Project: **1340**

Project title: **Long-term simulations with improved and extended REMO versions**

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Thanks to the DKRZ resources for 2025 we have been able to run the regional climate model REMO for WAS-44 and a new defined domain CAS-11 (see figures below) effectively, which has led to significant insights regarding the climate in Central Asia. These findings not only enhance our understanding of regional climate dynamics but also contribute to the ongoing improvements of REMO where we did some simulations with different soil data sets, parametrizations, soil hydrological scheme, and first test with a new vegetation module.

Figure 1 presents results from the benchmark runs of REMO and its interactive vegetation scheme iMOVE covering the 27-year period of 1979-2005 (Analysis only includes 1981-2005) using already the new soil hydrological scheme (5layers). The figure shows the added value of precipitation [mm/day] for 0.11° (GSWP-W5E5 is used as validation data) over the publicly available CORDEX-CORE data over Central Asia. We can conclude that the higher spatial resolution model has better overall agreement with the observation data and adds further value over the coarse CORDEX-CORE data. Nevertheless, the benchmark run of CAS-11 still differs in sign compared to the validation data in some parts of the domain which is a signal that there is room for improvement.

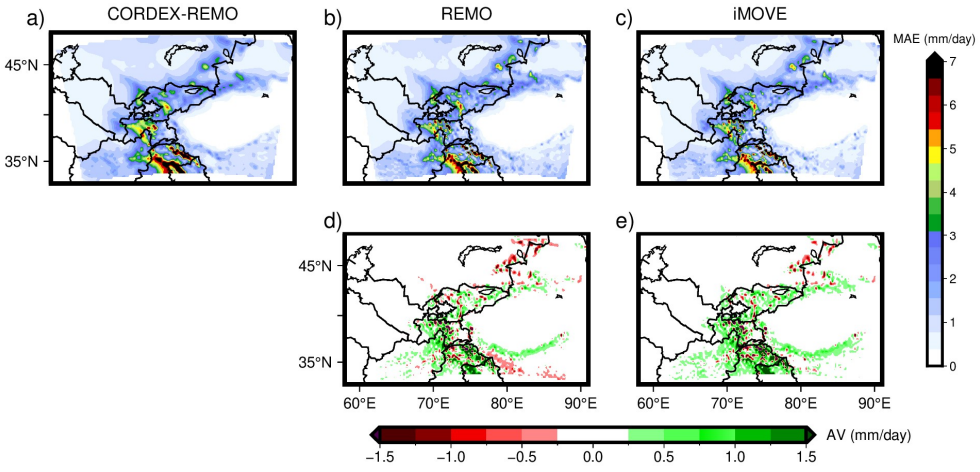

Figure 1: Mean Absolute Error (MAE) w.r.t. GSWP-W5E5 Obsclim data for precipitation (mm/day) (panel a-c) for the period of 1981-2005.

Figure 2 shows area-averaged precipitation time-series for two model simulations we carried out at Levante for CAS-11 domain for two RCPs (4.5 & 8.5; only RCP8.5 results are shown here). We further plan to simulate the future climate over the region using CMIP6 data as boundary forcing.

