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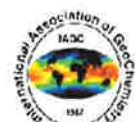
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BOOK OF ABSTRACTS

Eds.: N. OTERO, A. SOLER AND C. AUDÍ



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CHARACTERIZATION OF EVAPORATION IN "LAS TABLAS DE DAIMIEL" NATIONAL PARK USING STABLE ISOTOPES OF WATER

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1. Introduction

"Las Tablas de Daimiel" National Park (TDNP), located in the centre of the Iberian Peninsula, constitutes a wetland of extreme importance in the migration of waterfowls. The sedimentation of charales is a good index of both global and local environmental changes in this wetland. At the present, the intensive aquifer depletion has caused the TDNP to be a recharge (influent) area instead of a discharge (effluent) one.

2. Methodology

The water balance of the TDNP is partially solved only for a period of intense surface water inflow. One of the most uncertain variables is the evaporation, whose estimation can be realized by the stable isotopes of the water. Comparison of the current isotopic composition of the evaporated waters with the isotopes in the sedimentary record will contribute to knowing the evolution of the evaporation in the last centuries.

The 2005-2009 period was very dry in the centre of the Iberian Peninsula, therefore the water inputs to the TDNP were scarce. Nevertheless, in the north of the TDNP, a wastewater treatment plant releases purified water to a ditch that finishes in the wetland.

In order to characterize the evaporative process in the TDNP, in the spring of 2008 water samples were collected from the ditch, large holes and riverbeds where the water table appears. In addition, the treated sewage was sampled.

3. Results

Treated sewage (sample 1 in Fig.1) has an isotopic composition close to the precipitation in this area (Díaz-Teijeiro et al., 2009, Fig. 1), whereas the rest of the samples fit to an evaporation line with slope 4.5 (about 50% of relative humidity). In the ditch the samples are progressively enriched in isotopes as the distance increases from the sewage spill, in accordance with a process of evaporation tied to the time of permanence of the water in the ditch.

In a specific zone, the tendency of the isotopic enrichment shows to the input of less evaporated groundwater (samples 8 to 12 in Fig. 1). This enrichment is clearer in samples of the water table (17 to 19) and up-stream from the sewage spill (2 in Fig. 1) because of the scarce renewal of the water.

Using the isotopic composition of precipitation as input, the estimated evaporation is 25% in the ditch, and up to 45% in the water table samples.

These results can be used as a reference of present and past evaporation (traced in the isotopic composition of charales), and will help to improve the water balance and the knowing of climate changes in the centre of Iberian Peninsula.

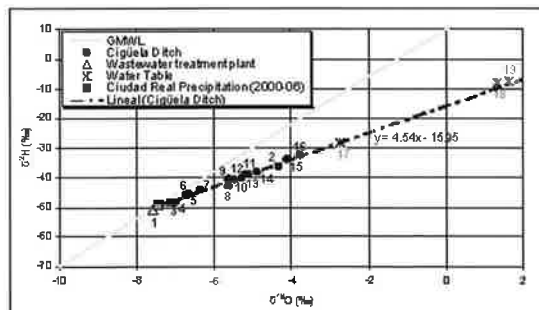


Fig. 1. $\delta^{18}\text{O}$ against $\delta^2\text{H}$ for the water samples collected in the north of the TDNP in spring of 2008

