Delimitation of volcanic conduits in intraplate settings in Northeastern Mexico:coupling geophysics, structural geology and geochemistry.

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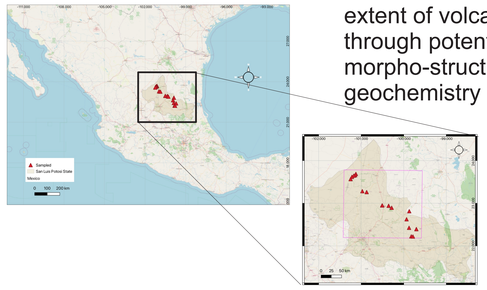
What is the origin of the volcanic conduits intraplate in San Luis Potosi?

Introduction: Intraplate volcanism occurs within tectonic plates and is associated either with hotspots or with the development and propagation of fractures induced by intraplate stresses, and thinning of the crust. In northeastern Mexico, specially in San Luis Potosi (SLP), Plio-Quaternary intraplate volcanic activity has been documented, linked to normal faulting (Aranda-Gómez et al., 2005).

Objetive:
Determine the geometry and extent of volcanic conduits through potential methods, morpho-structural analysis and geochemistry



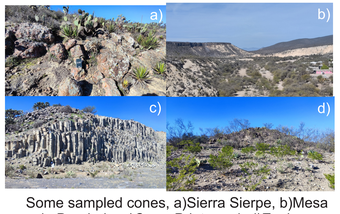
Study area with intraplate cones sampled in the state of San Luis Potosi.

Metodology:

1° Gravimetric and magnetic data

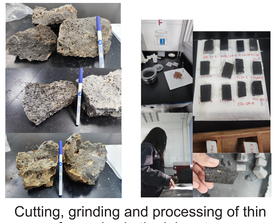
Location	Direction line	Intensity	Inclination	Decline
Mante city Tamaulipas	North - South East - West	44380 / 44196 nT	51°10' / 51°13'	06°49' / 06°33'
Victoria city Tamaulipas	North - South East - West	44893 nT	52°21'	06°23'
Matehuala San Luis Potosi	North - South	447883 nT	51°52'	07°31'
San Luis Potosi San Luis Potosi	North - South	44703 / 44143 nT	50°27' / 50°45'	07°57' / 07°32'

2° Fieldwork



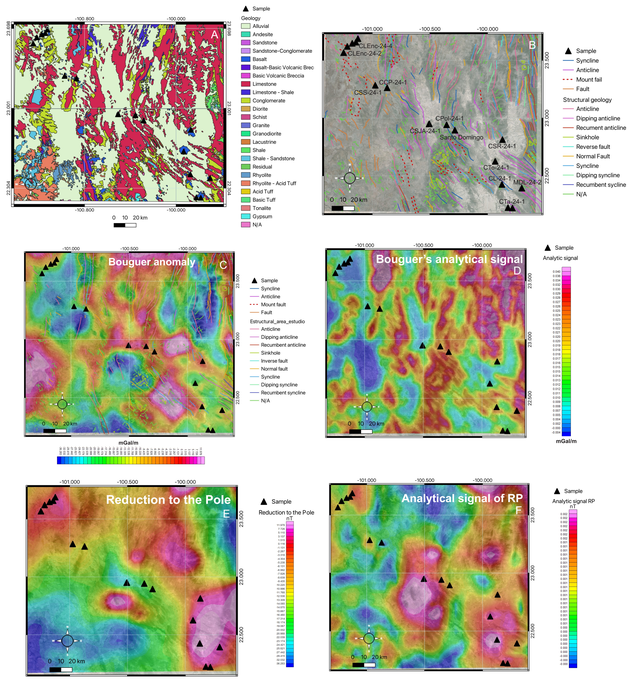
Some sampled cones, a)Sierra Sierpe, b)Mesa de Don Luis, c)Cerro Prieto and, d)Encinos.

