EGU21-11535
https://doi.org/10.5194/egusphere-egu21-11535
EGU General Assembly 2021

Hydrogeophysical coupled inversion in coastal aquifers: the Argentona case

Andrea Palacios[1,2,3], Tybaud Goyetche[1,2,3], Niklas Linde[4], and Jesús Carrera[1,3]
[1]Institute of Environmental Assessment and Water Research (IDAEA), Consejo Superior de Investigaciones Científicas (CSIC), Barcelona, 08034, Spain
[2]Department of Geotechnical Engineering and Geosciences, Technical University of Catalonia (UPC-BarcelonaTech), Barcelona, 08034, Spain
[3]Associated Unit: Hydrogeology Group (UPC-CSIC), Barcelona, Spain
[4]Institute of Earth Sciences, University of Lausanne, Lausanne, 1015, Switzerland

Most, if not all, models of real aquifers go through a calibration process to adjust their hydraulic and solute transport parameters in order to bring the simulations outputs closer to the field observations. In coastal aquifers, the datasets are commonly composed of head time series, solute concentrations from water samples, and water and formation electrical conductivity, these last being of particular importance in coastal settings due to their relevance for seawater detection. Argentona is a well-instrumented field site of a coastal alluvial aquifer located 40 km NE of Barcelona, where a 2-year Cross-Hole Electrical Resistivity Tomography (CHERT) experiment was performed. CHERT provided high resolution electrical resistivity data in depth and allowed the visualization of dynamic aquifer processes. In the present work, we test the calibration of the Argentona SWI model using both the hydrological and the geophysical datasets. To do so, a density-dependent groundwater model was combined with CHERT forward modeling within a parameter calibration framework. In the process we pay attention to the CHERT capacity to recover aquifer salinities, to the coupling of the hydrological and geophysical simulations through petrophysics, to the use of the field specific relations and to the inverse problem parametrization, among other things. Pre-calibration analysis showed the sensitivity of the formation electrical resistivities to the porosities and to the petrophysical parameters, so the inverse problem solves for hydraulic transmissivities, porosities and petrophysical parameters. From the comparison of the preliminary results from the hydrological and the hydrogeophysical calibration, we observe that they point towards a better calibration of model porosities when the electrical resistivity is included in the inverse problem. The results will be compared to other parameter estimation methods, such as laboratory tests, the tidal method and heat tests, also performed at the Argentona site. We will conclude on the added value of the geophysical dataset in the calibration process, the possible improvements and drawbacks of the method.