INTEGRATION OF MULTI-SOURCE DATA FOR THE REALIZATION OF A HYDROGEOLOGICAL MAP CASE OF STUDY : PLAIN OF MLETA OF THE BIG WATERSHED OF THE ORAN SEBKHA

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KEY WORDS: watershed, hydrogeological map, GIS, DTM, satellitale imagery, Wells data and spatio-chart.

ABSTRACT:

The traditional approach used in the hydrogeological studies is generally long and very expensive in time and money. With the advent of the geographical information system (GIS), satellitale imagery and the digital terrain model (DTM), it became possible to integrate purely digital techniques able to release hydrogeologist of many tasks met in study.
The wells data of the study zone presents gaps in the altitude (Z) parameter. To overcome this problem we used a method which consists to extrapolate the value of altitude (Z) from the digital terrain models. The satellite images as for them, will intervene in the correction of various discontinuities affecting the thalweg which will serve in the update of the hydrographic channel and for use of satellital image like melts cartographic and in the realization of the spatio-chart. These data will be treated, corrected to be finally integrated into a GIS for establishment of the hydrogeological map of the Mleta plain of the big watershed of Oran Sebkha.

1. INTRODUCTION

These last years, the hydrogeologic studies knew a big scientific progress thanks to the use of different technics of automatic cartography. The latter permits the integration of the multi sources data through a computer tool as the MapInfo software serving to acquire, manipulate, stock and process the georeferencing informations.
It is in this optics that we started a hydrogeologic study of the big watershed of the sebkha of Oran using a numerical approach, while using a set of information data (cartographic, altitude, satellite, hydrogeologic, etc..).

2. PRESENTATION OF THE ZONE OF STUDY

The region of survey is situated in the external zone of the tellien domain. It is situated between two sets of moutains, the mounts of Tessala to the south, culminating at 1061 meters and the mounts of the Murdjadjo to the North, culminating at 584 meters. These two sets form between them, the big endoréic basin named the watershed of the big sebkha of Oran. The sebkha is constituted of a big extended salt lake, surrounded by a set of plains juxtaposed to the north (plain of Misserghin, Amria, Bou-Tlelis, etc.) and to the south a very big extended plain (plain Mleta).
Geographically, the zone of experimentation is localited between the meridians (0° 45 - 0° 55) (W) and the parallels (35° 20 - 35° 30) (N). Fig n°1

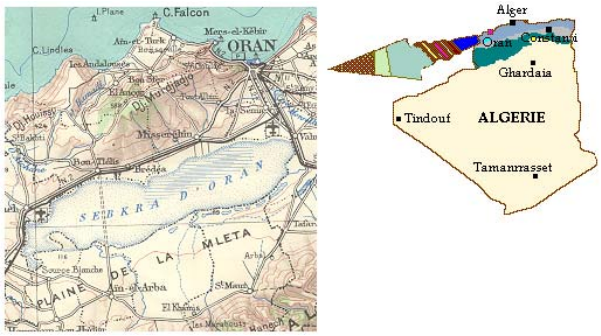

Figure 1. geographical Situation

3. METHODOLOGY OF WORK

The objective of this work is to introduce a set of informations provided from different sources (hydrogeological, geographical and satellite data) in order to produce hydrogeological map by a numeric approach. The different steps of our work can be structured as in flow chart. (Fig n°2)

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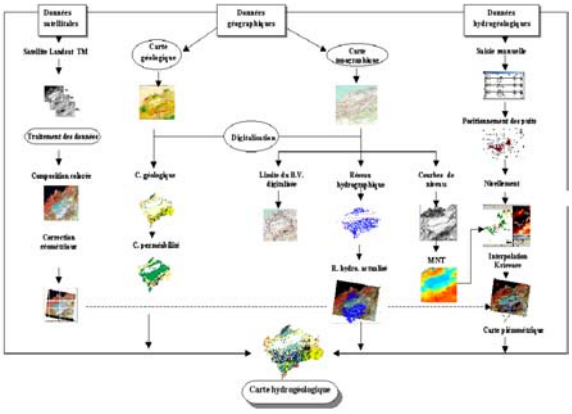

Figure 2 . Flow chart adopted for the development of the hydrogeologic map

4. DEVELOPMENT OF THE PIEZOMETRIC MAP

To establish the piezometric map of the area of interest, we used data provided by the national agency of hydraulical ressources (ANRH). Several piezometric compaigns were led by this agency. This data presents the hiatuses and anomalies at statical level, altitude,..etc, which will not help in elaborating the hydrological map. To overcome this problem we used a method which consists in extrapolating the value of the altitude parameter (Z) from the digital terrain models.

