MAJOR-OXIDE AND TRACE-ELEMENT GEOCHEMICAL DATA FROM ROCKS COLLECTED ON LITTLE SITKIN ISLAND, FROM LITTLE SITKIN VOLCANO, ALASKA

Jessica F. Larsen, Christina A. Neal, and Cheryl E. Cameron

Raw Data File 2020-4

This report has not been reviewed for technical content or for conformity to the editorial standards of DGGS.

2020
STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

STATE OF ALASKA
Mike Dunleavy, Governor

DEPARTMENT OF NATURAL RESOURCES
Corri A. Feige, Commissioner

DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS
Steve Masterman, State Geologist & Director

Publications produced by the Division of Geological & Geophysical Surveys are available to download from the DGGS website (dggs.alaska.gov). Publications on hard-copy or digital media can be examined or purchased in the Fairbanks office:

Alaska Division of Geological & Geophysical Surveys (DGGS)
3354 College Road | Fairbanks, Alaska 99709-3707
Phone: 907.451.5010 | Fax 907.451.5050
dggspubs@alaska.gov | dggs.alaska.gov

DGGS publications are also available at:

Alaska State Library, Historical
Collections & Talking Book Center
395 Whittier Street
Juneau, Alaska 99801

Alaska Resource Library and
Information Services (ARLIS)
3150 C Street, Suite 100
Anchorage, Alaska 99503

Suggested citation:
Larsen, J.F., Neal, C.A., and Cameron, C.E., 2020, Major-oxide and trace-element geochemical data from rocks collected on Little Sitkin Island, from Little Sitkin Volcano, Alaska: Alaska Division of Geological & Geophysical Surveys Raw Data File 2020-4, 4 p. http://doi.org/10.14509/30440

MAJOR-OXIDE AND TRACE-ELEMENT GEOCHEMICAL DATA FROM ROCKS COLLECTED ON LITTLE SITKIN ISLAND, FROM LITTLE SITKIN VOLCANO, ALASKA

Jessica F. Larsen[1], Christina A. Neal[2], and Cheryl E. Cameron[3]

INTRODUCTION

During the 2005 summer field season, geologists Michelle Coombs, Christina Neal, and Jessica Larsen from the University of Alaska, Fairbanks and the U.S. Geological Survey, Alaska Volcano Observatory (AVO) conducted fieldwork on Little Sitkin Island in the western Aleutians of Alaska. The primary purpose of the fieldwork was to install geophysical networks for volcano monitoring. As part of this effort, AVO geologists conducted reconnaissance fieldwork focused primarily on sample collection for geochemistry.

Little Sitkin Island is located in the Rat Islands region of the Aleutian Islands, Alaska. Little Sitkin volcano is listed by AVO as historically active. However, only unconfirmed events are noted from historical records (www.avo.alaska.edu; Grewingk, 1850; Snyder, 1959). Little Sitkin may have produced a caldera-forming eruption 11,700 years ago, as described by Snyder (1959) and Miller and others (1998). The island is predominantly made of possibly Tertiary age volcaniclastic deposits and Pleistocene to Holocene lava flows from Little Sitkin volcano (Snyder, 1959). The terrain is rugged, consisting of the steep-sided Little Sitkin edifice, which hosts active fumarole fields and hydrothermally altered volcanic rock in and around the summit crater.

This report is based on two days of fieldwork completed on September 28 and 29, 2005, by two AVO geologists. The samples collected represent regions northwest and west of the summit crater, and a traverse along a valley to the southwest and south of the summit crater (fig. 1). Geologists were dropped off by helicopter on the island to work on foot, while the helicopter supported geophysical network installations. On September 28, geologist Christina Neal collected samples on the northwest to west flanks of the volcano. Samples 05LSCN001A, 05LSCN001B, and 05LSCN001C are dense and pumiceous juvenile clasts from block-and-ash flows mapped as the Patterson Point formation (Qp), which is noted as possibly contemporaneous with caldera collapse by Snyder (1959). We note that sample 05LSCN001C has an anomalous rare earth element (REE) pattern compared with the rest of the Little Sitkin dataset. In particular, Ce and Eu are distinctly higher than the rest of the analyses. We verified correct transcription of the 05LSCN001C data from the raw data file to the AVO database and are not aware of sample contamination, though we are not able to check the physical sample at this time. Caution is warranted when using data from this sample. Sample 05LSCN007A is a “near vent” sample of the West Cove Lava flow (Qlw), mapped as part of the Little Sitkin Dacite unit (Snyder, 1959). As described by Snyder, the Qlw unit represents dacitic lava flows broadly distributed to the east and south of the summit crater. The West Cove lava, however, is a fissure-fed flow that outcrops to the west of the summit crater and the near-vent sample reported by this study is basaltic andesite in composition.

