Division of Geological & Geophysical Surveys

RAW-DATA FILE 2015-17

GEOCHEMICAL ANALYSES OF ROCK SAMPLES FROM THE TONSINA AREA, VALDEZ QUADRANGLE, ALASKA

by

Melanie B. Werdon

$2.00

December 2015

THIS REPORT HAS NOT BEEN REVIEWED FOR TECHNICAL CONTENT OR FOR CONFORMITY TO THE EDITORIAL STANDARDS OF DGGS

Released by
STATE OF ALASKA DEPARTMENT OF NATURAL RESOURCES
Division of Geological & Geophysical Surveys 3354 College Road
Fairbanks, Alaska 99709-3707
907-451-5010
dggspubs@alaska.gov
www.dggs.alaska.gov

GEOCHEMICAL ANALYSES OF ROCK SAMPLES FROM THE TONSINA AREA, VALDEZ QUADRANGLE, ALASKA

by
Melanie B. Werdon[1]

INTRODUCTION

The State of Alaska's *Strategic and Critical Minerals (SCM) Assessment* project, a State-funded Capital Improvement Project, is designed to evaluate Alaska's statewide potential for SCM resources. The *SCM Assessment* is being implemented by the Alaska Division of Geological & Geophysical Surveys (DGGS), and involves obtaining new airborne-geophysical, geological, and geochemical data throughout Alaska.

As part of the *SCM Assessment*, DGGS acquired airborne magnetic and electromagnetic data (Emond and others, 2015) over the Tonsina mafic–ultramafic complex, Chugach Mountains, Valdez Quadrangle, Alaska. In 2014 and 2015 DGGS also collected and geochemically analyzed 114 rock samples from mafic and ultramafic rocks to evaluate the Tonsina area's potential for platinum-group elements, nickel, and chromium (fig. 1); analytical results are presented in this report. The analytical data tables associated with this report are being released in digital format as comma-delimited text (CSV) files. A complete explanation of the data file structure and contents as well as full details about the sampling project can be found in the metadata file associated with the digital version of this report, which is available from the DGGS website (doi:10.14509/29519).

