Geophysical Research Abstracts
Vol. 13, EGU2011-8111, 2011
EGU General Assembly 2011

How atypical is the Algerian passive margin? First results from structures imaged by seismic data off Tipaza, central Algerian margin

Angélique Leprêtre (1), David Graindorge (1), Frauke Klingelhoeffer (2), Philippe Schnurle (2), Rabah Bracène (3), Abdelkarim Yellès (4), and Jacques Déverchère (1)

(1) IUEM / UBO, UMR Domaines Océaniques, Plouzané, France (david.graindorge@univ-brest.fr), (2) Ifremer, Plouzané, France, (3) Sonatrach, Boumerdès, Algeria, (4) Craag, Alger, Algeria

The origin of the Algerian margin remains one of the key questions still unresolved in the western Mediterranean sea. Part of the answer lies in the basin of whom the nature and the age is still discussed. Thereby the way the basin has opened as well as its geometry have received various interpretations that are still questionable. Most models of evolution agree to propose that the westernmost margin has been shaped as a STEP-fault (transcurrent) margin by the westward displacement of the Alboran block controlled by the rollback of a remnant Tethyan ocean. The central Algerian margin has probably recorded a different evolution, generally believed to have involved: 1) a NW-SE basin opening related to a southward slab retreat, 2) a collision of internal zones (Kabylies), 3) a slab detachment or a tear with a double migration (W and E), 4) an associated strong thermal perturbation at about 17 Ma, and 5) a late final reactivation in compression. In this work, we gather the available structural information on a N-S transect off Tipaza, where the margin is enlarged due to the presence of a topographic high (the Khayr-Al-Din bank) which is assumed to represent a remaining tilted block of the passive continental margin. We present a preliminary FAST tomographic model (First Arrival Seismic Tomography, Zelt et Barton., 1998) obtained from the cruise SPIRAL (2009) led by an Algerian-French consortium. This velocity model has been obtained by the inversion of 11478 travel time recorded by a set of 39 OBS (Ocean Bottom Seismometers) from 751 sub surface low frequency airgun source shots. A second layered velocity model obtained using the Zelt and Smith (1992) forward inversion scheme integrates subsequent Multichannel Seismic (MCS) information of the sedimentary layers and 4 land stations data. The velocity models have been used to build a gravity model that fits the observed gravity anomaly. These sections give the first low-resolution whole structure of the Algerian margin from the coastal ranges to the deep Algerian Basin in the Tipaza area. The combined SPIRAL MCS line 6 outlines precisely the internal structure of the sedimentary section depicting the intensive salt tectonics and allowing to image locally below the salt layer. We evidence a spectacular thinning of the crust from a thickness of 15 km in the upper margin to only 5-6 km in the deep basin. Then the Algerian basin exhibits a thin crust with velocities that match an oceanic nature. The transitional zone is about 20 to 30 km large and is imaged as a sharp transition, in marked contrast with the area off Boumerdes further east. The velocity model confirms that the steep slope corresponds to the northern flank of a 10 km thick continental crust block. Quaternary sediments are clearly thicker at the foot of the margin, and the top of the crust appears to dip southwards, which we interpret as a possible indication of the reactivation in compression of the margin. This is reinforced by a folded structure at the foot of the slope which is clear on MCS lines. For the deep structures, the upper mantle depicts velocities that range between 8.0 and 8.2 km/s, ruling out a strong effect of serpentinization or underplating at this place. We then present this tomographic structure in the light of global tomographic models, petrological and seismotectonic data of the area in order to discuss the role played by the slab rollback and possible detachment in this margin formation and evolution until today.