



Analysis of an intense tropical-like cyclone over the western Mediterranean Sea through a combined modeling and satellite approach

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Vortices with characteristics similar to those of tropical cyclones, such as the presence of an “eye” and of spiral-like cloud bands, are occasionally observed in satellite images over the Mediterranean. In such tropical-like cyclones (TLC, sometimes called Medicanes) a symmetric warm core can be identified across the whole troposphere. The present study focuses on a specific Medicane that affected the western part of the Mediterranean basin on 5-9 November 2011. Such a vortex displayed the longest persistence (about 60 hours) of tropical features compared to other TLCs recently analysed over the Mediterranean.

Numerical simulations performed with the WRF model were able to reproduce properly the evolution and the track of the cyclone. The interaction between an upper level potential vorticity (PV) anomaly, associated with a synoptic scale disturbance, and the low level vorticity anomaly associated with the cyclonic circulation in the vortex, develops a PV tower in the mature stage of the cyclone lifetime. The time evolution of some synoptic parameters identified as favourable to TLC formation and of the dynamic and thermodynamic properties of the cyclone are analysed.

Finally, the microwave precipitation retrieval method 183-WSL and the water vapour spectral bands of the Meteosat SEVIRI sensor are used to describe the characteristics of the storm in terms of cloud development, and precipitation regime and type (convective/stratiform). In particular, the satellite analysis of cloud top height and retrieved rainfall indicates that the stage characterized by the most intense convective activity and rainfall anticipates the mature phase (when the cyclone is deeper and characterized by tropical features), during which convection is shallower and rainfall weaker.