

MAAR CONFERENCE IN HUNGARY

Ulrike Martin (Wuerzburg, Germany, ceboruco@web.de)

and

Károly Németh (Geological Institute of Hungary, Budapest, nemeth_karoly@hotmail.com)

Maars are small-volume volcanoes that are the second most common volcanic landforms on Earth. Maar volcanoes have characteristically wide and deep craters, commonly referred as ‘hole-in-the-ground’ features (see Fig. 1). Magma and water explosive interaction is considered to be the main driving force that causes their creation. The sudden formation of steam during magma and water interaction produces a steam explosion that disrupts the country rocks and creates a mass deficit in and around the explosion centre, which leads to the formation of a collapse crater. Because the formation of maars is driven by the interaction of ground water and uprising melt, after the collapse of the crater, ground water inflow quickly fills the volcanic depression and creates a deep crater lake. Maar lakes are steep sided, often surrounded by unstable steep tephra cliffs that can erode into the lake quickly.

During the post-eruptive history of a maar volcano, landslides, crater-wall collapses and the initiated volcanoclastic debris flows and turbidity currents form a typical lacustrine succession in the maar lake. This destructive period is often accompanied by a lengthy period of quiet, during which the deposition of suspended material may produce laminated sequences. These laminites are often characteristic of the paleoenvironment, and therefore maar volcanoes are commonly considered to be excellent sites in which continental depositional records can be well preserved.

Maar volcanoes are not a strictly or well characterised group of volcanoes. There is an almost continuous transition to scoria (cinder) cones, which are considered to be the most common volcanic landforms on Earth. Scoria cones have frequently had only a short-lived eruptive history, when magma–water interaction took place. In this respect, maars may be viewed as ‘wet’ equivalents of scoria cones. Maar volcanoes are even more **colourful**?? if we consider that they commonly form groups or clusters, or have structurally-controlled alignments. In volcanic fields, the volcanoes commonly fall between the two end-members such as maars and scoria cones and therefore the study of such landforms should include both. In recent years, volcanological research on maars and their associated volcanism has enjoyed a noteworthy renaissance. Thus after the First International Maar Conference, which took place in Germany in 2000, a second meeting was held in Hungary in 2004.

The reason for organising the 1st IMC the Eifel region of in Germany was to bring volcanologists working on maar volcanism to the type locality of such phenomena. The joint field trips also showed typical young maar volcanoes, where the surficial deposits were ready accessible for study. By contrast, the 2nd IMC invited people to the Pannonian Basin, where maar volcanoes are often eroded and their crater infill material or their deeper root zones are exposed. This attracted a broad range of researchers to the 2nd IMC and the associated field trips. The success of the conference can be judged by the attendance of 108 participants from 28 different countries. The presentations covered research areas from every continent, including Antarctica.

The scientific symposia were grouped into ten different theme sessions, namely:

1. Maars and their tephra deposits (*Michael Ort, Flagstaff and Piero Delino, Bari*)
2. Diatremes and their root zones (*Volker Lorenz, Würzburg and Vlastimil Konecny, Bratislava*)

3. Structural control on pipe emplacement and economy geology of maar-diatreme volcanoes and their root zones (*Stephan Kurszlauskis, Toronto and Bruce Kjarsgaard, Ottawa*)
4. Dykes, sills, plugs, domes, scoria cones, lava lakes and associated peperites in maar-diatreme volcanoes (*Ian Skilling, Pittsburgh and Jaroslav Lexa, Bratislava*)
5. Geophysics of maar-diatreme volcanoes (*Georg Büchel, Jena and Peter Suhr, Freiberg*)
6. The physics of maar-diatreme volcanism (*Bernd Zimanowski, Würzburg and Ulrike Martin, Heidelberg*)
7. Maar crater-lake limnology and maar crater sediments (*Kurt Goth, Freiberg and Károly Németh, Budapest*)
8. Surtseyan volcanism (*Alexander Belousov, Petropavlovsk-Kamchatsky and Ulrike Martin, Freiberg*)
9. Hazards, environmental issues, nature protection, and geoparks of maar-diatreme volcanoes (*Ulrike Martin, Heidelberg and Barnabás Korbély, Budapest*),
10. Volcanic fields—polygenetic volcanoes (*Greg Valentine, Los Alamos and Károly Németh, Budapest*).

The Second International Maar Conference was held in Lajosmizse near Kecskemét city in the Great Plain of Hungary. The 1st IMC was held in 2000 with the aim of initiating a series of scientific meetings on maars. The 2nd IMC was organised by researchers from Hungary, Slovakia, and Germany, demonstrating the common work being undertaken by old and new members of the European Union. It was supported by the Geological Institute of Hungary, the Geological Institute of the Slovak Republic, and Würzburg University. The Organizing Committee led by Ulrike Martin (Würzburg) and Károly Németh (Budapest) had also successfully persuaded various major scientific organisations to support the meeting, both scientifically and financially. Therefore the 2nd IMC became an important event in 2004 for the International Association of Volcanology and Chemistry of Earth Interior (IAVCEI) and the International Association of Sedimentologists (IAS). Moreover, the 2nd IMC was officially organized by the IAVCEI Commission of Volcanogenic Sediments (CVS), which has just recently changed leadership (Vern Manville [GNS, Taupo], Ulrike Martin [Heidelberg] and Károly Németh [Budapest]).

