

Active Volcanoes of the Kurile Islands: A Reference Guide for Aviation Users

Open-File Report 2008–1162

Active Volcanoes of the Kurile Islands: A Reference Guide for Aviation Users

By Christina Neal, U.S. Geological Survey; Alexander Rybin and Marina Chibisova, Institute of Marine Geology and Geophysics, Sakhalin, Russia; and Edward Miller, Airline Pilots Association, Herndon, Virginia

Open-File Report 2008–1162

U.S. Department of the Interior
U.S. Geological Survey

U.S. Department of the Interior
DIRK KEMPTHORNE, Secretary

U.S. Geological Survey
Mark D. Myers, Director

U.S. Geological Survey, Reston, Virginia: 2008

For product and ordering information:

World Wide Web: <http://www.usgs.gov/pubprod>

Telephone: 1-888-ASK-USGS

For more information on the USGS--the Federal source for science about the Earth, its natural and living resources, natural hazards, and the environment:

World Wide Web: <http://www.usgs.gov>

Telephone: 1-888-ASK-USGS

Any use of trade, product, or firm names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

Although this report is in the public domain, permission must be secured from the individual copyright owners to reproduce any copyrighted materials contained within this report.

Suggested citation:

Neal, Christina, Rybin, Alexander, Chibisova, Marina, and Miller, Edward, 2008, Active volcanoes of the Kurile Islands: A reference guide for aviation users: U.S. Geological Survey Open-File Report 2008-1162, 10 p.

Contents

Introduction.....	1
Monitoring of Kurile Volcanoes.....	1
How the Aviation Sector is Notified of Eruptions in the Kuriles.....	1
Pilot Reports of Volcanic Activity.....	2
Rates of Eruption in the Kuriles	2
Acknowledgments.....	2
References Cited.....	2

Figures

Figure 1. Map of the Kurile Island area and active volcanoes (red asterisks), principal air routes (labeled), navigation fixes (black triangles), and three subsection maps shown in figures 2, 3, 4.....	3
Figure 2. Map of the North Kurile Islands.....	4
Figure 3. Map of the Central Kurile Islands	5
Figure 4. Map of the South Kurile Islands	6
Figure 5. Volcanic Activity Reporting form for air crews lists the specific observations that are most important to pass along to ATC as soon as safely possible	7

Tables

Table 1. Active volcanoes of the Kurile Islands and relevant location, elevation, and eruption history	8
Table 2. Important web sites that are sources of information about Kurile Volcanoes	9

Conversion Factors

Inch/Pound to SI

Multiply	By	To obtain
	Length	
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
mile, nautical (nmi)	1.852	kilometer (km)
yard (yd)	0.9144	meter (m)
centimeter (cm)	0.3937	inch (in.)
millimeter (mm)	0.03937	inch (in.)
meter (m)	3.281	foot (ft)
kilometer (km)	0.6214	mile (mi)
kilometer (km)	0.5400	mile, nautical (nmi)
meter (m)	1.094	yard (yd)

Temperature in degrees Celsius (°C) may be converted to degrees Fahrenheit (°F) as follows:
 $^{\circ}\text{F}=(1.8\times^{\circ}\text{C})+32.$

Temperature in degrees Fahrenheit (°F) may be converted to degrees Celsius (°C) as follows:
 $^{\circ}\text{C}=(^{\circ}\text{F}-32)/1.8.$

Altitude, as used in this report, refers to distance above sea level.

Active Volcanoes of the Kurile Islands: A Reference Guide for Aviation Users

By Christina Neal¹, Alexander Rybin², Marina Chibisova², and Edward Miller³

Introduction

The many volcanoes of the remote and mostly uninhabited Kurile Island arc ([fig. 1](#); [table 1](#)) pose a serious hazard for air traffic in the North Pacific. Ash clouds from Kurile eruptions can impact some of the busiest air travel routes in the world and drift quickly into airspace managed by three countries: Russia, Japan, and the United States. Prevailing westerly winds throughout the region will most commonly send ash from any Kurile eruption directly across the parallel North Pacific airways between North America and Asia (Kristine A. Nelson, National Weather Service, oral commun., 2006; [fig. 1](#)). This report presents maps showing locations of the 36 most active Kurile volcanoes plotted on Operational Navigational Charts published by the Defense Mapping Agency (map sheets ONC F-10, F-11, and E-10; [figs. 1, 2, 3, 4](#)). These maps are intended to assist aviation and other users in the identification of restless Kurile volcanoes. A regional map is followed by three subsections of the Kurile volcanic arc (North, Central, South). Volcanoes and selected primary geographic features are labeled. All maps contain schematic versions of the principal air routes and selected air navigational fixes in this region.

