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# The validation and climate change signal of the Phase I CREMA experiment.

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For the phase I CREMA experiment the regional climate model RegCM4 has been used to simulate the present and future time period over 5 domains across the word (Africa, South America, Central America, West Asia and Mediterranean) to contribute to CORDEX for a total of 34 simulations, spanning the period 1970-2100.
Three GCMs have been used taken from the CMIP5 ensemble and they are HADGEM2ES, MPI-ESMMR and GFDL-ESM2M. The selection has been made according to the best RegCM4 performances when driven by those GCMs.
For the present day period (1975-2205) the RCMs are evaluated and compared with the GCMs in term of ensemble mean biases, root mean square error and correlation by mean of Taylor diagrams for the two seasons DJF and JJA. For the temperature and precipitation biases the global and regional models are quite comparable. When the 5 domains are taken into account in the Taylor diagrams the individual regional model simulations show consistent improvements compared to the global model. This is confirmed by all the domains and by all the model configurations. For precipitation the situation is more complex and requires a detailed analysis for the different domains and model settings.
The change signal has been also analyzed for the period 2070-2100 compared to the reference period 1975-2005. The ensemble mean change for the regional models show a stronger warming signal over Western Africa for DJF and Central and Southern Africa for JJA when compared with the global model mean change and a weaker warming signal over the Mediterranean domain for JJA. For precipitation, the regional ensemble mean change shows a stronger drying over the Western and Eastern Africa and north-east South America continent for the JJA season and an opposite wet signal for Northern Europe when compared with the global ensemble mean change. Also in the central part of India the regional ensemble shows a weaker monsoon for the future when compared to the global ensemble change that show and increase of precipitation during the JJA season. A stronger drying is also evident in Mexico and Central America from the regional simulations.
For DJF the regional change signal shows a wetter Mexico and a wetter south Brazil and Argentina compared to the dryer signal coming from the GCMs and a dryer east Brazil.
Some of these differences can be attributed to the land-surface feedback mechanism that are modulated by local processes and internal model physics like for example has been shown from a previous study in Western Africa (Mariotti et al. 2011).