RESILIENCE OF GREAT SEDIMENTARY BASIN AQUIFERS: WATER SECURITY AND SPAs

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1. Introduction

• The resilience of the aquifers is unknown in many cases and it is a key capacity to get a sustainable management.
• In this poster an analysis of the resilience capacity of a great detrital sedimentary basin aquifer is made through the case study of the Las Salinas spring (an old discharge area today dissappeared due to the intensive groundwater exploitation).
• The concepts of resilience and water security has an intensive relationship. The resilience of an aquifer is defined as the capacity to deal with perturbations without modifying its structure and functioning. The concept of water security is defined as the reliable provision of quantitatively and qualitatively acceptable water for health, the production of goods and services, and the livelihoods, along with an acceptable level of water-related risks (Gray and Sadodoff 2007).

2. Methodology

• Long term trends analysis of quantity and quality data.
• Explorating the aquifer’s resilience components.
• The analysis of the resilience of an aquifer implies an in-depth knowledge of the aquifer system, in its physical aspects (geometry, storage volume, etc), but also, fundamentally, in its dynamics aspects, either for qualitative and quantitative processes.
• Case study: Las Salinas spring (Fig. 1), an old discharge area located in Medina del Campo groundwater body, an intensively exploited aquifer since the 1970’s (Figure 3, Table 1).

3. Historical evolution

Las Salinas spring. There are references dating from the XVII century reporting the influx of people to this place in search of mud baths.

The Palacio de las Salinas spa was born in 1891.

Current shallow well to supply Palacio de Las Salinas spa.

4. Results and discussion

• Large sedimentary basins often host large detrital aquifers whose resilience to various impacts is, a priori, large.
• However, accumulation of shocks at the local level leads to changes at regional level.
• Basis of the resilience analysis: from what to what? From groundwater abstractions (identified as the main impact) to the aquifer.
• This analysis takes into account an integration of previous literature data and reports, and new data obtained by the authors under the NAIAD H-2020 Project.
• Key data: chemical analysis pictures which lead to define the chemical evolution conceptual model shown in Figs 4 and 5.
• The GWB of Medina del Campo may present symptoms of water insecurity, which is a contradiction to its dimensions as an aquifer, and a manifestation of the deterioration of its resilience.

5. References


6. Acknowledgements

This research has been funded by the Project “Bases hidrogeológicas y geoquímicas de España”. Co-funded by the European Union (funding from “ERDF” and “FEDER” funds). The present study is a part of the research project “RESILIENCE OF GREAT SEDIMENTARY BASIN AQUIFERS: WATER SECURITY AND SPAs” funded by the European Union (funding from “ERDF” and “FEDER” funds). This paper is an excerpt of the information contained in the project.

Fig. 1. Location of the Las Salinas spring in the Medina del Campo (Spain) based on aerial view of Fig. 2.

Table 1. Geochemical and mineralogical properties of the groundwater samples from Medina del Campo (Spain) (Pinheiros-Borges et al., 2020).

Fig. 2. Graphical scheme of hydrochemical ratios in pH vs Ca concentration from Las Salinas spring (after Saez-Alvarez).

Fig. 3. Historical evolution of the Las Salinas water spring and the location of the spa in surgical view since 1897.

Fig. 4. Chemical evolution of the Las Salinas water spring and the evolution of its chemical properties since 1897.

Fig. 5. Key data of chemical analysis of groundwater samples from the Palace of Las Salinas spa in different wells and different years.

Fig. 6. Replacement of CaNa waters by CaHCO3 waters.