

U.S. DEPARTMENT OF THE INTERIOR  
U.S. GEOLOGICAL SURVEY

**Notification procedures for Kamchatka volcanic eruptions:  
A case history of Sheveluch volcano, April, 1993**

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## Introduction

The Kamchatka Peninsula in the Russian Republic hosts 30 active volcanoes along an 850-km-long arc (Fig. 1). These volcanoes comprise some of the largest volcanoes along the Pacific rim and average 3 to 5 eruptions a year (Fedotov and others, 1991). An additional 40 active volcanoes in the Kurile Islands south of Kamchatka marks the offshore continuation of this volcanic arc towards Japan.

Prevailing winds (Fig. 2) often carry airborne ash from these eruptions (Kirianov, 1992) into the numerous international North Pacific air routes that lie offshore and parallel to the Kamchatka Peninsula. Of more concern, however, is a newly designated air route, Kamchatka One, which crosses the southern part of Kamchatka (Fig. 2) near several active volcanoes.

Members of the Alaska Volcano Observatory (AVO)<sup>1</sup> and the Institute of Volcanic Geology and Geochemistry (IVGG) began discussions in 1991 on problems which volcanic ash from Kamchatka eruptions posed to aircraft. Several lectures and many formal and informal meetings were held on this topic at the IVGG and at the Elizovo airport near Petropavlovsk-Kamchatsky. In addition, two Russian volcanologists (Drs. Vladimir Kirianov and Ivan Melekestsev) attended the Volcanic Ash/Aircraft Symposium in Seattle in July, 1991 and presented papers on this topic.

As a further outgrowth of these discussions, the Kamchatkan Regional Government in the spring of 1993 funded a project designed to monitor active Kamchatkan volcanoes through seismic, acoustic, and physical volcanology studies. The goal of this project is to understand, predict, and report volcanic eruptions. The Kamchatkan Volcanic Eruption Response Team (KVERT) was formed composed chiefly of scientists from the IVGG in Petropavlovsk-Kamchatsky but including members of the Institute of Volcanology (IV), mostly seismologists; Vladimir Kirianov is the project chief for KVERT.

## Notification Procedures

In March, 1993, an agreement was reached between KVERT and AVO for AVO communication channels to be used to disseminate information from KVERT because of communication problems currently existing in the Russian Far East. AVO has developed extensive communication links and notification procedures (including the use of a simple color code depicting the status of activity) to alert government agencies, the airline industry, and the public of volcanic unrest and eruptions in Alaska. Over the past year, AVO and the IVGG have established an e-mail link between Petropavlovsk-Kamchatsky and Anchorage. In March 1993, arrangements were completed for improved urgent telephone communications.

The agreed-upon procedure calls for a phone call to be made from Petropavlovsk-Kamchatsky to AVO in the event of a major eruption in Kamchatka and after local Kamchatka government agencies and airlines have been notified by KVERT. Primary and secondary phone contacts have been established and arrangements made for non-business hours notification. Because of the high cost of the call, the length of the message is to be kept to a minimum and follows a rigid format stating the name of the volcano, the time

<sup>1</sup>The AVO is a cooperative program consisting of scientists and facilities of the USGS in Anchorage, Alaska and Menlo Park, California; the Geophysical Institute of the University of Alaska in Fairbanks (UAFGI); and the Alaska Division of Geological And Geophysical Surveys (ADGGS) in Fairbanks.

and type of the activity, height of the eruption column, etc. Follow-up phone calls would then be made by AVO to KVERT.

The reporting of minor activity and routine happenings at Kamchatkan volcanoes will generally be by e-mail and KVERT will release the information by means of an Information Release through AVO to groups outside of Russia specifically interested in Kamchatkan eruptions. KVERT would also use a Level-of-Concern Color Code similar to AVO's (Fig.3). In the event of a major volcanic crisis, KVERT would distribute the information through AVO as a Kamchatka Volcano Update which would have the same wide distribution as that for an Alaskan eruption.

## Case History

This agreement was almost immediately put to the test when, early in April 1993, Sheveluch volcano, the northernmost active volcano in Kamchatka (Fig. 1), began to show signs of seismic unrest after several weeks of minor ash and gas emission. Between April 4-7, earthquake activity increased from 5 earthquakes per day to an almost continuous swarm.

