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Strike-Slip Deformation at the Ocean-Continent Boundary of the Algerian Continental Margin : Surface Expression of a STEP?

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The complex geodynamic evolution of westernmost Mediterranean during Tertiary suggests the occurrence of STEPs (Subduction-Transform Edge Propagators) along the south-east Iberian-Balearic and the west Algerian margins, in relation to the westward roll-back of the Tethyan slab. Conceptual and numerical modelings of STEP predict strike-slip deformation above the deep tear of the slab, which has not been evidenced so far. We present here the first structural evidence of strike-slip deformation offshore Algeria likely associated to a STEP. New deep multichannel seismic lines of the Algerian-French SPIRAL cruise (September 2009, R/V Atalante) and complementary industrial lines from Sonatrach on the westernmost Algerian margin display a narrow and straight asymmetric basin, bounded by two steep conjugate faults parallel to the margin toe. This basin is divided in two main segments following the change in direction of the margin in the Tenes area. The downward offset of the base of the Messinian salt layer in the basin attests of a thick-skin tectonics. The overall geometry of this basin is in favor of a Miocene to Plio-Quaternary crustal strike-slip deformation, with a transtensional component in the eastern segment, and possibly a dextral shear sense. Wide-angle SPIRAL seismic data modeling indicates that the basin is located at the ocean-continent transition (OCT). Although less clearly expressed in the Khayr-al-Din segment, a comparable basin is also present eastward in the central part of the margin offshore Great Kabylia. Its geometry there is similar to the one observed offshore Tenes, or with a transpressional component at its easternmost end northward of Tizirt. It is also located at the OCT that is further north in this area. We discuss the interpretation of this more than 400 km-long basin as the surface expression of a STEP offshore Algeria and the implications for the geodynamic evolution of Western Mediterranean.

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