



Validation of modeled changes in extreme precipitation in the Rhine basin

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In this study, we investigate the change in multi-day precipitation extremes in late winter in Europe using observations and climate models. The objectives of the analysis are to determine if climate models can accurately reproduce observed trends and, if not, to find causes of the difference in trends.

Similar to earlier finding for mean precipitation trends and despite a lower signal to noise ratio, climate models fail to reproduce the increase in extremes in much of northern Europe: the model simulations do not cover the observed trend in large parts of this area. A sea level pressure trend dipole over continental Europe causes positive trends in extremes in northern Europe and negative trends in southern Europe. Climate models have a much weaker pressure trend dipole and as a result a much weaker (extreme) precipitation response.

Circulation changes are also responsible for the underestimation of trends in the Rhine basin. When adjusting for the circulation trend mismatch, the observed trend is well within the spread of the climate model simulations. Therefore, it is important that we improve our understanding of circulation changes, in particular related to the cause of the apparent mismatch between observed and modeled circulation trends over the past century.