## 2015-2016 ACTIVITY OF KAMCHATKAN AND NORTHERN KURILES VOLCANOES (RUSSIA) AND DANGER TO AVIATION

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There are 36 active volcanoes in Kamchatka and Northern Kuriles with several of them being continuously active. In 2015-2016, four of the Kamchatkan volcanoes (Sheveluch, Klyuchevskoy, Karymsky, and Zhupanovsky) and two volcanoes of Northern Kuriles (Alaid and Chikurachki) had strong and moderate explosive eruptions. Moderate gas-steam activity was observed at Bezymianny, Kizimen, Avachinsky, Koryaksky, Gorely, Mutnovsky, and other volcanoes.

Strong explosive eruptions are the most dangerous for aircrafts because they can send to atmosphere up to several cubic kilometers of volcanic ash and aerosols during a few hours or days. Ash clouds can propagate for thousands of kilometers away from a volcano remain in the air for several days, and pose a continuous threat to aircrafts, as the melting temperature of ash particles is below operating temperatures of jet engines.

The eruptive activity of *Sheveluch volcano* resumed in 1980 and is continuing at present. In 2015 strong explosive events at Shiveluch occurred on January 7, 12, and 15; February 1, 17, and 28; March 4, 8, 16, 21-22, and 26; April 7 and 12. Each time ash plumes rose up to 7-12 km a.s.l. and extended for more than 900 km to different directions from the volcano [3]. Ashfalls occurred in Ust'-Kamchatsk on March 16, and in Klyuchi on October 30. In the second half of 2015 and early 2016, an intensive growth of the northern block of lava dome was observed, accompanied by strong and moderate hot avalanches. Aviation color code of Sheveluch was Orange during 2015-2016. Activity of the volcano was dangerous to international and local aviation.

Explosive-effusive eruption of *Klyuchevskoy volcano* lasted from January 1 to March 24, 2015 [1]. Strombolian explosive volcanic activity began on January 1, 2015. On January 8-9 a lava flow was detected at the Apakhonchich chute on the SE flank of the volcano. Vulcanian activity of the volcano began on January 10. Ashfalls occurred on January 11 and 28, and on February 7 in Kozyrevsk, as well as on January 21 and 27, on February 5, 11, and 13-16 in Klyuchi. Paroxysmal phase of the eruption occurred on February 15 when continuous series of explosions sent ash up to 8 km a.s.l. during five hours of eruptive activity. Ash plumes drifted for about 1000 km mainly to the east from the volcano. A thermal anomaly was observed in satellite images again on August 28 and it was registered time to time till December 31. Aviation color code of the volcano was Yellow during January 1-11; Orange during January 11 – February 15; Red on February 15; Orange during February 15 – March 25; Yellow during March 25 April 6; Green during April 6-14; Yellow during April 14-18; Orange during April 18-26; Yellow during April 26 – May 5; Orange during May 5-13; Yellow during May 13 – July 20; Green during July 20 – August 28; Yellow during August 28 – December 31, 2015. Next Strombolian explosive eruption began on March 3, 2016 and continues at the time of this writing. Volcanic explosions send bombs up to 500 m above the volcanic crater. The volcano sometimes produces strong gas-steam plumes containing small amounts of ash. Aviation color code of the volcano is Yellow at present. Eruptive activity of Klyuchevskoy poses a continuous threat to international and local aviation.

*Karymsky volcano* has been in a state of explosive eruption since 1996. Moderate ash explosions at Karymsky volcano were observed during 2015-2016 with ash plumes rising up to 5 km a.s.l. and extending for more than 300 km mainly to the east from the volcano [3].

Aviation color code of the volcano was Orange. Activity of the volcano was dangerous to local aviation.

Explosive eruption of *Zhupanovsky volcano* began on June 6, 2014, and continues in unstable regime at present time. In 2015, explosions sent ash up to 8-11 km a.s.l. on March 7-8 and 25, July 12, and November 30; and up to 3.5-6 km a.s.l. on other days [3]. Ash plumes extended for about 1200 km mainly to the east from the volcano. During January 26 - February 6, February 9-15, February 23 – March 01, March 25 - April 03, April 4 to May 20, May 21 – June 8, June 16 – July 12, and July 15 – November 27 the volcano was in a state of relative quiescence. The activity culminated in explosions and flank collapses of Priemysh active cone on July 12 and 14, and November 30, 2015. Aviation color code of the volcano was Orange from January 1 to May 16; Yellow from May 16 to June 8; Orange from June 8 to July 19; Yellow on July 19-20; Green from July 20 to November 27; Orange from November 27 to December 10; Yellow on December 10-17; and Green on December 17-31. In 2016, explosions sent ash up to 8-10 km a.s.l. on January 19, 21, and 24, February 5, 7, 9, and 12, and on March 24 [2]. Ash plumes extended for about 600 km in different directions from the volcano. Aviation color code of the volcano was Orange from January 19 till April 13, and then Yellow till present. Activity of the volcano was dangerous to international and local aviation.

The eruption of *Chikurachki volcano* occurred on February 15-18, 2015 and March 28-31, 2016. In 2015, ash plumes rose up to 7.5-8 km a.s.l. and extended for nearly 280 km to the west and to the east of the volcano [3]. In 2016, ash plumes rose up to 4 km a.s.l. and extended for about 570 km to the NE, south, and SW from the volcano. Aviation color code of the volcano was Orange during February 16-22, Yellow on February 22-26 in 2015; Yellow on March 29 – April 05 in 2016. Activity of the volcano was dangerous to local aviation.

The intensive thermal anomaly at *Alaid volcano* was observed in satellite images from October 1, 2015 [3], till present. In 2016, strong gas-steam plumes containing ash rose up to 3 km a.s.l. on March 03, from March 30 till April 1 (simultaneously with eruption at Chikurachki Volcano), and on April 9. Aviation color code of the volcano was changed to Yellow on October 1, 2015, and then to Orange on March 3, 2016. The volcano remains at Orange at present. Activity of the volcano was dangerous to local aviation.

References

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