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Distribution of oxygen-18 and deuterium across the Tunisia

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Groundwater use in Tunisia

In their fourth report, the Intergovernmental Panel on Climate Change (IPCC) warns that temperature will increase and rainfall will decrease especially in the Mediterranean coastal areas of North Africa with a global warming increase. People in Tunisia located in north Africa largely depends on groundwater use for irrigation, which caused the drawdown of groundwater.

For sustainable groundwater use, it is essential to understand the groundwater system.

Isotopic Mapping

Kendall (2010) pointed that large scale spatial isotope studies of water cycle can provide important insights into the groundwater recharge process. Kendall (2001) also showed the effectiveness of isotopic mapping by taking surface water samples over large areas, because surface water can be representative value of rainfall water of whole basin.

High resolution isotopic mapping also can help us to identify the important sites such as recharge area in the surface and groundwater flow system.

Objective and Methodology

The objective of this research is showing isotopic map and clarifying the groundwater recharge process across the Tunisia.

Sampling survey was conducted form from July 7th to11thand, from Nov 12th to 20th in 2011. Water samples were taken mainly from river across the whole of Tunisia. We measured electrical conductivity, ORP, and pH in situ. We also analyzed the stable isotopes (D, 18O) in laboratory.

However, in southern area, wadi river were dry up even in rainy season. Then we took water from some Magels (traditional water tank to collect rainfall during rainy season). Magel is covered by concrete and prevent evaporation effect. Then the water in Magel can be integrated value of rainfall during rainy season.

Results and Discussion

Stable isotopic values were plotted on river system map and compared with topographic map. Generally, isotopic values in eastern coastal area tended to be relatively high (delta D = -27.6 ˜ -6.9 per mill, delta 18O = -4.4 ˜ 0.1 per mill). Meanwhile, values in western inland area were relatively low (delta D = -41.9 ˜ -27.7 per mill, delta 18O = -7.9 ˜ -4.5 per mill). This tendency is remarkable especially in Mejerda River watershed located in northern Tunisia. Isotopic values along the mainstream increased with distance from coat to inland (inland effect).

However isotopic values at some points located in northern coastal area were low. These values were lower than average precipitation value at nearest observation point of IAEA. There is possibility that these low value come from not base flow but short time rain event.

More sampling are planned in gap area on the map and, in same points to see seasonal change.

Keywords: groundwater, stable isotope, tracer, isotopic mapping