Volcanic and Magmatic Studies Group

December 2019 Newsletter (No. 44) 'a stone when it is examined will be found to be a [volcano] in miniature'

VMSG2020 in Plymouth!

Between 7th and 9th January the city of Plymouth will host 129 presentations - 45 Oral and 89 posters, across 7 symposia over the 2.5 days. It is still possible to register to attend the meeting
see: http://tinyurl.com/VMSG2020

Editorial

Welcome to the final newsletter of 2019 – and what a year it has been! We on the VMSG committee hope it has been a geologically fulfilling year. If not, never mind, VMSG 2020 at Plymouth will soon be upon us!

To brighten the gloomy months of winter this issue is a fieldwork special! We've a fantastic report from the first winner of the Henry Emeleus Award, a bit of spontaneous Krakatoa-ery and an exciting conference visiting mission from one our Bursary Award Winners!

These illustrate how the wonders of magmatism and volcanism are dispersed far and wide (just like that Yellowstone VEI 8 we're always reading about in the Daily Express). But, there are serious resource issues on the horizon, we are now dealing with a climate emergency. In the context of our professional lives how much travelling is too much?

Scenic Setting for VMSG 2020 in Plymouth

For example, the 2019 EGU meeting meant that scientists put **94 million miles** on the global carbon travel clock (https://github.com/milankl/CarbonFootprintEGU) . A quick Twitter poll of 82 members of our community showed that 66% were focused on other lifestyle changes while only 18% were actively trying to cut travel. We all know that the accumulated value of other changes can be swiftly 'offset' by one or two flights a year. Is our work of sufficient importance to continue to justify this? Perhaps there is a stalemate around groupthink and asking the new stream of early career researchers to take the initiative and the career hit if they pave the way is unfair when it is senior researchers who have established a norm to network in person, and frequently. Would it make things easier if we act as a community together? Should we? Does that make action

more likely? Are there great virtual networking facilities and methods? Can we share and encourage best practice or invest in 'real offsetting schemes? Should we make better use of rock archives lurking in all the basements of all the universities?

We should try to find adjustments that work with our discipline and act to make the changes needed now. Most of all, doing nothing for want of a good idea is not an option. We will be discussing this further at our January committee meeting and canvassing opinion in the New Year!

Here are some more ideas shared with me when calling for articles in this newsletter:

Zoom for reliable and good video conferencing and results sharing (£££) https://zoom.us/

An example of offsetting from Cardiff:

https://www.cardiff.ac.uk/sustainable-places/research/projects/regrow-borneo

An insight into the student perspective from PhD students at UEA:

http://www.scienvy.co.uk/blog/files/Air-Travel-in-Academia.html

'Magma pathways in sill-complexes' – Henry Emeleus Award 2019

Contributed by Awardee Craig Magee

Figure 1: John and Simon ponder whether magma channelization resulted in the localized thickening of this composite sill, exposed on the north shore of Loch Scridain

It was a great honour earlier this year to find that my pilot research study, focused on examining how magma flows through the Loch Scridain Sill-complex on the Isle of Mull (Scotland), received the inaugural Henry Emeleus Award. I was privileged to know Henry, unfortunately only for a limited amount of time, and it was a pleasure to once again head out into the field and follow in his foot-steps in unravelling the British and Irish Palaeogene Igneous Province.

Through the Henry Emeleus Award, myself and field assistant, John MacDonald (University of Glasgow), headed out on the 8th September to arrive in the dark and rain at Scoor House in the middle of nowhere on the Isle of Mull. We were joined by Simon Martin, a current PhD researcher at the University of Liverpool, whose knowledge of the area and keen eye for flow lineations were a great help! Although the rain upon our arrival was not the last we saw, we were broadly lucky with the weather and managed to get some excellent sunny field days in along the glorious white sand beaches of the Ross of Mull; sadly we couldn't keep the VMSG community updated on our work due to a complete lack of phone signal and supposed 'wifi', which really only left us wondering 'why bother?'.

