Emplacement of complex fall deposits from heterogeneous magmatic systems: the bimodal Cuicuiltic member at Los Humeros caldera, Mexico

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The Cuicuiltic Member of Los Humeros Caldera, in the eastern Mexican Volcanic Belt is a Holocene, ca. 6 m thick fallout deposit formed by alternated layers of trachydacite and basaltic-andesite pumice and scoriae that record the youngest explosive activity from the caldera. It has been subdivided in nine units (C1 to C9) according to its textural and chemical characteristics. The distribution of its internal units is varied across the caldera; felsic layers dispersal is almost radially from the center, whilst the mafic units are clearly from the SE and NE sectors. The Cuicuiltic eruption was fed primarily from one central vent and subsequently from at least three independent but simultaneously active basaltic vents located few kilometers apart. The eruption began with a trachydacite explosive phase depositing pristine gray pumice in the center of the caldera (C1 and C2), followed by short period of mixing accompanied by basaltic andesite pumice (C3). After a short repose period, at least two andesitic to basaltic fissure vents went off ejecting pumice and scoria along a weakness structural plane, parallel to the nested Potreros caldera scarp (C4 and C6). These eruptions turned less energetic with time until reaching Strombolian style. However, trachydacite pumice (C5) erupted in between the basaltic-andesite scoriae and kept falling intermittently accompanied by mingling (banded pumice-bearing layer C7). Simultaneous activity from the central felsic vent and local basaltic episodes deposited layer C8. The end of the eruption is marked by deposition of a pumice layer from a probably hybridized magma chamber. Preliminary studies evidence a heterogeneously zoned magma reservoir with two high-melt zones, one trachydacite and the other a discrete basaltic, both interacting at some point during the eruption. This unusual type of bimodal and coeval volcanism has been little documented. However, the phenomenon is probably more common than what expected, but unfortunately pristine exposures, contrasting compositions and detailed stratigraphic sections are necessary to document such changes within a paleosol-bounded eruptive unit. The nearly simultaneous eruption or in short succession, of magmas of contrasting composition reveals the complexity of the magmatic system. The significance of recognizing the multiple vent nature for this eruption translates on a much better understanding of the Los Humeros magmatic behavior over time and remarks the importance of thoughtful field relations when studying complex fall deposits from caldera volcanoes.