



PREVIEW

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Innovative downhole geophysical methods, petrophysical characterization and high frequency downhole monitoring of seawater intrusion dynamics in a coastal aquifer. The Me Distraes project, Argenton, Spain.

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The detailed hydrogeophysical characterization of coastal aquifers provides a base to study both submarine groundwater discharge and salt water intrusion processes. With the objective to investigate the response of a coastal aquifer to a series of boundary conditions, **a new experimental site was developed** through a clastic aquifer located 30 km north of Barcelona (Spain). This hectometer scale site is located 50 m from the seashore and equipped with 17 nearby shallow holes, with depths ranging from 15 to 28 m.

A series of **innovative downhole geophysical measurements and experiments** have been deployed over the past few years, either in a time-lapse or stationary manner. These measurements are performed through PVC due to the unconsolidated nature of the sediment. Also, the granitic mineralogy prevents clays identification from a direct use of gamma ray profiles. In time lapse, high frequency electrical resistivity induction measurements show that preferential flow paths are identified in a fast and reliable manner. Also, changes in depth of the fresh to salt water interface (FSWI) are precisely described, either in response to **marine tides**, or to short lived but often intense **Mediterranean rain event**. Changes on the order of 1.70 m are obtain in a few hours of heavy rain. Overnight as well as seasonal changes such as months of dryness are also illustrated due to the local variability of pore fluid salinity and temperature, even over short periods of time such as tens of minutes.

For a more continuous description of downhole processes over time and depth, **downhole geophysical observatories** were emplaced in early 2017. Intense rain events such as that of **October 19, 2017 or January 21, 2020** reveal the high frequency interplay between sea water intrusion and fresh water outpour into the sea.