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Do groundwater data from piezometers correlate with FO-DTS and CHERT in costal aquifers?

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Understanding the behaviour of the freshwater-seawater interface and its mixing dynamics is a key issue to characterize submarine groundwater discharge (SGD) and define sustainable management of groundwater resources in coastal aquifers. A new experimental site has been constructed north of Barcelona city (Spain) to test and compare different methods for monitoring and characterizing seawater intrusion and SGD. The site comprises 16 piezometers located between 30 and 90 m from the coastline. 12 of the 16 piezometers are organized in four nests of three partially penetrating piezometers (2 m screened) at different depths ranging between 15 and 25m. The deepest piezometers of each nest and the independent piezometers are equipped with 36 electrodes in order to perform cross-hole electrical resistivity tomography (CHERT). In addition to that, all piezometers are equipped with Fiber Optic cable to perform Distributed Temperature Sensing (FO-DTS) with two fiber optic cable lines of around 600 m length each. FO-DTS allows measuring temperature at 1 m resolution which can be used to identify the thermal effects of the sea and the inland aquifer.

Here we compare water electrical conductivity and water temperatures obtained from vertical profiles in each piezometer with temperature data obtained from FO-DTS and bulk electrical conductivity from CHERT for different field surveys. Results indicate that while the temperature obtained from profiles in piezometers correlate partially with the one obtained from the FO-DTS, bulk electrical conductivity from CHERT is a good indirect measurement of groundwater electrical conductivity (i.e. salinity) along time.

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