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Refraction and micro-earthquake survey of the 21.5°N propagating rift on the Mid-Atlantic Ridge

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In this presentation, the micro-seismicity and seismic structure of the $21.5\,^{\circ}\mathrm{N}$ propagating rift on the Mid-Atlantic Ridge are examined. This is the largest age-offset propagating ridge in a median valley environment, having formed about four million years ago when an existing transform fault became unstable and began to propagate. From the extent of the fossil fracture zone, it can be seen that the transform fault existed and was stable for many millions of years before the onset of propagation. Thus, a detailed study of this propagating system could yield valuable insight into what caused the stability of the original transform fault to break down in the first place, and hence into the stability of ridge discontinuities as a whole.

From the beginning of January 2004 to the end of June 2004, an array of fifteen ocean bottom seismometers and hydrophones recorded seismic activity over the propagating ridge tip and transform zone, following a detailed refraction survey of the area. Here we present the velocity model derived from a refraction line across the ridge tip, as well as microseismicity inferred from the passive experiment. The velocity model indicates significant crustal thinning beneath the sheared zone and failed rift. Local seismic activity is confined predominantly to the transform zone, a consequence of the severe deformation taking place there. It is also interesting to note the relative aseismicity of the propagating rift as opposed to the failing rift, very likely due to a depleted magma supply to the latter.