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Analysis of the 30 May 2014 tornadic storm in Vilabella, Catalonia

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On 30 May 2014 thunderstorm activity affected Catalonia (NE Spain) and around 16:45 UTC an EF0 tornado was observed in the village of Vilabella, located 75 km SW of Barcelona. The damaged area was mainly rural, with low population density compared to nearby towns and cities but not far from important infrastructures including a high speed train railway (6 km), a highway (7 km) or from Reus international airport (15 km). The tornado was observed from several neighbouring locations and video and photographic shooting was made quickly available through social networks. A site survey indicated that the damage concentrated mostly on a farm, which experienced partial roof removal, located near the Vilabella railway station; additional effects on nearby fields included small limbs and branches broken. The damage path was about 1.9 km long and did not exceed 40 m. Economical losses were estimated in approximately 20 kEur.

The meteorological synoptic setting in South-Western Europe was dominated at sea level by the presence of the Azores islands high pressure system extending trough the Iberian Peninsula. During the day a relative low pressure region intensified over northern Italy associated to a dissipating cold front extending from France to the UK while another relative low pressure area built over SE Iberian Peninsula. An upper level trough (with an axis oriented E to W) in the geopotential height and temperature fields moved progressively from France (6 UTC) to the Iberian Peninsula (12 and 18 UTC) decreasing the temperature from -17 to -20 Celsius at 500 hPa favouring an increase in instability indices from low to moderate values (TT from 48 to 56 and CAPE from 100 to 400 J/kg at 12 UTC according to HIRLAM model data) while at 300 hPa at 12 UTC passed a short wave trough with an axis oriented N to S. This situation produced storm activity over Catalonia, mostly organized as multicell thunderstorms, apparently more intense over the N and E sectors, rather than central-south, where the tornadic storm took place.

We present an analysis of surface observations, satellite imagery, total lightning data, and Doppler radar observations, which indicate that the tornadic parent storm exhibited radial velocity shear features suggesting possible rotation but limited vertical extension (5 km 30dBZ tops) and echo intensity (52 dBZ). Results are compared with previous tornadic case studies aiming to identify factors to support the forecasting and surveillance of this type of severe weather events.