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Formation and evolution of the Lithosphere Asthenosphere Boundary and oceanic crustal Layer 2A across the Atlantic Ocean from 0 to 75 Ma using ultra-deep seismic reflection imaging technique

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The plate tectonics theory is based on the existence of a rigid lithosphere plate moving over the underlying ductile asthenosphere, forming the most prevalent active plate boundary on earth, lithosphere asthenosphere boundary (LAB), but the nature of this plate boundary remain very elusive. Surface wave tomography has been used to define the LAB, with resolution >30 km vertically and hundreds of kilometre laterally. Recently, receiver function methods have been used to image the LAB, but the vertical resolution is about 10 km with a very limited sub-surface sampling. In order to image the LAB on metric scale, we acquired seismic reflection data in the equatorial Atlantic Ocean starting the Mid-Atlantic Ridge at zero age to near the continental margin of Nigeria corresponding to a lithosphere of 75 Ma and across the great equatorial fracture zones (Romanche, St Paul, and Chain). We used a 12 km long multi-sensor streamer towed at 30 m water depth and a 10170 cubic inch air gun source consisting of six sub-arrays each with 8 airguns. These data have allowed us to image the base of the LAB down to 90 km depth. We have also imaged the layer 2A continuously from 0-75 My over the oceanic crust. In this talk, we will present the above results in detail to provide the insight about the formation and evolution of the LAB and layer 2A with age.