On April 7, KVERT notified AVO by e-mail of the potential for an eruption from Sheveluch and warned that they had placed the Level of Concern Color Code for the volcano at ORANGE. AVO immediately released the KVERT Update through its own FAX and e-mail communication channels to various U.S. government agencies including the FAA, National Weather Service, other volcano observatories, and many airlines.

Several more KVERT Updates and AVO Information Releases received by e-mail were issued by AVO between April 7-21 calling attention to the continuing seismic unrest. On April 21 at 1720 ADT (Alaska Daylight Time), or 0120 UTZ, AVO received a brief phone call from KVERT stating that Sheveluch had a small eruption at 1500 ADT (2300 UTZ) and a much larger eruption at 1530 ADT (2330 UTZ). The height of the eruption column was estimated at 60,000 feet (20 km). The Level of Concern Color Code was now reported by KVERT as RED.

Following standard AVO operating procedures, phone calls were made to the Federal Aviation Administration (FAA), the National Weather Service (NWS), the military, and the Synoptic Analysis Branch of the NWS between 1736 and 1740 ADT. At 1840 ADT, again following agreed upon procedures, AVO called KVERT for additional information. At 1850, a written Update (Appendix 1) was faxed to the more than 60 AVO user groups which include most U.S. domestic and many foreign international air carriers. Further information was received by phone at 1855 ADT and passed on to the FAA, NWS, etc. by phone within minutes of its arrival. Since April 21, further Information Releases and Updates have been disseminated by KVERT through AVO as the situation has warranted.

The formation of KVERT is an important step in the real-time monitoring and reporting of volcanic eruptions in Kamchatka. The response by KVERT and AVO to the Sheveluch eruption was very well-received by AVO's constituency including the FAA, the NWS, the military, the media, and the foreign and domestic air line community. The cooperative communication network established between AVO and KVERT, although still fragile and expensive to operate, should be of considerable mutual benefit in the monitoring and reporting of volcanic eruptions across a large part of the north Pacific rim.

### References Cited

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- Kirianov, V. Yu., 1992, Volcanic ashes in Kamchatka as potential hazards for aviation: Volcanology and Seismology, n. 3, p. 16-30, in Russian. (Also in press, Proceedings Vol., 1st International Symposium on Volcanic Ash and Aviation Safety, T.J. Casadevall, ed., U.S. Geological Survey Bulletin 2047.

