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Assessment of meteorological droughts across West Africa using two different regional climate models

Diarra Dieng (1,2,4), Patrick Laux (1), Dominikus Heinzeller (3), Gerhard Smiatek (1), Jan Bliefernicht (2), Abdoulaye Sarr (5), Amadou Thierno Gaye (4), Harald Kunstmann (1,2)

(1) Karlsruhe Institute of Technology (KIT), Institute of Meteorology and Climate Research (IMK-IFU), Campus Alpin, Germany, (2) University of Augsburg, Institute of Geography, Germany , (3) National Oceanic and Atmospheric Administration (NOAA), Earth System Research Laboratory (ESRL), Global System Division (GSD), Boulder, USA, (4) Laboratoire de Physique de l'Atmosphere et de l'Ocean Simeon Fongang (LPAO-SF), Ecole Superieure Polytechnique, Universite Cheikh Anta Diop (ESP-UCAD), Dakar-Fann, Senegal, (5) Agence nationale de l'Aviation civile et de la Meteorologie, Dakar, Senegal

As emphasized in the Special Report on Extreme Events (SREX) of the Intergovernmental Panel on Climate Change (IPCC, 2012), droughts may have severe impact on social, ecological or natural systems. In the past, the failure of the rainy season as well as the inherently high rainfall variability across West Africa was often leading to droughts, and finally to crop failures and food shortages. West Africa, characterized by semi-arid to arid conditions, is dominated by rain-fed agriculture and thus highly vulnerable to climate change. Rainfall variability is expected to increase further under climate change.
The focus in this study is on the analysis of drought indices at different time scales, as derived from two different high-resolution (12 km) regional climate models (RCMs). Within the WASCAL program (West African Science Service Center on Climate Change and Adapted Land Use), the COSMO-CLM (CCLM) and the Weather Research and Forecasting (WRF) are subject to constant improvements, for instance in terms of numerical schemes or the horizontal resolution in the climate change modeling activities. Drought indices such as the Standardized Precipitation Index (SPI) and the Effective Drought Index (EDI) across different agro-ecological zones of West Africa are derived and analysed with respect to severity, intensity, duration and geographic extend. Results are presented and discussed for the past, based on downscaled ERA-Interim data, and expected changes are derived for the future, based on MPI-ESM-LR and MPI-ESM-MR and the time slices 1981–2010 (Control), 2021–2050 and 2071–2100 for the emission scenario RCP4.5.