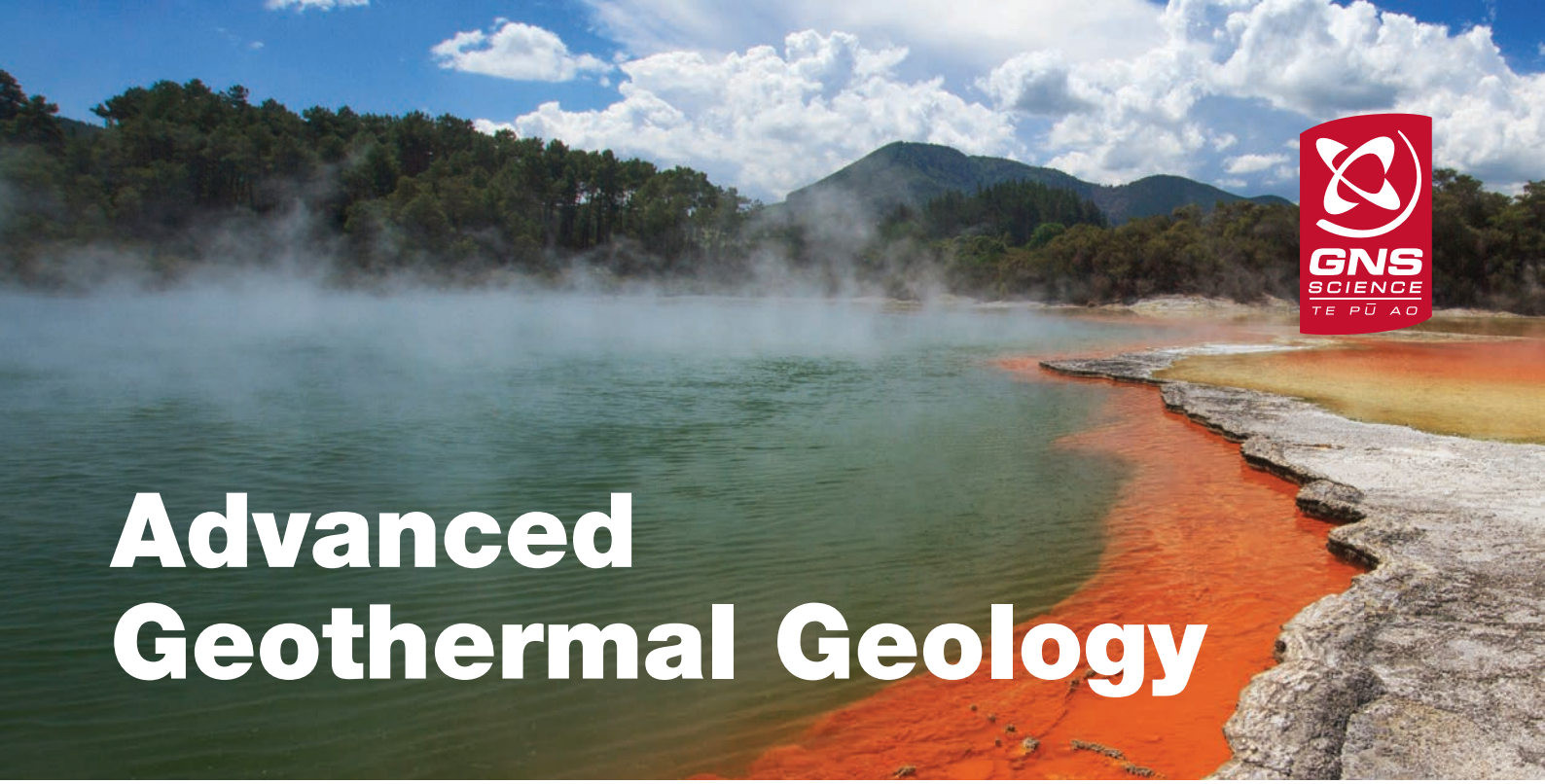

Advanced Geothermal Geology

The objective of this course is to provide an advanced overview of geothermal geology and state-of-the-art methodology and simulation tools.

10-14 FEB 2020

Location:
GNS Wairakei Research Centre & University of Auckland

TOPICS COVERED

This course complements JOGMEC's introductory course and is useful for:

- Geoscientists who have completed the JOGMEC course and want to advance their knowledge
- Geoscientists working for oil/exploration companies interested in geothermal geology practices
- Geothermal geoscientists interested in state-of-the-art / current practice methodology
- Senior students and/or researchers in geothermal or complementary fields

REGISTER NOW

www.gns.cri.nz/geothermal-workshop **Cost*: $6,560+GST/per person**

- Limited number of spaces available (max 15 attendees)
- Minimum number of attendees required (12)
- Registrations close 20 December 2019*
- Course commences in Rotorua

* Includes internal NZ travel, accommodation and food
* Excludes international travel

* GNS Science reserves the right to cancel the course if minimum numbers are not reached by 20 December 2019. A full refund will be arranged for all registration fees received.

