Geophysical Research Abstracts,
Vol. 10, EGU2008-A-09366, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-09366
EGU General Assembly 2008

Application of local potential vorticity modifications to improve the numerical prediction of an intense Mediterranean cyclone

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Despite continuous improvements of numerical weather forecasting systems, some extreme weather events still remain hardly predictable even at very short-range. The forecast of such cases may be limited by the quality of the initial conditions, themselves strongly sensitive to the density of observations and to the data assimilation system which may reject correct values as they differ too much from the background field. In this context, the human intervention appears to be essential to monitor and, if necessary, modify numerical outputs by comparing them with the latest observations. This study deals with a useful methodology that allows a forecaster to modify a numerical output in case of discrepancy with observational data. The decision to modify or not a numerical analysis or a forecast is based on comparison between potential vorticity (PV) fields and METEOSAT-7 water vapour (WV) brigthness temperatures (on the bandwidth 5.7 - 7.1 μm). As the METEOSAT-7 WV channel is mainly affected by the temperature near the tropopause level, it is possible, under some assumptions, to relate dark and bright features of WV images to relevant PV anomalies. Therefore, in case of mismatch between analyzed or forecasted PV fields and METEOSAT-7 WV images, one can apply PV modifications according to the observations to improve the numerical outputs. In the present work, we made an attempt to apply PV corrections guided by METEOSAT-7 WV imagery to a case of intense cyclogenesis in the western Mediterranean. We will discuss some PV modifications that improved the correspondence between PV fields and METEOSAT-7 WV imagery and involved a better forecast of the cyclone and its associated deep clouds and precipitation.