The fine fault structure estimated from seismic activity -In the region of the western Shizuoka earthquake swarm-

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Earthquake swarm activity had started from November 12, 2007 at western part of Shizuoka Prefecture, Japan. The source region is located at 17km depth in the vicinity of the Hamamatsu city. The maximum magnitude of the activity is 4.0. There were six events with magnitude more than 3.0 up to now. To determine well resolved hypocenter distribution is important for understanding the fine fault structure and the rupture process during the swarm like activity. We relocated the hypocenter locations, using the differential arrival time obtained by both manual picking and waveform cross-correlation analysis. We will discuss the fault structure ruptured during the swarm like activity and temporal variation of hypocenter on a fault.

The hypoDD algorithm was applied to the double-difference data. We used the 870 earthquakes which occurred in the period between 1 January 2002 and 31 May 2007. The differential arrival times for the manually picked P- and S-wave were 18 million pairs. We also used the differential arrival times obtained by the waveform cross-correlation analysis. The correlation measurements were conducted by using a velocity waveform of 1.25 s time window applied a 3-20 Hz band-pass filter, including the manually picked P- or S-wave arrival times. We obtained a data set of accurate differential arrival times that contained 180 million pairs.

We determined the focal mechanisms using absolute P and SH amplitudes and P-wave polarity. According to the method in Ide et al. (2003), we determined the spectral levels by fitting the omega2-model (Boatwright, 1987). We determined the focal mechanisms for the events of which magnitude is more than 2.0. We could precisely determine the focal mechanisms of 53 events.

The relocated epicenter distribution extended for approximately 2.5 km, which aligned with the direction of NW-SE. All of focal mechanisms are left-lateral strike slip with P axis of EW direction. The trend of epicenter distributions in the map view is well consistent with the NW strikes of the nodal planes of the focal mechanisms. Along the cross-section perpendicular to the fault plane, the earthquakes are distributed in the northeast dipping direction with high dip angle of 80 degree. The width of earthquake distribution from the fault plane is less than 50 m. The dip angle of the earthquake alignment is well coincide with that of the focal mechanisms. These results suggest that almost all the earthquakes occurred on the fault plane with EW strike and 80 dip angle.

The swarm like activity started at the central part of source region and migrated from NW and SE direction with increasing time. The region of swarm like activity spread on the fault plane from November to December, 2007. The large earthquake with M3.0 occurred in the front of migrating hypocenter distribution. This result suggests that the fault plane of EW strike was ruptured during approximately two month, migrating the seismic activity. On the other hand, it seems that the rupture area of M 4.0 event occurred on end of January, 2008 overlaps the region of previous swarm like activity. Since the earthquake did not occur off from the fault plane, it is suggested that this fault plane is much weaker than any other pre-existing fault plane around it.

The surface traces of left-lateral faults exist around the swarm activity region. The strike of surface trace of left-lateral faults is consistent with the trend of hypocenter distribution. The swarm like activity might be triggered due to crustal fluid which could weaken the strength of fault plane.