Upper crustal structure from the Nauru Basin to Ontong Java Plateau

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The Ontong-Java Plateau is one of the largest igneous provinces in the world. Despite its significance to solid earth circulation and links between the solid earth and the environment via mass and energy transfer, its genesis is not well understood.

In February 1998, we acquired seismic reflection and refraction data aboard R/V Hakuho Maru of Ocean Research Institute, University of Tokyo, along a 1200 km long transect from the Nauru Basin to the north-central Ontong-Java Plateau. Their upper crustal structure was obtained. The results from the sonobuoy data collected during the cruise are mainly presented.

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In February 1998, we acquired seismic reflection and refraction data aboard R/V Hakuho Maru of Ocean Research Institute, University of Tokyo, along a 1200 km long transect from the Nauru Basin to the north-central Ontong-Java Plateau using a multichannel seismic system (1000-3400 cubic inch source; 1200 m, 48-channel solid streamer), 28 sonobuoys, and ocean bottom seismometers. The objectives were to image the stratigraphy and structure of the OJP's upper crust, including the transition from thick crust of the central OJP to thinner, oceanic crust of the Nauru Basin, to discern their relative geological histories. MCS and sonobuoy data show that sediment thins from the center of the Nauru Basin towards its boundary with the OJP, which is defined by and inflection point in slope between the flat Nauru basin abyssal plain seafloor and the gentle slope of the northeastern OJP flank. Acoustic basement is observed at different levels in the Nauru Basin; subsequent to the formation of oceanic crust and deposition of abyssal sediment, the Nauru Basin was affected by substantial basaltic volcanism which is manifested as flows, sills, and dikes. Sediment thickness increases, in general, from near nil at the boundary of the OJP with the nauru Basin towards OJP's crest,. The increase in sediment thickness with decreaseing water depth is consistent with the bulk of the sediment being carbonates. Three major domains may be discerned in OJP's sedimentary record along the transect. From east to west, these are: 1) a lower slope, 2) an upper slope and 3) the crest. Basement is relatively smooth in the lower slope and crestal domains, and disrupted in the upper slope domain. In general, refracted arrivals from the Ontong Java Plateau are considerably stronger than from the Nauru Basin on the sonobuoy records.