

The Selsund Pumice and the old Hekla crater.

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In historical time Hekla has mainly produced intermediate tephra and lava with a silica composition of about 55% SiO₂. In the first phases of the larger eruptions tephra of up to 63 % SiO₂ was erupted. All eruptions started with a Plinian phase but a large part of the magma was erupted as lava. Only two historical eruptions producing silicic magma are recorded; in 1104(H1) and 1158 AD. The latter one produced the only known acid Hekla lava.

In prehistoric time basaltic andesite production was much less, at least in the form of lava flows. Large eruptions producing mainly rhyolitic or dacitic tephra occurred with long time intervals, 7600(H5), 4200(H4), 3900(HSv) and 3000(H3) years ago (cal. BP). These eruptions were all highly explosive producing a large amount tephra; no lava flows are known. The historic acid eruption H1 was smaller, and the 1158 eruption much smaller. As a long repose period usually preceded the large eruptions, such events are not expected in the near future. Increased frequency of intermediate eruptions indicate that silicic magma is not residing beneath Hekla volcano at present.

The HSv eruption which produced the Selsund pumice 3900 years ago, was in many respects different from the other silicic eruptions. The repose period before this eruption was short compared to the other large eruptions, only 300 years elapsed from the second biggest Hekla eruption, H4. HSv started with a Plinian phase carrying tephra aeriially, but most of the tephra travelled as a water saturated debris flow or lahar. The lahar inundated about 100 km² of lava fields, grazing land, and brushwood southwest of Hekla, traveling almost 30 km as a debris flow and all the way to the seashore as a diluted water flood. The thickness of the deposit is estimated at 3 m on the average, which gives a volume of 0.3 km³ for the deposit. This requires up to 0.2 km³ of water, of which a source has to be explained.

It has been shown that the flow left the slope of the volcano by a narrow path between two hyaloclastite ridges. This limited proximal distribution of the flow, along with a rather warm climate, exclude melting of ice as a source for the water. There was most likely a lake there at this time, probably a crater lake formed in the last phase of the H4 eruption. The eruption probably started through this crater as a phreatoplinian phase; later the eruption column collapsed into the lake, subsequently the crater rim broke and initiated the debris flow.

This was probably the main location of the large silicic eruptions prior to HSv; H5 7600 years ago and H4 4200 years ago. The Hekla ridge itself is mostly formed by intermediate lava flows both during the well known historical period and also in frequent intermediate eruptions recorded after H3, 3000 years ago (Bryndís G. Róbertsdóttir, 1992). Therefore, the Hekla mountain was considerably lower 4000 years ago. According to the course of events in the H4 eruption (Ingunn M. Þorbergsdóttir, 1999), increased explosivity in the last phase of the eruption could have resulted in formation of the crater which later filled with water. There are no indications that the eruptions H3 and H1(1104 A.D.) originated at this location, and the silicic lava erupted in 1158 AD originated at a similar site to the present main crater of Hekla.

References:

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