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Newsletter of the Volcanology and Igneous Petrology Division
Geological Association of Canada

No. 67 January 3, 2008

From the President

Belatedly, Happy New Year to one and all from the executive of the VIP division. By the time you receive Ashfall, it will be close to various deadlines for the annual GAC-MAC meeting in Quebec City at the end of May, including the deadlines for the submission of abstracts and nominations for the division's awards. Most of the activities of the division traditionally take place during the annual meetings of GAC; the division plays an important role in the promotion of volcanology and igneous petrology in Canada. The meeting will be a good opportunity to meet other members and to talk about a lot of new happenings in volcanology and igneous petrology. It is quite an exciting time. I hope that many members will be able to attend the meeting.

The organizers of 2008 Quebec have put on a sizeable program in volcanology and igneous petrology. The division is sponsoring several activities. Brian Cousens and Steve Piercey are organizing a short course entitled "S*ubmarine volcanism and mineralization: modern through ancient*". This two-day course will include one day of lectures with a second-day field trip to the Thetford Mines ophiolite led by Alain Tremblay. For details visit the short course website.

Wulf Mueller, Real Daigneault, Vital Pearson and Damien Gaboury are preparing a pre-meeting field trip on "*Effusive and explosive subaqueous volcanism in the Abitibi greenstone belt*". The division is also sponsoring three special sessions: *Effusive and explosive subaqueous volcanism* (conveners: Wulf Mueller and John Stix), *Bimodal magmatism: petrogenesis and tectonic setting* (conveners: Jarda Dostal and Brendan Murphy), and *Anorthosite to Rapakivi granites: a tribute to the career of Ron Emslie* (conveners: Mike Hamilton, James Scoates and Tapami Ramo). As you may know, Ron was the recipient of the 2001 Career Achievement Award from our division.

The division awards several medals each year for the best PhD, MSc and BSc theses in volcanology and igneous petrology. It also awards the Career Achievement medal to a distinguished member in our field. We look forward to receiving your nominations for the awards. Finally, the executive would like to increase the membership of the division. So please encourage your colleagues, and particularly students, to become members; it supports volcanology and igneous petrology in Canada.

From the Editor

Hi folks, and welcome to the first issue of 2008. We have only one article in this issue, an account of a field trip to the Canary Islands, generously provided by Wulf Mueller. While, I do not want to nag, I would like to remind you that this newsletter can only continue to exist with your contribustions! If you have ideas for articles or even some spectacular photos that you wish to share, please drop me a line.

There have been a few volcano-related stories in the news recently. The Volcano World web site features a story on the Gamkonora volcano in Indonesia. Apparently villagers on slopes of the volcano are reporting that a recent eruption had a beneficial effect when it fumigated their coconut plantations, ridding them of the sexava pest. The Discovery Channel web site includes and interesting story about the imaging of a recent undersea eruption along the East Pacific Rise. They have used Alvin images to piece together a map showing 22 million cubic metres of new lava.

Finally just a quick reminder that the deadline for the Léopold Gélinas medals is fast approaching. Visit the VIP web site for details of how to submit your nominations. We are also seeking nominations for the Career Achievement Award for 2008.

Evolution of an oceanic island: shield volcano, stratovolcano and large-scale caldera collapse stages

Excursion Report: Tenerife, Canary Islands 19th October to 3rd November 2007

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Introduction

The Spanish Canary Islands represent a young volcanic archipelago in the Atlantic Ocean adjacent to the west coast of Africa (Figure 1). This ca. 35 Ma old archipelago (Muñoz et al., 2005) is composed of seven volcanic islands, which include Feurteventura, Gomera, Gran Canaria, Hierro, La Palma, Lanzerote, and the largest, Tenerife. The Canary archipelago is considered the result of mantle plume magmatism (Thirlwall et al., 2000; Abratis et al., 2002), although opinions may differ. The island of Tenerife is the second largest oceanic island in the world with the stratovolcano, El Teide attaining an elevation of 3717m.

