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A hydro-meteorological modeling study of a flash-flood event over Catalonia (Spain)

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During the early morning on June 10th 2000, the Catalonia region was affected by a hazardous convective precipitation episode, which produced a huge increase on flow regimes for many internal catchments of the region. This modeling study is focussed upon the Llobregat basin, the most important internal catchment with an approximate extension of 5000 km^2. A first objective is the characterization and calibration -based on rain-gauge data- of the watershed hydrological response to this flash-flood event. Second, since this kind of episodes present short recurrence intervals in Mediterranean Spain, the forecast driven runoff simulations can become a valuable tool for the increase of lead-times associated with emergency management procedures in future episodes. Therefore, NCEP meteorological analyses have been used to initialize the MM5 mesoscale model and simulate the flash-flood episode with appropriate space and time scales to force the HEC-HMS runoff model. Finally, the sensitivity of the catchment's response to the spatial and temporal uncertainty in the rainfall patterns is analysed based on an ensemble of perturbed MM5 simulations. Perturbations are introduced through small shifts and changes of intensity of the upper-level precursor synoptic-scale trough. Main results indicate that: **(1)** The basin's hydrological characterization and calibration offers a very good performance in terms of the peak discharges, their timing and volume estimations; **(2)** The MM5-control driven runoff simulation shows a reasonable good reproduction of observed discharges, so the system seems to be a suitable tool for the hydro-meteorological forecasting chain of flash-floods in the Llobregat catchment; **(3)** The ensemble of perturbed runoff simulations does not exhibit any important degradation of the forecast skill and one of the members even outperforms the control experiment. It appears, then, that the catchment is

relatively insensitive to rainfall forecast errors of a few tenths of kilometres and no more than 1-2 hours. Finally, it should be noted that the HEC-HMS calibration has been aimed for a single particular event, so a wider recalibration and verification task should be first accomplished for other flash-flood events before generalizing the value of the hydro-meteorological forecasting system in the Llobregat basin.