Active Tephra in Kyushu 2010: International Field Conference

Workshop on Tephrochronology, Volcanism and Human Activity Kirishima City and (Kagoshima Prefecture), South Kyushu, JAPAN, May 9-17, 2010

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Figure 1. Participants of the 2010 INTAV-J meeting, with Sakurajima volcano in the background (photo courtesy of Koji Okumura).

In May of 2010 the inter-congress meeting of the INQUA International Focus Group on Tephrochronology and Volcanism (INTAV) was held in Kirishima City, Japan. INTAV was formed in 2007 at the International Union for Quaternary Research (INQUA) congress held in Cairns. It replaced SCOTAV (Sub-commission on tephrochronology and volcanism), COT (Commission on tephrochronology), and earlier groups dating back to the 1960s.

76 participants from 11 countries attended the INTAV-J meeting (Figure 1). The venue of the meeting was the Kokobu Civic Centre, which was very generously provided essentially free of charge by the Kirishima City authorities (in return for the delivery of two public lectures, one by David Lowe and the other by tephra/volcano guru of Japan, Hiroshi Machida, on Sunday 9 May). Participants were treated to a personal welcome by the Mayor of Kirishima City, Shuji Maeda, followed by what appeared to be a very special (and delicious) banquet. However, this spread turned out to be standard lunch and dinner fare provided by the Civic Centre cafeteria and was enjoyed by participants on several occasions during the meeting. Mayor Maeda graciously invited the entire conference group to his personal residence for another spectacular banquet on Monday evening which included the use of dining 'rooms' in caves cut into the c. 30 cal. ka Ito ignimbrite. Traditional Kagoshima fare was put on, accompanied by the local alcohol 'sho-chu', which is made from fermented sweet potato and is not altogether unlike its Russian cousin vodka.

Sukurajima volcano provided a stunning backdrop for a tephrochronology meeting. The volcano has been in a state of ongoing activity since 1955, with approximately 8670 eruptions since 1955, and well over 500 eruptions

already this year. Several small vulcanian eruptions occurred during the meeting, with the first on Tuesday afternoon, exactly as the meeting broke for coffee.

The beauty of such a small gathering of specialists is that there is no need for multiple concurrent sessions, and with 48 talks and 38 posters presented over the 3 days, it was possible to attend every talk and view each poster. Session themes included:

- Tephrochronological frameworks and palaeoenvironmental reconstructions (marine, ice-cores, and terrestrial records), such as INTREPID, INTIMATE and PAGES projects
- Tephra studies and archaeology
- Regional studies
- Geochemical protocols and methods and their development
- Chronological development and databases
- Objective correlation and quantification of uncertainty
- Explosive volcanism
- Magma genesis
- Hazards in volcanic regions

One of the highlights of the oral sessions was a special session on the recent Icelandic eruption from *Eyafjöll* volcano. Presenters Chris Hayward, Thor Thordarson (both University of Edinburgh) and Siwan Davies (Swansea University) presented and discussed some of the first results produced from this 'world stopping' eruption event. It became very clear during the course of the meeting that this series of eruptions will provide an excellent opportunity to enhance knowledge on cryptotephra from Icelandic volcanoes, which are being increasingly utilised for time control in the Northern Hemisphere ice and marine core records. An INTAV-sponsored research project on the eruptives is being planned (see Davies *et al*., 2010). Another highlight was the high-quality invited keynote addresses, of which there were six (each up to 40 minutes): Nick Pearce (UK) (LA-ICPMS applications in tephrochronology), Duane Froese (Canada) (Yukon-Alaskan Quaternary studies linked by tephras), Siwan Davies (UK) (tephras in ice cores), Simon Blockley (UK) (tephra age modelling tephras including via Bayesian studies), Mitsuhiro Nakagawa (Japan) (petrology and eruption processes of Shikotsu and Aira calderas), and Takeshi Nakagawa (latest geochronological and analytical work on the Lake Suigetsu varved sequence).

