Geophysical Research Abstracts
Vol. 21, EGU2019-2902, 2019
EGU General Assembly 2019
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# Lithospheric Structure and Tectonic Processes Constrained by Microearthquake Activity at the Central Ultraslow-Spreading Southwest Indian Ridge (49.2° to 50.8°E)

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Beneath ultraslow-spreading ridges, the oceanic lithosphere remains poorly understood. Using recordings from a temporary array of ocean bottom seismometers, we here report an ∼17-days-long microearthquake study on two segments (27 and 28) of the ultraslow-spreading Southwest Indian Ridge (49.2° to 50.8°E). A total of 214 locatable microearthquakes are recorded; seismic activity appears to be concentrated within the west median valley at Segment 28 and adjacent nontransform discontinuities. Earthquakes reach a maximum depth of ∼20 km beneath the seafloor, and they mainly occur in the mantle, implying a cold and thick brittle lithosphere. The relatively uniform brittle/ductile boundary beneath Segment 28 suggests that there is no focused melting in this region. The majority of earthquakes is located below the Moho interface, and a 5-km-thick aseismic zone is present beneath Segment 28 and adjacent nontransform discontinuities. At the Dragon Flag hydrothermal vent field along Segment 28, the presence of a detachment fault has been inferred from geomorphic features and seismic tomography. Our seismicity data show that this detachment fault deeply penetrates into the mantle with a steeply dipping (∼65°) interface, and it appears to rotate to a lower angle in the upper crust, with ∼55° of rollover. There is a virtual seismic gap beneath magmatic Segment 27, which may be connected to the presence of an axial magma chamber beneath the spreading center and focused melting; in this scenario, the increased magma supply produces a broad, elevated temperature environment, which suppresses earthquake generation.