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Flash flood forecasting with the Surfex/Topmodel coupled system

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Within the European Commission FP6 Integrated Project PREVIEW (**PREV**ention, **I**nformation and **E**arly **W**arning), a specific action (WP4340) is dedicated to the improvement of the Mediterranean flash-flood forecasting. Its general aim is to improve the very short-range forecast of Mediterranean flash-floods over medium basins, based on the next generation European high-resolution Numerical Weather Prediction (NWP) models. One cornerstone of the project is the development of hydro-meteorological coupled systems based on kilometric scale atmospheric models and hydrological models adapted to the fast hydrological response of Mediterranean catchments. In particular, a full 2-way coupling between the hydrological model TOPMODEL and the surface scheme (SURFEX) of the MESON-NH model has been developed. The hydrological model performs the lateral soil water distribution over the catchments and diagnosed saturated areas, from which the surface model relying on the ISBA scheme for natural land cover simulates the surface run-off. Then, surface runoff and deep drainage are routed on the hillslopes and in the river to the catchment's outlet. So total discharges are simulated. Moreover, more realistic soil moistures are expected for the meteorological simulations.

To test the ability of the SURFEX/TOPMODEL coupled system to reproduce severe flash-flooding, it has been applied to an heavy precipitation episode that occurred over Southeastern France, on 5 to 10 September 2005. Horizontal resolution of SURFEX and TOPMODEL models are 1 km and 50 m respectively. As a first step, the cou-

pled system has been driven by observed rainfall (radar data and spatially interpolated raingauge observations) for the three main watersheds affected by the heavy precipitation. The best simulation of discharges is obtained when the coupled system is driven by raingauge observations. Moreover, the soil water contents distribution is notably improved when comparing to the SURFEX scheme alone : the top of the catchments become drier whereas the soil is wetter near the hydrologic network. Sensitivity experiments varying parameters of the water routing to the outlet and the initial soil moisture have been also carried out .

Then, high-resolution rainfall forecasts have been used as input to the coupled model. Hourly precipitation forecasts from MESO-NH 2.5 km simulations with different initial conditions have been supplied as input to SURFEX/TOPMODEL. Better scores are obtained when the 2-way system uses as input the MESO-NH simulation starting from a mesoscale data assimilation instead of a large scale analysis. As a matter of fact, even though errors in location and in intensity in the forecast rainfall fields exist, it seems that there are some relevant information in the hydrological responses considering not too small catchments and a regional approach.