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Compound flood potential in Europe

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The interaction between storm surges and hydrometeorological phenomena on the land has been gaining increasing attention recently, especially after the severe flooding during the Harvey storm. In Europe, several compound events were recorded in the past century in western Europe and the Mediterranean region. Here, we investigate the joint occurrence of storm surges, precipitation, river discharges and waves through a statistical analysis based on copulas. We use several datasets covering most of Europe, including observations and data from the European Flood Awareness System (EFAS), ERA-Interim climate reanalysis and a regional climate model within CORDEX framework. The results show considerable regional differences in dependency structures and resulting joint probability of extreme surge, precipitation and river discharge events. We also compare correlations obtained from modelled data with those calculated from observational datasets. Finally, we synthesize the joint probability of occurrence of extreme compound events, and intensity of their components, in the form of a composite index, thus identifying areas where compound floods could be of most concern.