
بسم الله الرحمن الرحيم

Discovery of Ground Water Reserves

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قال تعالى:

{ وَجَعَلْنَا مِنَ الْمَاءِ كُلَّ شَيْءٍ حَيٍّ ﷺ أَفَلَا يُؤْمِنُونَ }

thing" "We made from water every living

Glorious Quran.

Ground water reserves

is very important

to the resettlement of the nomadic people

and the agricultural

in the arid and semi arid lands.

Man’s capability to utilize
the arid and semi-arid environment
changes and expands
as
he gains new insights and technology
with
respect to water and its resources.

The discovery of new ground water requires knowledge

of

geology, soil, drainage patterns and vegetation of the terrain.

These surfaces features involve

extensive inventory of resources, monitoring of environmental conditions, and measuring changes, both short- long- term.

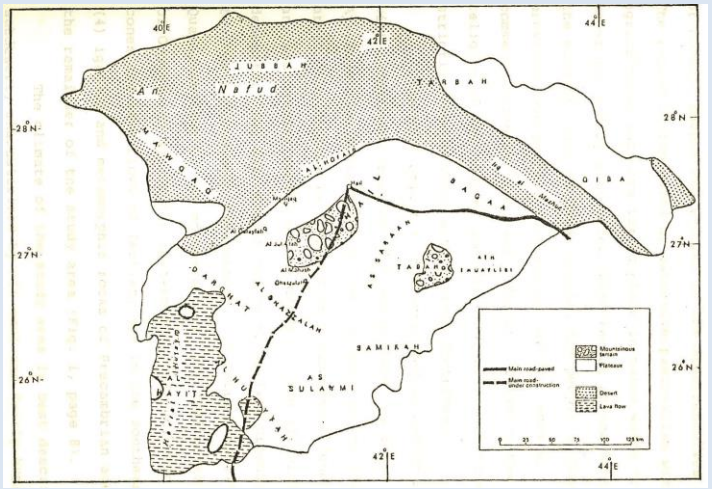
The earth observation satellite data play

an important role in detecting a wealth of hydrologic information.

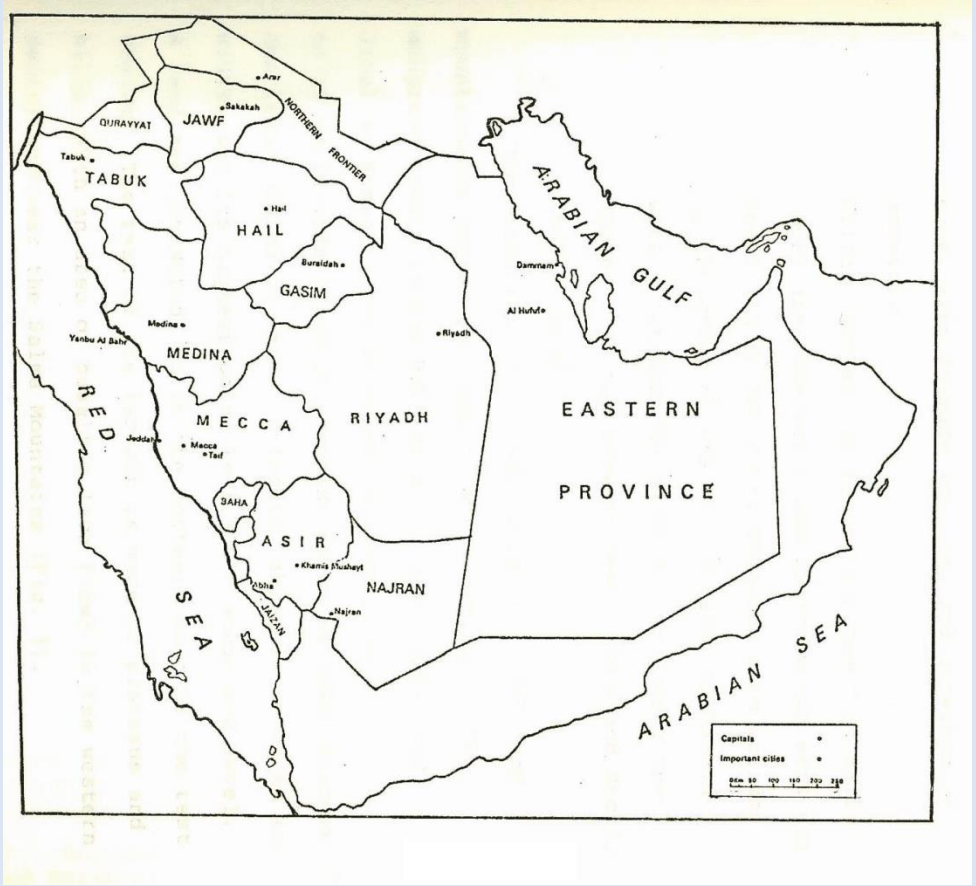
Two MSS images and RBV image (1972, 1979 and 1980 respectively)
of Ha'il Region of the Kingdom Saudi Arabia
were selected to apply remote sensing techniques
(image: correction, enhancement, analysis and interpretation).

