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# Tectonic constraints and hydrological functioning in several playa-lakes from southern Spain

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We have selected three main wetland systems located in southern Spain to describe the tectonic factors that have given rise to the formation of closed depressions originating playa – lakes in a semi arid climate context. The three wetlands are located in the provinces of Córdoba, Seville and Cádiz (Andalusia). The low-permeability of the materials - often Triassic clays and marls – forming the closed depressions generates a local groundwater flow system that coincides with the surface watershed. The main surface water inputs comes from the watershed (runoff) and the main groundwater inputs comes from a local aquifer placed at the bottom of the closed depression. Water outputs are mainly due to the evaporation from the playa-lake and ET from the vegetation. This hypothesis is coherent with the geological origin and is supported by hydrological observation, numerical modelling and and surface-groundwater daily monitoring of time series in some of the studied playas.
The southernmost playa lake studied is Medina playa-lake, hosted in the northern edge of a 1748 ha closed basin (Cádiz). The main structure that has generated the northern edge is an antiform with a core of Triassic and Miocene sediments and an upper part formed by alluvial conglomerates. This antiform acts as a barrier to the natural runoff, flowing to the north, remaining the cause for the genesis of the endorheic basin that leads to the establishment of the playa-lake.
The Conde playa-lake (Córdoba province) is also placed in the northern edge of its 1109 ha closed basin. In this case, clay, gypsum-rich matrix tectonic mélange with a NE-SW orientation has been described in this sector. This melange define a non-continuous NE-SW uplift ridge, which acts as a natural barrier to the northwardly directed runoff originating the Conde playa-lake formation
Finally, in Seville province, there is a large (251 km2) continental inner depression, formerly a Quaternary inland delta, that has lead to the formation of a lacustrine area above a regional Triassic substratum of marls and clays. Nowadays, the majority of the area is drained out for agricultural purposes. The morphology of the relief and the distribution of the fluvial network seem to indicate the existence of a hill with a pseudo-diapiric structure. Accordingly, the lacustrine area (Lantejuela wetlands) could be the filling of the peripheral basin formed in the southern part of the hill. The existence of recent diapiric processes would explain the modification of the fluvial network pattern and the formation of the lacustrine basin. A record of hydrological variables in one of the playas of Lantejuela wetlands, Calderon playa-lake, has confirmed us the previous hypothesis, which is that the surface watershed is the hydrological local flow system from which all the water inputs come from. The presence of a local aquifer placed at the bottom of the closed depression in Calderon basin, hydrologically disconnected from the regional detrital aquifer, has also been described by means of time series of water level and water temperature in selected wells dug into the regional aquifer, the playa-lake and a near-shore piezometer dug into the local aquifer. Several water balances at a monthly and daily scale in these playas also reinforces the hypothesis of disconnected local groundwater flow system as the main hydrological unit that explains its hydrological behaviour and that is in accordance with the tectonic origin of this ecosystems, often misinterpreted as karstic lakes.