OC01 - Hydrological modelling of three sand-dune ponds located on Doñana National Park (Andalusia, Spain)

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The Doñana aquifer spreads over some 2,600 km² in the provinces of Huelva and Seville. This territory depends on groundwater resources for the water supply of nearby towns and, to a greater extent, also for crop irrigation. The so-called Natural Space of Doñana is located over this aquifer, and it includes a protected area (National Park and Natural Park) of almost 1,080 km². Many of the ecosystems in Doñana depend on the groundwater, which is found at a very shallow depth over wide areas.

There are several sand-dune ponds of seasonal and permanent hydrological regime located on the Biological Reserve of the Doñana National Park, just 2 km from the coast. Most of them are strongly linked to groundwater.

A hydrological modeling has been carried out on three of these sand-dune ponds (Santa Olalla, Zahillo and Sopeton) during the dry season (from May 18th to August 18th 2016, when Sopeton pond dried out). The modeling, based on the estimation of the evaporation and/or evapotranspiration from the pond's surface and the evolution of the water level in each of the systems, showed the rate of groundwater discharge/recharge in each of them. During the studied period, the rate of specific groundwater discharge to Santa Olalla pond was found to be 2,4 mm/day, whereas in Sopeton was 1 mm/day. Zahillo pond exhibited a different hydrological functioning. The results of the modeling in this pond showed a net groundwater recharge instead of discharge, meaning that the aquifer was not providing groundwater to the pond. The pond recharged the sand aquifer at a rate of -0,9 mm/day.

Finally, evolution of the piezometric levels in the sand aquifer at different depths, monitored at an hourly interval during year 2016, suggest a possible influence of groundwater pumping in the area, being Zahillo pond, the closest to the area where the groundwater extraction is being made and also the shallowest of the three studied ponds.