CONTACT Angus Howden *a.howden@gns.cri.nz*

WORKSHOP PROGRAMME

Day 1

10 Feb 2020

Rotorua – Taupō

Introduction to New Zealand Geothermal Development

Meet with GNS geothermal specialists and local iwi (Māori) in Rotorua, to view the Rotorua Caldera and thermal manifestations (including Pohutu Geyser) at Te Puia thermal area, learn about the cultural importance of geothermal activity to New Zealand's indigenous Māori and New Zealand's approach to community engagement. Travel with GNS staff to Taupō, with stops at Ohaaki and Wairakei, where Contact Energy staff and GNS will describe the geology and structure of the Taupō Volcanic Zone, and history of geothermal development.

Day 2

11 Feb 2020

Wairakei Research Centre (GNS Science), Taupō / MB Century Drill site

Application of Geosciences in Geothermal Exploration

Attendees will learn from GNS specialists about the application of geology in geothermal exploration and development, including well site geoscience. GNS experts will introduce geological controls on permeability, system hydrology which include insights from geothermal geophysics. We will visit MB Century Drilling company to learn about drilling technologies and practices, and visit an active drill site near Taupō (conditional on operational issues) with MB Century and GNS staff to gain further insight on drilling operations and activities of a wellsite science team.

Day 3

12 Feb 2020

Wairakei Research Centre (GNS Science), Taupō

Role of Geology in Geothermal Exploration, Drill Targeting and Wellsite Services

GNS specialists will introduce and discuss hydrothermal alteration and how geology, alteration and known thermal conditions can be used in the development of conceptual models, project feasibility and well targeting strategies, and the role of the geologist in drilling operations. Attendees will participate in a cuttings/core logging exercise, incorporating the study of hydrothermal alteration, application of microscopy and other analytical tools (hyperspectral), and the collective interpretation of information from these results and how they can aid in ongoing exploration. These insights will build towards an overview of 3D geological framework modelling practices, covering data QC and management, model value, application and limitations, and model build demonstration.

Day 4

13 Feb 2020

Wairakei Research Centre (GNS Science), Taupō – Waiotapu Geothermal Field – Auckland

Exploration Strategy and Field Development Planning

Here, we bring together the concepts introduced over the preceding days, to evaluate how an exploration geoscience strategy melds with field development. There is opportunity to revisit issues or questions raised during the course before leaving Taupō to the Waiotapu Geothermal Field. Waiotapu is a protected system, but we can evaluate its surface alteration and speculate how the area might be explored for power generation, if it was deemed possible. If time permits, the attendees can visit a local direct use application in the area, before travelling to Auckland.

Day 5

14 Feb 2020

The University of Auckland

Integration of Geological Data to Numerical Modelling for Sustainable Development

Attendees are introduced to numerical modelling tools and techniques, and our approach for melding geological insight and resource capacity assessment, and the inferred steady state / conceptual (hydrological) model of the system, with scenario (numerical) modelling appropriate for a proposed development. Sustainable field management practices are highlighted. Through an integrated modelling exercise, attendees will understand what geoscience data is important, and how it is best managed and used to effectively size and to manage a development activity and environmental effects over the life of a project.

PRESENTORS

Dr Andrew Rae

Senior geologist – GNS Science

Andrew Rae joined GNS Science in September 2005, to work as a geothermal geologist. During this time, he has been involved with ongoing geological wellsite services, and now manages the rig geology team that has operated at all the New Zealand geothermal systems presently used for power production. He is also involved with geothermal resource assessments in New Zealand, Japan, Taiwan, Indonesia, Papua New Guinea, Philippines, Uganda and Chile, along with geothermal resource consenting processes and evaluations. He has been involved with assessing the established geoscientific management protocols for major geothermal exploration and development companies, providing methods for streamlining procedures.

Samantha Alcaraz

Senior geothermal geomatician – GNS Science

Samantha is the Team Leader of the Geothermal Geology and Modelling team at GNS Science. With 10+ years' experience as a GIS expert / 3D Modeller in the geothermal industry, Samantha is our geothermal data management specialist. Samantha is an expert user and trainer of the software Leapfrog Geothermal. Through her modelling expertise she has a key centralising role within multi-disciplinary teams to create integrated geoscience models that support the development strategies of geothermal fields. She has worked on geothermal fields in New Zealand, Japan, Taiwan, Indonesia, and Philippines and trained people worldwide.

