



Climate change impact indicators for the Mediterranean coast with particular focus on Venice

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With the changes that are occurring in the Earth's climate system there is great concern about how these changes will impact society, in particular in coastal areas, where projected sea level rise will pose huge challenges. As part of the Copernicus Climate Change Service (C3S) contract awarded to Deltares (C3S_422 Lot2 Deltares-European Services) by ECMWF, the Institute of Marine Sciences of the National Research Council (CNR-ISMAR) Italy is part of an international consortium that is working to provide a number of Climate Impact Indicators (CII's), ISMAR being focussed on the Mediterranean Sea region, and particularly, the city of Venice. These CII's have been chosen in consultation with a number stakeholders based mainly in Venice. To compute these indicators we performed simulations in the Mediterranean and the Venice lagoon using the SHYFEM model, forced using wind and pressure datasets from ECMWF. The model was validated for historical (1977-2005) and ERA5 reanalysis (2001-2016) periods, and then future simulations (2041-2100) were performed using two climate scenarios, RCP4.5 and RCP8.5, representing mitigation and business as usual scenarios respectively. Here we present the CII's computed using results from these simulations. As our users are based in Venice, a city that is prone to flooding, the indicators relate to flooding and future flood prevention through the use of mobile barriers installed at the Venice lagoon inlets, the MOSE (MODulo Sperimentale Elettromeccanico) project. Specifically we compute the average number and period of closures of the flood barriers per year, and the economic costs of flooding both with and without the flood barriers. Also we compute indicators relating to turbidity and water quality in the lagoon, as well as a more general indicator measuring the risk of wave overtopping of sea barriers along the Mediterranean coast. These indicators give a projection of how flooding risks will change with future climate change under the two different scenarios, providing useful information to stakeholders about climate impacts and costs needed for future planning.