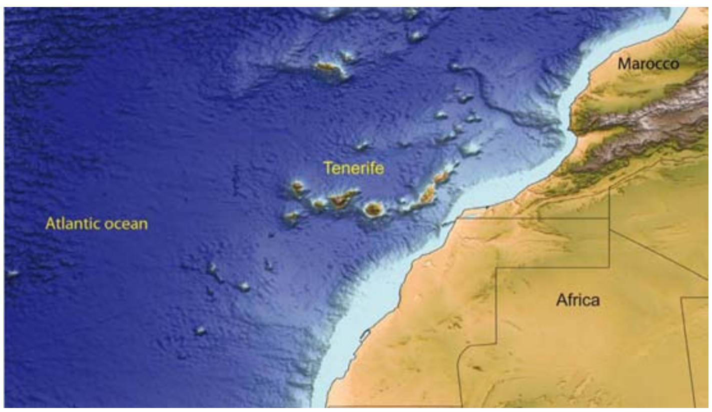

Figure 1: Canary Archipelago off the coast of Africa is composed of seven volcanic islands with the triangular island of Tenerife in the heart of the volcanic chain.

The El Teide stratovolcano (Figure 2) and its neighbour, Pico Viejo, overprint the northwestern rim of the Las Cañadas caldera (Ablay and Martí, 2000), which is considered an overlapping (Martí and Gudmundsson, 2000) or a nested caldera complex. The complex is composed of the Ucanca, Guajara and Diego Hernandez calderas that shifted eastwards due to magma chamber migration (Martí and Gudmundsson, 2000). The triangular-shaped Tenerife is a classical oceanic island, in which the volcanic base constitutes an amalgamation of individual shield volcanoes, referred to as Anaga, Teno and Roque del Conde Massifs. The Miocene shield volcanoes evolved and amalgamated from ca. 13-3 Ma, producing features and a geometry similar to that of the Island of Hawaii. Following amalgamation, volcanism progressed from expansive subaerial mafic flows to central volcanic edifices with constrained lava flows of phonolitic composition that developed within the central part of the island between 3 to 1 m.y. The incipient stage of the Las Cañadas caldera complex commenced with the Ucanca caldera (ca. 1.02 m.y.) and culminated with the Diego Hernandez caldera (ca. 200,000-170,000 yrs; Martí and Gudmundsson, 2000). Renewed basaltic and phonolitic volcanism formed the Pico Viejo and El Teide stratovolcanoes (Ablay and Martí, 2000; Carracedo et al., 2007). As is typical for large oceanic islands, major landslide events punctuated volcanic construction during the shield-forming phase (Walter and Schmincke, 2002; Walter et al., 2005) and the Las Cañadas caldera-forming phase (Hürlimann et al., 2004; Carracedo et al., 2007).

Figure 2: University of Chicoutimi participants on the extensive columnar-jointed feeder dyke complex of Garcia's Spur with channel-shaped mafic a'a flows and fumarole activity emanating from the El Teide stratovolcano with El Piton in the background (Las Cañadas caldera complex, October 21st, 2007).

Objective

The aim of this 15 day excursion was to familiarize students with the hallmarks of an island volcano that displays all the ingredients of volcanic construction from an early shield volcano stage, to stratovolcano formation, to subsequent caldera development. As many of the participants work in Archean supracrustal rocks associated with mineralization, modern analogies yield significant insight into the geometry and dimensions of volcanoes, their collapse as well as rejuvenation. They also show processes such as (1) the complex interaction between explosive and effusive volcanism, (2) the constant interplay between multiple dyke intrusions, synvolcanic faulting, hydrothermal alteration, and mineralization, and (3) multiple landslide structures. For those working in the Archean Blake River and Hunter Mine groups of the Abitibi greenstone belt, which are considered a subaqueous caldera systems (Pearson and Daigneault, in review; Mueller et al., in press), the subaerial Las Cañadas caldera complex was a true eye opener. The group was fortunate enough to have Joan Martí (In-

Figure 3: Joan Martí and Joachim Gottsmann (both in upper left part of photo) explaining to students clastogenic lava flows (rheo-ignimbrites) of phonolitic composition (trail to Montaña Blanca of the Las Cañadas caldera complex, October 22nd, 2007). Notice abundant light coloured pumice airfall deposits.

stitute for Earth Sciences, CSIC Barcelona) and Joachim Gottsmann (University of Bristol) to give a first hand account of the evolution of the Las Cañadas caldera complex (Figure 3). In addition, Joan Martí introduced the students to the volcanology of clastogenic lavas (rheo-ignimbrites), a hybrid volcanic rock that flows like lava but originates from explosive magma fountains. The guide book by Cas et al. (2005) for the Caldera Workshop, Tenerife (Martí and Gottsmann, 2005) was used for this field course.

