

## Estimation of subsurface structure of Shinyu crater lake, Tateyama Caldera, based on the water level and seismic observation data

\*Ryohei Kawaguchi<sup>1</sup>, Naoko Saito<sup>2</sup>, Shin'ya Onizawa<sup>1</sup>

1. Meteorological Research Institute, 2. Toyama local Meteorological office, Japan Meteorological Agency

Shinyu, located in the Tateyama caldera is a crater lake with the diameter of about 40 m and the depth of about 5.6 m. The water level of Shinyu is maintained by the influx of hot water from vents at the bottom of Shinyu. Shinyu had continued the full water level for decades, but periodic geyser activity was reported from 2014 which has the period of 0-20 days (Fukui et al 2018). In order to investigate the activity of the water level change in Shinyu, we installed water level meter and seismometer around Shinyu from June to October in 2017 and 2018. In this study, we estimate the underground structure of Shinyu based on the temporal changes of water level and seismic data.

The water level change was observed by a bubble type water level meter which has a sampling period of 10 minutes. In addition, a seismometer was installed at about 20 m from the Shinyu. The seismic data was recorded with a sampling frequency of 100 Hz.

During the observation period, we were able to obtain the water level change data of 7 cycles in 2017 and 8 cycles in 2018, respectively. For the preliminary analysis, we examined the periods of water level changes, dividing the water level change cycle into four categories, dry-up, rising in the water level, full water level, and descent in the water level. As a result, the period of the dry-up is about 3 days, the rise in water level is about 4.5 days, the full water is 0 to 20 days and the descent in water level is about 0.5 days. The period of raising and decent of the water levels were almost constant for each cycle. During the rising and full of the water level, rising of hot water with gas bubbles were observed by the image of Shinyu surface taken by time-lapse camera. The amplitudes level of seismometer data was clearly different between the period of rising and full of water level and the period of dry-up and decent of water level. These indicate that geyser activity of Shinyu is occurred by boiling of hot water in the water reservoir located below the Shinyu.

When the shape of Shinyu is conical and the flux of the hot water drop under the Shinyu is constant, the flux of dropping hot water is estimated about  $0.06 \text{ m}^3/\text{s}$  by the size of Shinyu and the period of the descent of water level. According the data of water level meter, the rate of water level descent were  $1.2\text{-}2.5 \times 10^{-3} \text{ m/s}$ . From these data, the radius of cylindrical pipe assuming below the Shinyu was estimated to be 2.8-4.0 m. We also report on the result of comparing the time scale of water level changes using the observed data and simulation result based on the previous geyser model.

Keywords: Shinyu, Tateyama caldera, geyser