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Predictive ability of severe rainfall events over Catalunya for year 2008

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In this study the full set of warnings issued by the Catalan Civil Protection Department for potentially-dangerous events due to rainfall intensity/accumulation has been analyzed for year 2008. The quantitative precipitation forecasts (QPF) from the Meteorological Service of Catalonia (SMC)-run limited-area model MM5 have been verified against hourly rainfall data provided by the rain gauge network covering Catalonia (with a density of about 1/200 km^2), dependent of SMC. MM5 uncertainty has been examined for five case studies by making use of satellite data and radiosounding profiles, and a QPF comparison has been undertaken between MM5 and COSMO-I7 limited-area models for the same case studies. The level of accuracy of the probabilistic forecast issued by SMC at regional scale has also been tested against rainfall observations, with the help of radar imagery for two given case studies. Verification results show that for long events (> 24h) MM5 tends to overestimate total rainfall, whereas for short events (< 24h) the model tends to underestimate precipitation. Case studies conclude that most of MM5's QPF errors are triggered by miscalculations of some of its cloud microphysical species, particularly the cloud liquid water and, to a lesser degree, the water vapour. The models' performance comparison demonstrates clearly that COSMO-I7 is able to predict rainfall more accurately than MM5, at least for the intense rainfall events over Catalonia analyzed in the case studies. The warnings based on probabilistic forecasts issued by SMC have proven fairly good when tested against observed rainfall at 6-hour intervals and at comarca-scale. For the two case studies analyzed, the 6-minute radar images help to further validate the SMC probabilistic warning forecasts at comarca-scale, since they have proven to be more efficient in identifying threshold-overcoming rain areas than the traditional verification method a posteriori by using rainfall measurements from the rain gauge network.