EMS Annual Meeting Abstracts
Vol. 16, EMS2019-661, 2019

Effect of circulation anomalies on the heavy precipitation predictability

Marek Kašpar (1), Vojtěch Bližňák (1), Miloslav Müller (1,2), and Petr Zacharov (1)

(1) Institute of Atmospheric Physics CAS, Department of Meteorology, Prague, Czech Republic (kaspar@ufa.cas.cz), (2) Charles University, Faculty of Science, Department of Physical Geography and Geoecology, Prague, Czech Republic

Extreme precipitation events (EPEs) belong to the most studied natural hazards because of their high impacts on the human society. The demand for reliable quantitative precipitation forecast is echoed by many user communities. However, the forecast skill is often insufficient to predict the amount, location, and timing of extreme precipitation accurately and consistently. Our research is motivated by the fact that the identification of factors affecting the predictability following by the quantification of their effect may significantly contribute to better assessment of the forecast uncertainty. We present results of the analysis of the dependence between the extremeness of circulation conditions and forecast skill using representative, mostly recent case studies in the territory of Czechia.

Reference EPEs are selected by the Weather Extremity Index which takes into account the rarity of 1-day totals, the affected area and duration of the events. EPEs are re-forecasted with the horizontal resolution of 2.8 km by the NWP model COSMO, the non-hydrostatic, compressible model which is able to resolve and explicitly simulate larger elements of organized convection. In order to evaluate the forecast skill, various spatial verification methods are used. Verification data comprise daily totals from rain gauge measurements from approximately 700 stations, precipitation intensities from a couple of pluviographs (since 1960) and radar measurements (since 2002).

The extremeness of circulation conditions is quantified by the method of anomalies using the NCEP/NCAR Reanalysis dataset. Frequency analysis of selected thermodynamic parameters is carried out in each grid box. An anomaly in a parameter is determined as a contiguous space where probabilities of exceeding are nearing 0 or 1. First, we determine the anomalies including their location and extent typical of the set of EPEs. Next, for each EPE, we compute magnitudes of individual typical anomalies. This enables to separate EPEs into several circulation variants and to evaluate the measure of the extremeness of circulation conditions by combining magnitudes of the anomalies. We assume that this measure would be significant explanatory variable of the forecast uncertainty.