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Using geoelectric tomography to analyse the local differences of water table dynamics in a small Mediterranean mountain catchment

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One of the main difficulties for validating distributed and semi-distributed hydrological models with local observations is the role of unsupported local controls of distributed variables. The semi-distributed hydrological model TOPBAL, a TOPMODEL version adapted for Mediterranean environments, was implemented in the Can Vila research catchment (0.56 km2, Vallcebre Research Catchments NE Spain, 42º 12'N, 1º 49'E). This model assumes spatially homogeneous properties of soils above impervious bedrock, whereas topography is the driver of local differences of the depth to the water table. In order to validate the water table simulations, a network of piezometers was installed in the loamy soils at diverse locations and equipped with continuous recording sensors.

During a poorly influenced two-month recession period, the comparison between simulated and observed local depths to the water table showed good linear relationships, but with diverse ratios, that were preliminarily associated to differences in the local quotients between differences in water reserve and head (storage coefficients).

Geoelectric tomography profiles performed at the piezometers showed nuanced differences in electric resistivity and evidenced that piezometers showing slower decreases of the water table level were located in sites with lower electric resistivity. As fine textured soils have usually lower storage coefficients, the differences of behaviour among piezometers should therefore be attributed to differences in aquifer permeability rather than to storage properties. Field and laboratory tests are ongoing for gathering hydraulic properties of soils in order to validate these findings and to support the use of geoelectric tomography for mapping these properties in the basin.