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title: **Hydrogeochemical monitoring in a coastal aquifer subject to an intense seawater abstraction. The case of the River Andarax delta (Almería, SE Spain)**

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INTRODUCTION

The delta of the River Andarax is situated on the coastal strip of the Detritic Aquifer of the Lower Andarax (Almería, SE Spain). The delta aquifer deposits consist of 100 m thickness of alternating sands, gravels and lutites. The desalination plant installed in this delta aquifer abstracts a large volume of seawater from coastal boreholes. A monitoring network was designed close to the water collection area, consisting of three piezometer clusters (PI, PII and PIII), 500 m apart, each including four simple piezometers: one that is slotted over its entire permeable length, and the remaining three with a 1–2 m slotted section at particular depths in the zones of fresh water, salt water and mixing. The piezometers in each cluster are positioned at different depth, depending on the position of the fresh and salt water bands in each monitoring group (Jorreto el al., 2009).

The fully-slotted piezometers were sampled in order to characterize the hydrochemistry of the area. Samples were taken at different depths corresponding to the fresh water band (12–15 m depth), band of transition (25–30 m deep) and saline band (38–55 m deep). The remaining piezometers were sampled over their slotted length. Overall, 22 samples were taken.

RESULTS AND DISCUSSION

The waters sampled from the piezometer network exhibit varying salinity (6.8 to 51.8 mS/cm) and a chloride facies, typical of a coastal aquifer with marine intrusion. Such wide variability in the different piezometers allows the hydrogeochemical zoning of the aquifer (fresh water, mixing zone seawater) to be determined. However, this zoning was not recorded in the fully slotted piezometer (PII1), sampled at five different depths. This piezometer gave relatively low ion contents compared to the others, except for nitrate, which was higher. Samples from this piezometer also showed a narrower dispersion than the other piezometers studied (Table 1). The homogeneity of the water from the five sampling depths in piezometer PII1 implies a salinity similar to that taken from the shallower, individual piezometer where the water was less saline (9.7 mS/cm). This homogeneity is interpreted as being a consequence of the abstraction of seawater in the boreholes closest to PII1, which must be affecting the situation of the interface in this piezometer. As seawater is abstracted, the interface descends – this phenomenon is detected from the temperature and electrical conductivity of water in the fully slotted piezometers. (Jorreto et al., 2006; Jorreto et al., 2009). As a result, the salinity of the water column in the borehole becomes close to that found in the upper aquifer levels.

Table 1. Means and standard deviations of ion content (mg/L) and electrical conductivity (mS/cm) in the fully slotted piezometers.

		EC	Ca	Mg	Na	K	Cl	HCO_3	SO_4	NO_3	Br	Sr
PI1	Standard Deviation	22.3	58	539	6285	188	9759	160	802	20	27	2
	Mean	37.1	511	956	9437	255	14669	365	2591	23	41	8
PII1	Standard Deviation	4.2	21	83	853	21	1564	3	97	12	4	0
	Mean	13.1	430	352	2399	49	4130	344	1602	83	11	5
PIII1	Standard Deviation	20.8	235	568	5794	146	10389	36	867	53	29	4
	Mean	32.2	786	946	7956	174	14438	337	2690	41	40	11

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REFERENCES

Jorreto S., Pulido-Bosch A., Gisbert J., Sánchez-Martos F., 2006: *Análisis de la evolución de la interfase en el delta del río Andarax mediante testificación geofísica*. in: J. Durán (Ed.), Las aguas subterráneas en los países mediterráneos, IGME, Serie Hidrogeología y Aguas Subterráneas, 17. Pp: 321–328.

Jorreto S., Pulido-Bosch A., Gisbert J., Sánchez-Martos F., Frances I., 2009: *The fresh water-seawater contact in coastal aquifers supporting intensive pumped seawater extractions: A case study*. C. R. Geoscience (2009), doi:10.1016/j.crte.2009.08.001.

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