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# Calibration of the distributed hydrological model MOBIDIC with multi-platform remote sensing data: an application in the Arno basin, Italy

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Remote sensing data can be used to extract distributed information about hydrological surface states and parameters needed in calibration and validation of water balance and flood forecasting models. In the present research, SAR and optical images of the Arno river basin in Central Italy were used to implement a calibration methodology for the estimation of the conceptual parameters of a distributed hydrological model, MOBIDIC. Six radar images from ERS-SAR 2 sensors (three for summer 2002 and other three for spring-summer 2003) have been used and a relationship between soil saturation indexes and backscatter coefficient from SAR images has been investigated. Analysis has been restricted to pixels with scarce or null vegetation cover, in order to legitimize the assumption that water content of the soil is the main variable that influences the backscatter coefficient. Vegtated pixels have been masked out considering NDVI indexes and land cover maps produced by optical sensors (Landsat-ETM, MODIS). In order to calibrate the soil moisture model based on information provided by SAR images several optimization runs have been performed with the Nelder-Mead non linear symplex to minimize a cost function. Such function is chosen either on the basis of measured discharge data or SAR images. In the first case, the cost function is the misfit between measured and modeled discharge flows at six selected hydrometers; in the second, the objective is the least-square regression between SAR backscatter and gravitational soil saturation obtained from the model, as a proxy to surface soil moisture.

Although the analysis has been limited to a restricted number of non-vegetated pixels, the results show that the information on soil moisture spatial distribution contained in

SAR backscatter images improves the calibration of the parameters that regulate soil dynamics, compared to the use of river discharge data only, and allows a better estimation of both quantities. In fact, the optimization run performed with SAR resulted not only in an improved regression between radar backscatter and soil saturation, but also in better estimates of the discharge data.