Plinius Conference Abstracts,
Vol. 10, PLINIUS10-A-00033, 2008
10th Plinius Conference on Mediterranean Storms

A sensitivity of MAP IOP 15 event to the estimated uncertainties in the upper-level dynamical factors

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Mesoscale mountain ranges, such as the Alps, are well known regions of frequent lee cyclogenesis. An event of deep Alpine lee cyclogenesis, MAP IOP 15, was associated with severe weather in the southeastern Alpine region. Heavy precipitation (exceeding 60 mm/24h) occurred over the northeastern Italy, Slovenia and continental Croatia, while extreme Bora (gusts over 50 ms^{-1}) developed over the northern Adriatic.

A numerical analysis on the sensitivity of the analyzed event to initial uncertainties in the upper-level dynamical factors was performed with the MM5 mesoscale model. First, a statistics of the differences in the upper-level potential vorticity was calculated using ECMWF and NCEP reanalysis of the 21 events of the strongest Mediterranean storms. This statistics served as a proxy for estimating the model uncertainties in the intensity and position of the upper-level trough. Thereupon, the statistics was used to deterministically scale the synoptic modifications (with a 90^{th} percentile of the derived model error statistics) in the intensity and position of the upper-level trough in the initial conditions of the analyzed event. In this way, a consistent method was used to produce an ensemble of MM5 model simulations, with an estimate of the model uncertainty in the upper-level trough only, thus exploring the predictability of the analyzed phenomenon due to the factor that strongly favors its development. The results indicated a notable variability in the intensity and position of the analyzed lee cyclone. Furthermore, the non-dimensional analysis of the background flow properties during Bora event showed that uncertainty in the initial upper-level circulations might result in changing the downslope windstorm flow regime, indicating the strong influence of the initial uncertainty in the upper-tropospheric dynamical factors to the correct prediction of the severe Bora in the Adriatic region.