The majority of the presentations given (other than purely technical talks) were concerned with tephrochronology in the Northern Hemisphere or Japan. Only 6 or 7 presentations discussed Southern Hemisphere studies, which was a little disappointing, but on the positive side there has been an explosion of interest in (crypto) tephra studies in western and central Europe. Australasia-focussed talks and posters included:

Quaternary stratigraphy and tephrochronology in the Chatham Islands, New Zealand.
K.A. Holt, V.E. Neall & R.C. Wallace

Tackling uncertainty in tephrochronology: objective 4 of the INTREPID project.
D.J. Lowe

Using tephrochronology to define and date the base of the Holocene for Australasia at Lake Maratoto (New Zealand) - an auxiliary stratotype for the Holocene GSSP.
D.J. Lowe & R.M. Newnham

Fingerprinting volcanic glasses unravels a new volcanic history for Ngauruhoe Volcano, New Zealand.
A. Moebis, S.J. Cronin, I.A. Smith

Merging eruption datasets: Building integrated eruptive records and realistic eruption forecasts.
M. Turner, S.J. Cronin & M. Bebbington

Developing methods for correlation of basaltic tephra layers to their volcanic sources in the Auckland Volcanic Field.
A. Zawalna-Geer & P. Shane

Two one-day mid-conference fieldtrips were put on as part of the meeting, with the cost included in the relatively modest registration fee. Unfortunately the foot-and-mouth outbreak in the neighbouring Miyazaki region in mid-late April forced a change in the proposed field trip routes, but nevertheless some excellent sites were visited.

The first field trip began with a visit to the Uenohara Jomon-no-mori archaeological centre, where remains of a 9,500 year-old Jomon period village have been preserved under layers of ash from repeated eruptions from Sakurajima and other surrounding volcanoes. We then travelled southwards towards Sakurajima itself. Sakurajima is a post-caldera volcano, approximately 26,000 years old and has produced numerous large plinian eruptions over its lifetime as well as vulcanian and stromblian activity. It was formerly an island in Kagoshima Bay, but during the Taisho eruption of 1914 (Figure 2), lava flows from the eastern craters of the volcano linked the western flank of the volcano to Osumi Peninsula.

While visiting the volcanic fan of Jigokugawara on the eastern flank of the volcano, participants were lucky enough to witness two small vulcanian eruptions from Showa Crater (Figure 3). This provided a real treat and really made the conference for many. After dragging the contingent of volcano-watchers back into the waiting buses, the trip proceeded to the western side of the volcano to the observatory to view more 20th century lava flows. Here we were again treated to a small vulcanian eruption.

The second mid-conference field trip took participants into the hills behind the town of Takatoge. We first visited an exposure of tephra and soil layers overlying the c. 30 cal. ka Ito ignimbrite. Most of these layers are derived from Sakurajima, and participants were quick to attack the section with newly purchased 'negeri gama' scraper tools. We then visited Tenjindan archaeological site, another Jomon era site which

Figure 2. Eruption from Showa crater, Sakurajima volcano, 12 May 2010.

was recently discovered during construction of a new roadway. Here a similar sequence of tephras to the previous stop was exposed. Various archaeological artefacts dating back beyond 26,000 years have been unearthed at this site, including pottery, china, stone tools, ovens, cooking pits and remains of dwellings. One of the oldest tephras from Sakurajima (Sz-Tko, 26 cal. ka) provides a critical datum for constraining the timing of human settlement in the southern Kyushu region following the catastrophic Ito ignimbrite eruption at c. 30 cal. ka, and numerous archaeological remains have been found between the Ito ignimbrite and the Sz-Tko tephra. Sites such as Uenohara and Tenjindan really emphasised just how limited our own New Zealand archaeological history is. This was further illustrated by David Lowe's pre-conference public lecture on using tephra to constrain arrival of humans in New Zealand. In this instance we have 2 or 3 marker tephra that are used as marker beds for humans in New Zealand, spanning back some 700 years, compared with southern Kyushu, where tephras and evidence of human activity are interbedded over a period of 26,000 years (or more)!

