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Modelling compound flooding events for multiple hazards mapping: an example from Sweden.

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Globally climate change has increased exposure to multiple hazards. In Sweden, 10-year events of precipitation and streamflow have started to cluster around the summer months for most of the country. However, Sweden's south and west coasts are especially vulnerable to river flooding events caused by extreme sea surges during the winter. This national-level analysis needs to be combined with detailed local assessments to quantify the hazard properly, its potential impacts and cascading effects. In response to this need, we explore the impacts of multiple hydrometeorological (i.e., weather and water) events that happen simultaneously or close together in Halmstad. Furthermore, we investigate the effects of climate change on the intensity and frequency of these hazards by focusing on extreme – low likelihood but high impact – events. Due to its geographical location, Halmstad is particularly vulnerable to flooding risks. Wind and waves combine to make the city vulnerable to flooding and storm surges. That confluence triggers extreme local sea level rise, resulting in high sea levels in Halmstad compared to nearby coastal towns. These compound flooding events in Halmstad are expected to increase in future climate scenarios. We will simulate multiple scenarios of compound flooding events with a two-dimensional hydrodynamic model. The model's values used as boundary conditions will be based on computed joint return intervals for fluvial flooding and extreme sea surge. This study can not only be used to support local adaptation strategies but will also contribute to the body of knowledge on the issue of compound flooding events in a changing climate. Local-scale assessments like this one are necessary for a nuanced understanding of the possible impacts of multiple hazards on society. At the same time, societies' dependency on critical infrastructure and vital societal services is increasing due to growing system complexity and interconnectedness. Together, these shifts will likely increase societal vulnerability and impact adaptive capacity.