Geophysical Research Abstracts
Vol. 21, EGU2019-2065, 2019
EGU General Assembly 2019

Evaluating the impact of climate change in flood risk and economic loss at the European scale

Maximiliano Sassi (1), Ludovico Nicotina (1), Anongnart Assteerawatt (1), Arno Hilberts (1), Pardeep Pall (2), Daithi Stone (3), and Michael Wehner (4)

(1) RMS, Model Dev, London, United Kingdom (maximiliano.sassi@rms.com), (2) University of Oslo, Oslo, Norway , (3) National Institute of Water and Atmospheric Research, Wellington, New Zealand, (4) Lawrence Berkeley National Laboratory, Berkeley, USA

We investigate the impact of climate change on European flood risk and associated financial loss due to flooding under 1.5°C and 2.0°C warming scenarios (reflecting a projected climate in the year 2115 according to RCP2.6, and a linear combination of RCP2.6 and RCP4.5, respectively) and for a counterfactual current-climate scenario where the climate has evolved without anthropogenic influence (reflecting a climate corresponding to pre-industrial conditions). Climate scenarios were generated with the Community Atmospheric Model (CAM) version 5. For each scenario we generate a 1000 years long stochastic set of the climate variables by Principal Component Analysis applied to the precipitation fields, and feed this 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, vulnerability, and exposure at location level. The stochastic meteorological forcing is 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 climate change scenario to current climate, 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 actual industry estimate. For the climate change scenarios, we obtain an increase in loss of 3-5 times with respect to the current-climate, which is in line with other studies for similar future global warming pathways. For the counterfactual scenario, however, we expect a smaller loss change with respect to the current-climate. Although precipitation extremes for this scenario increase slightly when compared to the current climate, the main driver of flood loss change appears to be temperature. In many parts of Europe, the number of days below freezing point increases after bias-correction, and hence runoff peaks are more often associated to snowmelt. A larger build-up of snowpack in a colder climate, leading to stronger runoff peaks upon melting, cannot be ruled out as unphysical, given the model calibration was performed for the present climate. We discuss approaches to potentially cope with the impacts of temperature difference between the natural and current-climate scenarios when evaluating the hydrological model.