780-thousand years of volcanic seafloor accretion at a melt-rich segment of the ultraslow-spreading Southwest Indian Ridge 50°28'E

Jie Chen[1], Mathilde Cannat[1], Chunhui Tao[2]
[1]Equipe de Géosciences Marines, Institut de Physique du Globe de Paris, UMR CNRS 7154, Université de Paris, Paris, France
[2]Key Laboratory of Submarine Geosciences, Second Institute of Oceanography, Ministry of Natural Resources, Hangzhou, China

The ultraslow spreading (~14 mm/yr) Southwest Indian Ridge (SWIR) has a thick axial lithosphere, as confirmed by earthquakes depths, and its melt supply has been shown to vary from enough to produce a fully volcanic seafloor, to nearly amagmatic, leading to widespread faulting of mantle-derived ultramafic rocks onto the seafloor. A substantial melt supply at segment #27 (central SWIR, 50°28'E) has been inferred from bathymetric, gravity, and geochemical data. Seismic data confirms that the crust in the center of this segment is up to ~9.5 km-thick, with a low-velocity anomaly (-0.5 km/s) in the lower crust that suggests a hot and/or melt-rich zone (Jian et al., 2017, JGR). Yet, microearthquakes occur down to 10 km, indicating a thick brittle lid on or very close to the ridge axis (Yu et al., 2018, JGR), and faults that control the axial valley in the adjacent, less magmatically active ends of the segment can be followed to the segment center. This setting is similar to that of several magmatically robust segment centers at slow and ultraslow ridges. The construction of the magmatic crust, and specifically the interplay between magma emplacement and faulting, are not well understood in this context. We address this question with a study of volcanic morphologies and faulting revealed by high resolution bathymetry and reflectivity data acquired by the AUV *QianLongII* (DY40 cruise; 2016) over the center of segment #27, covering ~780 thousand years of crustal accretion. Mapping of volcanic facies ranging from smooth to hummocky terrains, fault scarps and fissures leads us to discuss the recent eruptive history of this melt-rich region, and its possible relation with faulting, both local and adjacent segment ends regions. Combining with other melt-rich ridge segments at slow and ultraslow spreading ridges, we interpret our observations into that 3-D melt focusing results in a complex magma plumbing system under the context of thick brittle lid.

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