To give a representative overview of Tenerife geology, three critical areas were selected. The group stayed the first week in the Las Cañadas caldera complex studying the caldera, the stratovolcanoes, the lava and clastogenic flows, the pyroclastic deposits, and the basaltic rift-related volcanic rocks. The next three days on the southeastern Bandas del Sur plain or volcaniclastic apron, concentrated on the pyroclastic outflow sheets, valley-fill deposits and cinder and scoria cones near El Médano, whereas the last three days emphasized the Miocene shield-building phase and the Santiago rift of the NW Teno Massif near Masca.

Las Cañadas caldera

The elongated, SW-NE trending, 9x16 km Ablay and Martí, Las Cañadas caldera complex (see excellent volcanic facies map of 2000), evolved diachronously over ca 800 ka as inferred by the migration of the magma chamber (e.g. Martí and Gudmundsson, 2000). The western Ucanca (1.02 Ma), central Guajara (570 ka) and eastern Diego Hernandez (170 ka) calderas overlap and are identified by linear feeder dyke complexes and faults such as Garica's Spur (Figure 4), which separate the Ucanca and Guajara calderas and define the cuspate shape of the caldera margin walls. The first two days of the field trip focused on the intra-caldera floor (elevation 1900-2100 m), which is composed of basaltic tube pahoehoe (Figure 5a) and a'a flows, and phonolitic dome-flow complexes (Figure 5b). The third excursion day was a focused climb of the 700m caldera wall to Pico Guajara (2715 m; Guajara peak). The ascent was

Figure 4: Garcia's Spur (Roques de Garcia) is a multi-injection feeder dyke complex and synvolcanic fault system. The feeder dyke complex separates the Ucanca and Guajara caldera-forming events, respectively and intra-caldera floors display locally up to 100m height difference along fault. El Teide stratovolcano with El Piton in the background with channelled a'a flows ca. 1.3 ka.

demanding but we all made it to the top. The geology of the Ucanca and Guajara formations was impressive with up to 40 m-thick welded pumice airfall deposits in part columnar jointed, local m-thick surge deposits, and massive non-welded pyroclastic flows and airfall deposits. The caldera wall gave an excellent cross-section of pyroclastic deposits associated with caldera eruptions. The phonolitic and basaltic lavas flows, and exogenic domes were restricted to the intra-caldera floor; pyroclastic airfall was subordinate, but ubiquitous.

Figure 5: a - top) Tube-shaped pahoehoe flows cascading ca. 30 metres down Garcia's Spur (Roques de Garcia). b - bottom) Well-defined phonolitic dome-flow complex related to Montaña Blanca formed at ca. 2 ka. Diego Hernandez caldera wall in background.

The climb to the top of stratovolcano Pico Viejo was by far the most strenuous of the trip, as the 14 km hike started off at 1900 m and ended at the top of the volcano at 3100 m. The trail followed the NW trending Santiago Rift zone and is characterized by mafic cinder and scoria cones. Airfall deposits were abundant and spindle-shaped bombs were omnipresent. After 3-4 hours of ascent we reached the top and lunched in collapsed pahoehoe lava tubes (Figure 6a) for shelter since temperatures dropped significantly during the climb. The Pico Viejo volcano is locally flat–topped due to infilling of the crater by subsequent lava flows and from this station the group could obtain an excellent view of the conduit (crater). Also visible was the phonolitic (white) pumice airfall deposits associated with the Montaña Blanca event and recent mafic a'a flows of El Teide (Figure 6b), which was still 700 m higher in elevation! The crater was well-exposed and showed how dykes grade into small domes. The sunny weather enabled us to see the prominent NW-striking Santiago rift zone, the Miocene Teno Massif (a remnant shield volcano, and the neighbouring island of La Palma (Figure 6c).

