

CONTENTS

| | | | |
|--------------------------|---|-------------------------|---|
| VISG Co-ordinator's Note | 1 | Global Eruption Roundup | 3 |
| News | 1 | Media Coverage | 3 |
| Research Spotlight | 2 | Upcoming Events | 3 |
| Research Highlights | 2 | Contact | 3 |

VISG CO-ORDINATOR'S NOTE

by Natalia Deligne

VISG wrapped up 2015 with a successful annual seminar, following by a productive meeting to **review and revise the VISG Charter**. We will be making recommendations to the Auckland Lifeline Group (ALG) to ensure our charter reflects our activities and also clarify our role as a peace-time group without operational crisis responsibilities.

This quarter's Research Spotlight features the Economics of Resilient Infrastructure (ERI) and Determining Volcanic Risk in

Auckland (DEVORA) project to develop a **scenario examining the consequences of a hypothetical Auckland Volcanic Field eruption**. ALG members generously contributed time and in some cases resources to the project – thank you. Please get in touch with me (see contact details on the last page of the newsletter) if you would like a copy of the final report, as we are experiencing delays in posting it on the ERI website.

NEWS

The **Annual VISG Seminar**, held in Auckland on 11 December, was a great success, with attendees from ALG member organisations, GNS Science, Universities of Canterbury and Auckland, NZTA, EQC, and Auckland, Waikato, and Bay of Plenty CDEM groups; live streaming and video recording was provided for the first time for those unable to make it to Auckland. Powerpoint presentations can be downloaded at <http://www.aelg.org.nz/volcanic-impacts/visg-seminars/>; contact Natalia Deligne for video recordings of specific presentations.

The VISG Wider Interest Group met in Auckland on 11 December to **review and revise the VISG charter**. Recommended changes will be presented to the Auckland Lifeline Group for consideration.

The **8th Annual DEVORA Research Forum**, held at the University of Auckland on 12 November, was a great success, with 22 presentations featuring the latest science on the Auckland Volcanic Field. The programme, powerpoint presentations, and posters can be downloaded at http://www.devora.org.nz/presentations_and_posters/.

Auckland ranked first in an international review of emergency management plans from 100 English-speaking cities. VISG contributed to the development of the Auckland Contingency Plan concerning volcanic eruptions. Congratulations Auckland CDEM!

In January, Daniel Blake (University of Canterbury PhD student) prepared a report on his research on the **impacts of volcanic ash on skid resistance** for NZTA's Skid-Resistance Technical Advisory Group (STAG). See Daniel's Research Spotlight in VISG newsletter issue no. 2 for a summary of his 2015 trip to Japan to learn first-hand about volcanic ash impacts to road transportation networks.

Jenni Hopkins (Victoria University of Wellington), **Grant Wilson** and **Heather Craig** (University of Canterbury) all passed their PhDs and graduated. Part of Jenni's PhD focussed on identifying and correlating tephra deposits produced by Auckland Volcanic Field eruptions, Grant Wilson examined volcanic hazard impacts to critical infrastructure, and Heather Grant studied agricultural impacts of volcanic eruptions. **Congratulations graduates!**

VISG newsletter Research Spotlight features from issues no. 1 and 2 featured prominently in the latest biannual Learned Australasian Volcanologist Association (LAVA), **LAVA News**. To learn more about LAVA visit <http://www.gsnz.org.nz/information/lava-nz-i-69.html>.

GeoNet is redesigning its website to improve user experience. Please fill out a **brief survey** for GeoNet know how you use the GeoNet website and what would make it better at: <https://7361g1j1.optimalworkshop.com/treejack/geonetsurvey>. Contact Sara McBride (s.mcbride@gns.cri.nz) for more information.



RESEARCH SPOTLIGHT

“Mt Ruauumoko”: Exploring consequences of an Auckland Volcanic Field eruption

by Natalia Deligne (GNS Science) and Daniel Blake (University of Canterbury)

Auckland is built on top of the Auckland Volcanic Field (AVF). The last eruption was only 550 years ago, and while the location, time, and size of the next eruption are unknown, the AVF will almost certainly erupt again in the future.

What might Auckland experience during a local eruption? A team of 10 researchers from GNS Science, the University of Canterbury, and Massey University recently explored this question through the development of a comprehensive scenario starting where the 2007-08 Tier 4 Civil Defence and Emergency Management (CDEM) Exercise Ruauumoko ended.

Exercise Ruauumoko was an all-of-nation exercise based on fictitious volcanic unrest in Auckland, culminating in the start of an AVF eruption in Mangere Inlet. The exercise did not explore the consequences of volcanic activity, rather focusing on the lead up an eruption when critical evacuation, mitigation, and preparedness decisions are made.

To explore the consequences of an AVF eruption, Determining Volcanic Risk in Auckland (DEVORA) researchers developed a geophysical scenario based on Exercise Ruauumoko, carrying it through to a month-long eruption in Mangere Inlet. DEVORA then teamed with Economics of Resilient Infrastructure (ERI) researchers to develop hazard footprint maps for “Mt Ruauumoko”

pyroclastic density currents, tephra fall, lava flows, ballistics, and construction of the volcanic edifice.

