An integrated study was conducted using remote sensing, hydrological and geophysical methods to investigate the role of structural elements in controlling the groundwater accumulation and flow in fractured basement complex. This research shows that the structural elements (fault/shear zones and dikes) could act as a conduit or a barrier for the groundwater depending on the direction of these elements with respect to the groundwater flow. These findings will help in more understanding of the fractured basement aquifers.

**OBJECTIVES**

1. What structural elements/features control the groundwater flow?
2. What is the nature of the structural control on groundwater accumulation and flow?
3. Identify new areas for digging potential well locations of high productivity.

**MAIN RESULT**

The adopted integrated methodologies could be readily applied to similar highly fractured basement arid terrains elsewhere.

**ABSTRACT**

An integrated study was conducted using remote sensing, hydrological and geophysical methods to investigate the role of structural elements in controlling the groundwater accumulation and flow in fractured basement complex. This research shows that the structural elements (fault/shear zones and dikes) could act as a conduit or a barrier for the groundwater depending on the direction of these elements with respect to the groundwater flow. These findings will help in more understanding of the fractured basement aquifers.

**FRACTURED CRYSSTALLINE AQUIFER**

**STUDY AREA**

1. **RADAR DATA - IDENTIFICATION OF WATER BEARING AREAS**
2. **TESTING WHETHER THE SATELLITE BANDS WATER-BEARING AREAS ARE PREFERRED PATHWAYS FOR GROUNDWATER INFILTRATION AND FLOW**

**NUBIAN SANDSTONE AQUIFER SYSTEM**

**STUDY AREA**

1. **INVESTIGATING THE IMPACT OF CONDUCTIVE FEATURES ON GROUNDWATER FLOW**
2. **GROUNDWATER POTENTIALITY**
3. **FINDINGS**

- Major sinistral NW-SE and dextral NE-SW trending shear zones, faults/fractures, and mafic dikes: are preferred pathways for surface or near-surface water flow along these structural elements.
- The majority of the investigated features were determined to be preferred subvertical pathways for groundwater flow as evidenced by the observed high Fraser-filtered VLF tilt values that were measured across the identified features.
- The groundwater flow is largely controlled by a complex network of preferred pathways encompassing walls, shear zones, faults, fractures, and mafic dikes.
- The suitable areas for digging new water wells are the at the intersections of these structural elements.

**METHODOLOGY**

2. Hydrological Data.
3. Structural Data
4. Geophysical methods: Very Low Frequency method (VLF)
5. Stable isotopic analyses.

**FINDINGS**

- The S to N groundwater flow in the confined Nubian Sandstone Aquifer System (NSAS) in central Sinai is intercepted by orthogonal (E-W trending) shear zones. These shear zones impede the groundwater flow causing considerable hydraulic head drop.
- A dramatic change in the regional flow direction was observed from south-north trend towards the Mediterranean Sea to a southwest-northeast trend across the political boundaries. Isotopic composition indicates change in water source within the high angle shear zones.
- The previous results suggest the alluvium of Wadi Gíñafí as a potential location for agricultural development.