Jul 1st, 12:00 AM

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Abstract: Environmental models are mostly developed to study processes at a certain scale. They are increasingly applied for analyses to support decision making of policy makers on natural resource and environmental risk management. Usually the policy scale differs from the scale the models are developed for as processes have to be taken into account occurring at various scales. In addition, many models were developed for research purposes rather than for policy support. As a consequence, several models are often combined into model chains to arrive at estimates for the policy scale, each sub-model describing a sub set of processes and only valid for a certain scale. The change of scale in such model chains involves up- and down-scaling of model inputs, model parameters as well as adaptations of model equations in order to enable predictions at the policy scale. The errors and uncertainties associated with these changes of scale often receive too little attention, which results in a lower quality of the model results and thus their usability (e.g. for risk analysis). Our contribution aims to a raise of the awareness of some specific problems and impacts that up- and down-scaling can have on the quality of model results. Too many up and down-scaling steps can result in too complex models which can increase the error of model results. At the detailed scale, too many processes may be taken into account, whereas on the coarser scales important driving variables and processes are not taken into account. We use a model chain (STONE) to provide an example on how the resulting error at the policy scale can be estimated and what options for error analysis and error minimization exist.

Keywords: Accuracy assessment; change of support; risk analysis; STONE; uncertainty.