IAVCEI *News* 2004 No: 2

INTERNATIONAL ASSOCIATION OF VOLCANOLOGY AND CHEMISTRY OF THE EARTH'S INTERIOR

MESSAGE FROM THE PRESIDENT

Oded Navon President

This letter is written in September 2004 and our focus is on Chile and on our meeting in Pucon. This is one more opportunity to thank the Chilean organizing committee, the scientific committee and all the others that helped in preparing this wonderful conference.

I would like to take this opportunity to look beyond Pucon 2004. In addition to many conferences and workshops organized by the commissions, IAVCEI will convene a meeting on Intraplate Volcanism in Guangzhou, China in May 2006. The focus of the meeting will be on plumes and large igneous provinces, with field trips to the Emishan large igneous province and to the kimberlite and alkali basalts of the North China Craton (more details at: www.gig.ac.cn/IAVCEI2006).

Then comes the year 2007, a special year for all earth scientists – The Year of Planet Earth. This initiative is aimed at focusing world attention on the special relation between humanity and its planet and on the important role of Earth scientists, not only in understanding the planet's past but also in helping predict and manage its future. This concept is familiar to IAVCEI members. This is exactly our attitude to volcanology. The title of the initiative is "Planet Earth in Our Hands – Earth Sciences for Society." Again, we were always there.

The Year of Planet Earth project was initiated by the International Union of Geological Sciences and the project is now led by a few organizations including UNESCO and IUGG – the International Union of Geodesy and Geophysics, the umbrella organization of seven associations of which IAVCEI is one (the others are the international associations of Geodesy, Geomagnetism and Aeronomy; Hydrological Sciences; Meteorology and Atmospheric Sciences; Physical Sciences of the Ocean; and Seismology and Physics of the Earth Interior). The idea of the Year of Planet Earth is to focus attention on Earth sciences and Earth scientists as the key players in understanding and preserving the delicate and dynamic equilibrium between humanity and its only planet and in building a sustainable world.

What does it all mean? The main idea is to encourage activities of Earth scientists in many directions: to launch new projects in Earth sciences (there are hopes for special budgets to back such projects); to carry out a world-wide educational outreach program at all levels and to increase the visibility of Earth sciences as an important discipline that deals with the most urgent problems of our planet. While part of the initiative depends on the goodwill of UN agencies and governments, much of it depends on us. We should come with good ideas for projects and we should go to the public in our countries, towns, universities and local schools and tell them about the importance of Earth sciences. I strongly believe that if we all stand and let our voices be heard, the benefits will show in future years and we will see more students in our university programs, more budgets for our activities, more tools for us to use and more recognition of our efforts and achievements.

The International Union of Geodesy and Geophysics is launching four additional initiatives during this year. The International Heliophysical Year aims to advance our understanding of the phenomena and physical processes that govern the Sun's influence on Earth. The International Polar year is advancing studies of the polar regions. Most relevant to our community are the International Geophysical Year + 50 (IGY+50) and the electronic Geophysical year (eGY) projects. IGY+50 celebrates the 50th anniversary of the very successful International Geophysical year launched on 1957. eGY is a central part of this celebration. Its aim is to facilitate and inspire (but not necessarily fund) projects related to electronic information: increase the accessibility of geophysical data; locate geophysical data; digitize data; convert the format of old data; create data centers and encourage the implementation of access protocols; and the release of existing data to all interested scientists. One interesting idea is to establish virtual observatories that would facilitate general access to data. Good old projects like Global Volcanism Network and WOVODAT may benefit from that initiative. I hope that this and many other new initiatives will emerge. I encourage those of us who are related to these activities to follow them closely. There will be interesting workshops, projects that need co-sponsors and opportunities to use eGY and IGY+50 as leverage for your own initiatives and requests for funding. In the other direction, it would be of help to IAVCEI to know about your activities and use them to increase the visibility of volcanology within geophysics and the visibility of geophysics in general.

Continued on page 12

IAVCEI Homepage: www.iavcei.org

INTERNATIONAL VOLCANIC HEALTH HAZARD NETWORK

Introduction

Volcanic eruptions have the potential to affect great numbers of people: 29,000 people were killed by a pyroclastic flow during the Mt. Pelée eruption of 1902 and 23,000 people were killed by a lahar in the Nevada del Ruiz eruption of 1985. The high death tolls associated with these primary hazards has encouraged the volcanic hazard assessment community to focus on the direct impacts of eruptions. Consequently, comparatively little research has been carried out into the long-term health hazards of volcanic emissions (ash, gases and aerosols), despite the fact that nine percent (500 million people) of the world's population lives within 100 km of an active volcano and may be exposed to such emissions. Furthermore, exposure can continue for years after the end of an eruption, raising the possibility of the development of chronic respiratory illness.

The health hazards of volcanic ash were first recognized following the eruption of Mt. St Helens in 1980. The eruption of the Soufrière Hills volcano, Montserrat (1995 - present), has further stimulated research on the health hazards of ash. At both volcanoes it was discovered that the ash contained cristobalite, a type of crystalline silica which could potentially cause silicosis (a fibrotic lung disease similar to asbestosis), if inhaled for years or decades. Volcanic particles also have the potential to cause asthma, bronchitis and lung cancer. Volcanic gases and highly-acidic sulphate aerosols can cause lung problems, poisoning of livestock and water supplies and, in high concentrations, death. These gases can be transported in the troposphere for 1000s of km, with major impacts on air quality and, indirectly, health, world-wide.

The field of volcanic health hazard research is young. Over the past 20 years, mineralogists, toxicologists and medics, mainly in the UK and USA, have carried out detailed research on the ash itself and on exposed populations. We have shown that ash particles are small enough to be transported deep into the lung, where toxic reactions occur. Demonstrating whether volcanic ash is actually a serious health hazard has proven difficult, however, because, as with smoking-related disease, long-term exposure is necessary and symptoms may not appear for decades.

The multidisciplinary nature of the research has meant that different teams working in the field of volcanic health hazards have rarely had the opportunity to discuss their work. For this reason, the International Volcanic Health Hazard Network (IVHHN) was founded through a Leverhulme Trust Research Interchange Grant (RIG) in February 2003. IVHHN has given us a forum for discussion, encouraging this rapidly-emerging area of research and uniting the international multidisciplinary community involved. As well as the hazards of volcanic ash, IVHHN is also addressing the hazard of inhaling volcanic gases and other far-reaching health-related hazards. IVHHN became an IAVCEI Commission in December 2003. This article explains the aims and successes of IVHHN and our future objectives.

Aims of IVHHN

- To promote the field of volcanic health hazard research.
- To nurture new and existing collaborations.
- To create forums for discussion including website, mailing list and regular meetings.
- To produce and disseminate guidelines to volcano observatories, scientists, emergency managers, health practitioners and the general public.
- To encourage collection of new geologic and medical data to evaluate health hazards.
- To form databases and collate literature on volcanic health hazards.

