Nature of oceanic lithosphere across the Equatorial Fracture Zones in the Atlantic Ocean using seismic tomography

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The Equatorial Fracture Zones in the Atlantic Ocean have played fundamental role in the breakup of Africa and Brazil. It has been suggested that the lithosphere beneath these fracture zones is cold. However, the nature of these fracture zones remains unknown. The ILAB-SPARC profile1 extends 850 km with 50 OBSs and 2867 airgun sources, crossing the St. Paul and Chain Fracture Zones and Romanche Transform Fault. From north to south, the age contrast cross St. Paul is 70 Ma and 40 Ma, that cross Romanche is 40 Ma and 7 Ma and that cross Chain is 7 Ma and 24 Ma. The seismic data shows that the mantle refractions can be recorded at offsets more than 700 km, which can sample the lithosphere deep to ~80 km below seafloor. The mantle refractions and first-order multiples are picked and inverted using seismic tomography. The tomographic result reveals a strong correlation between P-wave velocity and the age of lithosphere. Below Moho, the inverted model shows normal velocity for lithosphere north of St. Paul and low velocity (< 7.8 km/s) beneath Romanche and south of Chain. The low velocity anomaly up to 20 km depth beneath Romanche may indicate the penetration depth of the Romanche Transform fault.