From global to local: SCORE's approach to the study of coastal extreme events

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Analyzing the local repercussions of climate change on coastal regions represents a significant contemporary challenge within the research community. The goal is to devise innovative and sustainable measures that enhance the resilience of coastal communities against adverse climatic events, specifically heightened coastal flooding, due to the combined effects of river floods, rising sea levels, and storm surges. A pivotal aspect in this endeavor is the utilization of climate data to formulate a downscaling strategy, transitioning from global-scale climate services to defining impacts on a local scale. At the forefront of addressing these challenges is the Smart Control of the Climate Resilience in European Coastal Cities (SCORE) H2020 project, a four-year initiative aimed at strengthening the resilience of coastal cities. It particularly focuses on tackling the challenges posed by climate change, with a keen emphasis on alterations in the frequency and intensity of floods resulting from the combined effects of extreme precipitation, sea levels, sea state, and long-term processes like coastal erosion. Within this context, adopting a comprehensive 'global to local' approach is paramount, especially in studying and understanding the effects on coastal flooding along with some processes interacting to each other (SLR, coastal erosion). Unraveling the complexities of coastal extreme phenomena, the project underscores the application of a modeling approach to simulate the effects on two Mediterranean areas, Massa, Italy, and Barcellona-Villanova, Spain. Both areas face the North Mediterranean but exhibit different exposures, making them valuable case studies for understanding the nuances of coastal extreme events. Moreover, the importance of this approach is evident in the estimation of climate change effects in coastal cities, requiring the use of urban-scale models coupled to downscaling climate models at unprecedented levels of resolution. In SCORE, this is achieved through a framework of downscaling models that simultaneously consider all interactions between the atmosphere and sea, leveraging global and regional solutions (forced by EUROCORDEX scenarios) to force marine and hydrological models.

Urban-scale models play a crucial role in simulating land and coastal flooding conditions under various scenarios and with different return times, contributing significantly to the understanding of coastal extreme events. This approach allows for the assessment

of financial resilience strategies and ecosystem solutions for adaptation, following a truly multidisciplinary approach. Through participatory processes involving citizens, scientists, and policy-makers, SCORE aims to foster public engagement, emphasizing the importance of this approach in comprehensively studying and addressing coastal extreme phenomena that impact communities and ecosystems.