

Helium isotope signatures of a gigantic off-ridge lava flow at 14S, EPR

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At mid-oceanic ridges, their magma has been thought to be strongly focused to the spreading axis, therefore magma tic activity was thought to be exclusively limited along ridge axis. However, recent survey clarified the existence of numerous lava flows and sea mounts in the area apart from the present ridge axis in southern Eastern Pacific Rise (EPR), clearly indicating the existence of volcanic activity in off-axis area. These off-ridge volcanic activities urge the review of a previous view about the magma system beneath mid-oceanic ridge system and evolution of oceanic crust. The YK04-07 survey targeted on the off-axis lava and seamount in 8-14_S area along the EPR to reveal the volcanic activity and magmatic process of the off axis volcanism. A huge off-axis lava field is discovered in the western off of the EPR-axis around 14_S during the survey in July to August 2004. To investigate geochemical signatures of source materials of the gigantic off-axis lava flow, that erupted well beyond the limit of the axial melt lenses, is important to evaluate its origin.

Glassy fragments of chilled margins were selected from five localities in the lava field: four of five localities were selected from two dives that form east-west across traverse of center of the field. The last one was selected from northern lobe of the field where sediment is very thin. As the benchmark of the helium isotope signature of normal ridge activity on the present ridge axis, glassy fragment of sheet lava that sampled on the ridge axis was also selected. All samples were crushed in vacuum to extract helium in vesicles. Detailed performance of instrument and analytical conditions are reported Tamura et al. (2005). Volatiles extracted was mainly CO₂, which also contains fairly abundant helium, up to 2E-6ccSTP/g. All five glasses in the field show ³He/⁴He ratios ranging 8.0-9.2RA: here RA-unit means atmospheric ³He/⁴He value, 1.4E-5. These values are well within the global variation of MORB not influenced any hotspots. Helium isotope value of the on-axis lava sample is well within the range of off-axis samples: 8.7-8.9 RA. On the other hand, it has been reported that the ³He/⁴He ratio of ridge axis around 17_S is much higher, well above 9RA . This implies following possibilities; 1) helium isotopic boundary may exist between 14_S and 17_S within MORB mantle region, 2) potential deep-origin hotspot may locate in southern EPR region and 3) heterogeneities beneath the ridge axis could be observed through the extrusive lavas even in the fastest spreading ridge.

Reference:

Tamura et al. (2005) IFREE report, vol. 2, in press.