Achievements and Recent Activities

In July 2003, IVHHN held its first annual workshop at the Cities on Volcanoes conference, Hilo, Hawaii. The meeting was attended by 80 delegates and involved invited talks and a discussion. The talks were given by expert members of IVHHN who summarized the research being carried out by the different disciplines involved. For example, Dr Peter Baxter (University of Cambridge, UK) gave an overview of volcanic health problems from a medical and epidemiological perspective. Professor Roy Richards (University of Cardiff, UK) discussed toxicological studies with volcanic ash and highlighted the disagreements between different laboratories in the outcome of their studies, with some laboratories concluding that volcanic ash was toxic whilst others have not. Dr Alison Searl (Institute of Occupational Medicine, Edinburgh, UK) summarized current techniques in air quality monitoring and exposure assessment and Dr Clive Oppenheimer (University of Cambridge, UK) outlined the health issues resulting from inhalation of volcanic gases. Professor Bice Fubini (Università di Torino, Italy) explained the chemical basis of the toxicity of inhaled dusts and Dr Claire Horwell (University of Bristol, UK) summarized recent work on the characterization of volcanic ash for the assessment of respiratory toxicity.

Our website (www.ivhhn.org) provides information on volcanic health hazards for scientists, hazard managers and the public and acts as a catalogue of experts. IVHHN currently has 31 expert members and more than 125 members who have joined the mailing list. The website has been visited by people in more than 100 countries. The response from South America, the Far East and Africa, where internet access is less common yet volcanic hazards are widespread, has been encouraging.

A key achievement since the initiation of IVHHN has been the writing of guidelines by IVHHN experts on volcanic health hazards. During the first year, we focused on guidelines for ash hazards, including standardization of laboratory techniques, collection of samples, and health and safety advice following ash falls. The guidelines are being ratified by a panel of experts from organizations such as WHO, NIOSH and USGS and will be published on the website and produced in pamphlet form for dissemination around the world.

IVHHN members have compiled several databases which will also be available on the website. These include: world-wide exposure standards for volcanic and industrial SO_2, H_2S and CO_2 to aid decision makers when assessing standards for volcanic areas; a database of well-characterized ash samples for rapid assessment of health hazard at the onset of new eruptions; and a database of current methodologies for leachate analysis with recommendations for standardising the techniques. IVHHN members are currently publishing two reviews for the volcanological and medical audiences on the respiratory health effects of volcanic ash and gas.

IVHHN has had a significant impact on the volcanological and medical community already, and has attracted international media interest with, amongst others, an article being written in Science magazine in the March 2003 special volcanology edition.

Future Objectives

The second annual meeting of IVHHN will take place at the IAVCEI General Assembly in Chile in November 2004. The meeting will be open to all delegates and will focus on overviewing the year's activities, and an open discussion on future directions for IVHHN and volcanic health hazard research. Relevant papers are being presented in Session 6b (Impact of Volcanic Eruptions on Environment and Society). The third annual meeting will be held within the Cities on Volcanoes 4 conference in Quito, Ecuador in January 2006.

Over the next two years, we will be publishing our guidelines and databases and will be holding further meetings to write guidelines on volcanic gas hazard, exposure assessment and air quality monitoring. IVHHN will continue to expand, stimulating new collaborations and research and will exist beyond the closure of the Leverhulme Trust grant (2006), thanks to its status as an IAVCEI Commission.

Claire Horwell

Electronic Geophysical Year Website
http://www.egy.org

SOUTH/CENTRAL AMERICA NEWS

Recent Significant Volcanic Activity

Soufriere Hills, Montserrat West Indies

Soufriere Hills volcano was quiet during late 2003, after significant dome activity and explosions in July. Seismic activity including volcanic tremor was followed by renewed eruptive activity on early March 2004 when ash clouds reached altitudes of 7 km a.s.l. (BGVN, 29:02).

Cerro Machin, Colombia

The Observatorio Vulcanologico y Sismologico at Manizales, reported an increase in seismicity at Machin volcano in April 2004. High frequency earthquakes with rates of up to 30 events/day were recorded for two days. The volcano's background rate is roughly 10 events/day.

A four-station seismograph network is currently operational to monitor the seismicity closely at Cerro Machin.
Source: INGEOMINAS-Observatorio Vulcanologico y Sismologico at Manizales

Tungurahua, Ecuador

Activity at Tungurahu volcano has remained at high levels. Explosive activity with plumes reaching up to 7.5 km has been observed during late 2003. During early 2004 ash clouds have reached altitudes of 2 km.
(BGVN 29:01)

Upcoming Meetings

October 2004. 42nd Brasilian Congress of Geology "Mineral Resources and Socioeconimics." Araxa, Minas Gerais, Brasil.

November 22-24, 2004. XII Latin American Congress of Geology. Quito, Ecuador.
http://www.menergia.gov.ec/php/proy_xiicongreso_MINERIA.php

November 23-28, 2004. International course of remote sensing detection and tracking of volcanic emissions, hot spots and ground deformation. Instituto de Alstos Estudios Espaciales "Mario Gulich", Falda del Carmen, Cordoba, Argentina.

People Moves/promotions, Organizational Events

Colombia: The Colombian Geological Survey (INGEOMINAS) has undergone some changes as part of the plans for the restructuring of all government institutions. The volcano observatories of Manizales, Popayan, and Pasto are ascribed to INGEOMINAS and a number of staff members have been relocated or their positions terminated. For more information visit INGEOMINAS website:http://www.ingeomin.gov.co

Chile: A new web site for the South Andes Volcano Observatory (OVDAS) in Chile was to be launched in July 2004. Stay tuned for more information.

John J. Sanchez
Geophysical Isntitute, University of Alaska Fairbanks.
903 Koyukuk Dr. Fairbanks, AK 99775
e-mail: jjalaska@giseis.alaska.edu

OCEANIA VOLCANOLOGY SITE REPORT — UNIVERSITY OF OTAGO

James DL White, Geology Department, University of Otago, 9015 Dunedin, New Zealand

For over a decade now I and my students at the University of Otago in far southern New Zealand have been working on volcaniclastic rocks with Bruce Houghton, Colin Wilson, and Vern Manville of New Zealand's semi-commercial successor to the geological survey, the Institute of Geological and Nuclear Sciences. Most of this work has been done with Vern Manville and postgraduate students, focusing on the sedimentary aftermath of eruptions in the Taupo Volcanic Zone (TVZ), from the subplinian eruption of Ruapehu in 1995/96, through plinian eruptions represented by the 1886 Tarawera eruption, to the large Taupo 1.8 ka caldera eruption (Beate Segschneider PhD; Erin Newton MSc). Sedimentation in Taupo's caldera lake after the eruption was the focus of an MSc

study by Roger Clarkson, followed up by a study with Nancy Riggs and Michael Ort (Northern Arizona U.). Ray Marx (MSc) is presently assessing the reasons that Rotorua caldera lake remained at a +90m forced highstand for tens of thousands of years after its outlet was blocked by ignimbrite from a nearby caldera. Other studies in TVZ with Bruce and Colin are examining primary volcaniclastic deposits of the Tarawera 1886 eruption (John Townend BSc (hons); Jean-Baptiste Rosseel's PhD) and aspects of the Rocky Hill ignimbrite (Ian Schipper MSc).

