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Hydrological status of the main ponds of Doñana National Park from 1994 to 2015 using telemetry and piezometry

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The present study aims to determine the causes of the reduction in the flooded surface in some of the most representative ponds of Doñana National Park (southern Spain) from 1994 to 2015 (i.e. 20 years), by means of the comparison of both the average flooded surface and the average depth to the water table in nearby piezometers during the first and the second decades of the studied period. In addition, the average precipitation during the mentioned period was used as a proxy of the water inputs onto the ponds. The average flooded surface was estimated by the analysis of LANDSTAD images and the depth to the water table was measured monthly in twelve nearby piezometres from 1994 to 2015. We found out that precipitation was 10% lower during the second decade of the studied period (675 mm/y vs. 552 mm/y). Consequently, all the ponds experienced some reduction in the flooded surface. Nonetheless, 5/8 of the ponds showed a significant reduction (ranging from 35 to 97%). In addition, a significant decay of the water table was detected in 3/5 of such ponds (Charco del Toro Zahillo and Taraje) although the difference in the depth between the two periods was low (ranging between 3.1 and 6.7%). In the rest of the ponds, two situations were detected: Larger ponds (Santa Olalla, Dulce, Sopeton) did not show a significant reduction in the flooded area during the studied period, whereas smaller ponds (Pajas, Hermanillos) experienced a general shrink of its surface. In both cases, the cause of such could not be explained by any hydrogeological alteration of its functioning but, most probably, to another cause, such as an increment in evapotranspiration (rate of +1C°/13 years in air temperature) increment of the vegetation cover (rate of +0.54% per year) or other anthropic causes (e.g. water abstractions to feed cattle).