

THE RUMANIAN EARTHQUAKE OF NOVEMBER 10, 1940

BY

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A VERY severe earthquake shook Bucharest and parts of Rumania at 7-09 a.m. Indian Standard Time (3-39 a.m. Rumanian Standard Time) on Sunday, the 10th November 1940. In Bucharest, according to Reuter's reports, the earthquake lasted for five minutes causing great damage. Almost all the buildings in the city were damaged, the Carlton building, an eight-floored skyscraper, crashed and many people were caught in the debris and perished; hundreds of domes, chimneys and towers came down like ninepins and not a single ceiling was left intact. There were also explosions of oil tanks causing many fires. In the provinces, Galatz is reported to have suffered the highest death roll and the greatest damage; in Foscani the centre of the city was completely destroyed and in Ploesti many buildings crashed; in Campina, Baicoui, Bustenari, Buzeau, Rumical and Sarat in the oil regions, there were explosions of oil tanks and breaking of pipe lines and considerable destruction of property and many casualties. In Bulgaria, the shock was reported to have caused some victims.

The earthquake was felt very severely in Kiev in Ukraine, Sinope and Inebolu in Turkey on the shores of the Black Sea and less severely in Budapest, the Hungarian capital. A shock was also reported to have been felt in the Marseilles region. Reports about the amount of damage and consequent loss of life are so far vague, evidently due to the present unsettled conditions in Europe. However, it is believed that the number of dead may not be less than 1,000.

The maximum intensity of the earthquake as obtained from the available macroseismic data is about VIII in the modified Mercalli scale (VIII-IX in the Rossi-Forel scale), and the area over which this intensity was observed is found to be over 10,000 square miles. The extent of the area over which the earthquake was severely felt is as large as 500,000 to 600,000 square miles. The great extent of the area in which the shock was severely felt with relation to the observed maximum seismic intensity suggests an abnormal depth of focus,

Rumania lies a little to the north of the Alps-Caucasus-Himalaya seismic belt. Earthquakes in this (Rumanian) region have not been as frequent as in Italy, Greece and Bulgaria which lie well inside the belt referred to above. In Milne's¹ *Catalogue of Destructive Earthquakes*, only 14 shocks were listed in Rumania in the whole of the nineteenth century beginning with the disastrous one of 1802. In the last twenty-five years, no destructive earthquake appears to have occurred though about ten shocks were recorded having their epicentres in Rumania. Of late, this region appears to have become seismically active. Three shocks were reported to have been felt in Rumania on February 1, 1940, the epicentre of which, according to Bucharest seismologists, lay in the Black Sea, 500 miles east of the Rumanian capital. These were not recorded by the Bombay seismographs. Another shock, which was, according to *Nature*,² one of the greatest during that month occurred on February 29, 1940. The epicentre was near Lat. 45° North and Long. 27° East in Rumania, according to Zurich seismologists. This was recorded by the seismographs in India as a shock of moderate intensity, but the tentative epicentre as determined at Bombay on the basis of Indian seismograms and published data of a few European and African stations was Lat. 34° North and Long. 25° East, near the island of Crete.³ This differs much from the Zurich determination. In this connection, it may be noted that the only damage reported was from Afium Karahisar in Anatolia. This indicates that the epicentre given by Bombay is nearer the affected area. On October 22, 1940, a slight shock was recorded by the Indian seismographs and the epicentre was near Bucharest where according to Reuter's report three shocks were felt bringing down house-fronts and ceilings.

The destructive earthquake of November 10, 1940, was recorded by all the seismographs in India, and the epicentre as tentatively determined at Bombay, immediately on receipt of telegraphic reports from Agra and

Calcutta was near Lat. $44^{\circ}5$ North and Long. $27^{\circ}0$ East about 60 miles away from Bucharest. The first movements as recorded by the Bombay seismographs give an azimuth of about 30 degrees West of North while the tentative epicentre lies about 38 degrees West of North. The tentative epicentre agrees well with the centre of the area of destruction which is near Lat. 45° North and Long. 27° East. The depth of focus of the shock was found to be about

over the world, B. Gutenberg and C. F. Richter^{a,b} have listed only two deep shocks with their epicentres in Rumania as shown below:—

Date	Epicentre	Depth of focus
1929, Nov. 1 .	$45^{\circ}9$ N., $26^{\circ}5$ E.	160 km.
1938, July 13 . .	$45^{\circ}7$ N., $26^{\circ}7$ E.	150 km.

