Volcanic Alert System (VAS) developed during the (2011-2013) El Hierro (Canary Islands) volcanic process

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In volcanic areas with long repose periods (as El Hierro), recently installed monitoring networks offer no instrumental record of past eruptions nor experience in handling a volcanic crisis. Both conditions, uncertainty and inexperience, contribute to make the communication of hazard more difficult. In fact, in the initial phases of the unrest at El Hierro, the perception of volcanic risk was somewhat distorted, as even relatively low volcanic hazards caused a high political impact. The need of a Volcanic Alert System became then evident. In general, the Volcanic Alert System is comprised of the monitoring network, the software tools for the analysis of the observables, the management of the Volcanic Activity Level, and the assessment of the threat. The Volcanic Alert System presented here places special emphasis on phenomena associated to moderate eruptions, as well as on volcano-tectonic earthquakes and landslides, which in some cases, as in El Hierro, may be more destructive than an eruption itself. As part of the Volcanic Alert System, we introduce here the Volcanic Activity Level which continuously applies a routine analysis of monitoring data (particularly seismic and deformation data) to detect data trend changes or monitoring network failures. The data trend changes are quantified according to the Failure Forecast Method (FFM). When data changes and/or malfunctions are detected, by an automated watchdog, warnings are automatically issued to the Monitoring Scientific Team. Changes in the data patterns are then translated by the Monitoring Scientific Team into a simple Volcanic Activity Level, that is easy to use and understand by the scientists and technicians in charge for the technical management of the unrest. The main feature of the Volcanic Activity Level is its objectivity, as it does not depend on expert opinions, which are left to the Scientific Committee, and its capabilities for early detection of precursors. As a consequence of the El Hierro experience we consider the objectivity of the Volcanic Activity Level a powerful tool to focus the discussions in a Scientific Committee on the activity forecast and on the expected scenarios, rather than on the multiple explanations of the data fluctuations, which is one of the main sources of conflict in the Scientific Committee discussions. Although the Volcanic Alert System was designed specifically for the unrest episodes at El Hierro, the involved methodologies may be applied to other situations of unrest.