VARIATION IN THE CHEMICAL AND ISOTOPIC COMPOSITION OF FUMAROLIC GAS AT TAAL VOLCANO, PHILIPPINE PRIOR TO THE 2020 ERUPTION

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Taal volcano island is located in the southern part of Luzon Island, Philippine, about 50 km south of Manila. Taal volcano island has a mountainous body of about 5 km across surrounded by the lake water in caldera. The Taal Main Crater Lake (MCL) with a diameter of 1 km is located at the center of Taal volcano island. Thirty-three (33) eruptions have been recorded between 1572 and 1977 at Taal volcano island. From the last eruption in 1977 to 2019, the relatively long dormant period has continued. On 12th January 2020, a large eruption happened at MCL. The plume of eruption raised up to 10km. Fumarolic gas contains components degassed from magma, so it responds to the up and down of volcanic activity, and chemical composition and stable isotopic ratio fluctuate sensitively. In this research, we focused on the time variation of several fumarolic gases discharging at Taal volcano island. From September 2016 to March 2019, the CO_2/H_2O ratio of a fumarole gas gradually decreased. The number of volcanic earthquakes started to increase in May 2019 followed by the enhanced number toward to the eruption in January 2020. The CO_2/H_2O ratio of the fumarolic gas in September 2019 raised to 5 times relative to the ratio in March 2019. Other parameters such as He/CH_4 ratio and apparent equilibrium temperature (AET) defined between H_2O and H_2 provided useful information to deduce the process beneath Taal volcano prior to the 2020 eruption.

Keywords: Taal volcano, Volcanic gas, Chemical composition, Stable isotope ratio

