Assembly of monotonous basaltic andesite magmas at Momotombo volcano, Nicaragua, and the 2015–2016 eruption

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The 2015-2016 eruption at Momotombo volcano, Nicaragua, followed a quiescent period of 110 years. The eruption had explosive and effusive phases, producing crystal-rich (31 vol.% phenocrysts) basaltic andesite (54.2 wt.% SiO_2) lava and ash. Apart from the timing of the 2015-2016 and 1905 eruptions at Momotombo, very little has been characterized about this system. Here we present a geochemical comparison between historic Momotombo eruptive products in an effort to conceptualize the evolution of the underlying magmatic system. Bulk rocks show a narrow compositional range (53.0–55.5 wt.% SiO_2), very similar to the 2015-2016 products. Matrix glasses from tephra samples are significantly more evolved, with 55.8-63.1 wt.% SiO_2, defining a liquid line of descent. Trace element relationships, particularly cerium anomalies (Ce/Ce*) and Ba/La ratios, imply that recent Momotombo magmas were derived from a similar source and underwent a repetitive, pre-eruptive evolutionary process. We find that magma differentiation is dominated by fractional crystallization of plagioclase and clinopyroxene as evidenced by europium anomalies (Eu/Eu*) and Dy/Dy* ratios. Low volatile contents (1.5 wt. % H_2O, 200 ppm CO_2) of plagioclase- and pyroxene-hosted melt inclusions from the 2015 ash suggest that the shallow crust (<100 MPa) is the stage for the final assembly of eruptible magma. Eruption occurs following multiple injections of magma, as indicated by chemical zoning in pyroxene crystals. Intriguingly, Momotombo's basaltic andesite volcanism dramatically contrasts with the explosive eruptions of crystal-poor dacite at the neighboring Monte Galán, a caldera that cross-cuts the northwestern flank of Momotombo but that must have an independent plumbing system. This work bears implications for the generation and mobilization of monotonous basaltic andesite magmas and reactivation mechanisms of quiescent mafic arc volcanoes.