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Mapping the oceanic flexure off Algeria: Along-strike changes in space and time

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Kinematic reconstructions in the Tethyan realm advocate for the frequent occurrence of slab polarity reversals following collisional stages. However, there is actually very few case studies of ongoing polarity reversals documented, a process that requires significant energy to bend the oceanic plate. In this study, we provide further evidence for an incipient slab reversal occurring along the Algerian margin after the closure of the western Ligurian Tethys (Western Mediterranean Sea). In the 70's, Auzende et al. (1975) have suspected the initiation of a suduction at this place from the first evidence of an anomalous, thick Plio-Quaternary layer at the margin toe.
The Algerian basin is a Cenozoic oceanic domain formed from back-arc extension induced by the southward retreat of the Tethyan subduction, a process that ended approximately 17-19 Myr ago with the collision of Kabylian blocks with Africa. However, it is suspected that the western and central oceanic domain is younger, since slab tear propagated from East to West, together with the westward migration of the Alboran block, and giving birth to a transform-type margin. Today, geodetic, seismological and neotectonic data show that the Algerian margin is experiencing a NW-SE compression due to the Africa/Europe convergence, which causes a significant number of large earthquakes (among them, Orléansville 1954, El Asnam 1980, Boumerdès 2003).
Using available seismic profiles, mostly from the Maradja (2003 and 2005) and Spiral (2009) cruises, we attempt to map the along-strike changes of the top of basement, the thickness of Pre-Messinian and Plio-Quaternary deposits and the onlaps within the sedimentary succession. From this analysis, we first discuss the changes in amplitude and wavelength of the oceanic flexure: we evidence a major difference between the western, transform-type margin and the eastern, rifted-type one. If the structure of the upper plate (continental margin) obviously plays a key role, we show that the age and the thermal/internal structure of the oceanic plate exert also some control of the flexural response. Secondly, we map and compare at a regional scale the development of the main active thrusts and folds of the margin. They are often buried at the margin toe and sometimes propagate within the deep basin. Lastly, we use the internal structure of the sedimentary wedge (growth strata) and a simplified age model to date the onset of slab reversal and to discuss a possible diachronicity of this tectonic inversion.