Generation of Seismic Swarm and Intrusion and Freezing processes of Dike within the Crust; --A case of East-off Kozushima Dike-

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After the intrusive event of Miyake-jima volcano on 26 June, 2000 an active earthquake swarm between Miyake and Kozu Island began, producing five earthquakes with their magnitude larger than 6. The swarm started at the western coast of basaltic Miyake-jima volcano on June 26, and propagated northwestward to rhyolitic Kozu volcanic island. An M6.4 earthquake occurred on July 1 at the northwestern tip of the swarm (near the eastern coast of Kozu Island). The regional crustal deformation became prominent after the event though the swarm propagation stopped at about 15km off eastern coast of Kozu Island. The rate of deformation observed by GPS was nearly constant until mid August followed by rapid decay. The swarm activity decays gradually but has generated intermittent bursts of short duration (e.g. Aug. 3-4). The swarm also activated the seismicity of the region in the oblique extent from the both tip of the swarm. The total amount of intruded volume became about 1km^3 from GPS observation, which was nearly the same amount of collapsed caldera (about 0.6km^3) and was consistent to the mass deficiency estimated from the gravity survey.

The question where the vast amount of magma comes from is still controversial. The model that the magma comes from the magma chamber of the Miyake-island conflicts with the continuous shrink of Miyake Island until September. A more plausible model may be that the magma may come from the sub-crustal magma pocket where magma is thought to be stagnant due to the density contrast between the crust and mantle.

At this moment, no direct evidence was found for the horizontal movements of intruded magma except for the initial 5 days. To understand for the mechanisms of more than one month of intruding process need mechanical as well as thermal considerations for the formation process of complex dike. To do this, the short term activity of seismic swarm can be only a key to clarify and specify the movement of intruding magma. A preliminary estimation of the pressure difference for the magmatic intrusion revealed that it might need about a few hundred to thousand Pa for a day-long activity of swarm event, in a case of buoyancy dominated magma intrusion process.