

## **Kamchatka and North Kurile Volcano Explosive Eruptions in 2015 and Danger to Aviation**

Olga Girina (1), Dmitry Melnikov (1), Alexander Manevich (1), Yury Demyanchuk (1), Anton Nuzhdaev (1), and Elena Petrova (2)

(1) Institute of Volcanology and Seismology FED RAS, Petropavlovsk-Kamchatsky, Russian Federation (girina@kscnet.ru),  
(2) Lomonosov Moscow State University, Geographical faculty, Moscow, Russia

There are 36 active volcanoes in the Kamchatka and North Kurile, and several of them are continuously active. In 2015, four of the Kamchatkan volcanoes (Sheveluch, Klyuchevskoy, Karymsky and Zhupanovsky) and two volcanoes of North Kurile (Alaid and Chikurachki) had strong and moderate explosive eruptions. Moderate gas-steam activity was observing of Bezymianny, Kizimen, Avachinsky, Koryaksky, Gorely, Mutnovsky and other volcanoes. Strong explosive eruptions of volcanoes are the most dangerous for aircraft because they can produce in a few hours or days to the atmosphere and the stratosphere till several cubic kilometers of volcanic ash and aerosols. Ash plumes and the clouds, depending on the power of the eruption, the strength and wind speed, can travel thousands of kilometers from the volcano for several days, remaining hazardous to aircraft, as the melting temperature of small particles of ash below the operating temperature of jet engines.

The eruptive activity of Sheveluch volcano began since 1980 (growth of the lava dome) and is continuing at present. Strong explosive events of the volcano occurred in 2015: on 07, 12, and 15 January, 01, 17, and 28 February, 04, 08, 16, 21-22, and 26 March, 07 and 12 April: ash plumes rose up to 7-12 km a.s.l. and extended more 900 km to the different directions of the volcano. Ashfalls occurred at Ust'-Kamchatsk on 16 March, and Klyuchi on 30 October. Strong and moderate hot avalanches from the lava dome were observing more often in the second half of the year. Aviation color code of Sheveluch was Orange during the year. Activity of the volcano was dangerous to international and local aviation.

Explosive-effusive eruption of Klyuchevskoy volcano lasted from 01 January till 24 March. Strombolian explosive volcanic activity began from 01 January, and on 08-09 January a lava flow was detected at the Apakhonchich chute on the southeastern flank of the volcano. Vulcanian activity of the volcano began from 10 January. Ashfalls occurred on 11 and 28 January, and 07 February at Kozyrevsk; and on 21 and 27 January, 05, 11, and 13-16 February at Klyuchi. Paroxysmal phase of the eruption displayed on 15 February: explosions sent ash up to 8 km a.s.l. during five hours, ash plumes drifted for about 1000 km mainly to the eastern directions of the volcano. A thermal anomaly began to noting at satellite images again from 28 August; and it was registering time to time till 31 December. Aviation color code of the volcano was Yellow on 01-11 January; Orange from 11 January to 15 February; Red on 15 February; Orange from 15 February to 25 March; Yellow from 25 March till 06 April; Green on 06-14 April; Yellow on 14-18 April; Orange on 18-26 April; Yellow from 26 April to 05 May; Orange on 05-13 May; Yellow from 13 May to 20 July; Green from 20 July to 28 August; Yellow from 28 August to 31 December. Activity of the volcano was dangerous to international and local aviation.

Karymsky volcano has been in a state of explosive eruption since 1996. The moderate ash explosions of this volcano were noting during the year, ash plumes rose up to 5 km a.s.l. and extended more 300 km mainly to the eastern directions of the volcano. Aviation color code of the volcano was Orange during the year. Activity of the volcano was dangerous to local aviation.

Explosive eruption of Zhupanovsky volcano began on 06 June, 2014, and finished 30 November, 2015. Explosions sent ash up to 8-11 km a.s.l. on 07-08 and 25 March, 12 July, and 30 November; and in the other days – up to 3.5-6 km a.s.l. Ash plumes extended for about 1200 km mainly to the eastern directions of the volcano. In the periods from 26 January to 06 February, 09-15 February, 23 February – 01 March, from 25 March to 03 April, from 04 April to 20 May, from 21 May to 08 June, from 16 June to 12 July, from 15 July to 27 November, the volcano was in a state of relative calm. The culminations of the 2014-2015 eruption of the volcano were explosions and collapses of parts of Priemys active cone on 12 and 14 July, and 30 November, 2015. Aviation color code of the volcano was Orange from 01 January to 16 May; Yellow from 16 May to 08 June; Orange from 08 June to 19 July; Yellow on 19-20 July; Green from 20 July to 27 November; Orange from 27 November to 10 December; Yellow on 10-17 December; and Green on 17-31 December. Activity of the volcano was dangerous to international and local aviation.

The eruptive activity of Chikurachki volcano lasted on 15-19 February. First explosions sent ash up to 7.5 km a.s.l., but later ash plumes drifted on the height about 3-4 km a.s.l. from the volcano. Aviation color code of the volcano was Orange during 16-22 February, and Yellow on 22-26 February. Activity of the volcano was dangerous to local aviation.

The intensive thermal anomaly over Alaid volcano was detecting at satellite images from 01 October till 31 December. Aviation color code of the volcano was Yellow during this time. A strong gas-steam activity of the volcano sometimes was observing. Activity of the volcano was dangerous to local aviation.