The enhanced MSS and RBV images were used for developing
a geo-hydrologic model.

This geo-hydrologic model was utilized to
map the following surface features
that supply important clues for
locating potential ground water reserves in
Ha'il Region.



The Ha’il Region

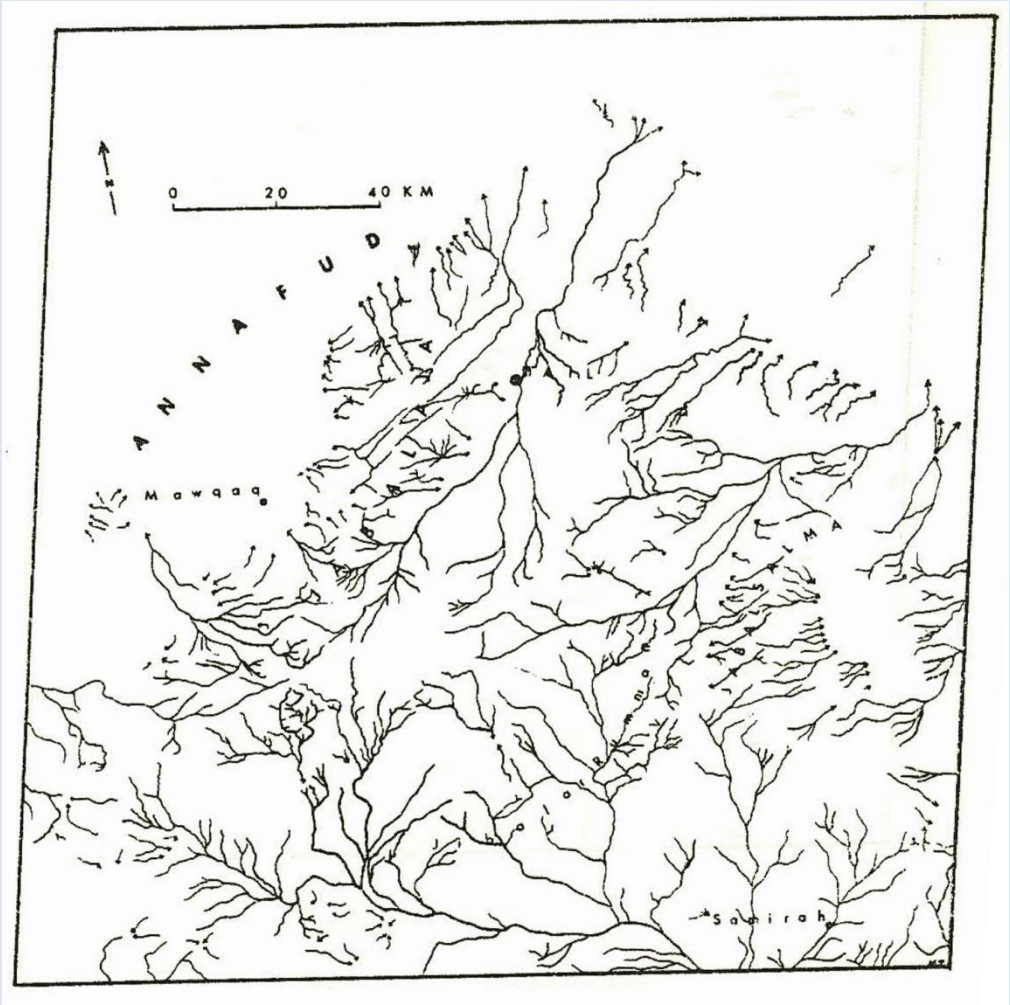


The 13’s Regions of KSA

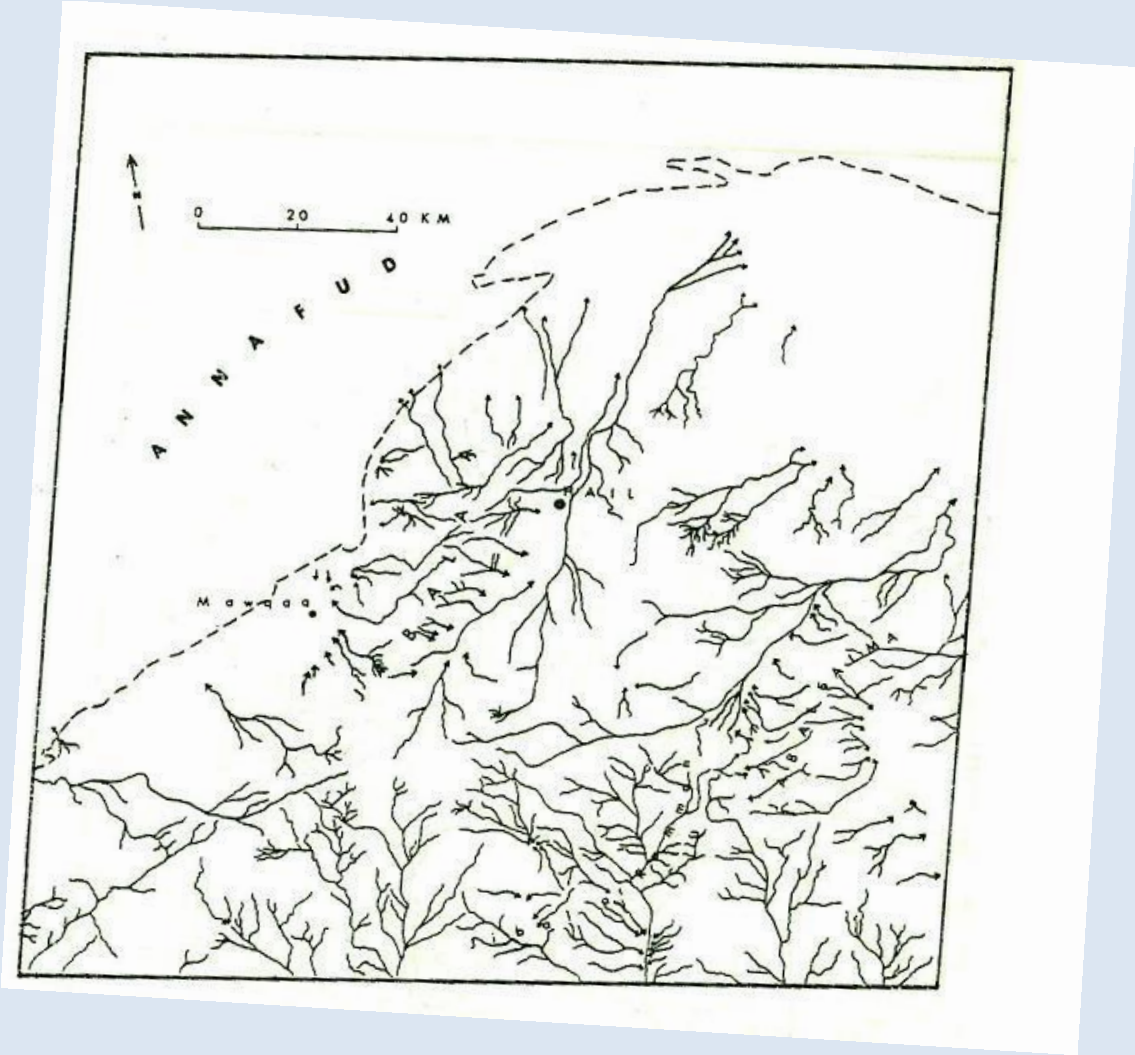