The 2nd IMC was also officially supported by the *Deutsche Geologische Gesellschaft* (DGG), the *Geologische Vereinung* (GV), the Society for Economic Geology (SEG) and the *Magyarhoni Földtani Társulat* (MFT). To support student participants and their presentations (both oral and poster) the Organizing Committee had attracted support from major publishing houses such as Elsevier, Amsterdam, and Springer Verlag, Heidelberg, and scientific organisations such as the University of Tasmania, the University of Otago, and the Society for Sedimentary Geology (SEPM) in the form of the award of book packages for the best student presentations.

At least four oral papers and some five to ten posters were given in each of the meeting's scientific sessions, showing the latest results on maar volcanism. Several leading researchers who attended the meeting raised the general scientific level. *Alexander McBirney* (University of Oregon), often considered to be the father of modern volcanology (author of one of the first volcanology text books) gave an interesting presentation about his long experience of working on monogenetic volcanic fields and the information we may need to understand before taking the decision to plan the location of high-risk waste facilities. Similarly, it was an honour to invite *Hans-Ulrich Schmincke* (GEOMAR, Kiel) for a plenary presentation. He provided a good comparative view of magma/water-driven explosive eruptions and magmatic gas-driven explosive eruptions and on understanding these processes

in the light of general knowledge of how maar or other small-volume volcanoes may work. *Volker Lorenz* (Würzburg University) made an important presentation, highlighting the significance of studying maar volcanoes from the point of view of volcanic hazards. Such volcanoes are commonly overlooked, despite the fact that major cities such as Auckland, Naples, or Mexico City are located on monogenetic volcanic fields, often accompanied with group of maars. Reports from remote sites from the Transantarctic Mountains by a strong research group from Otago University, New Zealand led by *James White* presented new results on its field study of extremely large pyroclastic successions, considered to be precursors of major flood-basalt eruptions driven by extensive phreatomagmatic explosive events. *Murray McClintock* (Otago University) pointed out that similar large-volume pyroclastic sequences are seemingly more common than had formerly been supposed. He also presented new observations from the Karoo Province of South Africa. Numerous descriptions about monogenetic volcanic fields from Mexico were provided by *Gerardo Carrasco-Nunez* and *Gerardo Aguirre Diaz* (both from UNAM) and *Ulrike Martin* (Heidelberg), from Argentina by *Miguel Haller* (Universidad Nacional de la Patagonia), from the Pannonian Basin by *Vlastimil Konecny* and *Jaroslav Lexa* (both from Bratislava), *Károly Németh* (Budapest), *Ulrike Martin* (Heidelberg), and from Russia by *Alexander Belousov* (Petropavlovsk) who gave a good overview on the architecture of such volcanoes. **This sentence was a bit confusing and I may not have put it correctly**

From the geoscience education point of view *Wendi Wendy? Williams* (University of Arkansa, Little Rock) described a general pedagogical strategy called ‘Universal Design’, which may be of help to students who have special needs during their studies. **In concert with?** Dr Williams’ lecture, an **initiative was given?** by *Ulrike Martin* (Heidelberg) and *Károly Németh* (Budapest) about possible connections between Montessori pedagogy and geoscience education, and their implication for educational projects in various national parks, or conservation sites, such as, for example, the Balaton Upland National Park in Western Hungary. During the meeting, Geopark projects were described from various regions: e.g. from Western Hungary by *Barnabás Korbély* (Budapest) and *Gábor Csillag* (Budapest) or from central Mexico by *Marco Rojas* and *M. name? Fort* (both Université Paris).

With regard to geoscience education strategies and the potential role of volcanologists in creating greater publicity for our science, the President of the IAVCEI, *Oded Navon* (Jerusalem), gave an informative and enthusiastic talk about the IAVCEI policies concerning this issue. The IAVCEI wishes to take an active role with its own committees in the programmes of the UNESCO Year Planet Earth in the year 2007.

