A Comparison of different types of catchment model for flash flood forecasting in steep catchments using either radar or rain-gauge precipitation inputs

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As part of the EU-funded research project, Carpe Diem, the performance of three different types of catchment model (lumped-systems, lumped-conceptual and distributed) are compared for a small (108 km^2), steep, catchment on the east coast of Ireland. The comparison focuses on discharge peaks, of particular interest for flash flood forecasting. The tests use various different types of spatial aggregation and combination of precipitation input information from radar and a network of raingauges. A split sample technique is applied, dividing the available data into equal-duration calibration and validation sets. Radar precipitation estimates were consistently lower than the rain-gauge estimates and some gauge-adjustment was necessary. Each type of catchment model had its advantages and disadvantages. The lumped-systems model (unit-hydrograph) was sensitive to the choice of loss function and ignores antecendent conditions. Nevertheless it performed better than expected. The lumped-conceptual model (SMARG) was best overall, but requires sufficient data for calibration. The distributed model (TOPKAPI) performed well, not quite as good as SMAR, but has the advantage of requiring a minimal amount of calibration. It performed as well with catchment-averaged precipitation as with the full spatially-distributed precipitation field from the radar.