

# Seismic activity and seismogenic layer in the Hida Mountain Range, central Honshu, Japan

# Kiyoshi Ito[1]; Hiroo Wada[2]; Shiro Ohmi[3]; Bogdan Enescu[4]

[1] Disas. Prev. Res. Inst, Kyoto Univ.; [2] Kamitakara Obs., Disas. Prev. Res. Inst., Kyoto Univ.; [3] RCEP,DPRI,Kyoto Univ.; [4] RCEP, DPRI, Kyoto Univ.

Seismic activities in the Hida Mountain range have some different characteristics from that in other tectonic regions. The range has some active volcanoes and the seismicity is closely related to the volcanic activities. Focal depths of the earthquakes are very shallow to be less than 5km, which indicates the seismogenic layer is very thin in the mountain range. We report these characteristic features of the seismicity derived from the microearthquake observations by the Kamitakara Observatory, Kyoto University.

Seismicity in the Hida range has the following characteristics;

- 1) Seismic activities occur in a narrow zone of 10km wide in the summit area along the mountain range.
- 2) Focal depths of the events are very shallow to be less than 5km in the summit area with increasing their depths towards both flanks of the mountain range.
- 3) Focal depths of events at the foot of the mountain range are rather deep as about 10-15km.
- 4) Detailed distributions of epicenters in the seismic zone along the mountain range, show few shocks occur just beneath the active volcanoes.
- 5) The earthquake sequences in the seismic zone are swarms and migrate from place to place along the mountain range.
- 6) The maximum magnitude of the earthquake in the seismic zone is M5.3; no larger events occurred for the past 30 years. The Western Nagano Prefecture earthquake of M6.9 in 1984 occurred in the southern foot of the Ontake-san volcano. There were no large events greater than M5.3 in the summit area of the mountain range.
- 7) The earthquake clusters migrates usually from south to north and return in the opposite direction.
- 8) Most of focal mechanisms of the events are of strike-slip type with a maximum pressure axis in northwest-southeast direction. However, reverse-fault type events sometimes occur, especially in the area of south of the Ontake-san volcano.
- 9) Events in a small and/or moderate earthquake sequence are distributed on a plane with a strike of E-W or N-S, which is consistent with the focal mechanisms of the largest events in the cluster.
- 10) The earthquakes in the Ontake-volcano and those in the Norikura- volcano are complementary; when one is active the other is quiet.
- 11) Low frequency earthquakes occur at the Moho discontinuity, but the locations are restricted near the Tateyama, Yakede and Ontake volcanoes.

As described above, the seismogenic layer is thin at the summit area of the Hida mountain range. This is closely related to the thermal structure. The migration of the earthquake swarms along the range show that breaking-and-healing processes are repeated by the movement of the fluid or gas. Stress recovery might be occurred for the repetition of earthquake swarms at the same place. Two velocities of swarm migration are observed; one is 1-2km/day of a jumping movement and the other is about 10km/day of a diffusion-like movement of the earthquakes. It is found that there is a zone in which seismic waves are greatly attenuated in the 5-20km deep in the mountain range. Distinct seismic reflectors are also located in the middle and lower crust in the area. These all indicate that there is magma in the mountain. Therefore, the detailed determination of magma is most important to reveal the seismic phenomena in the area.