A QUASI-TROPICAL CYCLONE OVER THE WESTERN MEDITERRANEAN: DYNAMICAL VS BOUNDARY FACTORS

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A small, quasi-tropical cyclone occurred on 11 and 12 September 1996 over the Western Mediterranean. Intense convective activity over the region during this period also produced a tornado outbreak in the Balearic Islands and torrential precipitation over eastern mainland Spain. Numerical experiments using the MM5 model are used to analyze this event. A sensitivity study, with a factors separation technique, examining the upper-level dynamic forcing, latent heat flux from the sea, and orography is conducted. A potential vorticity (PV) inversion technique is used to reduce the amplitude of an upper-level intense trough and then evaluate its effects. Orography does not play a significant role during this particular cyclone development. Conversely, both the latent heat flux and the upper-level trough are crucial for low-level cyclogenesis, resulting in an air-sea interaction instability. At the first stage of the cyclogenesis, the upper-level PV anomaly enhanced the low-level circulation of the synoptic-scale low and enhanced the latent heat flux from the sea. During its mature stage, the circulation associated with the small-scale cyclone enhanced the latent heat flux from the sea, thereby helping to maintain the development of deep convection and so inducing further cyclone deepening by diabatic heating. This scenario represents an air-sea interaction instability feedback mechanism. The primary role of the sea as a source of heat and moisture in this particular event is highlighted by performing a sensitivity analysis of the cyclone formation to different SST's. Thus, the interaction of the upper-level anomaly and the heat fluxes from the sea emerges as the main agent for the genesis and evolution of the small quasi-tropical cyclone.