



## A high-impact meso-beta vortex in the Adriatic Sea

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On the evening of November 12, 2019, an exceptional high tide hit the city of Venice and the central-southern area of its lagoon, damaging a large part of its historical center. The main cause of the event was a small warm-core mesoscale cyclone, which formed in the central Adriatic Sea and intensified during its northwestward movement.

Simulations with different initialization times were carried out with the Weather Research and Forecasting (WRF) model, showing a strong sensitivity to the initial conditions, since the track (and strength) of the cyclone was determined by the exact position of an upper-level potential vorticity (PV) streamer. The factors responsible for the cyclone development are also investigated. The pre-existence of positive low-level cyclonic vorticity, associated with the convergence of the Sirocco and Bora winds in the Adriatic, made the environment favorable for cyclone development. Also, the interaction between the upper-level PV anomaly and the low-level baroclinicity, created by the advection of warm, humid air associated with the Sirocco, was responsible for the cyclone's intensification, in a manner similar to a transitory (stable) baroclinic interaction at small horizontal scales.

Conversely, convection and sea surface fluxes did not play a significant role, thus the warm-core feature appears mainly as a characteristic of the environment in which the cyclone developed rather than a consequence of diabatic processes. The cyclone does not fall into any of the existing categories for Adriatic cyclones.