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Skill assessment of regional climate models: T/P correlations impacts on hydrological modeling

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Regional climate models (RCMs) provide a useful source of data for assesment of climate change for hydrology. There are numerous RCMs variating in skill of representing the contemporary climate. There are methodologies to assess this skill. (Sennikovs and Bethers, 2009) composed the methodology based on the representation of temperature, precipitation as well as standard deviation of temperature and precipitation. In this paper we would like to propose a different skill assesment to improve results obtained from using the time series of RCMs as a forcing for hydrological models. While performing calculations by various well calibrated hydrological models it was noted, that there is a problem to represent the magnitude of the spring floods, if using data from RCMs for the contemporary climate.

The goal of our study, was to find the reason of this problem, and try to find the best avaible RCM for hydrological modelling. Our main focus lies on the correlation of temperature and precipitation (T/P). The hypothesis made was that RCMs are unable to represent adequately the properties of T/P correlation and that it may be the cause for the inability of the hydrological models to represent the spring flood peak. We have chosen 18 RCM runs from the PRUDENCE (Prediction of Regional scenarios and Uncertainties for Defining EuropeaN Climate change risks and Effects) project and 21 RCM runs from the ENSEMBLES project for the control period 1961-1990 as well as observations for the same period. Bias-correction of daily temperature and precipitation data series as proposed in (Sennikovs and Bethers, 2009) was performed on the RCM data. The T/P correlation was determined for every model and compared with the observed data. Hydrological runs were made for each model. The models' ability to represent the spring floods were compared to the skill of representing T/P correlation.

Analysing the results gave us the opportunity, to correctly assess how the T/P correlation affects hydrological modelling. For the analysis 3 pilot basins where chosen (Berze, Stende and Ciecere) all of whom are covered by snow during the winter months. RCMs have a different higher values of T/P correlation coefficients compared to observed data in the winter months. It was possible to compare different RCMs and how well they represent the spring floods, so giving the possibility to choose the most suited for hydrological use in the northern regions. Using this skill assessment gave us an opportunity to improve the quality of hydrological modelling using RCM data.

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References

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