LECTURE

Kamchatka: volcanic wilderness

Summary of lecture presented to the Society on Saturday 14th October 2000 by Dr Tony Waltham, of Nottingham Trent University.

The Kamchatka peninsula, on the east coast of Russia, has a line of active volcanoes over the plate boundary where the Pacific Ocean floor is subducted beneath the continental plate of Siberia. It is the link between the volcanoes of Alaska and the Aleutians with those of Japan and the Kuriles.

Petropavlosk is the only town on Kamchatka. It stands against Avacha Bay, a magnificent natural harbour that is the home of Russia's Pacific fleet of nuclear submarines. Consequently Kamchatka was a closed area through the long years of the cold war, and its volcanoes were little known - except for the occasional major eruptions (of Bezymianny in 1956, and Tolbachik in 1975). The wane of the Russian military has now made visits to Kamchatka possible for westerners, and some volcanoes near Petropavlovsk are now accessible.

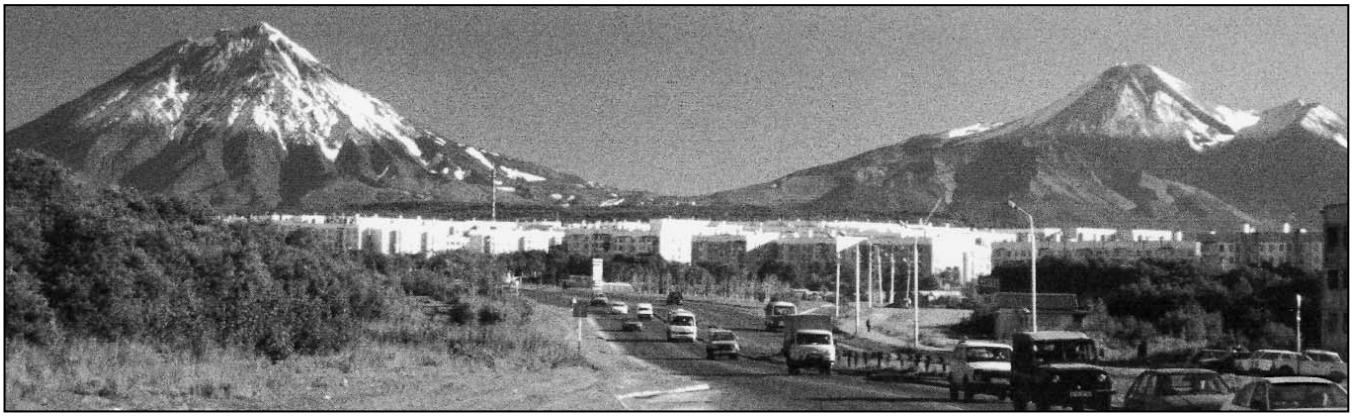
The twin cones of Koryaksky and Avacha rise directly above the back of Petropavlovsk. Both are classic andesite volcanoes with explosive eruption habits. About 30,000 years ago, the flank of Avacha failed, causing an enormous lateral blast towards the bay. The associated debris avalanches left boulder-grade deposits that are 150 m thick beneath parts of the modern city. Koryaksky is a comparable volcano, 3456 m high, currently dormant with only summit fumaroles and its last pyroclastic flows 45 years ago. A flank collapse is likely some time in the future, and will destroy a huge urban area. Avacha has its old open-sided crater now almost filled by a symmetrical cone. A walk to the top, 2741 m above the bay, provides a spectacular but energetic hike. Its crater was filled with lava in 1991, but fumaroles and solfataras are still active.

North of Petropavlovsk, the Valley of Geysers is Kamchatka's big tourist site, cut into the perimeter of the Uzon caldera, deep within the Kronotsky Nature Reserve of immaculate tundra. It usually pulls in about 50 visitors a day - which is two helicopter-loads on the only way of getting there (short of walking for a week). Boardwalk trails lead past a host of geothermal features. The Fountain Platform is a splendid bank of steaming geyserite with more than 100 geothermal vents - cyclic geysers, continuously fountaining spouters and simple fumaroles. It is claimed as the world's greatest concentration of geysers, but none erupts to more than a few metres high. Not far from it, the Velikan (Giant), Bolshoi (Big) and Malyi (Small) Geysers erupt to heights of 25, 10 and 8 m respectively. Cycle times on the steamy Bolshoi and the oblique fountain of Malyi are short enough that visitors can rely on seeing at least one eruption on their fly-in visit. The Valley probably ranks as the world's number two geothermal area at present (but it is a long way behind Yellowstone). An added bonus to the visit is the fly-past of Karimsky, a perfect andesitic cone whose Strombolian eruptions are so frequent that the helicopters circle the summit until it performs.

South of Petropavlovsk, Gorely is a classic basaltic volcano. Parasitic cones and old aa flows drape a broad shield that sits inside a shallow caldera, and its deep summit craters contain a cold one with icebergs from a small crater glacier, and a hot lake with steaming acidic water. Next to Gorely, Mutnovsky is a huge complex andesitic volcano. Its summit is swathed in glaciers, but the western slope is broken by a caldera that has its lower wall breached by a deep snow-floored gorge. The walk into this is magnificent. Walls of coarse pyroclastics are laced with dykes, and the caldera floor has glaciers spreading across it from the summit. These melt away just short of the caldera wall where they encounter geothermal heat. Steam jets and boiling mud pools lie in front of the ice, and steam plumes from deep crevasses belie more hidden fumaroles. A flank crater produces a steam plume hundreds of metres high from a wall fizzing with fumaroles and solfataras. Its last eruption was in 1960, and (until its next) it provides a splendid volcanic wilderness.

Literature

Waltham, T., 2000. Geyser watching. *Geology Today*, **16**, 97-101.
Waltham, T., 2001. A guide to the volcanoes of southern Kamchatka, Russia. *Proc. Geol. Assoc.*, **112**, 67-78.



Koryaksky (left) and Avacha (right) seen above the outskirts of Petropavlovsk. The modern cone of Avacha sits inside the incomplete rim that remains after its ancient flank collapse.