Name and Location

Name:	Carlisle volcano
Synonyms:	Carlisle Island
Type:	Stratovolcano
Location:	Carlisle Island, in the Islands of the Four Mountains group; about 491 km west-southwest of the tip of the Alaska Peninsula
Latitude, longitude:	52°54'N, 170°03'W
Elevation:	1620 m
USGS 1:250,000 quadrangle:	Amukta
CAVW Number:	1101-23

Form and structure

Carlisle Island consists of a single symmetric cone, 1524 m high and 6.5 km in diameter at sea level (fig. 74); its steep upper slopes are generally snow-covered year round. Little is known about Carlisle volcano's structure and composition. The topography suggests that the lower slopes of Carlisle are slightly more irregular in form and more dissected by erosion than are the uppermost slopes. According to Sekora (1973), the western margin of the island consists of a small plateau at an elevation of 50 m, suggesting that the Carlisle stratovolcano is constructed on an emergent marine terrace.

Volcanic activity

1774
1828
1838
Nov. 1987

Carlisle was reported "active" in 1774 and 1828, and "smoke" was noted above the island in 1838 (Coats, 1950). However, documentation of these episodes is poor. Various names were applied to Carlisle on early hydrographic charts, including Uliaga, Kigalgain and variants thereof; it was also sometimes referred to along with the western half of Chuginadak Island, as Tanak-Angunak. It is thus possible that some of the activity ascribed to Carlisle should be attributed to Uliaga or Mount Cleveland (Coats, 1950). Petroff (1884, citing Grewingk, 1850) lists activity at "Chegulakh" (53° 08'N, 169° 24'W) and "Ouliagan" (52°53'N, 169°40'W) for the period 1700-1710. Coordinates for "Chegulakh" plot near modern Kagamil volcano, whereas "Ouliagan" could actually be Carlisle Volcano or Mount Cleveland. A separate listing is given for "Taunakh-Angunakh", which is either Mount Cleveland on Chuginadak Island or Carlisle Volcano. However, a separate listing is also given for Kagamil and there is some question as to whether "Chegulakh" actually refers to Kagamil. Furthermore, other entries for activity in "the Four Peaks islands" are given for 1796-1800. Any of the activity during 1700-1710, 1774, 1796-1800, 1828, and 1838 could refer to Carlisle Volcano as well as to Mount Cleveland or even Kagamil Volcano.

The most recent activity occurred during mid to late 1987. Steam was reported emerging from the summit of Carlisle on August 28, and on November 16, two pilots observed a plume of steam and some ash rising to 2500 m altitude and streaming 30 km east-northeast from the summit of a volcano they tentatively identified as Carlisle; however, the eruption could possibly have been from Mt. Cleveland, 10 km to the southeast, which had also recently been active (Smithsonian Institution, 1987.

Composition

Carlisle Island has not been mapped. The volcano is assumed to consist of interbedded basaltic and/or andesitic lava flows and pyroclastics.

Name and Location

Name:	Yunaska volcanic complex
Synonyms:	Yunaska Island
Type:	Shield volcano with caldera and associated stratovolcanoes, cinder cones and lava field
Location:	Yunaska Island, in the Islands of the Four Mountains group; about 540 km west-southwest of the tip of the Alaska Peninsula
Latitude, longitude:	52°38′N, 170°38′W
Elevation:	550 m
USGS 1:250,000 quadrangle:	Amukta
CAVW Number:	1101-21

Form and structure

Yunaska Island lies near the west end of the Islands of the Four Mountains group and is flanked by Chagulak and Amukta Islands on the west and the remainder of the group on the east. Yunaska Island is roughly oval in form and about 23 km long. It consists of two volcanic centers separated by a flat valley with moderately sloping walls (fig.75). The western volcano, 950 m high, is the eroded remnant of a series of four overlapping stratocones (Nicolaysen and others, 1992); a group of cinder cones and fissure flows extends from the west end of the stratocone complex. This western volcano has presumably not been active in historical time.

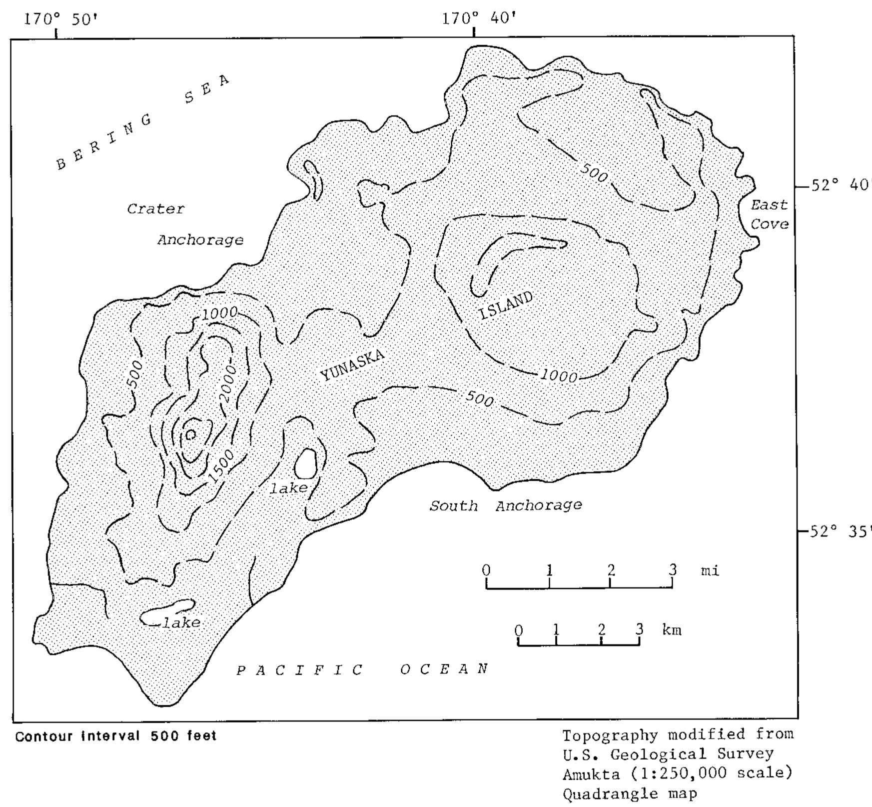


Figure 75. Topographic map of Yunaska volcano.

The eastern volcanic center, to which all recent Yunaska volcanism has been attributed, has been described by Nicolaysen and others (1992) and Lamb and others (1992) in preliminary reports as a large shield volcano topped by two overlapping calderas. No age has been reported for caldera formation but the fresh morphology of the younger caldera and the non-glaciated nature of the associated pyroclastic rocks suggests it at least is Holocene in age. The older of the two calderas (caldera CI, Lamb and others, 1992) has a diameter of 10-13 km, the younger (caldera CII) about 3 km. Low ridges and peaks along the northern and eastern shores of the island define the postulated caldera (see physiographic descriptions in Sekora, 1973). Sinuous ridges and small cones, craters, and lava flows of the active field occur both within and outside caldera II. The most prominent flow extends 1.5 km south from the southwestern lip of caldera II but does not reach the sea. A second area of relatively young lava flows lies north of the caldera, and a smaller flow is situated on the east flank.

Known cones and inferred lava vents outside the caldera are located within 1 km of the rim. Within the caldera is a 500 m cone that has its own small summit crater. Low relief on the eastern part of Yunaska Island implies that either the pre-caldera volcano had a shield-like form, or that a former cone has been subsequently destroyed. No hot springs or active fumaroles are known to exist on the island.

Volcanic activity

1817	1929?
1824	Nov. 3-4, 1937
1830	

Several episodes of minor volcanism and two violent events have been attributed to Yunaska Island in historical times. Smoke was reported in 1817 and possibly in 1929 (Powers, 1958), and a minor ash emission was observed in 1830. A major explosive eruption took place in 1824 (see Coats, 1950). The ship Boxer reported a “violent volcanic eruption” with “flames” originating from near the center of the island in early November of 1937 (Anchorage Times, November 4, 1937).

Composition

Like other members of the Four Mountains group, Yunaska Island has not been geologically mapped. Nicolaysen and others (1994) report in an abstract that the pre-caldera rocks include plagioclase + olivine basalt and andesite flows ranging in composition from 51-55% SiO_2. Cross-cutting dikes and post-caldera rocks include andesite to dacite compositions (56.4-64.5% SiO_2).

Name and Location

Name:	Amukta volcano
Synonyms:	Amukta Island
Type:	Stratovolcano
Location:	Amukta Island, westernmost of the Islands of the Four Mountains group; about 585 km west-southwest of the tip of the Alaska Peninsula
Latitude, longitude:	52°30'N, 171°15'W
Elevation:	1066 m
USGS 1:250,000 quadrangle:	Amukta
CAVW Number:	1101-19

Form and structure

The undissected stratovolcano of Amukta volcano composes most of nearly circular, 7.7-km-wide Amukta Island (fig. 76). The cone, about 5.8 km in basal diameter and topped by a 0.4 km wide summit crater, appears on synthetic-aperature radar imagery to be built upon a 300+ meter high, east-west trending arcuate ridge. Extensions of that ridge on the southwest and east sides of the island indicate an older caldera approximately 6 km in diameter and open to the sea on the south side. No hot springs or fumaroles have been reported from Amukta. Sekora (1973, p. 29) reports the presence of a cinder cone near the northeastern shore of the island.

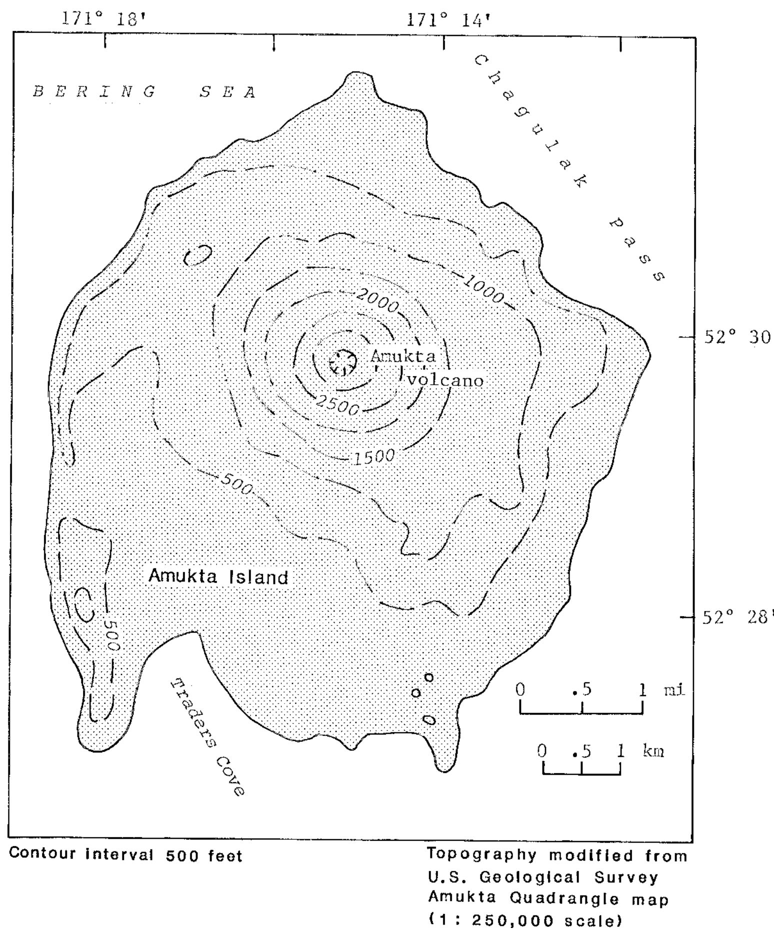


Figure 76. Topographic map of Amukta volcano.

Volcanic activity

1770?	July 12, 1984
1786-1791	Aug., Sept. 1987
1876	July, Sept. 1996
February, 1963	

Well documented reports of historical Amukta volcanism are sparse; activity was noted from 1786 to 1791, and again in 1876 (Coats, 1950). Petroff (1884, citing Grewingk, 1850) lists activity at Amukhton in 1770, presumably the same volcano; conversely, Dall (1870, citing Grewingk, 1850) describes a cessation of activity at Amukta in 1770.

On February 13, 1963 an eruption occurred involving the central crater and one or more parasitic vents; both ash and lava were produced (Anchorage Times, February 11, 1963; Decker, 1967). Persistent low clouds obscured the exact source of the lava, but the flow was seen to extend from the west side of the cone southwest into the sea at Traders Cove (Bulletin of Volcanic Eruptions, 1963).

In early July 1996, a passing ship reported a 1-km high plume of “ash and smoke” (Neal and McGimsey, 1997). On August 28 Mt. Cleveland, 100 km to the northeast, was also active and winds were blowing towards Amukta. In late August and early September, 1987, a commercial pilot observed a 10.5-kilometer-high eruption plume rising through cloud cover near Amukta Island. On September 4, another pilot observed a small dark ash plume issuing from the summit of Amukta (Smithsonian Institution, 1987). On Sept. 18, yet another pilot reported a 300m-high ash plume.

Composition

No geologic map or rock descriptions are available for Amukta volcano.

Name and Location

Name: Seguam volcano
Synonyms: Pyre Peak
Type: Stratovolcano within caldera(?)
Location: Seguam Island is in the central Aleutian arc, 645 km west-southwest of the tip of the Alaskan Peninsula
Latitude, longitude: 52°19′N, 172°31′W
Elevation: 1054 m
USGS 1:250,000 quadrangle: Seguam
CAVW Number: 1101-18

Form and structure

Seguam Island consists of the remnants of two late Quaternary calderas. Holocene volcanic cones occur in both of the calderas and a third Holocene cone lies at the east end of the island. Pyre Peak, commonly referred to as Sequam volcano (fig. 77), highest of the young cones, dominates the western half of the island and occupies the center of the western caldera (Singer and others, 1992) that is defined by remnants of a semi-circular ridge about 3 km in original diameter and about 700 m high. A Holocene basalt field surrounds Pyre Peak (Singer and others, 1992) extending down to shoreline. This general area has been the site of most if not all historical volcanic activity. Late Quaternary lavas and pyroclastic rocks ranging in age from 1.1 Ma to 0.03 Ma underlie the basalt. The two Holocene cones to the east are surrounded by andesite and dacite lava flows with well preserved constructional features (Singer and others, 1992).

