

Seismic activity and attenuation structure around the Fukushima and Yamagata Prefectures' border after Tohoku earthquake

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Around the border between Fukushima and Yamagata prefectures, seismicity was suddenly activated after off the Pacific coast of Tohoku earthquake. We estimated distribution and focal mechanisms of the earthquakes to clarify features of the seismic activity. A three-dimensional seismic structure in the northeastern Japan derived in a previous study showed that fluid might affect the seismic activity in this swarm. A Q_p/Q_s and Q_s value greatly change by existence of fluid. Then, we estimated the Q values to clarify physical properties in this region by taking velocity amplitude spectral ratio between P and S waves.

First, we found that hypocenters were concentrated into four clusters. We also observed hypocenter migration to lateral and vertical direction in some clusters. Most earthquakes have the thrust-type focal mechanisms. Average Q_p/Q_s and Q_s values on the ray paths from hypocenters to stations show high Q_p/Q_s and low Q_s at relatively near stations from source region. While paths from the hypocenters to far stations show low Q_p/Q_s and high Q_s . This feature might indicate that high attenuation region exists in nearby source region. Further, we estimated a detail Q structure of the swarm area by using combination of spectra ratio data which have very similar ray paths. As a result, the blocks in which many earthquakes occurred have high Q_p/Q_s and low Q_s , whereas those for the region between the clusters show vice versa. When we compared with other geophysical data, this high Q_p/Q_s and low Q_s values seem to reflect the influence of fluid. Hypocenter migration would be explained by upward migration of fluids due to difference of density.

Keywords: attenuation structure, Seismic activity, swarm, hypocenter migration, fluid