal scale. The temporal snapshots of global DMI contour maps over the 21st century indicate progressive increase in drought propensity over the continent of Africa with gradual shifting of the drought prone areas from eastern to western side. The lower part of the North American continent is found to gradually dry up, while, the upper part continues to be wetter till 2070 and then dries up. In Europe, high DMI is observed over the northern parts during 2011-2040; however, the high drought propensity zones seem to gradually shift to the south as the century draws to a close. In Australia and India, high drought propensity is observed during the middle third (2041-2070) of the assessment period. A regional linear trend analysis at the continental scale indicates that the most significant increase in drought propensity occurs in Northern Africa & the Gulf Region (DMI increase of about 0.18 per 100 years) and in the southern parts of Africa (DMI increase of about 0.11 per 100 years). Globally, many regions show an increasing trend in drought propensity whereas only those landmasses which have a substantial portion in the high latitude areas (above 45°N latitude) show a decreasing trend.