

Oceanic detachment faults at the ultra-slow spreading Southwest Indian Ridge

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Our study focuses on the melt-poor, easternmost region of the Southwest Indian Ridge. We use the most extensive set of off-axis data available to date for an ultra-slow spreading ridge, extending up to about 28 myrs-old lithosphere, to discuss the characteristics and conditions of formation of corrugated surfaces. These surfaces extend 4 to 73 km along-axis (i.e. along-axis extension of inferred detachments), and 4 to 30 km in the spreading direction (i.e. cumulated offset along detachments). Some surfaces appear to have formed as part of a long-lasting episode of asymmetric large offset axial normal faulting. The most spectacular of such episodes affected a ridge length of 100 km, and lasted 6 myrs in the interval between magnetic anomalies 8 and 6, while spreading rates were faster (up to 29 mm/yr against 14 mm/yr between anomaly 6 and present). Individual corrugated surfaces of all ages face thicker gravity-derived crust in conjugate lithosphere, and correspond with positive residual topography, consistent with an origin in the footwall of large offset axial normal faults. Our observations further suggest that large-offset axial normal faults are actually more common than indicated by corrugated surfaces alone, and account for a sizeable proportion of lithospheric accretion at melt-poor ultra-slow ridges.