DISPERSION OF SURFACE-WAVES CROSSING AREAS OF VARIOUS CRUSTAL THICKNESS

by

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Crustal thickness has been computed for Eurasian paths with interpretation of the dispersion Rayleigh-waves generated by earthquakes. The parameters of the earthquakes in question are listed in Table I.

The data have been recorded with Kirnos-type seismographs in Budapest.

Table I.

No.	Data	Origin time			Geographic coordinates of earthquake		km
		h	m	s			
1.	4. 1. 1962	04	35	42,6	33,9° N	135,2° E	8970
2.	7. 5. 1962	17	39	50,3	45,3° N	146,7° E	8500
3.	27. 8. 1962	16	20	05	38,3° N	142,4° E	8940
4.	22. 10. 1962	15	23	32,9	49,8° N	155,8° E	8420
5.	11. 11. 1962	11	31	44,5	55,8° N	113,1° E	6040

The wave-path are shown in Fig. 1. The group-velocity curves have been constructed in the usual way. The arrival times of the different periods were corrigated by a phase-shift curve, computed from the constants of the instrument. The group-velocity-period functions of different earthquakes did not differ substantially from each-other, thus identical theoretical group-velocity curves could be used for the interpretation (Fig. 2.)

The comparison of observed group-velocity data with theoretical curves gave a crustalthickness of 35 km.

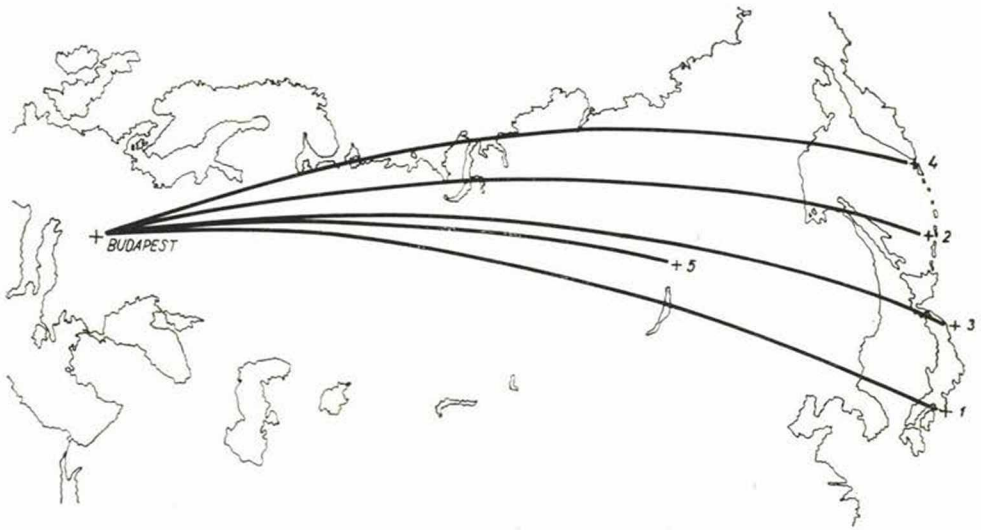

Fig. 1.

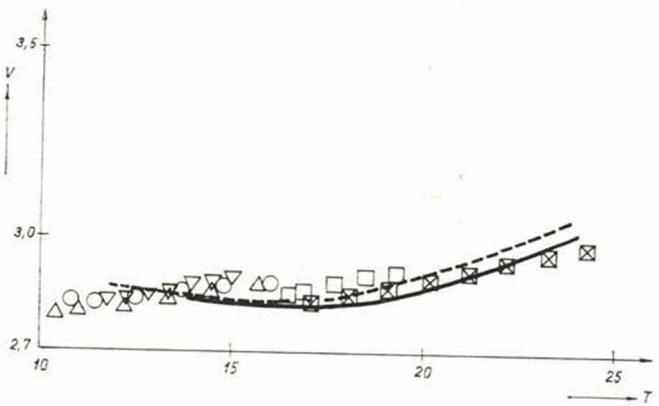

Fig. 2. Recorded data and theoretical curves of the dispersion of Rayleigh waves for Eurasian wave paths. Data taken from Table I are symbolized as follows:

○ for shock 1,
□ for shock 2,
▽ for shock 3,
⊗ for shock 4,
△ for shock 5.

The theoretical curves are those by R. Stoneley (2), the dashed line refers to $H_1 = 24$, $H_2 = 12$, $H = 36$ km. The full line refers to a crustal thickness of 34 km

Conclusion

The wave-paths of the utilized earthquakes cross the East-Siberian area in a depth of 2 – 3000 km. A greater crustal thickness was to be expected but we found only a continental crust of 35 km thickness. Our two earlier papers are worth to be mentioned from this point of view.

a) Average crustal thickness was computed for Eurasian paths using dispersion Love-waves of two South-China earthquakes in 1960 (4).

The recording station was Budapest. A crustal thickness of 33 km was obtained, in spite of the fact that 30 percent of the wave-paths crossed high-mountain areas, where E. F. Savarensky using the same principle found a value of 55 km.

b) In 1962. E. Bisztricsány computed crustal thickness from the Rayleigh-wave generated by an earthquake in the West Indies. In that case, crustal thickness was found to be equal to that under the oceans though 16 to 20 percent of the wave-path crossed a continent (Europe) where crustal thickness had been found to be 35 km.

The above considerations reveal that the real average crustal thickness is not always reflected by the surface-wave dispersion of waves crossing regions of different crustal structure. Surface-wave dispersion needs, then, further theoretical examination.

LITERATUR

1. Savarensky, E. F.: On the determination of group and phase velocities from observations. *Bull. Izv. Acad. Sci. USSR Geophys. Ser.* No. **11.** 1959.
2. Stoneley, R.: Rayleigh-waves in a medium with the surface layers. *Month. Not. Roy. Astr. Soc. Geophys.* Suppl. 7. No. 2. 1955.
3. Bisztricsány, E. – Kiss. Z.: A computation of average crustal thickness from Love wave dispersion, for an Eurasian wave path. *Ann. Univ. Sci. Budapestinensis, Sec. Geol.* III. 1960. 15 – 17.
4. Savarensky, E. F. – Sikharnlidze. D. J.: Determination of the thickness of the Earth's crust from Love-wave dispersion observations. *Bull. Izv. A. S. USSR. Geol.* III. 1959. 620 – 622.
5. Bisztricsány E.: Dispersion of Rayleigh-waves along a mainly Atlantic path. *Geof. pura e appl.* 54. 1963. 84 – 86.