

Historical review of deep seismicity of the Japanese islands and neighborhoods

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Wadati (1927) presented the convincing evidence of frequent occurrence of earthquakes deeper than 300km in the central Honshu. Honda (1934) showed the principal deep earthquake zone running in NNW-SSE direction, crossing central Honshu and the Soya deep earthquake zone running in ENE-SSW direction, crossing Soya Strait. Wadati(1935) reaffirmed both earthquake zones and showed the Kyushu deep earthquake zone running in NNE-SSW direction along Kyushu and Ryukyu islands. He drew the iso-depth lines of deep earthquakes and showed those lines dipping away from the trench toward the Asiatic continent northwestward and Philippine Sea toward WSW. He drew the iso-depth lines along the Kyushu deep earthquake zone run in NNE-SSW direction toward Asiatic continent. The deep earthquake zone defined by those iso-depth lines are called the Wadati-Benioff zone after its discoverer.

The distribution of earthquakes was studied by Wadati and Iwai(1956), Usami et al.(1958) and Katsumata(1966), based on the data edited by the Meteorological Agency, and reaffirmed the similar distribution of deep earthquakes, though they the iso-depth lines.

Utsu(1986) showed the distribution of earthquakes in the Japanese islands and neighborhoods, based on the data of the International Seismological Center from 1964 to 1983, and drew the iso-depth lines of deep earthquakes. The general tendency was not different from that by Wadati(1935), but those lines were not drawn concentrically as Wadati(1935) showed, but drawn linearly running in N-S direction and dipping westward in Japan Sea area. He pointed out the occurrence of deep earthquakes to the west of the Bonin islands and in the outside of the deep earthquake zones. The figures showed many earthquakes were far from the iso-depth lines.

Wadati(1927) pointed out that the Nobi earthquake of 1891, the Anegawa earthquake of 1909, the Kanto earthquake of 1923, the Kita-Tajima earthquake of 1925 and the Kita-Tango earthquake of 1927 took place on the central part where the deep earthquake zone crossed. In addition to that, he found a deep earthquake occurred 4 days after the occurrence of the Kita-Tajima earthquake near the epicenter of the former deep earthquake, and another deep earthquake 51 days before the Kita-Tango earthquake near the epicenter of the deep one.

Honda(1934) and Wadati(1935) indicated that the deep earthquakes tended to occur along the Quaternary volcanic zones.

Suzuki(1970) showed the frequent occurrence of shallow and deep earthquakes along the volcanic zones in South Kyushu.

Mogi(1973) pointed out that shallow great earthquakes along the trench took place 1 or 2 years later the occurrence of deep earthquakes in the deeper part along the deep earthquake zone.

Suzuki and Sekiguchi(1974) showed the intimate relation of occurrence of shallow and deep earthquakes along the margins of the mountains and surrounding areas in the south part of northeast Honshu.

Suzuki and Kobayashi(2004) showed the relation of sporadic distribution of deep earthquakes with Cretaceous and Paleogene felsic volcanic and granitic rocks in central Honshu.

Suzuki(2006) pointed out the occurrence of the Mid-Niigata earthquake of 2004 was preceded by deep earthquakes along the Shinanogawa earthquake zone to the west of the mountains in the south of northeast Honshu.

The studies stated above show that the distribution of deep earthquakes must be pursued in relation to topography and geology, which is the aim of the research group of deep structure of island arcs founded in 2001.