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Diagnosis and Modeling of the Explosive Development of Winter Storms: Sensitivity to PBL Schemes

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The correct representation of extreme windstorms in regional models is of great importance for impact studies of climate change. The Iberian Peninsula has recently witnessed major damage from winter extratropical intense cyclones like Klaus (January 2009), Xynthia (February 2010) and Gong (January 2013) which formed over the mid-Atlantic, experienced explosive intensification while travelling eastwards at lower latitudes than usual [Liberato et al. 2011; 2013].

In this paper the explosive development of these storms is simulated by the advanced mesoscale Weather Research and Forecasting Model (WRF v 3.4.1), initialized with NCEP Final Analysis (FNL) data as initial and lateral boundary conditions (boundary conditions updated in every 3 hours intervals). The simulation experiments are conducted with two domains, a coarser (25km) and nested (8.333km), covering the entire North Atlantic and Iberian Peninsula region. The characteristics of these storms (e.g. wind speed, precipitation) are studied from WRF model and compared with multiple observations.

In this context simulations with different Planetary Boundary Layer (PBL) schemes are performed. This approach aims at understanding which mechanisms favor the explosive intensification of these storms at a lower than usual latitudes, thus improving the knowledge of atmospheric dynamics (including small-scale processes) on controlling the life cycle of midlatitude extreme storms and contributing to the improvement in predictability and in our ability to forecast storms' impacts over Iberian Peninsula.

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