This geo-hydrologic model was utilized to map the following surface features that supply important clues for locating potential ground water reserves in Ha'il Region.

1. Distributions of exposed bedrock, alluvium and eolian feathers were used to study porosity differences which affect the flow of water.

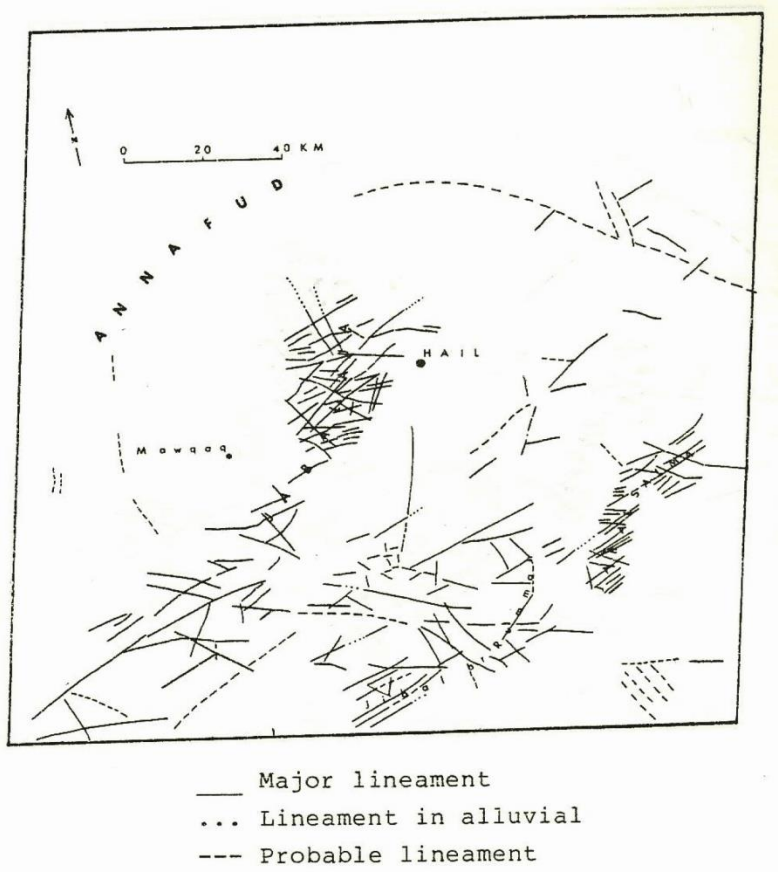
2. Distribution and direction of major drainage systems were used to infer surface and sub-surface water flow from mountains into potential basin reservoirs.

