



Modelling dependence and coincidence of marine flooding phenomena: methodology and simplified case study in Le Havre in France

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As coastal zones in France are densely populated, marine flooding represents a natural hazard threatening the coastal populations and facilities in several areas along the shore. Indeed, marine flooding is the most important source of coastal lowlands inundations. Coastal floods appear to be multiphenomena events characterized by several explanatory variables (sea level, rain, etc.). Modelling these phenomena jointly is a key issue for the coastal engineering community. Marine floods are mainly generated by storm surges which make water level rise above the tide. Several ideas and approaches have been proposed in the literature to analyse and characterize marine flooding hazard with either extreme storm surges or sea levels. However, few studies have compared them in order to find out the strengths and the weakness of each one. Hence, the present work supports these ideas, takes up some of them to complete some aspects with regards to the analysis of combined tide and extreme storm surges and proposes a new concept using the dependence and coincidence of marine flooding phenomena. This analysis is applied on the city of Le Havre, a French urban city on the English Channel coast.