



## **Are regional scale climate change signals for precipitation detectable with a high resolution RCM ensemble over the next decades?**

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To derive estimates for trends and probabilities of climate change signals ensemble methods become more and more important. An ensemble of realisations of possible future climate is of special importance for parameters with a high natural variability – like precipitation. The larger number of data enables better estimates of probability density function parameters and higher signal-to-noise ratios which are especially needed for the analysis of extreme events.

In order to estimate possible future changes in heavy precipitation statistics for parts of Central Europe, we analysed a set of high resolution RCM simulations with resolutions below 20 km, with COSMO-CLM and REMO together with additional data from the ENSEMBLES project.

Although many aspects of the temporal development and the year-to-year variability in the RCMs are inherited from the global model, there are important characteristics on the regional scale the GCMs can not account for. An example is summer precipitation dominated by small scale convection and the effects of typical geographical features in Europe which act on scales which are mostly subgrid for current GCMs.

The analysis covers regional scale means, spread and agreement of the ensemble simulations. Furthermore, the trends of the internal variability over different periods and the significance of the changes of the RCM and GCM results have been studied. An important question with respect to the detectability of climate change signals is whether the changes due to the climate trend are larger than the ones induced by internal variability or the use of different emission scenarios.

There seems to be a common trend in the results for increased precipitation variability in the upcoming decades which implies a higher likelihood of extreme events. This could even compensate in some regions the effect of a slightly decreased mean precipitation in summer. Unlike in winter when the ensemble a quite homogenous precipitation trend in Central Europe, summer time trends in the regional models show small scale regional variations in the precipitation signal. Such behaviour is also found in observed trends for the 20th century. The significance and potential reasons for the occurrence of such structures are discussed with respect to mean and extreme precipitation.