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Economic loss due to flooding in Europe at 1.5°C global warming

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We study the impact of climate change on European flood economic losses under 1.5°C global warming scenario. Climate scenarios were generated with the Community Atmospheric Model (CAM) version 5 under the protocols of the Half a degree Additional warming, Prognosis and Projected Impacts (HAPPI) experiment. Present climate scenario corresponding to the years 2006-2015 includes observed forcing conditions for sea surface temperatures (SSTs) and sea-ice cover. The future 1.5°C scenario was constructed following SST warming according to the response to the RCP2.6 in CMIP5 model simulations. Each scenario comprises five 10-year long simulations that differ in the initial weather state. For each scenario we generated a 1000 years long stochastic set of precipitation based on the main modes of variability of gridded precipitation data through Principal Component Analysis applied to the monthly precipitation fields of the combined 50 simulated years. The other variables were obtained through an analogue month approach. Stochastic monthly fields were subsequently disaggregated in space and time to 3-hourly, 6 km resolution grids, and these were finally fed to a well-calibrated flood-loss model. The flood-loss model comprises a rainfall-runoff component, a flood routing scheme, an inundation component and a financial module that integrates flood hazard, buildings vulnerability, and economic exposure at location level. Prior to model evaluation, the stochastic meteorological forcing was bias-corrected with the stochastic set (based on observations) employed in the construction and calibration of the flood-loss model. The method for bias-correction preserves the ratio of quantiles of the future scenario to the present and preserves the correlation structure of the forcing variables. Average annual loss for Europe with the current-climate scenario generated by CAM is within 10-15% of the current industry estimate (based on observations), which suggests the applicability of the proposed approach. For the future scenario the model suggests a significant increase in loss (> 4 times) with respect to the present, which is in line with other studies for similar future global warming pathways.