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ALGERIA GEOTHERMAL COUNTRY REPORT

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ABSTRACT

The geothermal exploration in Algeria has proven a large low- enthalpy geothermal potential. Geothermal utilisation included mainly therapeutic purposes and a few experimental greenhouses in the south part of Algeria.

1. INTRODUCTION

The geothermal exploration program in Algeria started in 1967 and was undertaken by the national oil company (SONATRACH). In 1982 the electrical company SONELGAZ in association with the Italian company (ENEL) undertook the geothermal recognition studies of the NE part of the country. In the first stage, the geothermal studies concerned mainly the northern-east part of Algeria. From 1983 and onwards the geothermal work is being continued by the Renewable Energies Centre (CDER) and the program was extended to the whole north part of the country.

The geothermal development has remained stagnant during the last decade. Presently renewed effort is put into developing large projects with as the first stage, the establishment of the geothermal atlas of Algeria.

The geothermal resources of Algeria could be grouped into the following broad areas (Fig1):
- the north part characterised by a complex geology of overthrusting allochtonous formations and where the geothermal aquifers are discontinues;
-the south part (northern Sahara) is geologically considered as a stable zone, characterised by sedimentary basins. Resources in water of the northern Sahara were the object of a detailed study conducted by the UNESCO and UNDP.

Experimental greenhouses located in Touggourt and Ouargla areas were installed, in the south of Algeria (Fig.1) using Albian geothermal water of 50°C.

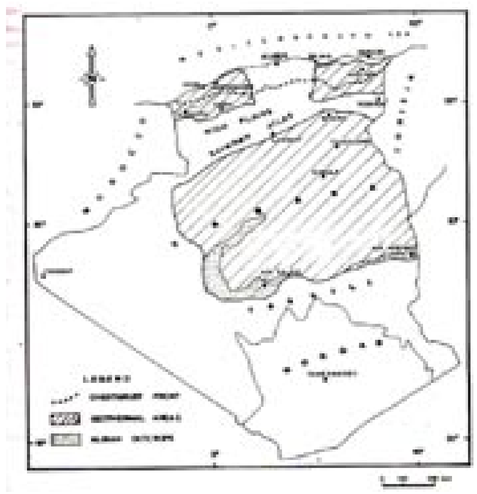

Fig. 1 Main geothermal areas (Fekraoui and Abouriche, 1995)

2. HYDROTHERMAL RESOURCES OF THE NORTH

More than 200 main hot springs have been inventoried; their temperatures range from 22°C to 98°C (Fig.2). The hottest are located in the northeastern part of Algeria (98 °C at Hammam Chellala spring).
Correlation between oxygen 18 and deuterium confirm the meteoric origin of these waters.

The Total Dissolved Solid of these springs is greater than 1 g/l (Fig.3) and the chemical composition vary from Na-Cl type to Na-HCO_3 and Na-SO_4 types. Despite the large availability of the chemical data for these springs, they are however not complete. Future work should focus on completing these data. In this goal one hundred springs are selected for the field and laboratory analysis.

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We have tested chemical geothermometers on some hot springs whose the data are available, the silica geothermometers were judged to be more reliable. For example the deep temperature is about 120°C for Hammam Chellala and Bou Hajar Springs in the eastern part of Algeria.

The geothermal gradient was evaluated using oil wells bottom hole temperatures and a few gradient data of well situated in the NE part. Because the data are scattered we have established a sketch of geothermal gradient. Figure 4 shows three anomalies with geothermal gradient greater than 5°C/ 100m.

3. HYDROTHERMAL RESOURCES OF THE SOUTH

The northern Sahara contains a large geothermal aquifer, which is of the "Continental Intercalaire". Detrital Mesozoic rocks constitute this aquifer; it is called Albian reservoir. It constitutes a continuous reservoir that spreads Tunisia until Libya and covers a surface of 600.000 km2 (Fig.1). The thickness of this reservoir varies from 200m (to the west) to more of 1000m (to the East). In its Eastern part, the aquifer is confined and the roof of the reservoir passes progressively from -800 m (at Ouargla) to -1300 m (at Touggourt) and to -2600 m (at Biskra). The temperature of waters at the exit of the deeper wells is about 50-60°C and the flow rate is of 100 to 400 l/s.

