

# PIP with GNS Science, New Zealand

*Eleri Clarke*

The PIP ran from September 2018 to December 2018 and I was kindly hosted by Agnes Mazot and Geoff Kilgour at GNS Science. During my time there I was invited to the weekly volcano monitoring meeting, where I would witness first-hand how volcanoes are monitored, how volcanologists use the data available to them to make decisions on volcano alert levels and how they convey these hazards to the general public.



*Figure 1* Volcano gas flight over White Island

For the first 6 weeks I was tasked to translate an Excel Macro program that GNS use to analyse the data collected during their volcano gas monitoring flights. During these flights they fly through the volcanic gas plume, collecting data on the concentration of CO<sub>2</sub>, SO<sub>2</sub> and H<sub>2</sub>S. The data is returned to GNS in the form of a .csv file which the Excel Macro converts into gas flux (in tonnes of that gas emitted from the volcano per day) and a concentration map of the plume. The excel Macro failed to update during the previous windows update and now does not work, so my colleague (Ben Clarke) and I offered to translate the program into Python (a

more stable and flexible alternative). Having never used Python before this was a great chance for me to learn a new and very valuable skill that I wouldn't have had time in my PhD to learn. I am now implementing this new skill with my own data now that I am back in Edinburgh. The result of this project was great: the new program is quicker and more user friendly and has also been sent to the USGS (US Geological Survey) for them to also use to monitor their volcanoes. During this project I was invited out on multiple monitoring field days, including one of the volcano gas flights to White Island, various geothermal spring sampling trips and seismic station (small boxes with seismometers inside to measure earthquakes) visits.

During the last 6 weeks I worked with Geoff Kilgour on a project that he himself didn't have the time to work on but was very interested in the results. During summer 2018, Geoff visited Ambae volcano in Vanuatu which was at that time erupting. He collected ash samples that he intended to use to understand the plumbing system of the volcano, and more importantly the timescales of magma residence. I was tasked with picking small (<5mm) crystals from the ash which we analysed at Victoria University, Wellington. I then modelled the data to calculate the timescales, using a technique that I hadn't used before.

Overall it was a fantastic experience that I am very grateful to have been able to take part in. I gained many more skills than I would have done just with my PhD and had a fantastic insight into the workings of a volcano observatory.



*Figure 2* Collecting gas samples from Soda Springs