Explosive Volcanism on the SW Indian Ridge

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Explosive alkaline volcanism was found in the rift mountains of the SW Indian Ridge between 12°41'E and 14°42'E, extending over ~18,000 km^2, an area roughly the size to the state of New Jersey. This includes an active volcano on the crest of the northern rift mountains at 14°37'E (Standish & Sims, 2010). The cratered terrain forms flat plateaux where spreading perpendicular lineated volcanic terraines are absent. These fields may grade laterally into normal lineated volcanic terrain in the rift mountains. The volcano lavas have heavy isotopes similar to the Bouvet Is, but low Helium ^{3}He/^{4}He (6.31, Georgen et al., 2003). In contrast the ridge adjacent to Bouvet Is has higher ^{3}He/^{4}He (8.1-12.9, Kurz et al., 1998). Dredging a high angle fault that cut through a crater recovered greenschist facies olivine gabbro and troctolite, weathered pillow basalt, diabase, scoria, highly vesicular (10 to 20%) fresh basalts, and a lava bomb. Much of the diabase, gabbro and pillow basalt are in fault gouge. This is the stratigraphy of a core complex overlain by young eruptives, indicative of off-axis explosive volcanism. Where lineated lavas grade laterally into cratered terrain, however, the explosive volcanism may have occurred on axis. There is no sign of such terrain in the rift valley today, however, and most of it is in the rift mountains of an oblique 200-km long amagmatic spreading center, where only peridotite and scattered basalts were dredged. An explanation for this volcanism is the thick lithosphere formed beneath an ultraslow highly-oblique ridge, with an effective full spreading rate of ~7.8 mm/yr. Thus, melting of the host mantle is supressed due to conductiive heat loss from above, resulting in low-degree volatile-rich melts largely representing an enriched fertile component in the underlying mantle.

Standish, J. J. & Sims, K. W. W. (2010), Nature Geoscience **3**, 286-292. Georgen, J. E., Kurz, M. D., Dick, H. J. B. & Lin, J. (2003), EPSL **108**, 509-528. Kurz, M. D., le Roex, A. P. & Dick, H. J. B. (1998), Geochimica Cosmochimica Acta, **62**, 841-852.