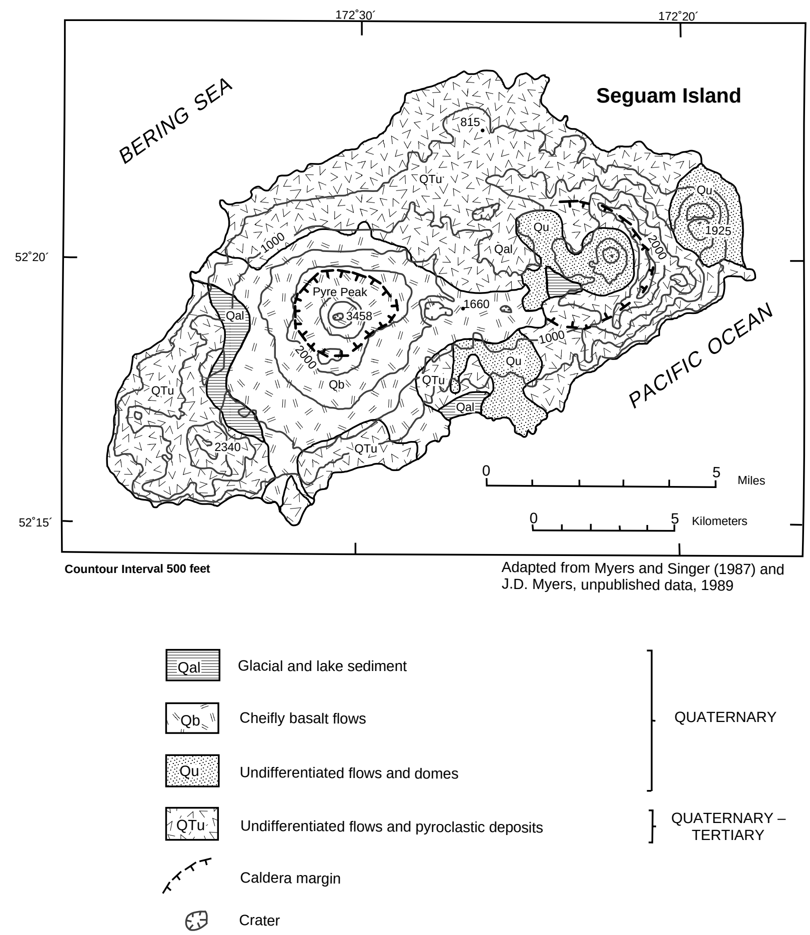


Figure 77. Geologic map of Sequam Island modified from Myers and Singer (1987) and J.D. Myers, unpublished data, 1989.

Volcanic activity

1786-1790	1901 ?
1827	1927
December 1891	March 6, 1977
Spring, 1892	December 27, 1992
	July 31-August 19, 1993

Several episodes of volcanism have been attributed to Seguam Island in the past 200 years, and it is likely that other events have gone unrecorded due to the remoteness and inclement weather of the region. The earliest documented activity is 1786-90 (Grewingk, 1850, cited in Petroff, 1884). “Smoke” was reported in 1827, and in

December of 1891 a minor eruption was reported (Coats, 1950). The most vigorous of the early eruptions took place in the spring of 1892; it produced detonations heard at the village of Atka, 120 km to the west, and two large cauliflower-shaped jets of ash (Jaggar, 1927; Coats, 1950).

In early March, 1977 the crew of the U.S. Coast Guard Cutter Mellon reported eruptive activity. Eight lava fountains, up to 90 m high, were noted along a radial rift about 1 km long and about 2.5 km southwest of the summit. At least two tongues of lava were extruded. The larger flow, 1 km wide, extended 2.5 km to the southwest; the smaller, 0.5 km wide, extended 1 km south. Neither tongue entered the sea. Pyroclastic material was also produced during the event. Dense clouds containing black ash and incandescent fragments were emitted from one or both of the vents effusing lava, and a coating of fine ash was visible on the surrounding snow. By March 8th, lava extrusion and fountaining had apparently ceased, but a considerable amount of steam, possibly containing some ash, was still being discharged. (Anchorage Times, March 8, 1977; Smithsonian Institution, 1977).

In late December 1992, U.S. Coast Guard pilots reported an ash cloud up to 1200 m above Pyre Peak, the site of the 1977 eruptive activity. Intermittent, localized bursts of ash rising 100-200 m were observed several days later, and the activity apparently subsided soon after (Smithsonian Institution, 1992). Explosive ash eruptions along with a lava flow were reported by Coast Guard observers from July 31, 1993 through August 19, 1993; ash clouds were reported to altitudes of 3,500 m at times during this interval.

Composition

Holocene post-Pyre Peak caldera lava flows, which were erupted from the vents along the caldera wall and from the central intracaldera cone, are highly porphyritic basalt (figs. 78, 79) in contrast to intracaldera dacite and rhyodacite in the eastern caldera (Myers and Singer, 1987). These young lavas overlie a sequence of Plio-Pleistocene andesitic flows and pyroclastic deposits that comprise the bulk of Seguam Island.

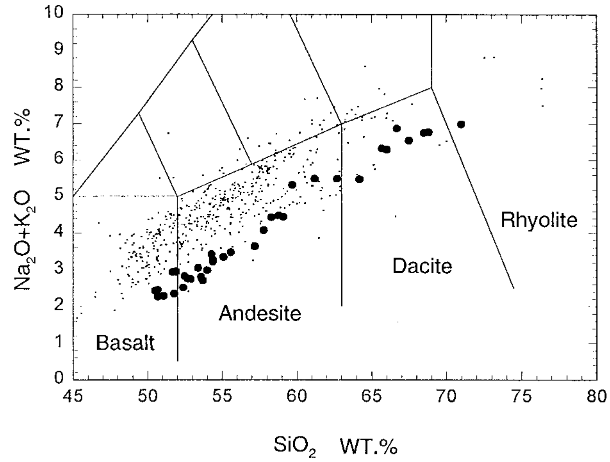


Figure 78. Total alkalies-silica diagram for Sequam volcanic rocks (solid circles) and other Aleutian arc volcanic rocks (small dots) of oceanic affinity (those located west of 165°W longitude). Discriminant lines and fieldnames (LeBas and others, 1986) are explained in Figure 2.

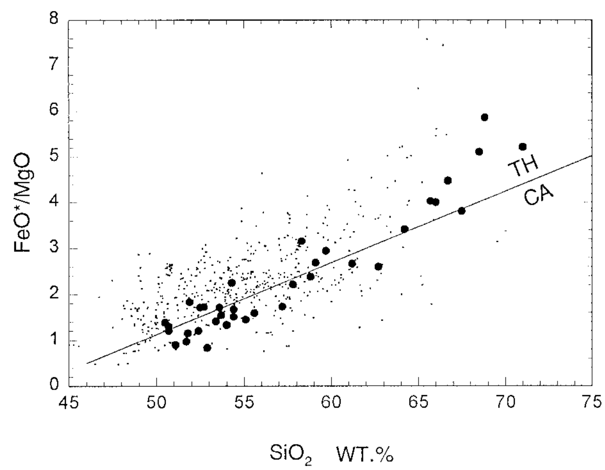


Figure 79. FeO/MgO-silica diagram of Sequam volcanic rocks (solid circles) and other Aleutian arc volcanic rocks (small dots) of oceanic affinity (those located west of 165°W longitude). Tholeiic versus calc-alkaline discriminant line from Miyashiro (1974).*

Name and Location

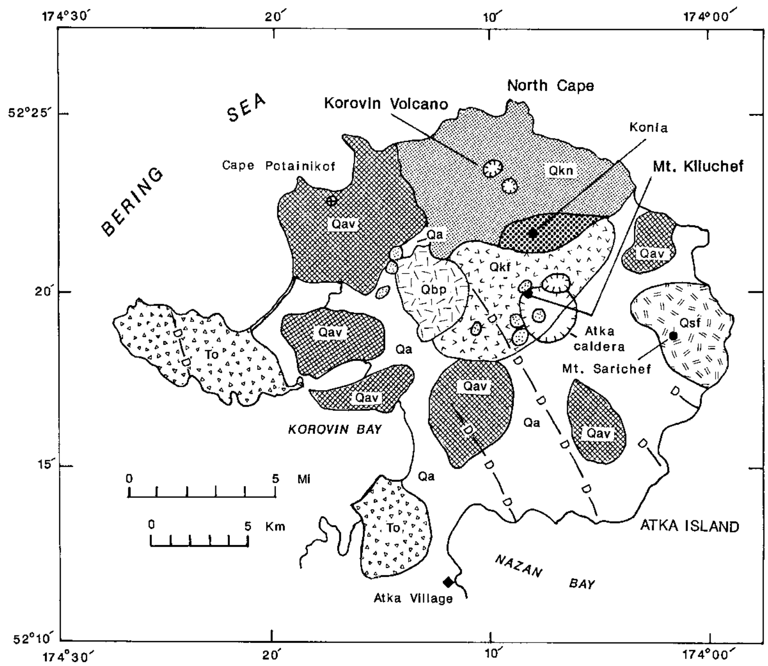
Name:	Korovin volcano
Synonyms:	None
Type:	Stratovolcano
Location:	Atka Island, in the central Aleutian arc about 760 km west-southwest of the tip of the Alaska Peninsula
Latitude, longitude:	52°23′N, 174°09′W
Elevation:	1533 m
USGS 1:250,000 quadrangle:	Atka
CAVW Number:	1101-16

Form and structure

The active volcanic front runs through northern Atka Island which has been geologically mapped on a reconnaissance scale by Marsh (1990) who described the overall structure of the volcanic center as that of a broad central shield upon which a large stratocone (Atka volcano) had been built. This cone was destroyed during caldera formation about 300,000 to 500,000 years ago. Korovin, neighboring Kliuchef, and probably Konia (fig. 80) are products of the latest stage of volcanic activity on the island, which began perhaps about 100,000 years ago based on the degree of dissection (B. Marsh, written commun., 1982).

Korovin volcano is a stratovolcano, 1533 m high and almost 7 km in basal diameter, having two summit vents 0.6 km apart (fig. 80). The northwestern summit vent is a symmetric cone with a small crater. The southeastern summit vent is on the remnant of a cone with a steep-walled crater, about 1 km wide at the rim and at least several hundred meters deep. Intercalated lava flows and pyroclastic rocks comprise the upper part of the crater wall, but the bottom one hundred meters or so are nearly vertical and apparently consist entirely of lava flows. A turquoise green lake fills the lower part of the crater; the color suggests the occurrence of solfataric activity (Sekora, 1973).

The west side of Sarichef and east flank of Konia are extensively dissected; Konia has a relatively fresh cinder cone on its west flank. Sarichef is most likely a satellite



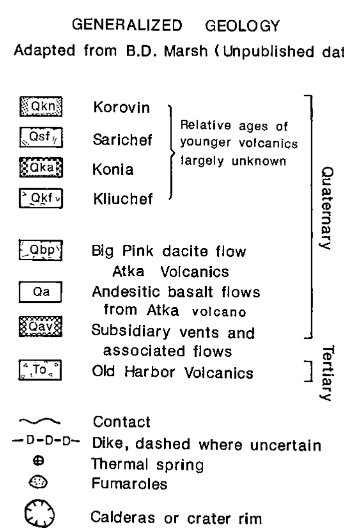


Figure 80. Generalized geologic map of the north end of Atka island including Korovin and Mt. Kliuchef volcanoes; adapted from B.D. Marsh (unpublished data).

vent of the earlier Atka volcano as is Kliuchef which is located on the northern rim of the Atka caldera. Korovin and Kliuchef are virtually undissected and are thus apparently of post-glacial age. Hot springs and fumaroles occur on the south and west flanks of Mt. Kliuchef and near the head of a glacial valley 6 km southwest of Korovin Volcano (Motyka and others, 1993).

Volcanic activity

1812 (Kliuchef) ?	1951?	May 23, 1986
1829-30	1953-54?	March 18, 1987
1844	1973	
1907?	1976?	

Minor volcanic activity has characterized northern Atka Island during historical time (Coats, 1950). One episode of activity—in 1812—has been attributed to Sarichef by Grewingk (1850), although it probably was associated with either Korovin or Kliuchef. Of the four vents on Mt. Kliuchef, the most northeasterly one appears to be the youngest and may be the source for the eruption of 1812 attributed to Sarichef (B. Marsh, written commum., 1982). Dall (1870, citing Grewingk, 1850) listed violent eruptions and earthquakes for the 1812 activity. Other eruptions have possibly gone unreported due to the endemic poor visibility and sparse population of the region.

Korovin has produced "smoke" and localized ash fall several times in the last 200 years. In 1907 "dense clouds of vapor" enveloped the summit of Korovin (Eakle, 1908) and a light coat of "fresh volcanic cinder" was observed on snowfields near Mt. Kliuchef (Jaggar, 1927, p. 24). Powers (1958) reported smoke in 1951 and various times in 1953 and 1954 (reports on file at Geophysical Institute, University of Alaska, Fairbanks). In 1973, Atka villagers in a boat near North Cape reported a 10 m wide lava flow extending half way down the northern flank of Korovin volcano from a fissure vent located near the northern summit (Reeder, 1988). "Smoke" emission was observed in 1976 at Korovin from Atka village, located 20 km to the south (Arctic Environmental Information and Data Center, 1978).

Steam emission was observed in early May, 1986, and on May 23rd a 600 m steam plume containing some ash reportedly occurred soon after a 7.7 magnitude earthquake struck about 100 km to the southwest (Smithsonian Institution, 1986).

