

The 1996 Surtseyan Type Eruption in Karymskoye Intracaldera Lake, Kamchatka, Russia

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On January 2-3, 1996 a surtseyan type eruption with a discharge rate of basaltic magma of ~10 millions kg/s occurred in Karymskoe caldera lake. Initial water depth above the eruption vent was ~50 m. Characteristics of the deposits together with analyses of videotape of several explosions have allowed us to model the eruptive events. Initial vent-clearing phreatic explosion(s) ejected blocks of country rocks (up to 3 m diameter) to distances up to 1.3 km. Then followed 10 to 20 hours of phreatomagmatic Surtseyan activity (100-200 outbursts of water-gas-pyroclastic mixture to heights up to 1 km, with initial velocities of 110 m/s). The eruption slugs collapsed back into the lake producing base surges (runout up to 1.3 km; average velocity 12.5 m/s). The eruptive cloud rose to a convective height of 3 km. The eruption ended with the ejection of scoria crust bombs (specific basaltic bombs with dense core and scoriaceous crust). Juvenile pyroclasts comprise 95% of the eruption deposits. These are poorly to moderately vesicular basaltic particles (SiO_2 52-53%; vesicularity 7-63%, mean 34%) shaped by a combination of vesiculation of magma and magma-water interaction. Erupted pyroclasts (0.047 km^3) formed a partially submerged tuff ring composed of parallel layers of moderately to poorly sorted lapilli ash and ash lapilli (Md from -3.9 phi to 0.6 phi; Inman sorting from 1.5 phi to 3.2 phi), each 10-60 cm thick. They were deposited by water-rich base surges that originated from collapses of Surtseyan type slugs. More widespread hazards of the eruption were tsunamis and lahars. At distances less than 1.3 km from the crater, base surges and ballistics were very destructive.