Geophysical Research Abstracts
Vol. 15, EGU2013-7766, 2013
EGU General Assembly 2013

Atmospheric conditions associated to an extreme rainfall event on Madeira Island (Portugal)

Flavio Couto (1), Rui Salgado (1,2), Maria João Costa (1,2)

(1) Évora Geophysics Centre, University of Évora, Évora, Portugal (couto.ft@gmail.com), (2) Physics Department, University of Évora, Évora, Portugal

Located in the Noth Atlantic Ocean (32º75'N and 17º00'W), the Madeira Island presents favourable conditions for orographic precipitation development, sometimes responsible for high records and floods, such as on 20 February 2010, when the island was affected by the worst flash floods in its recent history, causing more than 40 deaths and huge economic losses. After this disaster, there is a growing interest in understanding the main mechanisms and atmospheric conditions that are relevant to the establishment of extreme rainfall and consequently flash flood occurrences in the island. This study describes the meteorological aspects associated to a case study of high rainfall amounts in Madeira on 25 January 2011. In this case, flash floods and socio-economic damages were not reported, but precipitation above 300 mm in less than 24 hours were observed in Madeira's highlands. The heavy rainfall episode is studied based on rain gauge and satellite observations, as well as numerical simulation with the Mesoscale Non-Hydrostatic Model (MESO-NH). The MESO-NH simulation initialized and forced by ECMWF analysis have been performed with 3 horizontal domains (9, 3 and 1 km resolution), making use of the grid nesting technique. The evolution of the mean sea level pressure field (MSLP) was analyzed from the outer domain outputs, while the other meteorological variables were further explored using the 1 km resolution results. The simulation showed that the orography is crucial in the formation and intensification of the localized heavy rainfall in the island. A remarkable aspect is the fact that this episode occurred in a low-cape environment. Related to the synoptic environment, this event was characterized by a low pressure system centered to the southeastern of the island, in opposition to the results obtained for other extreme events occurred in the past two years, when the high precipitation amounts were due to the effects of the orography on the passage of cold fronts, frequently accompanied by atmospheric river structures.