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The timing of eclogite facies metamorphism in the northern Appalachian Mountains based on Sm-Nd garnet and $^{40}Ar/^{39}Ar$ mica geochronology

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The Worcester Mountain Complex (WMC) of northern Vermont, USA contains phengite-garnet-kyanite pelitic schists interpreted to represent Laurentian-derived sediments that underwent subduction zone metamorphism during the Ordovician Taconic Orogeny. Owing to the polymetamorphic history of the Appalachian orogen, metamorphism related to the Taconic Orogeny is often overprinted and obscured by subsequent metamorphic events during the Salinic and Acadian Orogenies. The WMC preserves Taconic mineral assemblages and occurs along strike with blueschist and eclogite facies rocks in the region [1]. It is a key locality to assess the extent and timing of Taconic eclogite facies metamorphism in the northern Appalachian Mountains. We present $^{40}Ar/^{39}Ar$ phengite and biotite data and garnet Sm-Nd isochron ages for meta-pelites within the WMC. The pelitic schists in the WMC contain large (5–10 mm) chemically zoned garnets and abundant fine-grained (0.2–0.5 mm) unzoned garnets that occur in isoclinally folded quartz veins. Thermobarometric data (Ti-in-quartz, Zr-in-rutile, pseudosection modelling) indicates that phengite, fine-grained garnets, and large garnet rims crystallized at eclogite facies conditions. Plateau and total fusion phengite $^{40}Ar/^{39}Ar$ ages range from 466.2 ± 0.4 Ma to 469.5 ± 0.6 Ma and are consistent with a preliminary Sm-Nd garnet ID TIMS isochron age of 471.8 ± 1.6 Ma for the fine-grained garnets. The $^{40}Ar/^{39}Ar$ phengite data provide minimum ages for peak metamorphism which is temporally consistent with estimates for Taconic (ultra) high-pressure metamorphism in the region [1]. Garnet Sm-Nd isochron analyses (in progress) target drilled core and rim fractions of large garnets to determine the timing of prograde amphibolite facies metamorphism recorded by garnet cores and peak metamorphism recorded by garnet rims. $^{40}Ar/^{39}Ar$ biotite data provide evidence for partial resetting with apparent ages of 336.87 ± 21.87 Ma corresponding to the first ~10% of gas released followed by a plateau age of 459.53 ± 0.95 Ma (>50% of gas released). Together, these results can be used to refine tectonic models for the Taconic Orogeny by providing details on the timing of formation, exhumation, and preservation of eclogite facies metamorphic rocks in the Northern Appalachian Mountains.

[1] Gonzalez et al., 2020, *Geology 48,* 947–951.