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High-resolution hydrological impact analysis of EURO-CORDEX climate change projections in a medium-sized Mediterranean basin with the In-STRHyM model

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Analysis of water resources variability cannot disregard the accurate estimate of the hydrological balance at adequate space-time resolutions. In this study, the spatially distributed and physically based In-STRHyM (Intermediate Space-Time Resolution Hydrological Model) model was used for analyzing the hydrological impact of climate change projected by several models run within the Coordinated Downscaling Experiment - European Domain (EURO-CORDEX) initiative in the Crati River Basin (Calabria, Southern Italy). In-STRHyM was developed for the purpose of estimating daily water balance over long time periods and assessing the evolution of water availability in medium-to-big sized Mediterranean basins. Specifically, historical simulations from 15 highly resolved regional climate models at 0.11° resolution with boundary forcings from six different Coupled Model Intercomparison Project Phase 5 global models were preliminary validated against monthly precipitation and temperature observations for the baseline period 1971-2005. Afterwards, 14 models out of 15 respecting well the seasonal variability of both precipitation and temperature in the study area were employed to derive the meteorological input for In-STRHyM both in the baseline period and in the future periods 2041-2070 and 2071-2100 under RCP 4.5 scenario, automatically regridding the meteorological information at the spatial resolution needed by the hydrological model (1 km^2). In-STRHyM allowed the daily distributed estimate of the main components of the terrestrial hydrological balance (e.g., snow accumulation and melting, soil moisture, groundwater content) together with discharge values in the selected outlets, highlighting significant water resources reduction in the study area and proving to be a robust, flexible and practical support to analyze both current and future water availability scenarios.