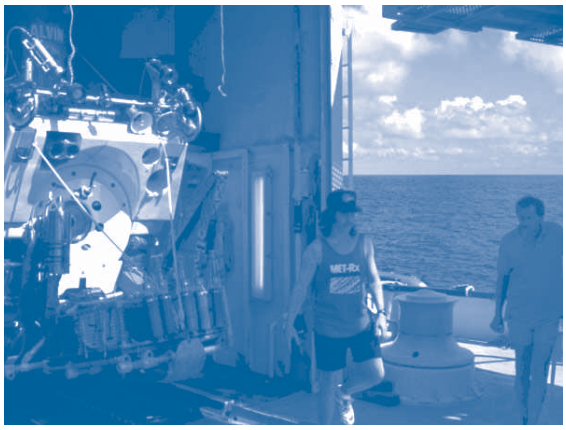
In addition to these TVZ studies, we have also worked in our backyard where intraplate magmatism has produced volcanoes intermittently throughout the Cenozoic. Closest to home was Uli Martin's PhD study of some of the earlier history of the Dunedin volcano (volcanic complex), which includes a subaqueously erupted phonolite pumice deposit and spectactular peperites and

dikes that re-melted their pumiceous host. Recent collaborative work with Kaj Hoernle and Paul van den Bogaard at GEOMAR in Germany has revealed that some of these dikes are a million and a half years older than the oldest rocks previously dated in the volcano, extending the duration of volcanism at the volcanic complex to 4.5 million years. Uli's study overlapped with Karoly Nemeth's examination of the associated Waipiata monogenetic volcanic field, focused particularly on understanding its numerous maar volcanoes. Wulf Mueller (U Chicoutimi, Quebec) has worked with us on older subaqueously erupted volcanoes along the coast to the north, where seacliffs provide superb exposures of the underwater deposits of surtseyan style volcanism on the early-mid Cenozoic continental shelf.

Another group of students has become involved with the Ferrar large igneous province in Antarctica, working on extensive volcaniclastic deposits underlying flood basalts and cut by doleritic intrusions. First results of this work have been provided in Murray McClintock's MSc thesis, publications in 2001 and 2002, and a manuscript recently submitted to BV. Two other MSc theses (Gillian Lockette, Simone Hood Hills) are now complete, and with Pierre-Simon Ross and Olivier Reubi three others have been submitted this year. All of this work to date has focused on understanding the origin of several km^3 of glassy Ferrar volcaniclastic fragments that are thoroughly mixed with quartzose country rock fragments of mm to cms size throughout the entire volume of the deposit. Part of the deposit has a chaotic

internal structure and is inferred to represent vent-complex infill, but an adjacent area exposes thick, poorly defined beds with extensive block layers, localized wisps of dilute PDC deposits, and accretionary lapilli. These are in part underlain by a debris-avalanche deposit that carried domains of plastically deforming basalt within it, indicating that the avalanche tore off a bit of molten basalt, and suggesting that the basalt's arrival initiated the avalanche.

An Antarctic-style volcaniclastic complex is also the focus of Murray McClintock's PhD work in the Karoo province of South Africa, which is collaborative with Bruce Houghton (now University of Hawaii) and Ian Skilling (University of Pittsburgh). Two substantial vent complexes have been investigated to date, each showing a similar level of complexity to that seen in Antarctica, but with many differences as well that tell us there remains a lot to learn about these large volcaniclastic complexes associated with flood-basalt volcanism.



Finally, in an attempt to follow up on Doris Maicher's PhD work on deep-sea hyaloclastite with Rodey Batiza, Bruce and I have obtained support from the Hawaii Undersea Research Laboratory for a series of submersible dives onto volcaniclastic deposits of Loihi Seamount in 2006. Partly related work with Gary Parker (University of Minnesota) is currently devoted to cold and warm-water density current experiments utilizing volcaniclastic sediment, which has already demonstrated some clear behavioral differences between these currents and others run with quartzofeldspathic sediment of similar grainsize distribution.

Future work will extend laboratory approaches to aspects of magma's interaction with wet sediment and sediment-laden water, in cooperation with Bernd Zimanowski's lab in Wuerzburg, Germany. A new target for fieldwork in Antarctica is the Ferrar plumbing system, which is exposed as dikes and sills at many sites in the Transantarctic Mountains; we aim to investigate physical features of dikes and sills in some detail to assess local, and ultimately larger-scale, movement of magma in the subsurface of this LIP. Within New Zealand, we are turning our attention from post-eruptive terrestrial deposits to marine tephra beds, with the aim of establishing what different beds can contribute to assessments of primary eruption processes, modes of sedimentation, and histories of particle storage.

BOOK DONATIONS

Program of donations of books and journals in geosciences to libraries of volcano observatories and earth science departments in developing countries.

We continue our efforts to send used books and journals to several libraries of volcano observatories and geology schools in developing countries.

During the current year a significant amount of bibliographic material has been sent to the following institutions:

— School of Geology, University of Costa Rica.
— Earth Sciences Dept., University of Concepcion, Chile.
— Geology and Environmental Science Dept. University of Buea, Cameroon.
— Geophysical Institute of Peru.
— Manizales, Popayan, and Pasto Volcano Observatories in Colombia.
— Geology Dept., University of Caldas, Colombia.

The donations program has been sponsored by IAVCEI and the Keith B. Mather Library at the Geophysical Institute (GI), University of Alaska Fairbanks (UAF). Many individuals have contributed with various donations ranging from boxes and stuffing materials to books and journals. Sue Cave, who staffs the mail room at the GI has been of great help in this program. John J. Sanchez and family have volunteered their time to select, pack and ship the books to the various locations.

In a previous IAVCEI newsletter we listed the individuals who have helped with donations. Thanks again to them and the following people who have recently made contributions of books and journals:

— Niren Biswas (Ret.), UAF/GI.
— Jeff Freymueller, UAF/GI.
— Stephen R. McNutt, UAF/GI.
— John Fournelle, Dept of Geology & Geophysics, University of Wisconsin.
— Jim Dixon, USGS, Alaska Volcano Observatory, Fairbanks, Alaska.
— Tom Murray, USGS, Alaska Volcano Observatory, Anchorage, Alaska.
— Stephanie Prejean, USGS, Alaska Volcano Observatory, Anchorage, Alaska.

John J. Sanchez

STATE OF THE ARC (SOTA) 2003 AN OVERVIEW

The third in a series of approximately triennial SOTA workshops, held at Timberline Lodge on the slopes of Mt. Hood (16-21 August, 2003), brought together an international group of some 90 leading experts and students of subduction zones and their related magmatism. The workshop theme, 'Energy and Mass Fluxes in Volcanic Arcs', provided a broad focus for discussion and debate concerning a number of cutting edge issues and developments. The goal of this report is to summarize the proceedings and to convey the spirit and accomplishments of the meeting — that is, the 'state of the art', as currently viewed by the participants.

