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Deep structure of the Easternmost part of the Algerian margin and adjacent deep basin in Annaba Region deduced from wide-angle modelling and multichannel seismic data

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Authors
Bouyahiaoui, B*, CRAAG, Algiers, Algeria
Abtout, A, CRAAG, Algiers, Algeria
Sage, F, Geoazur, Sophia-Antipolis, France
Klingelhoefer, F, Ifremer, Brest, France
Yelles-Chaouche, A, CRAAG, Algiers, Algeria
Collot, J Y, Geoazur, Sophia-Antipolis, France
Galvé, A, Geoazur, Sophia-Antipolis, France
Schnürle, P, Ifremer, Brest, France
Marok, A, Abou Bekr Belkaid university, Tlemcen, Algeria

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Deep penetrating low frequency multichannel and wide-angle seismic data were acquired in order to study the deep structure of the Algerian margin. In this work, we present the results from wide-angle modeling of the North-east Algerian margin in the region of Annaba, along a N-S transect extending 117 km offshore and 80 km onshore. Data from 42 OBS (ocean bottom seismometers) and 13 broadband seismological stations were used to model the velocity structure by travel-time tomography and forward modeling of the P- and S-waves. Within the deep basin, the resulting velocity models images a ~ 3 km thick sedimentary cover that thickens to ~ 5km at the foot of the margin and thins to ~ 300m toward the uppermost part of the margin. The igneous crust is about 5 km thick in the deep basin, except between 40 and 60 km distance from the margin toe where it locally reaches 7 km. below the continental margin; the crust gradually thickens to reach ~23 km at the shoreline, a value typical for continental crust. The ocean-continent transition is located at the margin toe and only a few kilometers wide. Below the igneous crust, velocities higher than 8.0 km/s are interpreted as the upper mantle. The velocity model is additionally constrained by gravity modeling and synthetic seismogram modeling. Within the deep basin, the wide-angle modeling reveals an oceanic crust thinner than usual. S-wave modeling constrains the Poisson ratio in the lower crust to be ~0.27 and therefore indicates that the deep crust is mainly composed by gabbros rather than by peridotites, suggesting normal accretionary processes in the part of the Algerian basin. We use these results, together with complementary gravity and magnetic data, to discuss the geodynamic models previously proposed for the opening of the Algerian basin.

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