The most recent eruptive activity at Korovin was observed on satellite imagery taken March 18, 1987. Three plumes, each 95 km long, were drifting east-northeast from the summit of Korovin and several vents 5-6 km to the south (Kliuchef). Later that day, a >3000-meter-high ash plume was observed drifting southward from the summit of Korovin (Smithsonian Institution, 1987).

Composition

Marsh (1990) reports that more than 90% of the lava flows on Atka Island are basalt, having an average silica content of about 50%. He also noted a slight tendency towards more silicic compositions in the very latest stages of activity for each volcano; Korovin and Kliuchef are composed mainly of basalt but have late dacite flows.

Phenocrysts in the basalts are plagioclase (An_{80-90}), olivine (Fo_{70}), titanomagnetite (Usp_{45}), and clinopyroxene in the more advanced stages of crystallization (B. Marsh, written commun., 1982). Orthopyroxene replaces olivine in the more silicic rocks and trace biotite was reported from the summit dacite dome of Kliuchef.

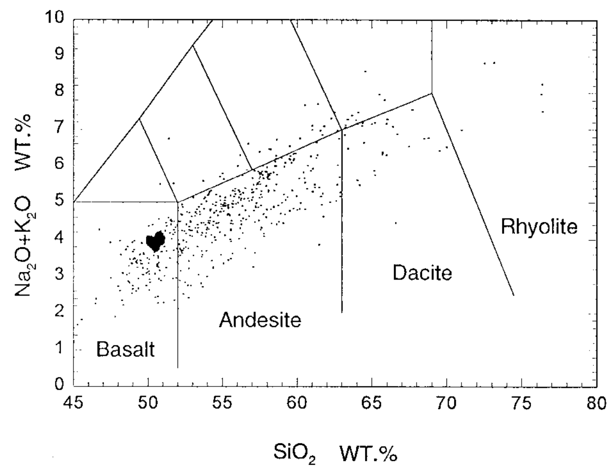


Figure 81. Total alkalies-silica diagram for Korovin volcanic rocks (solid circles) and other Aleutian arc volcanic rocks (small dots) of oceanic affinity (those located west of 165°W longitude). Discriminant lines and fieldnames (LeBas and others, 1986) are explained in Figure 2.

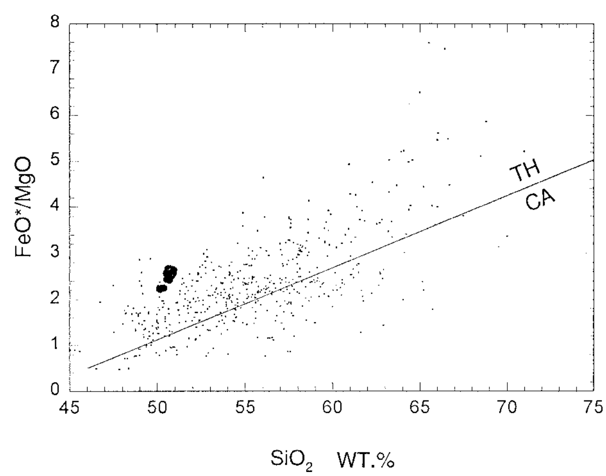


Figure 82. FeO/MgO-silica diagram of Korovin volcanic rocks (solid circles) and other Aleutian arc volcanic rocks (small dots) of oceanic affinity (those located west of 165°W longitude). Tholeiic versus calc-alkaline discriminant line from Miyashiro (1974).*

Name and Location

Name:	Kasatochi volcano
Synonyms:	Kasatochi Island
Type:	Stratovolcano
Location:	Kasatochi Island, in the central Aleutian arc, about 838 km west- southwest of the tip of the Alaska Peninsula
Latitude, longitude:	52°11′N, 175°30′W
Elevation:	314 m
USGS 1:250,000 quadrangle:	Atka
CAVW Number:	1101-13

Form and structure

Kasatochi Island, like Gareloi, Bogoslof and several other volcanoes in the western Aleutian arc, represents the emergent summit of a predominantly submarine volcano. The island consists of a single, undissected cone with a central lake-filled crater about 0.75 km in diameter (fig. 83). A maximum height of 314 m is on the southern crater rim; elevation of the lake is less than about 60 m. Kay (1990) reports a lava dome on the northwest side of the cone at an elevation of ~150 m.

Coats (1956) refered to Kasatochi as one of a group of little-known volcanoes that appear to be stratovolcanoes composed of basaltic and andesitic flows and pyroclastics. The mean slope of the southern flank (about 18°) is considerably less than the mean slope of the northern flank (about 45°). This asymmetry of form may reflect a predominance of lava flows low on the southern flanks, or, it may be due to a higher rate of erosion by wave action from the north. Bathymetry indicated that Kasatochi is at the northern end of a 15-km-long, 6-km-wide submarine ridge that is normal to the trend of the Andreanof Islands. Water depths along the ridge are less than 90 m; if Kasatochi is constructed entirely on the ridge, the total height of the volcanic pile is only a little more than 400 m.

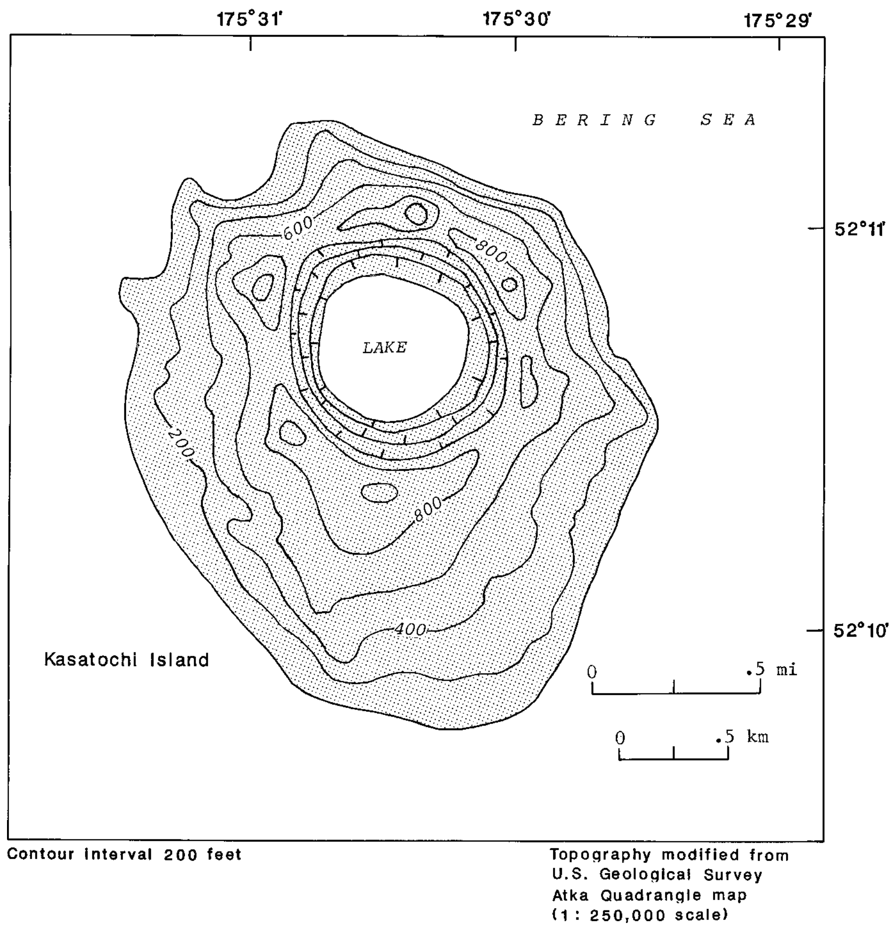


Figure 83. Topographic map of Kasatochi Island volcano.

Volcanic activity

1760?
1827
1828

The recorded history of eruptions at Kasatochi is sparse; the episodes listed above were originally attributed to Koniuji, a small volcanic islet situated 25 km to the east. Koniuji, however, is “deeply eroded” and “does not appear to have been active in Recent time”; the relatively undissected Kasatochi appears a more likely source of historical volcanism (Coats, 1950, Table 2). Little detail is available concerning the historical events: the island was reported “rising” in 1760 (Grewingk, 1850, cited in Petroff, 1884) and “smoke” was noted in 1827 and 1828. In 1899, the crater lake disappeared for a brief period while steam rose from the crater; the lake eventually reappeared (Jaggar, 1927). No activity has been confirmed at Kasatochi in this century.

Composition

There are no geologic maps and little petrologic data available for Kasatochi Island. Kay (1990) states that the lava flows and scoria are olivine basalt and pyroclastic rocks and dome lavas are hornblende andesite and dacite.

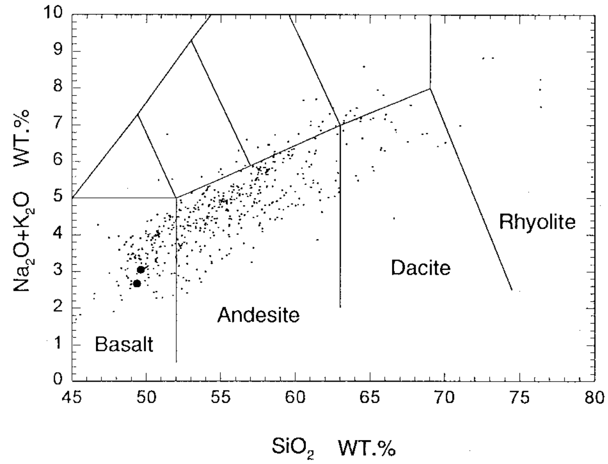


Figure 84. Total alkalies-silica diagram for Kasatoachi volcanic rocks (solid circles) and other Aleutian arc volcanic rocks (small dots) of oceanic affinity (those located west of 165°W longitude). Discriminant lines and fieldnames (LeBas and others, 1986) are explained in Figure 2.

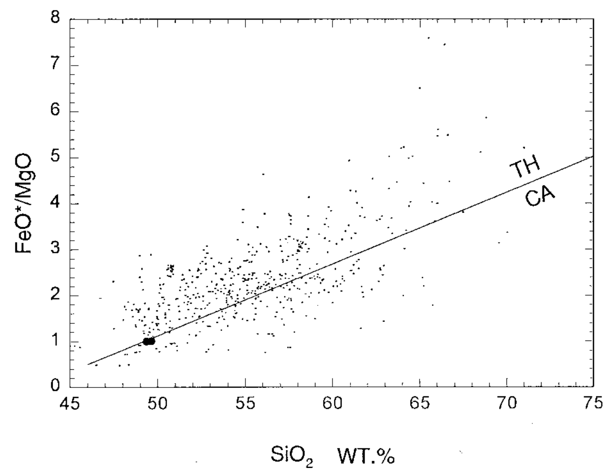


Figure 85. FeO/MgO-silica diagram of Kasatochi volcanic rocks (solid circles) and other Aleutian arc volcanic rocks (small dots) of oceanic affinity (those located west of 165°W longitude). Tholeiic versus calc-alkaline discriminant line from Miyashiro (1974).*

Name and Location

Name:	Great Sitkin Volcano
Synonyms:	Great Sitkin Island
Type:	Stratovolcano with caldera and dome
Location:	Great Sitkin Island, central Aleutians, about 965 km west-southwest of the tip of the Alaska Peninsula
Latitude, longitude:	52°05'N, 176°08'W
Elevation:	1740 m
USGS 1:250,000 quadrangle:	Adak
CAVW Number:	1101-12

Form and structure

Great Sitkin Volcano occupies most of the northern half of Great Sitkin Island, a member of the Andreanof Islands group in the central Aleutian Islands. The volcano is roughly oval-shaped, 8 by 11 km at the base, with the long axis trending east-west (fig. 86). It is a composite structure consisting of the remains of an older, decapitated volcano and a younger parasitic cone that collapsed forming a small caldera (0.8 by 1.2 km) on the west flank (Simons and Mathewson, 1955). The highest point on the island is apparently a remnant of the former central volcano's eastern rim. Most of the constructional surface of the cone has been deeply eroded. A steep-sided, recently emplaced dome (unit Qgd, fig. 86) occupies the center of the caldera at an elevation of 1220 m. The dome is 183 m high, 0.4 km wide, and 0.6 km long with a blocky, flat top. Five small plugs (unit Qa, fig. 86) are intruded into the northwest slope of the cone; three of the plugs are aligned in a northwest direction from the crater, and the remaining two are aligned north-northwest.

Rocks that comprise the main cone are named the Great Sitkin volcanics (unit Tgc, fig. 86), and consist of andesite and basalt lava flows interbedded with tuff beds (Simons and Mathewson, 1955). Lava flows predominate on the upper part of the cone, which has undergone extensive glacial erosion; construction of the cone may have begun in late Tertiary or early Quaternary time and was apparently completed before

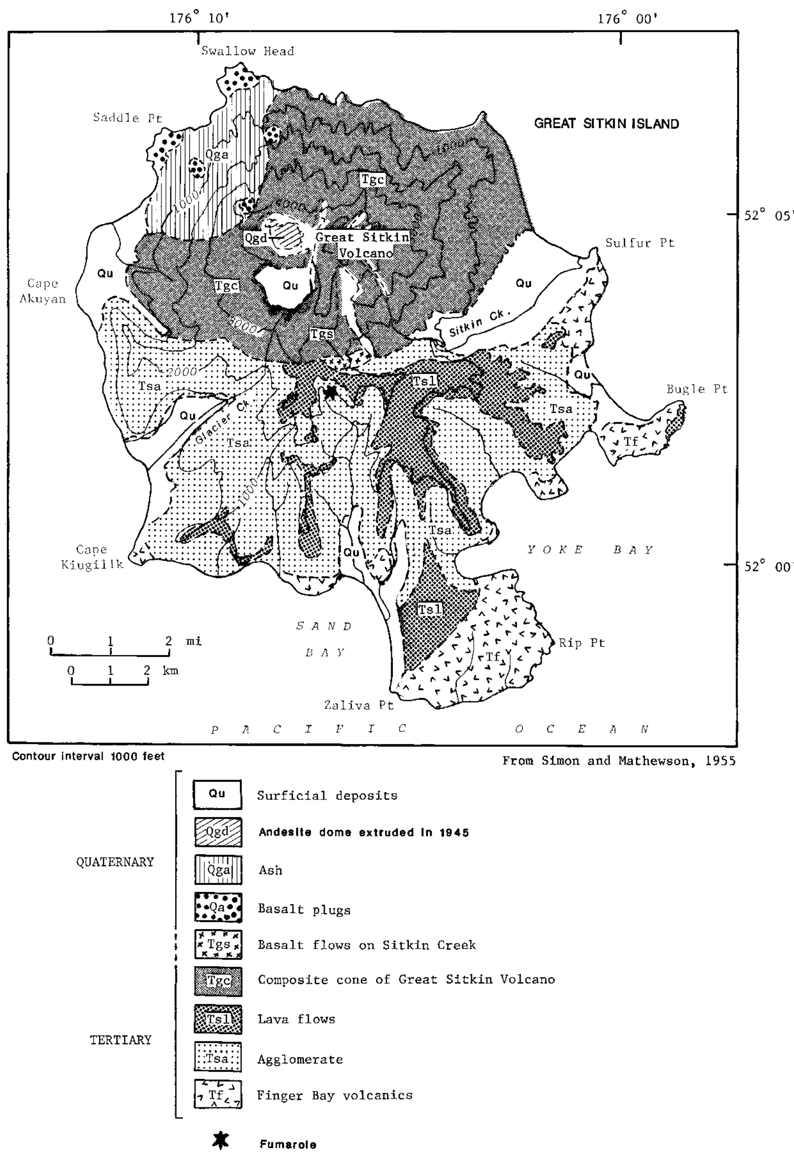


Figure 86. Geologic map of Great Sitkin Island from Simon and Mathewson (1955).

the end of Pleistocene glaciation. Partial destruction of the cone's former peak was followed by a westward shift in eruptive activity. A parasitic cone was built and subsequently destroyed during caldera-forming eruptions of unknown age. Pumice, scoria, and rock fragments from this eruption blanket the island to depths of a few centimeters to more than 6 m. Overlying the pumice deposit on the northwest flank of the main cone is an ash deposit that was apparently erupted from a subsidiary vent located immediately northwest of the crater (Simons and Mathewson, 1955). A glacially truncated, columnar jointed basalt flow occurs low on the south flank of the main cone near the head of Sitkin Creek (unit Tgs, fig. 86). This flow is the product of a flank eruption, the source of which is covered by pumice (Simons and Mathewson, 1955, p. 31).

Great Sitkin volcano is built upon the eroded remnants of a late Tertiary shield volcano, which forms most of the southern half of the island. The undeformed succession, termed the Sand Bay volcanics by Simon and Mathewson (1955), consists of pyroclastic rocks, mainly volcanic breccias, which are overlain by a sequence of andesite and basalt lava flows. The succession crops out in a gently dipping radial pattern suggesting a source near the present cone.

The Sand Bay volcanics unconformably overlie the Finger Bay volcanics, an older, highly altered and deformed sequence of lava flows, breccia, and tuff that form the rugged headlands along the southern and southeastern coasts. By correlation with nearby Adak Island, the Finger Bay volcanics are probably no younger than late Eocene in age, and may be as old as Cretaceous (Scholl and others, 1970).

Volcanic activity

1792	March, 1945
1828-29	Aug. 14, 1946
1904	1949-50 ?
Nov., 1933	19 Feb-Sept., 1974

Several episodes of volcanic activity, most relatively minor, have been reported for Great Sitkin Volcano since its discovery in 1741 during the Bering Expedition. Other eruptions have probably gone undetected as a consequence of the island's remoteness from principal shipping lanes. The major event that produced both the crater and the extensive pumice fall blanketing the island is interpreted by Simons and Mathewson (1955, p. 32, 40) to have taken place within the past several thousand years, and possibly only a few hundred years ago.

In historical times, "smoke" has been reported above Great Sitkin in 1828-29, 1904, 1946, and 1951 (Simons and Mathewson, 1955; Wentworth, 1951, p. 6) and explosive eruptions in 1792, 1933, 1949-50, and 1974 (Anchorage Times, February 21, 1974; the 1974 event may have included some additional dome growth as well as vigorous phreatomagmatic activity. The ash layer on the northwestern slope of the main cone was probably deposited during one of these eruptions as it appeared to Simons and Mathewson (1955) as "at most only a few hundred years old". The most notable recorded activity occurred in March of 1945 when much of the crater dome was apparently extruded (Coats, 1950). A nocturnal glow was visible above Great Sitkin from Adak Island for a period of several weeks. Army aviators observed clouds of steam rising from the crater, and a strong earthquake was felt at Sand Bay during this time. Steam has been observed subsequent to dome emplacement, and on August 14, 1946, a small smoke cloud was observed from Adak Island (Simons and Mathewson, 1955). Powers (1958) reports ash eruptions in 1949-50.

Activity at Great Sitkin during 1946-48 comprised periodic steam emission from the crater and the continued existence of a group of hot springs, mud pots and fumaroles about 4 km south of the crater rim (Byers and Brannock, 1949). The hot springs occur at the site of a possible volcanic vent that predates the rocks of Great Sitkin Volcano.

Composition

Petrographic information for rocks of Great Sitkin volcano is from Simons and Mathewson (1955); Marsh (1976) provides another general account. Lava flows and tuff beds make up the main cone. Flow rocks are mostly black to light grey, medium-grained porphyritic andesite and basalt (figs. 87, 88) displaying little or no flow structure; Marsh (1976) classifies the rocks as andesites and basaltic andesites. Phenocrysts include plagioclase, calcium-rich pyroxene, olivine, and magnetite. Local pyrite impregnation and plagioclase alteration probably indicates former solfataric activity at one site on the southeast flank. Flow rocks at the summit are also altered. The crater dome is a black vitrophyric andesite.

Pumice erupted during caldera formation is buff to light brown-grey. The tephra blanket contains fragments up to 10 cm in diameter. The ejecta contains crystals of plagioclase, pyroxene and amphibole set in a matrix of pale glass; pyroxene crystals are up to 6 mm across. Minor amounts of rock fragments, primarily of two types, are mixed in the pumice blanket. A second minor constituent of the pumice blanket is lithic fragments of coarse-grained cumulative gabbro xenoliths consisting of plagioclase and amphibole grains up to 2 cm across, and accessory olivine, pyroxene and magnetite.

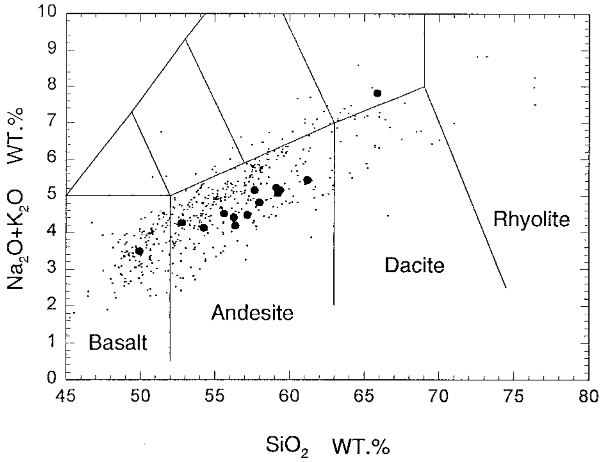


Figure 87. Total alkalies-silica diagram of Great Sitkin volcanic rocks (solid circles) and other Aleutian arc volcanic rocks (small dots) of oceanic affinity (those located west of 165°W longitude). Discriminant lines and field names (Le Bas and others, 1986) are explained on Figure 2.

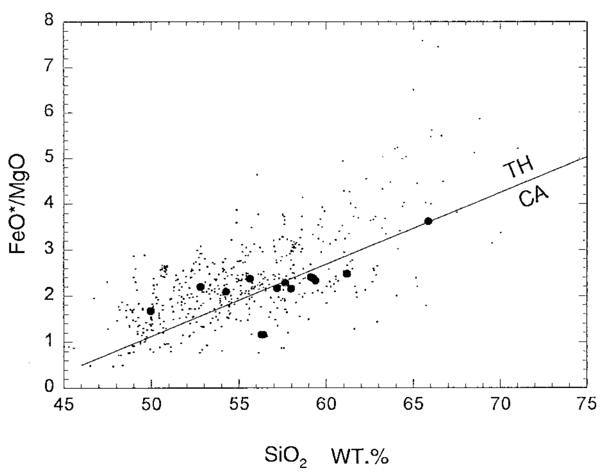


Figure 88. FeO/MgO-silica diagram of Great Sitkin volcanic rocks (solid circles) and other Aleutian arc volcanic rocks (small dots) of oceanic affinity (those located west of 165°W longitude). Tholeiitic versus calc-alkaline discriminant line from Miyashiro (1974).

NAME AND LOCATION

NAME:	KANAGA VOLCANO
SYNONYMS:	NONE
TYPE:	STRATOVOLCANO WITHIN CALDERA
LOCATION:	KANAGA ISLAND, ONE OF THE ANDREANOF GROUP NEAR THE CENTER OF THE ALEUTIAN ARC; 965 KM WEST-SOUTHWEST OF THE TIP OF THE ALASKA PENINSULA
LATITUDE, LONGITUDE:	51°55′N, 177°10′W
ELEVATION:	1307 M
USGS 1:250,000 QUADRANGLE:	ADAK
CAVW NUMBER:	1101-11

Form and structure

Kanaga Volcano occupies the northern corner of Kanaga Island, one of the most southerly members of the Aleutian chain. It is a symmetric composite cone 1307 m high and 4.8 km in diameter at sea level (fig. 89), built of interbedded basaltic and andesitic lava flows, scoria layers and pyroclastic rocks. Mudflow deposits and other volcaniclastic rocks occur on the volcano's lower slopes. A circular summit crater, approximately 200 m across and 60 m deep, contains recent deposits of vent agglomerate, and several active fumaroles.

A mantle of volcanic ash and pumice, up to 7 m thick, and containing several soil horizons, blankets the northern half of the island. Most of this deposit was probably erupted from Kanaga Volcano, although some may be derived from explosive eruptions on nearby islands (Coats, 1956a, p.74; Fraser and Barnett, 1959, p. 226). A thin layer of andesitic and basaltic pumice, younger than the ash-and-pumice mantle, coats the volcano's upper slopes, and blocks of dense basalt occur across the island. Fragments of the latter material have produced impact craters up to 4 km from the summit. Four young andesitic flows extend from fissures near the summit of the cone on the south, southwest, and northeast flanks (unit Qkb, fig. 89).

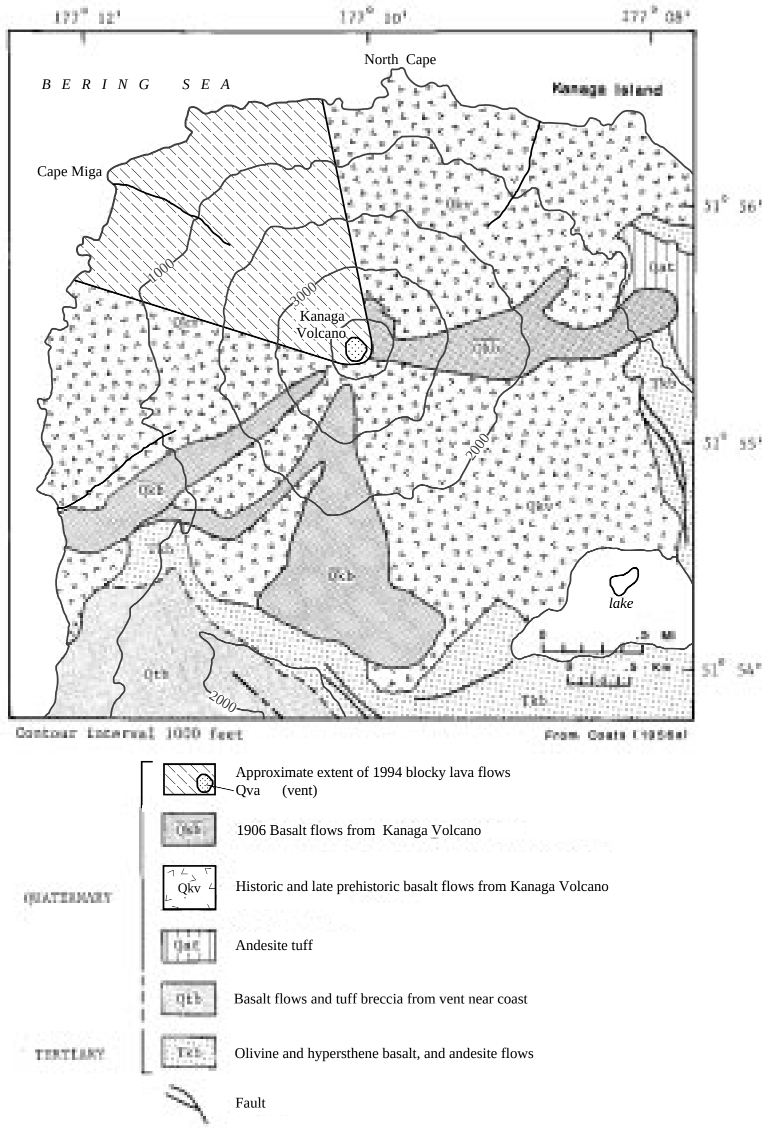


Figure 89. Generalized geologic map of the north end of Kanaga Island after Coats (1956a).

Kanaga Volcano is flanked on the south and east by an arcuate ridge up to 800 m in elevation; a somma lake, 2 km in diameter, is situated between Kanaga Volcano and the southeast corner of the arcuate ridge. The ridge and associated scarp may represent the eroded remnant of a caldera rim. Two observations support the caldera origin of the ridge. First, although dissected, remnants of the ridge are located along 150° of an approximately circular arc and the radially outward dip of the comprising flows indicates a central source near the present summit of Kanaga Volcano. Secondly, a thin (0.6-9 m) but widespread blanket of andesitic crystal-lithic tuff (unit Qat, fig. 89) occurs over northern Kanaga Island south and east of Kanaga Volcano (Coats, 1956a) where relative age and lithologic character suggest that it may be the product of a caldera-forming eruption.

Coats (1950, 1956a, b) suggested the caldera formed through collapse of a Tertiary volcano (Mount Kanaton) near the end of Pleistocene time. However, Miller and Kirianov (1994) suggested periods of caldera formation on Kanaga occurred ~6,000, ~4,500, and ~3,000 yBP based on tephrochronology studies on nearby Adak Island.

Precaldera rocks include flows and pyroclastic rocks and minor intrusive rocks. Coats (1956a), and Fraser and Barnett (1959) have assigned a late Tertiary to Pleistocene age to these older rocks. Apparently several episodes of volcanism preceded construction of modern Kanaga Volcano. Low outward dips imply that most of the older rocks were part of a broad, shield-shaped volcano with a vent area near the site of Kanaga Volcano. There is, however, evidence that at least one composite cone was constructed on the site before formation of the caldera, and of other vent eruptions from the flanks of the ancient volcano (Coats, 1956a).

Evidence of glaciation has not been noted on Kanaga Island, although adjacent islands such as Tanaga display signs of glacial erosion down to sea level.

Volcanic activity

1763?	1827
1768?	1829
1786?	1904?-May, 1906
1790?	1933?
1791	1993-95

Persistent but relatively mild volcanic activity has characterized Kanaga Volcano during the past 200 years. “Smoke” was reported above the island in 1790, 1791, 1827, and 1829; some or all of these accounts may actually refer to steam produced by hot springs on or near the cone (Coats, 1956a). Activity of an unspecified nature was noticed in 1763, 1768, 1786 (Grewingk, 1850, cited in Petroff, 1884), and 1933 (Coats, 1950). The most significant volcanic event observed on Kanaga during the historical period was a series of lava flows erupted in 1906 (Coats, 1956a), and possibly earlier in 1904 (Jaggar, 1927). A trapper living on the island in 1906 experienced several earthquakes and witnessed lava pouring down both east and west sides of the cone. Coats (1956a) interpreted these flows to be the ones now present on the northeast and southwest slopes of Kanaga Volcano. Another flow, slightly older, is perhaps the result of the poorly documented activity in 1904.

The most recent eruption began in mid-1993 and continued intermittently through most of 1995. The eruption was characterized by steam and ash plumes rising to as high as 7.5 km and drifting a few tens of kilometers downwind, lava extrusion within the summit crater, and minor avalanching of incandescent debris down the north flank reaching the sea in some cases (Neal and others, 1995 a, b). Strong sulfur odors were detected on occasion by ground observers in Adak, 33 km to the east.

Solfataric activity on Kanaga Island has been known since the first exploration of the Andreanof group in 1760-1764 (Coats, 1956a). Hot springs located at the foot of the cone were not found by Coats in 1946, but he did observe several conspicuous fumaroles near and in the summit crater. The most spectacular of these produces a vapor cloud that can be seen on a clear day from Adak, 50 km to the east. Several other fumaroles are floored with opaline products of rock disintegration. Fissures emitting a variety of hot gases (including hydrogen sulfide) are sulfur encrusted. The maximum surface temperature measured was 104°C (Coats, 1956a). Fumarolic activity was also reported in 1951 (Wentworth, 1951, p. 6).

Composition

Geologic mapping and petrographic studies of Kanaga Island were conducted in 1946 by R. Coats and in 1952 by G. Fraser and F. Barnett. Kanaga Volcano is composed of interbedded scoria, tuff breccias, and flows; compositions (figs. 90, 91) probably include basalt, andesite, and/or basaltic andesite. In general, both older and more recent lava flows comprise grey to black vesicular flow rocks with glass in the groundmass. Phenocrysts are typically zoned plagioclase (up to 4 mm long), smaller grains of hypersthene and augite, and accessory magnetite and apatite. Some flows contain hornblende, or rarely, olivine.

The two most recent pyroclastic deposits were also studied by Coats (1956a). The first, limited in distribution to the slopes of Kanaga Volcano, consists of two thin pumice layers; the older contains pale gray pumice and the younger contains dark grey pumice. The second deposit comprises ejecta of basalt blocks, some of which were ejected as much as 50 km from the main cone, which contain labradorite and augite phenocrysts with accessory magnetite in a groundmass of equant feldspar grains and pale glass. These tephra deposits predate all but one of the four youngest lava flows.

Rocks of the pre-caldera (shield?) volcano apparently range from basalt to andesite in composition. Crystal-lithic tuff, possibly erupted during a caldera-forming eruption, is high-SiO_2 andesite or dacite in composition.

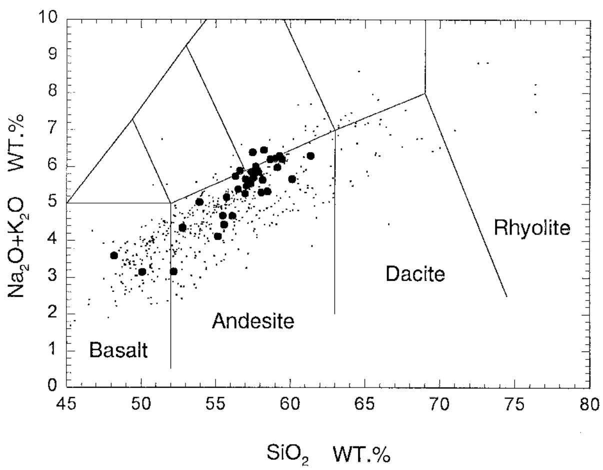


Figure 90. Total alkalies-silica diagram of Kanaga volcanic rocks (solid circles) and other Aleutian arc volcanic rocks (small dots) of oceanic affinity (those located west of 165°W longitude). Discriminant lines and field names (Le Bas and others, 1986) are explained on Figure 2.

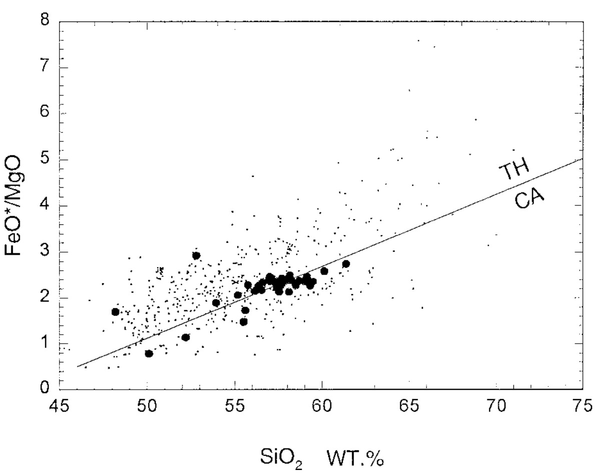


Figure 91. FeO/MgO-silica diagram of Kanaga volcanic rocks (solid circles) and other Aleutian arc volcanic rocks (small dots) of oceanic affinity (those located west of 165°W longitude). Tholeiitic versus calc-alkaline discriminant line from Miyashiro (1974).

Name and Location

Name:	Tanaga Volcano
Synonyms:	None
Type:	Stratovolcano with two flanking strato-volcanoes
Location:	Tanaga Island, westernmost of the Andreanof Islands, about 1024 km west-southwest of the tip of the Alaska Peninsula
Latitude, longitude:	51°53'N, 178°08'W
Elevation:	1806 m
USGS 1:250,000 quadrangle:	Gareloi Island
CAVW Number:	1101-08

Form and structure

Tanaga Volcano is the central and highest of three adjacent stratovolcanoes at the northwest end of Tanaga Island (fig. 92). The volcano, mostly undissected by erosion, has an altitude of between 1770 and 1830 m. Interbedded lava flows and pyroclastics of the upper slopes have initial dips as steep as 35°. The three stratovolcanoes lie unconformably on a slightly older series of interbedded lava flows and pyroclastics, which Fraser and Barnett (1959) suggest are of late Tertiary or Pleistocene age. A shield-like form is inferred for this earlier volcanic center based on shallow radial dips. Alternatively, it may be that only the lower flanks of an old stratovolcano have been preserved. Arcuate ridges and scarps border the three modern stratovolcanoes on the east and south, features that may represent the partial rim of a caldera developed in late Pleistocene time (Coats, 1950; 1956).

Tanaga Volcano and the neighboring cones roughly define an east-west trend across northern Tanaga Island. At least four cones adjacent to Tanaga Volcano apparently have been active since the last glaciation. The stratovolcano located 4 km west-southwest of Tanaga Volcano is in an older, breached crater. A blanket of fine ash, as much as 6 m thick covers large areas of Tanaga Island. The ash, stratified and intercalated with thin soil layers, may have accumulated over a period of several thousand years.

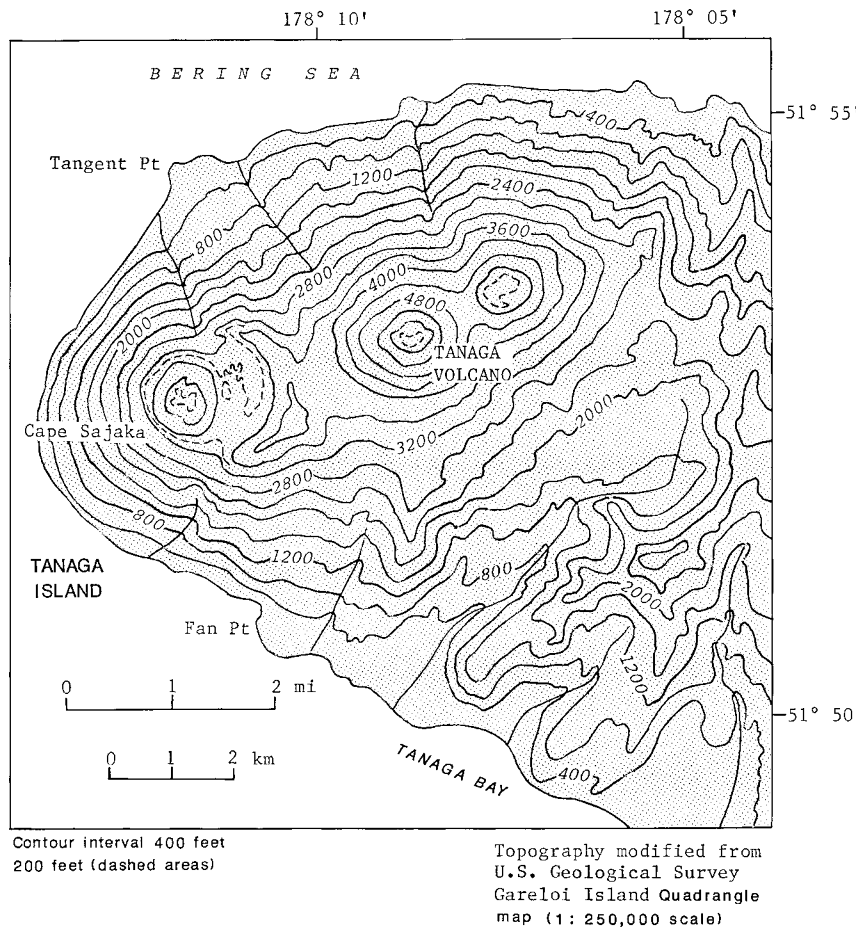


Figure 92. Topographic map of Tanaga volcano.

The oldest rocks on Tanaga Island comprise a thick sequence of unaltered shallow marine and subaerial lava flows, tuff breccias, and subordinate interbedded sediments. This series, considered to be of late Tertiary or

Quaternary age based on microfossils and mollusks (Fraser and Barnett, 1959; Marlow and others, 1973), constitutes the southern half of the island, and may underlie the northern part as well. Though Tanaga was extensively glaciated during the Pleistocene—morainal material has been recognized in high-altitude cols and cirques throughout the northern portion of the island—only a few small patches of ice remain on the flanks of the dormant easternmost cones.

Volcanic activity

1763-1770?	1829
June 7, 1791	1914

Few details are available concerning historical activity of Tanaga Volcano, and some or all of the events attributed to it may have involved adjacent cones in the northwest part of the island (Coats, 1950). Tanaga was reported active throughout the period 1763-1770. Smoke was noted above the island in 1791 and 1829, and a lava flow was observed in 1914 (Coats, 1950, table 2).

Composition

The lava flows of northern Tanaga Island range in composition from crystal-rich, high-alumina basalt to glassy dacite (Coats and Marsh, 1984). The basalts are characterized by nearly unzoned phenocrysts of plagioclase (An_{80-92}) and olivine (Fo_{65-73}), clinopyroxene ($En_{43}Wo_{44}$) and titanium-magnetite, whereas the andesites and dacites have zoned plagioclase (An_{85-65}), and orthopyroxene (En_{69}) instead of olivine (Coats and Marsh, 1984). Fraser and Barnett (1959, p. 222) present a single chemical analysis of a basalt flow or sill, from the oldest rocks on Tanaga Island, having a SiO_2 content of 51.8%.

Name and Location

Name:	Gareloi volcano
Synonyms:	Mount Gareloi
Type:	Stratovolcano
Location:	Gareloi Island, northernmost of the Delarof group, Andreanof Islands, about 1062 km west-southwest of the tip of the Alaska Peninsula
Latitude, longitude:	51°47′N, 178°48′W
Elevation:	1573 m
USGS 1:250,000 quadrangle:	Gareloi Island
CAVW Number:	1101-07

Form and structure

Mount Gareloi, which makes up most of Gareloi Island, is a stratovolcano 10 km by 8 km in diameter at its base (fig. 93) with two summits, separated by a narrow saddle. Two small glaciers extend northwest and southeast from the saddle. The northern, slightly higher peak is on the southern rim of a crater about 300 m across, which contains several active fumaroles. Thirteen younger craters, from 80 to 1600 m in diameter, are aligned along a south-southeast trending fissure that extends from strandline to the southern summit (fig. 93). These craters formed during a major explosive eruption in 1929 that also produced four blocky lava flows (unit Q1, fig. 93), and a blanket of glassy andesitic tuff that covers an area roughly 2.5 x 5 km on the volcano's southeast flank (Coats, 1959).