3° Laboratory analysis

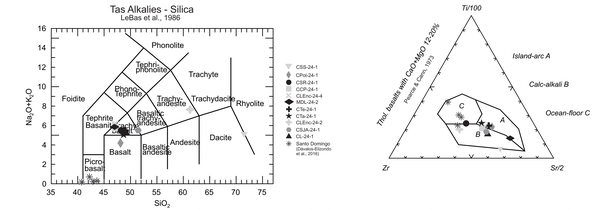


Cutting, grinding and processing of thin of samples in the laboratory.

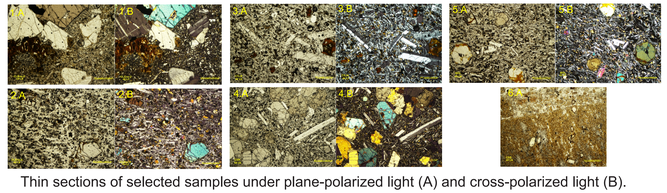
Results:



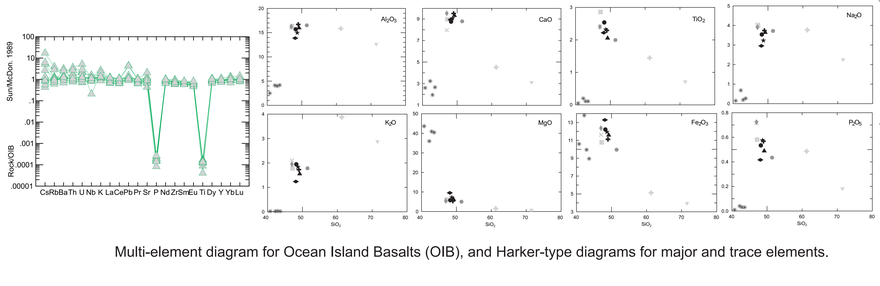
Geologycal map (A), structural map (B), gravity maps (C y D), and magnetic maps (E y F).



Alkalis-silica classification diagram and tectonic discrimination diagram for basalts.



Thin sections of selected samples under plane-polarized light (A) and cross-polarized light (B).



Multi-element diagram for Ocean Island Basalts (OIB), and Harker-type diagrams for major and trace elements.

Conclusions:

Based on studies by authors such as Aranda-Gómez, Luhr, and the SGM, the estimated age of the monogenetic cones ranges from 0.35 to 1.68 Ma for nine of them, whereas Cierro Prieto is approximately 13.2 Ma, and Sierra Sierpe is around 97.5 Ma.

The Bouguer anomaly reveals high values in trachybasaltic monogenetic complexes, highlighting structural fault orientations: N-Sin the NW region and NW-SE in the SE region.

The analytical signal applied to the Bouguer anomaly indicates high-density sedimentary materials, while porosity measurements in the monogenetic cone samples confirm low densities, resulting in medium to low anomaly values.

Magnetic susceptibility analysis from reduction to the pole confirms the presence of basaltic materials rich in magnetite and other ferromagnesian minerals.

The analytical signal applied to the reduction to the pole identifies three main anomalies associated with remnants of magma ascent conduits.

Nine of the studied cones exhibit a trachybasaltic composition, characterized by a high content of olivine, clinopiroxene, alkaline feldspar, and calcic plagioclase phenocrysts. Sample CLEn-24-2 presents a trachyandesitic composition, containing amphibole, pyroxene, and sodic plagioclase crystals. Sample CSS-24-1 is dacitic in composition, featuring pyroxene, amphibole, and biotite crystals.

Based on the Sun and McDonough (1989) diagrams, anomalies in Ti and P suggest fractional crystallization and the presence of magnetic minerals.

Major elements suggest fractional crystallization, showing a positive trend for K2O, TiO2, MgO, Fe2O3, and P2O5, and a negative trend for Al2O3, CaO and Na2O.

Trace elements indicate magma evolution primarily driven by the fractionation of plagioclase, mafic minerals, and accessory phases.

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