Moisture tagging as a tool for the systematic analysis of moisture sources in torrential rainfall episodes

Damián Insua Costa (1), Gonzalo Miguez Macho (1), and María del Carmen Llasat Botija (2)

(1) Universidade de Santiago de Compostela, Spain (damian.insua@usc.es), (2) Universitat de Barcelona, Spain (carmell@am.ub.es)

The regional atmospheric Weather Research and Forecasting (WRF) Model with an implemented moisture tagging capability has been used to analyze the main moisture sources in two famous torrential rainfall episodes occurred during the autumn of 1982 (October and November) in the Western Mediterranean area, which is regularly affected by this type of adverse weather events. The procedure consists of selecting a priori potential moisture source regions for the considered extreme event, and to perform simulations with the tagging technique to quantify the relative contribution of each selected source to total precipitation.

For the selected events we study the influence of four possible potential sources: evaporated moisture in the Western or Central Mediterranean, moisture from the Atlantic Ocean and moisture advected from the interior of Africa (possibly tropical moisture). Results show that these four moisture sources explain almost all of the accumulated precipitation in the two episodes. In the October event, the main moisture sources were evaporation in the Western and Central Mediterranean, although the injection of moisture from Africa (especially at medium and high levels) also had a relevant contribution. However, in the November event, the contribution of Atlantic moisture was predominant, with evaporation in the Western Mediterranean playing a secondary role. This method could be systematically applied to many other events for a detailed characterization of moisture sources in each type of episode, which could be useful to assess the importance of main source regions when forecasting these extreme rainfall events.