On dynamics and attribution of the 2018-2021 drought in Southern Africa

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Abstract

Precipitation over the Southern Africa exhibits a pronounced annual cycle and strong interannual variability: It can be substantially influenced by remote processes such as El Niño-Southern Oscillation and Subtropical Indian Ocean Dipole as well as regional variability of the Angola Low - a low-pressure cyclonic circulation centred east of the Angolan highland - which can modulate convergence of low-level moisture over southern Africa. Since October 2018 precipitation during austral rainy seasons over parts of southern Africa (primarily encompassing areas of Angola, Zambia, Zimbabwe, Botswana and Namibia) reached very low levels and this led to severe socio-economic impacts in a region very vulnerable to drought: Poetntially more than 45 million people across the 16-nation Southern African Development Community could be food insecure. This study explores dynamics, including teleconnection aspects, and whether and to what extent anthropogenic climate change has modified the probability and magnitude of such large-scale meteorological drought by applying a multi-dataset (combining observations and models) event attribution. We utilise a set of satellite-era and long-term observations as well as long-term reanalysis products (e.g., 20CRv3) and CMIP5/6 simulations (particularly large ensembles) to show amplifying influence of climate change and explore conditional perspective by taking into account atmospheric circulation and teleconnection elements.

Keywords: drought, Southern Africa, extreme event attribution, atmospheric dynamics, teleconnections

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