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# Hydrologic Predictions in an Experimental Mediterranean water-limited Basin, the Mulargia river Basin

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Extensive field campaigns are fundamental for the understanding of the physical processes of the soil, vegetation and atmosphere interactions, and for testing hydrologic models. An experimental, highly instrumented basin, the Mulargia river basin (area of about 65 $km^2$) located in center-east Sardegna (Italy), was settled in April 2003. The outlet section of the basin is slightly upstream of the Mulargia Lake, which is part of the reservoir system of the Ente Autonomo del Flumendosa, which in turn constitutes the water supply for much of southern Sardinia, including the island's biggest city, Cagliari. Hence, the basin has a key role in the water resources management of Sardegna.

The soils in the basin are generally of modest thickness, the vegetation throughout the basin has been in part altered by human activities, with many areas (before covered by scrubs) converted to pasture. Urbanized areas are a minor component.

Two eddy-correlation towers were settled in different vegetation cover areas of the basin (one is a grass field and one is a typical Mediterranean environment with shrubs). The towers monitored continuously land-surface fluxes (latent and sensible heat fluxes), meteorological data (precipitation, air temperature and humidity, etc.) in-

cluding 4-component radiations (incoming and outcoming longwave and short waves) and surface temperatures with infrared transducers, soil heat flux, and soil moisture. At the outlet section discharge data are acquired hourly, and two other raingages are present in the basin. The observation period is April 2003-December 2004.

Periodically (weekly and monthly) field observations of soil moisture and leaf area index (LAI) were collected extensively in the basin. In particular, surface soil moisture measurements were performed using TDR technique and gravimetric method in 8 fields of 1 ha each., and *LAI* measurements were collected using the Li-Cor LAI 2000 in several points of the basin.

Finally, three remote sensing images were acquired: one is an ASTER image (spatial resolution of 30 m) of June 2003, and two are Quickbird images (spatial resolution of 2.8 m) of August 2003 and May 2004. Using the *LAI* field observations, *LAI* basin maps were made for being used in the distributed hydrologic model.

A continuous distributed hydrologic model, which includes a detailed land surface model (LSM) and the Muskingum-Cunge method for runoff propagation, are applied at both local scale (at the two tower sites) and basin scale for hydrologic predictions (runoff, evapotranspiration, soil moisture, surface temperature). Interestingly, a significant flood occurred during the observation period, allowing the test of the model for also extreme events. Comparison with observed data demonstrates that the model is able to well predict hydrologic processes.