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Major- and Trace-Element Concentrations in Rock Samples Collected in 2006 from the Taylor Mountains 1:250,000-scale Quadrangle, Alaska

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Open-File Report 2007–1386

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Suggested citation:
Klimasauskas, E.P., Miller, M.L., and Bradley, D.C., 2007, Major- and trace-element concentrations in rock samples collected in 2006 from the Taylor Mountains 1:250,000-scale quadrangle, Alaska: U.S. Geological Survey Open-File Report 2007-1386, 6 p.

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Introduction

The Kuskokwim mineral belt of Bundtzen and Miller (1997) forms an important metallogenic region in southwestern Alaska that has yielded more than 3.22 million ounces of gold and 400,000 ounces of silver. Precious-metal and related deposits in this region associated with Late Cretaceous to early Tertiary igneous complexes extend into the Taylor Mountains 1:250,000-scale quadrangle. The U.S. Geological Survey is in the process of conducting a mineral resource assessment of this region. This report presents analytical data collected during the third year of this multiyear study. A total of 138 rock geochemistry samples collected during the 2006 field season were analyzed using the ICP-AES/MS42, ICP-AES10, fire assay, and cold vapor atomic absorption methods described in more detail below. Analytical values are provided in percent (% or pct: 1 gram per 100 grams), parts per million (ppm: 1 gram per 1,000,000 grams), or parts per billion (ppb: 1 gram per 1,000,000,000 grams) as indicated in the column heading of the data table. Data are provided for download in Excel (*.xls), comma delimited (*.csv), dBase 4 (*.dbf) and as a point coverage in ArcInfo interchange (*.e00) formats available at *http://pubs.usgs.gov/of/2007/1386/.*

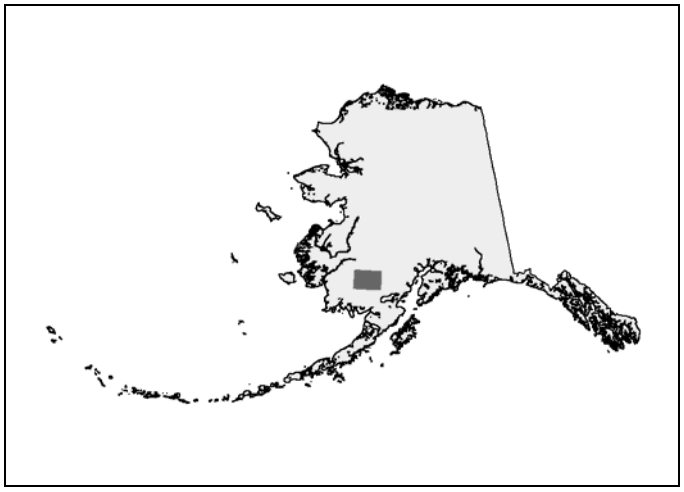

Figure 1. Location (shaded box) of Taylor Mountains 1:250,000-scale quadrangle, Alaska

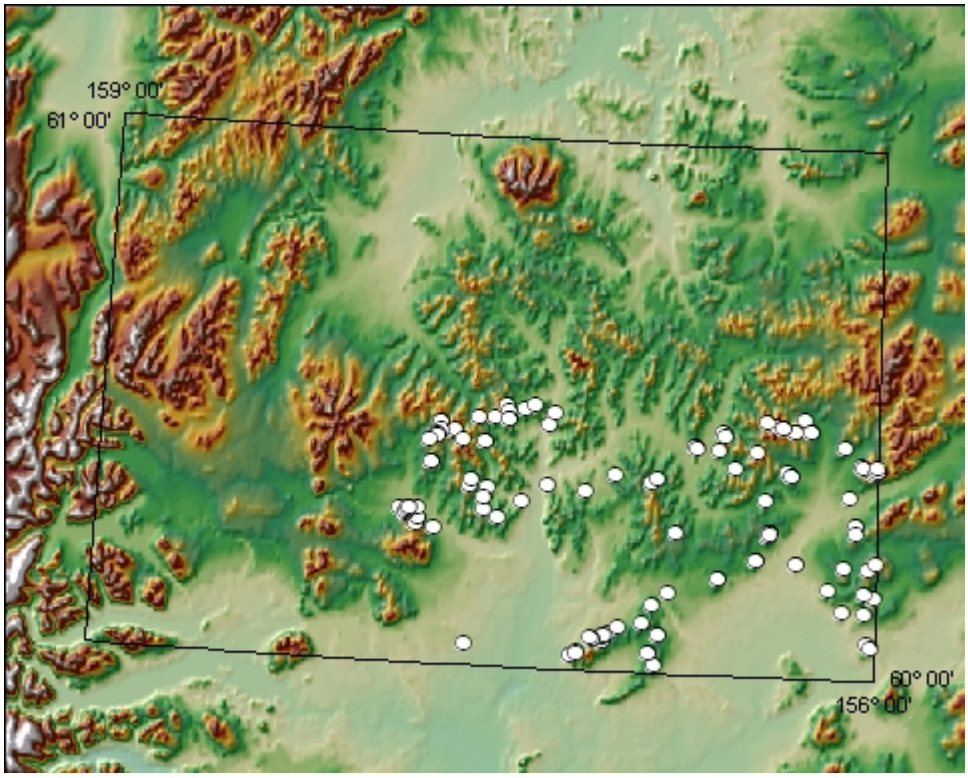

Figure 2. Location of samples collected in the Taylor Mountains 1:250,000-scale quadrangle (black box shows quadrangle boundaries), Alaska, by the USGS in 2006.