Monitoring of Kurile Volcanoes

Currently, only one Kurile volcano, Alaid Volcano on Atlasova Island in the far northern Kuriles, is monitored by a single real-time seismic station ([fig. 2](#)). As of 2008, time-delayed seismic data from several seismic stations on Iturup and Kunashir Islands in the South Kuriles ([fig. 4](#)) are collected at scientific institutes on Sakhalin Island. The region also is examined using satellite data several times a day by volcanologic and meteorological authorities in Russia, Japan, and the U.S. Sensors and satellites used include the Moderate Resolution Imaging Spectroradiometer (MODIS), Advanced

Very High Resolution Radiometer (AVHRR), Geostationary Operational Environmental Satellites (GOES), and the Japanese MTSAT. The frequent cloud cover in the area, however, severely hinders satellite surveillance and eruptions from Kurile volcanoes can go undetected for many hours.

Satellite information, along with occasional ground-based observations on the southernmost islands are used by the Sakhalin Volcanic Eruption Response Team (SVERT) to evaluate the status of active Kurile volcanoes and issue summary reports via e-mail (Rybin and others, 2004). The Kamchatka Volcanic Eruption Response Team (KVERT) is responsible for volcanoes on the island of Paramushir and Atlasova in the North Kuriles ([fig. 2](#)) and also issues status reports based on satellite and occasional ground-based observations. A single seismic station on Paramushir Island transmits data to Petropavlovsk, but is not capable of consistently detecting volcanic unrest in real-time (Neal and others, 2007).

How the Aviation Sector is Notified of Eruptions in the Kuriles

Airlines may receive formal notification of eruptions or unrest in the Kuriles via several message types over the Aeronautical Fixed Telecommunications Network (AFTN) and the Internet. The 24-hour operation of the Tokyo Volcanic Ash Advisory Center (VAAC) issues Volcanic Ash Advisories (VAA) and sometimes Graphical Volcanic Ash Advisories for suspected or confirmed volcanic clouds in the Kuriles and Kamchatka. Meteorological Watch Offices for the region (Yuzhno-Sakhalinsk and Petropavlovsk-Kamchatsky) issue SIGMETs for ash clouds in their areas of responsibility. If ash drifts into U.S. airspace, VAAs and SIGMETs also may be issued by the Anchorage and/or Washington VAACs, the Alaska Aviation Weather Unit, or the Kansas City Aviation Weather Unit. International NOTAMs also may be issued for significant eruptive activity. Finally, KVERT, SVERT, and the Alaska Volcano Observatory issue email alerts of known volcanic activity that are then posted to their institutional web sites ([table 2](#)).

¹USGS Alaska Science Center, Alaska Volcano Observatory, 4210 University Drive, Anchorage, Alaska 99508.

²Institute of Marine Geology and Geophysics, Sakhalin, RUSSIA.

³Airline Pilots Association, 535 Herndon Parkway, P.O. Box 1169, Herndon, Virginia 2072-1169.

Pilot Reports of Volcanic Activity

Flight crew observations of volcanic activity while aloft remain an important means by which the International volcanologic, meteorological, and aviation communities are alerted to volcanic activity. This is especially true for remote, seismically unmonitored volcanoes such as the Kuriles. Pilots are required to report atmospheric hazards to their controlling Air Route Traffic Control Center (ARTCC). Pilots should submit PIREPs regarding volcanic activity using the Volcanic Activity Reporting form (VAR; [fig. 5](#)) as a guide. Items 1 through 8 of the VAR are most critical and should be transmitted to air traffic control as soon as possible. If a VAR is not available, pilots should relay enough information to identify the position and type of volcanic activity. The VAR can be found in appendix 10 of the Aeronautical Information Manual.

Rates of Eruption in the Kuriles

Of the 36 active volcanoes listed here, many display ongoing thermal or fumarolic activity (Rybin and others, 2004). Since 2002, small eruptions have occurred at Chikurachki and Ebeko volcanoes on Paramushir Island ([fig. 2](#); McGimsey and others, 2005; McGimsey and others, 2008) and at Chirinkotan in the Central Kuriles ([fig. 3](#); Neal and others, 2005).

