Available online at www.sciencedirect.com

SciVerse ScienceDirect

Procedia Earth and Planetary Science 7 (2013) 397 – 400

Procedia
Earth and Planetary Science

Water Rock Interaction [WRI 14]

Three-dimensional modeling of aquifers of the coastal basin gharb, NW Morocco

A. Mansouri[a], A. Mriedekh[b], I. Kacimi[a]*, K. Nadia[a], M. Kili[a], T. Bahaj[b]

[a]*University Med V, Faculty of Sciences Rabat-Agdal, Earth Sciences Department, Morocco*
[b]*University Mly Ismail Faculty of Sciences and Technics Er-rachidia, Morocco*

Abstract

The Gharb Basin is located in the northwest of Morocco, covering an area of 4000 sq. km. It is especially known for the alluvial style of its deposits and the very heterogeneous character of its aquifers. Moreover, the coastal fringe of its aquifers is uncertain due to the effects of sea level changes during the Plio-Quaternary. To better understand its hydro-geological potential, new technological tools offer new opportunities for visualization and analyzing data acquired by different methods. The exploitation of geo-electrical data in a SIG showed that the sand bodies (electrically resistant) are divided into broad depressions whose limits have been established for the first time (Kénitra-Beht Ouest and Oued Touirza).

Keywords : Gharb Basin; drilling; geoelectric; GIS 3D modeling.

1. INTRODUCTION

The study area is part of the coastal strip of the Gharb plain. It has the form of a narrow strip of 70 km wide and 80 km long and it is parallel to the coastline between Kenitra from the south and the hills of Lalla Zahra the north (Fig 1). It is an alignment of a large dune system parallel to the coastline. (Fig 2)**[1].** The Gharb basin has also been the subject of structural reconstructions based on seismic profiles. They show the existence of satellite basins in its center most likely associated with the Neogene basin evolution and reveal the geometry of potential aquifers layers of Gharb Basin **[2]**, stipulating geographical continuity from west to east. Recent results involving 3D GIS models have shown that the aquifers in the coastal zone, located on either side of the coastal dunes, are distinguished from the other segments of the aquifer of Gharb and they are divided into broad depressions whose limits are established. this paper

* Corresponding author. Tel.: +212661374112; fax: +0-000-000-0000 .
E-mail address: iliaskacimi@yahoo.fr.

Selection and/or peer-review under responsibility of the Organizing and Scientific Committee of WRI 14 – 2013
doi:10.1016/j.proeps.2013.03.176

presents, (1) a correlation between geoelectric and geological units, (2) 3D geometry of sand bodies of the aquifers in the studied area based on integration into a GIS Database 3D of geophysical data and drillings data, and (3) a preliminary model of migration of these sand bodies.

Fig1. Geographical situation and geological context.

Fig2. Physiographic elements and geoelectric lines.

2. GEOLOGICAL FRAME

The Gharb is located at the boundary of two structural domains: southern Meseta, and northern Rif. It is a vast alluvial plains of the lower part of O.Sebou that corresponds to an asymmetric depression. Its structure is closely related to tectonic movements for which rif was the origin and the Meseta. These tectonic events are contemporaneous eustatic movements that are very active in late Miocene, Pliocene and Plio-Villafranchian: The basin is subsiding since Vindobonian medium and its subsidence has persisted since the Quaternary to the Present [3]. During the Pliocene, the basin was presented in the form of gulf whose boundaries are parallel to the southern front of Rif and in the limit Meseta. During Upper Pliocene, like the rest of the Mediterranean, the Gharb basin was under the effects of a major compressive tectonic phase, in parallel, a continental sedimentation marks the center of the basin while borders, especially in the West, sedimentation are mainly composed of bioclastic limestones. In Villafranchian, the structure of coastal basin became clearer with the installation of coastal dunes [4].

3. DATABASE AND METHODOLOGY

The Gharb basin has been the subject recognition by drilling and studies of recognition by various geophysical methods .In this work we performed a synthesis of geological, hydrogeological and a reinterpretation of previous geophysical data to build the 3D model of the aquifers in the coastal area of Gharb. A database in GIS has been built. It includes 260 drillings and 40 geophysical slices the NW-SE direction constructed from the interpretation of 1150 electrical surveys where technical data relating to geological and hydrogeological facies are available These data were kindly provided by the Administration for Hydraulics (ADH) and the National Office of Drinking Water (ONEP). The methodology is the development of specific methods of treatment of cuts in addition to the maps. The specific methods also involve the integration of geophysical data (resistivity), the reading of values in the roof of geoelectric horizons and coordinates of various surveys.

4. RESULTS AND DISCUSSION

4.1. Lithostratigraphy and geoelectric level

The lithostratigraphic framework of the Gharb coastal basins is presented by correlating lithofacies and electrofacies. This was possible, by performing several geoelectric on mechanical drilling, which allowed us the correlations of lithologic facies at geoelectric levels (Fig 3A & 3B) [5]. The sedimentary sequence begins at the base by depositing a thick sequence of marly several hundred meters of Miocene, which is the bedrock, represented by resistivity values around 5 ohm.m. It is surmounted by a geoelectric unit whose resistivity values vary from 10 to 400 ohm.m. This unit consists of sandy clay, clayey sandy, limestone and sand of lower-middle Pliocene age (Fig 3A & 3C). These levels are overlain by carbonate matrix sands or sandy clays resistivity ranging from 10 to 200 ohm.m Unit 2 of Upper Pliocene age. This