



## **Study of upper air conditions in tornadic and waterspout events in the Iberian Peninsula and Balearic Islands using ERA5 reanalysis data**

Oriol Rodríguez and Joan Bech

University of Barcelona, Applied Physics - Meteorology, Barcelona, Spain (orodriguez@meteo.ub.edu, joan.bech@ub.edu)

Tornadoes affect every year coastal areas from the Iberian Peninsula and Balearic Islands (Gayà, 2018), where important conurbations such as Barcelona, Palma, Valencia, Malaga or Lisbon are located. Forecasting its occurrence is still a challenge, but a deep knowledge of upper air conditions related to tornadic events may enhance forecasting tasks. Tornado and waterspout environments for the region of study have been analysed using ERA5 data (C3S, 2017), whose spatial and temporal resolution are  $0.25^\circ$  and 1 hour respectively with 37 pressure levels. For each event location a vertical temperature, humidity and wind profile has been extracted to calculate thermodynamic, kinematic and combined parameters.

This study has been performed using a tornado and waterspout database, which consists of 471 individual tornadoes and 635 individual waterspouts occurred between 1980 and 2018. The main sources of information to build it up have been Gayà (2018), Rodríguez and Bech (2018) and citizen collaboration severe weather databases such as ESWD (ESSL), SINOBAS (AEMET) and XOM (Meteorological Service of Catalonia). Up to 917 soundings have been analysed, 432 of which related to tornadic events and the rest to waterspout episodes. For each one, several parameters as CAPE, Storm-relative Helicity (SRH), Wind Shear (WS), Supercell Composite Parameter (SCP) and Universal Tornadic Index (UTI) have been calculated and studied. The results have been also compared with previous studies carried out using sounding data.

This study has been performed in the framework of the HYdrological cycle in the Mediterranean EXperiment (HyMeX), projects CGL2015-65627-C3-2-R (MINECO/FEDER), CGL2016-81828-REDT (MINECO) and the Water Research Institute (IdRA) of the University of Barcelona.

### References

C3S. 2017. Copernicus Climate Change Service. ERA5: Fifth generation of ECMWF atmospheric reanalyses of the global climate. Copernicus Climate Change Service Climate Data Store (CDS), 24 April 2019. <https://cds.climate.copernicus.eu/cdsapp#!/home>.

Gayà M. 2018. Els Fiblons a Espanya: Climatologia i catàleg de tornados i trombes (Whirlwinds in Spain: Climatology and Catalogue of Tornadoes and Waterspouts). Second edition. Universitat de les Illes Balears: 619 pp. (in Catalan).

Rodríguez O, Bech J. 2018. Sounding-derived parameters associated with tornadic storms in Catalonia. *International Journal of Climatology*, 38: 2400–2414. <http://doi.org/10.1002/joc.5343>.