LETTERS TO THE EDITORS

SEISMOLOGY

Microbarograph Records from the Russian Large Nuclear Explosions

DURING the recent series of Russian atomic weapon tests, microbarographs were operated at this Establishment. The instruments used were purely mechanical devices having limited frequency response. Excellent records were obtained from several of the larger firings at Novaya Zemlya and particularly from the 50-megaton firing of October 30. Taking the origin time as 08.33 hr. from a study of the seismic signal, we saw the start of the first characteristic microbarograph record (Fig. 1*a*) 3 hr. 11 min. later at 11.44 hr. on October 30; subsequent to this, we obtained clear signals at approximately 16.40 hr. on October 31 (Fig. 1*b*); 00.10 hr. on November 1 (Fig. 1*c*); and 12.40 hr. on November 2 (Fig. 1*e*). We looked for a signal at around 05.10 hr. on November 2 but could not see one against the background (Fig. 1*d*).

It would appear that the waves are being successively reflected at the antipodes of Novaya Zemlya and at Novaya Zemlya, with relatively little absorption or scattering. We have re-examined our records of the 30 megaton firing on October 23 and they show similar evidence of reflexions corresponding relatively in time to those shown in Figs. 1*b* and *c* for the 50-megaton firing, but with the signal to noise ratio much smaller.

Observations made on the phenomena with more refined instruments or arrays and a compilation of results on a world-wide scale could yield extremely interesting data about the Earth's atmosphere. We have noticed a number of points of interest already in our brief examination of the records. For example, there is a good agreement between the wave shape observed and the form one would expect from a study of the paper by Hunt *et al.* (ref. 1, particularly Fig. 10). Brune *et al.*[2] have recently treated the problem of an elastic surface wave on a sphere and found a $\pi/2$ phase shift at each polar reflexion; our observations, although difficult of interpretation because of dispersion, do suggest a phase reversal after two such reflexions. The waves diverging from the origin (Figs. 1*a*, *c* and *e*) also appear to have a simpler, more compact, waveform than the waves converging on to the origin (Fig. 1*b*).

An interesting comparison can also be made with the records obtained following the eruption of Krakatoa in 1883[3]. The average time along several paths for waves to pass around Earth following Krakatoa was 36 hr. 20 min. ± 10 min. (*S.E.* 35 readings), the corresponding figure from our records being 36 hr. 27 min. with an accuracy of a few minutes.

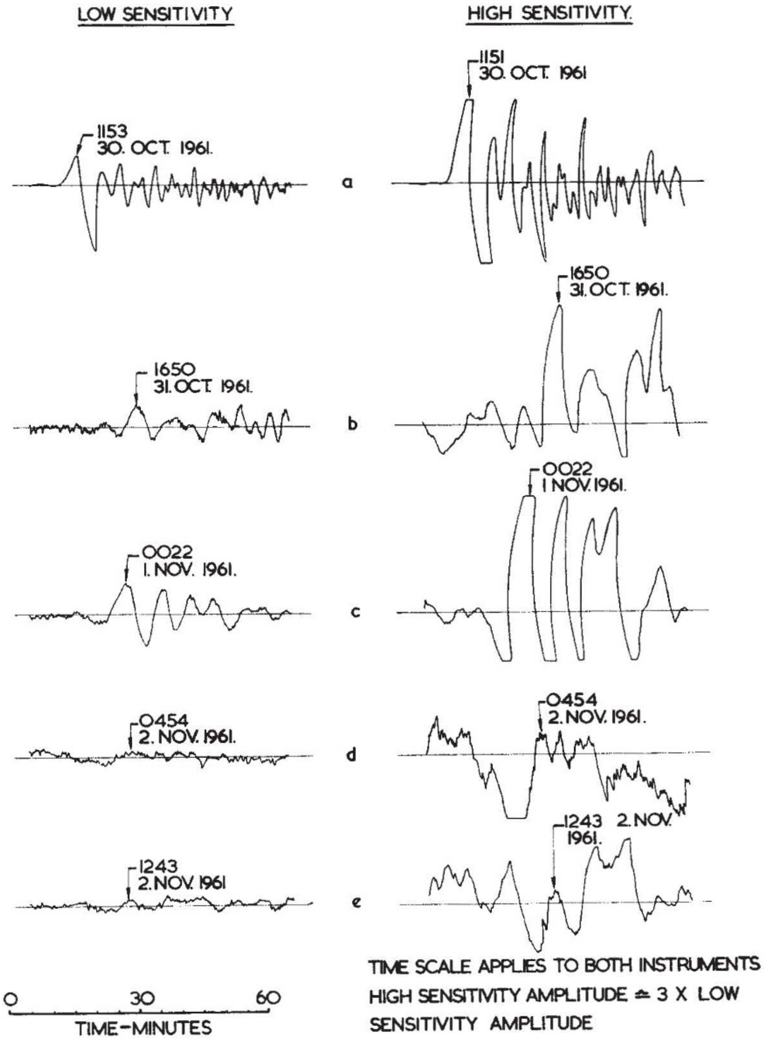

Fig. 1. Microbarograph records taken at the Atomic Weapons Research Establishment, Foulness

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[1] Hunt, J. N., Palmer, R., and Sir William Penney, *Phil. Trans. Roy. Soc.*, A, No. 1011, 275 (1960).

[2] Brune, J. N., Nafe, J. E., and Alsop, L. E., *Bull. Seism. Soc. Amer.* 51, 2, 247 (1961).

[3] Symond, G. J. (ed.), *The Eruption of Krakatoa and Subsequent Phenomena* (Trubner and Co., London, 1888).