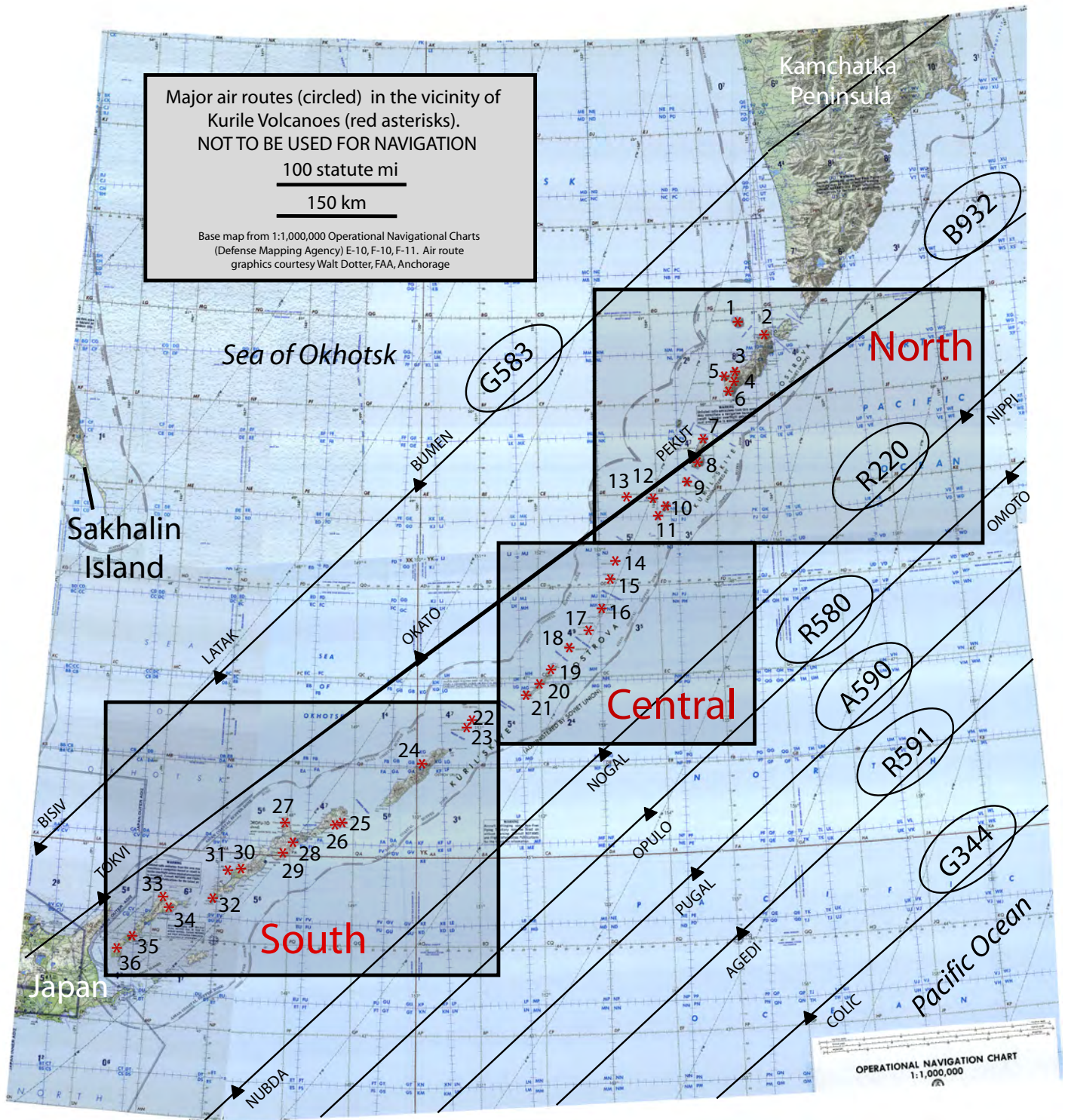
Sarychev Peak in the Central Kuriles ([fig. 3](#)) has been the most active volcano in the Kurile Islands in the last century producing 10 eruptions between 1923 and 1989. The next most active volcanoes include Alaid, Ebeko, and Chikurachki, all in the North Kuriles. In 1981, an eruption at Alaid Volcano distributed ash in a north-south curtain that extended more than 1,500 miles from the northern Bering Sea to the Central Kuriles. A similar eruption cloud today would severely disrupt all Russian Trans East and NOPAC air traffic. Chikurachki erupted five times between 1958 and 1986 and an additional three times between 2002 and 2005 (Siebert and Simkin, 2002-; Rybin and others, 2004). Based on the average number of recorded eruptions from the last century, an eruption has occurred about once every 1.6 years (or 0.6 eruptions per year) in the Kurile Islands. This compares to a similarly calculated Alaskan eruption rate of about two eruptions per year (Miller and others, 1998).

Acknowledgments

The authors thank Walt Dotter and Gail Ferguson of the Federal Aviation Administration for assistance with map figures and content. Reviews by Tom Miller, Marianne Guffanti, and Chris Zimmerman improved the presentation.

