19. On Emergence of Large Earthquakes from Common Seat.

By Akitune IMAMURA, M.I.A.

(Comm. July 12, 1947.)

That large earthquake does never take place once more from the same origin was a view due to the late Dr. F. Omori, although it seems to have been better to add to it a phrase "within a period of 300 years," seeing that in his days earthquake date available for statistic study could go back only as far as the end of the XIV century. The view is nevertheless to be revised still further; not only the compilation of records on past earthquakes have since been well revised and supplemented, but the manner of statistic study concerning particularly the origins of past large earthquakes has also been advanced in virtue of the application of other auxiliary branches of science and the results attained through seismometric and geodetic investigation of large earthquakes recently occurred. Thus, for example, the recent regional Nankaidō earthquake, which may be regarded as emerged from the origin of as large as 300×100 km in extent, might undoubtedly have had greater, though not the whole, portion of this seat in common with either of the great Nankaidō earthquake of 1707 or 1854. As to large inland earthquakes, which emerge from much smaller origins, there are even cases when they are likely to have started from seat quite identical to each other, as I have pointed out in my paper on the Tūkusi earthquake of 679, similar earthquake having taken place at the same place 1113 years later, that is to say, in 1792¹⁾. Besides, there are a few other cases, the present note being the result of my further study about those earthquakes.

As I have pointed out elsewhere²⁾, the Dewa earthquake of 850 originated at the same place with the Kisakata earthquake of 1804. While years have elapsed since the later earthquake had been well studied about its distribution of seismic intensities and land deformations associated with it, it was not so with the earlier one, owing to the fact that at the time of its occurrence country to the north of Mt. Tyōkai was inhabited only by uncultured Ainu tribe, whereas locality to its south, the area worst shaken with land more or less depressed, was not accurately known where it was so. The fact is that the office of the provincial government, then situated in a fortified area called Dewanosaku, was abandoned together with the fortifications as consequence of havoc wrought by the said earthquake, so that in time the ruins had disappeared and its old site completely lost, until it was discovered in 1931. Since then investigation was promptly carried out; two fold land deformations in the littoral north

1) Read before the February Meeting, this year.

2) Imamura: Jap. Jour. Astr. & Geop., 16 (1939), 79.

of Tyōkai were discovered, one assigned as an accompaniment of the 1804 earthquake and the other of the 850 earthquake, both being almost equal to each other and distributed similarly, so that it may be said that the 1804 earthquake originated at the same place with the 850 earthquake after it had elapsed as long as 954 years.

The Nadati earthquake of 1751, which may be regarded as caused by an acute westward tilting of the Nisikubiki-Kamiminoti block or a sudden advancement of its folding, is likely to have been preceded at the same place by another destructive shock that happened 888 years before it, namely, the great Etyū-Etigo earthquake of 863, a small islet or islets near Naoetu, it is said, having disappeared on that occasion¹⁾.

The destructive Zenkōzi earthquake of 1847 is another example: it originated at the place where occurred another destructive earthquake on August 26, 887. As to the earlier earthquake, no detailed information about the effect of its shakings are given, but landslides and blockings of river courses ended with consequent collapse and inundation of a tremendous scale, so characteristic in the case of the 1847 earthquake, occurred quite similarly in the case of the 887 earthquake. On the other hand, since the regional destructive earthquake of 887 occurred off the Pacific coast of Honsyū simultaneously with the above-mentioned Sinano earthquake, there may arise a view that the landslide in question might have been a result of this sub-oceanic earthquake, although its actual occurrence is improbable, seeing that there occurred in the case of the regional sub-oceanic Tōkaidō earthquake of 1854 no such earth disturbances even in a far smaller scale as compared to those experienced in the case of the 1847 earthquake. It may thus be said that the Zenkōzi earthquake of 1847 emerged from the seat where the 887 earthquake took place 960 years ago.

The above-mentioned Zenkōzi earthquake may be regarded as the final phase of paroxysmal advancement of acute movement undergone by the Nisikubiki-Kamiminoti block, the first phase having appeared as the destructive Oomati-gumi earthquake of 1714, and the second as the Nadati earthquake of 1754²⁾. It is so much so that the above-mentioned Etyū-Etigo earthquake of 863 and the North Sinano earthquake of 887 might have been a series of similar movement of the same block. If so, there might possibly have been present the first phase corresponding to the Oomati-gumi earthquake of 1714 in the later activity, in which case the large Sinano earthquake of 841 is likely to represent that phase in the earlier activity. The consideration is based on the facts that on that occasion the Itoigawa-Suntō line was in a very active state as was manifested with telluric dis-

1) Read before the April Meeting, this year.

2) Since 1847, there occurred, on or near the boundary of the said block, large earthquakes such as, for example, the Matusiro earthquake of 1858, the Susaka earthquake of 1897, the Oomati earthquake of 1918, the Naganuma earthquake of 1941, and the Huruma earthquake of 1943, each having been far smaller than the 1847 earthquake, and belonging merely to the category of after-shock in a wide sense.

turbances such as the Idu earthquake of 841, the Ettyū-Etigo earthquake of 863, the most energetic Huzi explosion of 864, the North Sinano earthquake of 887, and so on, and that the area covered by Oomati-gumi, that is to say, the Otari valley in North Azumi County, is, seismically, one of the most unstable districts in Japan; the place being the end portion of Fossa Magna as well as the so-called median line, is incessantly under the sway of telluric force given damages to railways, particularly to railway tunnels, and sometimes causing landslides associated with swarms of earth-tremors or earthquake sound. It may thus be said that the Oomati-gumi earthquake of 1714 was that which emerged from the seat of past large earthquake after it elapsed a time as long as 873 years.

Earthquake faults, which were associated with the destructive Idu earthquake of 1930, were very widely distributed in the whole province such that there shall be no more vacant space left for the occurrence of another large earthquake unless it takes place at the same seat. This reasoning should similarly apply to the past Idu earthquake, which took place in 841 and was so great that several relief works for the devastated province, such as, for example, granting monetary aid, remission of taxes, etc., were promptly undertaken by the government especially under the Imperial Rescript. In all probability, the Idu earthquake of 1930 emerged from the same seat as in the 841 earthquake, the time interval between the two events thus coming out as 1089 years.

Furthermore, there are a few similar cases, though rather vague, other than the above-mentioned, namely, the East Harima earthquakes of 868 and 1864, and the Kwantō earthquakes of 818 and 1923. The East Harima earthquake of 1864, however, was far smaller than the 868 earthquake, whereas coincidence of the origins of the Kwantō earthquakes of 818 and 1923 is rather uncertain.

It may thus be concluded from the data so far mentioned that there are cases when large inland earthquake emerges from seat where similar, large earthquake ever occurred in remote historic times, and that the time interval required for the repetition is likely to exceed 800 years. Further, there are cases when the said repetition took place after more than 1100 years had elapsed, although these data suggest in nowise the presence of the maximum limit for such repetitions, since our statistic data are available only as far back as 1300 years, or to be on safe side, 1150 years.