Constraints on the *P-T* conditions and timing of prograde subduction of the Voltri Ophiolite

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The thermal structure of subduction zones places a primary control on the release of volatiles and associated mass transfer during subduction. This is because the timing and conditions of the metamorphic devolatilization reactions that control the release of fluids during subduction are sensitive to pressure, temperature, composition, and deformation.

Yet, while many models for subduction zone metamorphism and associated fluid release assume continuous reequilibration during burial and heating, there is substantial evidence in the rock record for signfiicant deviations from equilbrium. Metamorphic reactions and fluid flow have been documented as both transient and periodic – controlled by factos such as initial fluid availability and deformation (in some cases seismicity). These alternate models have significant consequences for the calculation of geochemical fluxes in subduction zones.

Here, we study mafic eclogites from the Voltri ophiolite to document the sensitivity of both prograde and retrograde metamorphism to fluid availability, local bulk composition, and deformation. Field observations show that eclogites (both Fe-Ti metagabbros and metarodingites) exist as large pods and dikes within variably serpentinized periodite. Within individual pods, eclogites vary from strongly mylonitic to undeformed/coronitic. Despite similar bulk compositions, petrographic and EPMA analysis reveal distinct inclusion assemblages, compositions, and chemical zoning within garnets from the mylonitic and coronitic eclogites, suggesting different garnet forming reactions.

Ongoing work includes 1) thermodynamic modeling to test the sensitivity of these reactions to changes in local bulk compositon and the role of deformation on metamorphic recrystallization, and 2) garnet geochronology to determine the absolute timing of garnet growth.

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