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Deep structure of the Algerian continental margin in the region of the Great Kabylies - Insights from wide-angle seismic data modelling

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During the Algerian-French SPIRAL cruise (Sismique Profonde et Investigation Régionale du Nord de l'Algérie) conducted onboard R/V Atalante (September-October 2009), one deep reflection and wide-angle seismic profile with total length of 140 km was acquired on the Algerian margin, offshore Greater Kabylia. 40 ocean bottom seismometers (OBS) were deployed on the profile, located perpendicular to the margin and it was additionally extended on land using 26 seismological stations. A 8350 in3 tuned air-gun array consisting of 10 Bolt air-guns was used to generate deep frequency shots to allow for a good penetration. A coincident multi-channel seismic profile was acquired using a 3040 in3 seismic source and a 4.5 km 360 channel digital seismic streamer. Underway geophysical measurements included gravimetric and magnetic data. The combined profile with a total length of about 260 km, crosses from north to south the Algero-Provençal basin, the central Algerian margin and onshore the crystalline basement of the Kabylides bloc up to the southward limit of the internal zones. We present results concerning the sedimentary and crustal structures in the study area using tomographic inversion, forward and gravimetric modelling. Modelling of the wide-angle and multi-channel seismic data reveals that the thickness of the sedimentary cover along the profile varies from several hundreds of metres onland in Tiziouzou basin (R. Bracéne 2001), to ~4 km at the foot of the margin and then decreasing northward to less than 3 km. The Messinian evaporitic units have been modelled by a high velocity layer, representing a velocity inversion with underlying pre-Messinian Miocene sedimentary layers. Progressive thinning of the continental crust towards the North is observed, with thicknesses decreasing from ~20 km at the foot of the margin to 4-5 km in the deep basin. Seismic velocities range between 6.2 and 6.6 km/s in the continental domain and 5.2 - 6.8 km/s in the deep basin. The uppermost crust of the deep margin is characterised by low velocities of only 4.5-5.0 km/s probably due to fracturing during the thinning of the crust. The transition between continental crust and crust of oceanic origin is located about 60 km from the coast. Its extension is very narrow (< 20 km) with a possibility of it being absent in this region. The crust underlying the basin at the foot of the continental slope is characterised by a thickness of only 3-5 km which is about 2 km thinner than normal oceanic crust. Seismic velocities however indicate that the crust is of oceanic origin and does not represent exhumed and partly serpentinised mantle material, although the presence of small amounts of mantle material in an otherwise igneous crust cannot be ruled out. Similar thin oceanic crust has been imaged in other Mediterranean Basins, such as the Liguro-Provençal basin (Gailler et al., 2009).

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