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MAJOR-OXIDE AND TRACE-ELEMENT GEOCHEMICAL DATA FROM TEPHRA COLLECTED ON VENIAMINOF VOLCANO, ALASKA

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INTRODUCTION

Alaska Volcano Observatory (AVO) geologists from the U.S. Geological Survey (USGS) and the Alaska Division of Geological & Geophysical Surveys (DGGS) conducted fieldwork at Mount Veniaminof during field excursions between 2001 and 2016. The primary purpose of the fieldwork was geologic investigation of Veniaminof volcano to elucidate its eruptive history and understand its eruptive behavior. Teams of geologists focused on 1) edifice lava flows, 2) flowage deposits (lahars and pyroclastic flows), and 3) tephra-fall deposits. This Raw Data File comprises 61 whole-rock analyses of pumices from Holocene-age tephra deposits collected from 36 field stations on the flanks of Veniaminof volcano in 2001–2004, 2010, and 2016. All but four samples in this report were collected by geologists Kristi Wallace and Chris Waythomas during 1- to 2-week summer fieldwork campaigns. Thomas Miller and Charles Bacon contributed four pumice samples of a young dacite-composition tephra collected in 2001 and 2002.

Mount Veniaminof is an ice-clad, basalt-to-dacite stratovolcano topped by an ice-filled caldera 10 km (about 6 mi) in diameter, located 775 km (482 mi) southwest of Anchorage on the Alaska Peninsula. With a volume of ~350 km^3 (~84 mi^3) Veniaminof is one of the largest and most active volcanoes of the Aleutian Arc (Miller and others, 1998; Bacon and others, 2009). Two Holocene caldera-forming eruptions are recorded in extensive pyroclastic-flow deposits around the volcano (Miller and Smith, 1987). Veniaminof has had at least 15 eruptions in the past 200 years, all from the approximately 300-m-high (about 984-ft-high) intracaldera cone and all largely basaltic-basaltic andesite composition, producing small lava flows and minor tephra deposits mostly confined to the caldera boundaries. The most recent explosive eruption was in 2018 (Loewen and others, 2019).

Geochemical characterization of tephra deposits is most commonly executed by using glass-phase chemistry rather than whole-rock (bulk) geochemistry. The bulk composition of a tephra may change over fallout distance by eolian fractionation (e.g., Westgate and Gorton, 1981) and therefore cannot be used to correlate tephra deposits over long distances. Whole-rock composition is commonly used to characterize juvenile material from flowage deposits (lahars and pyroclastic flows) and lavas. In order to readily compare (correlate) juvenile material from proximal tephra-fall deposits with other proximal deposits, tephra whole-rock analysis is required. This Raw Data File is focused only on whole-rock geochemical analyses of significant coarse-grained tephra deposits exposed on the flanks of Veniaminof volcano for use in correlating tephra deposits across the large volcanic edifice, and with proximal flowage deposits and edifice lava flows. Results of glass geochemistry of Veniaminof tephra and all other whole-rock analyses of samples collected is part of an ongoing study and not included in this report.

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The analytical data table associated with this report is available in digital format as .csv at https://doi.org/10.14509/30578 and is also available in .html and .csv from the AVO Geochemical Database (https://avo.alaska.edu/geochem/; Cameron and others, 2019). Sample descriptions, locations, and sample types are included in the analytical data table. Samples collected during this project, including hand sample material, remaining powder from these whole-rock analyses, and partially crushed sample remains are stored at the Alaska Geologic Materials Center or at the USGS Alaska Tephra Laboratory in Anchorage.

DOCUMENTATION OF METHODS

Pumice samples were collected from prominent, coarse-grained (≥0.5 cm diameter) tephra-fall deposits and a few pyroclastic flow deposits on the flanks of Mount Veniaminof (fig. 1) during 2001–2004, 2010 and 2016 fieldwork. Sixty-one tephra samples were collected from 36 field stations for whole-rock geochemical analysis. Pumice samples were hand-picked as whole bomb or lapilli clasts from in-situ deposits. Surface float was sampled from the ground surface.

