

The Study of Stable Isotopes (^{18}O , ^2H & ^{13}C) in Kardeh River and Dam Reservoir, North-Eastern Iran

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Abstract : Among various water resources, the surface water has a dominant role in providing water supply in the arid and semi-arid region of Iran. Andarokh-Kardeh basin is located in 50 km from Mashhad city - the second biggest city of Iran (NE of Iran), draining by Kardeh river which provides a significant portion of potable and irrigation water needs for Mashhad. The stable isotopes (^{18}O , ^2H , ^{13}C -DIC, and ^{13}C -DOC), as reliable and precious water fingerprints, have been measured in Kardeh river (Kharket, Mareshk, Jong, All and Kardeh stations) and in Kardeh dam reservoirs (at five different sites S1 to S5) during March to June 2011 and June 2012. On $\delta^{18}\text{O}$ vs. $\delta^2\text{H}$ diagram, the river samples were plotted between Global and Eastern Mediterranean Meteoric Water lines (GMWL and EMMWL) which demonstrate that various moisture sources are providing humidity for precipitation events in this area. The enriched $\delta^{18}\text{O}$ and $\delta^2\text{H}$ values (-6.5 ‰ and -44.5 ‰; VSMOW) of Kardeh dam reservoir are compared to Kardeh river (-8.6 ‰ and -54.4 ‰), and its deviation from Mashhad meteoric water line (MMWL- $\delta^2\text{H}=7.16\delta^{18}\text{O}+11.22$) is due to evaporation from the open surface water body. The enriched value of $\delta^{13}\text{C}$ -DIC and high amount of DIC values (-7.9 ‰; VPDB and 57.23 ppm) in the river and Kardeh dam reservoir (-7.3 ‰; VPDB and 55.53 ppm) is due to dissolution of Mozdooran Carbonate Formation lithology (Jm1 to Jm3 units) (contains enriched $\delta^{13}\text{C}$ DIC values of 9.2 ‰ to 27.7 ‰; VPDB) in the region. Because of the domination of C3 vegetations in Andarokh_Kardeh basin, the $\delta^{13}\text{C}$ -DOC isotope of the river (-28.4 ‰; VPDB) and dam reservoir (-32.3 ‰; VPDB) demonstrate depleted values. Higher DOC concentration in dam reservoir (2.57 ppm) compared to the river (0.72 ppm) is due to more biological activities and organic matters in dam reservoir.

Keywords : Dam reservoir, Iran, Kardeh river, Khorasan razavi, Stable isotopes

Conference Title : ICIHG 2017 : International Conference on Isotope Hydrology and Geochemistry

Conference Location : Rome, Italy

Conference Dates : September 18-19, 2017