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Seismic data interpretation for hydrocarbon potential, for Safwa/Sabbar field, East Ghazalat onshore area, Abu Gharadig basin, Western Desert, Egypt

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ABSTRACT

Safwa/Sabbar oil field located in the East Ghazalat Concession in the proven and prolific Abu Gharadig basin, Western Desert, Egypt, and about 250 km to the southwest of Cairo, it's located in the vicinity of several producing oil fields ranging from small to large size hydrocarbon accumulation, adjacent to the NW-SE trending major Abu Gharadig fault which is throwing to the Southwest.

All the geological, "structure and stratigraphic" elements, have been identified after interpreting the recent high quality 3D seismic survey for prospect generation, evaluation and their relation to the hydrocarbon exploration.

Synthetic seismograms have been carried out for all available wells to tie horizons to seismic data and to define the lateral variation characters of the beds.

The analysis has been done using the suitable seismic attributes to understand the characteristics of different types of the reservoir formations, type of trap system, identify channels and faults, and delineating the stratigraphic plays of good reservoirs such as Eocene Apollonia Limestone, AR "F", AR "G" members, Upper Bahariya, Jurassic Khatatba Sandstone, upper Safa and Lower Safa Sandstone.

The top Cenomanian Bahariya level is the main oil reservoir in the Study area, which consist of Sandstone, Siltstone and Shale, the thickness is varying from 1 to 50 ft along the study area.

In addition to Upper-Bahariya there are a good accessibility of hydrocarbon potential within the Jurassic Khatatba Sandstone and the Eocene Apollonia Limestone. More exploring of these reservoirs are important to increase productivity of Oil and/or Gas in the study area.

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1. Introduction

1.1. Location

The study area is geographically located onshore, within the south-eastern part of the northern portion of the Western Desert

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region of Egypt .The block is situated about 250 km to the west-south-west of Cairo and 200 km to the southwest of Alexandria, as shown in (Fig. 1).

It's located between latitudes 29°45" and 30°05"N and longitudes 27°30" and 28°10"E, in the vicinity of several producing oil fields ranging from small and large size hydrocarbon accumulation, Along the southern edge of the East Ghazalat concession, the map in (Fig. 1) shows multiple oil fields on either side of the concession.

East Ghazalat Concession is located in the proven and prolific Abu Gharadig Basin, North Western Desert, Egypt.

2. Western Desert General Geological History

The geologic history of the northern Western Desert is summarized as follows:

