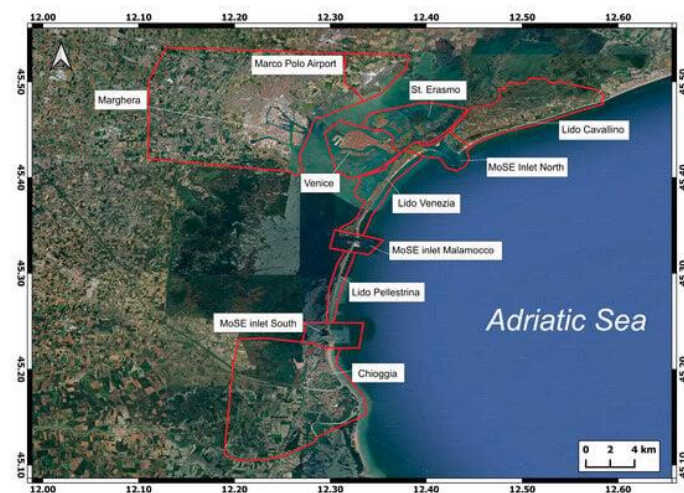


Multi-Temporal Relative Sea Level Rise Scenarios up to 2150 for the Venice Lagoon (Italy)

Summary

From the analysis of geodetic data and climatic projections for the Shared Socioeconomic Pathways (SSP1-2.6; SSP3-7.0 and SSP5-8.5) released in the Sixth Assessment Report (AR6) of the Intergovernmental Panel on Climate Change (IPCC), we estimated the rates of LS, the projected local relative sea level rise (RSLR), and the expected extent of flooded surfaces for 11 selected areas of the Venice Lagoon for the years 2050, 2100, and 2150 AD. Vertical Land Movements (VLM) were obtained from the integrated analysis of Global Navigation Satellite System (GNSS) and Interferometry Synthetic Aperture Radar (InSAR) data in the time spans of 1996–2023 and 2017–2023, respectively. The spatial distribution of VLM at 1–3 mm/yr, with maximum values up to 7 mm/yr, is driving the observed variable trend in the RSLR across the lagoon, as also shown by the analysis of the tide gauge data. This is leading to different expected flooding scenarios in the emerging sectors of the investigated area. Scenarios were projected on accurate high-resolution Digital Surface Models (DSMs) derived from LiDAR data. By 2150, over 112 km² is at risk of flooding for the SSP1-2.6 low-emission scenario, with critical values of 139 km² for the SSP5-8.5 high-emission scenario. In the case of extreme events of high water levels caused by the joint effects of astronomical tides, seiches, and atmospheric forcing, the RSLR in 2150 may temporarily increase up to 3.47 m above the reference level of the Punta della Salute tide gauge station. This results in up to 65% of land flooding. This extreme scenario poses the question of the future durability and effectiveness of the MoSE (Modulo Sperimentale Elettromeccanico),



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