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How do model parameterization and meteorological uncertainty affect large-scale drought characteristics?

Johanna Blöcher (1), Vojtěch Moravec (1), Petr Pavlík (1), Filip Strnad (1), Martin Vokoun (1), Martin Hanel (1), Oldřich Rakovec (1,2), Rohini Kumar (2), Petr Máca (1), and Yannis Markonis (1)

(1) Czech University of Life Sciences, Faculty of Environmental Sciences, Department of Water Resources and Environmental Modelling, Prague, Czech Republic (hanel@fzp.czu.cz), (2) UFZ-Helmholtz Centre for Environmental Research, Leipzig, Germany

Drought is a complex phenomenon, which propagates through the water cycle compartments at different temporal and spatial scales. Drought is defined as water deficit in precipitation, soil moisture, groundwater and/or streamflow. Uncertainty in model parameterization and meteorological forcings can affect drought classification, due to differences in the exceedance probabilities of the simulated events. This uncertainty includes the interaction between the meteorological, agricultural, and hydrological droughts. In this study, we evaluate the selected sources of uncertainties in the hydrologic modeling of drought. We employ simulations of the mesoscale Hydrological Model (mHM) covering the last 250 years in the continental Europe. To quantify the uncertainty in drought characteristics, an ensemble of 10 sets of meteorological forcings times 10 sets of hydrological model parameterizations is constructed, which yields a combination of 100 ensemble members. Our results depict how some widely used ensemble techniques can be used to analyze uncertainties of hydrological simulations and how this affects drought characteristics of three drought types.