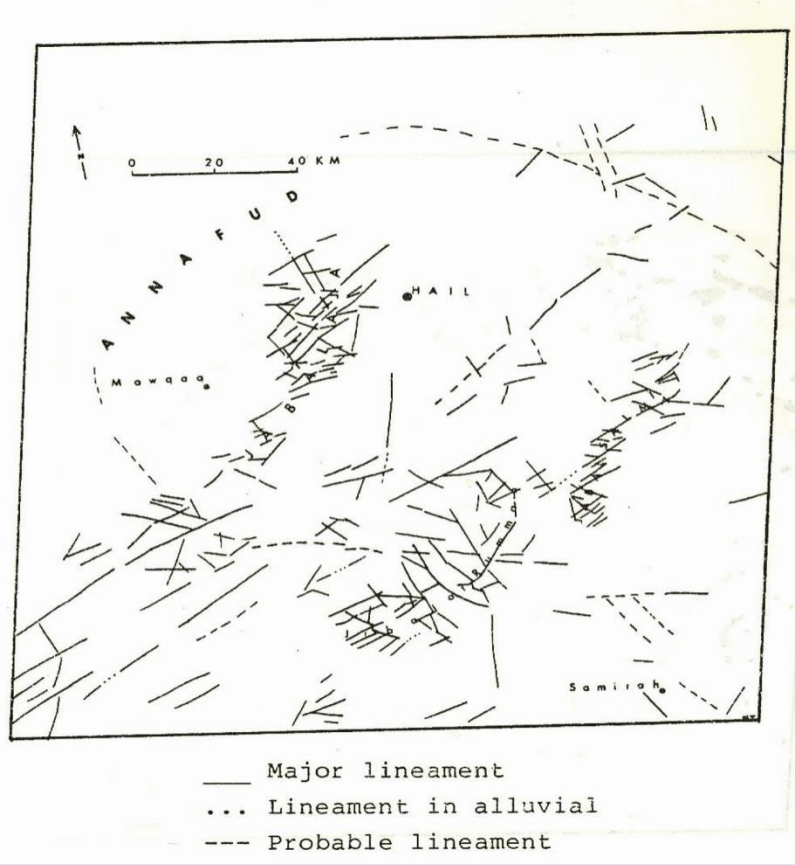


3. Drainage texture (e.g. coarse, medium, or fine) was used to infer water infiltration rates.

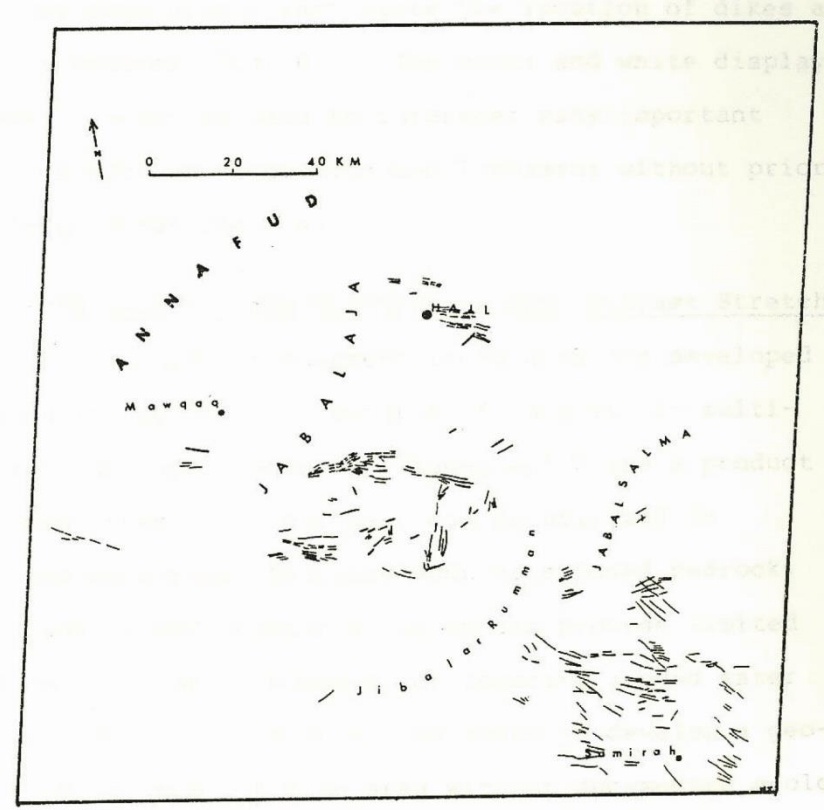


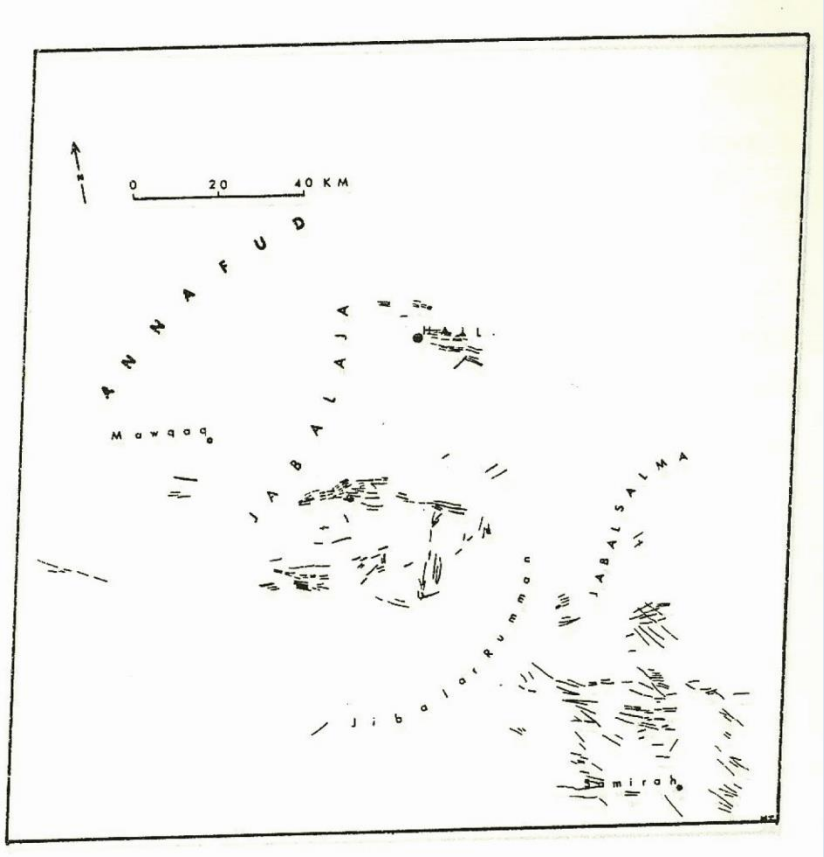
4. Lineaments in bedrock and surficial deposits locate potential environments for increased ground water movement.



