**Changes in Dependence between Compound Coastal and Inland Flooding Drivers around the Contiguous United States Coastline**

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**Abstract**

Low-lying coastal zones are prone to flooding from multiple drivers such as storm surge (oceanographic), excessive river discharge (fluvial), and/or surface runoff (pluvial). The flooding impacts can be exacerbated, depending on local characteristics, when flooding is intensified by concurrent (or successive) occurrence of multiple drivers known as ‘compound flooding’. Recently, co-occurrence of flooding drivers is becoming more frequent and intense leading to more adverse impacts. In this study, we carry out a continental scale analysis for the CONUS coastline at locations with sufficiently long overlapping records to characterize the changes in dependence between compound flooding drivers over time. We also investigate the changes in dependence over time during tropical (May-November) and extratropical (December-June) seasons. Lastly, we assess how the dependence structure varies with time. We use observations (gauge records) for the analysis. Dependence between different pairs is assessed using statistical measures for dependence (Kendall’s rank correlation coefficient, τ; and tail dependence coefficient, χ). The dependence structures (particularly the tails of bivariate distributions) are compared using Kullback–Leibler (KL) Divergence to assess if there are significant changes in tails of bivariate distributions over time.

This analysis provides a comprehensive characterization of changes in compound flooding potential at locations around the CONUS coastline. We observe significant increase in dependence and tail dependence between surge and discharge calculated using a moving 30-year time windows at some locations (e.g., Washington DC). This provides insights on where and how compound flooding potential has changed over time to be incorporated in flood risk assessments and planning.