Assessing the separate contribution of the domain, RCM, and GCM to the uncertainty in CORDEX simulations over the overlapped regions that include Jordan

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Jordan is a Middle Eastern, developing country at significant risk for the adverse effects of human-induced climate change, including drought incidents. The region is highly vulnerable to drought due to being a water-scarce nation that shares limited water resources, the arid and semi-arid climate conditions, and the population explosion owing to the surrounding conflicts. Using regional climate model simulations from the Coordinated Regional Downscaling Experiment (CORDEX) project, a robust study has been developed to analyze current and future drought conditions in Jordan. The country is included in more than one CORDEX domain. This poses the question, as how sensitive is downscaling to the choice of domain? The regional climate models (RCMs) and the global climate models (GCMs) are two other sources of uncertainty. The goal of this first step study is to address the separate contributions of domain selection, downscaling regional models, and forcing global models to simulation uncertainty. This information will direct the best use of CORDEX to produce climate change signals by combining the results from the various CORDEX domains and enhancing the drought analysis.

Legasa et al. (2020) and Diez-Sierra et al. (2022) assessed the uncertainty related to the choice of domain as opposed to that of models combining the uncertainty related to RCMs and GCMs. Legasa et al.’s work was conducted over the Mediterranean region. They concluded that the domain selection effect is negligible.

In this study, seasonal and monthly climatology data of temperature and precipitation variables from MENA (Middle East and North Africa) and Africa CORDEX domains were considered to construct Taylor diagrams and apply the analysis of variance method over Jordan's region. The results of the two variables show that the domain contributes the least to the variance and is negligible, whereas the GCMs-related uncertainty contributes the most. This result supports the procedure of building a grand ensemble of various model simulations relating to overlapping domains, which will be used to enhance the drought analysis and assist policymakers with planning mitigation and adaptation procedures.
References:
