Tracking the timing of subduction and exhumation using $^{40}Ar/^{39}Ar$ phengite ages in blueschist and eclogite facies rocks (Sivrihisar, Turkey)

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Geochronologic studies of high-pressure/low-temperature (HP/LT) rocks can be used to determine the timing and rates of burial and exhumation in subduction zones by dating different stages of the pressure-temperature history. In this study, we present new *in situ* UV laser $^{40}Ar/^{39}Ar$ phengite ages from a suite of lawsonite blueschist- and eclogite-facies rocks representing different protoliths (metabasalt, metasediment), different structrual levels (within and outside of a high strain zone), and different textural positions (eclogite pod core vs. margin) to understand the timing of these events in an exhumed Neotethyan subduction zone (Sivrihisar Massif, Tavsanli Zone, Turkey). Phengite in the cores of eclogite pods yield ages of 90 – 92 Ma for lawsonite eclogite and 82 ± 2 Ma for retrogressed, epidote eclogites. Eclogite records the narrowest range of ages (10 – 12 m.y.) of any rock type analyzed. Transitional eclogite-blueschist facies assemblages and lawsonite + garnet + phengite veins from eclogite pod margins yield mean weighted ages of ~ 91 Ma, similar to the lawsonite eclogite pod-core age, but record a wider age range (~ 20 m.y.). Blueschists and quartzites record a more variable range of ages that may in part be related to structural position: samples within a high-strain zone at the tectonic contact of the HP rocks with a meta-ultramafic unit have more narrow age ranges (< 20 m.y.) and preserve younger ages, whereas blueschists and quartzites sampled outside of this zone display a larger spread of ages (22 – 38 m.y.) and preserve older ages. Variations in the preservation of $^{40}Ar/^{39}Ar$ ages correlate with the preservation of HP mineral assemblages and quartz c-axis fabrics as well as the effects of deformation. Collectively, these results show that high spatial resolution $^{40}Ar/^{39}Ar$ phengite data record a range of stages of metamorphism during subduction and exhumation, and that *in situ* UV laser phengite $^{40}Ar/^{39}Ar$ ages, when considered in a geologic, petrologic, and structural context, document prograde (subduction) and retrograde (exhumation) stages of this history.