



Temperature and precipitation verification over Pannonian Basin in EURO-CORDEX simulations during summer season

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In previous studies, it was noticed that many Regional Climate Models (RCMs) tend to overestimate mean near surface air temperature and underestimate precipitation in the Pannonian Basin during summer, leading to so-called summer drying problem [1]. Our intention for this study was to analyze temperature and precipitation biases in the state of the art EURO-CORDEX multi-model ensemble results in the summer season. Models' results from the historical runs, and over time period 1971-2000, for temperature, precipitation and sea level pressure were verified against gridded E-OBS data set. In total there were 30 selected integrations, with different combinations of RCMs and Global Climate Models (GCMs). In order to assess the impact of the different lateral boundary conditions on the results from RCMs simulations, emphasizing the errors of the corresponding driving models used in 30 RCMs simulations, results from driving GCMs are also verified.

Verification results for selected time period was expressed in term of four verification scores: bias, root mean square error (RMSE), spatial correlation coefficient and standard deviations. Verification scores were evaluated within a sub-domain in the center of the region bounded by longitudes, 14E and 27E, and latitudes, 43.5N and 50N, in which topography elevation is below 200 m. This sub-domain was selected to eliminate the influence of results over the surrounding mountains on spatially averaged scores [2], because previous studies indicated a pronounced summer drying problem in low lying areas. Our analysis showed that 17 RCMs tend to overestimate the temperature, 8 RCMs tend to underestimate the temperature and 5 RCMs tend to estimate temperature around E-OBS gridded data set. On the other hand, most of the RCMs that overestimate the temperature, underestimate the precipitation. According to the results, temperature bias was in the range from -1.9°C to $+4.4^{\circ}\text{C}$, while precipitation bias was in the range from 42% to -70%. For some models the positive temperature and negative precipitation bias were even more pronounced, leading to the conclusion, that the problem is still present in the majority of analyzed simulations. Analysis of the sea level pressure was conducted as an indirect indicator of errors in advection processes in RCMs, which was indicated, beside others, as a potential precursor of temperature and precipitation biases [3]. To better understand the sources and reasons for summer drying problem further research is needed.

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[2] Lazic I., Djurdjevic V., (2019): EURO-CORDEX regional climate models' performances in representing temperature and precipitation over Pannonian Basin, Book of abstracts, 5th PannEx Workshop, 3-5 June 2019, Novi Sad, Serbia.

[3] Szépszó G., (2006): Adaptation of the REMO model at the Hungarian Meteorological Service (in Hungarian). Proceedings of the 31st Scientific Days for Meteorology, 125–135.

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