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Volcano Instability on the Earth and Other Planets

McGuire, W. J., Jones, A. P. and Neuberg, J. (eds), 1996. Geological Society Special Publication 110. ISBN 1-897799-60-8. List prices \$125/£75, and to GS members \$58/£35.

The preface of this volume states that it "addresses the growing interest in destabilised and collapsing volcanoes which followed the spectacular landslide and climatic eruption at Mount St. Helens in May 1980". It contains 26 papers concerned with physical volcanology, of which 12 describe Italian volcanoes, one is concerned with Martian calderas, one with domes on Venus, and one with general problems of volcanic instability in the solar system. Most of the remainder of the papers discuss particular regions of Earth, of which two are principally concerned with mathematical modelling of the processes involved. The volume itself is Special Publication 110 of the Geological Society of London. Like many of the previous special publications, this collection of papers started as a conference of the Geological Society. This format has advantages and disadvantages, both of which are illustrated by this book. The best of the papers in such volumes are excellent, and are often Ph.D. theses that would otherwise never be published. The worst are uncritical reviews with no data or new ideas which do little more than add to the publication list of the authors concerned. It is not easy for the editors to reject papers that were given at the conference, few of which are invited. Furthermore the publication schedule does not allow the papers to be edited to produce a coherent book. Despite these problems, many Earth Scientists, including this reviewer, find such Special Publications extremely useful. They are up-to-date, have good reference lists, a few excellent papers, and are cheap for Fellows of the Geological Society (though less so for librarians). It is quite easy to ignore the poor papers.

Huge landslides on the flanks of subaerial volcanoes were recognised more than 100 years ago. Some geologists, particularly Moore, had proposed that ocean islands produced landslides that were often at least ten times larger than the subaerial slides. Such proposals became generally accepted when it became possible to map the deep sea flow in two dimensions using acoustic methods. There is no discussion of this technique in this book, or of the corresponding radar

methods used on Venus, though three of the papers show images produced by these methods. I was disappointed there were not more, and especially that there were no synthetic aperture radar images of subaerial terrestrial examples. Many of the papers contain topographic contour maps that clearly show the geometry of large slides. I found the papers concerned with the Italian volcanoes disappointing. They are largely concerned with local geology and make little effort to compare Italian volcanoes with those elsewhere, or to draw any general conclusions about the processes involved in creating the observed structures. Such comparative studies could well be revealing, because of the striking mineralogical differences between many Italian magmas and those from other island arcs. I found the study of four Nicaraguan volcanoes by Van Wyk de Vries and Borgia the most interesting of the regional studies, because they show how the geometry of the slumps is affected by the competence of the rocks on which a volcano is built.

Two important theoretical issues arise from these studies: how can a large landslide be produced by a volcano like Hawaii, whose slope is only about 6 degrees; and what acts as the trigger for the movement of these enormous masses? A number of papers in this volume discuss the first of these issues, which arises in several areas of tectonics. Most geologists believe that fluid pressures, produced by water or magma, act to reduce the effective stress. The authors in this volume adopt this point of view and use finite element models to study the stress distribution. However, it is not clear that fluid pressure is responsible for the landslides on Venus that affect the pancake domes, because there is no free water on Venus, and there is little evidence that geometry of the slides is related to dyke intrusions. Yet the landslides look similar to those on Earth. There is little discussion of the triggering problem.

Given the importance of the topic of this volume to land use and construction, I was surprised that so few of the authors had a geo-technical background.

This volume is a good introduction to the problem of the volcanic instability, and is good value, especially for Fellows of the Geological Society. Like many of the Special Publications, it would be improved by removal of about a third of the papers, and I would encourage the editors of such volumes to be slightly tougher about what they accept for publication.

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