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Dynamical downscaling of present climate extremal episodes for the BINGO research site of Cyprus

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Besides global warming, climate change is expected to cause alterations in precipitation amounts and distribution than can be linked to extreme events such as floods or prolonged droughts. This will have a significant impact in strategic societal sectors that base their activities on water resources. While the global climate projections inform us about the long-term and weather forecasts can give useful information only for a few days or weeks, decision-makers and end-users also need guidance on inter-annual to decadal time scales. In this context, the BINGO (Bringing INnovation to onGOing water management - a better future under climate change) H2020 project aims both at reducing the uncertainty of near-term climate predictions and developing response strategies in order to better manage the remaining uncertainty.

One of the project's main objectives is to develop improved decadal predictions, in adequate spatiotemporal scales, with a specific focus on extreme precipitation events. The projected rainfall will be eventually used to drive hydrological impact models. BINGO focuses on research sites that encompass river basins, watersheds and urban areas of six European countries including Norway, Cyprus, Germany, Portugal, The Netherlands and Spain.

In this study we present the dynamical downscaling of the ERA-Interim dataset for validation purposes and for the research site of Cyprus. Five extreme rainfall periods were identified from the observed precipitation archives and were simulated in very high horizontal resolutions (4∼1 km) using the WRF limited area atmospheric model. To optimize the performance of the model we have tested a combination of three cumulus and five microphysics parameterization schemes that resulted in 15 simulations for each extreme precipitation event. The model output was compared with daily or hourly (where available) representative rain gauge data. A set of statistical metrics was applied in order to objectively select the best performing model configurations in terms of precipitation. In a later phase, periods of future extreme precipitation or droughts will be identified from the output of the MiKlip decadal prediction system and will be downscaled in order to assess the short-term climate change impact on the water resources of Cyprus.