

Relation between the depth of seismogenic layer and topographical altitude

Hiroyuki Takayama[1]; Kohji Hosono[2]; Akio Yoshida[3]

[1] M.R.I.; [2] Earthq.Info.Predict.Div.,JMA; [3] MRI

Having investigated the depth of the seismogenic layer in the Japanese islands using the new JMA hypocenter catalog, we found following characteristics.

1. In Hokkaido, the seismogenic layer is relatively deep in the mountainous areas from Teshio through Hidaka compared to that in the zone along the volcanic front.
2. In Tohoku, the seismogenic layer is deep in coastal regions of the Pacific Ocean and the Japan Sea.
3. The seismogenic layer is shallow in the backbone of mountains in northeastern Japan, alpine areas in the Chubu district, and the San-in volcanic zone.
4. In Kanto, Tokai, Kii Peninsula, southern coast of Shikoku and eastern coast of Kyushu beneath which the Philippine Sea plate subducts, the seismogenic layer is relatively deep except the region around the Izu Peninsula.
5. Along the Median Tectonic Line in the Kii Peninsula and Shikoku and its extension to the west in Kyushu, the seismogenic layer is shallow.
6. The seismogenic layer is relatively deep in low lands such as the Kanto plain, Nobi plain, Niigata plain and the coastal area of the Setouchi Sea compared to that in mountainous high lands.
7. Shallow activities are observed in the areas where large earthquakes occurred in recent years.

We investigate the relationship between the depth of the seismogenic layer and topographical altitude in the Japanese Islands quantitatively. We confine the area of the study to the west of the Volcanic Front in Hokkaido and northeastern Japan and to the north of the Median Tectonic Line in Chubu and south western Honshu to avoid difficulty to separate out crust earthquakes in the coastal regions of the Pacific Ocean.

In the previous study we found out that the seismogenic layer is relatively deep in low lands such as the Kanto and Niigata plains compared to that in the surrounding mountainous areas. However, the feature becomes obscure when all the data in the Japanese Islands is plotted in one figure. Therefore, we examine the relationship confining the area. In Hokkaido, northeastern Japan, northern Chubu and northern Kinki, the relationship is clear, though the correlation coefficient is not exactly the same for every region. On the other hand, the relation is not observed in Kyushu, Shikoku and southern Kii Peninsula. This is because the seismogenic layer is shallow in the zone along the Median Tectonic Line.

It is considered that the depth of the seismogenic layer reflects the thermal structure in the crust (Kobayashi, 1976; Ito, 1990; 1992). From this view point we investigate the meaning of the relationship between the seismogenic layer and topographical altitude and the cause why the feature is not observed in the zone along the Median Tectonic Line.