EMS7/ECAM8 Abstracts,
Vol. 4, EMS2007-A-00185, 2007
7th EMS Annual Meeting / 8th ECAM
© Author(s) 2007

Unpredictability of tornado occurrence: the atypical case of Cassacco, ITALY, - Winter 2006 - F2 tornado

I. Gallai (1), **D. B. Giaiotti** (1,2), I. Gladich (3,4), F. Stel (1,2)

(1) OSMER – ARPA FVG, Visco (UD), Italy, (2) European Severe Storms Laboratory, DLR-IPA, Oberpfaffenhofen, Münchner Str. 20, 82234 Wessling, Germany, (3) University of Trieste, Trieste Italy, (4) International Centre for Theoretical Physics, Trieste, Italy. (dario.giaiotti@osmer.fvg.it)

This work presents the analysis of a tornado event occurred in NE Italy during the winter season, December 09, 2006. The tornado was observed and photographed by more than one witness. The intensity of the tornado is estimated F2 (T4 in the TORRO scale), fluttering debris has been observed and several of them produced damages to houses. The event occurred in an environment with low values of convective available potential energy (CAPE), storm storm-relative environmental helicity (SREH) and wind shear (WS), if compared with typical values for tornadic environments in the same and other geographical areas (Brooks and Doswell, 2000; Giaiotti et al. 2007). Doppler Radar imagery has been analyzed looking for a mesocyclonic signature that could had hosted the tornado, but no evidence of a mesocyclones has been found. The five minutes time resolution mesonetwork data of temperature, pressure, moisture and horizontal wind at the ground level have been used for the identification of specific boundaries in the buoyancy and the related horizontal relative vorticity fields. No peculiarities have been found. Upper level radiosounding data does not reveal any intense jets. So this tornado event appears to be inconsistent with the conceptual model for the convective intense vortex formation (Thompson et al. 2003; Brooks et al. 1994) and it is a missing alarm case for the common forecasting empirical rules (Giaiotti et al. 2007). Furthermore, during the same stormy day another tornado was observed in the same area, but no photos have been taken, nor damage estimates are available. Witnesses' reports support the conjecture that this second vortex was an F0 not producing any damage since it hit an uncropped area in open country. A numerical simulation by

means of the Weather Research and Forecasting (WRF) model has been carried out with spatial resolution of 4 km for the 48 hours time window interested by the tornado event, using ECMWF boundary conditions. Evaluation of the model output quality, by means of the mesonetwork and radiosounding data, was considered first, then analysis on the low levels WS and SREH has been carried out. The model simulation has a good agreement with the mesoscale measured reality, the WS and SREH field does not present any signature of tornadic prone environments allover the domain, in agreement with what was revealed by radiosounding data in a single grid point of the interested area with a time resolution of 12 hours. This case study rise the attention on the use of the empirical relations between convective available potential energy (CAPE), storm-relative environmental helicity (SREH), or wind shear (WS), that are commonly used for operational tornado forecasts in met-offices. The predictability of the presented weather event is discussed in detail and it is compared with the predictability of other tornadoes occurred in the same area (Bechini et al, 2001; Bertato et al, 2003) .

References

Bechini R, D. B. Giaiotti, Manzato A., Stel F., Micheletti S., The June 4^{th} 1999 severe weather episode in San Quirino, Italy, a tornado event?, 2001, Atmos. Res. 56, 213-232

Brooks E. H, Doswell C. A., Cooper J., On the Environments of Tornadic and Non-tornadic Mesocyclones, 1994, Wea. Forecasting, 9, 606-618

Brooks H, Doswell C. A. Some aspects of the international climatology of tornadoes by damage classification, 2000, Atmos. Res. 56, 191-201

Bertato M., D. B. Giaiotti, Manzato A., Stel F., An interesting case of tornado in Friuli-Northeastern Italy, 2003, Atmos. Res. 67-68, 3-21

Giaiotti D. B., Steinacker R., Stel F. Atmospheric Convection: Research and Operational Forecasting Aspects. 2007. Springer Verlag, pp. 227.

Thompson R. L., R. Edwards, J. A. Hart, K. L. Elmore, P. Markowski, Close Proximity Soundings with Supercell Environments Obtained by Update Cycle, 2003, Wea. Forecasting 18, 1243-1261

Acknowledgments

Part of this work was carried out in the frame of FORALPS Project (EU INTERREG IIIB – Alpine Space). It is also included in the “Intensity distribution of mesoscale and local scale vertical atmospheric vortexes (mesocyclones and tornadoes)“ research project which belongs to the XXI cycle Ph.D. in Environmental Fluid Mechanics, University of Trieste, ITALY.