IAVCEI-Commission on Volcanic Lakes

FIRST CIRCULAR

CVL 10 Workshop, New Zealand
17-26 March 2019

Ruaumoko – Atua of volcanoes
Artist: Te maari Gardiner

Invitation

On behalf of the International Association of Volcanology and Chemistry of the Earth's Interior, its Commission on Volcanic Lakes and GNS Science, we are pleased to invite you to the 10th Volcanic Lakes Workshop to be held in New Zealand in March 17-26, 2019.

The meeting aims to bring together volcano scientists from a wide range of sub-disciplines, including physical volcanology, hydrology, limnology, biochemistry, geochemistry and geophysics, all with a view toward establishing broad communication amongst the disciplines and development of holistic models of volcanic lake environments. The goals of the workshop are to provide ample opportunity for exchange of ideas around data collection and monitoring methodologies in volcanic lake environments, hazard recognition and mitigation, and copious discussion of conceptual models for wet volcanic systems.

As for previous workshops, CVL10 is designed around both formal scientific sessions and field visits to several of the well-studied magmatic-hydrothermal environments in New Zealand, including Mt. Ruapehu, Waimangu, Lake Rotomahana and Whakaari (White Island). Dependent on states of unrest, we will endeavour to provide sampling opportunities / data collection from these sites. Water column sampling will be possible from Lake Rotomahana, whereas lakeshore and/or spring sampling opportunities will be available from Ruapehu, White Island and selected thermal areas at Waimangu.

Themes for the Conference

We anticipate that the formal sessions (up to 3 days of oral and poster sessions) will be thematic, and we invite ideas and/or proposals for up to 5 symposia. A theme of particular interest from the NZ perspective is "Eruption Hazards from Wet Volcanic Systems", and we are pleased to invite papers around this topic, with submissions ranging from monitoring to modelling, and everything in between.

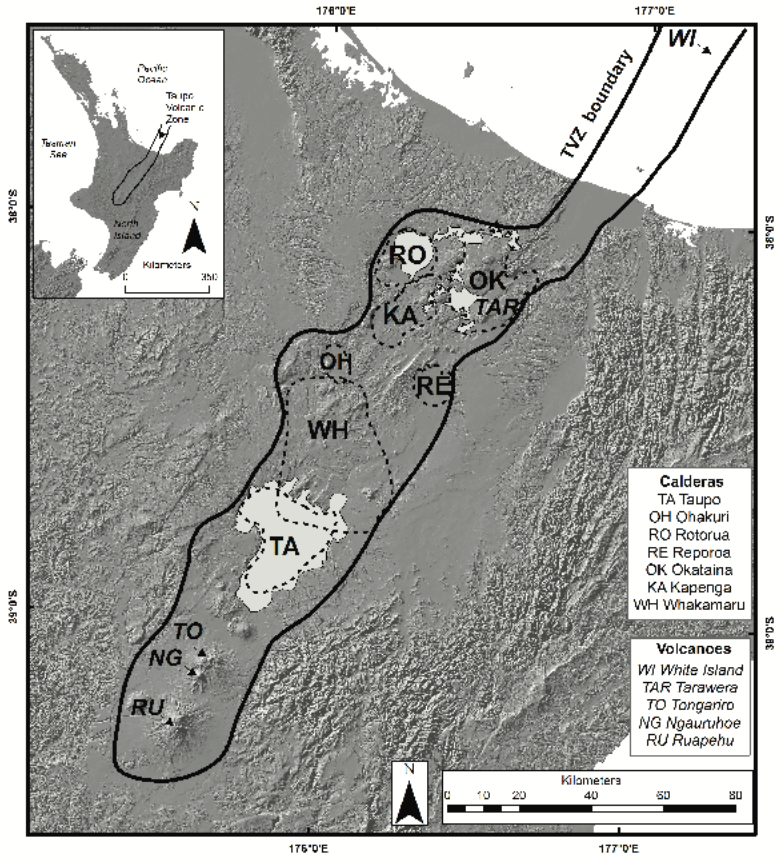
Please submit proposals for additional workshop symposia by May 31st, and these will be disseminated in the second circular which will be out in early August, 2018.

Photo across Lake Taupo to the volcanoes of Tongariro National Park.

Volcanism in New Zealand

Tectonically, the Taupo Volcanic Zone (TVZ) is described as an extensional arc (Wilson and Rowland, 2016), where the Pacific Plate is actively subducting beneath the Indo-Australian Plate. This gives rise to both NE trending andesitic arc magmatism which currently occurs along the eastern margin of the volcanic region, but also crustal extension along the arc which is responsible for some 2 km of subsidence along the axis of the volcanic region. No fewer than 7 centres of silicic volcanism and associated calderas have been identified in the region, most notably that of Taupo some which is regarded as the world's most violent eruption in the last 5000 years.

New Zealand has a lot to offer those who study the intersection between active volcanoes and the Earth's hydrosphere. Although just two volcanoes (White Island and Mt Ruapehu) are currently active, with a total estimated energy output exceeding 4000 MW the TVZ hosts more than 20 geothermal systems, all having magmatic heat sources of varying age and depth, and all pointing to the vast extent of this magmatic province. In short, it is an ideal place to host CVL10!



