**Advances in volcano-seismic monitoring at MVO: 2000-2002**

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Public safety on the island of Montserrat, and of aviation in the region, depends critically on the ability of the Montserrat Volcano Observatory (MVO) to detect and effectively respond to rapid escalations in activity of the Soufriere Hills Volcano (SHV) associated with pyroclastic flows and ash plumes. In January 2000, MVO was no longer able to detect such escalations in activity because of the failure of its seismic data acquisition and alarm systems. It became a race against time to deliver robust round-the-clock seismic monitoring. More than ever before, MVO's ability to carry out its mission became intertwined with the quality of its software.

Almost every aspect of seismic monitoring at MVO was overdue for attention. Both the analog and digital seismic networks failed the Y2K transition. Acquisition systems had to be rebooted manually up to 25 times daily. In conjunction with poorly designed data archive software and procedures, data loss averaged 50%. Obsolete and specialist operating systems (which could not be supported locally) could not be computer networked, so much of the connectivity required to analyse RSAM or TILT data, or process events, had failed. Instead convoluted, time-consuming procedures to move data around using a Zip drive had developed. There had never been any integrate between the analog and digital networks meaning that two entirely separate sets of acquisition, analysis and archival systems had to be maintained. Indeed, every event had to be classified (and if possible, located) on each network with only half the full set of stations available (leading to poor solutions), and doubling the workload.

Only basic data analysis such as classifying and counting events was possible, and no tools were available for analysis of continuous seismicity (e.g. tremor, dome collapses, lahars). There was no online data archive, making quantitative comparison between “today” and “last year” impossible, and indeed data were stored in a haphazard way on tapes nearing the end of their lifespan, making it likely that this valuable dataset might be lost to science forever.. Spares were inadequate, meaning that loss of a single piece of hardware could bring an end to all seismic monitoring for a period of months while new equipment was ordered. Moreover, MVO relied on obsolete telemetry no longer supported by its manufacturers. It became top priority for MVO to overhaul and modernise every aspect of its seismic monitoring programme.

From these humble beginnings, MVO designed and developed a leading-edge seismic monitoring programme. Between 2000 and 2002 MVO upgraded its data acquisition systems, merged its networks, developed a real-time magnitude system and a location system for pyroclastic flows, recovered valuable seismic data and established an online database of all seismic data and made it accessible to researchers, streamlined its data processing, and developed a wide array of MATLAB and web-based monitoring tools (including spectrograms, digital helicorder plots, sonograms, hypocenter plots, magnitude/earthquake count histograms, pyroclastic flow maps etc.). A diagnostic alarm system watching all potential points of failure immediately paged the seismologist if any issues were found, and all systems were run in parallel and computers designed to reboot/re-run in the event of a power outage. Through such measures, data capture exceeded 99%. A successful proposal for a modern digital seismic network was funded (installed in 2005) and proposals were also submitted for a Belham Valley warning system and an infrasonic network, paving the way for later developments. These dramatic improvements in the reliability and capability of the seismic monitoring programme at MVO contributed significantly to public safety and without these efforts, it is likely that data of profound scientific interest would have been lost.

This important work has largely been overlooked, not least because in 2003 there was a rapid demise in seismic monitoring as vital hardware, software and data were removed, deleted and modified without the seismologist’s consent, once again putting public safety in jeopardy. Since this time, other seismologists have come along and once again carried the MVO seismic monitoring programme forward, and these advances will also briefly be discussed.