

## **A lengthy volcanic crisis becomes a way of life: The 14 year eruptive process of Tungurahua Volcano, Ecuador**

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The successful handling of the Tungurahua fourteen yr eruptive process is due to many factors. Monitoring started by the Instituto Geofisico a decade before the 1999 reactivation and continues. The conjoined long-term participation by IG scientists in monitoring and volcanic studies has provided an institutional memory and a thread of knowledge that is referential for making critical decisions on volcanic behavior. IG scientists, well-recognized in the community and by officials are also key contacts for conveying volcano information and for listening to concerns and the perspectives of local people. IG monitoring operations are conducted from the Tungurahua Volcano Observatory, OVT, located NW of the crater and also from the main IG office in Quito. OVT has a senior scientist and assistant who make daily diagnosis of eruptive activity, foster incoming data streams and monitoring systems, participate in emergency committee meetings, give press interviews, and provide advice to local authorities when eruptive activity increases. Some local farmers and community members have been selected as volunteer volcano observers, vigias. All participated in briefings by OVT on volcano monitoring practices and also get yearly updates at IG and SNGR-sponsored workshops. Some vigias have served for over a decade and their observations are well-trusted. Communication by UHF radio system permits observations of vigias to be recorded and compared with instrumentally-derived data. Mayors and SNGR personal also interact with OVT via this radio system. Vigias also help with installation of IG geophysical stations, their upkeep and security and at some sites they measure ash thickness and weight. The vigias are local referents on volcano issues and they are a fundamental link between OVT and local residents since they pass along critical information during crises and facilitate evacuations. The long-term eruptive activity has varied between VEI 1 to 3 levels, generally allowing the continuance of agricultural and other economic activities. Keeping the attention of authorities and the population has been aided by on-off eruptive cycles of 4 month intervals over the past few years. Instrumentation upgrades have been achieved in collaboration with JICA, USAID, NOVAC, the SNGR, the Ecuadorian NSF and cooperation with French IRD scientists provided high-quality modeling of PDCs. Incorporating data from BB seismic stations, cGPS, tiltmeters and DOAS has refined eruptive activity prognosis. Challenges for continued monitoring includes financing the overall operations, maintaining the presence of experienced scientists at OVT and having to often instruct new officials in volcanic hazard issues and their management. The IG maintains a web page where daily and special reports of volcanic activity are available and links to social media can be found. The volcano is the focus of the collaborative 3 yr STREVA project.