4. Acknowledgements

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5. References

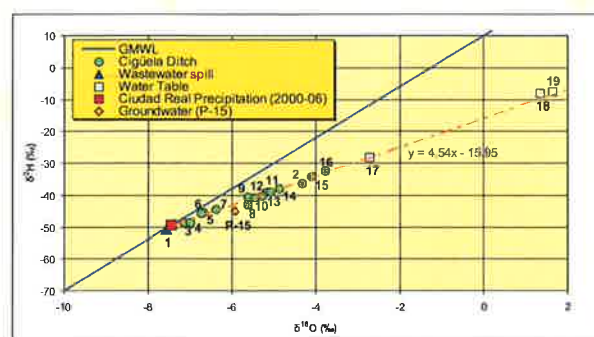
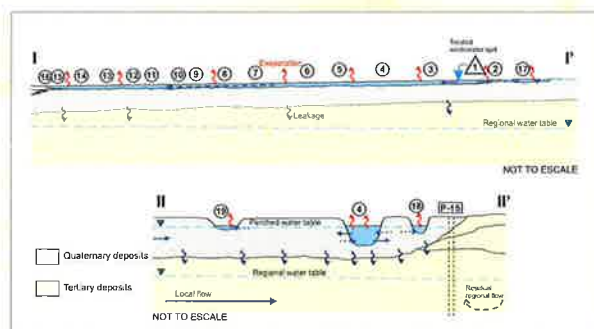
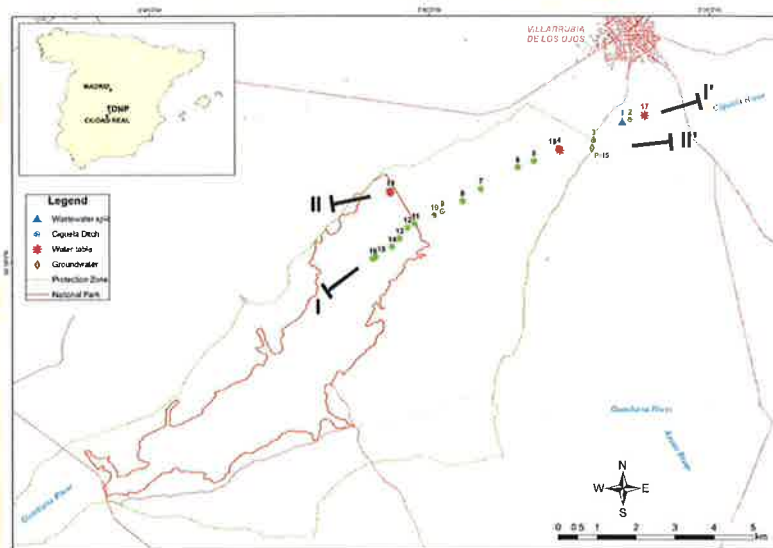
- Díaz-Teijeiro, M.F., Rodríguez-Arévalo, J., Castaño, S., 2009: La Red Española de Vigilancia de Isótopos en la Precipitación (REVIP): distribución isotópica espacial y aportación al conocimiento del ciclo hidrológico. *Ingeniería Civil*, 155, 87-97.

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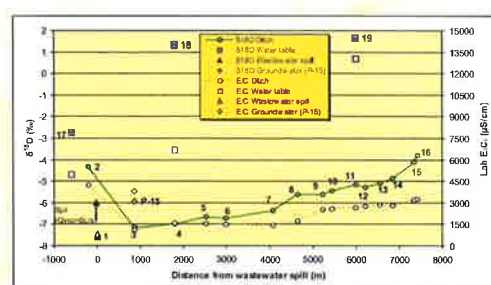
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"Las Tablas de Daimiel" National Park (TDNP), located in the centre of the Iberian Peninsula, constitutes a man-modified wetland of extreme importance in the migration of waterfowls. Dry periods are frequent, as the sedimentary record shows. Consequently, evaporation plays an important role in the water balance.

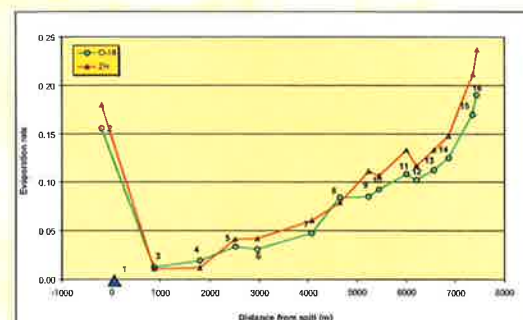
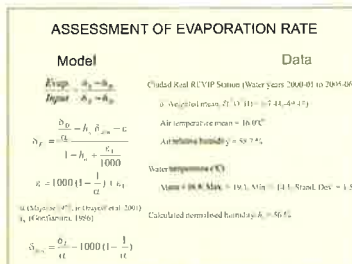
The 2005-2009 period was very dry in the area and the water inputs were scarce. For a long time, treated wastewater spilled to a ditch was the only input in the northern area of the Park. This water was sampled in the spring of 2008 along the ditch, in order to characterize the evaporative process by means of stable water isotopes.



Treated sewage has an isotopic composition close to the precipitation in Ciudad Real REVIP station (Díaz-Teijeiro et al., 2009), whereas the rest of the samples fit to an evaporation line with slope 4.54. In the ditch, the samples are progressively enriched in stable isotopes and total dissolved solids as the distance increases from the sewage spill, representing different evaporative stages in the same water body tied to the time of residence of the water.



Evaporation rate was assessed using an isotope mass balance approach based on the Craig and Gordon Model (Gonfiantini, 1986). Isotope enrichment of the residual water fraction in the water body due to evaporation is near 25% in the most distant sample from main water source. Further application of this method to longer data sets, representative of different atmospheric and climate conditions, could help to assess the water balance in the current wetland hydrology and paleoclimate studies.



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