Characteristic earthquake sequence off Kamaishi, Iwate Prefecture (2) - subclusters in a small earthquake cluster

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We estimated precise hypocenter locations and focal mechanisms of microearthquakes belonging to cluster where 'characteristic' events have occurred. The relocated hypocenter distribution shows that the cluster has plane shape whose size is 1.5 km x 0.5 km and dip angle is about 35 degrees, and is divided into three small sub-clusters. Small earthquakes belonging to the western two sub-clusters have almost the same focal mechanisms: EW thrust fault type with a nodal plane whose dip angle is about 35 degrees. On the other hand, earthquakes in the easternmost sub-cluster have a nodal plane with a dip angle of about 25 degrees. This result may indicate that the cluster is caused by a small unevenness of the plate boundary.

The northeastern Japan arc is one of the most seismically active areas in the world. However, there are no historical records of large earthquakes near the seashore between 39N and 40N although microearthquake activity is very high there. Igarashi et al. (1999) investigated a cluster whose location is about 10 km away from the seashore and depth is around 45 km, and found that the cluster is dominated by nearly identical and regularly occurring small earthquakes with JMA magnitude of 4.8 +- 0.1 and a recurrence interval of about 5.35 years. Many microearthquakes also have occurred in the cluster. Very few events occurred just after the 'characteristic' events but the seismicity gradually became active in the latter half of the recurrence interval. In this study, we relocated relative hypocenters of microearthquakes in the cluster using waveform similarity and estimated focal mechanisms of small earthquakes in order to investigate the cause of the cluster. The relocated hypocenter distribution shows that the cluster is divided into three small sub-clusters. The entire distribution of the hypocenters has plane shape whose size is about 1.5 km (EW) by 0.5 km (NS) and dip angle is about 35 degrees. Focal mechanisms of small earthquakes belonging to the western two sub-clusters are almost the same: EW thrust fault type whose dip angle of the westward dipping nodal plane is also about 35 degrees. On the other hand, earthquakes in the easternmost sub-cluster have a nodal plane with a dip angle of about 25 degrees. This result may indicate that the cluster is caused by a small unevenness of the plate boundary.