



INTEGRATED GEOPHYSICAL STUDIES OF EASTERN SIRT BASIN AND SOUTHWESTERN CYRENAICA PLATFORM, LIBYA

Y. Abushaala (1), A. Ben Suleman (2)

(1) Exploration Dept., OMV Exploration and Production Ltd, Libya Ltd.

(2) Geophysics Department, Faculty of Science-Al Fateh University

Libya is situated on the Mediterranean foreland of the African shield; it extends over a platform of cratonic basins. These basins have been differentiated into intra-cratonic and epi-cratonic basins, each with a specific development tectonic history, and own hydrocarbons systems. Sirt basin forms a rift system and a main oil hydrocarbon accumulation, particularly in the southeastern and the northwestern regions. The present study represents a comprehensive seismic and gravity investigations aimed to provide qualitative and quantitative information that would assist in the interpretation of the tectonic and structural history of the area under investigation.

Seismic data used in this study includes four different surveys with different seismic sources (dynamite and vibroseis) and varying grid density ($2 \times 2 \text{ km}^2$ to $5 \times 5 \text{ km}^2$). These data had a variable quality, so that quality control (QC) and mis-tie had to be precisely performed, due to the fact that it consequently had a strong influence on the seismic interpretation. Depth conversions were constructed using six interval velocities resulting in depth seismic sections and depth maps. The gravity database for this study was collected from the Libyan Petroleum Institute database. This gravity database was used to generate the Bouguer gravity anomaly map that represents the basic map used in the overall interpretations, as well as in generating more specialized gravity maps used in the detailed gravity investigations. All maps employed the Lambert projection. The tectonic histories were reflected in the seismic and gravity data by dominantly showing two major structural trends; a NE-SW trend which represents the

Cyrenaica platform and a NW-SE trend represents the Sirt Basin. Stratigraphic units; pre-, syn- and post rift have been distinguished into three phases in Sirt basin area, by seismic data. However, there are limited distribution of some horizons; Nubian and Maragh, and these had a poor quality of data which obscured picking them. In addition the gravity data shows the possibility of dextral strike slip fault with NE-SW trending direction which has been developed during the formation of Sirt basin. The hydrocarbon system of the study area dominantly represents the northwestern region of Sirt basin petroleum system; Sirt shale source rock, Nubian, Maragh, Sabil, Gir and Augila reservoirs. However, Triassic source rock might contribute in the eastern part of the area. A lack of structural traps (three or four ways dip closure) was shown in the shallow horizons on some parts from seismic interpretation, because of the tilted fault block was aligned with the fault dip. This situation can be contrasted with Zelten Platform in the opposite direction of Ajdabiya trough which shows a good fold forced closure. Nevertheless, three leads have been recognized from seismic data; patched reef, structural closure and fold drape.