

## Development of a monitoring system of remote island volcanoes using an autonomous vehicle of the Wave Glider

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Nishinoshima is a remote island volcano 1000 km south of Tokyo. On November 20, 2013, a brand new island was born nearby the older Nishinoshima. Over the past two years with continued volcanic activity, it has grown up to 12 times the size of the original island, which is offering us a rare opportunity to study how volcanic island forms and grows.

We develop a remote island volcanic activity monitoring system using an unmanned vehicle of the Wave Glider (WG), manufactured by Liquid Robotics Inc. of California, USA. The WG is designed to go forward using the wave and solar energy without any fuel and is equipped with a satellite communication modem to transmit data message to the land station in real-time. It has led the way to make ocean data collection and communications easier and safer, lower risk and cost, and real-time. In order to investigate the feasibility of the WG for station-keeping operation, we made a long-term deployment in the sea off Miyagi. Based on the detailed analyzing of 5 months navigation data from September to May in 2014, the potential utility of the WG as a sea surface gateway has been confirmed to identify the operating parameters.

In the remote island volcano monitoring system the WG plays roles not only in a satellite relay device but also in a multi-parametric observatory platform with microphones for detecting infrasound waves associated with volcanic eruptions, with hydrophones for detecting acoustic and seismic waves associated with deep volcanic activities, with wave gauges for detecting heave displacements associated with volcano collapse, and with video cameras. We investigated the performance of these sensors except for the wave gauge close to the Nishinoshima volcano during the KR15-03 cruise of R/V KAIREI in February 2015 (Hamano et al., 2016; Ichihara et al. 2016) and obtained extremely important results to establish the remote island volcano monitoring system.

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