Location map of the principal volcanoes and calderas of the Taupo Volcanic Zone.

Areas to be visited as part of CVL10

Mt. Ruapehu

The crater lake on Ruapehu is one of the more extensively studied volcanic lake systems on Earth. The lake is currently 110 m deep, and holds ca. 9 million m^3 of hyper-acidic water. A most interesting feature of the lake is its thermal cycling behaviour, with temperatures ranging from 9 °C to greater than 40 °C. The cycles correspond directly to varying gas emissions through the vent-lake system, with CO_2 and SO_2 emissions ranging from < 100 to 2400 T/d and < 5 to 550 T/d respectively.

The volcano has had two historic lake expulsion events in 1945 and 1995, with the latter providing the first ever opportunities to sample and characterise gases from the magmatic system. The lake took some 10 years to refill after the 1995/96 eruptions, and today stands at overflow.

Depending on the state of unrest and weather, the group will visit the lake by helicopter. Permits will be obtained for lakeshore sampling, but no water-borne activities will be possible. Everyone should have up to 2 hours on the lake shore, which should provide ample opportunity for remote and/or direct sensing activities (e.g., multigas, gas tubes, etc.), or just sitting back and enjoying this very beautiful place.

Note: Ruapehu is an alpine environment, and weather can be both changeable and unpredictable. Participants should have at least some mountaineering experience, with skills in the use of ice axe and crampons in the event that weather or unforeseen operational issues preclude descent by helicopter. Snowpack will be at a minimum by mid-March, and although the descent on foot is not technically difficult, there are permanent snow/ice fields in the summit area that must be negotiated. Warm alpine clothing, suitable foot ware and alpine equipment (ice axe and crampons) are absolute necessities.

Waimangu and Lake Rotomahana

Lake Rotomahana is part of the Tarawera Volcanic Complex located in the southern part of the Okataina Volcanic Centre, the most recently active of the 8 major rhyolite eruptive centres in the Taupo Volcanic Zone. Over the past 26,000 years, rhyolitic and basaltic eruptions formed the Tarawera volcanic complex in the southern part of Haroharo Caldera. Prior to the 1886 Tarawera eruption, the Rotomahana area was a site of numerous phreatic and magmatic eruptions and was host to an intensely active hydrothermal field with hot springs, geysers, fumaroles and two famous sinter terraces known as the Pink and White Terraces. Two small lakes occupied part of the site of present day Lake Rotomahana: Lake Rotomahana (hot) and Lake Rotomakariri (cold). The most destructive manifestations of the 1886 Tarawera basaltic eruption occurred in the Rotomahana area during large scale phreato-magmatic events.

Phreatomagmatic and hydrothermal explosions ejected both hydrothermally altered and juvenile rocks, forming large explosion craters. Shortly after the eruption, the Rotomahana valley began filling with cold water. Today, surface hydrothermal activity in Lake Rotomahana is focused in the western part of the lake with numerous fumaroles, hot springs and geysers (known as Steaming Cliffs) occurring along the shoreline, and a number of bubbling areas clearly visible offshore.

Eruptive activity occurred also to the southwest of Lake Rotomahana in the Waimangu area in 1886. Since then, surficial hydrothermal features have established themselves, and there have been numerous hydrothermal eruptions in the area, as recently as 2016. Today, surface activity consists of hot springs, fumaroles and the large Inferno and Frying Pan hot crater lakes.

Steaming Cliffs on the western shore of Lake Rotomahana (2013).

Lake Rotomahana and Mount Tarawera in the background. Waimangu valley and Inferno Crater Lake in the foreground (2005).

Aerial view looking west to the main crater floor of White Island (Whakaari).

White Island

White Island, situated 48 km off of the Bay of Plenty coast, is New Zealand's most active volcano. The 1976-2000 volcanically active period consisted of phreatic, phreato-magmatic and magmatic events, and the formation of the eruption crater complex in the western sub-crater. A quiescent period between 2000-2012 fostered 3 crater lake cycles, and the re-establishment of acid spring discharges on the main crater floor. Activity recommenced in mid-2012, and since then there have been numerous phreatic and phreatomagmatic eruptions, and the extrusion of a dome in the eruption crater complex. All the while, fumarolic emissions on the main crater floor have reflected through their compositions the changing state of the magmatic-hydrothermal system. In essence, this is a classic "wet" oceanic island volcano.

We will travel to the island by launch (ca. 2 hours), and spend approximately 3.5 hours in the crater. Depending on the state of the hydrothermal system and level of volcanic unrest at the time, full advantage will be made of this time to sample springs, pools and/or crater lake and/ or make in situ measurements of gases.

Please appreciate that group safety is always of paramount importance, and we have strict guidelines for crater access at any one time which may place constraints on possible activities on the day. There won't be time for sampling fumaroles on this day, but optional arrangements can be made for a post-workshop gas sampling trip to the island.

White Island crater lake early 2014. The lake was growing at this time, and was close to overtopping the dome which was extruded in late 2012.