We started by applying the Auckland CDEM Contingency Plan, in consultation with Auckland CDEM staff, to determine when and where evacuations would be ordered. We next drew on 20+ years of New Zealand-lead volcanic impact reconnaissance trips, historical volcanic impact documentation and controlled laboratory testing to describe and quantify the impact of “Mt Ruauumoko” to Auckland’s infrastructure.

In a world first, we quantified the “end-user experience” – how long and where would there be rolling electricity blackouts, water and fuel shortages, lack of sewage treatment, reduced or no capacity at Auckland Airport, reduced transportation options, and reduced Ports of Auckland services. This is a novel approach, as traditionally impact and risk scientists have focused on quantifying damage and repair costs. While these are extremely important for property and asset owners, they are less important for the public: during a crisis the public is more interested in level of service, such as whether or not there is access to potable water, rather than the dollar amount of damage the water network has sustained.

We met with over 20 ALG members to ground truth our level of service estimates for the entirety of the scenario: ALG members have

a profound knowledge of their networks, systems requirements, and capabilities. We learned a huge amount during these meeting, and are deeply grateful for the time provided to us. In some cases, our initial attempts to quantify impacts were off the mark, and so we revised and updated our work.

It is challenging to succinctly summarise our final 164 page report (contact Natalia Deligne for a copy). In our “Mt Ruoumoko” scenario, most of the physical damage to critical infrastructure occurs as a result of initial pyroclastic density currents. Evacuation orders and health and safety considerations have major implications for infrastructure repair and service restoration. Supply chain disruption is another key factor. In the “Mt Ruauumoko” scenario, remaining transportation networks are comprised for over 2 months, water and power shortages last over a year, and raw sewage is discharged into both harbours for over 2 years.

Our findings will be used by the ERI economics team as a case study for the Modelling the Economics of Resilient Infrastructure Tool (MERIT).

We learned a lot through developing this scenario, which we will aim to share with the community over the next year. We thank ALG members for their support and time. We received funding from the ERI and DEVORA research programmes.

RESEARCH HIGHLIGHTS

An interdisciplinary international team successfully **drilled in the Orakei Basin** and obtained one of the longest high resolution cores in New Zealand. The 206 metres of core (mostly lake sediment) retrieved from two holes will help researchers learn more about volcanic eruptions in the Auckland Volcanic Field as well as understand more about our climate over the last 100,000 years. See DEVORA’s Facebook page for more information.



Drilling platform at Orakei Basin (left) and examining new core (right).
Photo credit: Elaine Smid

GLOBAL ERUPTION ROUNDUP

By Josh Hayes

Reported volcanic impacts over the last few months have been predominately due to evacuations relating to volcanic unrest or relatively minor eruptions.

Etna - Sicily, Italy

Europe's most active volcano, Mount Etna, erupted early December. Ash from the eruption fell in Catania, and a number of villages. The ash plume resulted in Reggio Calabria airport being closed, disrupting flights to Milan and Rome.

Momotombo – Nicaragua

In early December, Nicaragua's Momotombo began erupting for the first time in over 110 years. Ashfall was reported in Puerto Momotombo (9 km WSW of volcano) and La Paz Centro (18 km SW of volcano). Activity has been increasing again in late February.

Popocatepetl – Mexico

In late January, people living in San Nicolas de Los Ranchos (population around 8000), which is 15 km NW of Popocatepetl, were on alert and ready to evacuate after minor eruptions occurred.

Mount Sinabung – Sumatra, Indonesia

Mount Sinabung has entered its third year of activity with explosions on the crater continuing to occur. Small-moderate sized pyroclastic flows occurring down the flanks of the volcano. As a result, a number of areas remain off limits.

Gunung Egon – Flores, Indonesia

Strong gas emissions in late January led to people living within 3 km of the volcano (~1200 people) being asked to evacuate the area, and thousands of gas masks being distributed by authorities.

MEDIA COVERAGE

The **New Zealand Herald** reported on **Auckland CDEM Group Plan's #1 ranking** in an international survey of city emergency plans (see News); see <http://www.stuff.co.nz/auckland/76493689/auckland-worlds-best-in-preparing-for-disaster-says-report>.

Jenni Hopkins' research findings on the sequence and tephra hazard footprint of Auckland Volcanic Field was profiled in the New Zealand Herald (http://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=11561528), **Sciblogs News**, **Voxy**, **Wellington Scoop**, and **Radio New Zealand** (<http://www.radionz.co.nz/national/programmes/summerreport/audio/201784975/what-happens-if-auckland-s-volcanoes-erupt>).

UPCOMING EVENTS

The **Auckland Lifeline Group Seminar: Building Auckland's Infrastructure Resilience** will be on 15 April from 9:00-12:30 at the Spark Conference Centre, 167 Victoria Street, Auckland. Contact Lisa Roberts for more information.



*Momotombo volcano, Nicaragua, on 2 December 2015 from the shore of Lake Managua.
Photo credit: Jorge Mejía Peralta*

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