References Cited

- McGimsey, R.G., Neal, C.A., and Girina, O., 2005, 2003 volcanic activity in Alaska and Kamchatka: Summary of events and response of the Alaska Volcano Observatory: U.S. Geological Survey Open-File Report 2005-1310, 58 p.
- McGimsey, R.G., Neal, C.A., and Ushakov, S., 2008, 2005 volcanic activity in Alaska, Kamchatka, and the Kuriles: Summary of events and response of the Alaska Volcano Observatory: U.S. Geological Survey Scientific Investigations Report 2007-5269, 92 p.
- 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.
- Neal, C.A., McGimsey, R.G., and Melnikov, D., 2005, 2004 volcanic activity in Alaska and Kamchatka: Summary of events and response of the Alaska Volcano Observatory: U.S. Geological Survey Open-File Report 2005-1308, 67 p.
- Neal, Christina, Girina, Olga, Senyukov, Sergey, Rybin, Alexander, Osiensky, Jeffrey, Hall, Tony, Nelson, Kristine, and Izbekov, Pavel, 2007: Eruption warning systems for aviation in Russia: a 2007 status report: Fourth International Workshop on Volcanic Ash, World Meteorological Organization (WMO) in close collaboration with the International Civil Aviation Organization (ICAO) and the Civil Aviation Authority of New Zealand, Rotorua, New Zealand, 26-20 March, 2007, 8 p.
- Rybin, A.V., Karagusov, Y.V., Izbekov, Pavel, Terentyev, Nikolay S., Guryanov, Vyacheslav B., Neal, Christina, and Dean, Ken, 2004, Status of monitoring active volcanoes of the Kurile Islands: Present and future: *in* Proceedings of the Second International Conference on Volcanic Ash and Aviation Safety. Published by the Office of the Federal Coordinator for Meteorological Services and Supporting Research, Session 2, p. 61-66.
- Siebert, L., and Simkin, T. (2002-). Volcanoes of the World: an Illustrated Catalog of Holocene Volcanoes and their Eruptions: Smithsonian Institution, Global Volcanism Program Digital Information Series, GVP-3, (<http://www.volcano.si.edu/world/>).



Base from a scan of 1:1,000,000 Operational Navigation Charts (Defense Mapping Agency) sheets E-10, F-10, and F-11.

Figure 1. Map of the Kurile Island area and active volcanoes (red asterisks), principal air routes (labeled), navigation fixes (black triangles), and three subsection maps shown in [figures 2, 3, 4](#).

