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MICROSEISMIC "HIGHS" AND "LOWS" IN THE BAY OF BENGAL

The paper by Anjaneyulu (1961) discussing microseismic "highs" and "lows" in the Bay of Bengal, probably presents the first detailed observational evidence on the effect of refraction of microseisms as they travel from the ocean to the Continent. Considerable work has been done in the past (Darbyshire 1956, Darbyshire and Darbyshire 1957, Iyer *et al.* 1958, Iyer 1961, Iyer and Kartha) on this problem. Assuming microseisms to consist of an appreciable amount of Rayleigh waves, it is well known that the dispersion effect due to variation of ocean depth is considerable, even for a simple model, of a finite layer (ocean) overlying an infinite elastic half space (granite). Table 1 gives the group velocity variation with ocean depth for the first mode Rayleigh waves of 5, 10 and 15-second period (Ewing *et al.* 1957). It is seen that for 5-second Rayleigh waves the group velocity drops almost to half as the depth changes from 0 –2·5 km. Thus at the edge of the Continental Shelf, a sharp change in velocity occurs and hence sharp refraction is to be expected.

TABLE 1

Variation of group velocity with ocean depth for first Rayleigh waves

Depth (km)	Period (sec)		
	5	10	15
	Group velocity (km/sec)		
0·0	2·58	2·58	2·58
1·5	1·93	2·41	2·54
2·5	1·13	2·10	2·38
3·5	1·26	1·65	2·16
4·5	1·33	1·12	1·93
5·5	1·37	1·15	1·54

A simple model of the continental structure of the Bay of Bengal is taken (shaded portion in Fig. 1). Rays of Rayleigh waves (5-second period) were assumed to originate at ten-degree intervals from Madras and their refraction at the continental margin was computed using Snell's Law, for velocity changing to half the value on land. It is seen that the two rays, one going due north and the other due south are not refracted, whereas the rays in between are refracted strongly and travel as a "beam" into the central part of the Bay of Bengal. This very simple diagram shows that if a Rayleigh wave "explosion" takes place at Madras, the 5-second waves would tend to concentrate giving a "high" energy beam towards the east flanked on either side by "lows". A little reflection will show that the reciprocal effect namely, a source in the "high" region should give much more microseismic energy at Madras than a source in the "low" region, which is exactly what Anjaneyulu reports. The existence of a second "high" south of Calcutta cannot be explained by this simplified approach. The present picture shows the trend rather than the quantitative result.

A detailed investigation (a continuation of what the senior author was able to do at the University of California, La Jolla using the high speed CDC 1604 computer) is under way at the Meteorological Office to draw the refraction diagram based on any two-dimensional velocity configuration provided by bathymetric and geological maps. The fast METEOR digital computer is used for this purpose. A study of the Bay of Bengal is included in this programme.

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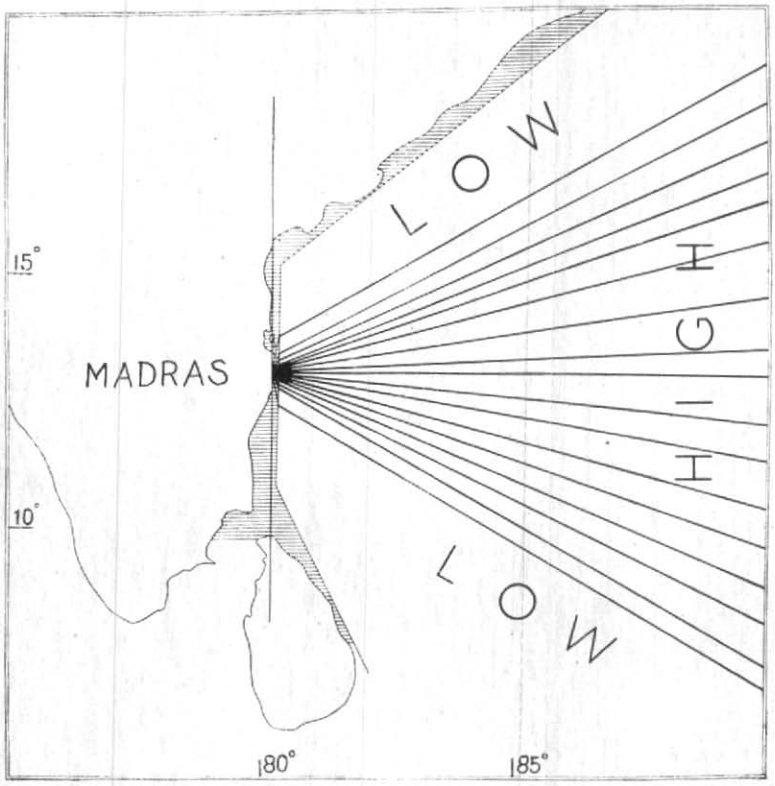

Fig. 1

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