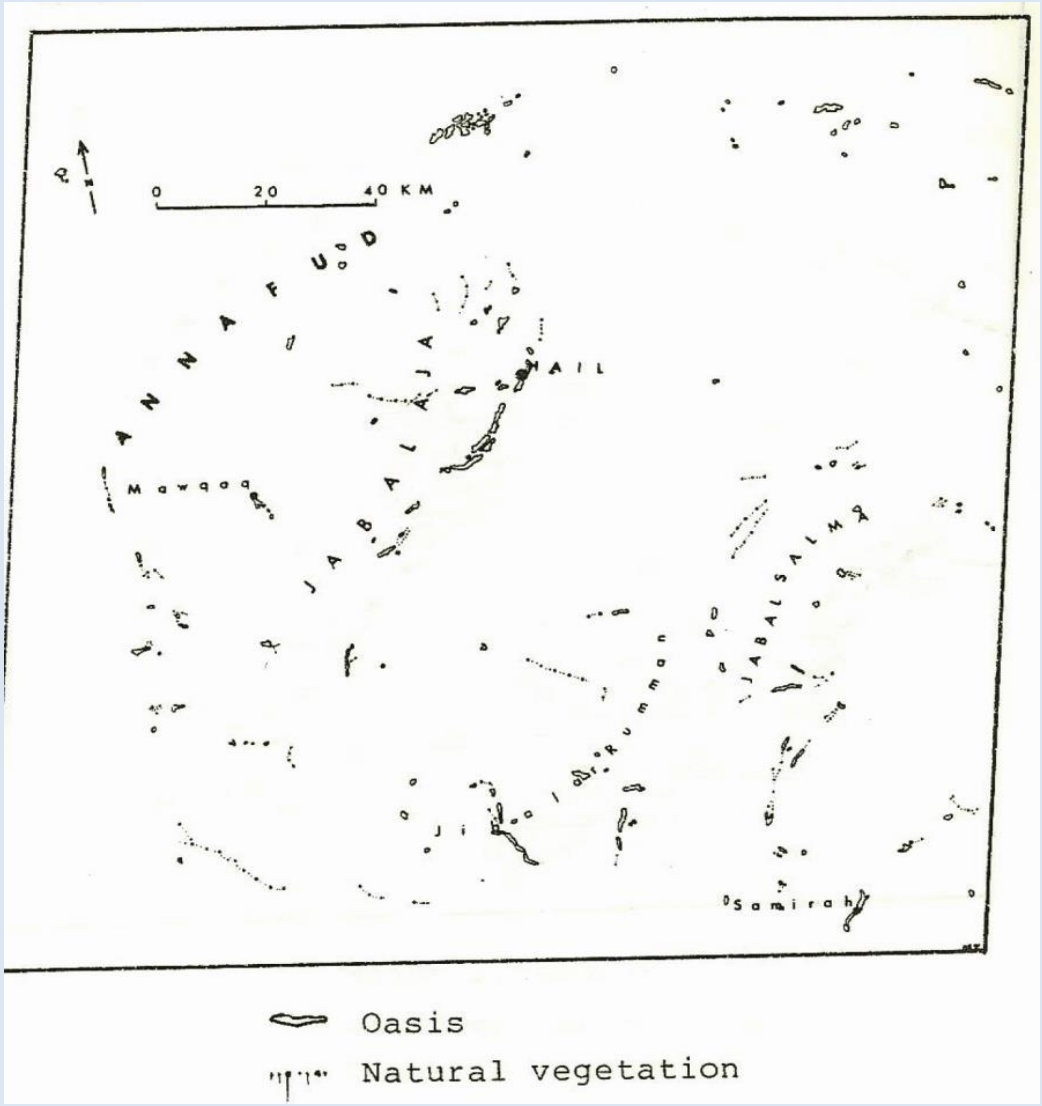


5. Dikes can act as underground dams altering both the surface and subsurface water flow.

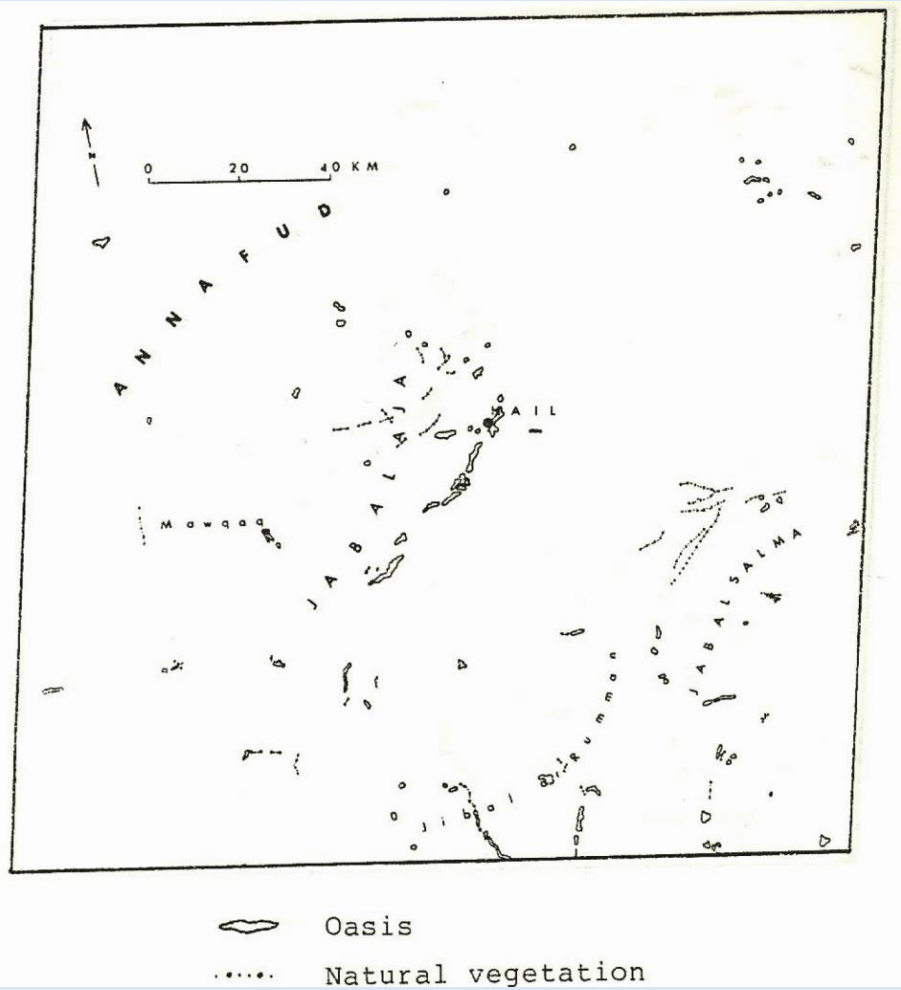




