BAROCLINIC AND DIABATIC REGULATION OF THE 10-12 NOVEMBER 2001 SUPERSTORM IN THE BALEARICS

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The western Mediterranean area was affected by a hazardous cyclone during the 10-12 November 2001 period. This extraordinary event affected very strongly northern Algeria during 10 November, where massive flooding after heavy rains killed hundreds of people and left thousands homeless. Later, the cyclone produced heavy rain and very strong winds in coastal regions of Spain and Italy. The effects of the storm were particularly notable in the Balearic Islands: wind gusts exceeded 140 km/h, rainfall up to 400 mm in two days was recorded and sea waves up to 10 m reached the shores of the islands.As a consequence, four casualties occurred, more than 100.000 trees were uprooted, many boats and coastal infrastructures were severely damaged and some crop fields were flooded.

An analysis of surface and upper leavel weather maps suggests that the cyclone was initiated as a baroclinic development over north Africa, and then moved northwards and deepened strongly over the Mediterranean. A diagnostic study of the situation using the quasigeostrophic framework has been performed to assess the baroclinic contribution to the cyclogenesis process. Results reveal the leading role of an upper level trough present over the western Mediterranean and north Africa that was associated with a very cold air intrusion from the north. This upper-level trough induced a low-level surge of warm African air over the Mediterranean and a notable deepening of the cyclone.

As an alternative approach for the diagnosis of the cyclone evolution, a piecewise Potencial Vorticity (PV) inversion is applied. This approach allows to isolate the contributions of three prominent PV positive anomalies identified over the western Mediterranean region: those associated with the aforementioned upper level trough and low level warm air anomaly, and the diabatically generated PV due to condensational latent heat release along the cyclone path.

Finally, nested domain simulations down to 2-km horizontal grid spacing are performed to assess the capability of the MM5 model for predicting the storm (control simulation) and to study the sensitivity of the cyclone characteristics to the previous PV anomalies (simulations with perturbed initial PV field).