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Verification of climatological ERA5 and WRF convective environments using radiosonde data

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Atmospheric convection is a major source of hazardous weather in many parts of the world, including the Pannonian Basin in Central Europe. It is therefore indispensable to explore the climatological distribution of convective environments and related phenomena, for which model data provide a spatially and temporally consistent alternative.

Several studies compared convective parameters derived from reanalysis datasets to radiosonde observations, but such evaluation of climate model output is less frequent.

This study uses sounding station measurements to verify convective environmental parameters derived from the ERA5 reanalysis and relatively coarse resolution WRF regional climate simulations for the 1985–2010 period over the wider Pannonian Basin region. Common parcel thermodynamic variables and environmental indices are calculated, such as CAPE, CIN, LI, TPW, lapse rate and wind shear. We carry out pointwise comparison between observed and modeled convective parameters in terms of basic statistical metrics and climatological means on a daily and monthly basis. Both pressure and model level data from ERA5 are included in the analysis.

In line with previous research, the ERA5 model level dataset reasonably represents the climatological distribution of convection-related variables. Preliminary results suggest that the WRF regional climate model is also quite skillful in reproducing convective environments, but large biases exist compared to the observations and reanalysis.

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