---

[1]University of Alaska Fairbanks, Department of Geosciences, P.O. Box 755790, Fairbanks, AK 99775; jflarsen@alaska.edu
[2]U.S. Geological Survey, Alaska Volcano Observatory, 4230 University Dr, Suite 201, Anchorage, AK 99508
[3]Alaska Division of Geological & Geophysical Surveys, 3354 College Road, Fairbanks, AK 99709

On September 29, 2005, geologist Jessica Larsen was dropped off on a high ridge and made a foot traverse to the south, down the valley to the east of two unnamed mountains noted as "1980" and "960" mountains by Snyder (1959) after their elevations. Samples 05LSJL001A, 05LSJL001B, 05LSJL002, 05LSJL003, 05LSJL005, 05LSJL008, 05LSJL009, 05LSJL013 are from the unit mapped as the Little Sitkin Dacite (Qls) by Snyder (1959). The samples represent a variety of different lithologies, including scoria bombs collected from the surface (05LSJL001A, 05LSJL001B), a juvenile clast from a pyroclastic flow (05LSJL005), and 5 samples from andesite lava flows (05LSJL002, 05LSJL003, 05LSJL008, 05LSJL009, 05LSJL013).

The analytical data table associated with this report is available in digital format as .csv and is also available in .html and .csv from the AVO Geochemical Database ([https://avo.alaska.edu/geochem/; Cameron and others, 2019](https://avo.alaska.edu/geochem/)). 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-

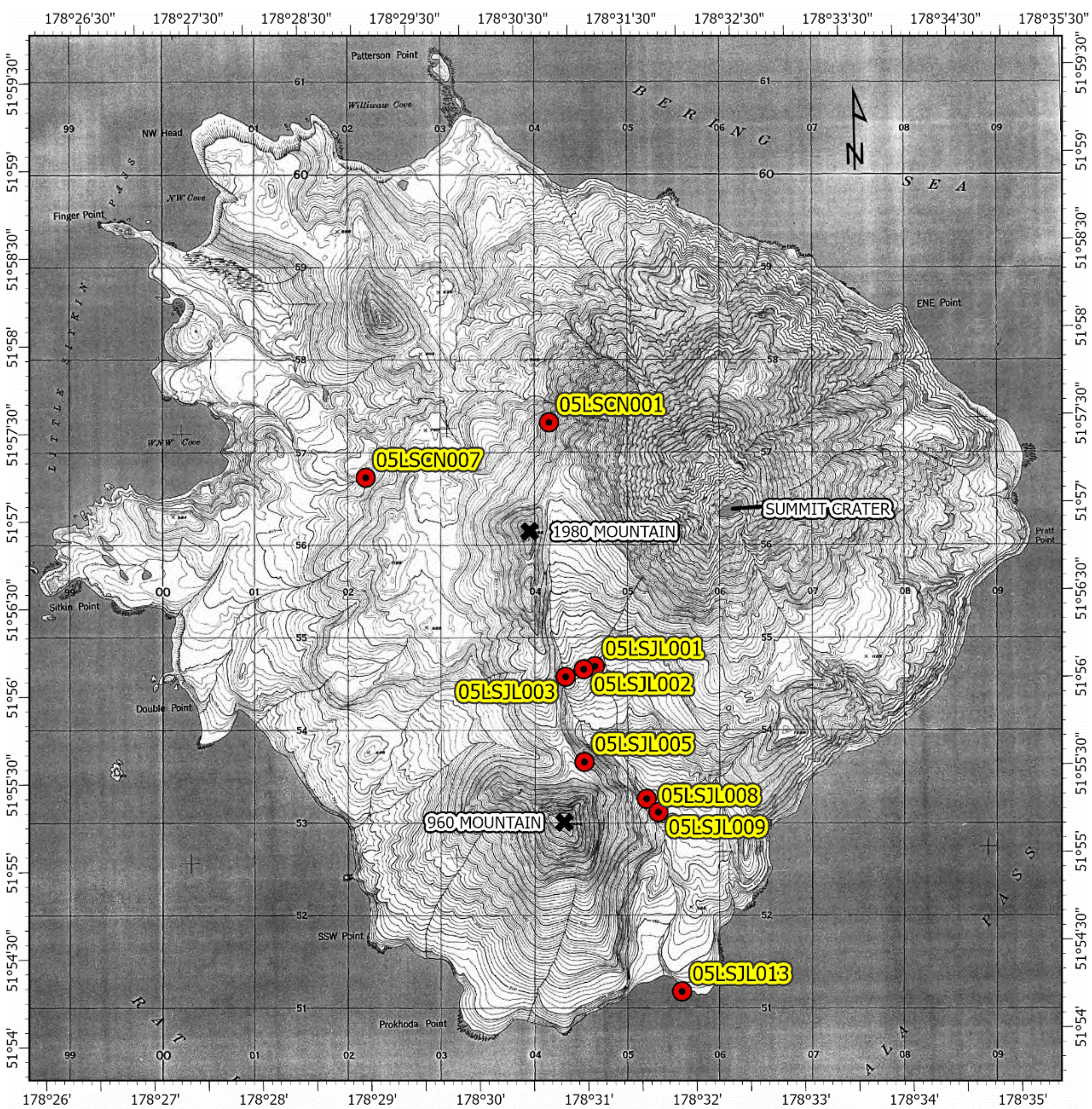

Figure 1. Sample location map.

rock analyses, and partially crushed sample remains are currently stored at the Alaska Geologic Materials Center (GMC) in Anchorage.