The aim of the fieldwork was to revisit some of the classic Loch Scridain Sill-complex exposures described all those years ago in the 1920's Mull Geological Memoir, with a view to understanding how the sills were emplaced. Inspired by findings from Marian Holness and Madeleine Humphreys in 2003 [Holness, M.B. and Humphreys, M.C.S., 2003. The Traigh Bhan na Sgurra Sill, Isle of Mull: flow localization in a major magma conduit. Journal of Petrology, 44(11), pp.1961-1976], we went in search of magma channels within the sills, which petrological data suggest remained active long after most the intrusion had solidified. Such channelization of magma in sills potentially helps answers the question as to how sill-complexes, networks of interconnected sills, can be constructed over long and varying periods of time (e.g., millions to tens of millions of years) without freezing; i.e. magma remains insulated in these channels so new pulses can flow progressively further. Understanding the dynamics of sill-complex construction is important because these plumbing systems can feed volcanic fields, potentially delivering magma to the

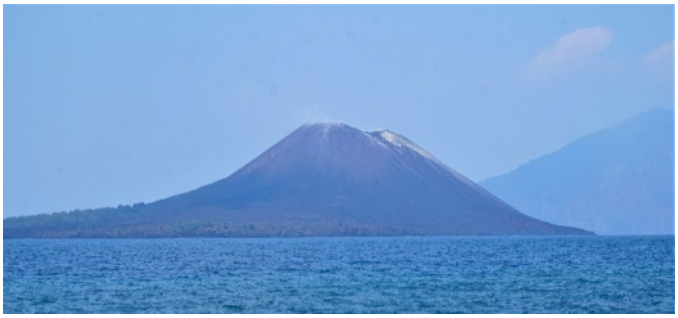
surface across broad areas (e.g., the Karoo sill-complex covers an area approximately the size of Spain).

We collected structural data on several exciting examples where the sills appeared channelized, including the Traigh Bhan na Sgurra Sill, and obtained block samples that will be analysed to derive their magnetic petrofabrics. With these fabrics, we will be able to reconstruct flow pathways within individual sills and, hopefully, across the entire sill-complex.

I would like to take this opportunity to express my thanks to the VMSG committee for this Award. Stay tuned for more information, or feel free to e-mail me at c.magee@leeds.ac.uk for details!

Recent urgency field expedition to Anak Krakatau

Mike Cassidy, Amber Madden-Nadeau, Sam Engwell, Alessandro Novellino and Seb Watt.

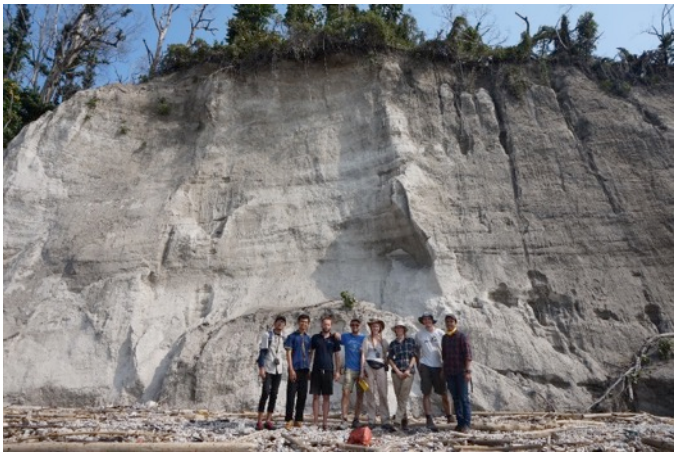


In early January this year, we were scrambling to get our NERC urgency grant submitted to head out to Indonesia. Just some weeks before, was the deadliest volcanic disaster since Mount Pintatubo, some 28 years prior. Half the island of Anak Krakatau, the resurgent island in the middle of the infamous caldera had collapsed into the sea, producing a tsunami reaching Java and Sumatra over 45 km away and killing over 450 people. Despite the mild explosive and effusive eruptions 6 months leading up to this event, no one was able to forecast the collapse and this lack of warning led to the high numbers of fatalities. The collapse was associated with a large explosive eruption reaching 17 km high, followed by two weeks' worth of intense explosive eruptions. We wanted to understand what triggered this collapse, was it the explosive activity, extra loading of the edifice or another factor? As a better understanding of this event could be vital for mitigating future volcanic island collapses.