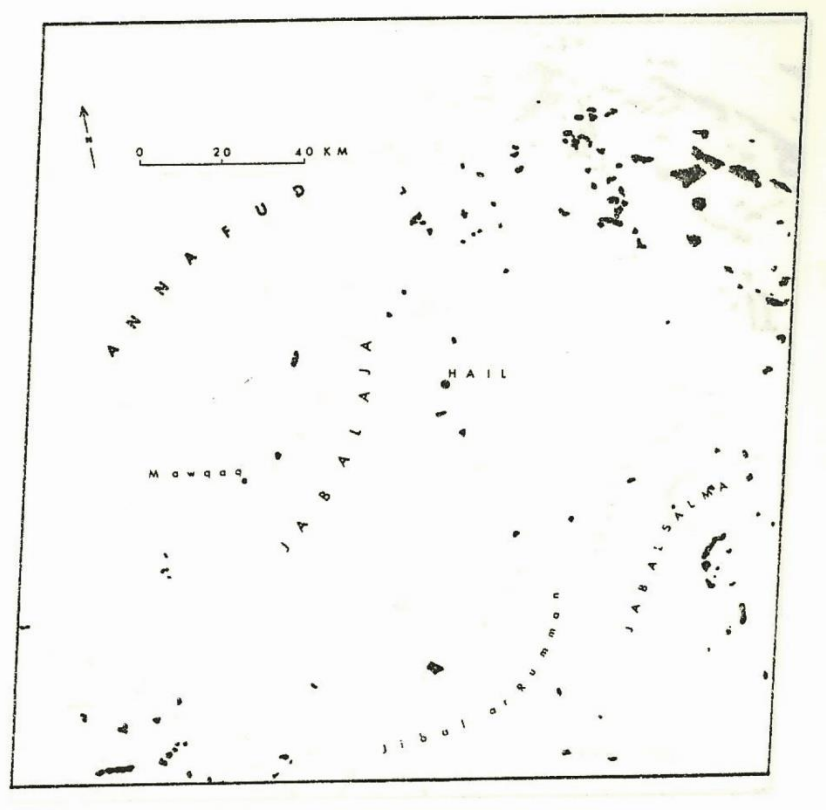
6. Preaphytic vegetation can be used as a potential guide to determine the depth and quality of ground water.