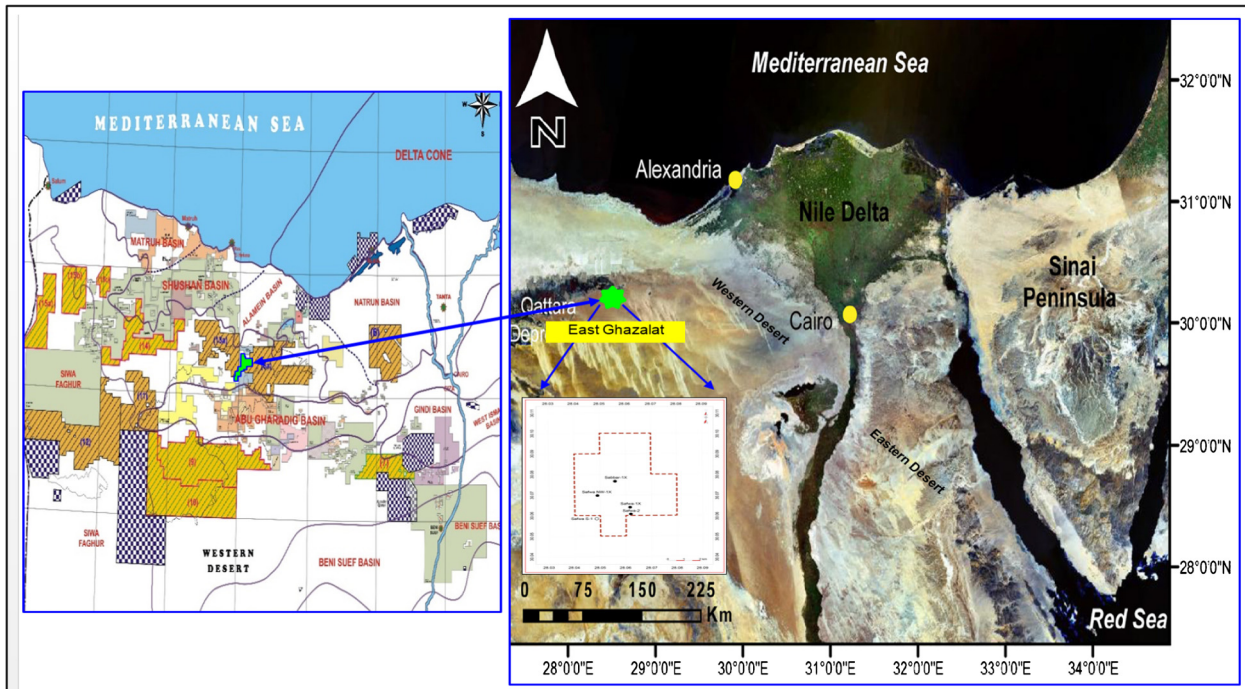


Fig. 1. Study area location map, Egypt, EGPC Western Desert concession map "2015".

- A shallow sea covered the central part of the Western Desert in Cambro-Ordovician time. A second transgression during the Carboniferous was restricted to the north.
- The Paleozoic sediments are more strongly folded than the overlying Mesozoic sediments, broad regional highs and lows may exist (ElShazly, 1977; Barakat, 1982). Khalil et al. (1983) mentioned that, there is a possible Paleozoic basin lies in the Abu Gharadig area, where 1300 m. of sediments were reached on drilling. A major disconformity is generally reported between the Paleozoic and Mesozoic (Beckman, 1967). No sediments of Permian age are known in Egypt (Orwig, 1982).
- The area above sea level was eroded at the end of the Paleozoic, i.e. Triassic sediments are missed.
- The area was subjected to emergence and local uplift (El Gezeery et al., 1972). This is represented by a widespread unconformity, which is recorded at the Jurassic-Cretaceous boundary.
- Lower Cretaceous transgression started from the north and northwest, then migrated to the east and possibly south. During Cenomanian, the deposition was affected by a major movement along the E-W faults crossing the central part of the study area.
- During Late Cretaceous, the sea continued to advance. It is represented by the wide transgression known in the geologic history of Egypt, which resulted in the extension of the Upper Cretaceous sediments extended beyond the limits of the other marine formations (Faris, 1956).
- Late Cretaceous-Early Tertiary diastrophism produced the major unconformities between Mesozoic and Tertiary sediments. Most obvious folds, which caused by the Laramide movements are the Syrian arcs, these started near the end of the Turonian (Salem, 1976), or during the Senonian (Beckman, 1967 and Barakat, 1982) and continued intermittently into the Paleozoic and locally to the end of the Eocene.
- At the end of Lower Eocene, a regional uplift or updoming occurred accompanied by a considerable block faulting along some old fault zones, with a partly NE-SW trend at least.
- During the Oligocene period, shaley Dabaa Formation had extended over most of the study area. Salem (1976) proposed a model for a series of NNW flowing rivers bringing those sediments to the Western Desert.
- During Early Miocene, the area received sandy fluvial-marine sedimentation reached the southern and western margins of it (Moghra Formation). Further transgression took place during the Middle Miocene and resulted in the deposition of the Marmarica Formation. From Late Miocene onwards, a general regression took place and most of the Western Desert was subjected to subarid erosion.
- Pliocene and Quaternary deposition is characterized by thin accumulation of clastics, with few calcareous interbeds across the area. Such deposition rests over the Middle Miocene or older sediments with a marked disconformity (Abdel Hamid, 1985).

2.1. Basin evolution

The prospectivity is related to several intra-basinal having NE-SW and E-W trends, forming structural highs and ridges. The main hydrocarbon play associated with stacked Cretaceous reservoirs, additional potential exists in platform area where Cretaceous and Jurassic and pre-Jurassic reservoirs are present at relatively shallow depth, the rocks are related to by both Cretaceous and Jurassic located in the basin and basin margins.

2.2. Structure

The structure of the study area is situated adjacent to the basin margin of Abu Al Gharadig Basin and with good accessibility to the hydrocarbons generated from the kitchen area where Cretaceous and Jurassic source rocks are capable of generating/expelling large volumes of oil and gas.

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