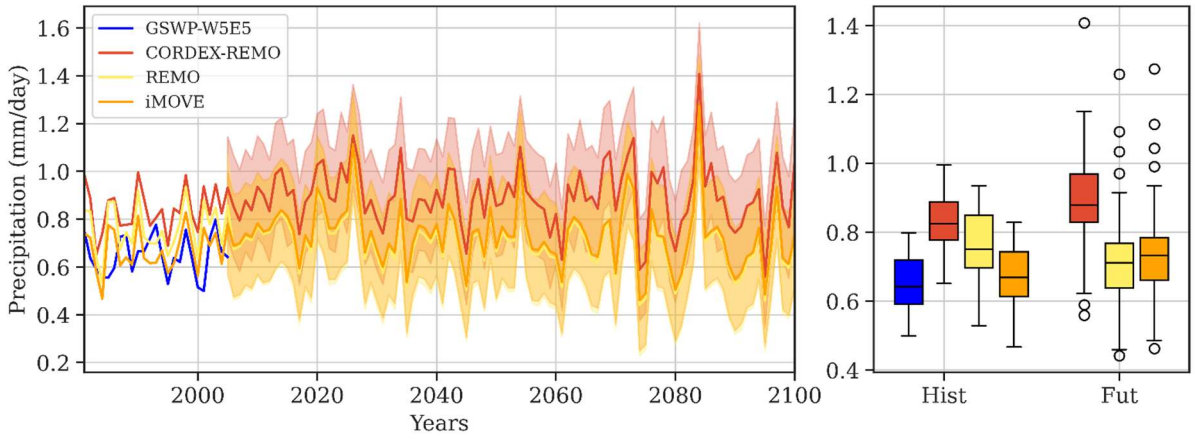

Figure 2: Area-averaged mean annual time series of raw precipitation for the entire domain for the period of 1981-2100 under RCP8.5.

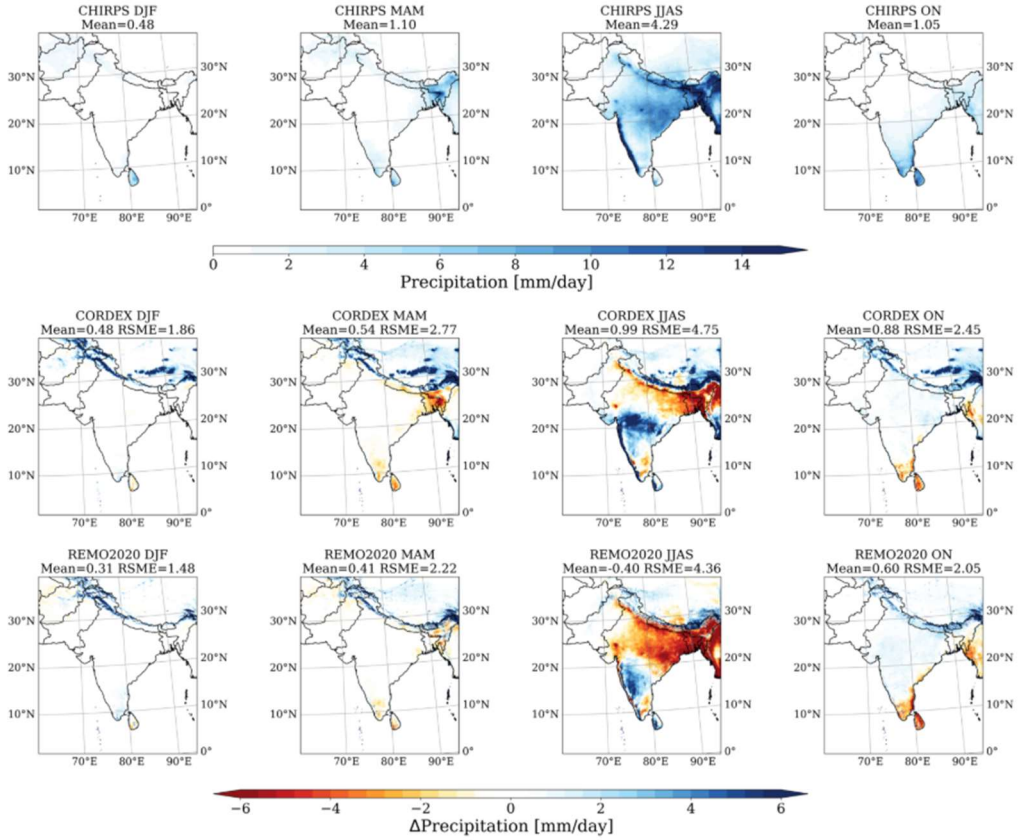

Figure 3: Daily precipitation bias over South-Asia domain from recent REMO2020 version (WAS-11; user defined, not exactly the CORDEX domain)

Figure 3 shows a spatial map of biases in precipitation over South Asia using the new REMO version i.e., REMO2020 which includes a lake module (Flake) and interactive vegetation module iMOVE. We see a better performance of the new version in capturing the precipitation distribution over the South Asian countries than its older version.

Some of the results of the research done in MOMO-MED project related to dynamic land-use change over Mediterranean region were collected and a scientific paper is under preparation.