Sample Preparation and Analysis

Samples were prepared for analysis at the U.S. Geological Survey laboratories in Denver, Colorado. Rock samples were crushed in a jaw crusher, then ground in a vertical pulverizer to less than 100 mesh (<150 microns). Samples were then thoroughly mixed to ensure homogeneity (Taylor and Theodorakos, 2002). Analyses were made by XRAL Laboratories in Don Mills, Ontario, Canada, under contract to the USGS. Rock reference materials and a series of multi-element solution standards were used for calibration and quality assurance and quality control (QA/QC) purposes (Taggart, 2002).

Analytical Methods

ICP-AES/MS 42-Element

A 0.25 gram portion of each sample was decomposed using a mixture of hydrochloric, nitric, perchloric, and hydrofluoric acids at low temperature. Digested samples were analyzed for 42 major, minor, and trace elements simultaneously (Table 1) by a combination of inductively coupled plasma atomic emission spectrometry (ICP-AES) and mass spectrometry (ICP-MS) (modified from Briggs and Meier, 2002).

Table 1. Elements determined by 42-element ICP-AES showing lower and upper reporting limits.

Element	Lower reporting limit	Upper reporting limit
Percent		
Aluminum, Al	0.01	15
Calcium, Ca	0.01	15
Iron, Fe	0.01	15
Potassium, K	0.01	15
Magnesium, Mg	0.01	15
Sodium, Na	0.01	15
Sulfur, S	0.01	5
Titanium, Ti	0.01	15
Parts per million		
Silver, Ag	1	10
Arsenic, As	1	10,000
Barium, Ba	5	10,000
Beryllium, Be	0.1	100
Bismuth, Bi	0.04	10,000
Cadmium, Cd	0.1	10,000
Cerium, Ce	0.05	1,000
Cobalt, Co	0.1	10,000
Chromium, Cr	1	10,000
Cesium, Cs	0.05	1,000
Copper, Cu	0.5	10,000
Gallium, Ga	0.05	500
Indium, In	0.02	500
Lanthanum, La	0.5	1,000
Lithium, Li	1	50,000
Manganese, Mn	5	10,000
Molybdenum, Mo	0.05	10,000
Niobium, Nb	0.1	1,000
Nickel, Ni	0.5	10,000
Lead, Pb	0.5	10,000
Phosphorus, P	50	10,000
Rubidium, Rb	0.2	10,000
Antimony, Sb	0.05	10,000
Scandium, Sc	0.1	1,000
Tin, Sn	0.1	1,000
Strontium, Sr	0.5	10,000
Tellurium, Te	0.1	500
Thallium, Tl	0.1	10,000
Thorium, Th	0.2	10,000
Uranium, U	0.1	10,000
Vanadium, V	1	10,000
Tungsten, W	0.1	10,000
Yttrium, Y	0.1	10,000
Zinc, Zn	1	10,000

ICP-AES 10-Element

Ten loosely bound metals (Ag, As, Au, Bi, Cd, Cu, Mo, Pb, Sb, and Zn) were made soluble by treatment of 1.0 gram of sample with a hydrochloric acid-hydrogen peroxide solution then extracted as organic halides using a 10% aliquot 336-diisobutylketone (DIBK) solution. Organic halide solutions were then quantified using ICP-AES (Table 2) (modified from Matooka, 1996).

Table 2. Elements determined by 10-element ICP-AES showing lower and upper reporting limits.

Element	Lower reporting limit	Upper reporting limit
Silver, Ag	0.08	400
Arsenic, As	1	6,000
Gold, Au	0.1	1,500
Bismuth, Bi	1	6,000
Cadmium, Cd	0.05	500
Copper, Cu	0.05	500
Molybdenum, Mo	0.1	900
Lead, Pb	1	6,000
Antimony, Sb	1	6,000
Zinc, Zn	0.05	500

Gold, Palladium, and Platinum by Fire Assay

A 30 gram portion of each sample was mixed in a crucible with 150 grams of flux, followed by addition of 1 mg of silver nitrate and covered with borax. Crucibles were placed in a furnace for 45 minutes at 1080º C. The resulting dore bead was heated to remove all lead, then digested in a mixture of nitric acid and hydrochloric acid. The final solution was adjusted to 10 ml and analyzed by ICP-MS. The lower reporting limits were 1 ppb for gold and palladium and 0.5 ppb for platinum. The upper reporting limits for all three were 10,000 ppb (Detra, 2006).

Mercury by Cold Vapor Atomic Absorption Spectrometry

Analysis of mercury (Hg) was obtained by digestion of 0.1 g of sample in a mixture of nitric and hydrochloric acids. Addition of potassium permanganate, sulphuric acid, and potassium persulphate, was followed by addition of a NaCl-hydroxylamine solution. Dilution completed the sample preparation. Mercury concentrations were determined using a Perkin-Elmer Flow Injection Mercury System, FIMS-100; the lower reporting limit of 0.02 ppm (modified from Brown and others, 1997).

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