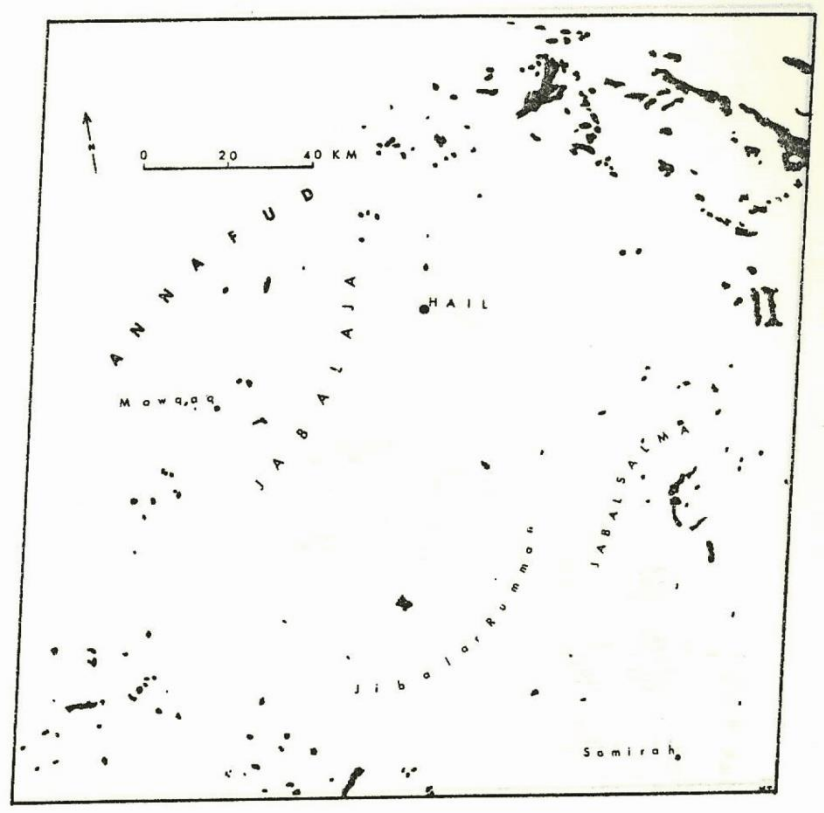


7. Irrigated vegetation locates existing recoverable supplies of ground water.



8. Playas mark the lowest portions of an enclosed basin and may indicate the location of shallow ground water; this water however may be highly mineralized.





The geo-hydrological models

The geo-hydrological models can be developed using two main approaches.

1. If there is adequate hydrological information for the area in question, conceptual models can be developed

prior to interpreting remotely sensed images.

2. If there is little or no ground data are available conceptual models can be developed based upon

the observations made from image interpretations.

Geographical Information System

Maps of the features were developed to scale 1:500,000

to be used in creating

The geo-hydrological models.

It was produced by

Overlays of the interpreted surface clues were registered manually with one another.

