



Scenarios of precipitation extremes in Poland for the 21st century, comparison of different methods

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At the moment there is a consensus concerning global warming and the increase of temperature. However much less is known on the hydrological response to warming trend and even in the regions where precipitation totals are not supposed to increase, the highest daily totals can become more extreme, because of the higher water holding capacity of the warmer air.

The aim of present study is to make projections of precipitation extremes in a future climate in Poland, compare projections obtained using different methods and evaluate the uncertainty of results.

Eleven RCM simulations made within the ENSEMBLES project and spatial resolution around 25 km, emission scenario A1B, driven by seven different GCM simulations were used in this study. 30-year control climate simulations for the reference period 1971-2000 were compared with observations at 40 Polish stations. Then the scenarios were made for two separate 30-year periods 2021-2050 and 2071-2100.

Because RCMs outputs are subjected to systematic biases, two transfer methods are used. One of them is distribution based refined version of Yang et al. (2010) scaling approach with scaling factors obtained on monthly scale for each percentile from 1 to 99. Three other methods were based on delta approach. In the first case, the distribution related change factors were obtained separately for each month and each percentile from 1 to 99. In the other cases the delta change approach was used to obtain new number of precipitation days as well as mean monthly precipitation totals and their standard deviations only. Weather generators were applied to obtain the distribution of daily totals. The first order Markov chain was used to decide whether the day is dry or wet and the gamma or mixed exponential distributions were applied to predict the daily totals (Wilks and Wilby, 1999).