



NVEWS analysis of volcanic threat of Nisyros caldera, Greece

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The USGS National Volcano Early Warning System (NVEWS) is based on a systematic assessment of the threats posed by active volcanoes coupled with an evaluation of current monitoring capability. Volcanic threat is the combination of hazards (the destructive natural phenomena produced by a volcano) and exposure (people and property at risk from the realisation of hazardous phenomena). The evaluation involves a methodical assessment of 15 hazard and 10 exposure factors including factors such as maximum VEI, eruption recurrence, hydrothermal explosion potential, local aviation exposure and transportation infrastructure. The evaluation is based on a score system, whereby the higher the score, the higher the threat is. We have applied the catalogue of questions to the volcanic island of Nisyros in Greece, an 8 km-wide strato-volcano located at the eastern end of the Hellenic island arc. The island hosts a 3.8 km-wide caldera and an approx. 0.9 km² hydrothermal area with phreatic craters, fumaroles and mudpools. The caldera has been the locus of at least 13 phreatic eruptions in historical times, the most recent in 1888, and is presently affected by considerable hydrothermal activity. A volcano-seismic crisis on Nisyros between 1995 and 1998 marked the reawakening of the volcano and was accompanied by ground uplift and seismicity which severely damaged infrastructure on the island. Our NVEWS analysis results in a score of 152 points, taking a cautious and conservative approach to hazard factors due to the lack of absolute ages for the most recent magmatic eruptions. Adverse exposure factors include significant scores relating to aviation and population exposure to volcanic hazards from Nisyros. The score puts Nisyros in the league of volcanoes posing a very high threat. The cut-off score between high threat and very high threat volcanoes in the US is 123 points. US volcanoes with a comparable threat level in-

clude Mt. St. Helens, Augustine and the Long Valley caldera. Existing monitoring programs at Nisyros must be described as rudimentary due to the lack of permanent multiparameter surveillance and obtain at best a Level 1 rating according to NVEWS guidelines. The recommendable level of monitoring is level 4 including deployment of instrumentation for continuous seismic and ground deformation surveillance, leaving a monitoring gap of 3 levels. Based on our analysis, we propose that the volcanic threat posed by Nisyros volcano is severely underestimated. It is therefore important to take steps towards a better understanding of the current dynamic behaviour of the volcano, in order to decrease response times in the event of renewed activity and to increase the ability to forecast events, therefore significantly reducing volcanic risk.