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Testing the efficacy of volcano alert levels

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Volcano observatories and governments use volcanic alert levels to characterize escalating volcanic unrest and activity. A proper adjustment of the level of unrest at a volcano provides crucial information to local populations and civil defense authorities on the expected activity at a volcano in the immediate future, with the express purpose of keeping populations out of harms' way. Given the importance of alert levels in the anticipation of eruptions we have analyzed the 'success' rate of alert levels on a global scale. We consider a successful alert to be one that was raised step-wise until the initiation of the eruption. A 'missed' alert is one that was not changed until after the eruption began. Our study includes over 50 volcanoes and over 60 eruptions, a large range of eruption sizes and volcano types (e.g, open and plugged vents) from a wide selection of countries. To include different countries we standardized the different schemes of alert levels. Preliminary analysis of data shows that in many cases the alert status of a volcano does not change until after the eruption has begun, and the success rate for different volcanoes varies between very low to up to 50 %. Overall, about 75% of the eruptions were not preceded by stepwise increase in alert level, and about 25% of the alerts were 'successful'. The percentages of success vary depending on the type of volcano and eruption size. At open-vent volcanoes, the success is only about 20%, but increases to about 30% at plugged volcanoes. We are now analyzing the results also in terms of level of instrumentation at each volcano and population at risk. A higher societal tolerance for false alarms would probably improve the early issuance of alerts, and hence raise the 20-30% success rate in the case of eruptions, but it might also increase the number of false alarms. We hope that the identification of the main factors (e.g. structural, decision making process or others) that control the success rate will allow the design of programs to improve those factors, and thus lead to more efficient use of alert levels for mitigation of the impact from volcano hazards.