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Flood warning for the city of Venice using an Ensemble Prediction System tool

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In Venice, a well-known UNESCO world heritage site, providing reliable and accurate sea level forecast is important for the management of daily activities and for operating the movable barriers that are presently being built for the protection of the lagoon from both frequent and rare extreme flooding events. In addition, and in order to adequately support decision-making processes, the estimate of the uncertainty associated with the storm surge forecast has become increasingly important. The procedure adopted to estimate the forecast uncertainty uses the results of a hydrodynamic model forced with a set of different meteorological forecasts. In this work an operational Ensemble Prediction forecasting System (EPS) of the sea level for the Venice Lagoon is presented and applied to an high storm surge flood event occurred in the year 2010. The sea level computation is based on the HYPSE model, which is a standard single-layer nonlinear shallow water model. The meteorological forcing (mean sea level pressure and surface wind fields) are provided by the ensemble members of the ECMWF (European Center for Medium Range Weather Forecasts) EPS. Results show that the EPS would have allowed to deliver a warning three days in advance of the event, assigning 75% probability to exceeding the critical threshold of 1.10 m s.m.l., which will require the activation of the movable barriers. The performance of the method is also discussed on the basis of an operational implementation covering a 3-month long period showing that the EPS spread represents well the uncertainty of the prediction.