

## **HYDROGEOLOGICAL MODELISATION OF THE KUFRA BASIN - NUBIAN SANDSTONE AQUIFER SYSTEM**

### **Context and objectives**

The transboundary Nubian Sandstone Aquifer System (NSAS) is the largest aquifer system in Northern Africa (2.2 million km<sup>2</sup>). Libya, Egypt, Sudan and Chad share this vast groundwater resource. Given the arid conditions, groundwater constitutes the single largest water resource for these countries. Since the early 1960s, groundwater has been intensively extracted from the Kufra oases in Libya and the New Valley in Egypt raising questions concerning the equitable use of groundwater. Also, the few but nevertheless very important available surface water resources such as Oasis, Lakes, Gueltas in the Kufra basin could be lost as a consequence of these extractions. Numerical modeling (MODFLOW) has been carried out by previous authors on the entire aquifer system; other models were developed in order to predict drawdown for different extraction scenarios. However, a hydrogeological model has never been carried out for the Kufra basin, one of the largest and most important sub-basin of the NSAS in terms of groundwater resource; potentially, the reason was the lack of data from the Chadian sector. The objective, therefore, is to develop a groundwater model for the Kufra basin by integrating all the new data (geology, hydrochemistry and stable isotopes, remote sensing) collected in Chad.

### **Research approach and methodology**

The student will benefit of all the results already developed during the PhD project (Marie-Louise Vogt) in order to develop a numerical hydrogeological model for this vast aquifer system. Some example of questions which could be guiding the development of the model are: (1) Is there any connection between the underlying Paleozoic aquifer, recharged in the mountains of Northern Chad, and the overlying Mesozoic aquifer that could explain the presence of perennial surface water, such as the Lakes of Ounianga? (2) Can the existence and location of the water divide in the Kufra basin be confirmed by the model?

### **Partners and collaboration**

The project will be supervised by Prof. P. Brunner. It will be carried out in close collaboration with PhD Marie-Louise Vogt. Given the security problems in Chad, this project do not have a field component. However, the results of this study will be of great impact for the development of plans for a sustainable use of this important water resource. Also, it is a unique opportunity to work on a very large aquifer system, with specific characteristics. Partners of this project are the Chadian Ministry of Water and the Ministry of Higher Education. The CHYN is already partner with the Master of Hydrogeology and GIS of the University of N'Djaména.

**Contact for further information:** [Philip.Brunner@unine.ch](mailto:Philip.Brunner@unine.ch) and [marie-louise.vogt@unine.ch](mailto:marie-louise.vogt@unine.ch)



**Lakes of Ounianga**