Kronotzk ignimbrites in Kamchatka.

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In the areas of present-day recent volcanicity on Kamchatka we find a development of baked pyroclastic rocks of a dacitic and rhyolite-dacitic composition, which are determined by their structural and geological features as ignimbrites. Everywhere these rocks are associated with large calderas or with tecto-volcanic depressions and are usually accompanied by subsequent depositions of rhyolitic pumices.

One of the places where ignimbrites are most widely developed is the area of Kronotzk volcanoes on the eastern coast of Kamchatka. The basaltic strato-volcano Uzon was the centre, which produced the most intense effusions of ignimbrites. As a result of these eruptions it became a caldera. Ignimbrite covers traceable to distances over 50 km in all directions from Uzon are found only in the lower parts of the old relief (Kronotzk lake depression) and in the valleys of previously existing rivers. The sheets are characterized by columnar jointing indicating their cooling after a hot state.

The following sequence is persistent in the section of Kronotzk ignimbrites (upwards):

1) On the surface of the old relief there is a cover of black hyaloclastic products or of *ignimbrite breccia* consisting of dark brown (microscopically) dacitic glass particles, which characterize the beginning of ignimbrite eruptions. The farther from the eruption centre, the smaller the size of glassy particles.

2) After a break expressed locally in deposits of pebbles and boulders, the second sheet of ignimbrites comes in into the sequence; a light gray welded *fiamme-ignimbrites,* containing considerable quantities of black (microscopically brown) lenses of dacitic glass. At the base of thick deposits the welded-tuff-ignimbrite becomes compact, heavy, lava-like and exhibits features of pneumatolytic alterations and crystallization. At greater distances the amount and size of welded-tuffs decreases and this type of ignimbrite acquires the outlook of the subsequent tuff variety.

3) Separated by a new interval the section ends in a third thicker sheet of light gray *ignimbritic tuff*, which consists of welded particles of light-brown rhyolite-dacitic glass and tiny fragments of basaltic lavas (10-15 %). The thickness of the sheet in the depression of Kronotzk lake exceeds 50 m.

4) Ignimbrite deposits in the area of eruption are overlain by accumulations of rhyolitic pumices and by flows and domes of rhyolites.

The brown glass of ignimbrites in all three sheets displays obvious signs of fusion of the old basaltic material from the body of the volcano. A change in glass colour from dark brown to colourless and of its composition from dacitic to rhyolitic in the process of caldera-forming eruptions indicates a regressing melting and contamination in the body of the volcano of basic lavas by a hot unhydrous rhyolitic magma.

This conclusion permits to imagine the mechanism of caldera-forming eruptions and the origin of Uzon ignimbrites as follows:

Rize from the deeper parts of the Earth's crust of a very hot unhydrous rhyolitic magma into the root of the old basaltic volcano. During a lengthy period a melting process and assimilation of the hard basaltic material is taking place and absorbtion from it of water and gas of a meteoric origin. At a certain stage in the new hybrid dacitic magma a limit of a grown internal pressure is reached, which ends in a gigantic eruption.

Judging by the character of the material deposited ignimbrite eruptions proceeded in lengthy continuous explosion blasts, which were similar to jets from a nozzle of an impulse jet engine. These jets were melting and widening the effluent channel and were emitting tremendous quantities of hot gas and melt emulsion. Clouds of this material being heavily loaded were streaming the ground as gas flows and were rapidly moving along the lower parts of relief and along the valleys leaving in them their glass suspension. At the moment of deposition it was of a very « fluffy » consistency and of great thickness.

The main cavity of Uzon caldera was formed by three such ignimbrite eruptions, which gradually bored and widened the crateral vent and not by collapses over the exhausted focus of the volcano.

Data on Kronotzk ignimbrites confirms the correctness of FENNER's, MARSHALL's and ZAVARITZKY's deductions on the formation of ignimbrites from incandescent emulsion-gas clouds.