The following day the group decided to take the lift to El Teide, the highest volcano in Europe. It is important to know that special permission (with a photocopy of passport), although free, is required to climb to El Piton the small volcano on top of El Teide. Only 125 permits a day are distributed (to be obtained in Santa Cruz and takes a week). Advanced booking is advised. Once at the summit station, the last 200 m to El Piton still had to be climbed, and the air at this altitude was quite thin for many of us! The top of this active volcano, with strong fumarole and hydrothermal activity, was highly instructive as it put the construction of an oceanic island into perspective. A bright sunny day that was very windy, at 3718 metres altitude and with temperatures of -4º C enabled a complete view of the island. Many of the sunbathed tourists up from the coast learned to regret wearing only shorts and t-shirts when they arrived at the top!

The ocean island view was magnificent. The basal

Figure 6: a - top left) Finding shelter for lunch in collapsed lava tubes on the steep-sided NW flank of Pico Viejo. b - top right) Group on the top of Pico Viejo with the summit of El Teide looming in the background. Notice the channelled a'a flows emanating from El Teide and El Piton. C - bottom) Overview of NW Santiago Rift zone with numerous cinder and scoria cones. In the background the Teno Miocene Massif (shield volcano-forming phase) with town of Santiago de Teide and the Island of La Palma is observed.

Miocene shield-forming phase, characterized by rugged topography, was readily recognized in the NE and NW of the island. The vertical 700 metre wall to the east remained a standout feature of the caldera, but two major horseshoe-shaped landslides, referred to as the Icod (ca. 170 ka) and La Orotava (ca. 570 ka; Figure 7a) events, which disrupted the Las Cañadas caldera wall on the northern and western side (Hürlimann et al., 2004) were evident due to the vertical escarpments bordering the landslide. As can be seen in Figure 7a, a large part of Tenerife's population is concentrated in the La Orotava area. The whole group reached the top of El Piton and many were excited as it was really a breath-taking experience (Figure 7a). The highly altered, buff to white coloured, phonolitic lavas and volcaniclastic rocks were prominent in the summit crater and along the rim (Figure 7b), as well as on the top of El Teide (Figures 2, 7b). The hydrothermal alteration and local showings were always associated with synvolcanic faults and their intersection.

Figure 7:a - top) Top of El Piton and view of the NE rift zone with a remnant caldera wall between the Icod and horseshoe-shaped Orotava landslide events. The Orotava area is heavily populated. b - bottom) Top of El Piton with group. Notice the highly altered volcanic rocks due to constant degassing (fumarole activity).

Pyroclastic deposits of the Bandas del Sur plain

The initial days of the second week concentrated on the explosive products on the volcaniclastic apron originating from the various episodes of the Las Cañadas caldera complex (e.g. Martí et al., 1994; Bryan et al., 2000; Edgar et al., 2002). On the southeastern Bandas del Sur plain, ignimbrites from Guajara and Diego Hernandez formations is prevalent (Brown et al., 2003; Pittari et al., 2006; Edgar et al., 2007), whereas pyroclastic debris of the 1.57-1.02 Ma Ucanca Formation is only exposed in the southwestern segment of the island between Adeje and Guía de Isora (major road TF-82). Because the stratigraphy is a complex issue in volcanic terranes, distinguishing between members and formations may be a function of terminology and correlations. The stratigraphy and lateral correlations between proximal Las Cañadas explosive deposits and distal outflow sheets remains a contentious issue (e.g. Brown et al., 2003; Edgar et al., 2007). It is therefore not surprising that Archean volcanic sequences have the same problem. During our excursion, Joan Martí remarked that age determinations are essential to understanding the evolution of a volcanic edifice but they do not replace detailed volcanic facies mapping, the petrography of individual deposits and volcanic emplacement concepts.