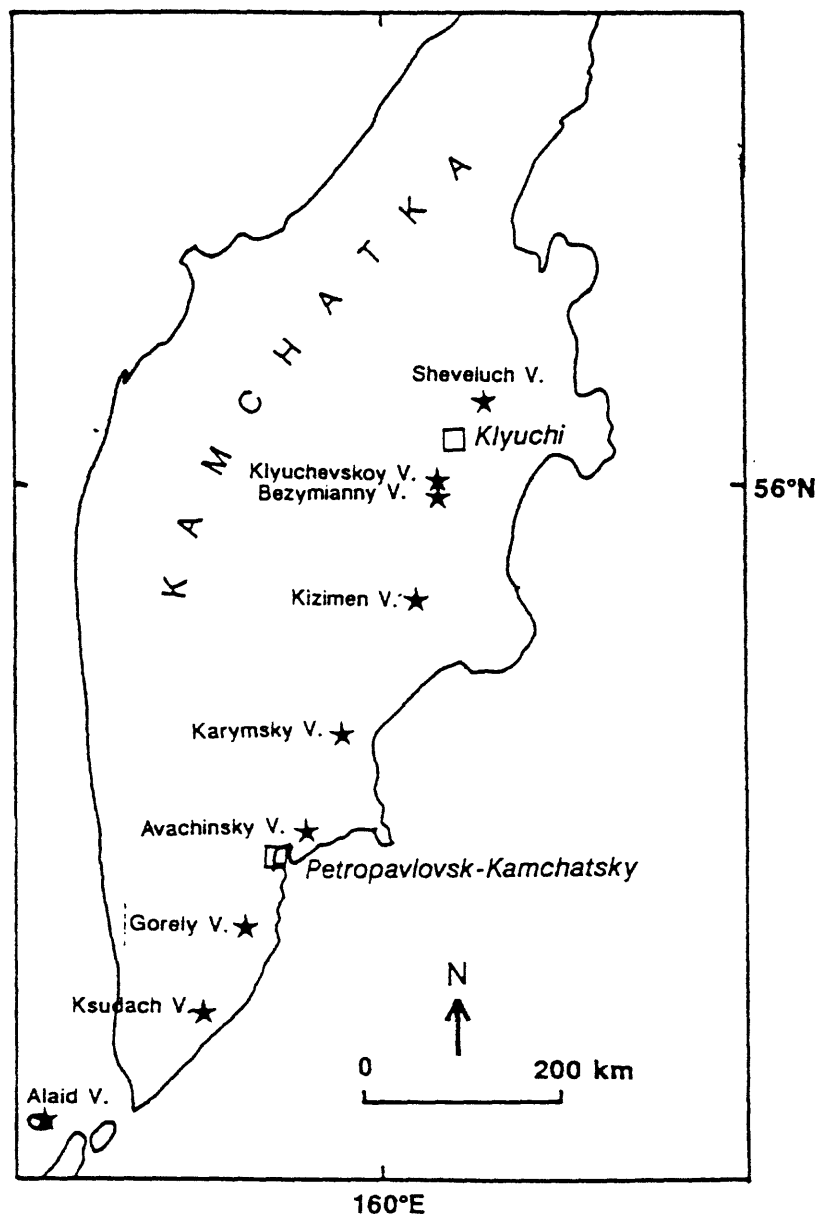


Figure 1. Map of Kamchatka showing location of some of the most active volcanoes.

