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Flood loss model transfer: on the value of additional data

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The transfer of models across geographical regions and flood events is a key challenge in flood loss estimation. Variations in local characteristics and continuous system changes require regional adjustments and continuous updating with current evidence. However, acquiring data on damage influencing factors is expensive and therefore assessing the value of additional data in terms of model reliability and performance improvement is of high relevance. The present study utilizes empirical flood loss data on direct damage to residential buildings available from computer aided telephone interviews that were carried out after the floods in 2002, 2005, 2006, 2010, 2011 and 2013 mainly in the Elbe and Danube catchments in Germany. Flood loss model performance is assessed for incrementally increased numbers of loss data which are differentiated according to region and flood event. Two flood loss modeling approaches are considered: (i) a multi-variable flood loss model approach using Random Forests and (ii) a uni-variable stage damage function. Both model approaches are embedded in a bootstrapping process which allows evaluating the uncertainty of model predictions. Predictive performance of both models is evaluated with regard to mean bias, mean absolute and mean squared errors, as well as hit rate and sharpness. Mean bias and mean absolute error give information about the accuracy of model predictions; mean squared error and sharpness about precision and hit rate is an indicator for model reliability. The results of incremental, regional and temporal updating demonstrate the usefulness of additional data to improve model predictive performance and increase model reliability, particularly in a spatial-temporal transfer setting.