Structure

The conference was organized around a thematic set of keynote presentations by leading researchers on the topics of [1] thermal structures of subduction zones (SZs) from petrologic and geophysical perspectives, [2] sources, processes, and rates of mass fluxes originating below the Moho, [3] chronologies and rates, mass contributions, and impacts of crustal level processes that influence arc magmatism, [4] energetics and dynamics of magma feeder systems, and [5] origins, budgets, and influences of magmatic volatiles. Much of the meeting was devoted to moderated in-depth discussions of these topics. Parallel poster sessions provided opportunities for participants to display current research and to interact in detail with interested colleagues. A concluding workshop was organized along the lines of small group discussions focusing on set of broad questions and issues that arose during the meeting, with the goal of identifying profitable avenues and approaches for future research. An intra-conference field trip to visit representative exposures of volcanic deposits from Mt. Hood provided yet another forum for informed but informal interaction. Field trips to Mt. St. Helens and to the central Oregon Cascades and Crater Lake undoubtedly enhanced the attraction of this meeting to a broad and international group. This format, the secluded nature of the venue, and high fugacities of catalyzing fluids resulted in a stimulating level of discourse and collaboration.

Formal Presentations and Discussion Topics

Current constraints on thermal structures of SZs were reviewed from petrologic and geophysical perspectives by Glenn Gaetani and Chris Kincaid, respectively. Whereas much progress has been made in recent years concerning conditions of melting of near-anhydrous mantle materials (e.g. mid-ocean ridge settings), the effects of fluids (mainly H_2O and CO_2) on melting in subduction systems are comparatively less constrained. There is even a basic need to reinvestigate the vapor-saturated solidus of common mantle materials using modern analytical tools, as well as the conditions of formation of volatile-rich magmas (including calcalkaline basalts and high-Mg andesites). Numerical approaches designed to simulate thermal conditions in subducting slabs and within the subarc mantle wedge have resulted in improved understanding of temperatures in these domains, but the results are sensitive to modeling approach and assumed boundary conditions. Until such models can be 'calibrated' by independent observations, there remain large uncertainties on predicted temperatures and geothermal gradients. As a result, questions remain concerning conditions under which direct melting of slabs or components thereof (e.g. sediments) may occur, to what extent slabs dehydrate, and regarding the relative contributions of flux melting versus decompression melting of convecting wedge mantle to arc magma production. First-order constraints on magma temperatures derived from (1) geothermobarometry of arc lavas or exposed intrusive equivalents and (2) laboratory experiments suggest that the subarc mantle may be relatively warm compared to many numerical models. Scaled fluid dynamic experiments potentially provide higher resolution, and seemingly imply that two-dimensional numerical models (i.e. crossections of arcs) could underestimate actual thermal conditions; i.e. along-strike components of mantle convection may have a significant influence on thermal structure. An important conclusion is that, with incorporation of T-dependent viscosity, the numerical and physical models predict sufficiently hot subduction regimes to be reconciled with petrologic constraints. Still, all indirect modeling studies need to be tested against independent constraints or benchmarks before they can be applied confidently to understanding petrologic processes. Moreover, it is clear that variance in the thermal conditions of SZs can result in a broad range in their behavior and this factor must be considered when comparing the outputs of magmatism and fluid fluxes from different arcs or arc segments.

John Eiler and Simon Turner reviewed geochemical and petrologic constraints on the mantle origins of arc magmas with particular emphases on source components, processes, and rates of melt formation and ascent. A broad diversity of mafic magma types is recognized ranging from common calcalkaline variants to those with affinities to OIB and MORB. A key and longstanding question concerns the relative roles of subducted sediments, oceanic crust, and variably hydrated slab mantle versus potentially heterogeneous wedge mantle lithologies in producing the observed spectrum. An important advance will be discerning the effects of compositional heterogeneity in the mantle and slab from the effects of melting regimes and how they can be reconciled with physical models. Considerable discussion of transport properties and elemental partitioning among hydrous fluids, silicate melts, supercritical fluids and mantle or slab minerals ensued bearing on the important issue of whether or not, from a geochemical perspective, there is compelling evidence for slab melting. Evidence from short-lived U-Th series radioisotopes added additional fuel to the discussion — a particularly acute unsolved problem in this regard is the partitioning behavior of Th between melts and fluids in the sub-arc environment. Young mafic lavas commonly exhibit large ^{226}Ra and ^{230}Th excesses that often correlate with anomalies in other robust slab tracers (e.g. ^{10}Be). Such observed isotopic disequilibrium in many arc lavas provides strong evidence for short (e.g. $\leq 10^4$ years) time scales for their formation and transport from near slab depths. Because the time scales appear to differ from one parent-daughter system to another, what these data imply concerning the mechanisms of elemental transport from slab to wedge and melting processes remains an open question. Moreover, the inferred short transport times carry significant implications concerning mechanisms of transport that remain to be fully explored.

Turning to shallower levels within arc systems, Georg Zellmer reviewed available U-Th-Ra isotopic studies of the full spectrum of arc lavas. These data, coupled with petrography and information on crystal size distributions and element diffusion profiles, provide important constraints on time scales of magma differentiation, storage, and transport. A variety of studies document the entrainment of older crystal populations, magma mingling, and other open-system processes that attest to

significant complexity in the formation of many evolved arc lavas, and raise questions concerning interpretation of the disequilibrium data. The differences in time-scales implied by Ra-Th and U-Th disequilibrium in some systems show that further investigation is needed into the extent to which such magmas inherit their isotopic disequilibria from parental basalts (some of which seemingly carry signals of slab-derived elemental fractionations) as opposed to higher level processes (e.g. melt reactions with hydrothermally altered rocks or other materials at crustal levels, or magma mixing). Combined studies using other isotopic and elemental tracers offer potential to resolve this question. Jon Davidson provided an overview of the problems associated with unraveling crustal contributions, while Mike Dungan provided a detailed case study showing how extensive yet geochemically subtle crustal modification may be. On a mineralogical scale, microanalytical studies of phenocrysts commonly reveal complex isotopic and elemental variations further attesting to common operation of open system processes in arc lavas. At the scale of a long-lived volcanic complex, petrographic, mineralogical, and geochemical studies commonly reveal intricate relations best interpreted in terms of magma mingling, and digestion of cogenetic cumulates and perhaps other rocks in the shallow crust. The message that comes through clearly is that many, and perhaps most, arc lavas experience one or more form of open system modification that may obscure details of subcrustal magmatic petrogenesis. Although this caveat may be most important for intermediate and evolved lavas, even primitive appearing basaltic lavas may be affected to some degree. The extent to which this may be apparent will depend, element by element, on the leverage exerted by the 'crustal filter'. Some features, such as the U-Th series disequilibria and ^{10}Be signals are hard to explain except as slab-derived signals, but may be 'diluted' as a consequence of crustal influence.