DOCUMENTATION OF METHODS

Rock samples were collected to verify the geochemistry of some of the prominent and possibly recent lava flows outcropping on the flanks of Little Sitkin volcano. With only two days of reconnaissance fieldwork, we targeted the voluminous block and ash flow deposits associated with the Patterson Point (Qp) unit, which was summarized by Snyder (1959) and representing a caldera-forming eruption. The West Cove lava flow (Qlw) possibly represents one of the youngest eruptions from Little Sitkin (Miller and others, 1998). However, its young age has not been verified with age dating methods. Lava flow samples were chipped from the flows using a sledgehammer. Juvenile samples from fragmental units were either hand-picked as whole bomb or lapilli samples. Surface float was sampled from the ground surface.

Location data were collected using handheld GPS devices and recorded in field notebooks. Location data utilize the WGS84 datum.

SAMPLE PREPARATION AND ANALYSIS METHODS

Samples were chipped in the lab after fieldwork was completed to remove surface alteration. After chipping, the samples were cleaned in water in an ultrasonic bath and then dried at 60 °C for 48 hours. Samples were prepared for analyses by Michelle Coombs, as part of the broader sample suite collected from Little Sitkin and Semisopochnoi Islands in 2005. Whole-rock major- and trace-element analyses were conducted by the Peter Hooper Geoanalytical lab at Washington State University (WSU). X-ray fluorescence (XRF) and Inductively-Coupled-Plasma Mass Spectrometry (ICP-MS) analyses were collected following the methods of Johnson and others (1999) and Knaack and others (unpub. data, 1994). The analyses reported here represent the same protocols applied by Nye and others (2018). The analytical precision and accuracy and significant digits of this dataset 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).

ACKNOWLEDGMENTS

We thank George Rains and the crew of the *Maritime Maid*, who provided safe and efficient logistical support to access the field area. Helicopter pilot Bill Springer was a pleasure to work with and his expert skills enabled us to work effectively in the remote western Aleutians. We thank the U.S. Fish and Wildlife Service for permitting and logistical support in Adak, Alaska. We also thank Michelle Coombs for preparing the samples for geochemical analyses, and John Perreault for the location figure for this report. Reviewers Matt Loewen, Tim Orr, and Michael Diggles provided constructive reviews that improved this publication.

REFERENCES

Cameron, C.E., Mulliken, K.M., Crass, S.W., Schaefer, J.R., and Wallace, K.L., 2019, Alaska Volcano Observatory geochemical database, version 2: Alaska Division of Geological & Geophysical Surveys Digital Data Series 8 v. 2, 22 p., https://www.avo.alaska.edu/geochem/. Http://doi.org/10.14509/30058

Grewingk, Constantine, 1850, Grewingk's geology of Alaska and the Northwest Coast of America [edited by Marvin W. Falk, translation by Fritz Jaensch published 2003]: Rasmuson Library Historical Translation Series 11, Fairbanks, AK, The University of Alaska Press, 242 p.

Johnson, D.M., Hooper, P.R., and Conrey, R.M., 1999, XRF analysis of rocks and minerals for major and trace elements on a single low-dilution Li–tetraborate fused bead: Advances in X-ray Analysis, v. 41, p. 843–867.

Miller, T. P., McGimsey, R. G., Richter, D. H., Riehle, J. R., Nye, C. J., Yount, M. E., and Dumoulin, J. A., 1998, Catalog of the historically active volcanoes of Alaska: U.S. Geological Survey Open-File Report 98-0582, 104 p.

Nye, C.J., Begét, J.E., Layer, P.W., Mangan, M.T., McConnell, V.S., McGimsey, R.G., Miller, T.P., Moore, R.B., and Stelling, P.L., 2018, Geochemistry of some quaternary lavas from the Aleutian Arc and Mt. Wrangell: Alaska Division of Geological & Geophysical Surveys Raw Data File 2018-1, 29 p. http://doi.org/10.14509/29843

Snyder, G. L., 1959, Geology of Little Sitkin Island, Alaska: in Investigations of Alaskan volcanoes, U.S. Geological Survey Bulletin 1028-H, p. 169-210, 1 plate, scale 1:20,000.