The timing of explosive events is now well-documented on Tenerife, but correlations remain difficult. The best proximal to distal correlation from vent to down-slope apron deposit is the 600 ± 9 ka Granadilla Member (Brown et al., 2003), which is a large volume (5 km^3) eruption event derived from the Ucanca caldera (Bryan et al., 2000). Numerous large volume eruptions characterize the 600 to 170 ka Diego Hernandez Formation. The 289± 6 ka to 309 ± 6 ka Fasnia member (Brown et al., 2003; Edgar et al., 2007) contains 21 mappable volcaniclastic units resulting from expulsion of 13 km^3 of magma (dense rock equivalent, DRE). The various units represent airfall deposits and pyroclastic density currents in the form of flows (ignimbrites) and surges, and exhibit the complexity of paroxysmal eruptions. Similarly, the 169± 1 ka to 196 ± 6 ka Abrigo member (20 km^3; Brown et al., 2003; Edgar et al., 2007) and the 268± 8 ka Poris member (3.5 km^3; Edgar et al., 2007) are composed of numerous ignimbrite events (Edgar et al., 2002). Volumetrically, 70 km^3 of magma (DRE) was related to the Diego Hernandez caldera-forming event, and probably between 130-210 km^3 for the Las Cañadas caldera complex, occurring over 1 m.y.

Numerous mafic scoria and cinder cones and lava flows, related to mafic rift volcanism, puncture the Bandas del Sur plain. The small-scale volcanic edifies are concentrated along NE-Dorsal rift zone, the Santiago Rift and the South Rift zone. There is constant interaction between mafic rift volcanism and central volcanic caldera-related phonolitic volcanism over the last 300 ka (Carracedo et al., 2007). The cones are characterized by both normal- and reverse-graded airfall deposits with abundant bomb-sag structures. Small spatter cones associated with the scoria cones were locally observed.

The group focussed on recognizing individual depositional units, unconformities between eruptive events and understanding transport processes in pyroclastic density currents (pyroclastic flows and surges; e.g. Brown et al., 2003; Pittari et al., 2005). The pyroclastic density currents or pyroclastic flow deposits showed a combination of features, commonly with a basal stratified division grading up-section into a massive division suggestive of bedload transport changing into massive laminar or granular flow conditions (Figure 8a). The underlying topographic highs and lows with valleys and plains, as well as mafic scoria cones facilitated the change in flow conditions. Pronounced low-angle stratification was accentuated by the change into lithic-rich and pumice-rich bedding units (Figure 8b, c). The sedimentary structures of the pyroclastic density currents changed dramatically along strike and up-section within the flow due to the composition, density of pyroclasts and underlying topography. Locally, large-scale stratified units were truncated by overlying pyroclastic density currents (Figure 8c), and scoria cones acted as barriers around which the younger pyroclastic flows meandered. The town of El Médano is built on the pyroclastic flows (Figure 9) between two scoria cones.

Masca and the Teno Massif: The last three days (October 30th to November 2nd) of this demanding field trip was spent in the historic town of Masca of the 6.0-6.4 ka Teno Massif (Thirlwall et al., 2000) in the NW sector of Tenerife. The aim was to show the complexity of the mafic shield building phase during ocean island construction. The Masca area displayed a 1,200 m vertical cross-section of the shield volcano ranging from extensive and thick columnar-jointed (flood?) basalt flows (Figure 10a) to small cinder cones interstratified extensive pahoehoe flow fields (Figure 10b). The Teno Massif is composed of mafic, hot spot related,

Figure 8: a - top) Pyroclastic outflow sheets of the Diego Hernandez caldera event along the coast at El Médano. Notice the stratified and massive divisions of the phonolitic deposit. b - bottom left) Pumice- and lithic-rich divisions of pyroclastic density currents with a basal stratified division followed by a stratified to massive lithic-rich units at La Caleta. c - bottom right) Massive pyroclastic flow overlying unconformably a stratified pyroclastic unit with alternating pumice- and lithic-rich bedding units (La Caleta-Tajao).