The origins of intermediate and felsic arc magmas were further considered from other viewpoints. George Bergantz considered the role of crustal formation in terms of available experimental data for melting of suitable crustal protoliths, potential heat sources, and geological investigations of the exposed roots of older subduction complexes. A review of experimentally produced melts suggests that magmas most closely resembling estimated average crustal composition (i.e. granodiorite/andesite) generally require water-undersaturated melting of mafic to intermediate amphibolitic protoliths. However formed, such rocks may melt in response to underplating or intrusion of hot basaltic liquids, but numerical models considering thermal diffusion and time scales place restrictive geometric bounds on the details of this process. Unfortunately, the rare basement exposures that have been studied to date do not corroborate such a model. Kelly Russell discussed attempts to combine thermodynamic, kinetic, and energetic constraints simultaneously to simulate compositional variations in magmas undergoing cooling, fractionation, and open system interaction with wall rocks or other assimilant material. Such models, bound by energetic constraints (often not accounted for by petrologists), provide more realistic and self-consistent tests to evaluate geochemical details of arc magma evolution. A central point is that rising magmas are strongly out of equilibrium with their surroundings and have the potential to react on very short timescales. Finally, Jon Blundy described experimental and numerical modeling attempts to simulate the development of dacitic magmas similar to those erupted at Mt. St. Helens. This model also invoked periodic inputs of basaltic magma into the deep crust, and remelting of differentiated products of those magmas to produce broadly dacitic liquids. Experimental studies coupled with petrographic investigations also provide new insights concerning temperatures and processes of magma differentiation, crystallization behavior, and volatile budgets. These presentations provoked considerable discussion and comments concerning magma conduits, storage, petrographic implications, etc. The evolution of specific arc magma suites can differ from one volcano to another – even on small distance scales – such that general petrogenetic models require some customization in detail. Nevertheless, it appears that in most cases the fundamental energy driving arc volcanism derives from inputs of basaltic magma from mantle sources. The crustal 'filter' (perhaps better conceptualized for Earth scientists as a 'distillery') in turn imparts unique attributes to the outputs seen at the surface. These latter effects may be difficult to distinguish from subcrustal inputs; they are are a nuisance to those interested in mantle reservoirs but central to those who want to know about how magmas erupt and why one volcano is explosive and another is not.

The last formal session concerned volatile species in volcanic arcs. Bernard Marty reviewed isotopic compositions of many volatile components in magmas and how these may be used to estimate their sources and fluxes in volcanic arcs. Most arcs display ^{3}He/^{4}He ratios that are close to the MORB ratio (8±1 R_a), implying that He predominantly originates from the upper mantle. Samples with lower values record contributions of crustal He, although at some localities lower values may derive from subducted slab materials. Both sediment/slab and mantle sources appear to contribute to the fluxes of N and C species, based on elevated $CO_2/^{3}$He and $N_2/^{3}$He ratios compared to the upper mantle. However, degassing from subducting slabs and from ascending arc magmas and, for some species, complex chemistry in the crust combine to obscure volatile budgets. Issues needing further work include forearc degassing fluxes (tied to metamorphic reaction paths in subducting slabs), reconciliation of large ('cryptic') fluxes estimated for C with lower estimates based on studies of quenched lavas and/or melt inclusions in phenocrysts, and effects of devolatilization on isotopic compositions of gas species (used in certain flux calculations). Improvements in remote sensing measurements are needed to better quantify local emissions, and global arc flux estimates can be improved by expanding existing studies to more arcs (particularly submarine volcanic plumes) and improving mass flux estimates for arc magmatism (i.e. arc growth rates). Sampling methods are also quite varied (fumaroles, hot springs, ground/airborne gas monitoring, and melt inclusion studies), sometimes with different results; these need to be fully reconciled or explained. Paul Wallace focused on the measurement techniques and inventories for major volatile components (H_2O, CO_2, SO_2, and Cl) in arc magmas, and discussed the 'S problem'. The latter refers to an imbalance between monitored S emissions in volcanic plumes compared to lower petrologic estimates of S available in associated magma bodies; the excess S needed for a mass balance has important, but unresolved, implications for gas behavior in magmatic systems, volumes of magma involved, and possibly recycling of volatiles from shallow magmatic-hydrothermal systems. Estimated subduction inputs and magmatic outputs for H_2O, CO_2, and Cl are qualitatively similar, suggesting efficient recycling of these volatiles back to the surface; however, forearc fluxes and plutonic sinks currently are ignored for lack of adequate data. Finally, advances in modeling the effects of volatiles (mainly H_2O) in driving magma ascent, vesiculation, and explosive eruptions were discussed. Success in predicting eruptive

Continued on page 8

Continued from page 7

styles hinges on better understanding of volatile inventories and magmatic degassing.

Future Directions and Research Objectives

During the course of the conference we developed a set of questions (below), the answers to which were considered important in developing a comprehensive understanding of arc processes, and that also seemed amenable to direct investigation. Participants split into groups to discuss potential approaches to resolve or constrain each. The deliberations of each group were presented and discussed in a concluding plenary session; brief summaries of these reports follow each question.

1. How can we better determine the thermal structures of SZs, and how does thermal structure vary in spatial and temporal senses?

Minimal constraints can be derived from magma temperatures (geothermometry) and further refined via experimental studies (see #4 below). Experiments on subducting assemblages and analog studies of ultra-high pressure (UHP) terranes can shed light on thermal conditions attained within subducting slabs. Seismology (e.g. earthquake mechanisms and tomography) may constrain thermal structure of anomalous regions and/or unique P/T loci in SZs and mantle wedge domains. Reconciliation of reduced heat flow values and petrologic constraints (e.g. mantle and crustal melting estimates) with thermal models can help eliminate inappropriate models and provide insights to improve modeling efforts. Experiments on appropriate mantle materials with and without volatiles are needed to improve estimates of wedge rheology.

2. What are the mass and energy fluxes in arcs, and how do they influence arc structure?

Mass balances at arcs are, well, in a state of flux. Large uncertainties remain regarding temporal productivity, plutonic versus volcanic rock ratios, extent of recycling of older arc material to make younger magmas, and compositional inventories. For heat flux estimates, considerably more quality heat flow data, complementary studies of magma-derived species, and quantification of groundwater effects on heat flow are needed at various scales. Volatile fluxes are needed both along strike and across arcs. Existing data are mainly limited to subaerial volcanoes, but surveys of submarine volcanoes may provide a means to more rapidly expand the database. Magma flux estimates can be improved via detailed seismic studies of young arcs situated on oceanic lithosphere where igneous rock and volcanogenic sediment volumes and effects of loading and lithosphere flexure can be constrained more accurately.

3. How do we differentiate steady state processes from transient events in SZs, and how are these related to tectonic forcing functions?

The concept of 'steady state' is a function of the time scale considered. Over time, events such as arc migration, variations in slab geometry, changes in the character of subducting slabs (e.g. loci of fracture zones, aseismic ridges), etc. can perturb the thermal structure, the character of reservoirs involved in arc magmatism, and the loci and mechanisms of melting. Understanding such effects requires comparative studies of modern arcs (where tectonic factors are best constrained). Temporal variations in magmatic activity at specific arcs also need to be characterized (production rates, compositions, etc.) and inverted to define realistic physical models. There is also debate concerning the significance of high temperatures inferred on petrologic grounds in the uppermost mantle beneath some arcs; whether this reflects transient spikes due to injection of mantle derived magma or regionally high mantle temperatures has important implications for dynamic processes in the mantle wedge.