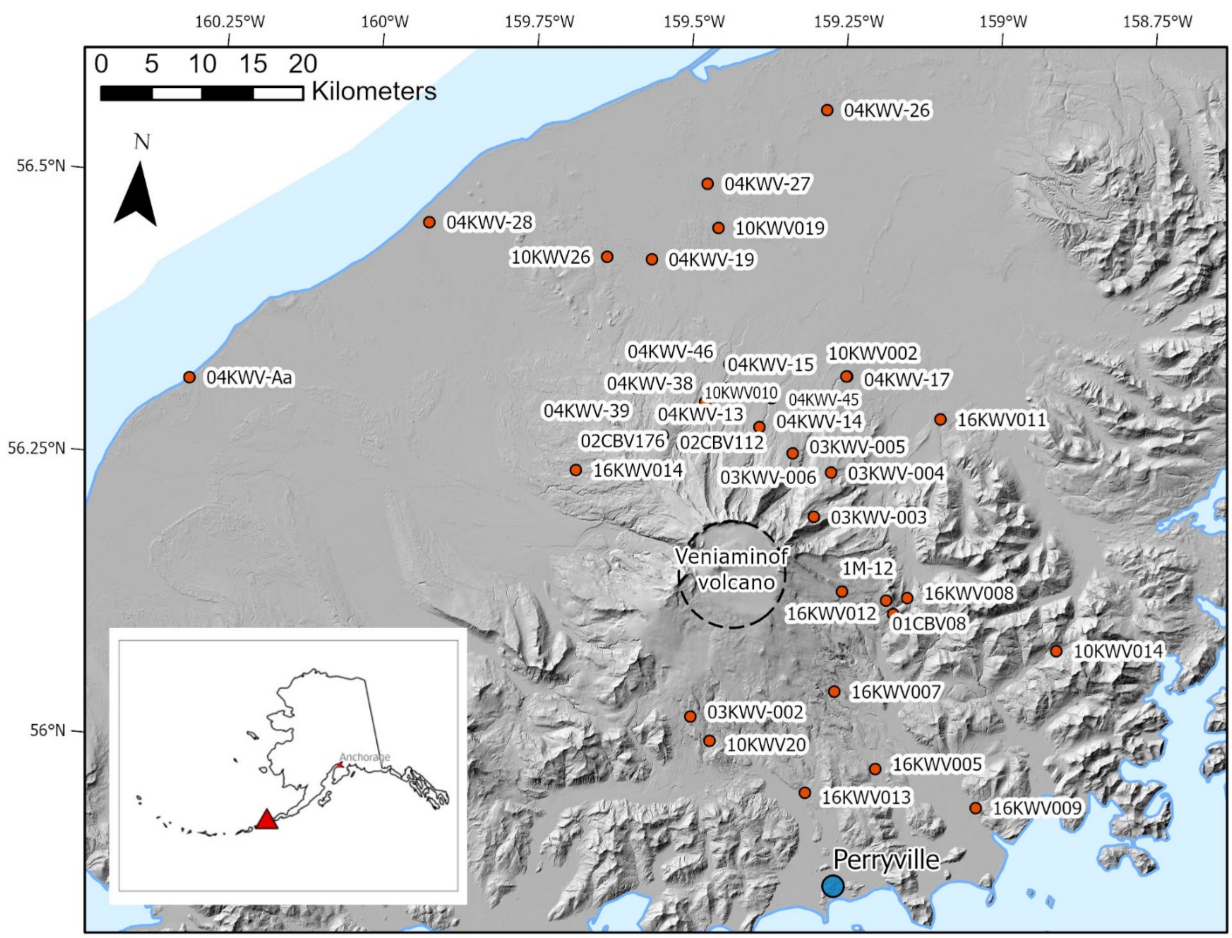

Figure 1. Sample station location map. The dashed line encircles the most modern caldera. Map base is a digital elevation model using interferometric synthetic aperture radar (IFSAR) (DGGS staff, 2013).

Location data were collected using handheld GPS devices and recorded in field notebooks. Location data originally utilized the NAD27 datum but all coordinates are converted to NAD83 datum to conform to the AVO geologic database (https://avo.alaska.edu/geochem/).

A total alkali silica (TAS) plot using Le Maitre and others (1989) (fig. 2) shows the whole-rock composition in this publication are dominantly andesite with some dacite/trachyte and two basaltic andesite tephra samples.

