

Letter to the Editor

A DEONTOLOGICAL CODE FOR VOLCANOLOGISTS? — A RESPONSE TO DEREK BOSTOK'S EDITORIAL

The Editorial by Derek Bostok in the August 1978 issue of this Journal regarding the recent volcano crisis at La Soufrière, Guadeloupe, presents some provocative thoughts. As a scientist who made four visits to Guadeloupe during the course of the crisis, and who served as one of the six non-French members of the ad hoc Comité Scientifique International sur La Soufrière, convened by the French government to deal with the situation, I feel obligated and qualified to respond. I should say at the outset that Professor McBirney kindly supplied me with a preliminary copy of Dr. Gudmundur Sigvaldason's comments that were published in the December 1978 issue. I shall not, therefore, repeat many of the details of the crisis that he has already described.

One of the most important aspects of the La Soufrière crisis of 1976 was that there was an imperfect scientific understanding of many aspects of the ongoing activity. In summary form, some of the more important aspects of the situation in August 1976 were as follows:

(1) Hundreds, even thousands, of local earthquakes were recorded each day, but the absence of an accurate velocity model at depth and the inadequacies of the seismic network did not permit the accurate location of hypocenters. Most events were known to be originating in a general region several kilometers beneath the summit of the volcano, but it was not possible to determine whether there was any systematic upward migration of these events.

(2) The ash that was continuously erupted from the summit of the volcano, sometimes discharged with almost explosive force, was thought to contain increasing quantities of fresh volcanic glass. This observation later turned out to be incorrect, but, at the time of the crisis, it was believed by many people that fresh magma was reaching the surface.

(3) Analyses of volcanic gases by Haroun Tazieff and his team did not indicate to them that a magmatic eruption was underway or impending. However, the collection of gases and interpretation of their chemistry is far from a perfected science. A great deal of additional work on many different volcanoes will be required to determine whether gas chemistry is a really accurate indicator of volcanic hazards.

(4) No measurements of ground deformation had been made, and it was therefore possible that the volcano was inflating without anybody knowing it.

(5) The reconnaissance geological studies that were available at the time were not able to provide the vitally needed details regarding the eruptive history of the volcano during the past 10,000–20,000 years. Therefore there was very little geological insight as to what the volcano was apt to do in the future. Poorly sorted pyroclastic deposits crop out at many localities on the volcano, but it was not known whether these deposits were the product of

pyroclastic flows, hot or cold mudflows, or cold avalanches. Moreover, the age and frequency of emplacement of most of these deposits was not known.

It was in the context of these five major areas of uncertainty that the Governor of Guadeloupe ordered the evacuation of all 73,000 people living on the slopes of the volcano. Controversies broke out immediately as to whether such a massive evacuation was justified, whether the evacuation lasted too long, and whether there was panic or complacency with regard to the assessment of the hazard. Scientists disagreed with scientists, and the rest is history.

But how does this bring us to the question of a deontological code — a code of “duty” or “moral obligation?” Bostok asks us to endorse Haroun Tazieff’s version of a deontological code — a code based on the assumption that the volcano never did pose a great threat, and that, if a rapid buildup did occur, the people could have been evacuated in time. According to such a code, those who *overestimated* the hazard should be censured for exaggerating the implications of the available data and for recommending, in panic, large-scale evacuation.

On the other hand, it is possible to consider another version of a deontological code that could be applied to the La Soufrière situation — a code based on the acknowledgement that (1) there were enormous gaps in the geophysical, geochemical, and geological understanding of the ongoing activity, (2) there was a reasonable probability (perhaps 1:20 or 1:50) that the activity could have progressed rapidly to the production of pyroclastic flows or destructive phreatic activity, and (3) there was legitimate uncertainty as to what was really going to happen. According to this code, those who *underestimated* the hazard should be censured for not acknowledging the wide gaps in the available data and, for arguing, with unrealistic coolness, against evacuation.

I have obviously oversimplified the development of these two deontological codes for La Soufrière, but, to me, it is telling that it is possible to argue for either of two very different codes, on the basis of only one set of facts. And that’s the important point — a really workable code would have to be based on a framework, a single set of criteria agreed to by all parties involved... if not by volcanologists in general. In theory, such criteria might include threshold levels of local seismicity, ground deformation, and gas chemistry, beyond which a truly hazardous situation would automatically be declared.

In reality, however, it is doubtful that such a code could ever be devised. As monitoring activities improve and are extended to more and more volcanoes, complications and equivocations will doubtless arise. We already know that outwardly similar volcanoes often function in remarkably dissimilar ways, and it is likely that this pattern will continue to be encountered in the future. This, of course, should in no way dissuade us from pursuing our work. Techniques and insights will doubtless improve in future years, but, as Gudmundur Sigvaldason has indicated, we must be ready to accept criticism and “hard knocks” as we continue our efforts to provide the best scientific evaluations possible.

RICHARD S. FISKE
Smithsonian Institution
Washington, DC 20560
U.S.A.