

Project A.B.O.

Abangan Bubog Okasyonal

Automated Ashfall Collection for Volcanology & Eruption Prediction Across the Globe

Catastrophic volcanic eruptions are rare, often very remote, and sometimes with devastating consequences



Calabarzon hosts two of the world’s most densely populated 5km radiuses around a volcano

Volcano	Country	Pop in 5 km rad	Yrs since eruption
Michoacan-Guanajuato	Mexico	5,783,287	73
Tatun Volcanic Group	Taiwan	5,084,149	1377
Campi Flegrei	Italy	2,234,109	487
Ilopango	El Salvador	2,049,583	145
Hainan Volcanic Field	China	1,731,229	92
San Pablo Volcanic Field	Philippines	1,349,742	675
Ghegham Volcanic Ridge	Armenia	1,265,153	3925
Dieng Volcanic Complex	Indonesia	1,092,929	0
Auckland Volcanic Field	N Zealand	1,049,110	579
Masaya	Nicaragua	989,888	0
Colli Albani	Italy	897,039	?
Harras of Dhamar	Yemen	791,276	?
Taal	Philippines	717,090	0
Coatepeque Caldera	El Salvador	616,730	?
Newer Volcanics Province	Australia	610,361	4925
Chichinautzin	Mexico	584,725	1626
Durango Volcanic Field	Mexico	571,282	?
Corbetti	Ethiopia	565,206	2421
Pululahua	Ecuador	534,403	1735
Batur	Indonesia	466,899	25

Source: [Smithsonian Institute Global Volcanism Program](#) | *What volcanoes have the most people living nearby?*

Why White Island erupted and why there was **NO WARNING**



Source: [Inside the Catastrophic Volcanic Eruption on a New Zealand Island in 2019](#)

Seismicity around Taal dropped prior to the 2020 eruption. Resulting in a **lowered alert level**



The Gray family swam in lake Taal **10 days** before the 2020 eruption

The **cutting edge of pre-eruptive modelling** and volcanology research relies on the condensed matter physics surrounding the transition point of molten glasses (**abo: volcanic ash**)

[Dingwell et al 2015 - Eruptive shearing of tube pumice: pure and simple](#)

FEBRUARY 26, 2015

Statement of Accomplishment

D ALLAN GRAY

WITH DISTINCTION

HAS COMPLETED THE ONLINE COURSE OFFERED BY LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN (LMU)



Volcanic Eruptions: a material science.

Volcanic eruptions are a powerful demonstration of the energy of the Earth's interior. A quantitative physico-chemical description of the nature of lava and magma and the role of experiments in quantifying the eruptive process were covered in this course.

D.B. Dingwell.

PROF. DONALD B. DINGWELL, PHD
DIRECTOR - DEPARTMENT FOR EARTH AND ENVIRONMENTAL SCIENCES
SECTION FOR MINERALOGY, PETROLOGY AND GEOCHEMISTRY
LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN

