

Detailed morphology of the Central Indian Ridge between 20-15S and 15-30S : preliminary results of KH06-4 Great Dodo Cruise

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The Central Indian Ridge (CIR) axis offsets toward west from the Rodrigues Triple Junction to the Egeria Fracture Zone and then offsets toward east from Marie Celeste Fracture Zone. Between these two fracture zones, the Rodrigues Segment consists of two segments Seg-15 and Seg-16. The western off-axis of Seg-15 is characterized by an east-west trending chain of seamounts and minor ridges, that is considered as a trace of CIR-Reunion hotspot interaction. The previous cruises collected the deep-towed sidescan images within the axial valley of the Rodriguez Segment and the off-axis bathymetry and magnetic survey in northern part of Seg-15. The Great Dodo Cruise, KH06-4 legs 3 and 4 of R/V Hakuho-maru, was conducted from December 2006 to January 2007 to understand the ridge-hotspot interaction of this area and to discover a new hydrothermal vent. We collected bathymetry data between 20-15S and 15-30S in unprecedented quality and resolution using 20kHz SeaBeam2120. The axial valley of CIR Segments 15 to 18 was fully covered by our survey and the Marie Celeste FZ and off-axis areas of Seg-16 were also covered. Seg-15 can be divided into four sub-segments from Seg-15A (south) to Seg-15D (north). The axial valley is 8-13 km wide and 600-800m deep in average. Offsets of each sub-segments is less than 8 km. Seg-15A is characterized with relatively deep axial valley and an axial volcanic zone is recognized approximately at the center of the valley. Seg-15B is the longest sub-segment in Seg-15 and shows asymmetric morphological structure. The eastern rift flanking valley wall is steep and straight, on the other hand the western one is ambiguous and winding. The axial volcanic zone is located near the western valley wall. Many small volcanic cones are aligned in NEN-SWS direction on the western ridge flank, which may be the influence of Reunion hotspot as same as the Three Magis and Gastiao Ridges in the west. In Seg-15C, the faults develop nearly symmetrically and the segment center becomes shallower. Seg-15D is a deep, short sub-segment and a relatively large volcanic cone is located at the segment center. The off-axis trace of the boundary between Segs-15 and 16 shows a zig-zag pseudo fault, indicating recent southward propagation of Seg-16 and the earlier northward propagation of Seg-15D. Axial valley floor of Seg-16 shows a prominent feature, which is different from Seg-15. Both segments ends are deep and characterized with well-developed faults, and the valley floor becomes shallow towards the segment center. The segment center was very flat and smooth plain over 10km along the axis, suggesting the dominance of sheet flows. To the north and south of this large lava plain, hummocky volcanic cones are distributed. Off-axis areas of Seg-16 were covered from the axis to 55 km in both sides. The current axial valley of Seg-16 is a single straight axis, however the off-axis area might be divided into two sub-segments. Northern off-axis morphology suggests the robust volcanism in near past. About 11.5km from the ridge axis, voluminous ridges (abyssal hills), whose depth reaches 1600 m, are located in both sides. East of this eastern off-axis ridge, two large seamounts are located. Two seamounts are aligned NE-SW direction, oblique to the ridge trend. Western seamount is slightly elongated to NNE-SSW and is relatively smaller (15km in diameter, top depth \approx 1100m). The eastern seamount is larger, 20km in diameter, and the top is shallower than 700m. Small cones (maybe volcanic, lateral cones) are distributed at the slope of these mountains. These mountains are not cut by any faults, suggesting off-axis volcanism of this segment. There is no similar large seamount in the western off-axis. We also mapped the Marie Celeste FZ, 200 km long offset between Segs-16 and 17. Prominent transverse ridges are found within the fracture zone valley, that may suggest the minor change of plate motion.