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Klaus, an exceptional winter storm over Northern Iberia and Southern France – a comparison between storm diagnostics

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The synoptic evolution and dynamical characteristics of storm "Klaus" (23 and 24 January 2009) are analysed. "Klaus" was an extratropical cyclone which developed over the subtropical North Atlantic Ocean on the 21st January 2009, then moved eastward embedded in the strong westerly flow and experienced a notorious strengthening on the 23rd January. The storm moved into the Bay of Biscay and deepened further before hitting Northern Spain and Southwestern France with gusts of up to 198 km/h. Afterwards, it steered southeastwards across Southern France into Northern Italy and the Adriatic. "Klaus" was the most intense and damaging wind storm in the region in a decade, provoked more than 20 casualties and insured losses of several billion Euros.

The evolution of "Klaus" is analysed using two standard cyclone detecting and tracking schemes: a) the vorticity maxima based algorithm originally developed by Murray and Simmonds [1991], adapted for Northern Hemisphere cyclone characteristics [Pinto et al. 2005]; and b) the pressure minima based algorithm first developed for the Mediterranean region [Trigo et al. 1999; 2002] and later extended to a larger Euro-Atlantic region [Trigo 2006]. Additionally, the synoptic and mesoscale features of the storm are analysed.

The vorticity based method detects the storm earlier than the pressure minima one. Results show that both tracks exhibited similar features and positions throughout almost all of their lifecycles, with minor discrepancies being probably related to different ways of both methods handling the spatio-temporal evolution of multiple candidates for cyclonic centres. In its strengthening phase, "Klaus" presents deepening rates above 37 hPa/24h, a value that after geostrophically adjusted to the reference latitude of 60ºN increases to 44 hPa/24h, implying an exceptional event with bomb characteristics. During maximum intensity change within 24 hours was 1.165hPa/(deglat)2.

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