Forecasting Venice Acqua Alta events

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The coast of the North Adriatic Sea, where the city of Venice is located, is known to be exposed to events of exceptional sea level high, called Acqua Alta events. Such events show a high damaging potential in terms of severe economic and social consequences. Therefore, the prediction of such events is of paramount importance, especially in a changing climate characterized by the increase in frequency and severity of extreme events.

The ability to forecast Acqua Alta events in advance relies on the accuracy of the numerical model used, but it also requires accurate boundary conditions that contain signals involved in the evolution of these phenomena. On the other hand, since the dynamics of these events appear to involve barotropic as well as baroclinic modes, the numerical model used for the prediction must be able to describe such processes with enough accuracy on a proper domain. The Mediterranean Analysis and Forecasting Physical System (MedFS), operational in the framework of the Copernicus Marine Service, has shown good skill in predicting these kinds of events.

In this work, several sensitivity numerical experiments based on the MedFS configuration and characterized by different settings and different atmospheric forcing fields are presented. The aim of the analysis is to better understand the underlying physical mechanisms and to assess the contribution of single processes playing a role in Acqua Alta events, with the main goal of improving the predictability of such events.