The spatial distribution of ocean core complexes (OCCs) on mid-ocean ridge flanks can indicate the variation of magmatism and tectonic extension at a given spreading center. A recent study revealed 11 prominent OCCs developed along the middle portion of the Central Indian Ridge (CIR) based on the high-resolution shipboard bathymetry. The CIR is located between the Carlsberg Ridge and the Indian Ocean triple junction. The detailed morphotectonic interpretations from the recent study suggested that the middle ridge segments of the CIR were mainly developed through tectonic extension with little magmatism. Furthermore, the OCCs exposed by detachment faults appear to the main host for active off-axis hydrothermal circulations.

Here we form a three-dimensional gravity model to investigate the crustal structures of OCCs developed between 12°S and 14°S at the CIR. These OCCs exhibit domal topographic highs with corrugated surface. The rock samples from these areas include deep-seated rocks such as serpentinized harzburgite and gabbro. A typical gravity study on mid-ocean ridges assumes a constant density contrast along the water-crust interface and constant crustal thickness and removes its gravitational contributions and thermal effects of lithospheric cooling from the free-air gravity anomaly. This approach is effective to distinguish anomalous regions that deviate from the applied crustal and thermal models. The oceanic crust around the OCCs, however, tends to be thinned due to detachment faulting and tectonic extension. In this study, we include multi-layers with different density contrast and variable thickness to approximate gravity anomalies resulting from the OCCs. In addition, we aim to differentiate the geophysical characteristics of the OCCs from the nearby ridge segments and infer tectonic relationship between the OCCs and ridges.

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