Attributing runoff changes to present and future climate projections across Europe

Ilaria Clemenzi, Yiheng Du, and Ilias Pechlivanidis
Swedish Meteorological and Hydrological Institute, Norrköping, Sweden

Weather and climate strongly influence the hydrology of natural and managed river basins. Changes in these forcings affect the water resources and hydrological extremes, i.e., floods and droughts, in time and space. Attributing the effect of climatic drivers on present and future runoff allows to understand the hydrological response of river basin to changing climate at the local and regional scale. Here, we investigated the runoff changes, including hydrological extremes, across Europe in the early (2010-2040), mid (2041-2070) and late (2070-2099) century. We used runoff simulations from the E-HYPE hydrological model and the bias-adjusted EURO-CORDEX climate model projections. The sensitivity of runoff changes to the climatic factors (precipitation and evapotranspiration) compared to the reference period (1981-2000) was evaluated with the climatic elasticity method through a Budyko approach. In addition, to address lack of robustness in our insights, we assessed the spatial consistency and uncertainty of the runoff changes due to the ensemble variability. Results showed that the sensitivity of runoff changes to climate change varies depending on the climatic gradient and basin physiographic properties. These results are a step towards enhanced hydro-climate services that allow attribution of (extreme) events to climate change.