



Can we really identify a representative subset of hydro-climatic simulations for impact modeling studies?

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Climate projections are associated with uncertainties both on the global and the regional scale, which are related to the different configurations of the modeling chain. Although a combination of numerous projections is usually needed to quantify the total uncertainty, practical impact modeling investigations can only handle a limited number of scenario combinations. Given the fact that all climate projections are subject to considerable uncertainty, it is crucial to know a representative, with regard to the information content, subset in an available ensemble. Here we propose a framework rooted in the concepts of information theory to identify a representative subset from a larger ensemble of climate projections. The Maximum Information Minimum Redundancy (MIMR) concept is used to identify the representative subset. The analysis is based on an ensemble of 16 climate projections for precipitation and temperature for the entire Sweden. The projections were further used to force the HBV hydrological model and simulate river discharge until the end of the 21st century. We identify the representative subsets for different statistical characteristics for precipitation, temperature and discharge and assess the sensitivity of the identification at different seasons and future periods. Results show that a subset of 20-35% of the total available projections can represent a large fraction of the ensemble range of hydro-climatic changes highlighting the information redundancy in large model ensembles. Finally, the identified subsets are sensitive to the choice of variables, seasons and future periods, whilst the identification should not be solely based on climatic variables but rather consider hydrological information as well.