

Crustal Thickness Behind the Tonga Arc Measured by Stacking of *pP* Precursors

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Precursors to the depth phase *pP* have been shown in some areas to be underside reflections from internal discontinuities within the lithosphere, particularly the Moho. If these precursors are recorded by dense arrays of seismometers, the signal processing techniques developed for reflection surveys using controlled sources at the surface can be applied to create an “upside-down” seismic reflection profile. Previous studies using this technique were primarily carried out with broadband seismometers. Here we use short period recordings from Japan’ s Hi-net array for intermediate- and deep-focus earthquakes in the Tonga-Kermadec subduction zone to measure crustal thickness within the Lau and South Fiji Basins and along the Lau Ridge. Because many Hi-net stations are located at the same sites as broadband stations in Japan’ s F-net, we are able to directly compare the ability of short-period and broadband seismometers to detect and resolve underside reflections. Our measurements sample areas that have been inaccessible to traditional surface seismic measurements. We have used modeling to address complications of bathymetric variability at the bounce points and receiver side heterogeneity. We have found the crust to vary in thickness from about 7 km to 20 km. Our measurements agree with existing measurements of crustal thickness from surface seismic refraction surveys where they overlap.

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