

Seamount subduction and accretion dynamics of the Franciscan complex revealed in the Snow Mountain area (Northern California)

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The Snow Mountain Volcanic complex (SMVC) has been proposed to be a subducted seamount in the Franciscan complex [1]. We reexamined this unit with new fieldwork, petrography, mineral and bulk-rock geochemistry, thermobarometry, and U-Pb geochronology.

We show that the large accumulation of pillow lavas in the SMVC over ~20 x 12 km, with a minimum thickness of 500 m, is the best geological argument in favor of a seamount origin, consistent with bulk-rock geochemistry showing alkaline geochemical signatures with trace element concentrations typical of ocean island basalts. Eruption of this seamount is dated at ~167 Ma by zircon U-Pb geochronology in felsic volcanics.

The whole unit has been affected by high-pressure-low-temperature metamorphism, attested by lawsonite, blue amphibole and sodium clinopyroxene replacing magmatic minerals, and numerous veins containing aragonite, lawsonite, albite or jadeitic clinopyroxene. Temperatures of ~240°C have been constrained by Raman spectroscopy on carbonaceous material in graywacke, while a vein assemblage of quartz, lawsonite, jadeite-48%, and albite allows to define pressure conditions of ~0.7 GPa, compatible with subduction at ~20 km. Detrital zircon geochronology of trench sediments deposited atop the SMVC suggests subduction shortly after 118 Ma.

Deformation of the SMVC was progressively localized above, within and below the seamount during subduction. While some of the deformation is localized within graywacke-hosted thrust faults, a part of it is localized in the basaltic rocks; however, no clear proof of subduction-related earthquake is observed. Numerous metamorphic veins with crack-seal textures are evidence for episodic fluid circulation during subduction.

P-T conditions and metamorphic ages of high-grade blocks above the SMVC and of graywacke-dominated units above and below it have been assessed, allowing to put the subduction of the Snow Mountain seamount in the context of accretion from ~170 to ~100 Ma in this portion of the Franciscan complex.

The combination of eruption and subduction ages of Snow Mountain and other seamount relicts in the Franciscan complex suggests that they possibly belonged to a seamount chain formed