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Multi-isotope systematics of the AD ~500-700 El Astillero and El Pedregal monogenetic cluster (Michoacán, Mexico)

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El Astillero and El Pedregal volcanoes are part of a recently discovered monogenetic cluster formed between AD 500-700 in the southwestern part of the Michoacán Guanajuato Volcanic Field (MGVF) [1], only 25 km to the south of the historic Paricutin volcano. The ~6 year-long eruption emitted ~0.5 km^3 (DRE) of magma, covering an area of ~15 km^2, and was characterized by a change from explosive (Strombolian) to effusive activity, accompained by a shift in the active vents; the eruption first formed El Astillero scoria cone and its associated tephra and lava field, and continued with the emplacement of the El Pedregal lava field.

The bulk magma composition (major and trace elements) of the volcanic products from the cluster show a continuous progressive change from basaltic andesite to andesite (e.g., SiO_2: 52.08- 59.07%), followed by a final reversal to intermediate compositions in the last two emitted lava flows from El Pedregal. Sr-Nd and high-precision Pb isotopes likewise changed systematically as the eruption progressed. The volcanic products become more radiogenic $^{87}Sr/^{86}Sr$ (0.70388-0.70403) and Pb isotope signatures ($^{206}Pb/^{204}Pb$:18.6319-18.6709, $^{207}Pb/^{204}Pb$: 15.5834-15.5981, and $^{208}Pb/^{204}Pb$: 38.3764-38.4497) and less radiogenic $^{143}Nd/^{144}Nd$ ratios (0.512836-0.512742) with time, also followed by a distinct reversal to intermediate isotopic compositions for the last two emitted flows from El Pedregal.

These geochemical characteristics could be explained by involvement of open-system fractional crystallization in the petrogenesis of the two monogenetic volcanoes. Notably, these isotopic signatures exhibit similar trends to those of the historic eruptions in the MGVF, including the late tephras and primitive lavas from Paricutin, and the high-MgO Jorullo lavas, which are interpreted as mantle-derived signatures [2,3]. We are currently pursuing Os and Hf isotope analyses to further evaluate the relative role of crustal assimilation versus mantle source heterogeneity in the evolution of this volcanic cluster.

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