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Effects of horizontal resolution of regional climate model simulations on convective and stratiform precipitation

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Regional climate models (RCMs) are tools widely used for modelling regional climate change. Many studies dealt with evaluation of precipitation characteristics in their outputs. However, little attention has been paid to ability of RCMs to reproduce convective and stratiform precipitation, although climate models simulate convective (subgrid) and stratiform (large-scale) precipitation separately through deep (precipitating) convection and large-scale precipitation parameterizations. We apply a recently proposed algorithm for disaggregating station precipitation data into predominantly convective and stratiform (Rulfová and Kyselý 2013), and evaluate biases in characteristics of convective and stratiform precipitation (e.g. annual cycle, proportion of convective and stratiform precipitation, dependence on altitude, and extremes) in three ALADIN-Climate/CZ RCM simulations for the recent climate (1982-2000) with different horizontal resolutions (50, 25 and 10 km). The horizontal resolution has a relatively small effect on studied characteristics. An improvement with increasing resolution is found mainly in reproduction of details related to orography. The effects of the horizontal resolution are more pronounced in characteristics of stratiform than convective precipitation due to stronger dependence of stratiform precipitation on altitude. We also find that the ALADIN-Climate/CZ RCM shows generally better agreement with the observed precipitation regimes for mean precipitation than for extremes.

Reference:
Rulfová, Z., Kyselý, J., 2013. Disaggregating convective and stratiform precipitation from station weather data. Atmospheric Research 134, 100-115.