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Orthopyroxenite xenoliths hosted in adakitic dacites at Grizzly Peak in the Clear Lake volcanic field, California, record slab melt-mantle interaction

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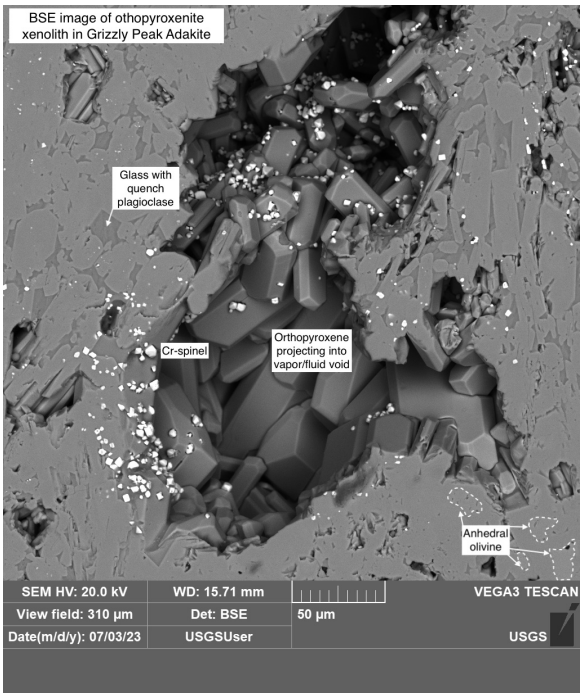

The eastern periphery of the Clear Lake volcanic field in northern California hosts adakitic lava flows ranging in age from ~2.1 to 0.67 Ma. These adakites track the melting of the retreating edge of the Juan de Fuca slab as it migrated northward beneath the region with the passage of the Mendocino Triple Junction, opening a slab window in its wake. The Grizzly Peak adakitic dacite erupted at 1.74 Ma and is exposed as a 2.5 km^2 mesa and creek-incised flow. The bulk composition is strongly adakitic (Sr/Y: 70-120) with ~67 wt.% SiO_2, high-MgO (~5 wt.%), Ni (210 ppm), and Cr (290 ppm). This glassy lava contains high-Ni (< 2500 ppm) oscillatory zoned enstatite (En_{84-94}) and plagioclase (An_{42-56}) phenocrysts. High-Ni (> 9,300 ppm) olivine (Fo_{85-93}) cores are present in some of the enstatite phenocrysts. Orthopyroxenite xenoliths are found dispersed throughout the unit.

The small (<2 cm) orthopyroxenite xenoliths are comprised of >97% very fine (50-100 um) idiomorphic enstatitic orthopyroxene (En_{72-91}), with <1% idiomorphic high-Cr# [100Cr/(Cr+Al) = 60-80] spinel, <2% anhedral olivine (Fo_{82-89}), and rare Fe-Ni sulfide inclusions. Glassy silicic veins (70-77 wt% SiO_2) with quench crystals of Na-rich plagioclase (An_{34}) form a network throughout many of the xenoliths. Some glassy veins host a different population of reacted olivine cores containing aluminum spinel inclusions Al# [100Al/(Cr+Al) = 85-96] rimmed by orthopyroxene with Cr-spinel inclusions. 200-300 um voids with idiomorphic orthopyroxene and Cr-spinel projecting into them are pervasive throughout the xenoliths and likely formed by a fluid or vapor phase that exsolved upon decompression.

The Coast Range Ophiolite accreted terrain underlies this area and exposures of depleted ultramafic rocks including dunites and harzburgites crop out regionally. We interpret the xenoliths to be fragments of the Coast Range Ophiolite lithospheric mantle that has been locally intruded by silicic slab-edge melts to form reaction orthopyroxenites from an olivine-bearing source material. The erupted adakites were likely formed by variably reacting with and melting of this reacted mantle. The oscillatory-zoned enstatite and plagioclase phenocrysts in the adakite record multiple batches of variably mantle-reacted slab melts that aggregated to form the Grizzly Peak adakite flow.