The intercalated lava flows and pyroclastic debris that make up Gareloi volcano were produced during two periods of activity separated by an extended interval of quiescence and erosion. Lava flows range from 1 m to more than 6 m in thickness; some flows of the older sequence appear to have originated from flank vents rather than from the summit. Some valleys cut in older rocks are U-shaped, suggesting that the older series is of late Pleistocene age or older. Rocks of the

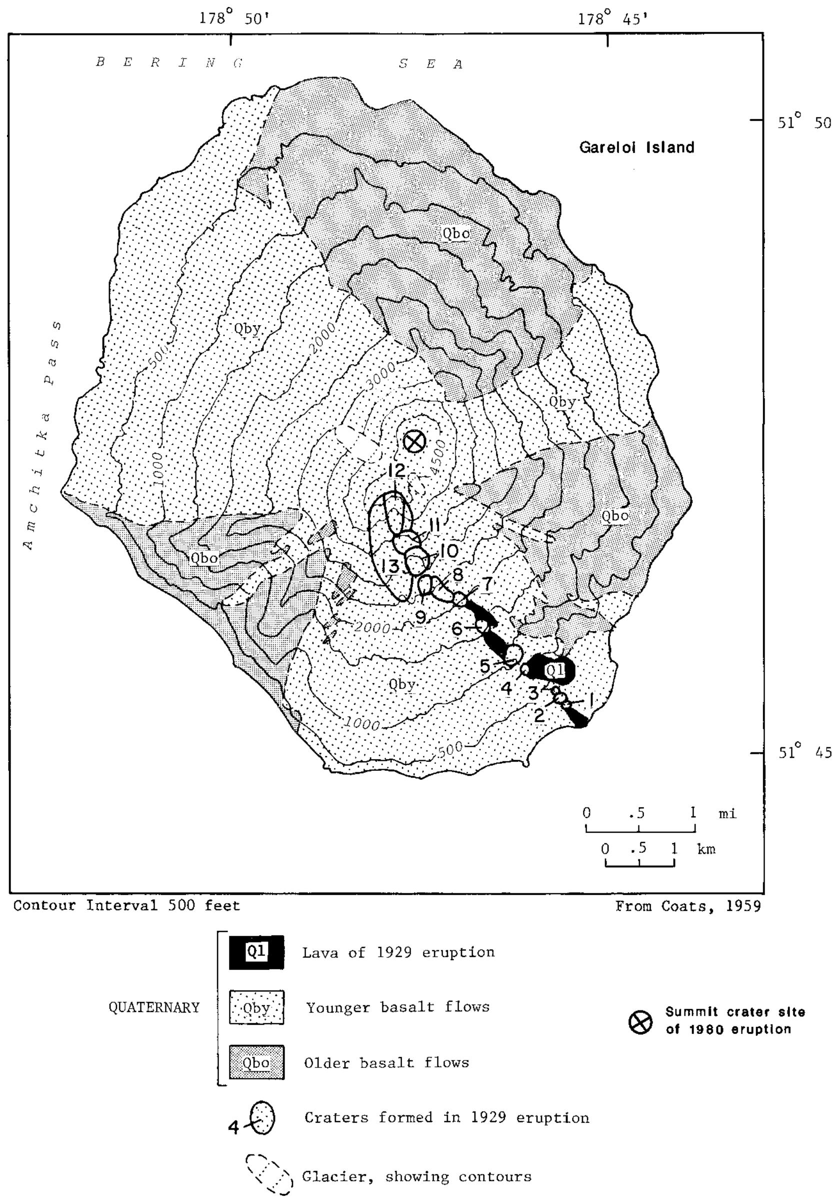


Figure 93. Geologic map of Gareloi Island after Coats (1959).

younger series are relatively undissected; many appear to have been erupted from at or near the summit crater. Craters formed during the 1929 eruptions are probably only partly of phreatic origin; erupted material includes essential, pumiceous glass, and reddened scoria. Lava flows that erupted in 1929 emerged at elevations below 600 m. In 1946, one crater at an elevation of 900 m, contained a small, milky blue-green lake, which suggests that acid fumaroles were still active in the crater at that time (Coats, 1959, p. 253).

Volcanic activity

1760	1922	Jan. 15, 1982
1790-92	1927	Sept. 4, 1987
1828-29	Apr. 1929-30	Aug. 17, 1989
1873	Aug. - Sept. 1980	

Volcanic activity has been frequently reported from Mount Gareloi since its discovery during the Bering Expedition in 1760. "Smoke" or unspecified activity was noted in 1760, 1828 and 1873, and 1927; lava extrusion in 1792; minor explosive eruptions in 1790 and 1791; and major explosive eruptions in 1922 and 1929-30 (Coats, 1950; 1959). The 1929 event is the most violent on record for Gareloi volcano; its course can be reconstructed in some detail from a second-hand report of what was apparently an eyewitness account (Coats, 1959, p. 252) and the findings of Coats' 1946 field examination.

In April of 1929, a phreatic eruption opened an elongate crater 1600 m in maximum diameter just below the southern summit; further explosions produced 12 smaller craters aligned along a south- to southeast-trending fissure. Glassy pumice, lapilli, scoria, and accidental rocks were then ejected from the lower craters, blanketing an area roughly 2.5 by 5 km on the southeast slope. Ash layers up to 2 m thick on Ogliuga Island, located about 16 km southeast, may be attributable at least in part to this eruption (Coats, 1956, p. 92) and several centimeters of pyroclastic debris are known to have fallen on Atka Island (about 300 km eastward) during the event. Extrusion of lava, which formed short steep flows, occurred at four sites along the fissure after the tephra eruptions. Various metallic oxides and halides (including atacamite, paratacamite and hematite) were deposited in several of the lower craters. Activity may have continued into 1930.

Known eruptive activity on Gareloi between 1930 and early 1980 was limited to that of fumaroles (Wentworth, 1951, p. 6) and sulfur dioxide emission at the northern summit, and discharge of odorless steam (maximum temperature 62^{o}C) from small transverse fissures on the southeast flank. In August and September, 1980, eruptions were reported at Gareloi volcano (Anchorage Times, August 16, and September 19, 1980); the nature of eruptive activity is uncertain, but apparently it involved ash and steam (Smithsonian Institution, 1980).

On January 14, 1982, a magnitude 3.2-3.3 earthquake struck the area; the following day, January 15, a 7-9 km eruption cloud was observed on satellite imagery (Smithsonian Institution, 1982).

On September 4, 1987, a commercial pilot observed a narrow flow-like feature on the east flank that extended from the north crater rim at 1500 m altitude down to at least 1100 m, below which it was obscured by clouds. Steam rose 100 m above the flow(?) and the crater was vigorously steaming (Smithsonian Institution, 1987). On August 17, 1989, a grayish black ash cloud was observed from a passing aircraft about 700 m above the volcano's summit (Reeder, 1992).

Composition

The only petrographic information currently available for Gareloi volcano was obtained by Coats during a brief reconnaissance survey in 1946. The older rocks, probably late Pleistocene in age, consist of olivine basalt flows, 1 to 6 m thick, that are commonly holocrystalline and rich in augite; coarse reddened scoria is interbedded with exposures on the northeast flank (Coats, 1959, p. 250). Younger flows consist of olivine basalt; augite and olivine content differ among the flows. Textures range from fine-grained with a few small phenocrysts, to seriate and porphyritic.

Juvenile material erupted in 1929 may be significantly more siliceous than the older basaltic or basaltic andesite rocks. The lava was apparently highly viscous and generally formed blocky, vesicular, or scoriaceous flows, one of which is 75 m wide and 15 m thick. Orthopyroxene, brown hornblende, plagioclase (average composition about An_{48}), and clinopyroxene were observed in lava flows and pyroclastics of the 1929 eruption (Coats, 1959, p. 254-255).

NAME AND LOCATION

NAME:	SEMISOPOCHNOI VOLCANO
SYNONYMS:	MOUNT CERBERUS
TYPE:	INTRACALDERA STRATOCONES
LOCATION:	SEMISOPOCHNOI ISLAND, EASTERNMOST OF THE RAT ISLAND GROUP, ANDREANOF ISLANDS, ABOUT 1168 KM WEST-SOUTHWEST OF THE TIP OF THE ALASKA PENINSULA; THE ISLAND IS LOCATED AT THE JUNCTION OF BOWERS RIDGE AND THE INSULAR ALEUTIAN ARC
LATITUDE, LONGITUDE:	51°56'N, 179°35'E
ELEVATION:	800 M
USGS 1:250,000 QUADRANGLE:	RAT ISLANDS
CAVW NUMBER:	1101-06

Form and structure

Mount Cerberus comprises three young, relatively undissected composite cones (fig. 94), all of nearly equal height (800m) and with basal diameters somewhat more than 3 km (Coats, 1959). The cones all have summit craters and are built principally of andesitic lava flows and pyroclastic rocks. The easternmost crater is the smallest and most irregular in shape of the three; its vent has apparently shifted position slightly during or between past eruptions. Lava flows appear to have originated from flank eruptions below 500 m altitude.

About 1.6 km east of Mount Cerberus is a partially destroyed cone, 260 m above sea level. In the northeast part of the caldera, a small scoria mound (Lakeshore Cone; unit Qbl, fig. 94) was the source of two small lava flows 4 km northeast of Mount Cerberus, and a small scoria and agglutinate mound occurs 1.9 km south of Mount Cerberus.

Lava flows (unit Qbc, fig. 94) on the north flanks of Mount Cerberus appear in general to be younger than those on the south flank. The

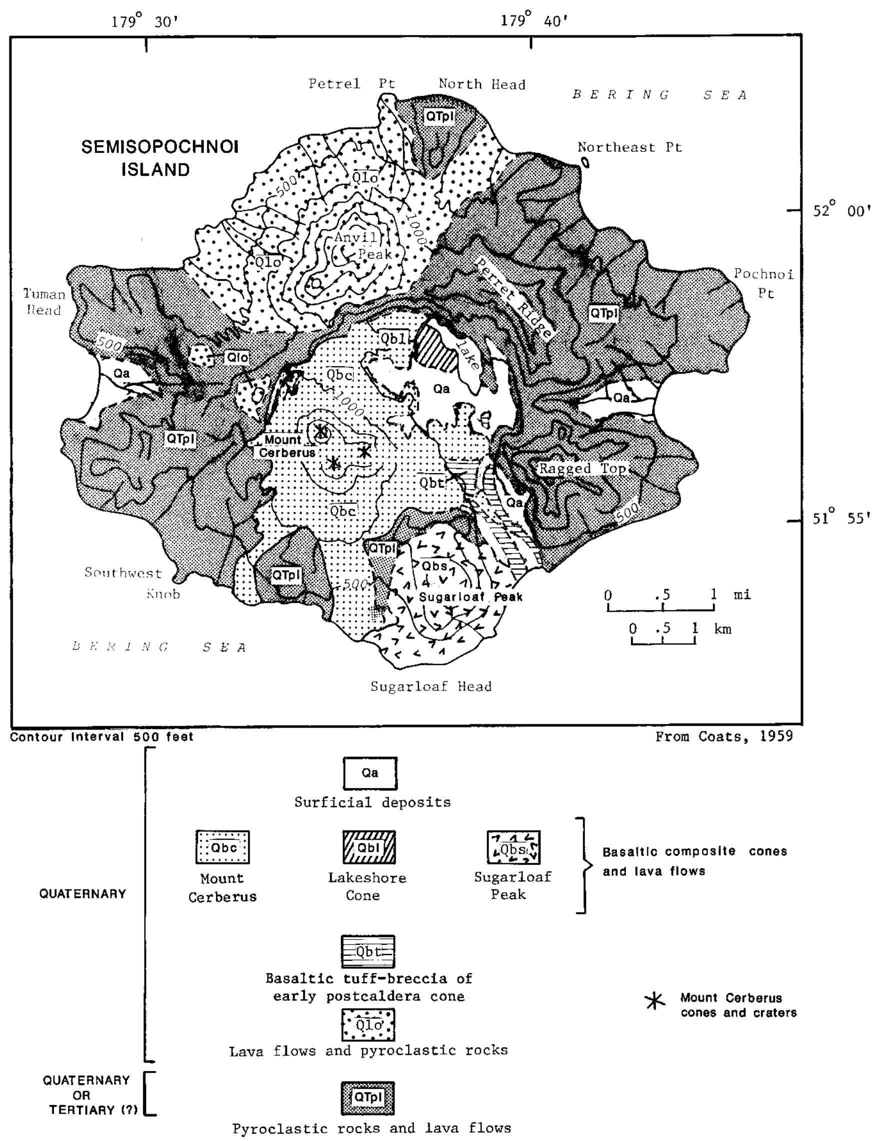


Figure 94. Geologic map of Semisopochnoi Island after Coats (1959).

youngest flow, as distinguished by degree of ash and vegetation cover, extends 600 m from the north base of the west summit and is probably no more than a century old according to Coates (1959). Other individual flows, consisting of single or multiple pulses as defined by sets of lava levees, can be identified. Many older flows, particularly those on the north flanks of Mount Cerberus, have been largely buried beneath loose detrital material washed from the upper reaches of the cone.

A widespread blanket of pre-Cerberus dacitic ash, and younger andesitic or basaltic ash derived from the eruptions of Cerberus and two neighboring cones, covers much of the island. The two neighboring cones—Sugarloaf Peak and Lakeshore—may also have been active in historical time (Coats, 1959). The summit of Sugarloaf Peak, 855 m high, lies about 4.4 km southeast of Mount Cerberus on the south coast of Semisopochnoi Island. Composed chiefly of pyroclastics with intercalcated lava flows up to 2m thick (unit Qbs, fig. 94), it has a double parasitic cone on its south flank from which vapor is sporadically emitted.

