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Evaluation of transverse fault performance in inter-basin water transport using isotopic and color tracking studies, case study: Dimeh spring, Koohrang

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1-Introduction

Dimeh spring emerges from the Zarab Anticline, Zagros Mountains (Iran), and the mean annual discharge is ~2.5 m3/s. The region has a semi-arid climate. A rainy season starts in October and usually ends in May, with snowfall common on the higher ground between December and February. The mean annual precipitation of the study area is about 1357 mm (Karimi Vardanjani et al., 2017). However, preliminary evaluations suggest that the spring recharge is from the Zarab Anticline, but in several previous dyes tracing tests, the dye was injected in the Zarab anticline was not seen in the Dimeh Spring (Janparvar, 2001; Pourab Co, 2012). Then, in order to find the catchment area of this spring, the present study has focused on tectonic aspects.

2-Methodology

In this study, the dye tracing techniques were employed to determine the flow path and isotope studies used to determine the catchment elevation. The transverse fractures extended from Zardkooh Mountains (Karoon River basin) to the Dimeh spring area (Zayandeh Rood River basin) were identified. Then, field surveys were carried out to identify areas that could be used for dye injection. Accordingly, a sinking spring in the Khadang Valley (Zardkooh Mountains) was selected for injection. Then, based on empirical formulas (Karimi Vardanjani, 2014), the required dye value was calculated, and 30 kg of Uranine dye was injected. Samples were collected from the main springs of the area for two months, and they were tested for Uranine. The rain was sampled twice a year at three different altitudes, and the samples were analyzed for Oxygen-18 isotope.

3- Results and discussion

As shown in Fig. 1, unlike previous tests, the dye was observed in Dimeh spring. There are two sharp peaks in the dye concentration-time diagram at the 26 and 33 days after injection. Furthermore, the relationship between elevation and $\delta^{18}O$ in precipitation shows that a big part of Dimeh spring waters recharges in Zardkooh Mountains. Some provisional water balance estimates have also been made to confirm this further.

4-Conclusion

This study shows that tectonic structures such as transverse faults can play an essential role in inter-basin groundwater transport. Two flow paths are identified in the Zardkooh Mountain Range:
A: The main route: Flow to the springs at the foot of the Zardkooh Mountains. Due to their low elevation, these springs constitute the main base level of the Zardkooh zone.
B: Second route to Dimeh spring: Due to the structural relationship between the Zardkooh karst aquifer and Dimeh spring through Khadang transverse fault zone, a network is formed that transfers part of the Zardkooh water to Dimeh spring.

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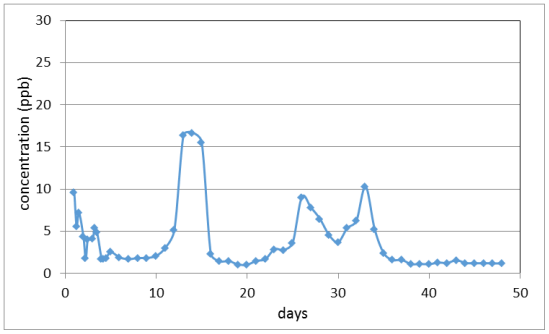

Fig 1. The dye concentration-time diagram of Dimeh spring.

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