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TITLE: Evaluating the performance of CMIP5 GCMs in Northern Eurasia and constructing optimal ensemble projection: analysis of regional precipitation patterns

ABSTRACT BODY: Despite significant improvements in the complexity and quality of the global climate models, even the most recent CMIP-5 GCMs differ in results at regional scale. Several studies have tried to assess and quantify the uncertainties of temperature and atmospheric pressure parameters, while the evaluation of precipitation parameters at regional scale is yet to be done. The goal of this study is to perform comprehensive analysis of precipitation uncertainty for Northern Eurasia. To accomplish this goal we contrast selected precipitation parameters from two generations of CMIP5 and CMIP3 GCMs with observations at regional level and suggest the methodology for constructing the optimal ensemble projection.

We used data from 744 Russian weather stations to identify 14 regions in Northern Eurasia characterized by coherent changes of temperature characteristics and precipitation. In each region we identified the tipping point, which divide timeseries into baseline period and period of contemporary climate change, and tested the ability of GCMs to simulate precipitation patterns and trends in each region. Ultimately, we ranked GCMs according to their performance in representing regional precipitation parameters. We used this ranking to construct several regional ensembles consisting of different number of high-ranked models and compared results from these optimized ensembles with observations and with the ensemble of all models.

The ultimate conclusion of our study is that the methodology based on pre-selection of top ranked models allows narrowing the range of uncertainty in climate projection at regional level. With latest generation of GCMs this methodology could be applied not only to air temperature but also to precipitation parameters. We also found that models from CMIP5 generation demonstrate much higher performance than CMIP3 models in replicating precipitation parameters in the period of contemporary climate change.

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