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Contrasting styles during a “Plinian” eruption: the example of Askja 1875.

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The 1875 eruption of Askja caldera in Iceland was one of very few large historical eruptions to include both Plinian and phreatoplinian phases. Previous workers have subdivided pyroclastic layers belonging to the main eruptive phase into: Layer B – a subplinian fall deposit, Layer C – products of phreatomagmatic fall and pyroclastic density currents, and Layer D a voluminous Plinian phase. We focus here on proximal products of Layer D, which are very coarse grained (including pumice bombs up to 7 m diameter), with 4 obvious sub-units defined by a white-grey/black color zonation.

Similarities exist between layers D1and D3 and layers D2, and D4. D1 and D3 are white non-welded pumice falls. D2 and D4 are black sometimes welded deposits with markedly more restricted dispersal. Units D1 and D3 can be traced around the caldera rim and D3 can be traced outwards to form the widespread medial-distal D fall.

The distribution of D2 deposits is localized along the northern rim and in the south west corner of the caldera. Along the northern rim, D2 deposits vary locally in thickness, up to 70 cm and grade markedly over short lateral distances in the degree of welding. D2 at the south west corner has a maximum thickness of 6 meters and is most densely welded where thickness is maximum. The distribution of D4 is restricted to the northern rim of the caldera, where the deposits show rapid changes in thickness over short lateral distances and welding and thickness decrease sharply passing outward from the caldera such that welding is absent more than 150 m from the rim exposures. D4 and D2 are restricted to close to the caldera rim and their dispersal is thus markedly less than that of typical plinian sheets, and more closely resembles that of deposits of low intensity fountaining eruptions.

The marked contrasts described above appear to be caused by a combination of shifts

in vent position and changing eruptive style. The latter clearly included both periods of a high stable convective plume and other intervals characterized by intense but lower fire fountaining.