Geophysical Research Abstracts
Vol. 15, EGU2013-8452, 2013
EGU General Assembly 2013

Analysis of moisture advection during explosive cyclogenesis over North Atlantic Ocean

Paulina Ordóñez (1), Margarida L. R. Liberato (1,2), Joaquim G. Pinto (3), and Ricardo M. Trigo (2)

(1) Escola de Ciências e Tecnologia, University of Trás-os-Montes e Alto Douro (UTAD), Vila Real, Portugal (mlr@utad.pt), (2) Instituto Dom Luiz (IDL), University of Lisbon, Lisbon, Portugal, (3) Institute for Geophysics and Meteorology, University of Cologne, Cologne, Germany

The development of a mid-latitude cyclone may strongly be amplified by the presence of a very warm and moist air mass within its warm sector through enhanced latent heat release. In this work, a lagrangian approach is applied to examine the contribution of moisture advection to the deepening of cyclones over the North Atlantic Ocean. The warm sector is represented by a 5ºx5º longitude/latitude moving box comprising the centre of the cyclone and its south-eastern area is defined for the tracks of different cyclones computed at 6-hourly intervals.

Using the lagrangian particle model FLEXPART we evaluated the fresh water flux (E - P) along 2-days back-trajectories of the particles residing on the total column over the defined boxes for case studies occurring during winter months from 1980 to 2000. FLEXPART simulations were performed using one degree resolution and 60 model vertical levels available in ERA40 Reanalyses at 00, 06, 12, 18 UTC for each case. Sensitivity studies on the dimensions of the target area - chosen boxes representing the warm sector -, and on its relative position to the center, were performed.

We have applied this methodology to several case studies of independent North Atlantic cyclones with notorious characteristics (e.g. deepening rate, wind speed, surface damages). Results indicate that the moisture transport is particularly relevant in what concerns the fast/explosive development stage of these extratropical cyclones. In particular, the advection of moist air from the subtropics towards the cyclone core is clearly associated with the warm conveyor belt of the cyclone. This methodology can be generalized to a much larger number of mid-latitude cyclones, providing a unique opportunity to analyze the moisture behavior associated with the explosive development.

Acknowledgments: This work was partially supported by FEDER (Fundo Europeu de Desenvolvimento Regional) funds through the COMPETE (Programa Operacional Factores de Competitividade) Programme and by national funds through FCT (Fundação para a Ciência e a Tecnologia, Portugal) through project STORMEx FCOMP-01-0124-FEDER-019524 (PTDC/AAC-CLI/121339/2010).