PAGEOPH, Vol. 125, No. 6, (1987)

0033-4553/87/060881-02$1.50+0.20/0

Introduction

In the past few years, substantial progress has been made in the field of Volcanic Seismology. While earthquakes occurring in volcanic environments are but one of the many ways to monitor volcanic activity, they provide substantial insight into the mechanism of magma ascent, and generally speaking into the pre-eruptive phases of a cycle of magmatic activity. Similarly, seismic waves are our prime means of sampling deep structures, and assessing any possible variation in their properties, suggestive of magmatic activity.

Interest in Volcanic Seismology was recently renewed by spectacular eruptions (Mt. St. Helens, El Chichon, Nevado del Ruiz), as well as significant seismic swarms (Long Valley, Campi Flegrei, Teahitia), and by recent progresses in the field of digital instrumentation, seismic tomography, and source studies; this resulted in special sessions on Volcanic Seismology, held at several meetings of the American Geophysical Union.

This topical issue of PAGEOPH contains 11 papers contributing to the general field of Volcanic Seismology. The first three are of a review nature, and cover several aspects of Volcanic Seismology.

Results obtained by DE NATALE *et al.* following dense instrumentation of the Campi Flegrei area near Naples during an episode of uplift, uphold the concepts of simple double-couples with constant stress drop for these volcanic earthquakes. TALANDIER and OKAL review methods using seismic waves to detect and identify submarine volcanic activity in inaccessible areas of the ocean floor, and discuss parameters influencing the generation of various types of waves. GRESTA and PATANÉ review seismological studies at Mount Etna, and point out that substantial lateral heterogeneity in the structure of its edifice is a controlling factor in the relatively low stress drops observed, and in the precise location of both seismic and eruptive activity.

The next two papers deal with the interpretation of seismic activity in terms of magma transport and eventual eruption. KARPIN and THURBER use the dense network at Kilauea and a 3-D crustal model to map the propagation or dilation of dikes into the edifice over periods of minutes to hours during rift intrusions. Reporting on the results of the dense instrumentation of Mount Erebus, KAMINUMA documents temporal evolution of the level of seismicity and the probable existence of a magma reservoir 5 km below the summit.

The next three papers deal with seismic investigation of the structure of the magmatic edifice, including occasionally their temporal variation. PEPPIN identifies 'exotic' seismic phases in records of Long Valley earthquakes, emanating from shallow crustal anomalies, which could be magma bodies. MIYAMACHI *et al.* report a significant decrease in the *P*-wave velocity inside the lava dome at Mt. Usu over a period of 30 years, attributable to the cooling and fracturing of the dome. DEL PEZZO *et al.* study the attenuation of seismic waves at Etna and other Italian volcanic areas, and compare it both to non-volcanic areas of Italy, and to Kilauea.

The next two papers study seismic tremors from volcanic edifices. At Pavlov, MCNUTT investigates the correlation of tremor with eruption and proposes a number of approaches towards quantification of a volcanic tremor dataset. At Etna, GRESTA *et al.* differentiate between two sources of distinct depths and characteristic frequencies.

The final paper by ACHARYA examines the question of the spatio-temporal relation between volcanic and seismic activity and the occurrence of major earthquakes for a number of subduction zones.

Emile A. Okal
Editor