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Convective and stratiform precipitation in ALADIN-CLIMATE/CZ

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When studying precipitation in mid-latitudes, it is appropriate to focus on the basic types: convective and stratiform. Stratiform precipitation is inherently more crucial for agriculture, and a decrease in its amounts, coupled with higher temperatures, can lead to a greater soil moisture deficit. Conversely, more frequent and intense convective and stratiform precipitation may result in floods and landslides, thus posing additional hazards and causing damages.

In this study, we analyze the characteristics of convective and stratiform precipitation (e.g. annual cycle, proportion of convective and stratiform precipitation, trends, and extremes) in the Czech Republic using data from the regional climate model ALADIN-CLIMATE/CZ, operated by the Czech Hydrometeorological Institute. The model has been upgraded to achieve a convection-permitting resolution of 2.3 km, along with the implementation of a non-hydrostatic, fully elastic dynamical core. As the outputs from this model will be utilized to enhance the accuracy of climate change scenarios for the Czech Republic region, it is necessary to evaluate the simulation accuracy of convective and stratiform precipitation.

We analyze two datasets of convective and stratiform precipitation from the ALADIN-CLIMATE/CZ model. Firstly, we examine direct model-simulated convective and stratiform precipitation. Secondly, we analyze convective and stratiform precipitation separated from the model's output using a physically based algorithm. While the algorithm is applicable over complex terrain, it exhibits better efficiency over land with smooth topography. Therefore, we believe it is suitable for the Czech Republic region. The characteristics of convective and stratiform precipitation derived from both datasets are compared to each other, as well as to observations from SYNOP stations and radar data