



## **Validation of five hydrological models across Europe and their suitability for making projections of future changes**

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One of the objectives of the EU-project IMPACT2C is to provide projections of water in Europe for the plus-two-degrees climate. For this purpose, a multi-model assessment was carried out using five hydrological models (E-HYPE, Lisflood, LPJmL, VIC and WBM) forced by the output from eleven selected CORDEX simulations, resulting in an ensemble of 55 simulations. We found significant changes in 30-year mean runoff in the north-eastern half of Europe, while significant drying is confined to some parts of the Mediterranean. In order to obtain insight in the suitability of the participating models to make climate projections, the models were extensively validated with river discharge measurements. Each model was run twice for the period 1979-2000 using two different climate forcing data sets, EOBS and WFDEI. Results show that model biases were very sensitive to the choice of the forcing data set, in particular to precipitation. However, we postulate that a model's ability to project climate change is better assessed by the skill of the model to simulate interannual variability than by the model bias. We then found that, despite large inter-model differences in structure and complexity, all models simulated interannual variability about equally well. Nevertheless, model rankings are shuffled considerably when EOBS forcing is replaced by WFDEI forcing. This was found both when models were ranked in terms of the magnitude of the bias and in terms of their ability to simulate interannual variability. We also validated the five hydrological models when forced by bias-corrected output from the CORDEX simulations for 1979-2000. We found that the computed discharges from the bias-corrected CORDEX simulations and the EOBS observational simulation differ insignificantly, in terms of all of the statistics that we considered and for all five models. This demonstrates the effectiveness of the bias corrections.