On human timescales, volcanic-induced tsunamis are rare, the last one was in the remote Kurile islands in the 1930s, before that 1888 (Ritter island, PNG) and prior to this was in 1883, the result of the caldera-forming eruption of Krakatau, which took 36,000 lives. However, we know most about such events through the geological record, with some of the largest recorded from ocean islands, such as Hawaii and the Canaries. The Anak Krakatau event, is therefore a unique opportunity to study the interactions between volcanism and sector collapses, with the benefit of modern day satellites, instrumentation and techniques. Once the Urgency grant was accepted, the next challenge was the Indonesian research permits, which believe us is quite the challenge! But finally, after a few months of delays, we embarked on our field excursion in early August. It was a team of Scientists from UK (Seb Watt – U. B'ham), Sam Engwell (BGS), Amber Madden-Nadeau (DPhil student, Oxford) and myself. Once there, we teamed up with our collaborators in ITB University in Bandung, Indonesia. We approached the Krakatau caldera after a 90 minute speed boat ride from the Javan coast and the difference to the island of Anak and the neighbouring islands that make up the caldera was stark. Amber and I were last in Krakatau 2 years ago, researching the 1883 deposits, but the vista we had become accustomed to on that trip had now changed considerably. The steep 300 metre high volcano in the middle of the caldera was now barely 100 metres and completely different in shape (see photos below). The sides of the surrounding islands, some 4 km away had been stripped of their vegetation as much as 50 metres above sea level due to the collapse-driven tsunami. The cliffs full of 1883 pumice had been scoured and left pumice rafting in the middle of the caldera, and heavy ash fall had killed much of the mature vegetation on the island of

Panjang. On this trip we set out to examine the eruption and tsunami deposits, and to use a drone to map out the tsunami trim lines, to help constrain the numerical models. The 20 cm of ash we found deposited on the neighbouring islands was more than we expected, confirming that this was most intense period of activity from Anak Krakatau since it emerged from the sea, some 100 years prior. Even before this eruption, Anak Krakatau was one of the fastest growing islands in the world, but the voluminous activity followed the collapse was equivalent of 12 years growth in only 11 days. It is now clear that the sector collapse caused fundamental changes to the nature of volcanism and likely the magma plumbing system underlying the volcano also - something we plan to examine further. However, what is not so clear is whether the explosive phase triggered the collapse, or if the collapse triggered the high intensity eruptions. These are just some of the important aspects we will be researching with the samples and data we have collected in these past few weeks.

Headline photo and below: The collapse edifice of Anak Krakatau in 2019 (2nd photo from the drone by Muhammad Edo Marshal, ITB university in Bandung, Indonesia). Photo opposite: The joint UK-Indonesian research team in front of the 1883 deposits:



Hear more about our trip on the BBC Science in Action podcast: https://www.bbc.co.uk/programmes/w3csym23

VMSG Bursary Report

Contributed by Ailsa Naismith

With assistance from the VMSG student travel bursary, I planned to attend the first ALVO conference in Antofagasta, Chile, to present a poster titled "Local perspectives of the eruptive activity of Volcán de Fuego, Guatemala"[1]. Due to widespread demonstrations in Chile the conference was postponed – I received the official email while en route! I thus had an unexpected opportunity to spend a fortnight in Bogotá, Colombia.

In Bogotá I made contact with three institutions devoted to academic research, monitoring, and disaster risk management: respectively, Universidad de Los Andes, Servicio Geologico de Colombia (SGC), and Unidad Nacional para la Gestión de Riesgo de Desastres (UNGRD). I have worked with the Guatemalan equivalent of the latter two (respectively, INSIVUMEH and CONRED), and could gain valuable knowledge by learning about challenges specific to another volcanological community.

The bursary enabled me to share my results with like-minded researchers, and to network with non-academic institutions to find potential for collaboration. At Los Andes, we discussed velocity structures underneath Ecuadorian volcanoes through seismic analysis. With colleagues I explored funding pathways for potential post-docs, and the opportunity to advise an undergraduate student project that unites satellite remote sensing data and seismic amplitudes to characterize recent unrest at Cerro Machin. At SGC we shared experiences of community interaction, including communication with indigenous people at Galeras. I was invited to share the results of similar work I have recently completed at Fuego.

My final visit was to UNGRD and developed my expectations of what successful collaboration between institution and communities looks like. I was particularly impressed by UNGRD's project, "*Volcán, Riesgo y Territorio*", that involved co-production of stories of eruptive activity in order to reduce vulnerability to volcanic hazard across Colombia.

