

Effects of a heavy rain event on the hydrodynamical and hydrogeochemical parameters in an alluvial coastal aquifer

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ABSTRACT

The fresh-salt water interface, even when in the long-term equilibrium, is affected by the time variability of recharge. The north-west coast of the Mediterranean Sea is characterized by heavy rain events at the Fall and early Spring. Within the aquifer, such events displace the mixing zone, driving back the seawater wedge over a short period of time. The main objective of this experiment was to study the high frequency spatial and temporal response of the mixing zone and its impact on geochemical processes during one such fast fresh water inflow event.

We carried the study at the Argentona experimental site (NE Spain), where heads, electrical conductivity and temperature are monitored in 16 boreholes over a 100 m scale. Water samples were taken over 5 days after the event to monitor changes in aquifers water composition. Furthermore, geophysical methods were applied with time-lapse cross-hole electrical resistivity tomography (CHERT), and downhole profiles including natural spectral gamma and formation electrical conductivity from induction.

Results of this week-long campaign show that (1) different head responses, which helps in confirming the hydrostratigraphic model; (2) changes in salinity, which suggest that dilution occurred rapidly after the event, but which are followed by a recovery towards higher salinity values, which suggest transient response; and (3) geochemical changes, which suggest that dissolutions and cation exchange reactions occurred immediately after the event.

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