Performance of the RegCM4 regional climate model over China

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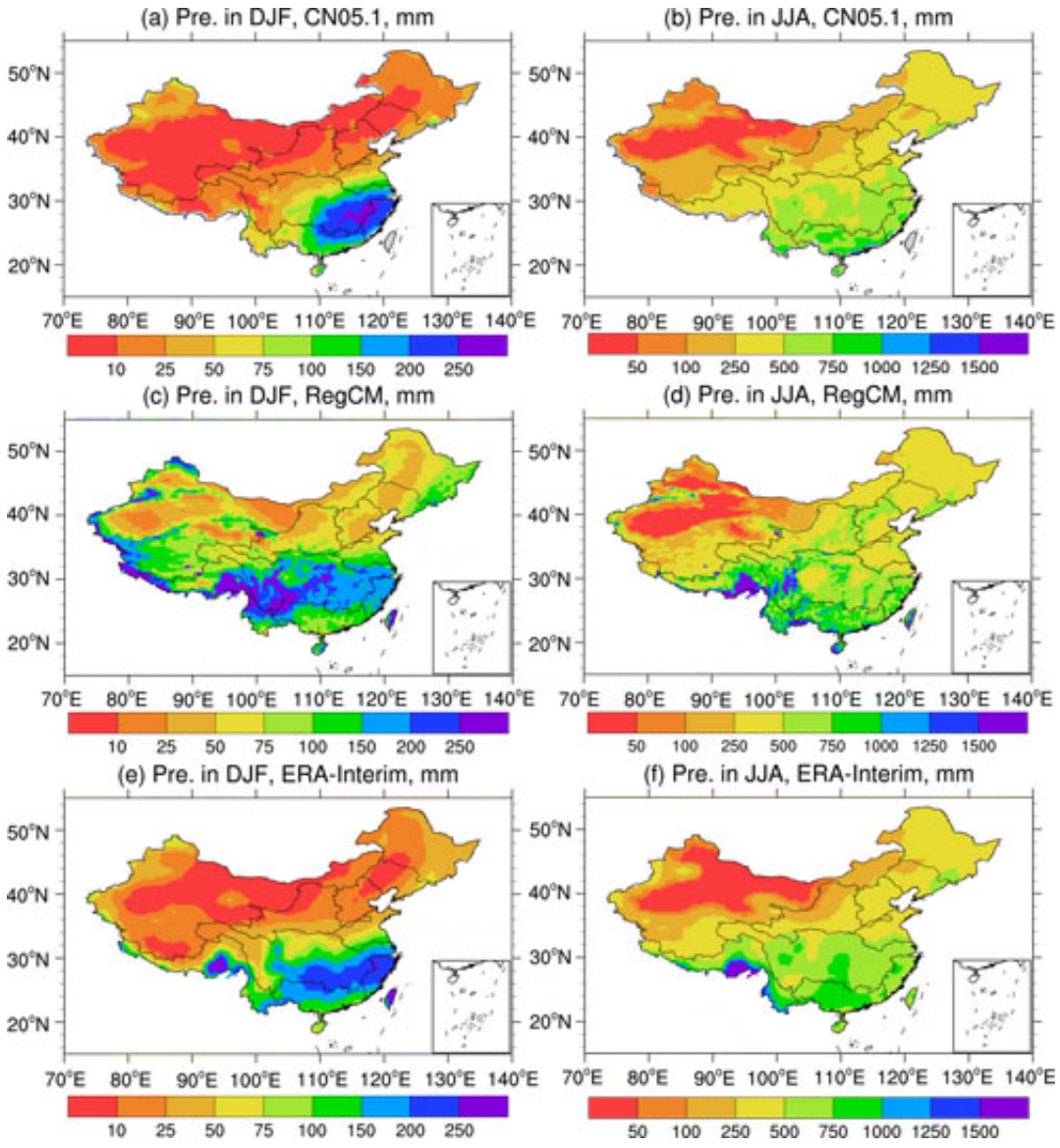

The mean precipitation over China during 1991-2010 (units: mm): (a) observation in December-February; (b) observation in June-August; (c) RegCM4

in December-February; (d) RegCM4 in June-August; (e) ERA-Interim in December-February; (f) ERA-Interim in June-August. Credit: Gao et al., 2017

The RegCM series of climate models are widely used throughout the world and in China. Applications include paleo and present-day climate simulation, mechanistic analyses, studies of atmospheric chemistry and aerosols, and climate change projections. The model is currently developed and maintained at the Abdus Salam International Centre for Theoretical Physics; the latest version is RegCM4. Recently, a long-term simulation was conducted with the corporation of the Institute of Atmospheric Physics of the Chinese Academy of Sciences, the National Climate Center of the China Meteorological Administration, and other institutes, to evaluate its performance in China.

The model was run over the East Asia domain in phase II of the International Coordinated Regional Climate Downscaling Experiment (CORDEX-EA) at a grid spacing of 25 km, and driven by the ERA-Interim reanalysis. The Emanuel scheme for convection and the CLM3.5 scheme for the land surface were employed in the simulation. The land surface coverage based on Chinese data was used in place of the model default due to its large discrepancies compared to reality over China. In addition, the surface emissivity in the model was also changed based on observation.

Their focus of the evalution is on temperature and precipitation over the major river basins of China. Results showed that the model reproduces the observed present-day climatology, interannual variabilities and extremes well over the region. More specifically, better performance in the summer season (June-July-August) compared to winter (December-January-February) was found for the climatology. In the winter, the model deficiencies include a warm bias at high latitudes, underestimated

precipitation in the south, and overestimated precipitation in the north. Greater model skill was found for temperature variability compared to precipitation. For the extremes, underestimation of heavy rainfall events in eastern China was found, along with an underestimation of consecutive dry days in northern China.

It is noted in the study that similar biases can be found in many other global model simulations and, to some extent, the ERA-Interim dataset with assimilation of many observations, indicating the challenge for climate models in simulating the monsoon climate over East Asia. Further simulations with this model version involving climate change projection are ongoing, and the results are expected in the near future.

The study is published in *Advances in Atmospheric Sciences*.

More information: Xuejie Gao et al, Performance of RegCM4 over major river basins in China, *Advances in Atmospheric Sciences* (2017). DOI: 10.1007/s00376-016-6179-7

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