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SLR-induced changes on storm flooding in coastal areas: the role of accommodation space

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Most of existing predictions of climate-induce changes in coastal storminess in the Mediterranean indicate the absence of any significant increasing trend in neither wave height nor surge. However, this does not mean that magnitude and/or frequency of storm-induced coastal hazards will not be affected by climate change. Thus, sea level rise will induce a series of long-term changes in coastal areas that although not directly affecting storminess will interact with storm-induced processes and, thus, changing coastal storm risks.
A typical approach to account SLR-induced effects on coastal inundation by storms is to modify present water level extreme climate by adding expected MWL increase. This implies to consider the coast as a static and passive system to SLR maintaining its configuration from actual to projected (rised) sea level and, as a result of this, the frequency of flood events should increase and, the magnitude of flooding associated to a probability of occurrence will also increase. This will only be realistic for really passive or rigid coasts. However, sandy coastlines will response to SLR and, thus, this approach should undervalue coastal resilience.
Within this context, the main aim of this work is to propose a method to assess the effects of SLR on the magnitude of storm-induced coastal flooding on sandy coastlines taking into account their capacity of response. It combines the use of a inundation model (LISFLOOD-FP) for delineating the flood-prone area for given storm conditions and, a coastal module to account for SLR-induced changes in the coastal fringe.
The method assumes an equilibrium-type coastal response to SLR which, ideally, implies that the beach profile will be reconstructed under the new higher water level, in such a way that the relative beach configuration will be the same. However, this should only be possible provided there is enough accommodation space in the hinterland. In most of developed coasts, the existence of human built infrastructures conditions and limits the availability of accommodation space and, thus, controls the magnitude of the coastal response and final configuration under SLR. This final configuration will determine potential changes in water level and overtopping regimes under the SLR scenario.
Thus, potential SLR effects on storm-inundation will range between no changes for a "complete-equilibrium" response to worst case scenario which corresponds to a non-response (static) situation. The method has been tested in a low-lying coast in Catalonia (Spain, NW Mediterranean) where accommodation space varies along the coastline for different SLR scenarios. Obtained results show that, in spite of any variation in storminess, storm-induced flood risk significantly increase in time due to CC. Moreover, the observed variations in accommodation space along the coast significantly affect the observed increase in flood extension and, in consequence, it becomes one an essential aspect to be controlled for efficient management of future inundation risks.