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The eSurge-Venice project: altimeter and scatterometer satellite data to improve the storm surge forecasting in the city of Venice

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On the framework of the Data User Element (DUE) program, the European Space Agency is funding a project to use altimeter Total Water Level Envelope (TWLE) and scatterometer wind data to improve the storm surge forecasting in the Adriatic Sea and in the city of Venice.
The project will:

a) Select a number of Storm Surge Events occurred in the Venice lagoon in the period 1999-present day

b) Provide the available satellite Earth Observation (EO) data related to the Storm Surge Events, mainly satellite winds and altimeter data, as well as all the available in-situ data and model forecasts

c) Provide a demonstration Near Real Time service of EO data products and services in support of operational and experimental forecasting and warning services

d) Run a number of re-analysis cases, both for historical and contemporary storm surge events, to demonstrate the usefulness of EO data

The re-analysis experiments, based on hindcasts performed by the finite element 2-D oceanographic model SHYFEM (https://sites.google.com/site/shyfem/), will
1. use different forcing wind fields (calibrated and not calibrated with satellite wind data)
2. use Storm Surge Model initial conditions determined from altimeter TWLE data.

The experience gained working with scatterometer and Numerical Weather Prediction (NWP) winds in the Adriatic Sea tells us that the bias NWP-Scatt wind is negative and spatially and temporally not uniform. In particular, a well established point is that the bias is higher close to coasts then offshore. Therefore, NWP wind speed calibration will be carried out on each single grid point in the Adriatic Sea domain over the period of a Storm Surge Event, taking into account of existing published methods.
Point #2 considers two different methodologies to be used in re-analysis tests. One is based on the use of the TWLE values from altimeter data in the Storm Surge Model (SSM), applying data assimilation methodologies and trying to optimize the initial conditions of the simulation.The second possibility is an indirect exploitation of the TWLE data from altimeter in an ensemble-like framework, obtained by slight variations of the external forcing. In this case the wind data from NWP models will be weakly altered (shifted in phase), the drag coefficient will be modified, and the initial condition of the model slightly shifted in time to account for the uncertainty of these factors.
This contribution will illustrate the geophysical context of work and outline the results.