BOOK REVIEW

B. GUTENBERG AND C. F. RICHTER, Seismicity of the Earth and Associated Phenomena. Princeton Univ. Press, Princeton, New Jersey, 1949, 273 pp.

When two of the world's most distinguished seismologists have been working on a subject for more than ten years, one may expect important results to come out. These expectations are more than satisfied by this book, which contains the important results obtained at the Seismological Laboratory at Pasadena. The book is epoch-making in geophysics, particularly because it treats a statistically homogeneous material. This is facilitated by a consequent use of Richter's magnitude scale for earthquakes, originally introduced in 1935, and considerably developed in subsequent years by Gutenberg and Richter. Its importance lies in the fact that the magnitude is strictly defined in instrumental quantities, thus completely objective.

The reviewer is very much impressed by the large amount of work which lies behind and not less by the accuracy and conscientiousness with which it has been carried out, e. g. all the determinations taken from the International Seismological Summary have been carefully examined, as well as all other previous determinations. All seismologists in the world must be very grateful to the authors that their determinations have been compiled in the tables in the book, pp. 117—252, containing date, time, location, depth, magnitude etc. for about 3000 earthquakes, a list of the greatest value for seismological investigations. Pp. 253—267 contain a table of about 450 active volcanoes. Another feature of great help in subsequent investigations is the large list of references (pp. 104—116), containing about 560 numbers, including not only papers on seismological studies of various earthquakes (both instrumental and directly in the earthquake regions), but also on vulcanology, gravity, geology, topography etc.

After a few introducing pages we find an interesting chapter on frequency and energy of earthquakes (pp. 16—25). It gives statistical results, which thanks to the magnitude scale are more reliable than hitherto. The basic relations are one for the energy E corresponding to the magnitude M and one for the annual number N of earthquakes of magnitude M:

$$^{10}\mathrm{Log}\, E = 12 + 1.8\, M$$

$$^{10}\mathrm{Log}\, N = a + b\,(8 - M)$$

a, b are constants, dependent on the depth of the focus. We learn that the total number of true earthquakes may well be of the order of a million each year; that the mean annual energy released in earthquakes is about 10^{27} ergs, and that the few large earthquakes contribute most to the energy. Table 7 on p. 22 gives statistics concerning the geographical distribution of earthquakes. Among other things we find that of the shallow earthquakes (depth $\leq$ 60 km) about 80 % belong to the Circum-Pacific Belt, of intermediate earthquakes (depth 70—300 km) 91.3 % belong to the Circum-Pacific Belt and the rest to the Transasiatic Belt, and that all deep earthquakes (depth $>$ 300 km) are located to the Circum-Pacific Belt.

The greatest part of the text (pp. 28—94) is devoted to the regional discussion, where region by region round the earth is treated with regard to earthquakes, volcanoes, gravity anomalies, geology etc. The Pacific arc structures have been studied with particular care. A vertical cross-section of a typical Pacific arc is given in Fig. 6, p. 29. The book contains almost exclusively facts and very few hypotheses. But in spite of the abundance of facts it is written in an enjoyable form. The accompanying maps are excellent; one could possibly wish that they would contain more of the geographical names given in the text. The facts and the results are too many to be mentioned here. One chapter (pp. 94—97) treats tsunamis (seismic sea waves) and contains many references. Pp. 97—101 are devoted to »Mechanism», and contain several interesting ideas. A question of interest is naturally to what extent recorded earthquakes for somewhat more than 40 years are representative, in other words it would be very interesting to compare the earthquake distribution given here with that of another 40—50 years.

I hope to have given by this review the impression that the book is of the greatest value for all who have something with the earth to do in their science, geographers, geologists, geophysicists of all kinds, particularly seismologists. It is hoped that the book will be a standard work in its field for many years, but it is also hoped that it will be continued as time goes on and more data are accumulated.

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