Evaluation of the heat flow in 230 oil wells using temperature measurement (BHT and DST) and various rock-porosity data, reveals an average of 82 ± 19mw/m2 (D. Thakherist and A. Lesker 1988)

4. CONCLUSIONS

In conclusion we can affirm that the North East and North West present a geothermal interest seen the geological conditions and the large number of hot springs without forgetting the south where the reserves in water, of the Albian sandstone, are very important (Fig.5).

More detailed studies on geothermal exploration and drilling are necessary to promote this energy.

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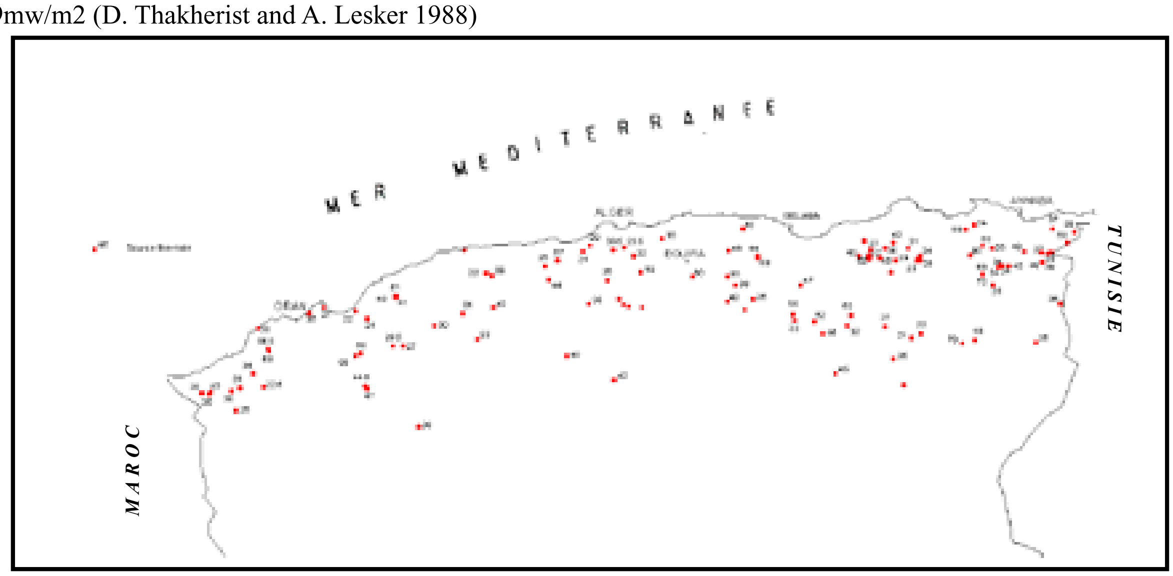