Figure 9: View of El Médano from Montaña Roja. The buff white coloured tephra contrasts sharply with the red-brown coloured rocks of the scoria cone. The town is a surfers' paradise.

high Ti-rocks that include alkalic basalt, ankaramite, mugearite, benmoreite, tephrite, and basanite (Thirlwall et al., 2000). Walter and Schmincke (2002) by mapping and measuring dykes direction recognized a thee-armed rift system composed of the NW-Teno-Bajo Rift, the N-S Masca Rift (Figure 10b) and an inferred NNE-striking rift zone based on dyke orientations. Two paleolandslide structures have been inferred for the Teno shield-building phase and include: 1) collapse of the Los Gigantes Formation and 2) collapse of the Carrizales Formation (Walter and Schmincke, 2002). In the town of Masca the older landslide deposits, composed of lithic breccias and disrupted volcanic rocks, is cross-cut by dykes of the Masca rift event.

The group hiked down the Masca rift zone (Figure 10a, b) to see an impressive cross-section of a subaerial segment of a shield volcano. The ca. 10 km trek lasted 6-7 hours, but as can be assumed scrambling back up the canyon (Spanish, barranco) was not an easy assignment! As most of this group has mapped and worked in subaqueous Archean mafic sequences, to see the subaerial counterpart was novel. The top of the stratigraphy at Masca has very thick complex columnar-jointed flows (Figure 10a), but in the middle part of the volcanic stratigraphy, instead of thick massive flows units, pahoehoe flow fields with local small explosive cinder cones (Figure 10b), were prominent. In the lower segment of the sequence, detailed observations of the pahoehoe flow units could be observed. All mafic flows were highly vesicular, and tube-shaped and flat pancake-shaped flows were omnipresent (Figure 11a, b). The volcanic layering seen in both flow forms suggest flow inflation. All through the canyon dykes of the Masca Rift were prominent whereas the NW-Teno-Bajo Rift was subordinate.

Figure 10: a - top) View of the Miocene Teno Massif with the town of Masca. Notice the thick columnar-jointed flows and accentuated topography b - bottom) A small cinder cone capped by pahoehoe flows and intruded by dykes of the N-S striking Masca Rift (Barranco de Masca).

Figure 11: a - top) Miocene Teno Massif (Barranco de Masca) with thick composite, highly vesicular, pahoehoe flows and tubes. b - bottom) Typical pahoehoe tubes (pillow type!) overlain by broad pancake-shaped pahoehoe flows with layering, suggestive of inflation.

Afterthought

The two weeks on Tenerife permitted students to get a 'feeling' for large volcanic edifices. We saw the subaerial evolution of an oceanic island, and how shield volcanoes, stratovolcanoes and calderas formed and developed with time. I think the perception of size was a significant issue. Even here, with almost perfect exposure, age determinations must be taken with a grain of salt. The students were a great group and I honestly think that conducting such excursions will animate more to get back to grassroots mapping and field-oriented studies, as it is that what we need. Machines are great, but ground truthing in the field is still required. From a logistic point of view it was very difficult at times, but to see the next generation of geologists get enthused about 'rocks' was certainly worth it. Below is a list of places we stayed to help those out who might be interested to do a similar private or professional excursion. I can only recommend these places, and I can certainly say the students enjoyed them as well. In addition, numerous companies and the SEG sponsored our students so thank you very much because without their help, the excursion would have been too expensive. UQAC professors Wulf Mueller, Jacques Carignan, Pierre Cousineau and Denis Côté thank our institution for the financial support.

Hotels and Bed & Breakfast used during the excursion

20 to 27 October, 2007 - Parador de Las Cañadas del Teide
Las Cañadas del Teide
38300 La Orotava (Santa Cruz de Tenerife)
TEL:011-34-922 386415
FAX: 011-34-922 382352
E-mail: canadas@parador.es

27 to 30 October & 2-3 November 2007 - Hotel Playa sur Tenerife
E 38612 El Médano, Playa de El Médano, Tenerife
TEL:011-34-922 176 120
FAX: 011-34-922 176 337
E-mail: info@hotelplayasurtenerife.com

