Figure 43: View of Aniakchak from caldera rim north of the Gates, facing South.

Controls on Explosivity at Cook Inlet Volcanoes project - Augustine work

This was our second brief field season at Augustine Island. Results from last year showed that juvenile clasts from the 1986 eruption chemically span the entire range of the andesite field. Importantly, this chemical diversity was evident in all deposits—i.e. there does not appear to be a zoned magma chamber nor do products seem to become more homogeneous during the eruption. End members could be distinguished on the basis of color and density. White, lowest density clasts had the highest silica content and dark gray, maximum density clasts had the lowest silica content. Between these two end members were brown, red, gray, and mixed clasts of variable composition although none with maximum or minimum compositions. Not surprisingly, end-member clasts also had distinct groundmass textures, whereas intermediate clasts had variable groundmass textures: with increasing density, microlite number density and size increased. Two questions arose from last years field work. First, did the proportion of end-member juvenile clasts change during the eruption (and did this effect eruptive dynamics)? and secondly, can we use the '86 eruption to look at the kinetic effects of composition on groundmass textures? If clasts within a given deposits were erupted at the same time (i.e. same ascent rate), then differences in groundmass textures may be related to composition. Alternatively, the clasts may be from small pods of melt residing at different depths, but which ultimately use the same conduit to the surface. In this scenario, initial conditions (water, depth, temperature, etc.), ascent paths and ascent rates may differ which would may make it difficult to tie variability in groundmass textures solely to chemical composition.

To attempt to answer the first question, we set up 10m x 10m grids on pyroclastic-flow deposits, from the earliest pumiceous flows related to initial explosive events through to the latest lithic flows related to dome-growth and -collapse events. We noted the color of the nearest clast at meter intervals and sampled clasts for density measurements at every other meter intervals. We thus hope to use density as a proxy for chemistry to record the evolution of the eruption. At each site we also picked representative clasts for chemical analyses to confirm, or refute, last year's findings regarding end-member compositions. Results from the 1999 field season do not show a clear relationship between maximum and minimum composition based on color and field density as last year. At this point, it is unclear whether we were not as good this year in picking out samples, which we can hopefully test when we run density measurements, or whether the relationship that looked so promising last year did not hold up with more sampling.

The second question will take obviously much lab work to determine glass chemistry, water content, temperature, and depth data. Diana Roman, a graduate student of Kathy Cashman's at Univ. of Oregon will be working on these issues for her PhD.

We also sampled the 1986 dome, which also shows tremendous chemical variation. Thanks to Tom Murray, we were able to get some helicopter time to work on the dome as well as to look at some tephra samples on the south side of the island. We visited a tephra site that I believe is described in Waitt and Begét's Open-File Report. If we have the correct section, then we were looking at tephra bed "C" (about 1200 yr B.P.). This is an impressively voluminous and coarse-grained tephra-fall deposit—at 4 km from the vent, the deposits is about 1 m thick, and pumice clasts are upwards to 25 cm in longest axis and lithic clasts (dense juvenile) are up to 10-15 cm in longest axis. At similar distances, historic tephra fall deposits (1883 to 1986) are rarely more than a centimeter thick and grainsize is mostly coarse sand to lapilli. This is a reminder that Augustine has had an eruptive style in the recent past from what we've seen in historic times.

Cynthia Gardner, Kathy Cashman, and Diana Roman

1986 Augustine Dome Fumarole Temperatures

Once again the temperatures of the fumeroles at the base of the 1986 Augustine Spine were measured during the annual GPS maintenance trip. This years measurements were made on August 14, 1999 with the Omega 873C thermocouple in cracks at the eastern base of the spine and 5 meters east of the spine. Holes in the base of the spine yielded a maximum temperature of 93.8, while 5 m east of the base had measured temperatures of 96.1, 96.4, and 96.5°C. Note that the theoretical boiling point of water at 4000 feet elevation is 96.0 C, and the elevation of the nearby A15 benchmark is 3964 feet. These temperatures are similar to those measured in the same locations in 1997 and 1998.

John Power

Emmons Lake Field Work

In late August, AVO's Tom Miller and Chris Waythomas, and Maggie Mangan (USGS, Menlo Park) and Frank Trusdell (USGS, Hawaiian Volcano Observatory) spent a week at Emmons Lake caldera on the southwestern end of the Alaskan Peninsula. Previous and ongoing geologic mapping has revealed that the largely tholeiitic center that formed near the close of the Tertiary underwent two

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