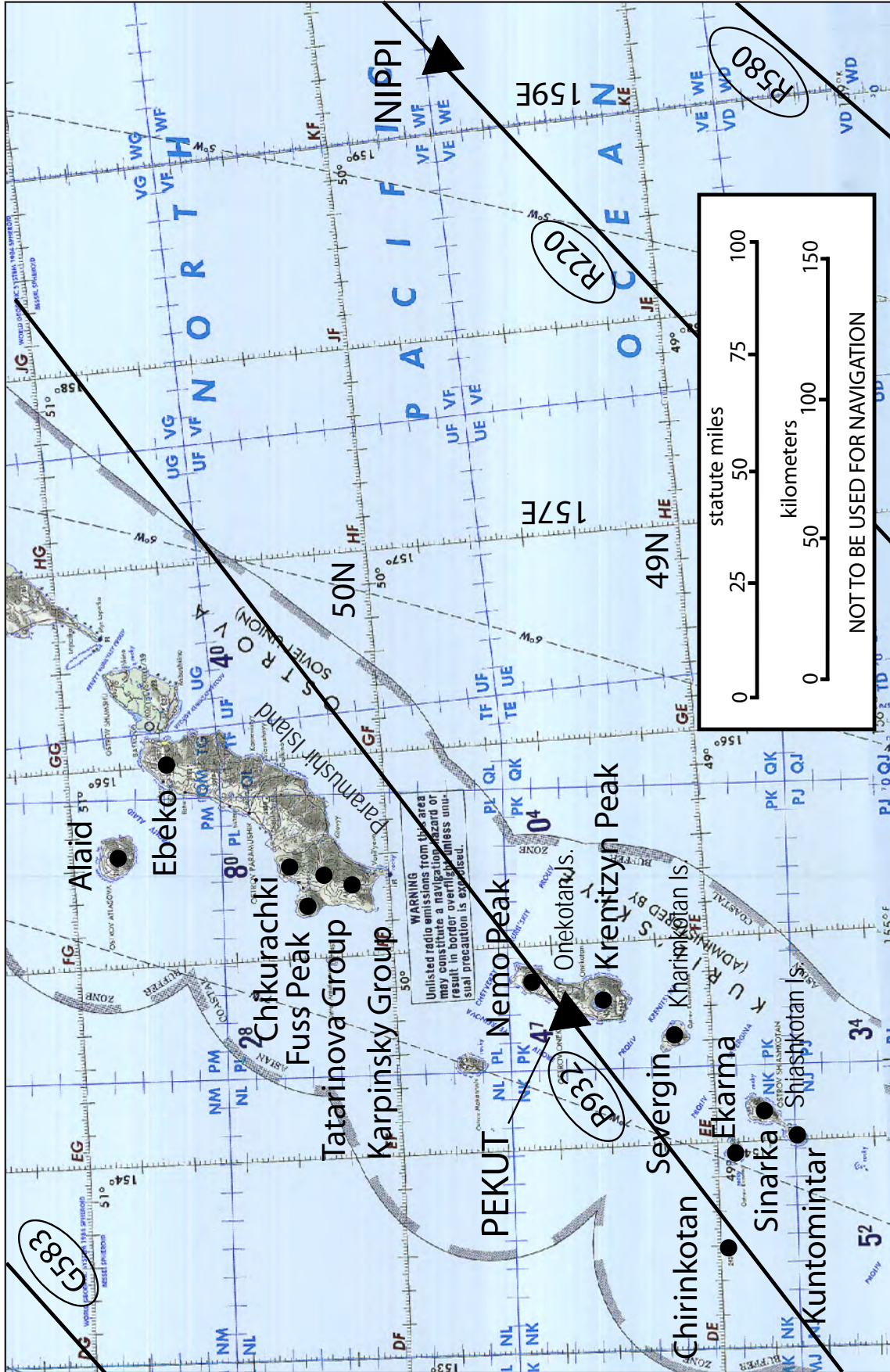


Figure 2. Map of the North Kurile Islands. Active volcanoes shown by black dots. Major islands labeled. Principal air routes and aeronautical fixes shown approximately located.

