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CRUSTAL STRUCTURE ACROSS THE TONGA-LAU REGION FROM WIDE-ANGLE SEISMIC DATA

Wayne C. Crawford [1,2], Douglas A. Wiens [3], John. A. Hildebrand [2], Spahr C. Webb [4], Leroy M. Dorman [2]

[1] Institut de Physique du Globe de Paris; [2] Scripps Institution of Oceanography;
[3] Washington University; [4] Lamont-Doherty Earth Observatory

crawford@ipgp.jussieu.fr / Fax: +33-1-4427-3849

We report the crustal structure, Moho depths, and upper mantle velocities on an 800 km line across the Tonga-Lau region at 18°-19°S. The survey starts on the Pacific Plate 200 km east of the Tonga Trench and spans the Tonga Trench, the Tonga Ridge, and the Lau Basin before finishing on the Lau Ridge. The data consist of 5148 airgun shots to one land and 19 ocean bottom seismometers. In the Lau Basin, the data reveal lower velocities, a thicker crust, and greater variability to the west of the spreading center than to the east. East Lau basin has an approximately oceanic crust morphology with ~7 km thick crust. SubMoho velocities beneath the west Lau Basin are ~7.6 km/s and those beneath the east Lau Basin are ~7.7 km/s, significantly lower than "normal" subMoho velocities of 7.9-8.1 km/s. At the easternmost edge of Lau Basin the crust thins considerably before thickening again beneath the Tonga Ridge. The deepest penetrating rays beneath the Tonga ridge (~12 km beneath the seafloor) do not penetrate into the Moho. The Tonga ridge has the most shallow heterogeneity of the area surveyed, probably due to the large amount of sediments filling in bathymetric features. The Pacific plate is normal old oceanic crust, with a crustal thickness of 6.5 km and a Moho velocity of 7.9 km/s. The data support the assumption that the Lau Basin was created primarily seafloor spreading after some initial rifting and extension at the western end, and that the deep melt source for the spreading center is located west of the rise axis.