Open Problems and Recent Advances in Volcanic Hazard Evaluation

Guido VENTURA1 and SHAN Xuanlong2

1 INGV, Roma, Italy 00143
2 Jilin University, Changchun, 130000


Abstract: Our ability to forecast volcanic eruptions depends on different factors including a reconstruction of the eruptive history of the volcano and the analysis of multi-source, long term time series of data. The recent availability of high-quality data allow us to apply probabilistic or deterministic approaches and provide scientifically-based information to decision-makers and civil protection agencies. Critical issues concern the definition of the various type of volcanic hazards, their quantification, and the construction of alert level scales. Another issue is the identification of the hazards with elevated potential to cause fatalities and damages to infrastructures. Recent advances in technology allow us to collect real-time, high-quality data from in-situ instruments and remote platforms, however, the merged analysis of these data is not simple and needs the interaction of different type of experts throughout elicitation procedures. In addition, while eruptions are always preceded by unrest, an unrest is not always followed by an eruption. So a question arises about the significance of signals anticipating (or not) an eruption. Other complexities are related to the occurrence of eruption-earthquake cause/effect relations and to hydrothermal systems, whose role in the active dynamics of a volcano may play a major role. As a result, the understanding of unrest episodes is a critical issue for the scientific community. Examples of unrests, recent advances in volcano monitoring techniques, and of international initiatives are presented along with successful and unsuccessful examples of forecasts. Case studies of hazard evaluation at different volcanoes including Vesuvius and Changbaishan are analyzed.

Keyword: volcanic eruptions, volcano monitoring, hydrothermal systems, volcanic hazards

About the first author
Guido Ventura, Male; born in 1961 in Pisa city, Italy; graduated from University of Pisa, Qualification to full professorships in Geochemistry and Volcanology, Member of the American Geophysical Union, Geological Society of America, European Geoscience Union. He is now interested in the study on Geochemistry and Volcanology. Email: guido.ventura@ingv.it; phone: (+39) 06-51860221