



## Rossby Wave-Breaking analysis of Explosive Cyclones in the Euro-Atlantic sector

Iñigo Gómara (1,2), Joaquim G. Pinto (3), Tim Woollings (4), Giacomo Masato (4), Pablo Zurita-Gotor (1,2), Belén Rodríguez-Fonseca (1,2)

(1) Department of Geophysics and Meteorology, Complutense University of Madrid, Madrid, Spain (i.gomara@pas.ucm.es),

(2) Institute of Geosciences (IGEO), UCM, CSIC, Spain, (3) Institute for Geophysics and Meteorology, University of Cologne, Cologne, Germany, (4) Department of Meteorology, University of Reading, Reading, UK

The relationship between Rossby Wave Breaking (RWB) and intensification of extra-tropical cyclones is analysed over the Euro-Atlantic sector. In particular, timing, intensity and location of cyclone development are compared with RWB occurrences. For this purpose, two potential-temperature based indices are used to detect and classify (anticyclonic/cyclonic) RWB episodes from the ERA-40 Re-Analysis extended winter data (October 1957- March 2001). Results show that explosive cyclogenesis (Normalised Deepening Rate  $>1$  Bergeron) over the North Atlantic (NA) is fostered by enhanced occurrence of RWB on days prior (-2 to 0) to their maximum intensification date. Under such conditions, the eddy-driven Jet is accelerated over the NA.

For explosive cyclogenesis over the eastern NA, enhanced cyclonic RWB over eastern Greenland and anticyclonic over subtropical Atlantic are observed. Particular analysis of events reveals that while in some cases both features appear simultaneously, in some others there is only presence of one of them, being the breaking over eastern Greenland more frequent than its southern counterpart. This leads to an intensification of the jet over the eastern NA and to the occurrence of windstorms over Europe.

On the other hand, such events over the western Atlantic are linked to a unique area of enhanced cyclonic RWB over western Greenland. The eddy-driven jet is here accelerated over the western NA. For lags +1, +2, enhanced occurrence of cyclonic RWB over southern Greenland and anticyclonic over Europe is also observed, potentially leading to the onset of Scandinavian Blocking. Non-explosive cyclones depict no sign of enhanced RWB over the area. Thus, we conclude that the relationship between RWB and cyclogenesis over the Euro-Atlantic sector is sensitive to cyclone's maximum intensity, deepening rate and its location.