Heavy rain prediction using deterministic and probabilistic models. The flash flood cases of 11-15th October 2005 in Catalonia (NE Iberian Peninsula)

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Catalonia (North-East Iberian Peninsula) has been periodically affected by heavy rainfall events in the last years. That kind of situations, are mainly concentred in autumn, which is the rainiest season in the region. Cases such as 21-23 October 2000, 8-10 October 2002, 16-18 October 2003, 6 September 2004 are clear examples of those events. The last case was the 11-15th October 2005 event. Maximum rainfall achieved values up to 250 mm in 24 hours, and more than 450 mm was the total amount recorded during the event in some places. 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.

Nowadays, there are different available methods that can be used to forecast such situations. We have used two of them in order to evaluate their capability of prediction regarding to extreme events: the deterministic MM5 model and a probabilistic model based on the analogous method.

MM5 has been applied to produce 48-72h simulations designed for four domains connected with two-way nesting and having 54, 18, 6 and 3 km horizontal grid resolution and with 23 levels of vertical resolution. Full physics is used and a Betts-Miller scheme is applied to parameterise convection for the first domain, Kain-Fritsch scheme for the second domain and different convective parameterisation are performed over the third and fourth domains. The simulation has been initialized with the 1^{o} NCEP FNL analyses and improved with NCEP ADP observational data.

The developed probabilistic model is based on similarity criteria. This model involved the geopotential fields at 1000 hPa, 850 hPa and 500 hPa as primary predictor fields and Geopotential at 1000hPa and humidity at the same level as secondary predictor fields, in the analogous selection procedure. The method applies the similarity criteria into two domains: the first one considers 30^{o}-60^{o} N latitude and 30^{o}W-30^{o}E longitude and the second one 37.5^{o}-45^{o} latitude and 5 ^{o}W-10^{o}E longitude, being centred over Catalonia, in order to do dynamical downscaling.