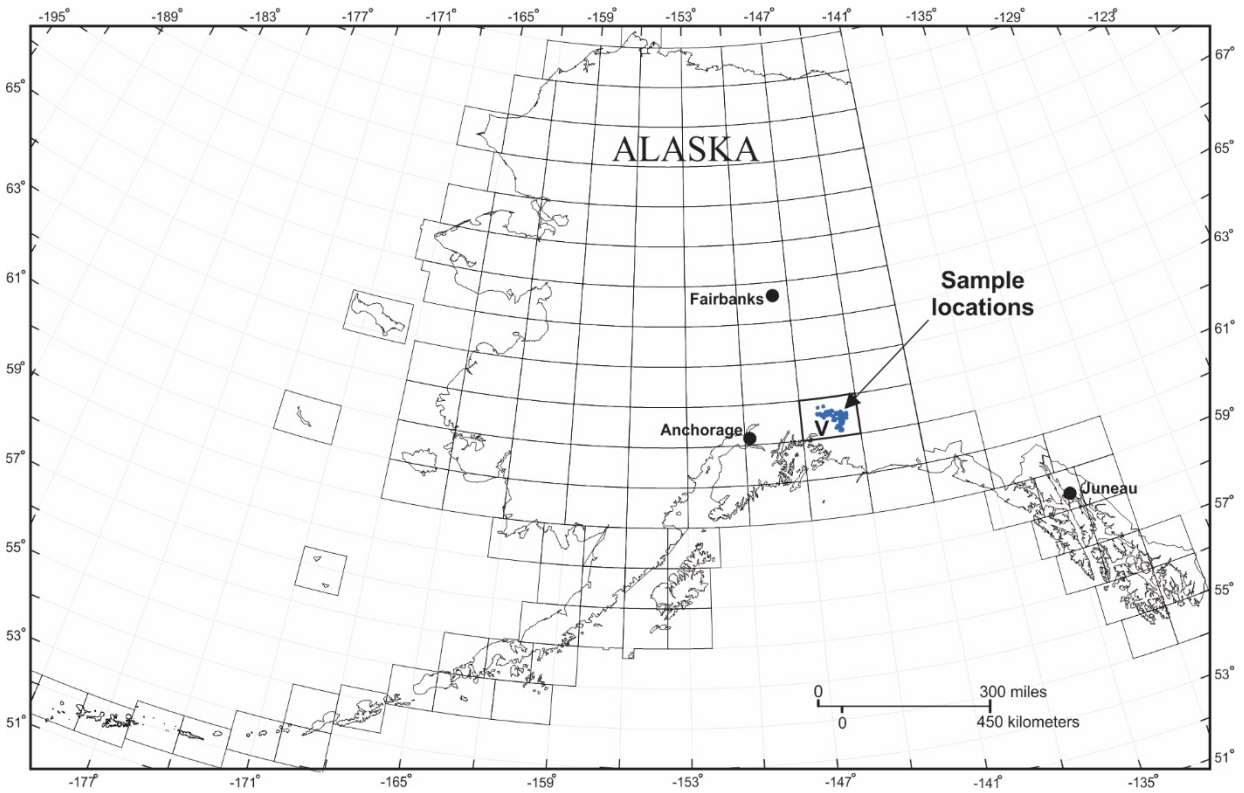

Figure 1. Map showing the location of rock samples in the Tonsina area, Valdez (V) Quadrangle, Alaska.

[1]*Alaska Division of Geological & Geophysical Surveys, 3354 College Road, Fairbanks, Alaska 99709-3707; melanie.werdon@alaska.gov*

DOCUMENTATION OF METHODS

SAMPLE COLLECTION

Rock samples were collected for two different purposes. Samples of sulfide- or chromite-bearing rocks, or altered rocks, were preferentially collected and analyzed for trace-element geochemistry. Most samples are "grab" samples, which were randomly collected at a location; however, a few samples are "select" samples, which were deliberately collected from chromite-rich layers in ultramafic rocks. Igneous rocks showing little alteration or weathering were collected for whole-rock major-oxide, minor-oxide, and trace-element analyses to aid in classification and study of petrogenesis and tectonic setting. These igneous rocks were also analyzed for trace-element chemistry, as some of the samples contain sulfide(s) and (or) chromite.

Location data for each sample were collected using a Garmin eTrex HC Series GPS (in 2014) and a Garmin GPSmap 62 GPS (in 2015), and are presented in latitude and longitude coordinates in decimal degrees with NAD27 datum and Clarke 1866 spheroid. Positional accuracy is considered to be less than 10 m for these GPS units.

SAMPLE PREPARATION

Rock samples were processed by ALS Minerals using their PREP-31C package. The samples were crushed to better than 70 percent passing 2 mm, and a 250 g split was pulverized to better than 85 percent passing 75 microns. Prior to crushing, samples for whole-rock analysis were trimmed with a rock saw to remove weathering.

ANALYTICAL METHODS

All samples were analyzed by ALS Minerals. Details of data validation and the analytical methods used are described below.

Data Validation: Analytical results obtained from samples submitted to the contract laboratory (ALS Minerals) must pass through two levels of data validation. The first level of quality control checks occurs at ALS Minerals. ALS Minerals is accredited to ISO/IEC 17025:2005 standards and conforms to requirements of CAN-P-4E and CAN-P-1579 (Standards Council of Canada, 2015). The laboratory's quality control protocol is to insert a reagent blank and a reference sample material with every batch of 20 samples to measure the analytical accuracy. Duplicate samples are analyzed at the end of the sample set to measure analytical variance as well as sample variance. Data passing the quality control criteria are sent to DGGS.

