Hazard study of french (Lesser Antilles) and Central American explosive volcanoes

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Volcanological research on potentially dangerous volcanoes requires that a knowledge of their past eruptive behavior be studied well enough so as to yield well constrained assessment of hazards and their zonation.

Two years ago and under IDNDR auspices, we started a basic knowledge program, building on available information, that specifically addresses the study of our active Lesser Antilles volcanoes in Martinique (Mount Pelée) and Guadeloupe (Soufrière), F.W.I. These are volcanoes which show a low frequency of highly damaging eruptions (cf. the 1902 eruption of Mount Pelée: 30,000 casualties). Selected Central American volcanoes were also chosen for study, by bilateral agreement between national communities, so that experience could be shared between the scientists envolved. At present, these are the Rincon de la Vieja and Arenal (Costa Rica). The selection was guided by two principles: (1) volcanoes with relatively high eruption frequency or permanently active, and (2) similarity of behavior with Lesser Antilles volcanoes. This type of arrangement also follows the IDNDR recommendations for technological transfer towards developing nations and reciprocal use of their exposure to natural disasters.

The french Lesser Antilles volcanoes have now been studied by a limited number of scientists for over 15 years. General geological and volcanological research has established the main trends of their activity since birth several hundreds of thousands of years ago. In addition, a limited number of Holocene (last 10,000 years) and historical eruptions were sudied in detail. These studies form a preliminary data base which has been used for establishing a first draft of hazard zonation maps.

Our purpose in initiating a cooperative program between the french organisms in charge of volcano monitoring and hazard mitigation and regional Caribbean nations, was to study a much larger number of eruptions on selected volcanoes, possibly all in a given time span, so that hazard mapping and zonation would not be biased. In addition, we wanted to focus on the volcanological precursors to major eruptions which, today, are poorly studied. The latter enterprise is aimed at relating the data from surveillance networks run by volcano observatories to accurate forecasting of future eruptions and their development. Financing was obtained from the french ministries of national education and research and the cooperation division of ministry of foreign affairs.

Lately, we have concentrated our study on the last characteristic eruptions of the chosen volcanoes to which future eruptions will most probably resemble. We proceed by several steps, starting with field studies of the detailed stratigraphy, areal extent, and structure of eruptive products. Samples for laboratory work in the disciplines of sedimentology, petrology and geochemistry, and age determinations are collected at this stage. Field and laboratory data are synthesized so as to produce a detailed scenario of the pre-eruptive and eruptive conditions of the given eruptions. Hazard assessment for future eruptions are then constrained from the data base; their zonation is based on reconstruction of past destructions.