

Geophysical evidence for a transform margin in Northwestern Algeria: possible vestige of a Subduction- Transform Edge Propagator

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This work is part of the Algerian-French SPIRAL program (Sismique Profonde et Investigation Régionale du Nord de l'Algérie) which provides unprecedented images of the deep structure of the western Algerian Margin based on several wide-angle and multichannel seismic data shot across the Algerian Margin. One of the different hypotheses for the opening of the western Mediterranean Sea, we are testing is that the western part of the Algerian margin was possibly part of the southern edge of the Alboran continental block during its westward migration related to the rollback of the Betic-Rif-Alboran subduction zone. A tomographic inversion of the first arrival traveltimes along a 100-km long wide-angle seismic profile shot over 40 Ocean Bottom Seismometers, across the Margin offshore Mostaganem (Northwestern Algerian Margin) was conducted. The final model reveals striking feature in the deep structure of the margin from north to south: 1- the oceanic crust is as thin as 4-km, with velocities ranging from 5.0 to 7.1 km/s, covered by a 3.3 km thick sedimentary pile (seismic velocities from 1.5 to 5.0 km/s) characterized by an intense diapiric activity of the Messinian salt layer. 2- a sharp transition zone, less than 10 km wide, with seismic velocities intermediate between oceanic seismic velocities (observed northward) and continental seismic velocities (observed southward). This zone coincides with narrow and elongated pull apart basins imaged by multichannel seismic data. No evidence of volcanism nor of exhumed serpentized upper mantle as described along many extensional continental margins are observed along this segment of the margin. 3- a thinned continental crust coincident with a rapid variation of the Moho depth imaged from 12 to ~20 km with a dip up to 50%. The seafloor bathymetry is showing a steep continental slope (>20%). Either normal or inverse faults are observed along MCS lines shot in the dip direction but they do not present large vertical displacement and could be related primarily to strike slip motion. These results support the hypothesis, that the margin offshore Mostaganem is not an extensional margin but rather a transform margin. There is little evidence of tectonic inversion as described eastward along the Kabylia Margin. Possibly strike slip motion affected the thinned continental crust and the transition zone suggesting that this margin is a vestige of the Subduction-Transform Edge Propagator (STEP) related to the westward migration of the Alboran block.

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