

Miocene-Pliocene Volcanism in the Sierra San Francisco, Central Baja California Peninsula, Mexico

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Volcanic rocks of the Sierra San Francisco (SSF), in northern Baja California Sur, Mexico, record post-subduction magmatism related to slab melting and slab window opening. The range is composed of andesitic and dacitic domes, mafic lavas, and volcanoclastic deposits (debris and block-and-ash-flow, lahar, and fluvial) that constitute the proximal to distal facies of a volcanic field with local eruptive ages that postdate the regional transition from subduction to transtension. Lowest observed volcanic units consist of interbedded and hydrothermally altered mafic lavas, tuff breccias, and andesite/dacite domes. These are overlain by volcanoclastic units and dacite domes that erupted between ~11-10 Ma. Volcanoclastic deposits comprise a section up to 800 m thick, locally flank and dip radially away from domes, and are likely associated with dome collapse. These deposits are unconformably overlain by a series of ~5.5-4.5 Ma Mg-enriched basaltic andesites (bajaites) that typically erupted along NNW-trending normal faults.

Low interbedded mafic lavas are chemically similar to syn-subduction lavas (>15 Ma) SE of the SSF, suggesting a typical subduction supraslab mantle source during waning, late Miocene Farallon plate subduction. ~11-10 Ma dacite domes and debris flow blocks display an adakitic geochemical signature, implying an origin involving late Miocene foundering and melting of the edges of the subducted Farallon plate during the opening of a slab window after the 12.3 Ma transition from subduction to transtension. Adakitic rocks of the SSF and the Santa Clara volcanic field 60 km to the SW may constrain the E-W extent of the slab window. The ~5.5-4.5 Ma bajaites display enriched REE and trace element patterns, potentially resulting from the rise of enriched subslab mantle through the slab window and interaction with supraslab mantle, previously metasomatized by slab melts. Thermal pulses associated with Gulf of California rifting may have provided the heat to generate Mg-rich magmas which ascended along rift-related faults, precluding significant crustal contamination or fractionation, and allowing magmas to retain their primitive character.

Further analysis will elucidate the timing of slab window development and the post-subduction mantle processes that drove the chemical evolution of SSF magmas.

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