30 Oct to 2 Nov 2007 - Casa Riquelme y Christine Masca
Buenavista del Norte, CP 38480 Tenerife
TEL: 011-34-922 863 678

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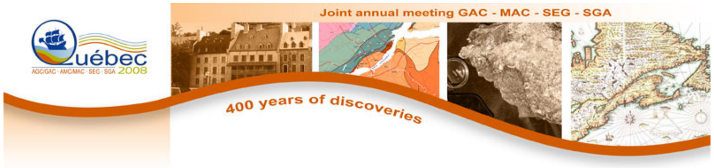
Meeting Announcements



GAC-MAC 2008

The Volcanology and Igneous Petrology Division is sponsoring the following activities at the Quebec City meeting, May 26-28, 2008.

Special sessions

1. Bimodal volcanism: petrogenesis and tectonic setting- Convenors: Jaroslav Dostal and Brendan Murphy

2. Anorthosites to rapakivi g ranites: a tribute to the Career of Ronald F. Emslie - Convenors: Mike A. Hamilton, James S. Scoates and Tapani Ramo

3. Effusive and explosive subaqueous volcanism   Wulf U. Mueller (Université du Québec à Chicoutimi), J. Stix (McGill University)

Short Courses

Submarine volcanism and mineralization: modern through ancient - Convenors: Brian Cousens and Steve Piercey. Sponsors to date: Volcanology and Igneous Petrology Division, Mineral Deposits Division, GAC

The short course will be held subsequent to the regular meeting (May 29, 30). The goal of the short course is to recap recent advances in the physical volcanology/geochemistry of seafloor volcanic suites and related hydrothermal systems, and to contrast modern volcanic examples with those in the rock record (Archean through Phanerozoic). The link between known or inferred tectonic setting and the style of hydrothermal (and other) mineralization will be emphasized. The material will be aimed at the non-specialist in both the fields of petrology and ore deposits, and one goal of the course is to bridge the professional gap between these two groups. The short course volume will be peer-reviewed, and will be available for sale to non-participants after the short course through MDD and GAC.

Seven presenters will participate. They are Richard Fiske, speaking on explosive submarine and subaerial felsic volcanism; David Clague, presenting modern mafic seafloor volcanism, including mafic pyroclastic volcanism and hydrothermal mineralization on the seafloor; Wulf Mueller, with extensive experience in caldera systems and Archean through modern mineralization; Steve Piercey, speaking on the application of lithogeochemistry to understanding the origin and exploration for VMS deposits; Harold Gibson, a specialist in ancient seafloor mineralizing systems; Dave Lentz, speaking on lithogeochemistry and dykes in volcanogenic ore-forming systems; and Mark Hannington, presenting a global perspective of modern submarine hydrothermal systems (mid-ocean ridge, island arc and back-arc).

We are currently planning a two-day short course, with a second-day field trip to the Thetford Mines ophiolite led by Alain Tremblay. A pre-meeting field trip to the Abitibi (Mueller) greenstone belt will be of interest to those participating in this Short Course.

For more information see the short course website

Pre-Meeting Field Trip

Effusive and explosive subaqueous volcanism in the Abitibi greenstone belt - Leaders: Wulf Mueller, Real Daigneault, Vital Pearson and Damien Gaboury

For more details visit the meeting web site

33rd International Geological Congress

The 33rd International Geological Congress will take place in Oslo from August 6-14th, 2008. There are a number of sessions that may be of interest to VIP members, including:

EUR 02 Archean greenstone belts of Fennoscandia and beyond
GHZ-08 Volcano flank instability: Causes, precursors and associated hazards
HPP-02 Precambrian ophiolites and related rocks
HPP-03 The first billion years of crustal evolution
MPI-04 Mafic dyke swarms: A global perspective
MPI-06 Layered intrusions and the evolution of magma chambers
MPV-05 Volcanic eruptions: Chamber-, conduit-, and depositional processes and their implication for monitoring and hazard assessment
MRD-14 Ophiolites, greenstone belts and ore deposits
MRD-20 Porphyry-type deposits

This is just a sampling of the many, many sessions on offer. Visit the web site for more information about the meeting and the more than 50 field trips