The selection of ground water sites in the area

was selected based on

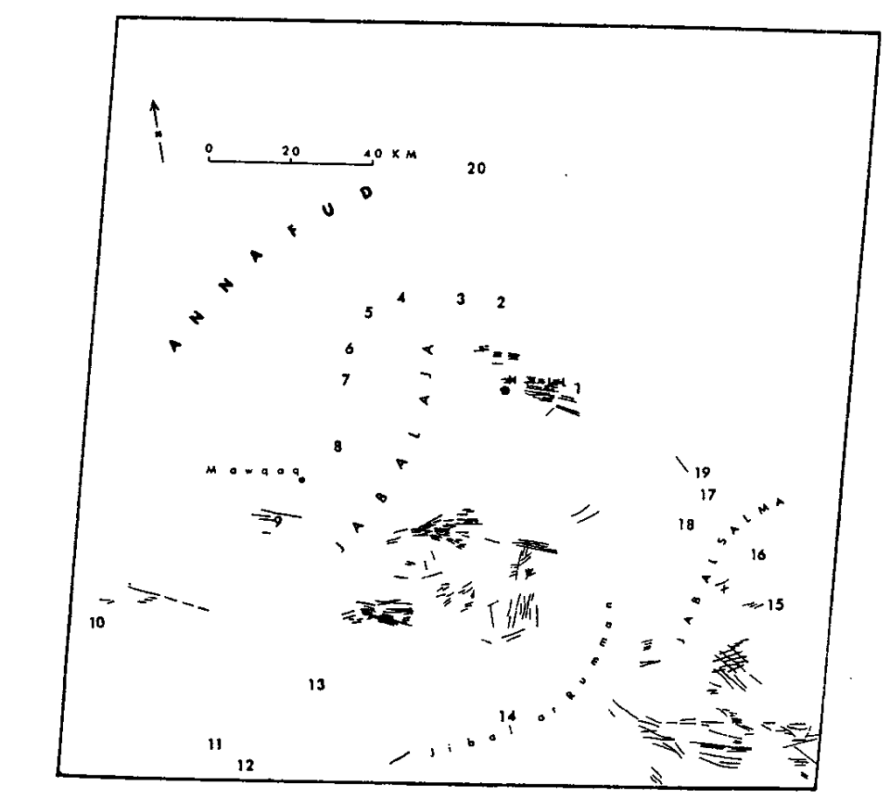
where are the most features located,

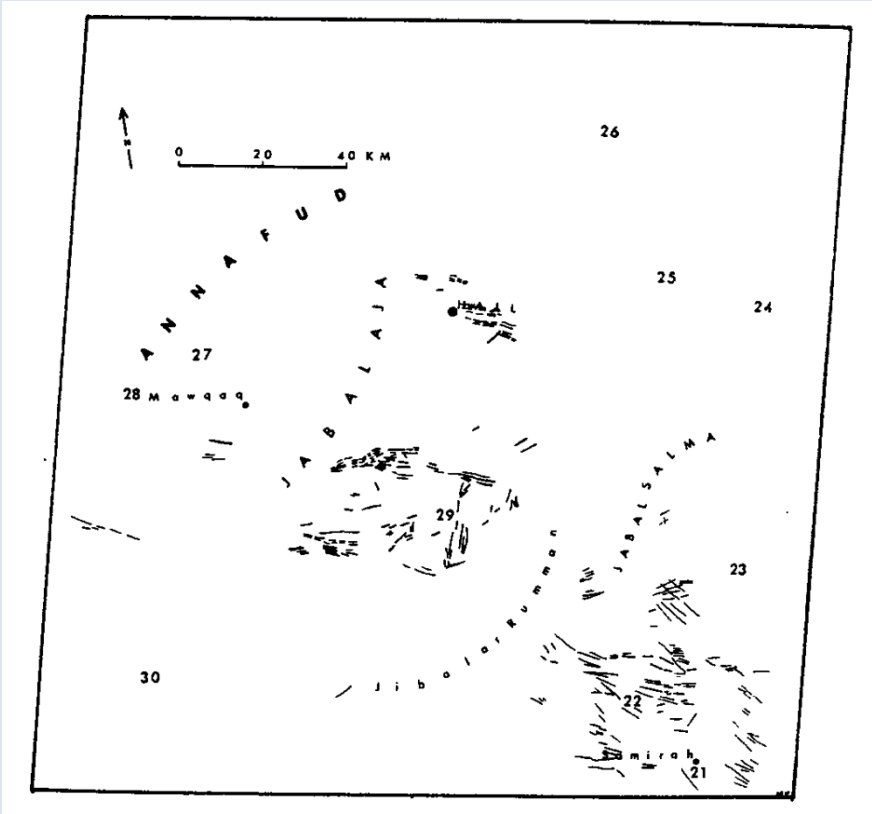
for example the occurrence of

wadis, vegetation, dikes and sand dunes.

Prediction of Sites for Ground Water Exploration

The prediction was made on the bases of preponderance of information given by the surface surrogates indicating the presence of ground water.





Conclusion and Recommendations

The predicted (30) selected sites from the geo-hydrological model were evaluated based upon the following criteria:

1. A real increase in vegetation between acquisition dates.
2. Drilling at the site.
3. Presence of settlements and farming activities.
4. Presence of surface surrogates suggesting potential ground water exploration sites.

By visiting the selected sites we have found the Geo-hydrological model was fairly successful in locating several potential ground water sites.

The Multispectral bands and the SAR Images of Earth Observation Satellite with Geographical Information Systems will play an important role in detecting a wealth of hydrologic information.

This model can be modified and improved

if more detailed geo-hydrological data are available

from

ground-monitoring stations and presently operating Earth Observation Satellites.

These data include

precipitation and runoff measurement, evapotranspiration, soil moisture, and documented geo-hydrological data.

The New Generation of the Earth Observation Satellites

have considerable improvement in resolution and multispectral capabilities.

The data from these satellites can provide improvements in delineation of surface features and in the overall performance of the geo-hydrological model.

THANK YOU FOR YOUR ATTENTION