Although I did not attend ALVO, I was able to share my research with another community of Latin American volcanologists, and perhaps this targeted approach was more effective than the conference experience. I made several new contacts, and through these gained a broader perspective of the interface between society and volcanism that greatly honed the direction of my thesis, now in its final stages. I am deeply grateful to VMSG for affording me this opportunity!

[1] The poster can be found here: https://reasoningwithvolcanoes.com/publications.

COV11

Dear all,

Your abstract submissions are very welcome for the S1.15 Volcanic Degassing: Insights into Volcanic Processes, Impacts and Hazard" at the next COV-11 that will be held in Crete from 23 to 27 May 2020, https://pcoconvin.eventsair.com/volcanoes11/

Session's description: Volcanoes release gas and aerosol particles into the atmosphere during eruptive episodes and by quiescent emissions. Volcanic degassing exerts a

dominant role in forcing the timing and nature of unrests and volcanic eruptions. Understanding the behaviour/exsolution of gases dissolved in magma, and measuring their emissions is crucial to characterise eruptive mechanism and evaluate impacts on health, atmospheric composition and environment. Emissions range from silent exhalation through soils to astonishing eruptive clouds that release gases and particles into the atmosphere exerting a strong impact on the Earth's radiation budget and climate over a range of temporal and spatial scales. Volcanic sulphate aerosols may lead to decrease in Earth's surface temperatures for years, and emitted halogens can perturb atmospheric chemistry. Through direct exposure and indirect effects, volcanic emissions may influence local-to-regional air quality, seriously affect the biosphere and environment, and the release of gas from soil may pose long-term health hazards. Gases are measured and monitored via a range of in-situ and remote sensing techniques, to gain insights into both the subterranean-surface processes and quantify the extent of volcano's impacts. Modelling of the subsurface and atmospheric processes, as well as laboratory experiments, are fundamental to the interpretation of the field-based and satellite observations. This session focuses on the state of the art and multi-disciplinary science concerning all aspects of volcanic degassing and impacts of relevance to the volcanology, environment, atmospheric/climate science and hazard assessment. We invite contributions discussing how we go from observations to the synoptic understanding of volcanic processes and their impacts. Core connection between the proposed session and societal risk mitigation: health, atmospheric composition and environment.

EGU 2020

Your abstract submissions is very welcome for our interdisciplinary session on volcanic plumes impacts on the atmosphere, environment and health. ITS2.14/GMPV10.3 at EGU, 3-8 May 2020, Vienna, Austria. (Co-organized by AS5/BG2/CL2/NH2).

https://meetingorganizer.copernicus.org/EGU2020/session/35847

Volcanic Plumes: Insights into Volcanic Processes, Impacts on the Environment and Health Hazards*

Volcanoes release gas effluents and aerosol particles into the atmosphere during eruptive episodes and by quiescent emissions. Volcanic degassing exerts a dominant role in forcing the timing and nature of volcanic unrest and eruptions. Understanding the exsolution processes of gas species dissolved in magma, and measuring their emissions is crucial to characterise eruptive mechanism and evaluate the sub-sequent impacts on the atmospheric composition, the environment and the biosphere. Emissions range from silent exhalation through soils to astonishing eruptive clouds that release gas and particles effluents into the atmosphere, potentially exerting a strong impact on the Earth's radiation budget and climate over a range of temporal and spatial scales. Through direct exposure and indirect effects, volcanic emissions may influence local-to-regional air quality, seriously affect the biosphere and environment, and the release of gas from soil may pose long-term health hazards. Gas emissions are measured and monitored via a range of in-situ and remote sensing techniques, to gain insights into both the subterranean-surface processes and quantify the extent of their impacts. In addition, modelling of the subsurface and atmospheric processes, as well as laboratory experiments, are fundamental to the interpretation of the field-based and satellite observations. This session focuses on the state of the art and interdisciplinary science concerning all aspects of volcanic degassing and impacts of relevance to the Volcanology, Environmental, Atmospheric and Climate sciences (including regional climate),

and Hazard assessment. We invite contributions on all aspects of volcanic plumes science, their observation, modelling and impacts.

Giuseppe on behalf of Pasqualle Sellitto, Tjarda Roberts, Evgenia Ilyinskaya, Emily Mason

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Editorial

Many thanks again to those who have contributed to this issue.