4. What is the composition of the mantle wedge, how does it melt, and what does it produce?

Comprehensive geochemical approaches can be organized to evaluate melt production (degree of melting) in a geographic context within one or more well-studied (intraoceanic?) arcs where slab additions and wedge depletion can be reasonably constrained. In principal, combined with a comprehensive phase diagram for peridotite, the above data can be inverted to a geographic map of P-T-H_2O-melt fraction. Development of such a phase diagram would provide a baseline from which departures or anomalies in melt chemistry could be interpreted and used subsequently to define further relevant experiments (e.g. for other mantle lithologies). Also, theoretical studies are needed to address melting processes under variable volatile contents, and for melt transport in a deforming mantle wedge.

5. What are the effects of the 'crustal filter' in modifying mantle magmatic inputs and/or in producing the observed compositional spectrum of arc magmas?

Fundamental parameters to determine include (1) the most primitive 'baseline' magma composition in an arc – and, specifically, whether or not high-Mg basaltic andesites are an important primary magma; (2) composition, thickness, and thermal structure of the local crust; (3) geologic history and duration of magmatic activity; and (4) stratigraphy and volcanologic context. Processes to evaluate in specific magmatic systems include partial melting, crystallization, recharge/mixing, and assimilation. Comprehensive geologic, petrologic, geochemical, geophysical and experimental approaches are needed to fully constrain these processes and to identify the lithologic reservoirs involved. Moreover, understanding magma evolution in the crust will place constraints on the energetics required, on subcrustal heat inputs needed, and on related physical mechanisms.

6. How does the slab impart signal (chemical/physical) to arc systems?

Major efforts are needed on several fronts. The depth, extent, and distribution of alteration (e.g. serpentinite and other hydrous minerals) in oceanic lithosphere are major factors controlling key chemical inventories in subducting slabs as well as their physical properties and behavior. Drilling, seismic studies, modeling studies and examination of exhumed UHP and arc terrains will provide further constraints. Experiments pertaining to slab dehydration and melting are needed for realistic compositions and realistic P-T paths. More comprehensive element partitioning studies (fluids, melts, near supercritical fluids) are needed at appropriate P-T conditions. Relations between spatial variations in arc outputs and subduction forcing functions (especially those linked to geophysical measurements) need examination. Particular focus on forearc domains can provide important constraints on early devolatilization history of subducting slabs.

7. How can we reconcile the disparate timescales across the compositional spectrum from U-Th series radioisotopes?

Several new studies suggest that shallow hydrous processes (e.g. dehydration of amphibole, phologopite, or other hydrous phases including water) and/or diffusion effects among source

minerals attending dehydration melting may influence U-Th series daughters and contribute to observed anomalies. The importance of such effects may be evaluated using trace element signatures for minerals capable of imparting such a signal (e.g. amphibole or phlogopite), through studies of xenoliths, or by direct experimentation. Also, experiments are needed to establish closure temperatures for different U-Th series systems. Possible complications due to magma mixing or interaction between magmas and hydrothermal fluids or alteration products may be tested using trace element and stable isotope geochemistry. Direct slab sources for U-Th series disequilibria (especially in evolved arc lavas) may be tested by the presence of robust slab tracers (e.g. ^{10}Be or other slab fluid indicators). Comparative differences among U-Th, Th-Ra, etc. and Sr diffusion ages in crystals are needed to determine if these systems record valid chronologies for specific processes.

8. How can we better constrain the systematics and effects of degassing in the crust?
For specific well-studied and monitored volcanoes, volatile fluxes need to be constrained for deep-seated magmas via petrologic methods, and their shallower emanations quantified using combined surface monitoring and geophysical methods. Theoretical models for volatile behavior are needed for a range of pressures, and these reconciled with observed fluxes. To achieve satisfactory models, further experimental work is needed on partitioning of volatile species into melts of diverse composition, including the effects that volatiles may have on each other during partitioning. Rates of volatile production need to be quantified using radiogenic tracers as appropriate. Valuable insights can also be gained from parallel studies of plutonic rocks.

9. What drives crystallization and degassing in magmas?
Important types of investigations include the following. Couple direct investigations of magmatic volatiles to seismic or other signals of fluid migration in the deep crust and upper mantle. Experimentally determine partitioning of S, Cl, H_2O and other volatiles into CO_2-rich fluids at high pressures. Study the abundance and isotopic composition of volatile species in related but compositionally diverse suites of magmas. Combine studies of natural samples with experiments to determine styles of phenocryst zoning induced by degassing versus cooling. Develop robust criteria to identify phenocrysts in equilibrium with host melts. Develop new geobarometers and geothermometers for common phase assemblages (e.g. olivine + spinel) occurring in hydrous calcalkalic magmas. Devise experiments to distinguish between decompression versus cooling controls on magma degassing. Evaluate effects of crystallization (i.e. crystal content) on the composition of melt inclusions in terms of post-entrapment modifications within samples and temporal evolution of related suites of samples.

Closure and Conclusion

The final function of the conference included overviews by several 'designated sages' of what was accomplished.

It was noted that SOTA 2003 brought to light an amusing lexicon of terms that may or may not become permanently installed in the arc literature. The concept of 'crystal cargo' refers to inherited material (or 'antecrysts', as coined by Wes Hildreth in the 2001 Penrose conference on silicic magmas) entrained in many arc lavas and provides patent evidence for the open-system nature of many arc petrogenetic processes. The term 'unwanted illegitimate daughters' (with the contraceptive acronym, UIDs) was proffered by Jon Blundy to those studying excesses of offspring in short-lived radioisotope systematics. And in a self-analytical vein, many participants were torn between roles as 'splitters' vs. 'lumpers' depending on the scale of their perspective on different issues — the former being perhaps the derivative of the latter (or the latter being the integral of the former, as suggested by Adam Kent).

The success of SOTA 2003 can be attributed to the presence of a diverse group of active researchers, including a contingent of emerging young scientists who brought with them novel ideas and expertise with state-of-the-art approaches and technologies. The size of the group promoted active discussion and interchange, and this was enhanced in the smaller group breakouts. Finally, all appreciated the setting, which was inspirational, and the secluded and comfortable venue that promoted undistracted interactions — often extending into the wee hours of the night. In the end, the success will be measured at least partly by the number of new collaborations formed and new ideas developed.

We conclude with a perhaps unsurprising observation. The complex variations within and between volcanic arcs are products of the inherent variability in composition and history of the slab, wedge, and crustal reservoirs involved. Depending on our experience and perspective, as students of volcanic arcs, we each see different parts of the anecdotal elephant. Yet, through conferences like SOTA there is increasing communication and integration of expertise among the disparate specialists that ultimately may result in development of a 'unifying theory' to bring all these parts into common focus and eventually serve as a useful predictive tool.

