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From global circulation to flood loss: Coupling models across the scales

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The prediction and the prevention of flood losses requires an extensive understanding of underlying meteorological, hydrological, hydraulic and damage processes. Coupled models help to improve the understanding of such underlying processes and therefore contribute the understanding of flood risk. Using such a modelling approach to determine potentially flood-affected areas and damages requires a complex coupling between several models operating at different spatial and temporal scales. Although the isolated parts of the single modelling components are well established and commonly used in the literature, a full coupling including a mesoscale meteorological model driven by a global circulation one, a hydrologic model, a hydrodynamic model and a flood impact and loss model has not been reported so far. In the present study, we tackle the application of such a coupled model chain in terms of computational resources, scale effects, and model performance. From a technical point of view, results show the general applicability of such a coupled model, as well as good model performance. From a practical point of view, such an approach enables the prediction of flood-induced damages, although some future challenges have been identified.