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Validation and analysis of high-resolution atmospheric model simulations of the cold Bora outbreak over the Northern Adriatic Sea in winter 2012

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The Adriatic Sea is regularly affected by cold and strong Bora winds blowing from the north-east, especially during the winter season. These events are characterized by intense surface heat loss and air-sea exchange, thus producing strong effects on the circulation of the Adriatic, triggering dense water formation and driving basin-scale gyres. Turbulent surface (latent and sensible) heat fluxes and Sea Surface Temperature (SST) are the two most important parameters that characterize intense air-sea interactions typical of Bora events, and their accurate simulation is required in order to properly describe and understand atmospheric and ocean circulation processes.

This study deals mainly with the atmospheric component of the modelling system available in the framework of the flagship Project "RITMARE", and presents the results of an application focused on the exceptional Bora episode occurred in winter 2012 (25 January-15 February). A number of short-range high-resolution atmospheric simulations have been performed to cover the entire period. Model performances have been evaluated in terms of variables of interest for oceanographic applications. As far as meteorological variables, surface fluxes and SST are concerned, the validation has been undertaken trough a comparison with available surface data (buoys) and satellite-derived SST, while Synthetic Aperture Radar (SAR) products have been used to assess modelled wind fields.

Two mesoscale operational-like modelling chains have been implemented, one based on BOLAM-MOLOCH models, the other on WRF. The use of different initial and boundary conditions provided by two global NWP systems, namely GFS (NCEP) and IFS (ECWMF), driving the high-resolution simulations turned out to have a remarkable impact on the results, mainly as a consequence of a different initialization of the SST field.

Results suggest the importance of adopting full bi-directional coupling between atmospheric and ocean circulation models at least in this semi-enclosed basin during extreme events.