Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

HDS004-P03 Room:Convention Hall Time:May 27 09:00-10:45

New multi-parameter observation network at Taal volcano, Philippines

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Taal volcano is one of the most active volcanoes in the Philippines. After an exceptionally long dormant period since the last eruption in 1977, renewed volcanic activity began in April, 2010. We deployed a new multi-parameter observation network at Taal volcano in November, 2010. The network consists of seismic, electromagnetic, GPS, and infrasonic stations, and their real-time data are transmitted to the head office of the Philippine Institute for Volcanology and Seismology (PHIVOLCS) in Metro Manila. We installed broadband seismic sensors (Guralp CMG-40T: 0.02-60 s) and short-period seismic sensors (Kinemetrics SS-1: 1 s), and created a network of seven seismic stations (5 broadband and 2 short-period stations) at the volcano. Seismic data are digitized by either Kinemetrics K2 or Basalt 24-bit data logger with a sampling frequency of 50 Hz. We installed three Overhauser magnetometers with one fluxgate magnetometer on Volcano Island. Data from Overhauser and fluxgate magnetometers were digitized with sampling intervals of 10 and 0.1 s, respectively. Three GPS receivers (Trimble NetR5) with a sampling rate of 10 s were also installed on Volcano Island. We further installed two low-frequency infrasonic sensors (ACO TYPE7144/4144: 0.01-10 s). All these data are first telemetered to Taal Volcano Observatory by a local digital telemetry system using 2.4 GHz wireless LAN, and then transmitted to the PHIVOLCS head office through a satellite telemetry system in real-time. Seismic, magnetic, GPS, and infrasonic data are received and processed by four PCs and two cluster machines installed in the head office of PHIVOLCS. These real-time multi-parameter observation data are automatically processed to visualize their temporal variations through web systems. We are currently developing a seismic waveform inversion technique suitable for Taal volcano that holds lakes: Effects of water on Green's functions are investigated to properly estimate seismic source mechanisms using a waveform inversion approach. Systematic uses of quantitative analysis techniques to analyze the data from the network will be useful to detect possible precursors of eruptions and contribute to improved monitoring of Taal volcano.