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Seismic monitoring at Deception Island volcano (Antarctica): Recent advances

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Deception Island (South Shetland Island, Antarctica) is an active volcano with recent eruptions (e.g. 1967, 1969 and 1970). It is also among the Antarctic sites most visited by tourists. Besides, there are currently two scientific bases operating during the austral summers, usually from late November to early March. For these reasons it is necessary to deploy a volcano monitoring system as complete as possible, designed specifically to endure the extreme conditions of the volcanic environment and the Antarctic climate. The Instituto Andaluz de Geofísica of University of Granada, Spain (IAG-UGR) performs seismic monitoring on Deception Island since 1994 during austral summer surveys. The seismicity basically includes volcano-tectonic earthquakes, long-period events and volcanic tremor, among other signals. The level of seismicity is moderate, except for a seismo-volcanic crisis in 1999. The seismic monitoring system has evolved during these years, following the trends of the technological developments and software improvements. Recent advances have been mainly focused on: (1) the improvement of the seismic network introducing broadband stations and 24-bit data acquisition systems; (2) the development of a short-period seismic array, with a 12-channel, 24-bit data acquisition system; (3) the implementation of wireless data transmission from the network stations and also from the seismic array to a recording center, allowing for real-time monitoring; (4) the efficiency of the power supply systems and the monitoring of the battery levels and power consumption; (5) the optimization of data analysis procedures, including database management, automated event recognition tools for the identification and classification of seismo-volcanic signals, and apparent slowness vector estimates using seismic array data; (6) the deployment of permanent seismic stations and the transmission of data during the winter using a satellite connection. A single permanent station is operating at Deception Island since 2008. In the current survey we collaborate with the Spanish Army to add another permanent station that will be able to send to the IAG-UGR seismic information about the activity of the volcano during the winter, using a communications satellite (SPAINSAT). These advances simplify the field work and the data acquisition procedures, and allow us to obtain high-quality seismic data in real-time. These improvements have a very important significance for a better and faster interpretation of the seismo-volcanic activity and assessment of the volcanic hazards at Deception Island volcano.