Geophysical Research Abstracts
Vol. 20, EGU2018-826, 2018
EGU General Assembly 2018

Investigating the statistical dependency between storm surge and river discharge at the global scale as an indicator of compound flood hazard

Anais Couasnon (1), Dirk Eilander (1,2), Ivan Haigh (3), Sanne Muis (1), Ted I.E. Veldkamp (1), Thomas Wahl (4), Hessel Winsemius (1,2), and Philip J. Ward (1)

(1) Institute for Environmental Studies, Vrije Universiteit Amsterdam, Amsterdam, The Netherlands, (2) Deltares, Delft, The Netherlands, (3) Ocean and Earth Sciences, National Oceanography Centre, University of Southampton, Southampton, United Kingdom., (4) University of Central Florida, Orlando, United States.

Flooding is one of the most frequent and damaging natural hazards globally. Coastal areas are particularly vulnerable as these are exposed to different sources of flooding driven by (the interaction of) oceanographic, hydrological, geological and meteorological processes. Global flood risk assessments currently consider either riverine flood risk or coastal flood risk, thereby neglecting the impacts of compound floods in which different kinds of floods occur simultaneously or in quick succession.

In this study, we assess the strength and structure of the dependency between river discharge and storm surge at the global scale in order to highlight locations where their interaction is of critical importance for flood risk assessments. We determine the dependency between gauged and modelled time-series of high river discharge and storm surge by using a rank correlation coefficient measure and a copula structure analysis. Past studies have quantified this bivariate dependency in various parts of the world using observation data. However, the geographical coverage of gauged data is sparse. Therefore, in this study we perform our analysis using global models to simulate a 36-year time-series of river discharges and storm surges. We use the ERAInterim (1979-2014) reanalysis dataset as consistent forcing for all models. We also extensively validate the ability of the models to simulate the dependency, by comparing the results with observations. This provides a quantitative insight in the ability of global models to capture essential characteristics of compound floods, such as timing and duration. We then calculate the nonparametric correlation coefficient and identify the dependency structure along the global coast. This thorough analysis of the statistical dependency between high river discharge and storm surge provides valuable and novel information about the spatial characterization of the compound flood hazard in delta and estuarine areas.