Origin of the Ontong Java Plateau: Initial Results of R/V Kairei KR05-01

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The Ontong Java Plateau (OJP) in the western equatorial Pacific is most voluminous large igneous province (LIP) on Earth. It encompasses an area of approximately 2.0x106 km2, and its maximum crustal thickness exceeds 30 km. Emplacement of the OJP at approximately 122 Ma represents a significant transfer of mass and energy from the mantle to the crust.

Since the 1980s, the predominant hypothesis for the origin of LIPs has been the mantle plume model, in which the bulbous head of a new mantle plume ascending from deep in the mantle melts extensively via decompression, following impact at the base of the lithosphere, for approximately 1-5 Myr. Research on the OJP to date indicates that the feature fails to exhibit several key characteristics predicted by mantle plume models. For example, total crustal uplift at the time of OJP emplacement is significantly less than plume models predict, and total crustal subsidence following emplacement is significantly less than either thermal cooling models predict or that observed from other oceanic plateaus and normal oceanic crust. Alternatives to a peridotitic plume model for the OJPs origin include an eclogite-rich plume or massive decompression mantle melting instigated by a meteorite impact. However, each hypothesis contains some elements that are difficult to reconcile with existing data, and therefore further investigations are needed to resolve the origin of the OJP.

In January 2005 aboard R/V Kairei cruise KR05-01, we obtained multichannel seismic (MCS) reflection, multibeam bathymetry and backscatter, subbottom profiler, gravity, proton precession magnetometer, and shipboard three-component magnetometer data to address the origin of the OJP. We completed the first N-S MCS transect of the OJP, as well as two dip lines across the transition between the OJP and the adjacent Lyra Basin. We also surveyed four proposed Integrated Ocean Drilling Program (IODP) sites. I present the preliminary results of MCS data at this session. Our geophysical work focuses on three problems 1) the relationship between the OJP and the adjacent Lyra Basin 2) the transition between the northern flank of the OJP and OJPs crest; and the age of Tauu atoll on the southern flank of the OJP. Initial results suggest a complex, faulted relationship between the OJP and the Lyra Basin, sediment thickness of approximately 1000 m and common semi-continuous reflections within igneous crust on the main OJP, and the emplacement of Tauu atoll significantly post-dating the main emplacement of the OJP.