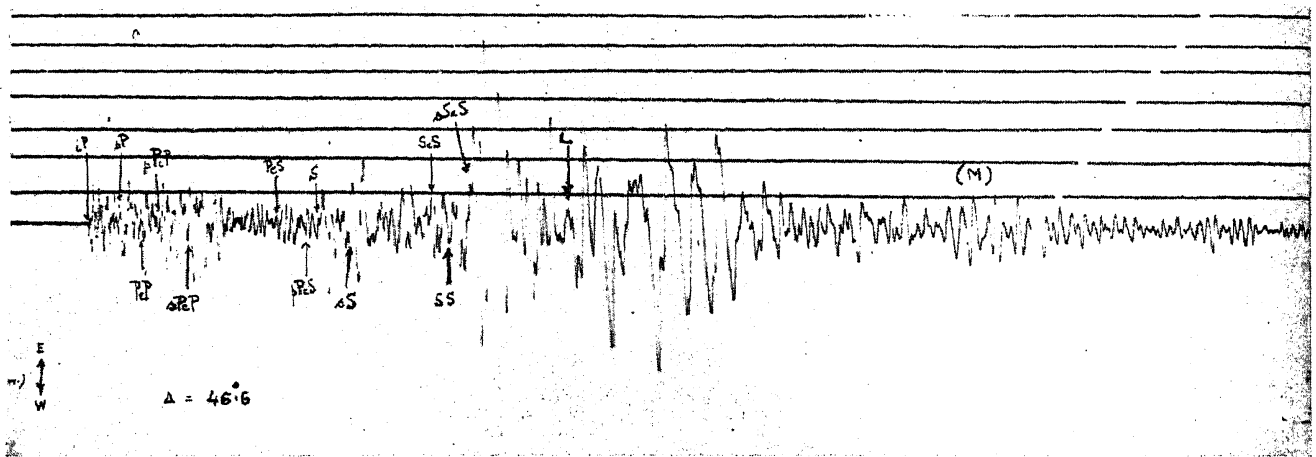


FIG. 1

150 km. from the Bombay seismograms and this is supported by the Hyderabad records, which were kindly loaned by the Director of the Nizamiah Observatory, Hyderabad, Deccan. The Calcutta seismograms and the data which were received just at the time of going to press also give about 145 km. The same order of depth was obtained from the macroseismic data using the well-known relationship^{1,2} between the observed maximum seismic intensity and the area over which the shock was felt.

The Bombay seismogram of the Rumanian earthquake as recorded by the Milne-Shaw East-West component is reproduced in Fig. 1. The great number of clear phases, which is a regular feature of deep focus seismograms, is to be noted. The maximum movement is recorded after sScS. The very well developed long-period waves commence with great amplitude and are followed by poor 'maximum' waves.

In their study of Depth and Geographical Distribution of Deep-focus Earthquakes all

Though most of the deep focus shocks are confined to the Pacific, a few isolated regions are found in Europe and Asia where intermediate* shocks are known to occur. In Europe, there are two such regions, viz., Rumania and the Aegian Sea. According to B. Gutenberg and C. F. Richter,^{a,b} "the isolated intermediate shocks in these regions are all related with active or comparatively late vulcanism".

* Earthquakes are classified by modern seismologists into normal, intermediate and deep ones. Normal shocks are those which have their origin comparatively near the surface, the intermediate ones originate at depths varying from 30 km. to 250 km. and the deep ones are from 250 km. to 700 km. from the surface.

¹ J. Milne, *Report of the British Association for the Advancement of Science*, 1911, p. 649-740.

² *Nature*, 1940, **145**, 460.

³ *Seismological Bulletin, India Meteorological Department Jan-March*, 1940, p. 19.

^{4a} B. Gutenberg and C. F. Richter, *Bull. Geol. Society of America*, **49**, 269.

^{4b} —, *Ibid.*, p. 281.

^{5a} —, *Ibid.*, p. 267.

^{5b} —, *Ibid.*, **50**, p. 1519.