4.1 Extraction of the altitude parameter

The altitude of a water point (well, boring, etc..) is a mandatory data in all htdrological studies. Because of the lack in altitude parameters data recorded within the (ANRH) data base, we used a new technic based essentially on the digital terrain models to level the wells. (Fig n°3)

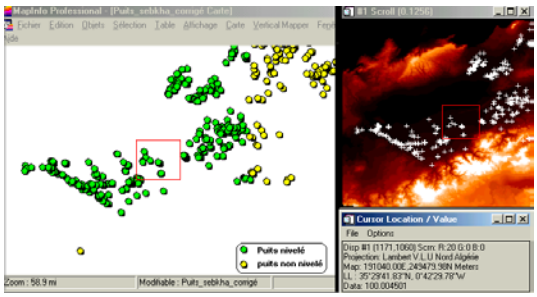

Figure 3 . Leveling technic used

4.2 The piezometric map of the Mlèta

The piezometric map of the Mleta plain, elaborated in 1986 from data well used the krigeage interpolation method. This method estimates the values of the points which have not been sampled using data combination. The weights of the samples are weighted by a function of structure given by the data. (Fig n°4)

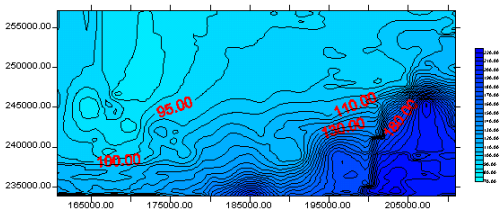

figure 4 . Illustration of the piezometric surface.

The block diagram illustration of 3D map as represented in figure 4, shows a very net view of the piezometric surface where clearly appears the domes and the depressions above, (Fig n°5)

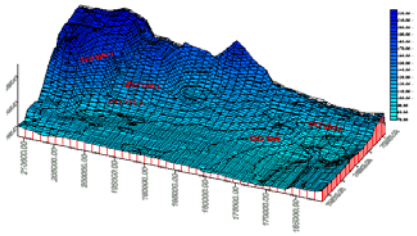

figure 5 . Representation of the surface piezometric in block diagram

5. THE INTERPRETATION OF THE PIEZOMETRIC MAP OF THE M'LÉTA

The tracing of the drainage axes and the dividing lines of the waters on the piezometric surface map show the different direction of the underground waters flow in the Mleta plain (see figure 6).

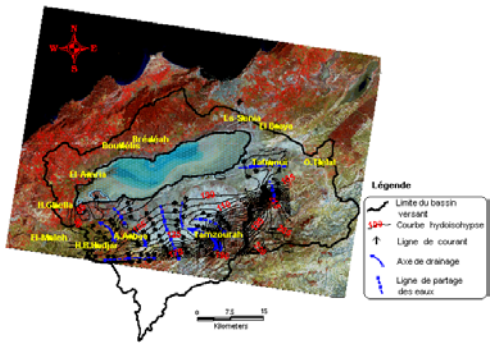

Figure 6 . Piezometric map of the Mleta

The elaborated piezometric map has a big axis of drainage situated in the center of the plain (zone of Tamzourah), wich is oriented in the South East-North West upstream and South-North downstream direction, the two other axes (zone of A. Arbâa and H. Bouhadjar) have the South East–North West direction.

The underground flow direction is toward the salty lake (sebkha).

The piezometric surface is marked by some protuberance, characterizing zones of important provision, located in South East part.

The curves hydroisohypses is tightened upstream, and the module of spacing is decreasing the uphill toward the downstream what translates the reduction of the permeability

near the border of the Sebkha due to the heterogeneity of the land.

6. PRESENTATION OF THE HYDROGEOLOGICAL MAP

The hydrogeological map is the result of the superposition of different layers (geological, hydrographical and piezometric). (Fig n°7)

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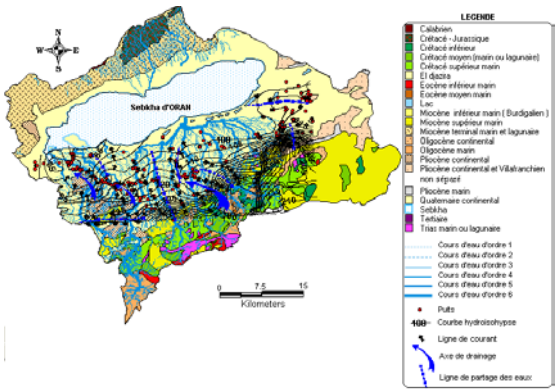

figure 7: Hydogeological map of the Mleta plain

Conclusion

The new techniques used in the setting of our work such as : digital terrain model (DTM), satellite imagery and geographical data permitted us to describe, in a numeric manner, the set of the parameters intervening in the working of the underground waters.

The operation of leveling, of the different wells covering the zone of survey, by the DTM permitted us to restore the indispensable altitude parameter automatically in the development of the piezometric map. This technique can be considered like an useful basis in the leveling of the wells that stays in most cases deprived of altitude parameter (Z), wich is the majority wells in Algeria.

The satellitale imagery can be considered like excellence cartographic basis in the updating of the hydrographic channel, road and urban, etc.. And lake a ideal cartographic support for the production of the spatio charte.

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