Author Publications

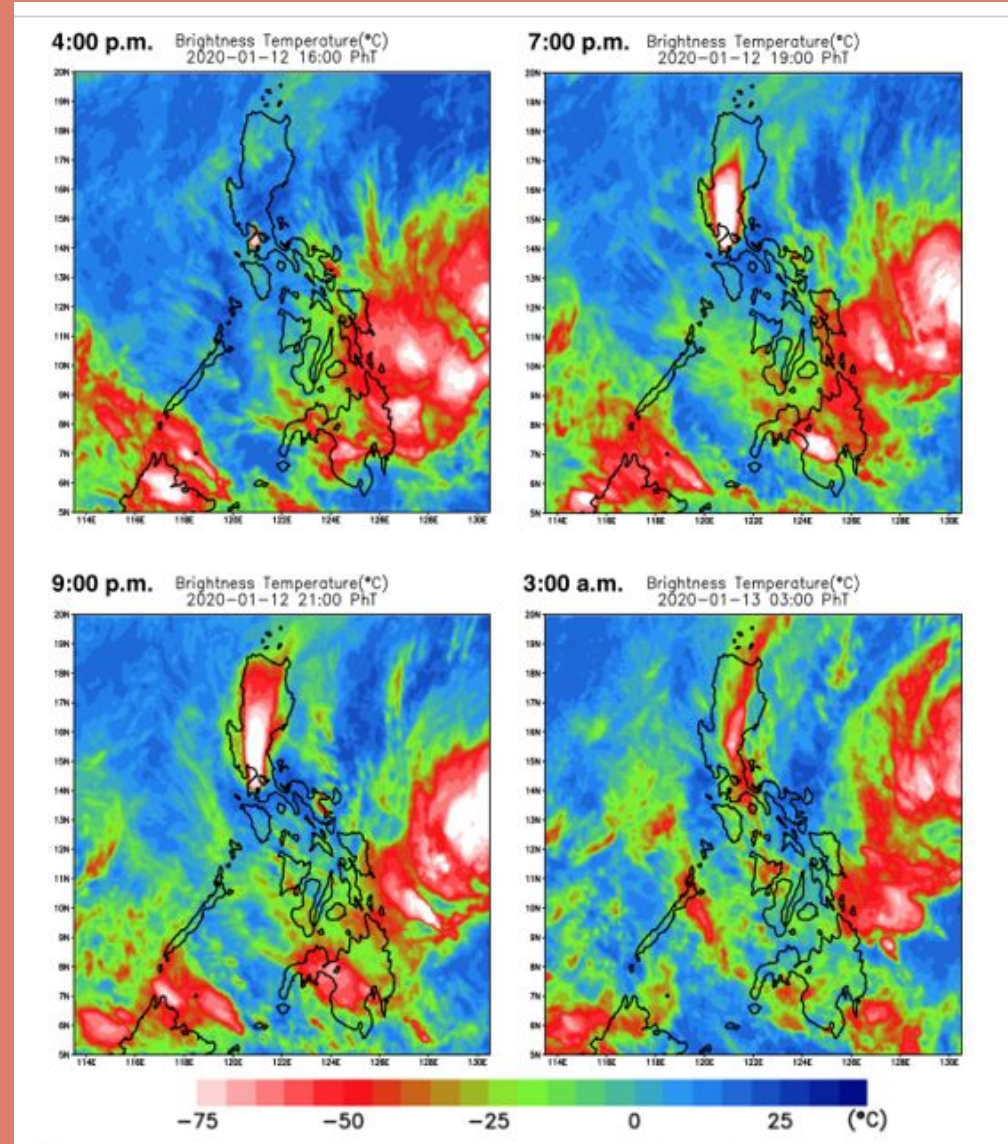
- [Investigation of the geothermal state of sedimentary basins using oil industry thermal data: Case study from Northern Alberta exhibiting the need to systematically remove biased data](#)
- [Geothermal energy as a source of heat for oil sands processing in Northern Alberta, Canada](#)
- [Implications of Post-Glacial Warming for Northern Alberta Heat Flow— Correcting for the Underestimate of the Geothermal Potential](#)

LMU and Ash Collection

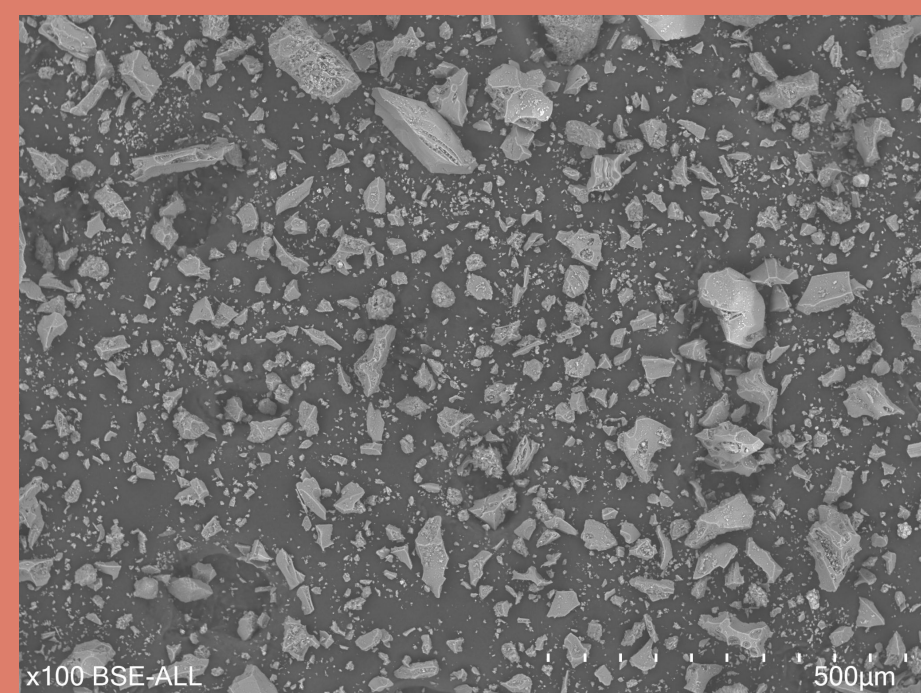
[Ludwig-Maximilians- Universität München \(LMU\)](#)

Ash samples collected from the 2020 eruption were sent to LMU for in-depth mineralogical analyses (see SEM images below).

