



## **The analysis of flash floods in Catalonia in the framework of the European project FLASH**

**M.C. Llasat** (1), L. Garrote (2), A. Barrera (1), A. Atencia (1), M. Barnolas (1), M. Llasat-Botija (1), T. Rigo (3), M.A. Prat (1), V. Altava-Ortiz (1), L. Mediero (4), J. Cabot (5)

(1) Meteorological Hazards Analysis Team (GAMA), Department of Astronomy and Meteorology, University of Barcelona, Spain, (2) Department of Civil Engineering: Hydraulics and Energetics, Technical University of Madrid, Spain, (3) Meteorological Service of Catalonia, Generalitat de Catalunya, Spain, (4) Department of Hydrology, Centre for Hydrographic Studies of CEDEX, Spain, (5) CLABSA, Spain (carmell@am.ub.es / Fax: +34 934021133 / Phone: +34 934021124)

Flash floods are a very common feature in the North-east of Spain. Every year, mainly during the summer or at the beginning of autumn, this kind of floods affects the littoral mountains or the Pyrenees region. Usually the maximum cumulated rainfall is less than 100 mm, with instantaneous intensities above 180 mm/h. They are associated with convective events for which more than a 30% of the total rainfall has intensity above 35 mm/h. In some occasions, this percentage overpasses the 70% and/or, more than 200 mm can be recorded. Depending on the hydrological response, human settlements and other factors, these flash floods can produce catastrophic impacts. The research in historical climatology shows this is a natural behaviour in this region in despite of natural climatic variability, but flood impacts have evolved along the time. Cases such as 13-15 November 2005, 2 August 2005, 11-13 October 2005 and 12-14 September 2006 are clear examples of flash floods. The most catastrophic was this one of 11-15 October 2005, for which maximum rainfall achieved values up to 250 mm in 24 hours, and more than 450 mm in the entire event. Barcelona city was also into the affected area where high rainfall intensities were registered, as show the 150 mm recorded in only 6 hours. In spite of so great amount of rainfall recorded, just a few small floods occurred, thanks to the efficient drainage urban system of the city, although catastrophic floods were produced in the Northern part of the region, producing 4 deaths. The September 2006 event also affected Barcelona city, with more than

200 mm in the South of the region and floods in other Spanish regions.

Those cases will be studied in the framework of the European Union FP6 project titled FLASH. After a deep analysis of the social impact of each case, as well as the meteorological diagnostics, the DBSIM hydrological model will be applied to simulate the flash floods produced, mainly near Barcelona city. The Distributed Basin Simulator (DBSIM) was specifically conceived for real-time operation in flood forecasting with data from meteorological radar and raingauges. This model has been included in an interactive decision-support environment for flood management (RIBS) with an advanced graphical interface that allows the extraction of valuable information at the user's request. In this case, DBSIM will be improved to be also applied over rainfall data obtained from the meteorological model MM5. 48-72h simulations designed for four domains connected with two-way nesting and having 54, 18, 6 and 2 km horizontal grid resolution and with 23 levels of vertical resolution will be produced. The simulation will be initialised with the 1° NCEP FNL analyses and improved with NCEP ADP observational data when available. Future research contemplates a posterior improvement by the introduction of lightning and satellite data. This contribution shows the followed methodology and first results obtained for one of the study cases.