



## **A comparison of predictability of historical heavy precipitation events**

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Heavy precipitation is still one of the primary goals of numerical weather prediction. The most intensive events occur very rare so it is hard to compare its predictability because of continuous changes in NWP models and initial conditions. This paper aims to evaluate a detail forecasts of historical precipitation events characterized by large value of weather extremity index (WEI). The forecasts are based on European reanalysis which provide a spatially complete and coherent record of global atmospheric circulation. Unlike archived weather analyses from operational forecasting systems, a reanalysis is produced with a single version of a data assimilation system, including the forecast model used, and it is therefore not affected by changes in method. Furthermore, the reanalysis often describes the atmospheric circulations better than contemporary NWP models.

The events are simulated using NWP model COSMO with 2.8km horizontal resolution over a domain of the Czech Republic and its close neighbourhood. The reason of selected horizontal resolution is an appearance of convective precipitation which is better described with detailed model with a deep convective parameterization switched off. The initial and boundary conditions came from three different versions of European reanalysis – ERA Interim, ERA 40 and ERA 20C. The 2.8 km predictions were computed in two ways – nested directly in ERA reanalysis or in COSMO 7 km resolution runs nested also in ERA reanalysis.

ERA-Interim reanalysis is based on a 2006 release of the IFS (Cy31r2), covers the years 1979 up to present and the system includes a 4D-Var data assimilation scheme. The overwhelming majority of assimilated data originates from satellites but the conventional observing system is also used. ERA-20C used a 2012 release of IFS (Cy38r1), covers the years 1900-2010 and is used to reanalyse the weather by assimilating surface observations. The assimilation methodology is 24-hour 4D-Var analysis, with variational bias correction of surface pressure observations. ERA-40 is based on 1995 release of IFS (Cy13r4), covers the years 1957-2002 and uses an updated form of the 3D-Var analysis used at ECMWF in 1997. ERA40 assimilates the conventional data as well as satellite data.

We selected 22 events from years 1979 to 2002 which is a range covered by all three chosen reanalysis. The model starts at 00UTC and produce 24h precipitation total from 06-06UTC. The forecasts are verified against precipitation totals from Czech precipitation network using grid to grid as well as spatial verification. The events and the verification results are compared also with WEI values.