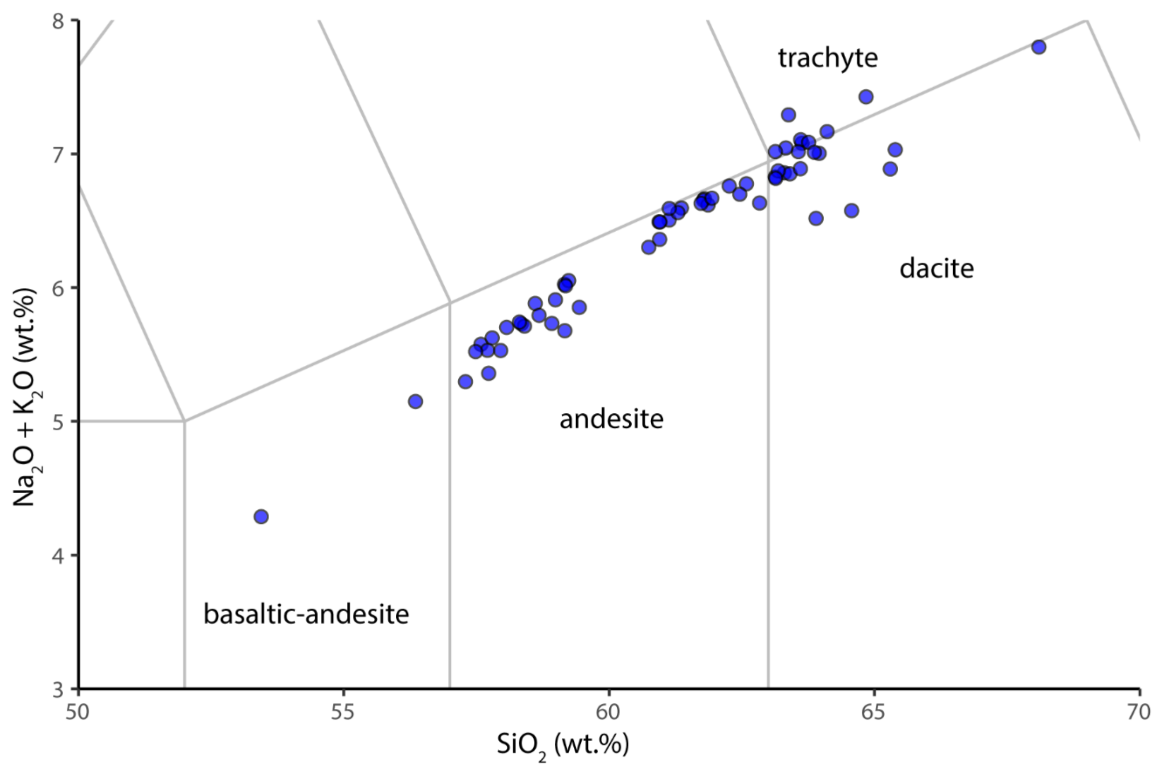

Figure 2. Total alkali silica (TAS) diagram showing the whole-rock composition of tephra samples.

SAMPLE PREPARATION AND ANLYSIS METHODS

After returning from the field, samples were chipped in the lab to remove surface alteration. After chipping, the samples were cleaned in tap water in an ultrasonic bath until the water remained clear and then dried at 60°C for 48 hours. Samples collected in 2003 and 2004 were submitted together for analysis in 2005, samples collected in 2010 were submitted for analysis in 2012, and samples collected in 2016 were submitted for analysis in 2017. Whole-rock major oxide and trace element analyses were conducted by the Peter Hooper GeoAnalytical lab at Washington State University. X-ray fluorescence (XRF) and Inductively-Coupled-Plasma Mass Spectrometry (ICPMS) analyses were collected following the methods of Johnson and others (1999) and Knaack and others (WSU, written commun., 1994). The analyses reported here represent the same protocols applied by Nye and others (2018). The analytical precision and accuracy are consistent with the overview provided by Nye and others (2018). AVO geochemical analyses were re-calibrated in 2007 so that they are time-consistent, and the analyses reported here are internally consistent with data collected post-2007 (Nye and others, 2018). Samples collected in 2010 were submitted only for XRF analysis and therefore do not have accompanying ICPMS data.

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