Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)

SVC54-08 Room:411 Time:May 1 11:30-11:45

Formation process of a volcanic island during the 2013-2014 eruption at Nishinoshima, Ogasawara, Japan

MAENO, Fukashi[1*] ; NAKADA, Setsuya[1] ; KANEKO, Takayuki[1]

[1]Earthquake Research Institute, Univ. Tokyo

New volcanic islets created by submarine eruptions are often observed around Japanese Islands. However, in most cases, such new islets are disappeared by wave erosion in short periods. To make a new volcanic island remaining for a long time, an amount of lava flows must occur and reclaim land from the sea. However, such relatively large-scale lava eruptions rarely occur. Therefore, the very initial stage of the formation process of a volcanic island has been poorly understood.

The submarine eruption off Nishinoshima, Ogasawara, has created a new volcanic islet since Nov 2013. The lava flow eruption continues for more than a few months, and the islet keeps growing. This eruption will give an opportunity to understand the birth and growth of a new volcanic islet. We studied variation of eruptive styles and sequences of this 2013-2014 eruption at Nishinoshima based on airborne observations and publicized aerial and satellite images (taken by JCG, GSI, and JAXA).

Nishinoshima forms a part of summit crater rim of a huge submarine volcano. The 2013-2014 eruption occurred inside the summit crater about 400 m off Nishinoshima with a depth of dozens of meters. In the first stage, Surtseyan eruptions repeated due to seawater entering a main crater of an islet. With the growth of the islet, the main crater was dried up and the eruption style changed to Strombolian with a scoria cone formation and lava flows that continuously effuse from the main crater over a few months. Lava flow front is brecciated by rapid cooling, or auto-brecciated, and eventually reclaimed the foreshore from the sea. The lava flows are then branched many times and extended to almost all directions. The continuous activity of Strombolian with lava flows suggests that magma is stably supplied from the deeper part of conduit.

Based on the change of outline of the islet and bathymetry data before the eruption, volume and discharge rate of lava flows are estimated. For the first 2.5 months by early Feb 2014, the volume of lava flow is estimated at about 6 M m^3. The discharge rate is estimated at 0.5-1$*10^5$ m^3/day with some fluctuations. This discharge rate is almost the same as that estimated for lava effusion in the 1934-1935 eruption at Showa Iwojima, southern Kyushu (1$*10^5$ m^3/day; Maeno and Taniguchi, 2006), which is one of the youngest remained volcanic islands in Japan. The volume of the 2013-2014 eruption is so far 1/4 of the total volume (24 M m^3) of the last 1973-1974 eruption, in which the volume of the last eruption was estimated based on bathymetry change before and after the eruption. The eruptive sequence and growth rate of the islet in 2013-2014 is different from the last eruption. This is probably because the eruption began at shallower depth than the last eruption. At the time of early Feb 2014, erosion signatures on lava flows are little, so that the new island is expected to further grow.

Keywords: Nishinoshima, volcanic island, lava flow, Surtseyan eruption, Strombolian eruption