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A protocol for the evaluation of climate change impact models

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Understanding the implications of climate change for our environment and subsequent services and disservices for nature and society is a key science challenge of our days. Simulation model chains that link the causality of climate-meteorology-hydrology-impact in some way or another are rapidly being developed and increasingly applied to understand the implications of future climate change projections. We discuss in our contribution the urgent need to simultaneously develop protocols to evaluate such models and their adequacy to ensure that scientific rigour is upheld in such analyses. We believe that such an evaluation protocol should consist of at least 3 evaluation stages to ensure a model is justified and its limitations are understood. These are: [1] Establishing an impact model as an adequate representation of our current understanding of the underlying system. [2] Establishing an impact model as an adequate model for the task at hand. [3] Establishing that dominant processes are adequately depicted to enable the assessment of intervention strategies. We argue that it is important to distinguish these stages because achieving stage 1 does not guarantee stage 2, while both stages 1 and 2 can potentially be achieved without ensuring stage 3. Different approaches to implement each of these stages exist and they range in rigour from simple (possibly simplistic) to complex (and therefore demanding). In our contribution we will use different impact modelling examples to discuss the current state of impact model evaluation, the limitations of current strategies and methods, and define additional development needs to obtain the scientific rigour we believe is needed for credible and robust impact assessment.