The lab is focused on the relationship between mineralogy, rheology & chemistry within explosive volcanic systems



Source: [Manila Observatory - Taal Volcano 2020 Eruption Impact on Air Quality. Part II: Air Quality Measurements and Current Plume Conditions](#)

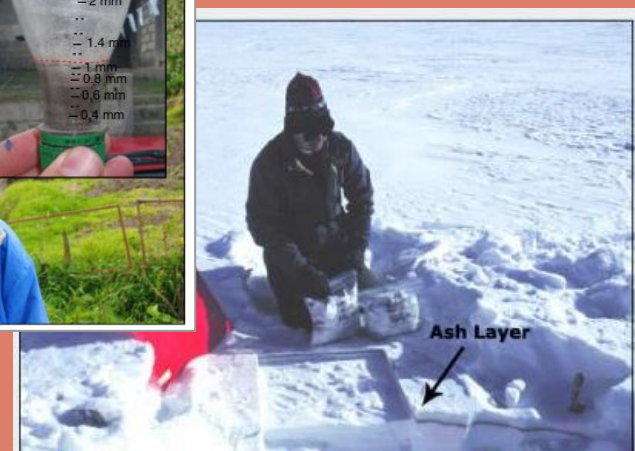


SEM images of Taal ash samples from LMU

Past approaches to Ashfall Collection



Bernard 2013 - [Journal of Applied Volcanology](#)



Procedures for Collecting and Returning Ash Samples from Modern Eruptions - [USGS](#)