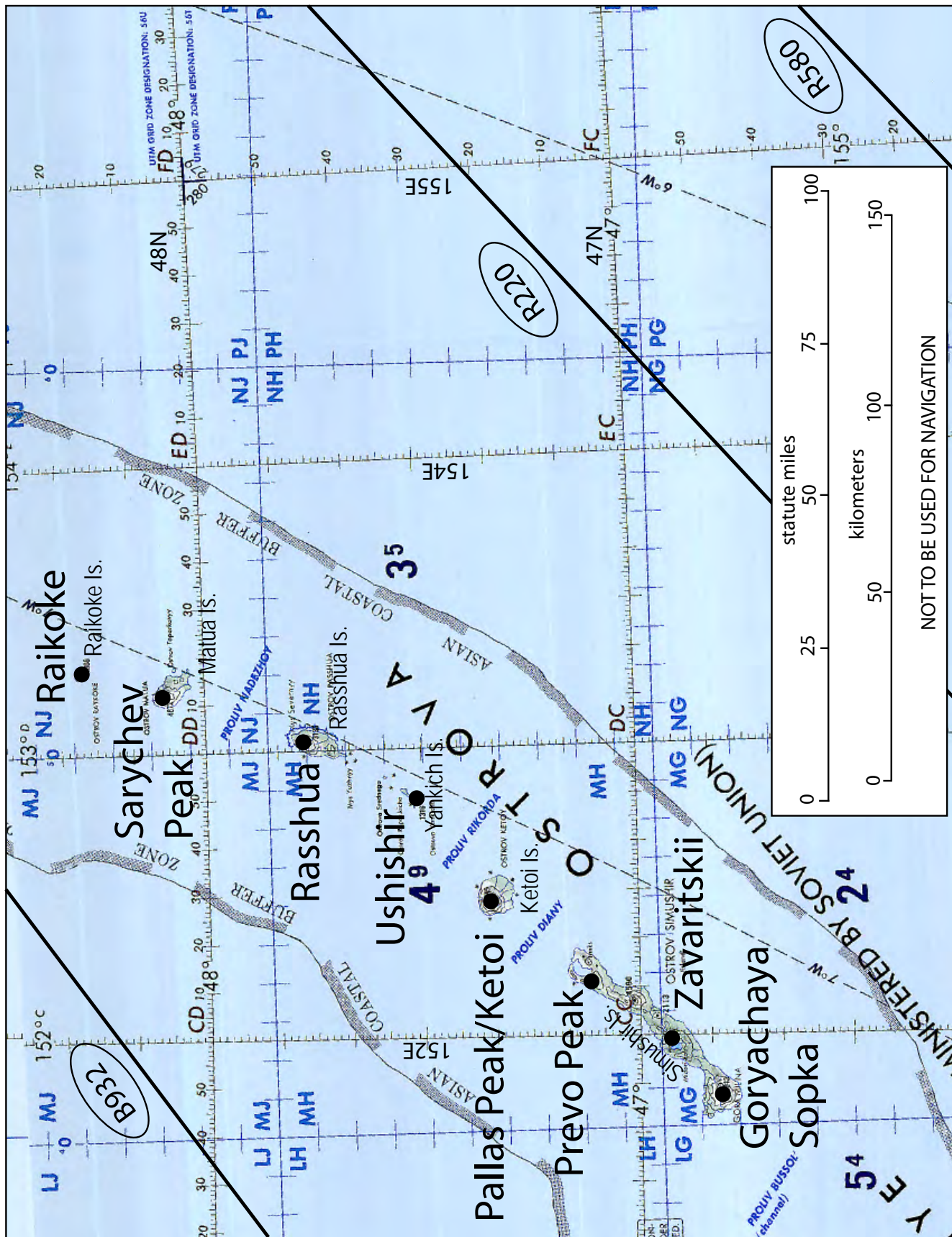


Figure 3. Map of the Central Kurile Islands. Active volcanoes shown by black dots. Major islands labeled. Principal air routes and aeronautical fixes shown approximately located.

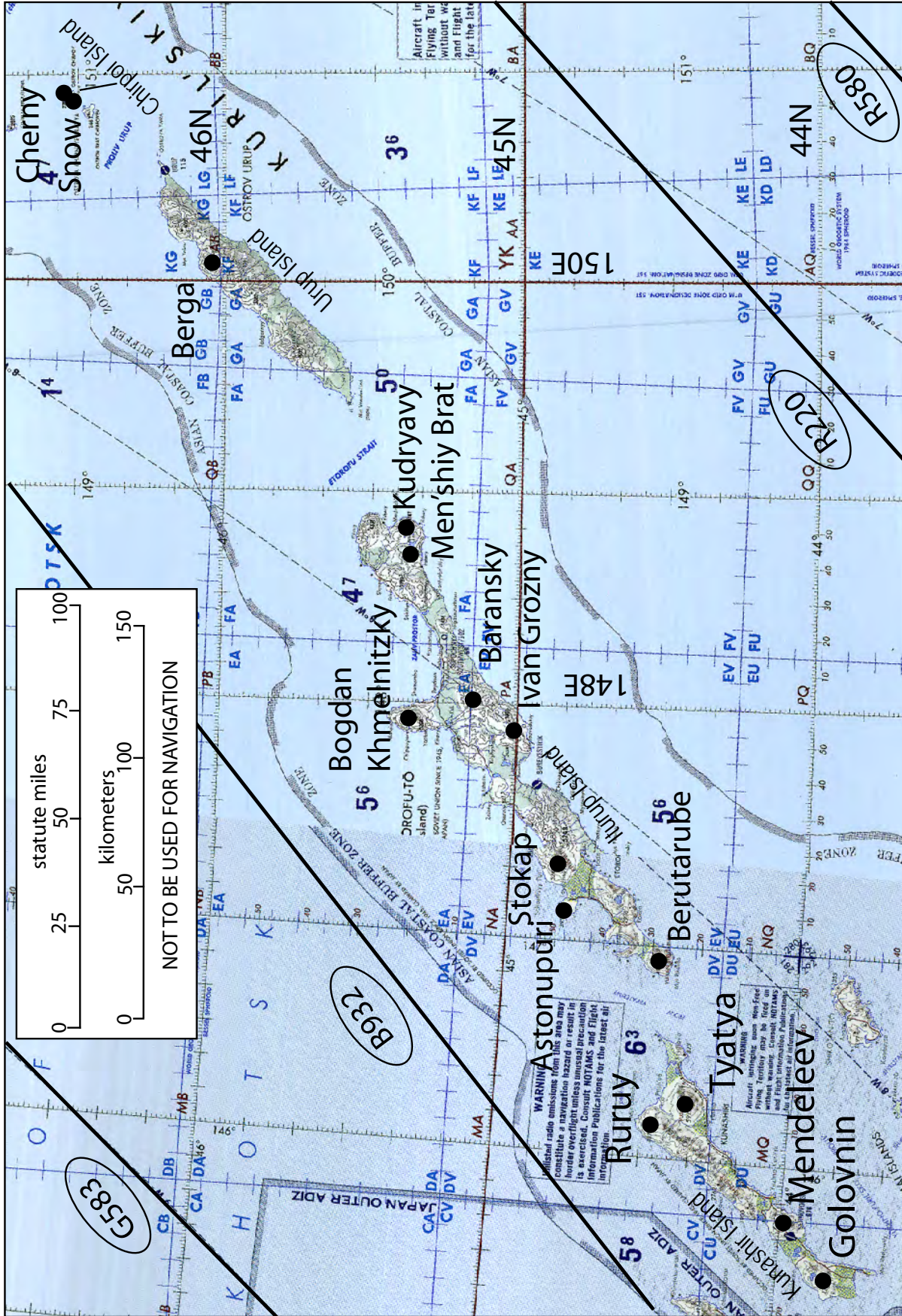


Figure 4. Map of the South Kurile Islands. Active volcanoes shown by black dots. Major islands labeled. Principal air routes and aeronautical fixes shown approximately located.

