

Water table variations in the hyperarid Atacama Desert: Role of the increasing groundwater extraction in the pampa del tamarugal (Northern Chile)

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In the hyperarid Atacama Desert (Northern Chile), the economic and social development is supported using fossil groundwater. The groundwater extraction (GWE) has significantly increased over the last 30 years, reaching $4.2 \text{ m}^3 \cdot \text{s}^{-1}$ in 2018 (+1890%) at the Pampa del Tamarugal Aquifer (PTA). But opposite assumptions lead to uncertainties concerning the role of the increasing anthropogenic pressures and the ephemeral recharge events in the water table (WT) variations. This paper analyzes: (i) the long-term groundwater levels changes between the late 1950s (post Saltpeter Work) and the early 2010s, and (ii) the short-term response of groundwater levels, based on the analysis of the 1998–2018 WT time series at 10 observation boreholes. Results indicate that the WT variations in space and time are strongly related to the anthropogenic pressure changes. Since the late 1950s, the WT is declining in the major part of the PTA. Nevertheless, local reduction of GWE together with ephemeral recharge events in alluvial fans allowed local WT rises. But after a large GWE increase (+114%) between 2004 and 2006, all observation boreholes highlight a general WT decline ($-9.8 \pm 5.8 \text{ cm} \cdot \text{yr}^{-1}$). Over the years, anthropogenic pressures became the dominant factor of the WT variations and led to overuse the aquifer.