The oldest rocks exposed on Semisopochnoi Island are deeply eroded remnants of a late Tertiary-early Pleistocene volcano that had an eruption center or centers somewhere within the central part of the present island. These rocks, termed the Pochnoi Volcanics, crop out northeast and west of Cerberus (unit Qtpl, fig. 94) (Coats, 1959). Remnants of composite cones, perhaps slightly younger than and parasitic to a main volcano, are exposed around the margins of the island (unit Qtp, fig.94). Four other cones, one of which may have contained a lava lake in its summit crater, and associated lava flows (unit Qlo, fig. 94) are distinguishable from the composite cone remnants by being less eroded (Coats, 1959). The aforementioned deposits are glacially eroded, although the youngest of the cones only slightly so. After glaciation, large volumes of dacitic pumice and ash were erupted during formation of an elliptic caldera (8 km in greatest width) and formed pyroclastic-flow deposits on the flanks of the volcano. Deposits of post-caldera, pre-Cerberus eruptions are limited to sparse pyroclastic deposits and thin flows (unit Qbt, fig. 94) which extend from within the caldera out through a breach in the southeast wall. Flows from Cerberus and the smaller Lakeshore Cone have nearly covered the caldera floor; a small arcuate lake, 2.5 km long, lies along the inner northeast rim of the caldera. Nearly all deposits of Mount Cerberus are contained within the southern and western portion of the caldera. Flows have breached the southern caldera wall in two places and extend 2-5 km to the coast.

Volcanic activity

1772	Sugarloaf? 1987
1790	
1792	
1830	
1873?	

Records of volcanism on Semisopochnoi Island are scant; historical eruptions could have involved the small Lakeshore Cone and Sugarloaf cone in addition to Mount Cerberus. However, since at least one of the early reports specified that the activity noted was in the center of the island, and Mount Cerberus is the least eroded of the recent cones, it is believed to have been the source of most recorded events (Coats, 1950; 1959). These events include emissions of smoke in 1772, 1790, 1792 and 1830 and unspecified activity in 1873. In 1947, wisps of steam were observed emerging from the vicinity of a parasitic cone on the south flank of Sugarloaf Peak (Coats, 1959).

None of the historical activity has been correlated with specific lava or pyroclastic deposits on Semisopochnoi. However, a young flow on the lower northeast flank of Mount Cerberus displays vegetation cover comparable to that on a 1906 Kanaga Island flow at slightly higher altitude, and was possibly erupted during the twentieth century (Coats, 1959, p. 502).

The latest reported activity occurred on April 13, 1987 when a plume extending 90 km ENE from Semisopochnoi Island was observed on satellite imagery; the plume extended only 15 km ENE several hours later. On April 24, 1987, a commercial pilot flying about 50 km SE of the Island observed that one of the snow-covered peaks, possibly Sugarloaf, was blackened (Smithsonian Institution, 1987).

Composition

The 1947 field studies of Coats provide the most detailed petrographic information available for Semisopochnoi Island. Mount Cerberus flows comprise primarily grey, porphyritic basalt or andesite (figs. 95, 96) with phenocrysts of plagioclase, augite, hypersthene and, more rarely, olivine. Locally, silicic lava flows of hypocrystalline andesite or dacite are intercalated with these basalts.

Pyroclastic material erupted from Cerberus is generally similar in composition to the lava flows. Fragments are less than 30 cm in diameter. Scoriaceous, dark grey to black essential lapilli constitutes about 5% of these deposits and small fragments of accessory lithic basalt make up most of the rest.

Products of Sugarloaf Cone differ from those of Mount Cerberus in that Sugarloaf specimens lack hypersthene, which occurs in every Mount Cerberus sample studied (Coats, 1959). Since activity at the two cones appears roughly contemporaneous, the cones may tap different magma chambers or different parts of the same chamber. Most of the Sugarloaf rocks are olivine basalts or picritic basalts, that have intergranular textures and phenocrysts of labradorite to bytownite plagioclase, conspicuous green augite, olivine and magnetite.

Lava flows and pyroclastic deposits of Lakeshore Cone were not closely examined by Coats and no petrologic information is available.

Rocks of the volcanic series of Semisopochnoi Island range from basalt to dacite (Coats, 1959; DeLong and others, 1985) with SiO_2 contents of 50.4-65.3% and are thoeliitic in character. A composite sample of ash and pumice associated with caldera formation has a SiO_2 content of 61.02%; other samples of pumice have SiO_2 contents of 60.22% and 60.98%.

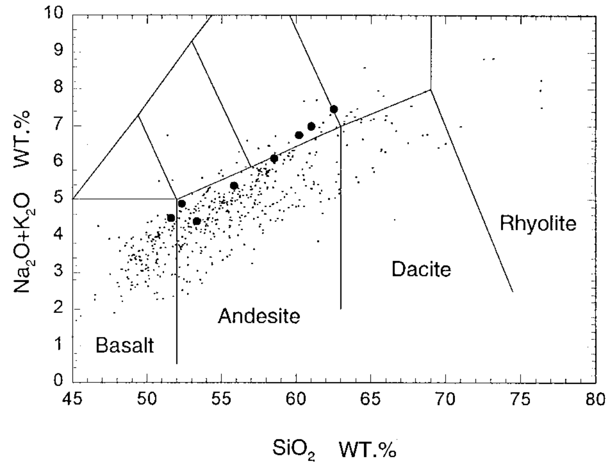


Figure 95. Total alkalies-silica diagram of Semisopochnoi volcanic rocks (solid circles) and other Aleutian arc volcanic rocks (small dots) of oceanic affinity (those located west of 165°W longitude). Discriminant lines and field names (Le Bas and others, 1986) are explained on Figure 2.

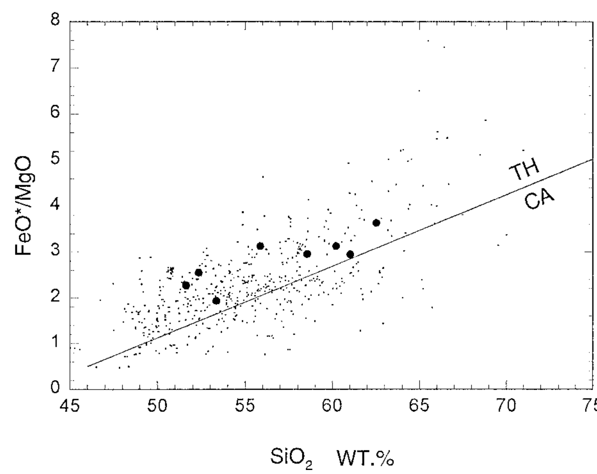


Figure 96. FeO/MgO-silica diagram of Semisopochnoi volcanic rocks (solid circles) and other Aleutian arc volcanic rocks (small dots) of oceanic affinity (those located west of 165°W longitude). Tholeiitic versus calc-alkaline discriminant line from Miyashiro (1974).

Name and Location

Name:	Little Sitkin volcano
Synonyms:	Little Sitkin Island
Type:	Stratovolcano within nested calderas
Location:	Little Sitkin Island, in the Rat Island group of the western Aleutian Islands, about 1200 km west-southwest of the tip of the Alaska Peninsula, and 76 km northwest of Constantine Harbor on Amchitka Island
Latitude, longitude:	51°57′N, 178°32′E
Elevation:	1188 m
USGS 1:250,000 quadrangle:	Rat Islands
CAVW Number:	1101-05

Form and structure

The active stratovolcano on Little Sitkin Island occurs within the eroded remnants of a nested double caldera of probable late Pleistocene age. The older caldera (Caldera One, fig. 97) is about 4.8 km in diameter and is centered slightly northeast of the island's midpoint. The caldera formed at the site of a large stratovolcano, the remnants of which are the oldest rocks exposed on the island (unit Qtw, fig. 97; Snyder, 1959).

A second stratovolcano was constructed almost entirely of lava flows (unit Qd, fig. 97) within Caldera One and attained a height of about 900 m. A cataclysmic eruption, possibly in early post-glacial time, resulted in the formation of a second, smaller caldera (Caldera Two, fig. 97) that partly destroyed this cone. Caldera Two is elliptical in outline and measures 2.7 by 4 km; the inferred eastern and southern margins are coincident with those of Caldera One. Field relations suggest that the northern boundary of Caldera Two is a hinge along which a large block, comprising most of the Caldera One stratovolcano, was tilted southward during the caldera-forming eruption. The highest peak on the island is on the post-caldera remnant of the second cone.

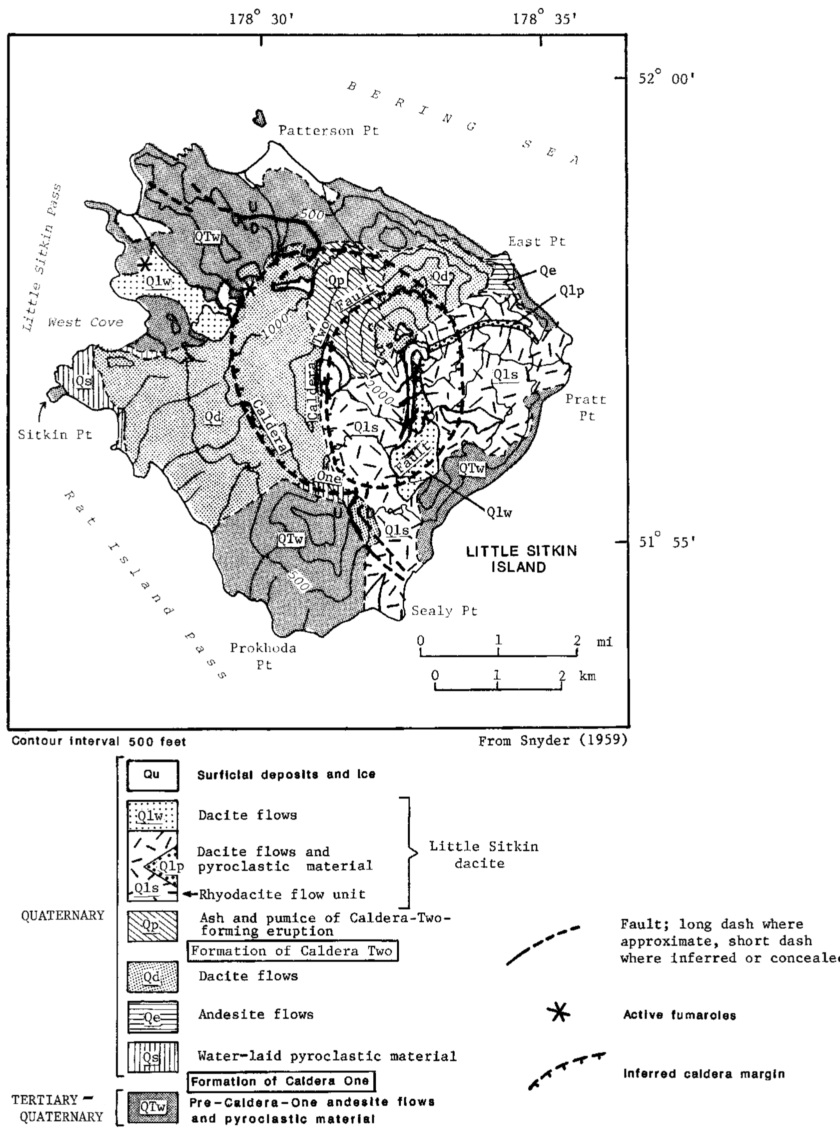


Figure 97. Geologic map of Little Sitkin Island after Snyder (1959).

A deposit of partly welded tuff up to 100 m thick (unit Qp, fig. 97) extends from the remnant cone northwest across the Caldera Two boundary fault, to slightly beyond the inferred location of the Caldera One boundary fault. The deposit is thought to have been emplaced by one or more pyroclastic flows, possibly associated with formation of Caldera Two (Snyder, 1959).

Post-Caldera Two deposits are mainly lava flows (units Qls, Qlp, and Qlw, fig. 97). Two relatively recent aa flows have well developed levees; one originated from the breached central crater of Little Sitkin volcano, and the other from a fissure along the western trace of the Caldera One boundary fault (Snyder, 1959).

Volcanic activity

1776
1828-30
ca. 1900?

Historical records of Little Sitkin volcanism are few and fragmentary. A 1776 eruption involving “flames” (C. Grewingk, cited in Dall, 1870), attributed to Sitignak, probably occurred at Little Sitkin volcano (Coats, 1950). Smoke was reported above the island during 1828-30 (Dall, 1870). Evidence of more recent volcanism is provided by Snyder (1959), who mapped two dacitic flows on the south and west flanks of the crater that appeared no more vegetated at comparable altitudes than andesite flows produced during a well-documented 1906 eruption on Kanaga Island, 60 km to the west. Snyder (1959, p. 183) argues that these extrusions “are not older than” the 1906 Kanaga flows, implying that Little Sitkin has erupted at least once during the 20th century.

Jaggar (1927), states that “Chugul and Little Sitkin are said to be fuming volcanoes”; no further details are given.

Current activity on Little Sitkin Island is limited to solfataric emissions. Three major fumarolic areas in the northwest quarter of the island are aligned parallel to the north-northwest trend of neighboring volcanic centers.

Composition

Petrographic data for Little Sitkin volcano are presented by Snyder (1959). The oldest rocks on Little Sitkin Island are andesitic lava flows, dikes, and pyroclastic deposits, with subordinate amounts of dacitic and basaltic lava flows and pyroclastic deposits (figs. 98, 99) of an ancestral composite cone. Plagioclase phenocrysts in a single sample of basalt range from 45% to 65% An-content and from 45% to 60% in a single sample of andesite (Snyder, 1959, p. 190-191). Augite exceeds or equals orthopyroxene in abundance, and olivine occurs in trace to accessory amounts in both the basalt and andesite.