Costs

Conference fees are at this stage are estimated to be NZD $1650 per person based on 50 participants. **This covers:**

- hire of the conference facilities and amenities (morning and afternoon teas and lunches) for 3 days in Taupo,
- bus transport to all field areas (Ruapehu, Waimangu/Rotomahana, Whakatane and Ohope (White Island)
- return helicopter transport to Ruapehu Crater Lake from the Whakapapa ski area,
- accommodation in Rotorua and launch hire for Lake Rotomahana,
- chartered launch to White Island from Whakatane,
- accommodation and meeting facilities for two nights at Ohope (24th-25th March)
- Transport from Ohope to Rotorua airport (26th March; arriving ~1400)

Not included in the conference fees are:

- Transport to Taupo from Auckland (17 March)
- Six nights accommodation and food costs in Taupo (17-23 March). As a guide, average cost for six nights accommodation in Taupo will be around NZD $840 single, NZD $480 shared twin for reasonably comfortable rooms (of course, cheaper and more expensive accommodation may be found). We suggest using website services such as Trivago or AirB&B to peruse/organise accommodation.
- Costs of any tourist activities for the free day in Taupo
- Meals (breakfast and lunch) during Rotomahana and White Island (Ohope) segments; conference dinner will be provided at a restaurant in Ohope on the last evening
- Transport from Rotorua to Auckland (26 March).

As many of the costs associated with the field excursions are fixed, costs will increase if we have less than 50 participants. We are currently working on sponsorship for the workshop which, of course, will offset costs.

Organising Committee (GNS)

Bruce Christenson
Agnes Mazot
Karen Britten
Brad Scott
Bubs Smith

Scientific Committee

Bruce Christenson (GNS, New Zealand)
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Nico Fournier (GNS, New Zealand)
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Dmitri Rouwet (INGV-Bologna, Italy)

FOR FURTHER INFORMATION
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CVL-10 Draft Itinerary

Day 1: Arrive Taupo, Sunday March 17

- 1400-1700 Registration for Conference at Great Lake Centre (GLC)
- Check in to accommodation
- 1700-1900 Official Welcome, Ice Breaker, Maori Welcome, finger food
- Evening free in Taupo (lots of restaurants)

Day 2: Sessions at Taupo GLC, Monday March 18

- 0830 start, Official Opening of Conference, local welcome (Iwi, Local govt., Sponsors, etc.)
- 0930 Science Sessions
- 1700 finish
- 1800 Excursion to Debretts Thermal Spa, barbeque (optional)

Day 3: Sessions at Taupo GLC, Tuesday March 19

- 0830 start
- 1700 finish
- Evening free in Taupo

Day 4: Sessions at Taupo GLC, Wednesday March 20

- 0830 start
- 1500 finish oral sessions
- 1600 Poster Session (with beer!)
- 1800 Finish
- Evening free in Taupo

Day 5:Mt Ruapehu (or free day if bad weather), Thursday March 21

- 0700 Pickup from motels
- 0930 Airlift from Top of the Bruce (TOB) to RCL
- 1430 Airlift from RCL to TOB
- 1700 Depart TOB
- 1800 Evening free in Taupo

NB If weather precludes Ruapehu, possible optional transfer to Waiotapu thermal area for the day.

Day 6:Free day (or back-up day for Ruapehu), Friday March 22

- If this becomes a free day, there are numerous tourist activities available in the Taupo area (from mountain biking to skydiving to simply sitting on the beach, or
- **Tongariro Crossing (optional)**
  - **0700 Pick-up motels and drive to Mangatepopo**
    - **Tama Lakes sampling**
  - **1700 Pick-up at Ketetahi car park**

Day 7:Transfer to Rotorua, Saturday, March 23

- 0900 Depart Taupo
  - Stops at Huka Falls, Wairakei bore field,
- 1030 Arrive Waimangu
  - Tour and purchase lunch at site
- 1430 Depart Waimangu to Rotorua
- 1500 Arrive Rotorua
  - Check in to hotel
  - Shopping and/or cultural opportunities
  - Evening is free (shop for groceries for breakfasts next three days)

Day 8: Lake Rotomahana, Sunday, March 24

- 0700 Breakfast at hotel
- 0800 Depart for Waimangu/Rotomahana
- 0845 Depart wharf
  - water column sampling
  - fumarole sampling (if interest arises)
  - water-borne diffuse degassing group measurements
- 1700 Depart Waimangu/Rotomahana for Ohope Beach
- 1900 Arrive Ohope, check into motel, dinner in Ohope

Day 9:White Island, Monday, March 25

- 0800 Depart Okataina Lodge for Whakatane
- 0830 Arrive Whakatane Harbour
- 0900 Depart for White Island on PeeJay 5
- 1100 Arrive White Island, disembark
  - Lake shore water sampling (access dependent)
  - Spring sampling (if flowing)
- 1530 Return to Whakatane
- 1730 Meet bus in Whakatane
  - Short ride to Ohope accommodation, check-in
- 1930 Conference Dinner

Day 10: Ohope, Tuesday, March 26

- 0900 CVL Business meeting
- 1100 Close of meeting
- 1200 Check out, bus transfer to Rotorua (Airport and bus station with services to Auckland).