

The ~400 yr B.P. caldera-forming eruption Half Cone Volcano, Aniakchak Caldera, Alaska

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Half Cone is the eviscerated remnant of a post-caldera composite volcano on the northwest floor of Aniakchak caldera (Alaskan Peninsula). Half Cone volcano last erupted ~400 yr BP (age constrained by two ^{14}C dates from below the climactic fall deposit), forming a partially filled caldera ~1 km in diameter. The pyroclastic deposit produced, informally known as the Pink pumice and Brown pumice, was studied at 60 sites, where thicknesses of all tephra layers and the five coarsest lithics from each tephra horizon were measured. The base of the ~400 yr BP deposit (Pink pumice) is composed of a coarse, pumiceous dacitic Plinian fall (63-67 wt.% SiO_2). The Pink pumice is a well-sorted deposit of richly vesicular, oxidized pumices. Pink pumice thickness decreases from ~4 m in the Half Cone walls, to ~1 m at a distance of 10 km to the north, to <1 m 60 km to the north. Above the Pink pumice in deposits located high in the Half Cone walls lie a sequence of highly oxidized, cliff-forming agglutinate horizons that are interbedded with black, densely welded units. Above that, the uppermost units in Half Cone wall alternate between very coarse, pumiceous fall deposits and poorly sorted, lithic-rich pyroclastic deposits. Medially and distally located deposits show the Pink pumice abruptly gradational with the Brown pumice layer, a well sorted, brown-colored, andesitic pumice fall (58-62 wt.% SiO_2). The collapse of Half Cone is marked by the violent deposition of tens of meters of debris from pyroclastic density currents that overlies the Brown pumice fall layer, partially filling the northern and central sectors of the caldera floor, and impacted and surmounted the north Aniakchak caldera rim. The effusion of a dacite (64-65 wt.% SiO_2) lava flow characterized by crystal aggregates dominated by plagioclase and orthopyroxene, referred to as the Cow Flop flow, was emplaced in the newly formed caldera basin, some unknown amount of time after the eruption. Using isopach maps and field measurements, we estimate that 1- 1.3 km^3 of magma was deposited as pyroclastic fall deposits, 0.10- 0.17 km^3 of magma was erupted as pyroclastic density currents, 0.01-0.02 km^3 of magma was erupted as the Cow Flop lava flow, resulting in a total erupted volume of magma between 1.1 and 1.5 km^3 (~4 km^3 bulk volume). The dispersal patterns of the Pink and Brown pumice falls were different, whereas the Pink pumice was deposited along a relatively narrow dispersal axis of approximately N30°E, the Brown pumice was deposited more extensively along a dispersal axis of approximately N60°E. The aerial distribution of lithic sizes in the Pink and Brown pumice layers was contoured into isopleths in order to estimate the column height of the eruptive plumes. During most of the deposition of the Pink pumice, the eruptive plume was 12-15 km in height (13-16 km *asl*), whereas the eruptive plume was 22-26 km in height (23-27 km *asl*) during the deposition of the Brown Pumice. This suggests that at the time of the ~400 yr BP eruption, wind direction at lower altitudes was towards the NNE, while wind directions at higher altitudes was ENE.