

Hydro-geophysical observations integration in numerical model: case study in Mediterranean karstic unsaturated zone (Larzac, France)

Cédric Champollion, Benjamin Fores, Nicolas Le Moigne, and Jean Chéry

UM2 / CNRS, Géosciences Montpellier, France, Montpellier, France (cedric.champollion@univ-montp2.fr)

Karstic hydro-systems are highly non-linear and heterogeneous but one of the main water resource in the Mediterranean area. Neither local measurements in boreholes or analysis at the spring can take into account the variability of the water storage. Since a few years, ground-based geophysical measurements (such as gravity, electrical resistivity or seismological data) allows following water storage in heterogeneous hydrosystems at an intermediate scale between boreholes and basin. Behind classical rigorous monitoring, the integration of geophysical data in hydrological numerical models is needed for both processes interpretation and quantification.

Since a few years, a karstic geophysical observatory (GEK: Géodésie de l'Environnement Karstique, OSU OREME, SNO H+) has been setup in the Mediterranean area in the south of France. The observatory is surrounding more than 250m karstified dolomite, with an unsaturated zone of ~150m thickness. At the observatory water level in boreholes, evapotranspiration and rainfall are classical hydro-meteorological observations completed by continuous gravity, resistivity and seismological measurements.

The main objective of the study is the modelling of the whole observation dataset by explicit unsaturated numerical model in one dimension. Hydrus software is used for the explicit modelling of the water storage and transfer and links the different observations (geophysics, water level, evapotranspiration) with the water saturation. Unknown hydrological parameters (permeability, porosity) are retrieved from stochastic inversions. The scale of investigation of the different observations are discussed thank to the modelling results. A sensibility study of the measurements against the model is done and key hydro-geological processes of the site are presented.