Before the 2nd IMC a Scientific Workshop called ‘*The Maar Engine*’ was held in Würzburg in the *Physikalisch Vulkanologisches Labor*, led by *Bernd Zimanowski*, *Piero Delino*, *Kenneth Wohletz* and *Volker Lorenz*. Immediately before and after the conference, two scientific field trips were organised to visit maar–diatreme volcanic fields in Western Hungary (led by *Ulrike Martin* and *Károly Németh*) and to Southern Slovakia (led by *Vlastimil Konecny* and *Jaroslav Lexa*). Both excursions focused on the crater and/or conduit filling zone of phreatomagmatic volcanoes. In Western Hungary, a great variety of peperite textures have been presented in various crater/conduit settings (see Fig. 2). Such textures are often associated with shallow subsurface sill and dyke complexes and/or cryptodome-like structures. During the Western Hungarian field trip good sites were shown to the participants to demonstrate that shallow sill and dyke complexes may be considered as potential feeder systems of small-volume phreatomagmatic volcanoes. *Károly Németh* and *Ulrike Martin* gave a talk about this possibility during the conference. Similar structural evidences have been demonstrated in Canada by *Nancy van Wagoner* (Acadia University) and by *Jaroslav Lexa* and *Vlastimil Konecny* (both from Bratislava) from Slovakia. During the field trips a great variety of joint patterns was seen, in association with lava lakes and/or plugs. Their irregular

structures highlighted the lack of knowledge in the relationship between wet environment and emplacing coherent lava bodeis (see Fig. 3). Overall, the two field trips were complementary to one another and were well suited to the general theme of the conference. In accordance with the intentions of the 2nd IMC, the two field trip were able to demonstrate the shallow subsurface architecture of small volume intra-continental volcanoes and in this respect gave significantly new perspectives to the studies of these volcanoes in comparison to the subjects presented at the First Maar Conference.

In addition, an inter-governmental agreement has been signed between Slovakia and Hungary to continue their co-operation in geological research. The participation of *Oded Navon* as current IAVCEI President gave significant status to the meeting and ensured the future of Maar Conferences. During the meeting it was provisionally decided that the next Maar Conference (3rd IMC) would be held in Mexico in 2009.

During informal discussions, on the basis of the 2nd IMC and its associated field trips, it was agreed that a few of the sites from the Western Hungarian phreatomagmatic volcanic fields are so well exposed that international research projects could be undertaken to establish the sites as type localities, to demonstrate the complexity of such small volcanic systems. A formal proposal to initiate such projects under the aegis of the IAVCEI is planned during the IAVCEI General Assembly in 2004 November, in Pucon, Chile. It has also been discussed and provisionally agreed that the Commission on Volcanogenic Sediments would take a more prominent role in the IAVCEI activities in the next few years, such as offering scientific sessions for the IAVCEI Continental Basalt Volcanism meeting in China in 2006, and a Special Workshop during the IUGG General Assembly in Perugia, Italy, in 2007. Further developments in the organisation of such sessions will be announced through the IAVCEI home-page (www.iavcei.org) or the IAS home page.

On the occasion of the 2nd IMC, an Abstract Volume was published in *Occasional Papers of the Geological Institute of Hungary* (Volume 203), edited by Károly Németh, Ulrike Martin, Kurt Goth, and Jaroslav Lexa (ISBN 963 671 240 9). A book was also published by the Geological Institute of Hungary as a field guide to Western Hungary, entitled *Mio/Pliocene Phreatomagmatic Volcanism in the Western Pannonian Basin* by Ulrike Martin and Károly Németh as Volume 26 of ***Geologica Hungarica, Series Geologica, Budapest book series ???*** (ISBN 963-671-238-7 or HU ISSN 0367-4150). A *Guidebook to the Southern Slovakia Alkali Basalt Volcanic Field*, by Vlastimil Konecny et al. has been published by the Geological Survey of the Slovak Republic (ISBN 80-88974-58-5). These books are available from the authors or via the publishing houses.

An update of the homepage of the 2nd IMC (www.mafi.hu/microsites/2IMC_Homepage/2IMC_Homepage_Files/WelcomePagePictures/2IMC.html)

is in progress. Further information will be available at this site about the abstracts and future Maar Conferences.

Selected papers from the 2nd IMC presentations are being collected for publication in the *Journal of Volcanology and Geothermal Research* as a Special Volume entitled *Monogenetic Volcanic Fields including Maar-Diatreme Volcanoes and their Root Zone, Tuff Rings, Tuff Cones and Scoria Cones*, edited by Ulrike Martin, Károly Németh, James White and Volker Lorenz. The preparation of another Special Volume in *Zeitschrift für Deutschen Geologischen Gesellschaft* entitled *Maar-diatreme Volcanism: Geophysical Studies, Economic Geology, Maar Lakes as Sedimentary Traps and Geoeducation*, edited by Kurt Goth, Vlastimil Konecny, Georg Büchel, Peter Suhr and Jaroslav Lexa has also been organized.

Figure captions

Fig. 1

Deep maar crater of the Crater Elegante in Sonora, Mexico.

Fig. 2

Great variety of peperite outcrops in various vent/crater setting of phreatomagmatic volcanoes of the field trips areas in Western Hungary.

Fig. 3

Field-trip participants in discussion, before a columnar-jointed basanite outcrop at Hegyestű, where the Educational Centre of the Balaton Upland National Park (a provisional Geopark in Central Europe) is located.