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Improvement of the performance of the distributed hydrological suite SAFRAN-ISBA-MODCOU using an exponential profile of hydraulic conductivity

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The SIM suite is composed of the SAFRAN meteorological analysis, the soil vegetation atmosphere transfer model ISBA and the distributed hydrological model MODCOU. This model (which simulate the river discharge at 900 points, corresponding to basins from 1000 km^2 to 90 000 km^2) is being used over France for both research and operational applications.

Soil hydrological transfers have been modified introducing an exponential profile of hydraulic conductivity at saturation in the three layered version of ISBA. This parameterisation takes into account the variations with depth in the soil characteristics. This parameteristion has been previously implemented and tested at two different resolutions (1žx1ž and 8x8 km2) by Decharme et al (2006). Two new parameters are introduced, representing the sub-grid hydrological transfers: near the surface the hydraulic conductivity is increased, and decreases in the deeper layer. These two new parameters require calibration. Sensibility tests have been done with different values of these parameters. The impact over water and energy fluxes, and over the river discharges have been evaluated. Tests show that a calibration at the basin scale is enough to improve the quality of simulated river discharge. The improvement of simulated river discharge is mainly due to a better reactivity of the runoff and a better low flow due to a slower drainage.

As current plans are to use this model for climate change impact in the Mediterranean area of France, sensibility tests have also been carried out on typical parameters of the region. The depth of the root soil layer of Mediterranean vegetation types have shown that higher values of this depth were also important to better reproduce the observed discharges. Other questions, as how the presence of karsts modifies water and energy

fluxes and, therefore, how they affect the calibration of the parameters of the model, have also been studied.