

Clough Award 2017 – Katmai and the Valley of Ten Thousand Smokes

In June 2017, Clough Award funding allowed me to participate in the International Volcanology Summer School, organised by University of Alaska Fairbanks, to Katmai National Park and the Valley of Ten Thousand Smokes, Alaska, USA. The eruption of Mount Katmai and the nearby Novarupta vent in 1912 was the largest volcanic eruption on Earth in the twentieth century. The resulting pyroclastic activity completely filled a nearby river valley with ignimbrites, which produced extensive fumarolic activity for several years, giving the valley its name.

The objective of the Summer School was to stay in the valley for ten days and observe and discuss the Katmai Cluster of volcanoes, and the erupted products of the 1912 eruption, which have largely escaped erosion and vegetation.



Figure 1 - The Lethe River cutting down through the 1912 ignimbrites in the Valley of Ten Thousand Smokes, with Mount Katmai in the background.

After meeting and preparing kit and supplies in Anchorage, we flew to King Salmon, a small settlement outside Katmai National Park. From there, we took a float-plane to Brooks Lodge, the only settlement in the National Park and one of the best places in the world to observe brown bears taking advantage of the annual salmon run. The next day we started the nine-mile trek from the bottom of the Valley of Ten Thousand Smokes to our camp for the duration of the trip on Baked Mountain, near the 1912 Novarupta vent. As well as camping and fieldwork gear, we had to carry ten days' worth of food – water came from nearby melting snowfields. The campsite on Baked Mountain consisted of three small huts, built by the USGS for volcano-monitoring fieldwork, and two tents.



Figure 2 - The campsite on Baked Mountain, looking across the Valley of Ten Thousand Smokes towards Mount Griggs

The first field day was spent exploring the vent of the 1912 eruption. This vent, termed 'Novarupta' is actually ten kilometres west of Mount Katmai, which was initially thought to be the eruption site. The site of the vent is now marked by a lava dome, which grew following the end of explosive volcanic activity. There is still fumarolic activity on the lava dome, showing that the magmatic system is still active.



Figure 3 - The still-steaming Novarupta Lava Dome, with the blasted edge of the vent exposed on Falling Mountain to the right

The next day we looked at the pyroclastic deposits in the Valley itself, where vertical successions have conveniently been exposed by the highly erosive Knife Creek. In these outcrops, it is possible to see the eruptive stratigraphy of the 1912 eruptions. Ash and

pumice of different compositions were deposited at different times over the three days of volcanic activity. The precise timings of these different phases of eruption are known, because ash-fall of changing compositions was recorded by people on Kodiak Island to the south.

Over the next couple of days we were hampered by poor weather. The worst weather condition in the Valley is wind, which picks up the loose ash and pumice, making visibility very poor and causing damage to gear and exposed skin. During bad weather we would stay in the huts at the campsite and give talks on our own work, and discuss the processes we had seen at work in the Katmai area.

When the weather cleared up, we spent a couple of days hiking to the nearby volcanoes Mageik and Trident. These volcanoes have displayed historical activity, but in the form of relatively small lava flows that do not have significant effects beyond the local area.



Figure 4 - Mount Mageik from Baked Mountain

On the final field day, we were lucky enough for the weather to clear enough for an attempt at climbing Mount Katmai itself. During the 1912 eruption, the magma chamber below Katmai drained sideways and was erupted at Novarupta. The draining of this magma chamber caused the summit of Katmai to collapse, forming a caldera roughly 5 km across.

To get to the rim of the Katmai caldera, we started very early in the morning and trekked to the base of the Knife Creek Glaciers. After climbing a snowfield, we made it onto one of the glaciers which provided a path to the rim of the crater. There was a lot of fresh snow, so we had to be wary of crevasses, but we managed to make it to the caldera rim at around 3pm.



Figure 5 - The caldera at the summit of Mount Katmai, formed during the 1912 Novarupta eruption

The caldera itself, with its lake and inflowing glaciers, was an amazing spectacle, and we were very lucky that the weather allowed us a clear view of the whole thing. As well as enjoying the spectacular volcanic landscape, we took some measurements of the height of the lake. It is unclear whether the lake is filling, draining, or reacting to underwater changes in the shape of the volcano, so researchers at UAF are taking yearly recordings to build up a dataset.



Figure 6 - Bob Gooday shamelessly posing by the Katmai caldera lake

After the long walk back to the campsite and a final day of rest, we began the hike back to Brooks Lodge. By this point in June, the salmon run was fast approaching, and we were lucky enough to see two different brown bear sows, each with cubs, awaiting the start of the fishing season. It was then a float-plane ride back to King Salmon, and a flight back to Anchorage to conclude our adventure.



Figure 7 - A mother brown bear with her cub on the shore of Naknek Lake at Brooks Lodge