Geophysical Research Abstracts
Vol. 17, EGU2015-8642, 2015
EGU General Assembly 2015

Structural control on the evolution of groundwater quality for B2A7 aquifer in the area extending from Ajlun to Yarmouk river in Jordan

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Groundwater flow in the Northwestern highlands of Jordan is controlled y the Ajlun Heights were groundwater flows towards north and west along the Yarmouk river and the Jordan Valley.
Due to water rock interactions, groundwater that discharges in the Jordan Valley and along the Yarmuk River is thermal, radioactive and mineralized. Its total dissolved solids especially in the confined parts of the aquifer.
Electrical conductivity of groundwater in the unconfined aquifer of B2A7 ranges between 500 to 700 μs/cm and increases up to 1600 μs/cm towards the confined part of the aquifer with a notable increase in Na and Cl towards the discharge areas. According to the chloride content in the groundwater the evaporation in the recharge areas is considered to be high representing 82% of the total rainfall.
Groundwaters are classified as calcium bicarbonate types with Mg/Ca ratios varying from 0.11 to1.21 and Na/Cl ratio in the range of 0.49 to 1.85. The chemical evolution of groundwater from Ajlun Heights toward Jordan Valley and Yarmouk River is marked by a progressive decrease in calcium and bicarbonate with increase of sodium, and chloride due to halite dissolution and upward percolation of deep saline groundwater.
The 3D modeling for the aquifer system indicated the rule of geologic structure in the groundwater digenesis through upward and downward leakage enhanced along high permeability lineaments.
According to the modeled water budget, the inflow to the upper B2A7 Aquifer 54 *106 m3/yr replenishing the B2A7 system as underground flow in the karstic limestone of the vadose zone. The underground discharge to the Yarmouk River and Jordan valley modeled to be 23.2 *106 m3/yr as underflow to the springs. The leakage from B2A7 aquifer into the lower aquifer is about 9.7 *106 m3/yr.
Within the north western lowered elevations the hydraulic different between upper and deep aquifers is at minimum an upward leakage and seems to take place through the main faults trending EW which was estimated to be 19 *106 m3/yr reflected by the groundwater elevated temperature and anomalies in the analyzed trace element such as Sr.
Key words:
Yarmouk river, B2A7 Aquifer, groundwater interaction, leakage