

Real time monitoring of underground temperature in Jigokudani, Midagahara volcano using LPWA devices

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Jigokudani is an active geothermal area in Midagahara volcano, Toyama prefecture, central Japan. It was formed as a result of repeated phreatic eruptions over 40,000 years. Increased volcanic activity in this area has been observed since 2011. In order to detect a precursory signal of a phreatic eruption, seismicity, observations should be conducted on seismicity, ground deformation, geothermal activity, volcanic gas, etc. A real time monitoring system of underground temperature using LPWA (Low Power, Wide Area) devices has been tested since 30 August 2018. An LPWA device (NHR, SS05-ST) is composed of thermometer and transmitter (LoRaWAN). 10 devices were deployed in Jigokudani. Temperature sensors (thermocouples) were placed at the depth of 50 cm. Transmitters send temperature data every 30 minutes to a gateway to the internet situated in Hotel Tateyama. The distances from the gateway to LPWA devices are within 1 km. Underground temperatures can be monitored on internet devices. Since Jigokudani has a heavy snowfall in winter, 7 devices were removed and 3 devices were left to test in winter. Though temperature data could be received until December 2018, no data could be received since then. Transmitters of around 50 cm high above the ground must be covered with snow. During summer and fall, LPWA devices are useful for real time monitoring.

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