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Short Communication

Crustal Structure of the Reykjanes Ridge at 63° N Derived From Seismic Measurements

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In 1976 the Institute of Geophysics of the University of Hamburg performed seismic measurements as part of a Presite Survey program for DSDP/IPOD LEG 49. Due to bad weather conditions only one split profile of about 60 km was obtained, at Site 409. The shots were recorded on F.S. Meteor by means of one moored telemetric buoy developed in the IfG Hamburg; one Ocean-Bottom-Hydrophone (OBH) was deployed. For the experiment explosives between 5 and 50 kg GEOSIT were fired at an average spacing of 0.820 km.

All seismograms were digitized, a 25 Hz lowpass filter was applied. For the calculation of ray path the time terms were corrected to sealevel. Differences in the intercept times between observed and calculated travel times made it necessary to introduce a thin sediment layer. Knowing the depth of the ocean floor from continuous echoprofilings, we calculated a set of possible sediment

Table 1. Structure section and interpretation

Depth (km)	Velocity (kms^{-1})	
	1.48	water
0.8		
	1.56	sediments
1.0		
	4.30	vesicular basalts
2.0		
	5.35	fresh basalts
3.5		
	6.59	gabbro, metabasites
6.8		
	7.86	mantle material

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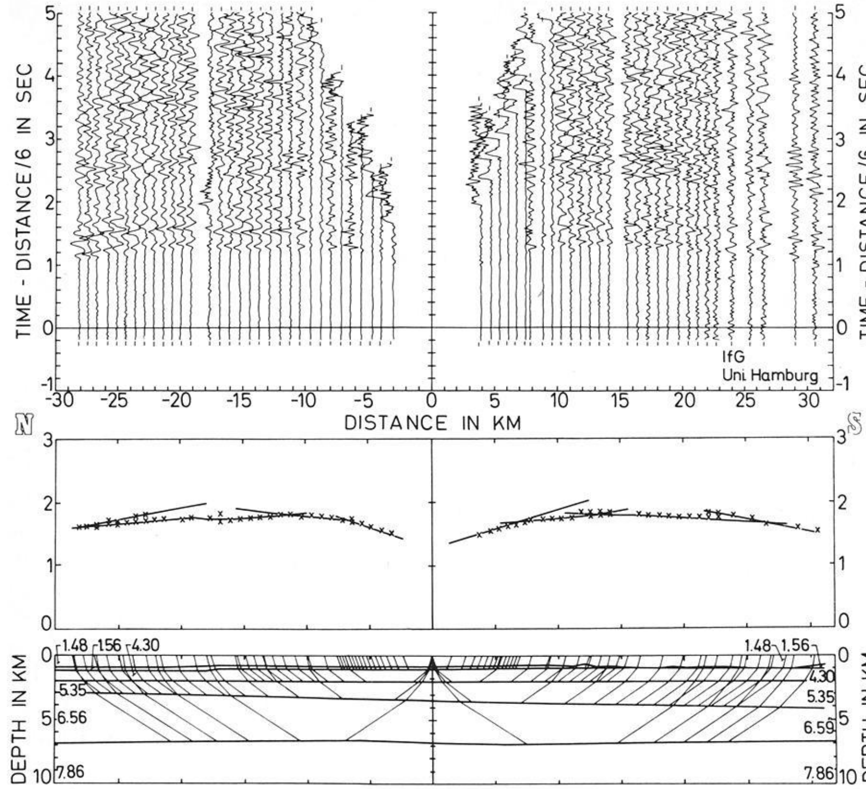

Fig. 1. *Upper part:* seismogram section in reduced time scale t-(x)/6. *Middle:* observed insets (crosses) and calculated travel times. *Lower part:* crustal section with calculated ray paths, *P*-wave velocities are given in kms^{-1}

velocities and thicknesses. The chosen velocity (see Table 1) is in good agreement with the velocity measurements in the sediments of Site 409 (Sharman, 1978).

Local dips as well as true velocities of the overlaying layer were taken into account to calculate configuration and true velocities of the underlaying layer. The boundaries of the layers were shifted vertically until observed and calculated travel time had the same value. Due to good fits an additional correction of travel times for local undulations of the layers was not necessary. Our final model is to be seen in Table 1 and Figure 1. Layer boundaries are almost horizontal except for the interface layer 2/3, where there is a slight rise in direction of Iceland.

Interpretation

We introduced a calculated sediment layer with a *P*-wave velocity of 1.56 km/s and a thickness of 0.190 km below the OBH. Drilling results gave evidence of an 81.5 m thick sediment layer with measured velocity of 1.57 km/s, the oldest aged late Pliocene. A thin sediment coverage with rapid variation in thickness as indicated by reflection profiles is consistent with the tectonic nature of an active ridge crest. The sediments are underlain by basaltic rocks with measured compressional wave velocities of 3.7–5.75 km/s (Sharman, 1978). We distinguish two refractors with *P*-wave velocities of 4.30 and 5.35 km/s, interpreted as vesicular to fresh basalts, thus corresponding to layer 2A and 2B (Houtz and Ewing, 1976). The next deeper refractor with a velocity of 6.59 km/s is interpreted as layer 3, associated with gabbros and metabasites, frequently dredged and drilled from the oceanic crust (Peterson et al., 1974). The mean *P*-wave velocity of layer 3 according to Christensen and Salisbury (1975), is 6.73 ± 0.19 km/s and the thickness is about 3 km for a young crust, i.e., younger than 2 my.

Our deepest refractor with a value of 7.86 km/s for the *P*-wave is considered to be the crust-mantle boundary. Depth and velocity of this refractor as well as the thickness of layer 3 suggest an interpretation as upper mantle velocity. In comparison to the other existing refraction seismic results of the Reykjanes Ridge and the Reykjanes Peninsula (Talwani et al., 1971; Björnson et al., 1972), this value is high, but we think our calculation and interpretation is well backed by the good quality of the seismograms.

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