Geophysical Research Abstracts
Vol. 15, EGU2013-3394, 2013
EGU General Assembly 2013

Moisture Sources and Large-Scale Dynamics Associated with a Flash Flood Event in Portugal

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On 18-19 November 1983, the region of Lisbon, in Portugal, was affected by a heavy precipitation event, soon followed by flash flooding, urban inundations and a burst of landslides around Lisbon [Zêzere et al., 2005] causing considerable infrastructure damage and human fatalities. With a total of 95.6 mm in 24 h observed at the longest serving station in Portugal (Lisbon's Dom Luiz Observatory), this was the rainiest day during the twentieth century and one of the rainiest registered since 1864.
We found that this event was triggered by the transport of tropical and subtropical moisture associated with an extratropical cyclone. The low favored a large stream of (sub) tropical air that extended over more than 10° of latitude and across the North Atlantic Ocean, carrying a large amount of moisture originally from lower latitudes, a so-called atmospheric river. The stationary position of the jet stream along the East Atlantic Ocean through Iberia caused a strong enhancement of the precipitation associated with the moist air.
A Lagrangian analysis of the transport of moisture in the Euro-Atlantic sector was performed based on the methodology developed by Stohl and James [2004, 2005], using the FLEXPART model. This Lagrangian methodology was employed to show that the evaporative sources for the precipitation falling over the area of Lisbon were distributed over large sectors of the tropical-subtropical North Atlantic Ocean and included a significant contribution from the (sub) tropics. This study [Liberato et al., 2012] aims to provide an example of the application of distinct Lagrangian techniques to achieve a better understanding of the relation between extratropical cyclones and the occurrence of a heavy precipitation event on the Iberian Peninsula.

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). Margarida L. R. Liberato was also supported by a FCT grant (SFRH/BPD/45080/2008).

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