

Enhanced multi-parameter monitoring network in Taal Volcano, Philippines

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Taal is the active Philippine volcano that poses the highest volcanic threat to the country's National Capital Region. Its explosive hydrovolcanic eruptions in 1754, 1911 and 1965 generated lethal base surges, volcanic tsunami and widespread fallout tephra, the occurrence of which today could cause immense social and economic losses. Taal's current repose period that began in 1977 has been punctuated from 1990 onwards by episodes of volcanic unrest characterized by seismic swarms, fissuring, ground inflation and hydrothermal activity. Through the past decade, the Philippine Institute of Volcanology and Seismology or PHIVOLCS, together with expert partners from Japanese, French, and US organizations, has developed what has become a multi-parameter monitoring network in Taal with real-time communication links to Taal Volcano Observatory (TVO) and the PHIVOLCS Main Office (MO). The current network is composed of mostly co-located deployments of five broadband and three short-period seismographs, three continuous GPS, three geomagnetic instruments, two infrasonic sensors, tiltmeters, magneto-telluric instruments and a prototype crater lake sensor. Multi-parameter data are transmitted in real-time via spread spectrum transceiver or GSM telemetry to TVO, where these are processed, archived and retransmitted to the MO in near-real-time via satellite and DSL links. Seismic, GPS and electromagnetic data are automatically processed and visualized in parallel via web portal in the MO. Broadband seismic data further augments automatic hypocentral solutions of the Philippine Seismic Network.

Enhanced monitoring of Taal in consequence has yielded new insights into the volcano's subsurface geology that could promote catastrophic eruption, its energetic geothermal system and one possible trigger for low frequency earthquakes. More importantly, the enhanced network has employed technology that ensures data redundancy and continuity of monitoring operations at the MO even when volcanic activity warrants decampment of TVO, ensuring the continuity of PHIVOLCS' vital eruption warning services.