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Use of Satellite data to improve the storm surge forecast in Venice

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Under the ESA project eSURGE Venice, scatterometer and altimeter data were tested to improve the storm surge forecast in Venice. Forecasts were made by a hydrodynamic model, SHYFEM (Shallow water HYdrodynamic Finite Element Model), running over the Mediterranean Sea. The model was forced by ECMWF wind and pressure forecast fields and a system with a similar set-up is operational at the Venice sea level forecast and warning Institute (ICPSM)since 2002.

Twelve exceptional Storm Surge Events (SEVs) that happened between 2002 and 2012 were reprocessed using the original settings and testing the improvements given by the use of satellite data. Scatterometer data were used to correct the speeds and the directions of the original forecast wind fields forcing the model. This correction was different for each wind field considered, depending on the scatterometer data considered valid for its correction. Altimeter data were analysed and low frequency components (msl), of the geoid part, were extracted. These data were then assimilated using a dual 4D-Var technique, previously tested with tide gauge data.

Results of the scatterometer correction show a reduction on the maximum peak error of 40% on average and minor improvements on the sea level reproduction with normal weather conditions. Research based on the assimilation of sea level data is still ongoing.