Mark Simpson

Senior geologist – GNS Science

Mark Simpson joined GNS Science 7 years ago as a geothermal geologist and is the senior rig geologist providing well services for all NZ developed geothermal fields. His research work is focussed on characterising hydrothermal alteration in the TVZ geothermal systems as well as for epithermal gold-silver deposits of the nearby Hauraki goldfield using hyperspectral (SWIR), XRD, automated mineralogy, fluid inclusion, petrographic and portable XRF techniques. Prior to joining GNS, he worked at The University of Auckland (14 years) investigating epithermal deposits of the Hauraki gold to reconstruct the paleo-hydrology and genesis of these former geothermal systems, identify vectors towards mineralisation and assess mineralisation potential.

Dr John O'Sullivan

Assistant Professor, Department of Engineering Science - University of Auckland

My present research focus is computational fluid dynamics for environmental flows. Currently I am working in two main areas. The first is modelling flow through porous media and its application to geothermal reservoirs. This includes: improving geothermal reservoir models by including geological structural information; inverse modelling to assist with geothermal model calibration and enable uncertainty analysis of geothermal reservoir models; and using scripting and parallelisation to control large and complex models.

The second is modelling turbulent wind flow. This includes: developing accurate RANS closures for use with atmospheric flows; wall functions and other near wall treatments that can be used to simulate rough terrain; and simulation techniques for large, parallelised models.

TRAVEL INFORMATION AND GETTING AROUND

FLIGHT RECOMMENDATION

Participants should arrive into Rotorua on Sunday 9 February 2020 ready for course commencement on Monday 10 February.

Suggested Air New Zealand flight details:

TOKYO TO ROTORUA

Sat 8 Feb 20 NZ0090 18:30 - 09:05(9 Feb) Narita - Auckland

Sun 9 Feb 20 NZ8151 11:35 - 12:20 Auckland - Rotorua

AUCKLAND TO TOKYO

Sat 15 Feb 20 NZ0099 09:50 - 16:50 Auckland - Narita

GETTING AROUND

AIRPORT (ROTORUA) TO HOTEL

Participants will be meet at Rotorua Airport by shuttle bus for transport to the hotel. Further details will be provided via email upon registration.

SITE TO SITE

Course participants will be transported over the week in a comfortable bus to each location throughout the week.

AUCKLAND TO AIRPORT

On Saturday 15th morning a shuttle bus will be provided to take participants from the hotel to the airport.

ACCOMODATION

Hotels at each location (Rotorua, Taupo, Auckland) will be organised for the participants. Further details will be provided via email upon registration

FREE TIME

Before and after the workshop, and at the end of each day, attendees will have free time to have a look around Rotorua, Taupo and Auckland.

COURSE COSTS DETAILS

INCLUDED

All accommodation, breakfast, lunch and dinners and all internal NZ travel (other than arrival flight, Auckland-Rotorua), after participants arrive in Rotorua is covered under the course fees. Entry fees to Te Puia and Wai-O-Tapu Thermal Wonderland are covered.

EXCLUDED

International flights (including internal flights Auckland-Rotorua) are not covered. No travel insurance or specific medical requirements are covered.

ITINERARY

The course is held over five days (Mon-Fri), starting in Rotorua and finishing in Auckland.

TRAVEL FROM JAPAN 8 - 9 February 2020

- Depart Japan (arrive 9 February 2020)
- Arrival in NZ — Transfer from Rotorua airport to hotel

DAY 1 10 February 2020 (9am - 5pm)

Rotorua and surroundings, travelling to Taupo

- Lectures on geothermal development in NZ from industry experts
- Visit Te Puia thermal manifestation and stops at the Ohaaki and Wairakei power stations

DAY 2 11 February 2020 (9am - 5pm)

GNS office in Wairakei and Taupo surroundings

- Lectures on the application of geology in geothermal exploration and development
- Field Trip around Taupo to geothermal location and drill locations (where possible).

DAY 3 12 February 2020 (9am - 5pm)

GNS office in Wairakei

- Lectures on well targeting strategies and wellsite services
- Laboratory exercises

DAY 4 13 February 2020

Transfer from Taupo to Auckland (CBD)

- From exploration to field development wrap-up
- Visit Waiotapu Geothermal Field and field evaluation

DAY 5 14 February 2020

Short walk (10min) from hotel to University of Auckland

- Incorporation of days 1-4 geothermal geology learnings and incorporation into a numerical model.
- Final dinner and awards

TRAVEL BACK TO JAPAN 15 February 2020

Transfer from Auckland City hotel to Airport

If you require further information or support regarding this registration, please feel free to send an email to *a.howden@gns.cri.nz*