Volcanic Activity Reporting Form (VAR)

Date _____

SECTION 1 - Transmit to ATC via radio	1. Aircraft Identification	
	2. Position	
	3. Time (UTC)	
	4. Flight level or altitude	
	5. Position/location of volcanic activity or ash cloud	
	6. Air temperature	
	7. Wind	
	8. Supplementary Information <small>(Brief description of activity including vertical and lateral extent of the ash cloud, horizontal movement, rate of growth, etc., as available.)</small>	
Mark the appropriate box(es).		
SECTION 2 - Completed and forward as directed	9. <i>Density of ash cloud</i>	<input type="checkbox"/> wispy <input type="checkbox"/> moderately dense <input type="checkbox"/> very dense
	10. <i>Color of plume or cloud</i>	<input type="checkbox"/> white <input type="checkbox"/> light gray <input type="checkbox"/> dark grey <input type="checkbox"/> black
	11. <i>Eruption</i>	<input type="checkbox"/> continuous <input type="checkbox"/> intermittent <input type="checkbox"/> not visible
	12. <i>Position of activity</i>	<input type="checkbox"/> summit <input type="checkbox"/> side <input type="checkbox"/> single <input type="checkbox"/> multiple <input type="checkbox"/> not observed
	13. <i>Other observed features of eruption</i>	<input type="checkbox"/> lightning <input type="checkbox"/> glow <input type="checkbox"/> large rocks <input type="checkbox"/> ash fallout <input type="checkbox"/> mushroom cloud <input type="checkbox"/> none
	14. <i>Effect on aircraft</i>	<input type="checkbox"/> communications <input type="checkbox"/> navigation system <input type="checkbox"/> engines <input type="checkbox"/> pitot static <input type="checkbox"/> windscreen <input type="checkbox"/> other windows <input type="checkbox"/> none
	15. <i>Other effects</i>	<input type="checkbox"/> turbulence <input type="checkbox"/> St. Elmo's fire <input type="checkbox"/> fumes <input type="checkbox"/> ash deposits
	16. <i>Other information deemed useful</i>	

Figure 5. Volcanic Activity Reporting form for air crews lists the specific observations that are most important to pass along to ATC as soon as safely possible.

8 Active Volcanoes of the Kurile Islands: A Reference Guide for Aviation Users

Table 1. Active volcanoes of the Kurile Islands and relevant location, elevation, and eruption history.

[Data sources: (1) Alexander Rybin, IMGG (working from Russian maps at scales of 1:50,000 and 1:200,000), (2) Siebert, L., and Simkin, T., 2002-, Volcanoes of the World: an Illustrated Catalog of Holocene Volcanoes and their Eruptions; (3) the on-line database of the Global Volcanism Program of the Smithsonian Institution (<http://www.volcano.si.edu/gvp/world/index.cfm>). Some inconsistencies between sources remain unresolved. This list and details will change as new geological information becomes available. **Bold:** Seismically monitored volcanoes. ****Italics:** Last eruption date unknown or highly uncertain. These volcanoes may display thermal/fumarolic activity. **?**, indicates uncertain eruption account]