Further Information

Details of the conference, a list of participants, submitted abstracts, and PowerPoint files from most presenters are available for inspection on the SOTA 2003 WebPage (http://www.ruf.rice.edu/~leeman/SOTA2003/info.html). In the next year a compilation of thematic papers submitted by conference participants will be published as a special volume of the Journal of Volcanology and Geothermal Research. There was unanimous support for continuing this series of conferences

Acknowledgements

SOTA 2003 received major funding from the U.S. National Science Foundation, as well as support from Rice University, Portland State University, the U.S. Geological Survey, the International Association for Volcanology and Chemistry of the Earth's Interior (IAVCEI), and the Volcanology and Magmatic Studies Group (U.K.). Many individuals assisted in many ways, but we particularly want to thank the field trip leaders (Charlie Bacon , Mike Clynne, Rick Conrey, Cynthia Gardner, Dan Miller, John Pallister, and Willy Scott) for sharing their expertise, the graduate students from Portland State University and Oregon State University for their help with logistics, and the staff at Timberline Lodge for taking good care of us.

SOTA 2003 Conveners

William Leeman, Rice University
Jon Davidson, Durham University
Tobias Fischer, University of New Mexico
Anita Grunder, Oregon State University
Mark Reagan, University of Iowa
Martin Streck, Portland State University

MEETING REPORT

The 25th IUGG International Meeting on Mathematical Geophysics
Frontiers in Theoretical Earth Sciences
Columbia University, New York City, June 16-18, 2004

The Committee on Mathematical Geophysics (CMG) is an Inter-Association Commission of the International Union of Geodesy and Geophysics (IUGG) whose purpose is to promote the development and application of mathematical methods and appropriate numerical techniques for the solution of geophysical problems across the complete spectrum of Association disciplines. The CMG derives from the Working Group on Geophysical Theory and Computers (WGGTC) that was one component of the International Upper Mantle Project and was initially led by Prof. V. Keilis-Borok (who actually attended the NYC Conference). The first meeting of the WGGTC was held in Moscow and Leningrad in 1964 whereas the first CMG meeting was held in Banff (Canada) in 1972. Since that time the CMG has met every two years.

Although from its beginning the work of the Working Group and Committee was inclusive of many of the geophysical disciplines, it is probably correct to say that its activity was driven, for the most part, by the field of seismology. In more recent years, however, the scope of the Committee activities has been considerably broadened. The most recent meetings were devoted to: Complex Space-Time Geophysical Structures (Villefranche sur Mer, France, 1994); Complex Systems in the Earth Sciences (Santa Fe, NM, USA, 1996); The Dynamic Earth (Cambridge, UK, 1998); Extreme Earth Events (Villefranche sur Mer, France, 2000); and Pattern and Form in Earth Dynamics (Torino, Italy, 2002). In all these meetings, although maintaining a strong interest in the solid earth, the Committee has engaged scientists working on many fluid aspects of the planet, including atmospheric scientists, oceanographers, and hydrologists.

The last meeting of the CMG was recently held in the campus of Columbia University, New York City, and was dedicated to the Frontiers in Theoretical Earth Sciences. The meeting was sponsored in part by the IUGG, the Lamont-Doherty Earth Observatory, and the NSF Joint program in Applied Mathematics and Earth & Environtmental Sciences at Columbia. The meeting was attended by about one hundred scientists and was dedicated to the theoretical representation of any aspect of the Earth Sciences, at all spatial and temporal scales, ranging from the core and mantle to the surface, oceans and atmosphere. I am glad to report that, for the first time, the CMG Conference Program presented several contributions on the theoretical modelling and simulation of volcanic processes.

Tomaso Esposti Ongaro and I opened the "Multiphase Systems I (Fire)" session with a review of the present modelling capabilities of the dynamics of volcanic columns. A few complementary modelling approaches were presented of the most common pyroclastic dispersal phenomena and the future modelling challenges highlighted. Antonio Costa and Giovanni Macedonio focused their attention on magma flow instabilities induced by viscous heating. They showed how, using a direct numerical simulation, this effect can produce secondary rotational flows able to form coherent structures that can be observed in nature. Martin Saar and Michael Manga analysed the rheology of lava flow dynamics by using the percolation theory. Such an interesting approach allows description of the interconnectivity of the individual elements of a random composite material (as lava) as a function of the individual objects and therefore to infer its rheological properties. Jeff Johnson, Alex Proussevitch and Dork Sahagian investigated the importance of disequilibrium degassing for the Strombolian and Vulcanian activity at volcanoes with silicic magma. By considering a simplified modelling of bubble growth based on more complex models, they showed that, for discrete transient events, equilibrium degassing is inconsistent with observation and field data. Finally, Abani Patra, Mike Sheridan, Markus Bursik, and co-authors illustrated the last version of the TITAN toolset developed for modelling rapid granular flows of geophysical masses over natural terrains. They discussed the ability of the code to predict the path and runout of a number of flows as well as their hazard.

A number of interesting talks relevant to the volcanological community were also included in sessions as "Advances in Computational Earth Sciences" and "Chemical and Tracer Dynamics". I particularly enjoyed the talks by Bill Applebe and Aime Fournier, illustrating the current capabilities of geophysical models and solvers; Ronald Cohen, focused on the modeling of earth material properties based on the solution of first-principle laws; and Marc Spiegelman, aimed to reconcile geochemical and geodynamical observation of dynamic processes at depth by the use of multiphase transport models. Many other talks pertaining to different Earth Sciences disciplines were of great interest. The complete conference program and abstracts can be found at the URL http://www.ldeo.columbia.edu/~mspieg/CMG2004/.

In summary, the 25th CMG Conference represented a good opportunity to evaluate the present status of the international research in the theoretical Earth Sciences as well as to highlight the future challenges to cope with in the future years. As far as the theoretical research work in volcanology is concerned, the conference presentations and posters clearly showed it has reached a remarkable level of maturity comparable to that reached by other more theoretical disciplines. I wish such a trend will continue and more and more groups active in theoretical volcanology will attend future CMG meetings. Furthermore a number of effective links and co-operations could derive from a cultural exchange with scientists working on disciplines complementary to volcanology.

Finally, I congratulate both Mark Spiegelman (Chair of the Local Organizing Committee) and Dan Rothman (Chairman of CMG) for the excellent organization of this excellent meeting.

Augusto Neri
Centro di Modellistica Fisica e Pericolosità dei Processi Vulcanici
Istituto Nazionale di Geofisica e Vulcanologia, Pisa
IAVCEI Representative of the CMG

Invite a colleague to join IAVCEI!

NORTH AMERICA NEWS (JULY 2004)

Monitoring of a Nascent Volcano near Three Sisters, Oregon, U.S.A.

An area of ~600 km^2, centered 5 km west of South Sister Volcano, has risen about 25 cm since at least 1997 and continues to rise at ~3 cm/yr. It has the volcanological community wondering whether the gestation of a new volcano is being recorded. The nearly aseismic deformation drew attention in March 2004 with the advent of a swarm of more than a hundred small earthquakes (magnitude to ~1.5) near the margin of the uplift. The snow-free months of summer 2004 will be busy with continued and improved monitoring efforts by the U.S. Geological Survey. The greatest change will be in the seismic network. The three fairly distal stations that now record earthquake activity in the area are being supplemented by four new seismic stations: one short period station and three 3-component, broad-band stations that will hugely improve the density and aperture of the network and will allow for better detection and location of activity. Installation of digital radios will improve the dynamic range, should activity become vigorous. Seismic monitoring is done jointly between the USGS and the Pacific Nortwest Seismic Network at the University of Washington.

