Origin of Saline Groundwater within Lake Urmia Area/Iran, based on Chemical and Isotope Data

Balderer, Werner [1], **bawerner@retired.ethz.ch**
Leuenberger, Fanny[1], **fanny.leuenberger@erdw.ethz.ch**
Rahanjam, Mehdi, Jafari, Fatemeh, Khalaj, Yousef[2],**Kumar, Bishim**[3];

[1]ETH Zurich, Geological Institute, Sonneggstrasse 5, CH 8092 Zurich, Switzerland

[2]Water Research Institute, ShahidAbbasspour Blvd., HakimiehTehranpars, Tehran, Iran I.R.
[3]Isotope Hydrology Section, IAEA, Vienna, Austria

Abstract:

Lake Urmia (lake altitude 1280 m.a.s.L.), with a surface area of 5.470 km2, is the largest lake inside Iran. It is located in Northwestern Iran within the three provinces of East Azerbaijan, West Azerbaijan and Kordestan. The water of Lake Urmia is hypersaline with a salinity of more than 180 g/l. This area is subject to environmental threats since not only the Urmia Lake surface is shrinking and its salinity is increasing, but the groundwater of the adjacent catchment areas showtrends of increasing salinity.
According to the observed hydrogeological setting and the result of chemical and isotope composition, the following 5 origins of salinity the area of Urmia Lake catchment have been identified:
1) Saline spring outflows occur at outcropping salt domes structures. These correspond to local hydrodynamic flow systems of normal infiltration cycle at morphological heights.
2) Brines from springs far distant to the Urmia Lake are related to upwelling fluids along diapiric structures (salt or mud plugs. Such hydrogeological situations are characterized as outflow zones of deep flow systems. 3) Brines of Lake Urmia (as also trapped saline groundwater) are intruding into fresh water aquifers in the lakeshore areas due to over- pumping and lowering of the hydraulic head of the shallow aquifer, 4) By evaporation of water of shallow origin (rain, river) within Lake Urmia or other open lakes. 5) Saline waters of deep origin are present in deeper aquifer layers below the overlying fresh shallow groundwater. These waters originate by dissolution (by water rock interaction) of rock minerals along their flow path)

Keywords: Saline Groundwater, Lake Urmia, diapiric structures, over-pumping