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Vp and Vs velocity models from the Eurasia-Africa plate boundary across the Gloria Fault, North Atlantic Ocean

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The oceanic crustal and uppermost lithospheric mantle structure across the Gloria Fault transcurrent plate boundary between Africa and Eurasia in the Northeast Atlantic is investigated based on seismic reflection, seismic refraction and wide angle reflection data. This experiment used 18 ocean bottom stations along a N-S 150 km long traverse together with coincident acquisition of a multichannel seismic reflection profile.
Structural and seismic stratigraphic interpretation of the reflection profile shows that Neogene to recent tectonic deformation on this segment of the plate boundary concentrated on the southern side of the Gloria Fault, i.e. the Africa plate.
Modeling of P and S seismic waves and gravimetric anomalies allowed estimation of velocities, density, Poisson's ratio and proposal of a compositional model. A five layer model is proposed in which layers 1 to 3 correspond to normal sediments and typical oceanic crust layers 2 and 3, respectively. Layer 5 yielded mantle velocities above 7.9 km/s. Layer 4 with 4 km of thickness has Vp velocities between 7.1 and 7.4 km/s.
Layer 4 velocities can be found at the base of the lower crust and at the uppermost hydrated lithospheric mantle as reported from various authors from other parts of the Earth. Enrichment in olivine at the base of the lower crust, as a result of underplating, could explain Layer 4 velocities; however, there are no morphologic evidences associated to plume activity. On the other hand, morphologic, geologic and seismicity generated along the Gloria Fault (M>7-8.4) indicates that the Gloria Fault has accumulated ductile and brittle deformation from the upper mantle through the surface.
It is here argued that pathways for fluid migration through seismic pumping mechanisms have provided the conditions for partial serpentinization of the peridotite mantle rocks, which probably make up the bulk of Layer 4.

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