



## **Assessment of groundwater potential of the crystalline basement of Wadi-Fira (Eastern Chad) using a multi-criteria correlation analysis and Remote Sensing data**

Hamza Brahim Mahamat (1,2), Le Coz Mathieu (1), Hamit Abderamane (1,3), and Moumtaz Razack (1)

(1) University of Poitiers, UMR 7285, 5 rue Albert Turpain, B8 TSA 51116, 86073, Poitiers- France (brahim.mahamat.hamza@univ-poitiers.fr), (2) Department of Geology, Polytechnic University Institute of Mongo, BP 4377, N'djamena-Tchad, (3) Department of Geology, University of N'djamena, BP 1117, Av. Mobutu, N'djamena-Tchad

Access to water in the Wadi-Fira aquifer system is a crucial problem in Eastern Chad because of (i) the complexity of the hydrogeological context (fractured basement), (ii) large extent of the study area (50,000 km<sup>2</sup>); And (iii) hard-to-access field data (only 34 water points were available to determine physicochemical and hydrodynamic parameters) often associated with high uncertainty. This groundwater resource is paramount in this arid environment, to meet the water needs of an increasingly growing population (refugees from Darfur) with a predominant pastoral activity.

In order to optimally exploit the available data, correlative analyzes are carried out by integrating the spatial dimension of the data with GIS tools. A three-step strategy is thus implemented, based on: (i) point field data with physicochemical and hydrodynamic parameters; (ii) maps interpolated from point data, to increase the number of "comparable" parameters for each site; and (iii) interpolated maps coupled to maps from Remote Sensing results describing the area's structural geomorphology (slopes, hydrographic network, faults).

The first results show marked correlations between physico-chemical and hydrodynamical parameters. According to the correlation matrix, the static level correlates significantly with the dominant cations (Ca<sup>2+</sup> ; R = 0.52) and anions (HCO<sub>3</sub><sup>-</sup> ; R = 0.53). Correlations are lower between electrical conductivity and transmissivity, and electrical conductivity and measured static level. A negative correlation is observed between Fluorine and transmissivity (r = -0.65), and the altered horizon (r = -0.5).

The most significant discharges are obtained in fissured horizons. The correlative analysis allows to differentiate mapped sectors according to the productivity and chemical quality regarding groundwater resource.

**Keywords:** Hydrodynamics, Hydrochemistry, Remote Sensing, SRTM, Basement aquifer, Alteration, Lineaments, Wadi-Fira, Tchad.