Addressing ambiguity in probabilistic assessments of future marine flooding using possibility distributions

Jeremy Rohmer, Gonéri Le Cozannet, Jean-Charles Manceau

Geophysical Research Abstracts
Vol. 20, EGU2018-4262, 2018
EGU General Assembly 2018

Addressing ambiguity in probabilistic assessments of future marine flooding using possibility distributions

Jeremy Rohmer, Goneri Le Cozannet, and Jean-Charles Manceau
BRGM, Natural Risks, Orléans, France (j.rohmer@brgm.fr)

Today, decision making in the area of coastal adaptation is facing a major challenge due to the deep uncertainties of sea level projections. These deep uncertainties (aka ambiguity or epistemic uncertainties), reflect the intrinsically imprecise nature of global sea level rise (GSLR) due to the lack of knowledge regarding the melting of ice, particularly in Antarctica. Possibility distributions are one of the mathematical tools enabling to overcome the ambiguity in the selection a unique probability laws by bounding all the plausible ones. By adopting this new mathematical tool, we aim at evaluating how GSLR uncertainties accumulate with other sources of uncertainties, namely: the choice in Representative Concentration Pathway (RCP) scenario, the ranking of high-end scenarios, the regional bias, the contributions of extremes and wave effects. The case study corresponds to a local low-lying coastal urban area exposed to storm surge and waves in the north-western Mediterranean coast. We focus on the probability of future flooding by 2100 defined as the probability of exceeding a critical threshold corresponding to the height of coastal defences. The joint sensitivity analysis of the probabilistic, possibilistic and scenario-like sources of uncertainty enables to highlight the key role of deep uncertainties of GSLR, of the statistical uncertainty related to extremes and to a lesser extent of the choice in the RCP scenario. These results heavily depend on the decision maker's attitude to risk (neutral, averse), which suggests the importance of entering into a loop of interactions with users, in order to collect their requirements and feedbacks, and involves research at the interface between behavioural and decision analytics, climate and coastal science as well as applied statistics.