After leaving Tenjindan we proceeded to the coast at Fumoto to see a spectacular exposure of the deposits of the Aira tephra formation (Figure 4). This formation was produced by a huge eruption (>450 km^3) from Aira caldera at approximately 30 cal ka. The formation consists of a basal plinian fall (Osumi pumice fall) overlain by an intraplinian flow (Tarumizu ignimbrite) from the first phase of the eruption, followed by a post-plinian flow (Tsumaya ignimbrite, not present at Fumoto) during phase two, overlain by a huge thickness of Ito ignimbrite deposited during the climactic phase of the eruption. Exposed in a c. 20-30 m cliff exposure, these deposits were reminiscent of our own Taupo-derived pumice pyroclastic flows and falls, and occurring at roughly the same time, the similarity between the Aira and Oruanui eruptives was remarked upon on more than one occasion.

To close the meeting, participants were treated to yet another spectacular banquet, held this time at the Satsuma Brewery. Food, beer and sho-chu were consumed in vast quantities, topped off by an impressive Taiko drumming performance.

The meeting was then followed with a three-day post-conference field trip attended by 37 participants. The trip traversed some spectacular landscapes and included visits (via ferry crossing) to the dramatic, rather ominous-looking Unzen volcano as a feature of

day 1. Deposits from the 1990-1995 Unzen eruption series included lava domes, block-and-ash flow deposits, and pyroclastic flow deposits. Older tephras, lahar deposits, and debris flows were also visited. Day 2 featured the extremely impressive, 30-km-wide Aso caldera and associated deposits and volcanoes. Within Aso caldera, the summit crater of the basaltic-andesite to basaltic stratovolcano of Nakadake is currently emitting volcanic gas (mainly SO_2) and participants all noted the effect (stinging in the eyes) of such gases as they traversed the active crater area. Boardwalks and stalls, and the arrival of a Harley Davidson motorbike group (complete with a dog in a back-pack), all added to a slightly bizarre but immensely enjoyable, memorable, and instructive atmosphere amidst the landscape of ash deposits, blocks, and bombs. Aso caldera had large numbers of flooded paddy fields on its extensive floor, formed following harvest of winter wheat crops a week or two earlier. After leaving Aso, participants viewed Aso-derived eruptives including fall and flow deposits beautifully exposed in three dimensions in an old tunnel accessed by a wonderful walk through languid, hilly countryside. On Day 3 the featured volcanoes were Kuji and Yufi-Tsurumi and their products. At many stops on the three-day excursion, two very widespread tephras were frequently evident, namely the 7.3 cal ka K-Ah tephra and the c. 30 cal ka AT tephra. The trip concluded at Beppu in time for participants to catch trains or planes or to stay overnight in the famous geothermal spa town.

The next INTAV meeting will be at a symposium planned for the 2011 INQUA congress in Bern: "Advances in tephrochronology and its application to archaeology and past-environment studies". The date and location of the next Inter-INQUA INTAV conference will be decided at Bern.

Reference

- Davies, S.M., Larsen, G., Wastegård, S., Turney, C.S.M., Hall, V.A., Coyle, L., Thordarson, T., 2010. Widespread dispersal of Icelandic tephra: how does the Eyjafjöll eruption of 2010 compare to past Icelandic events? *Journal of Quaternary Science 25*: 605-611.

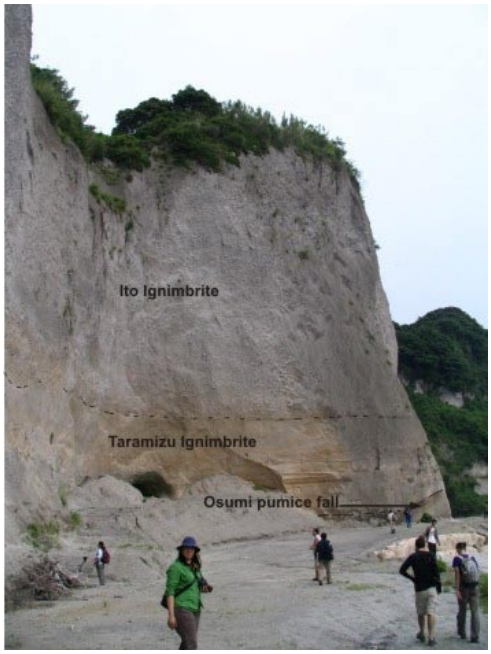

Figure 3 (BELOW). Torii (gateway to shrine) at Kurokami village, buried in 2 metres of pumice fall from the Taisho eruption in 1914.

Figure 4 (RIGHT). Aira tephra formation at Fumoto.