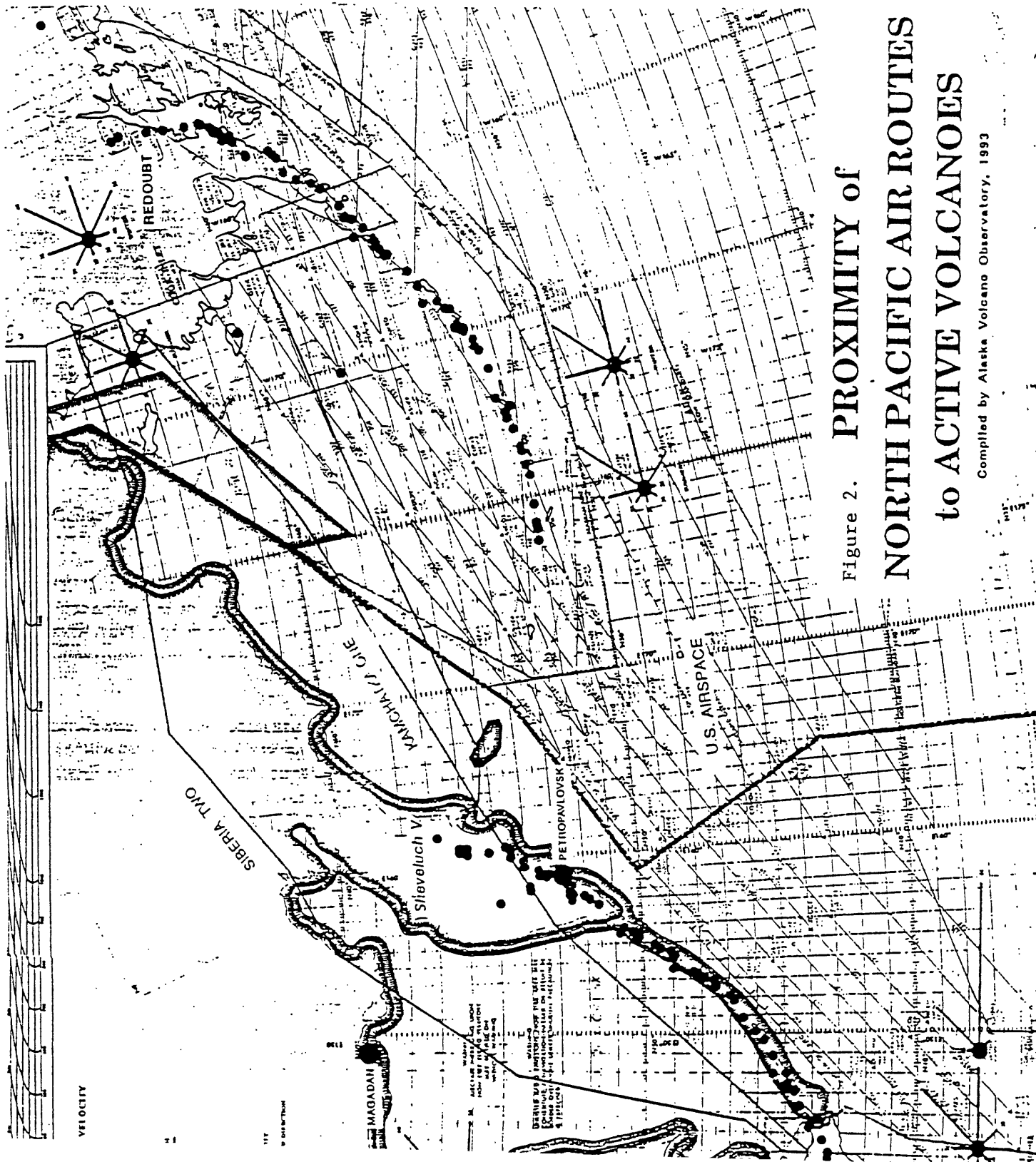


Figure 2. PROXIMITY of  
NORTH PACIFIC AIR ROUTES  
to ACTIVE VOLCANOES

Compiled by Alaska Volcano Observatory, 1993

## APPENDIX 1

## ALASKA VOLCANO OBSERVATORY

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4200 University Drive  
Anchorage, AK 99508

Geophysical Institute  
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AK Division of Geological  
and Geophysical Surveys  
794 University Ave. Suite 200  
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**INFORMATION ONLY:**  
**THIS IS THE COLOR CODE TO ACCOMPANY VOLCANO**  
**UPDATES FROM THE ALASKA VOLCANO OBSERVATORY**

**LEVEL OF CONCERN COLOR CODE**

To more concisely describe our level of concern about possible eruptive activity at Mt Spurr, the Alaska Volcano Observatory has developed a color-coded classification system. The definitions of the various colors have been modified slightly since the 1989-90 eruption of Redoubt Volcano. General descriptions of the type of activity associated with each of the four color codes are included below. The various colors indicating our level of concern about potential eruptive behavior are as follows:

**GREEN :**           Volcano is in its normal "dormant" state.

**YELLOW :**         Volcano is restless.

Seismic activity is elevated. Potential for eruptive activity is increased. A plume of gas and steam rise several thousand feet above the volcano which may contain minor amounts of ash.

**ORANGE :**         Small ash eruptions expected or confirmed.  
Plume (s) not likely to rise above 25,000 feet above sea level.

Seismic disturbance recorded on local seismic stations, but not recorded at more distant locations.

**RED :**            Large ash eruptions expected or confirmed.  
Plume likely to rise above 25,000 feet above sea level.

Strong seismic signal recorded on all local and commonly more distant stations.

Figure 3: AVO Level of Concern Color Code

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INFORMATION RELEASE

Wednesday, April 21, 1993 6:00 pm ADT (0200 GMT)

The following Update was received from K V E R T (Kamchatkan Volcanic Eruptions Response Team )

MT. SHEVELUCH VOLCANO, Kamchatka, Russia  
56° 38' N, 161° 19' E

Wednesday, April 21, 1993

CURRENT LEVEL OF CONCERN COLOR CODE IS RED.

LAST LEVEL OF CONCERN WAS ORANGE.

For definition, see AVO update of 8/24/92

AVO received word at 5:20 PM ADT this evening that Sheveluch Volcano on the Kamchatka Peninsula had erupted at 3:00 PM ADT (2300 GMT) and again at 3:30 PM ADT (2330 GMT). At 4:40 PM ADT (0040 GMT), the height of the eruption column was estimated at 60,000 feet. At 6:45 PM ADT, the ash cloud is moving to the west-southwest over the Kamchatka Peninsula. This information was provided by KVERT (Kamchatkan Volcanic Eruption Response Team).

Sheveluch has a history of violent explosive eruptions and has had numerous short-lived ash eruptions over the past several weeks during which the Level of Concern was raised from YELLOW to ORANGE. Prior to the current activity, small ash-producing eruptions had occurred in 1984 and 1985. The largest historic eruptions yet recorded occurred in 1964 and 1854.

KVERT continues to monitor the volcano closely. AVO will relay additional information as it is received.

PLEASE CONTACT KVERT OR AVO IF YOU HAVE ANY QUESTIONS OR COMMENTS.

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