Fig. 2 Temperatures of the main hot springs

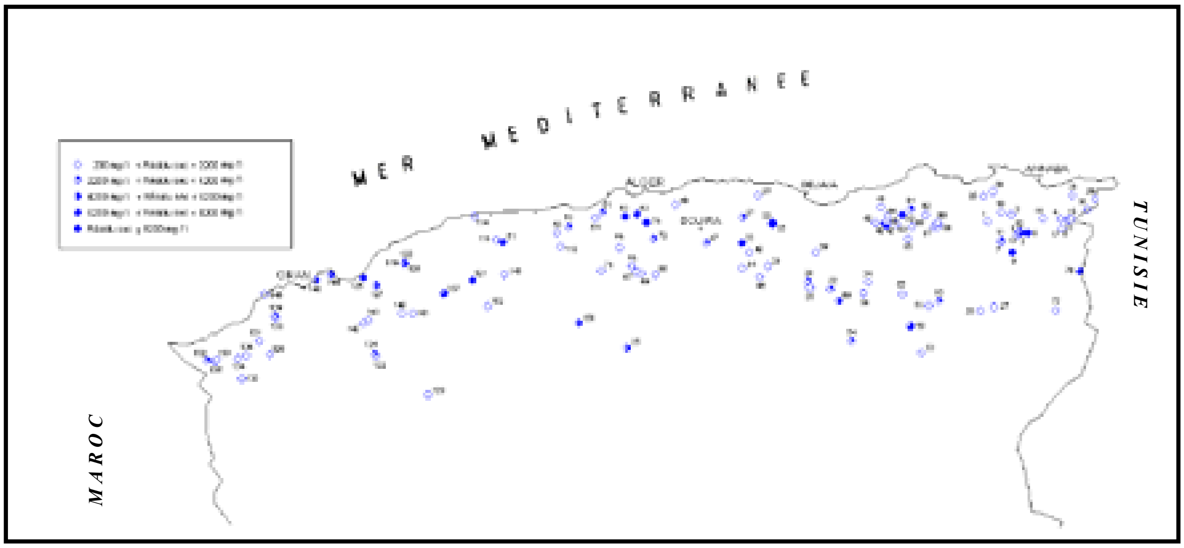

Fig. 3 Total dissolved solid of the main hot springs

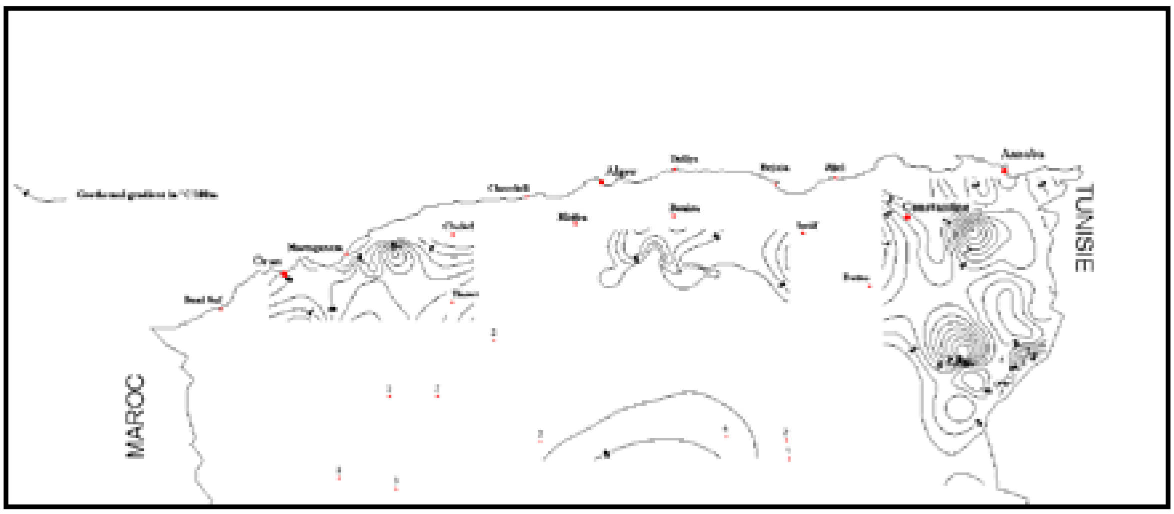

Fig. 4 Sketch of geothermal gradient for the north part of Algeria

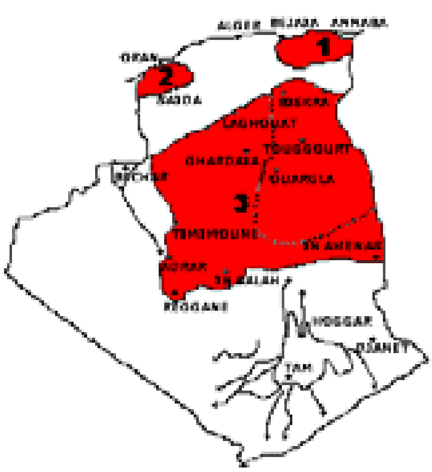

Fig. 5 Zones of geothermal interest