

## New fumarole activity at the southwest rim of Ioyama in Kirisima volcanoes, Southern Kyushu

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A new fumarole appeared on the southwest rim of the Ioyama old crater in the Kirisima volcanoes on December 14<sup>th</sup>, 2015. Previously, two main fumarole zones were active in Ebinokogen site: the Ebino fumarole zone in the west and the Ioyama fumarole zone in the east (Geothermal Research Department, the Geological Survey of Japan (GSJ), 1955). The Ebino fumarole zone was very active from the 1940s to 1960s (Council for conservation of nature of Ebinokogen, 1987). Temperatures were measured by GSJ at depths of 1 m in the Ebino fumarole zone and observed 96°C in 1954. In the 1940s to 1960s, this zone moved to the west, and the activity decreased until 1970s.

The center of the Ioyama fumarole zone is about 0.8 to 1 km to the east of the center of the Ebino fumarole zone (Geothermal Research Department, GSJ, 1955). Records from sulfur mining indicate that the Ioyama fumarole zone has been active before AD 1900. The oldest fumarole temperature was recorded over 80°C in Ioyama measured by Oda Ryohei on August 12<sup>th</sup>, 1916 (Oda, 1922). Akiko Yoshano described the fumarole in a short Japanese poem in 1929. The temperature of the fumarole in the Ioyama fumarole zone reached between 96 and 120°C in 1954 (Geothermal Research Department, GSJ, 1955). The highest temperature in the Ioyama fumarole zone was recorded as 247°C in March 1975 (Kagiyama, 1979) and five measurements over 150°C in August 1987 (Kagiyama, 1987). However, the activity of this zone declined in 1990s, and we could not find the fumarole in 2008.

The first volcanic tremor was observed on August 14<sup>th</sup>, 2014 under the periphery area of Karakunidake. And volcanic earthquakes and tremors were observed occasionally from July 2015 (JMA Homepage). A member of the Kirisima nature guide club found a very small fumarole on the afternoon of December 14, 2015 on the southwest rim of Ioyama old crater. A fumarole had previously been identified at this location in the Ioyama fumarole zone. The fumarole temperature was 80°C on this day. We observed temperatures between 93 and 96°C in the fumarole on December 25<sup>th</sup> and 27<sup>th</sup>. This new fumarole and high temperature area has continued to expand to the north and south of the original location as of February 2016. We are monitoring changes in the temperature, direction of movement, and location of the fumaroles.

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