



Dynamics of the Gong windstorm (Jan 2013) in the context of a 20-year high-resolution simulation of Iberian climate

Pedro M.A. Miranda (1), Maria João Chinita (1), Rita Cardoso (1), Pedro Soares (1), Pedro Viterbo (1,2), Paulo Pinto (2), and Manuel Mendes (2)

(1) University of Lisbon, IDL, Lisboa, Portugal (pmmiranda@fc.ul.pt), (2) IPMA, Portugal

In the last decade, Portugal was affected by a number of windstorms associated with mid-latitude cyclones, some with significant impact on built infrastructures, namely on the electric grid. Two of those storms were particularly violent, the Oeste storm on the 23 December 2009, and the Gong storm on 19 January 2013. The Klaus storm, on the 23 January 2009, had some impact but only in the northern edge of Iberia, but the Xynthia storm, on the 27 February 2010, had extensive impact in the Portuguese territory. Considering impacts on the electric grid, these 4 storms are part of a set of about 10 storms per decade, although earlier storms didn't get a name.

The relevance of these extreme events in recent climate motivated a case study analysis of the more relevant storms and its analysis in a continuous regional climate simulation of the Iberian climate. The RCM simulation used WRF at 9km resolution, with ERA-Interim boundary conditions initially for the period 1989-2008, here extended until 28 Feb 2013. The former simulations were extensively validated against Iberian gridded temperature and precipitation datasets (Soares et al 2012), and against Portuguese station data (Cardoso et al 2013). Results are here validated, in the extended 24 year period, also against standard 10-m wind observations. Case study analysis used the same boundary conditions and model (WRF), but at both 9 and 3 km horizontal resolutions, and also included sensitivity experiments to different parametrizations.

While the WRF RCM simulation, forced by ERA-Interim, presents an overall excellent performance in the representation of both the mean climate (temperature, precipitation and wind), and also in the representation of high-rank precipitation quantiles, the two most extreme windstorm events are not well represented. However, the Gong storm is very well represented in the case study simulation, even at 9km resolution with exactly the same boundary conditions, but a somewhat different initial state. The Oeste storm is also poorly simulated in both simulations. Xynthia and Klaus, on the other hand, are both well represented in the continuous RCM simulation.

The Oeste storm was earlier diagnosed as a sting-jet storm, using Doppler radar techniques, corresponding to the conceptual model of Browning (2004). The present case study simulation shows that the same applies to the Gong storm, although the latter has a somewhat larger horizontal scale. An increased relevance of this extreme storm dynamics in recent and future European storms is an intriguing possibility. The sensitivity of these storms to details in the synoptic environment is a very relevant issue in the analysis of storm trends in future climate scenarios.

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References

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