Map No. (fig. 1)	Name	IAVCEI Catalog No	Location	Year of last historical eruption	Elevation
North Kuriles					
1	Alaid (Atlasova Is.)	0900-39	50°52'N, 155°34'E	1986	7,674'; 2,339 m
2	Ebeko (Paramushir Is.)	0900-38	50°41'N, 156°01'E	2005	3,793'; 1,156 m
3	Chikurachki (Paramushir Is.)	0900-36	50°19'N, 155°28'E	2007	5,956'; 1,816 m
4	<i>Tatarinova (Paramushir Is.)</i>	–	50°18'N, 155°27'E	**	5,020'; 1,530 m
5	Fuss Peak (Paramushir Is.)	0900-34	50°16'N, 155°15'E	1854	5,814'; 1,772 m
6	Karpinsky Group (Paramushir Is.)	0900-35	50°08'N, 155°22'E	1952	4,413'; 1,345 m
7	Nemo Peak (Onkotan Is.)	0900-32	49°34'N, 154°48'E	1938	3,342'; 1,019 m
8	Krenitzyn Peak (Tao-Rusyr Caldera; Onkotan Is.)	0900-31	49°21'N, 154°42'E	1952	4,344'; 1,324 m
9	Severgin (Harimkotan Is.)	0900-30	49°07'N, 154°30'E	2007?	3,796'; 1,157 m
10	Sinarka (Shiashkotan Is.)	0900-29	48°52'N, 154°11'E	2003?	3,064'; 934 m
11	Kuntomintar (Shiashkotan Is.)	0900-28	48°45'N, 154°01'E	1924	2,717'; 828 m
12	Ekarma (Ekarma Is.)	0900-27	48°57'N, 153°56'E	1980	3,842'; 1,171 m
13	Chirinkotan (Chirinkotan Is.)	0900-26	48°59'N, 153°28'E	2004	2,375'; 724 m
Central Kuriles					
14	Raikoke (Raikoke Is.)	0900-25	48°17'N, 153°15'E	1924	1,808'; 551 m
15	Sarychev Peak (Matua Is.)	0900-24	48°06'N, 153°12'E	1976	4,744'; 1,446 m
16	Rasshua (Rasshua Is.)	0900-22	47°45'N, 153°01'E	1957?	3,113'; 949 m
17	<i>Ushishir (Yankich Is.)</i>	0900-21	47°31'N, 152°48'E	**	1,276'; 389 m
18	Ketoi (Pallas Peak; Ketoi Is.)	0900-20	47°20'N, 152°29'E	1960	3,248'; 990 m
19	Prevo Peak (Simushur Is.)	0900-19	47°01'N, 152°07'E	1914	4,462'; 1,360 m
20	Zavaritzi (Simushur Is.)	0900-18	46°55'N, 151°57'E	1957	2,050'; 625 m
21	Goryachaya sopka (Simushur Is.)	0900-17B	46°50'N, 151°45'E	1944?	2,923'; 891 m
South Kuriles					
22	Cherny (Chirpoi Is.)	0900-15	46°31'N, 150°52'E	1857	2,047'; 624 m
23	Snow (Chirpoi Is.)	0900-15	46°31'N, 150°52'E	1982	1,296'; 395 m
24	Berga (Kolokol Group, Urup Is.)	0900-12	46°03'N, 150°04'E	2007?	3,215'; 980 m
25	Kudryavy (Medvezhi; Iturup Is.)	0900-10	45°23'N, 148°50'E	1999	3,235'; 986 m
26	<i>Men'shiy Brat (Iturup Is.)</i>	0900-10	45°23'N, 148°47'E	~400 yrs BP	1,847'; 563 m
27	Chirip cluster (Bogdan Khmelnitzky; Iturup Is.)	0900-09	45°23'N, 147°55'E	1860?	5,131'; 1,564 m
28	Baransky (Iturup Is.)	0900-08	45°06'N, 148°01'E	1951	3,717'; 1,133 m
29	Ivan Grozny (Iturup Is.)	0900-07	45°01'N, 147°52'E	1989	3,802'; 1,159 m
30	<i>Stokap (Iturup Is.)</i>	–	44°50'N, 147°20'E	**	5,361'; 1,634 m
31	Atsonupuri (Iturup Is.)	0900-05	44°48'N, 147°08'E	1932	3,953'; 1,205 m
32	<i>Berutarube (Iturup Is.)</i>	0900-04	44°27'N, 146°56'E	1812	4,003'; 1,220 m
33	<i>Ruruy (Kunashir Is.)</i>	0900-032	44°27'N, 146°08'E	**	4,872'; 1,485 m
34	Tyatya (Kunashir Is.)	0900-03	44°27'N, 146°15'E	1973	5,968'; 1,819 m
35	Mendeleev (Kunashir Is.)	0900-02	43°59'N, 145°44'E	1977	2,910'; 887 m
36	<i>Golovnin (Kunashir Is.)</i>	0900-01	43°51'N, 145°30'E	~1,900 yrs BP	1,775'; 541 m

Table 2. Important web sites that are sources of information about Kurile Volcanoes.

Organization	Web Site
Tokyo Volcanic Ash Advisory Center	http://ds.data.jma.go.jp/svd/vaac/data/index.html
Anchorage Volcanic Ash Advisory Center	http://vaac.arh.noaa.gov/
Washington Volcanic Ash Advisory Center	http://www.ssd.noaa.gov/VAAC/washington.html
NOAA Alaska Aviation Weather Unit Alaska FIR SIGMETs	http://aawu.arh.noaa.gov/aawuapps/sigmetgs.php
NOAA National Weather Service Aviation Weather Center	http://adds.aviationweather.gov/airmets/
Kamchatka Volcanic Eruptions Response Team	http://www.kscnet.ru/ivs/kvert/current/index_eng.php
Alaska Volcano Observatory	http://www.avo.alaska.edu/activity/

This page intentionally left blank.

Manuscript approved for publication, April 17, 2008

Prepared by the USGS Publishing Network,

Bobbie Richey

Linda Rogers

Sharon Wahlstrom

For more information concerning the research in this report, contact the

Director, Alaska Science Center

U.S. Geological Survey

4210 University Drive

Anchorage, Alaska 99508

<http://alaska.usgs.gov>

