Offshore Cyrenaica High Resolution Bathymetry Analysis: New Revelations using WWII Technology

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Abstract

The offshore area of Cyrenaica has a scarce history of geological studies, because of the limited offshore hydrocarbon exploration activities, compared to the Nile Delta Basin to the east and the Gabes-Tripoli Basin to the west. The structural high onshore is known as Al-Jabal Al-Akhadar (The Green Mountain) which is dominated by carbonate formations ranging in age from Cretaceous up to late Miocene. The geological architecture of the exposed geology is under constant research and is largely understood. However, subsurface data is scarce and offshore data is almost not available, except for few offshore wells and 2D seismic lines. This lack of data led to a search in all the different public and private domains in order to have a detailed view on the offshore area of Cyrenaica and attempt to relate the geological features observed to its development. The data processed in this research project utilizes sonar data collected from the second world war. This data was compiled with the help of different software packages to produce a detailed 3D bathymetric map. The bathymetry map produced is the first in this region and was quality checked against neighboring countries bathymetry calculations and sea floor seismic maps. The submarine features revealed by this bathymetric map gave rise to new geological features that can further develop our understanding of the origin of Al-Jabal Al-Akhadar. Based on this bathymetry map features such as a submarine trench, magmatic bodies, submarine canyons, and a sea floor high area "plateau" was interpreted. The maximum depth of this trench reaches -4096 mss, 152 km north of Benghazi City. The bathymetry produced shows volcanic bodies 150 km north the city and south of the trench helping identify its polarity and raising discrepancies in previously interpretation polarity. This suggests that the trench is a subduction zone, probably leading to the uplift and formation of the Al-Jabal Al-Akhadar anticlinorium. It is found that the axis of the trench diverts to the north towards Italy once it approaches the submarine volcanic rocks and continues till it merges with the Apennines thrust belt. In this paper the interpreted trench (subduction zone) will be named the Cyrenaica Trench. Analysis of satellite images on the onshore area suggest that the African plate kinematics at the uplift had different vectorial angles resulting in a dextral strike-slip motion across the Cyrenaica Trench combined with subduction. This paper will present a general investigation of the structural setting of the onshore and offshore area of this mountain range and its structural extensions in an attempt to unravel its complex tectonic history, utilizing high resolution 3D bathymetries, satellite images and field work.