The second level of data validation is performed at DGGS. All samples submitted to ALS Minerals were accompanied by a set of DGGS in-house, mineralized, and whole-rock reference samples (blinds) submitted at the rate of 1–2 per 20-sample batch. The data for the reference samples are evaluated by comparing the "obtained" analytical value to the "expected" value for each element. The values must fall within the range of acceptance, which varies between ±5 percent and ±20 percent depending on the analytical method. Samples associated with rejected quality control data are reanalyzed by ALS Minerals. No samples were associated with rejected quality control data in this study, and therefore no samples were reanalyzed.

Analytical Methods: The following list describes each analytical method and sample weight (in grams).

a. Platinum, palladium, and gold values were analyzed by 30 g fire assay with inductively coupled plasma–mass spectroscopy (ICP-MS) finish (ALS Minerals method PGM-MS23) for all samples.

b. Forty-eight major- and trace-element compositions for rock samples were determined on a 1 g sample (ALS Minerals method ME-MS61) using a four-acid digestion followed by inductively coupled plasma–atomic emission spectrometry (ICP-AES) and ICP-MS.

c. Samples that exceeded detection limits for elements of interest were reanalyzed using specific elemental tests. For this report, samples with over-limit values for chromium (Cr) were reanalyzed using a 0.5 g split using four-acid digestion with ICP-AES (ALS Minerals procedure Cr-OG62).

d. Whole-rock geochemistry samples were analyzed using ALS Minerals complete whole-rock characterization package (CCP-PKG01) on a 10 g split. Major- and minor-oxide values were determined using lithium meta-borate fusion digestion and ICP-AES (ALS Minerals method ME-ICP06). Relatively resistive trace elements, including rare-earth elements, were determined using a lithium borate fusion digestion and ICP-MS (ALS Minerals method ME-MS81); Ag, Cd, Co, Cu, Li, Mo, Ni, Pb, Sc, and Zn were determined by four-acid digestion and ICP-AES (ALS Minerals method ME-4ACD81); and As, Bi, Hg, Sb, Se, and Te were determined by aqua regia digestion followed by ICP-MS (ALS Minerals method ME-MS42). Total C and S were analyzed by Leco combustion furnace (ALS Minerals method ME-IR08).

RESULTS

This report includes the following components: A text report (PDF file), an analytical-data table (.csv file), a detection-limits table (.csv file), a metadata file (.htm), and a ReadMe file (.htm) that provides an overview of these files. All files associated with this report are available from the DGGS website (doi:10.14509/29519).

In the analytical-data table, field names (column headers) show the element and the units in which they are reported. In the detection-limits table and the metadata file, documentation is provided to explain each field name, as well as additional details such as lab name and method codes, analytical-method types and documentation, and the upper and lower detection limits for each of the elements and methods. For each element, for each sample, the analytical-data table either contains assay values, or it contains coded-value placeholders:

null or blank = not analyzed

-1 = the element's assay result is less than the lower detection limit for the method

-2 = the element's assay result is greater than the upper detection limit for the method

-3 = composition of this sample makes detection impossible by this method; interference problems

-4 = sample was submitted to the laboratory, but insufficient sample material was available to conduct an analysis

ACKNOWLEDGMENTS

Gina R.C. Graham collected sample 2014GRCG040. Paula K. Davis provided editorial review, and Steve S. Masterman provided scientific review of the text and data.

REFERENCES

Emond, A.M., CGG, Burns, L.E., Graham, G.R.C., and CGG Land (US) Inc., 2015, Tonsina electromagnetic and magnetic airborne geophysical survey data compilation: Alaska Division of Geological & Geophysical Surveys Geophysical Report 2015-1. doi:10.14509/29169

Standards Council of Canada, 2015, Criteria and procedures for laboratory accreditation: Standards Council of Canada, https://www.scc.ca/en/about-scc/publications/criteria-and-procedures/laboratory-accreditation, accessed December 14, 2015.