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Recharge Mechanism to North-Western Sahara Aquifer System (NWSAS) Using Environmental Isotopes

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Abstract

A comprehensive understanding is highly needed for any successful transboundary cooperation policy. Moreover, an analysis of the NWSAS can be of particular interest for policy makers and researchers. This paper aims to reveals and to assess the renewability of North Western Sahara Aquifer System(NWSAS) as one of the major transboundary multi-layered aquifer system, in North Africa, shared by Algeria, Tunisia, and Libya and is often referred to as the Système Aquifère du Sahara Septentrional (SASS).The paper is primarily intended for exploring whether it receives a considerable fraction of modern water as recharge or it is at risk of being depleted and excessively pumped, where the main challenge for NWSAS ,is that it should be abstracted rationally for equitable use.

Environmental isotopes data of 18O, 2H, 3H ,14C as well as characteristics of d-excess are used to illustrate whether NSWAS is renewable or non-renewable resource.Geochemical, hydrological and statistical evidences supporting the renewability of NWSAS are provided through pairs of cross-plots .

The study has clearly indicated that NWSAS is receiving a considerable fraction of modern water as recharge to the aquifer because of the following reasons; Firstly, the moderately depleted delta values of O-18 and H-2 of water from Sahara Atlas in Algeria and the Dahar and the Dj. Nefoussa in Tunisia and Libya with 18O content (- 6.0%■ to -5.0%■) compared with that of palaeowater (-7.0 to -9.0 %■) indicate a considerable fraction of modern water recharging NWSAS.This considerable fraction of modern water should be attributed to originate from the present-day precipitation (-6.5%■).Secondly, the presence of significant amount of 14C >2 % and 3H > 5TU., frequently found in data should be attributed to a mixing with shallow and modern water, where old water practically contains no 14C.

The foregoing facts are in good agreement with the results of conventional hydrologic approach. This would contradicts the assumption that the NWSAS is non-renewable water resource. In this context, the NWSAS is being located in one of the driest regions on the planet, these huge resources have been recognized to be of great importance to the socio-economic development of its riparian countries. So the present paper addresses the necessity of identifying specific cooperation problems which evolve out of these hydrogeological attributes and prevalent use patterns.

Accordingly, the description of NWSAS as non renewable, devoid of any meaningful recharge , a rather stagnant water body, disconnected from any surface water body in addition to its classification as “non-renewable” would therefore be misleading and represents one of the most obvious inaccuracy as well.

Keywords stable isotopes of 18O and 2H, unstable isotopes of 14C and 3H.renewal , socio-economic development, Riparian,