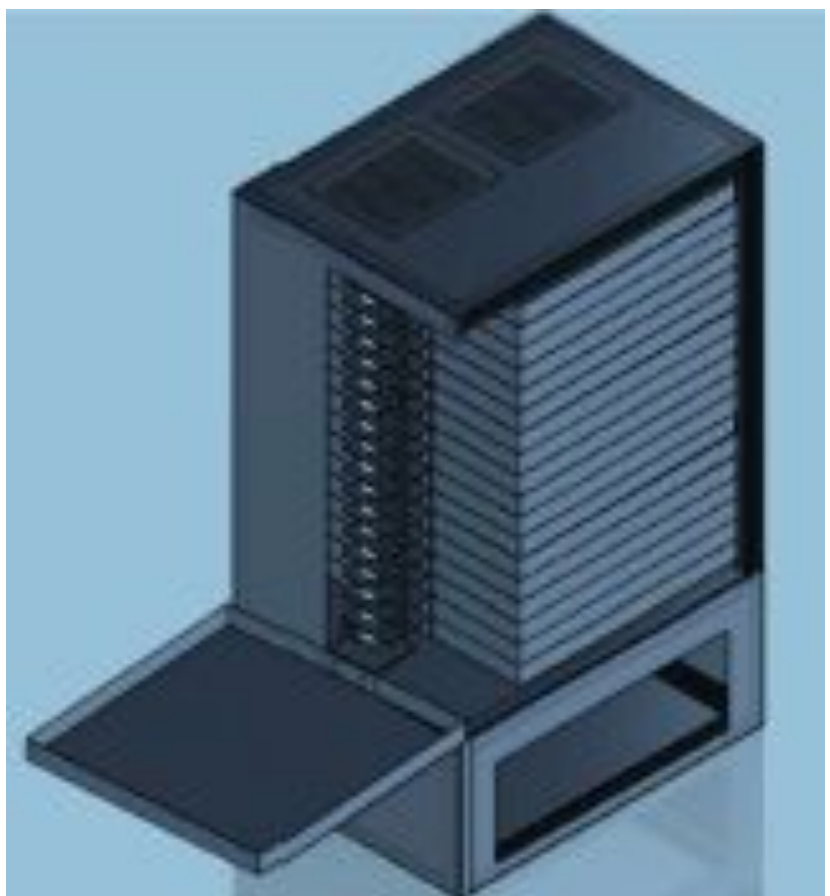
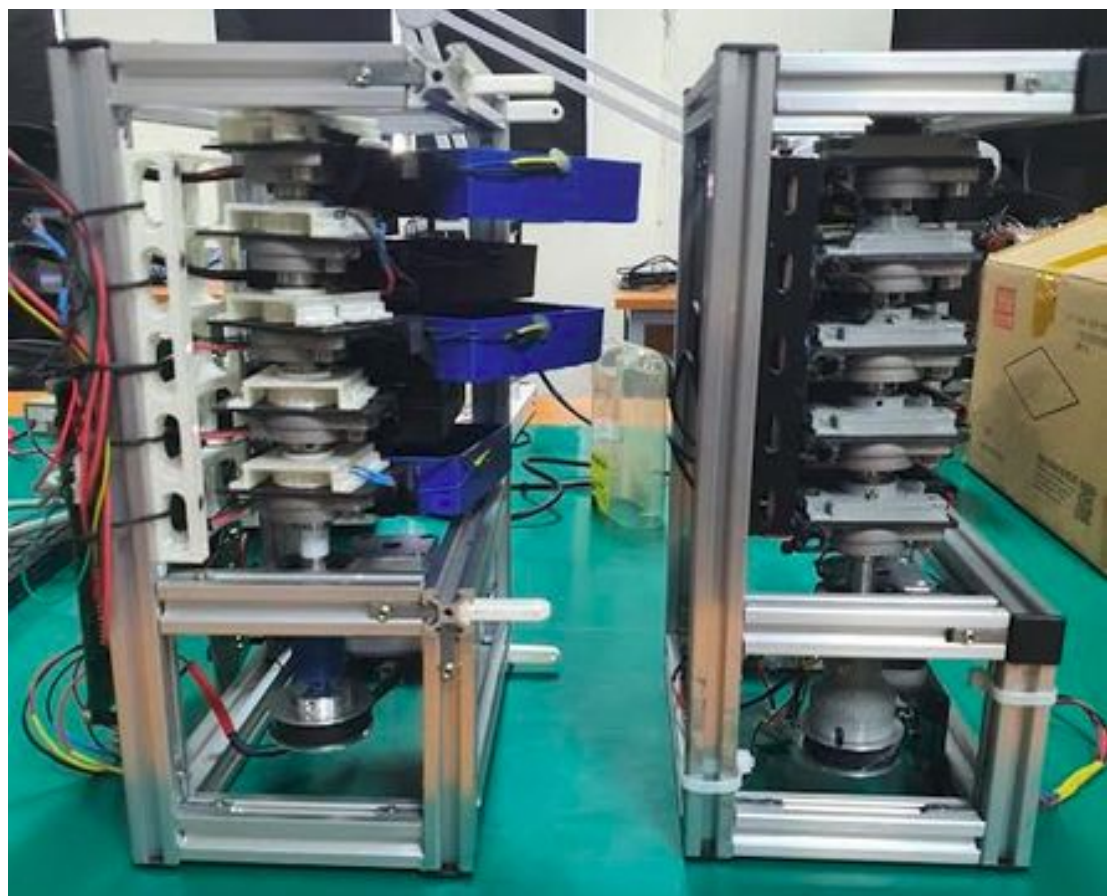
First iteration of A.B.O. collectors

Selected Publications

- [Roman et al - Nature 2021](#) - Earthquakes indicated magma viscosity during Kilauea's 2018 eruption D.C.
- [Carnegie Institution for Science, ScienceDaily 2016](#) - Volcanoes get quiet before they erupt
- [A reappraisal of explosive-effusive silicic eruption dynamics: syn-eruptive assembly of lava from the products of cryptic fragmentation - ScienceDirect](#)
- [Syn-eruptive, soft-sediment deformation of deposits from dilute pyroclastic density current: triggers from granular shear, dynamic pore pressure, ballistic impacts and shock waves](#)

A.B.O. Device Automation

Building on a history of prototyping works since 2018, Engr Krizzie Benzon (of DOST ASTI's Electronics Prototyping Development Centre) worked with Allan Gray to develop the automated version of the Ashfall collector during 2021 & 2022 via ASTI's GARAGE program



Interested in working with us to advance disaster preparedness for the Philippines?

AI Gray - al@paglalayag.net
Co-Founder & Director
sunE, Hessner & Paglalayag

