THE LIBYAN CONTINENTAL MARGIN, BETWEEN 23°30 E AND 25°30E

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Abstract
Between 23°30 and 25°30 Long. East, i.e over a distance of approximately 200km, the morphology, sedimentary cover and geological stuctures of the continental margin off Libya have been analyzed using swath bathymetry and seismic reflection data recorded during PRISMED 2 survey. This segment of the Mesozoic african continental margin of the Mediterranen sea shows three distinct areas characterized by contrasted morphology and geologic structures. Such variability is partly explained by differential overthrusting of the Meditterranean ridge over its foreland, the libyan continental slope and, by incipient continental collision processes.

Keywords: Eastern Mediterranean Sea, Continental margin, Libya, Geologic structure.

Introduction

On the basis of PRISMED 2 survey data, the Mesozoic passive margin of Eastern Mediterranean Sea, north of Libya, between Longitude 23°30 and 25°30 East, i.e. on a distance of about 200km, can be divided into three distinct segments showing different morphologies and contrasted geologic structures.

Morphology and structure

Over the study area, between Crete and Libya, the African margin faces the northern bordering Mediterranean Ridge (MR), which itself overthrusts the base of the former Mesozoic continental slope; the two features are now only separated by a narrow furrow.

A first segment constitutes the continental slope off Cyrenaica. There the continental margin has been tilted to the south as shown by southward dipping seismic sequences covered by unconformable and thin recent units. A second margin segment (about 80 km long), offset towards South from the previous one is cross cut by important canyons which have probably contributed to the sedimentary infill of the flat and narrow depressions that disconnect the base of the continental slope from the MR thrust front. In this domain seismic data show the MR accretionnary prism to be overriding on the base of the continental slope, as attested by the presence of discontinuous reflectors, detected at depth beneath the MR toe .Finally, a third margin segment, characterized by comparable sedimentary cover,made of two main units separated by an erosional unconformity, can be distinguished eastwards. Deep reflectors may also be locally detected at depth beneath the proximal overriding MR front of deformation. Within the three margin areas, the sea bottom displays numerous evidences of sedimentary slumps. Finally, the three segments face distinct domains of the MR front, characterized, either by few, almost flat and imbricated thrusts (western slope segment), northward dipping and steepy thrust zones, (central margin segment), or by a series of small and assymetric folds in which progressively eastward thickenning Messinian evaporites are involved.

Discussion and conclusion

Our seismic data, as well as a few previous MCS lines and other geophysical data (1, 2, 3, 4), do not show any evidence of typical Messinian evaporitic sediments in the investigated area of the libyan continental slope. We therefore believe that the late Miocene event has been either recorded on the margin by thin clastics, or more probably by an erosional unconformity, between the upper and lower seismic units.

On the western slope, this hiatus may well be mixed up with an angular unconformity detected between the southward tilted lower sequences and the upper ones.We are propose that the tectonic event which lead to this tilting, was coeval with the Messinian erosional episod. In other words, a pre-collision event between the MR and the Libyan margin, apparently better expressed westwards, may have already occured by latest Miocene times.

Finally, the differences at the contact between the margin segments and the MR frontal thrust zones appear to be not only related to differences in precollision setting (5), but also to the presence,or not, of evaporitic units. The availability of this material is inferred to have greatly facilitated the MR southward growth, and its progressive overthusting above the former Mesozoic continental slope (6, 4). We believe that this area of the Libyan continental margin can be considered, as a whole, as a good model where progressive geologic effects of an initiating continental collision migth be evaluated.

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