Monitoring of the deformation will also see improvement by the addition of a third continuous GPS station, the second within the area of deformation. Additional rounds of annual campaign GPS, leveling of a line across the deformed area, and a gravity survey are slated for late summer. The snow-free time will also be used for acquisition of radar satellite imagery from the new satellite ENVISAT that will serve as comparison for subsequent images. Owing to demise, illness and data incompatibility among satellites with InSAR capability, no satellite-based deformation data have been resolved since 2002. Original detection of the uplift by Chuck Wicks was by InSAR interferometry.

Water monitoring work in the area will be improved by installation of a third continuous probe to detect temperature, pressure (proxy for discharge), and conductivity. This probe will be in the headwaters of Separation Creek near a cluster of springs with thermal signatures and above where the earthquake activity took place. Detection of a few tens of ppm CO, potentially a tracer of magmatic activity, keeps interest in water compositions piqued. Periodic sampling of springs and streams in the area for geochemical analysis, including He and C isotopes, will be supplemented by a sampling of gases from a snow-melt pond atop South Sister.

Thanks to Dan Dzurisin, Bill Evans, Seth Moran and Mariek Schmidt for information about the ongoing monitoring work. Apologies for not acknowledging the many people involved in this interesting work by name.

Anita Grunder
Dept. of Geosciences
Wilkinson 104

VOLCANOLOGY AT THE AUSTRALIAN GEOLOGICAL CONVENTION,

FEBRUARY 2004

LAVA, the Learned Australasian Volcanological Association, is a specialist group in volcanology under the auspices of the Geological Society of Australia. Established in July 1998, LAVA is an active group that has grown rapidly to nearly 100 members (that is lot in this part of the world). Our aims include the provision of a forum for discussion on topical issues related to ancient and modern volcanic environments in the Australasian region. We also facilitate the exchange of ideas and information between workers in volcanology and related disciplines, and attempt to establish stronger links between volcanological researchers and industry-based geologists working in volcanic terrains. On a more general level, we aim to foster research and training in volcanology in the Australasian region and highlight the importance of volcanology to the wider community.

In February, 2004, LAVA organized two symposia and a 4-day pre-conference field trip at the Australian Geological Convention in Hobart, Tasmania. The AGC is the largest national meeting of geoscientists in Australia and is held approximately every 18 months. The themes for the symposia at the conference were volcanic processes and products, and volcanic hazards. James White (Otago University) delivered a keynote address on the many and varied influences of external water on volcanic processes. The volcanic hazards symposium reflected our close proximity to active volcanoes in the southwest Pacific. Papers in this symposium covered the social and psychological complications as well as the physical impacts of volcanic events. The keynote address from Shane Cronin (Massey University) explored the importance of how hazards information is delivered to indigenous communities using examples from his research in Pacific island countries. Both symposia attracted large audiences and generated a lot of discussion during question time. The pre-conference field trip was led by Jocelyn McPhie and Keith Corbett, and investigated the volcanic evolution of the Cambrian Mount Read Volcanics in western Tasmania. Participants included academic and government researchers, industry geologists and students.

LAVA publishes a half-yearly newsletter that features articles by members on new topics related to their research and highlights of conferences, papers and issues of interest to volcanologists in Australasia. In 2005, LAVA is planning to run a field meeting on a western Pacific volcanic island to undertake volcanic-hazard mapping. The details of this trip will be posted on our website later this year. However, for other information related to LAVA, please visit www.es.mq.edu.au/geology/volcan/LAVA.htm.

Jocelyn McPhie

IAVCEI is pleased to announce a new life member

Mr Kazutaka Manner

Please consider becoming a life member — it is good for you and for IAVCEI.

FUTURE MEETINGS

November 14-29, 2004
IAVCEI 2004 General Assembly, Pucon, Chile
contact: iavcei@sernageomin.cl

April 1-9, 2005
International Workshop on Ocean Island Volcanism
Cape Verde Islands
contact CV2005@ist.utl.pt

January 23-27, 2006
Cities on Volcanoes 4, Quito, Ecuador
contact: mhall@igepn.edu.ec

May 14-18, 2006
IAVCEI 2006 China, Continental Basalt Volcanism
contact: xlhuang@gig.ac.cn

July 2007
IUGG General Assembly, Perugia, Italy
contact: www.iugg.org

June 2012
IAVCEI 2012 Alaska, Centennial of 1912 Katmai Eruption, Fairbanks, Alaska, USA

Further information may be found on the IAVCEI website at www.iavcei.org

Message from the President
Continued from page 1

Last, in 2007 the IUGG general assembly will convene in Perugia, Italy. A high profile for IAVCEI in this meeting is important for all of us. Half of the IAVCEI budget comes from your membership fees. The other half consists of IUGG allocations that are decided according to the proportion of volcanologists in the registration to the IUGG assembly. I would like to suggest that many of the Pucon sessions can decide on future research and re-convene at Perugia in 2007 and later in 2008 at our next general assembly. This continuity may be very useful in moving forward concerted efforts in attacking important issues. Tasks may be assigned at Pucon, and the results can be presented at Perugia and at the 2008 IAVCEI general assembly.

I hope that we will all enjoy Pucon, enjoy the field trips and enjoy Chile! See you again in Guangzhou, China in 2006 and in Perugia in 2007.

Oded Navon
President

This issue was edited by Steve McNutt, Secretary-General, and Jon Dehn, Deputy Secretary-General, IAVCEI Layout and Design by Sheila Finch

IAVCEI 2003-2007 EXECUTIVE COMMITTEE

President	Oded Navon (Israel)	oded.navon@huji.ac.il
Vice President	Jocelyn McPhie (Australia)	j.mcphie@utas.edu.au
Vice President	Toshitsugu Fujii (Japan)	fujii@eri.u-tokyo.ac.jp
Secretary-General	Steve McNutt (USA)	steve@giseis.alaska.edu
Members	Renato Solidum (Japan.)	solidr@phivolcs.dost.gov.ph
	Jean-Chrisophe Komorowski (France)	komorow@ipgp.jussieu.fr
	Hugo Moreno (Chile)	hmoreno@surnet.cl
	Anita Grunder (USA)	grundera@geo.orst.edu
Past President	Steve Sparks (United Kingdom)	steve.sparks@bristol.ac.uk
Editor, Bulletin of Volcanolgy	John Stix (Canada)	stix@eps.mcgill.ca
Deputy Secretary-Geneneral	Jon Dehn (USA)	jdehn@gi.alaska.edu
Member Secretary	Caroline Giddings (Australia)	members@iavcei.org

IAVCEI Newsletter Regional Editors 2004-2007

Region	Editor	E-mail
Asia	Renato Solidum	solidr@phivolcs.dost.gov.ph
South/Central	John Sanchez	jjalaska@giseis.alaska.edu
Europe and Africa	Jean-Christophe Komorowski	komorow@ipgp.jussieu.fr
North America	Anita Grunder	grundera@geo.orst.edu
Oceana	Jocelyn McPhie	j.mcphie@utas.edu.au