Petrographic data on the pyroclastic rocks that may have been erupted during formation of Caldera One are limited to inclusions of nonporous and pumiceous dacite. In the inclusions, plagioclase phenocrysts have an average An-content of 45%, quartz is not observed, clinopyroxene and orthopyroxene occur in varying proportions, and olivine and hornblende are present but uncommon.

The lava flows composing the central cone built within Caldera One range in composition from andesite to dacite and are characterized by ubiquitous andesitic xenoliths. Plagioclase phenocrysts in one specimen of andesite range from 26% to 74% in An-content; pleochroic brown hornblende, clinopyroxene, orthopyroxene, and opaque are the other phenocryst phases. The dacite contains plagioclase phenocrysts ranging in An-content from 23% to 55%; orthopyroxene, clinopyroxene, hornblende, opaques, and tridymite are the remaining phenocrysts. Trace amounts of olivine occur in other specimens of both andesite and dacite that lack tridymite.

Tuffs emplaced during formation of Caldera Two are separable into 2 varieties: an upper, light grey to blue-grey, firmly consolidated ash-and-lapilli tuff, and a lower, grey-white to salmon-pink welded tuff; both of these are probably pyroclastic flow deposits. The upper unit contains 1 to 2% angular to subangular blocks of andesite, basalt, and dacite up to 60 cm long. The lower unit contains 5 to 10% rounded to subrounded bombs(?) consisting of black glass with layers, blebs, and stringers of white glass. Plagioclase phenocrysts range in An-content from 43% to 76%, and abundance of clinopyroxene equals or exceeds that of orthopyroxene. Olivine, hornblende, and quartz are not known to occur.

Post-Caldera Two lava flows range in composition from andesite to dacite or rhyolite. Plagioclase phenocrysts in a single sample of andesite range from An_{35} to An_{56}; in 4 samples of dacite, the range is An_{25} to An_{78}. Plagioclase phenocrysts in 2 samples of dacite or rhyolite range from An_{27} to An_{50} and from An_{35} to An_{60}.

One of the young flows that may have erupted in the early 1900’s is an andesite or low-silica dacite. Like the older, post-Caldera Two low-silica dacites, this sample contains plagioclase phenocrysts ranging from An_{36} to An_{62}.

continued

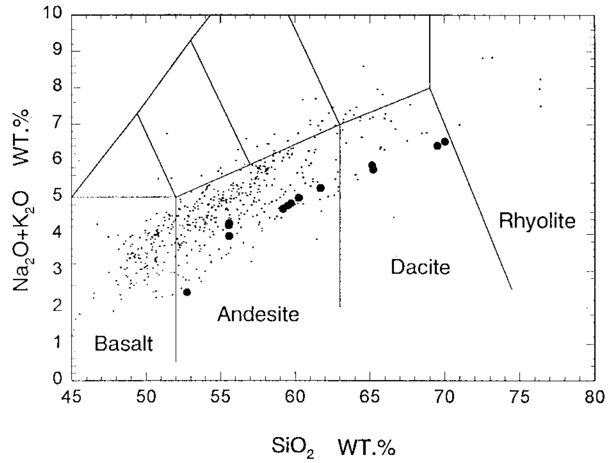


Figure 98. Total alkalies-silica diagram of Little Sitkin volcanic rocks (solid circles) and other Aleutian arc volcanic rocks (small dots) of oceanic affinity (those located west of 165°W longitude). Discriminant lines and field names (Le Bas and others, 1986) are explained on Figure 2.

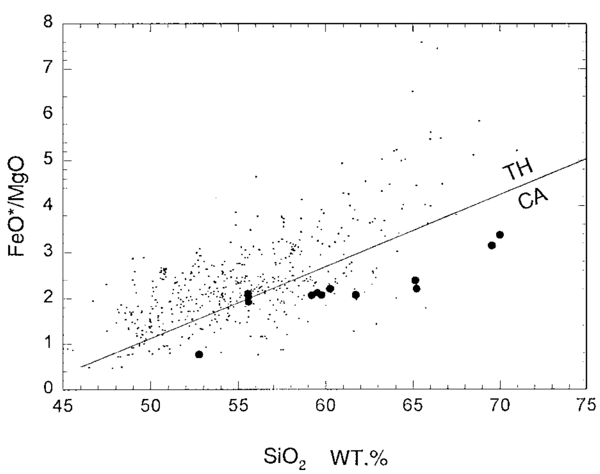


Figure 99. FeO/MgO-silica diagram of Little Sitkin volcanic rocks (solid circles) and other Aleutian arc volcanic rocks (small dots) of oceanic affinity (those located west of 165°W longitude). Tholeiitic versus calc-alkaline discriminant line from Miyashiro (1974).

Name and Location

Name: Kiska Volcano
Synonyms: None
Type: Stratovolcano
Location: Kiska Island, westernmost of the Rat Island group, in the western Aleutian Islands: 1270 km west-southwest of the tip of the Alaska Peninsula, and about 400 km west of Adak
Latitude, longitude: 52°06′N, 177°36′E
Elevation: 1220 m
USGS 1:250,000 quadrangle: Kiska
CAVW Number: 1101-02

Form and structure

Kiska Volcano is a stratovolcano, 8.5 by 6.4 km in diameter at its base and 1221 m high, on the northern end of Kiska Island. A slightly elliptical crater, about 0.4 km in diameter and breached on the north, occupies the summit (fig. 100). A parasitic 30-m-high cinder cone, formed in 1962 near sea level, occurs at Sirius Point and an older parasitic cone, now levelled by marine erosion, occurs at sea level 5.6 km southwest of Kiska Volcano.

The southern part of Kiska Island has been glacially eroded, but the volcano shows no evidence of glacial dissection (Coats, 1956). Surface lava flows are thus younger than the last major glaciation. Five of the youngest lava flows (unit Qkr, fig. 100) have been mapped separately by Coats and others (1961) based on geomorphic expression; the flows of block lava have steep fronts as much as 30 m high. Source areas of the flows range from the base of the cone to the summit. The highest flows appear to have emerged from the summit crater through the breached north wall.

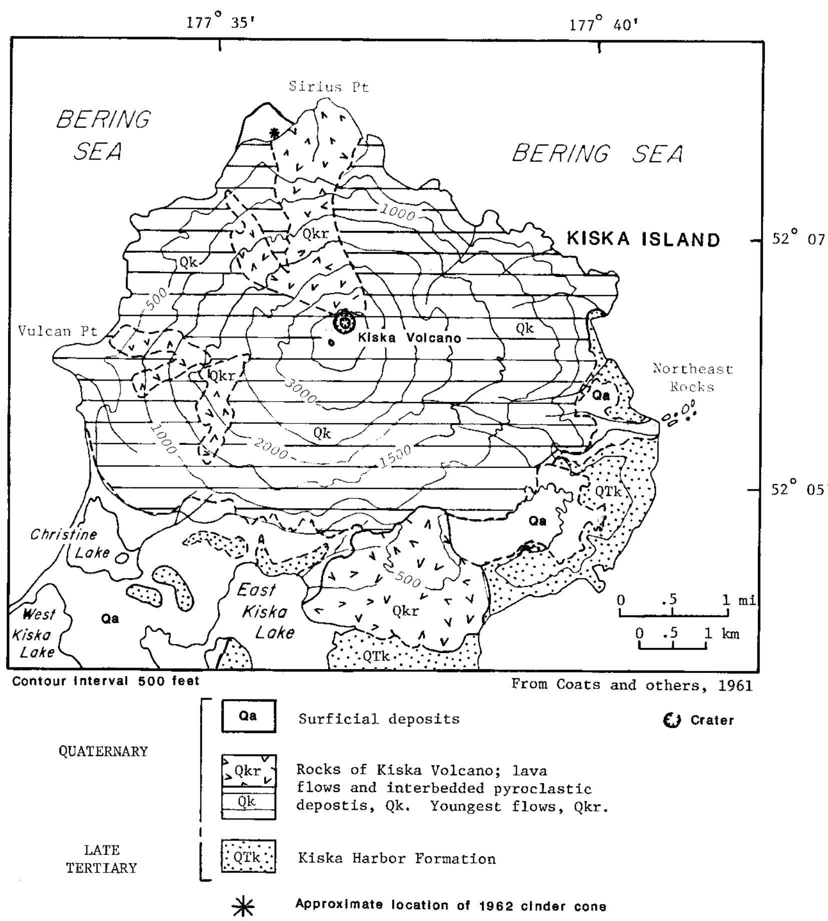


Figure 100. Geologic map of the north end of Kiska Island after Coats and others (1961).

Kiska Volcano is underlain and flanked on the south by the remains of an older composite volcano; a single K-Ar age of 5.5 ± 0.7 m.y. is cited in Marlow and others (1973) for an andesitic lava flow in this older volcano.

Volcanic activity

1907	March 18, 1964
1927	September 11-16, 1969
January 24, 1962	April 15, 1987 ?
	June 1, 1990

Records of activity during early historical time are scanty; crater solfataric emissions were mentioned as early as 1905 and “smoke” was observed over the island in 1907 and possibly in 1927 (Coats, 1950). Coats briefly visited Kiska volcano in 1947 and found no evidence of recent ash flows nor any active fumaroles; the youngest lava flows were more heavily vegetated at any given altitude than counterparts on adjacent islands known to have been erupted in the 20th century. The youngest lava flows before 1962 were probably between 100 and several hundred years old. Coats concluded that any events between 1905 and 1947 were at most solfataric (Coats and others, 1961).

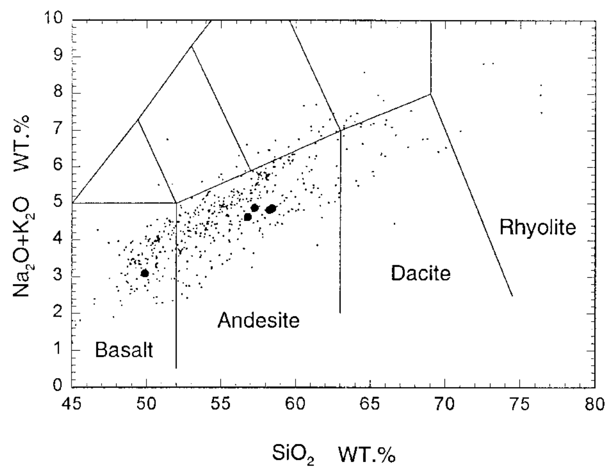
An explosive eruption occurred on January 24, 1962 accompanied by lava extrusion and the construction of a cinder cone about 30 m high at Sirius Point on the north flank of Kiska Volcano, 3 km from the summit of the main cone (Anchorage Daily News, January 30, 1962). A second eruption that produced a lava flow was reported to have occurred March 18, 1964 (Bulletin of Volcanic Eruptions, 1964). Coast and Geodetic Survey personnel recorded renewed activity on Kiska Island in early September, 1969; an ash column was observed rising to 400 m and steam to 4000 m. “Flames” and what appeared to be lava were reportedly visible from Amchitka, 80 km distant. On September 16, strong sulfur odors, air temperatures elevated by 10 to 15°C, and possible evidence of a small lava flow were noted during a military flight over north Kiska Island (Smithsonian Institution, 1969; eyewitness accounts on file at Geophysical Institute, University of Alaska, Fairbanks.)

On April 15, 1987, a narrow, drifting plume located 60 km east of Kiska Island, was observed on satellite imagery and is inferred to have originated at Kiska volcano (Smithsonian Institution, 1987).

Steam and minor ash emission from an upper flank vent on June 1, 1990 was reported by an observer on neighboring Amchitka Island (Anchorage Times, June 3, 1990; Smithsonian Institution, 1990). Although a sizeable steam plume was reported during the next several days, ash emission apparently lasted only several hours.

Composition

Coats and others (1961) provide the only detailed petrographic information available for Kiska Volcano; their work is based on reconnaissance studies carried out in 1947 and 1951. Interbedded lava flows and pyroclastic deposits make up the main cone. Both glass and hornblende are reported to occur in the pyroclastic material. Lava flows range from less than 1 m to more than 30 m thick and are primarily grey, fine-grained porphyritic andesite (figs.101, 102). Some of these rocks contain hypersthene and minor olivine; others are two-pyroxene andesite. Five of the youngest flows examined by Coats and others are medium grey to light brown and consist of augite-hypersthene andesite, locally containing minor olivine, and basalt.



Figuare 101. Total alkalies-silica diagram of Kiska volcanic rocks (solid circles) and other Aleutian arc volcanic rocks (small dots) of oceanic affinity (those located west of 165°W longitude). Discriminant lines and field names (Le Bas and others, 1986) are explained on Figure 2.

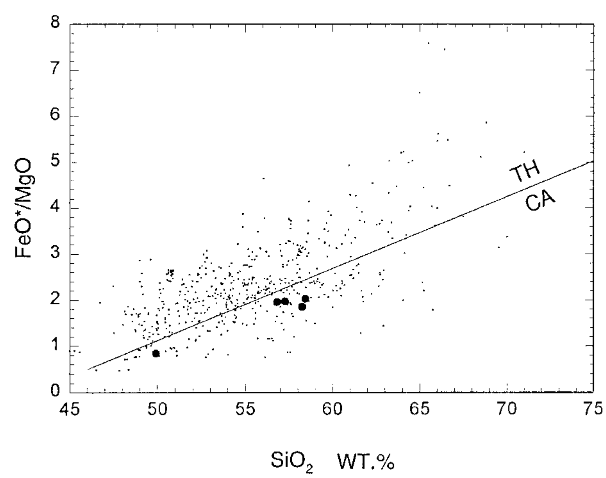


Figure 102. FeO/MgO-silica diagram of Kiska volcanic rocks (solid circles) and other Aleutian arc volcanic rocks (small dots) of oceanic affinity (those located west of 165°W longitude). Tholeiitic versus calc-alkaline discriminant line from Miyashiro (1974).