

Partitioning the contributions of dependent offshore forcing conditions in the probabilistic assessment of future coastal flooding

Jeremy Rohmer¹, Deborah Idier¹, Remi Thieblemont¹, Goneri Le Cozannet¹, François Bachoc²

¹ BRGM, 3 av. C. Guillemin, 45060 Orléans Cedex 2, France

² Institut de Mathématiques de Toulouse, 118 Rte de Narbonne, 31400 Toulouse, France

Correspondence to: Jeremy Rohmer (j.rohmer@brgm.fr)

Abstract. Getting a deep insight into the role of coastal flooding drivers is of high interest for the planning of adaptation strategies for future climate conditions. Using global sensitivity analysis, we aim to measure the contributions of the offshore forcing conditions (wave/wind characteristics, still water level and sea level rise (*SLR*) projected up to 2200) to the occurrence of a flooding event at Gâvres town on the French Atlantic coast in a macrotidal environment. This procedure faces, however, two major difficulties, namely (1) the high computational time costs of the hydrodynamic numerical simulations; (2) the statistical dependence between the forcing conditions. By applying a Monte-Carlo-based approach combined with multivariate extreme value analysis, our study proposes a procedure to overcome both difficulties by calculating sensitivity measures dedicated to dependent input variables (named Shapley effects) using Gaussian process (GP) metamodels. On this basis, our results show the increasing influence of *SLR* over time, and a small-to-moderate contribution of wave/wind characteristics, or even negligible importance in the very long term (beyond 2100). These results were discussed in relation to our modelling choices, in particular the climate change scenario, as well as the uncertainties of the estimation procedure (Monte Carlo sampling and GP error).