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162-3 - QUANTIFYING RADIATION DAMAGE USING CATHODOLUMINESCENCE, PHOTOLUMINESCENCE, AND RAMAN SPECTROSCOPY ON ZIRCONS FROM THE COAST RANGE OPHIOLITE AND SIERRA NEVADA BASEMENT: IMPLICATIONS FOR THE THERMAL HISTORY OF BASEMENT ROCKS AND THE OVERLYING GREAT VALLEY FOREARC BASIN, NORTHERN CALIFORNIA

Tuesday, October 12, 2021

9:00 AM - 1:00 PM

Oregon Convention Center - Exhibit Hall A

Booth No. 115

Abstract

The collective Franciscan accretionary prism, Coast Range ophiolite (CRO), Great Valley forearc (GVF) basin, and Sierra Nevada batholith document late Mesozoic-early Cenozoic convergence along the western margin of North America. In northern California, basement rock underlying the GVF varies across the basin with the CRO in the west, the Sierra Nevada metamorphic belt and batholith in the east, and accreted island arcs in the north. Parts of the CRO, such as the ophiolite complex exposed at Del Puerto Canyon in central California, record a thermal event that is associated with Late Jurassic magmatism based on zircon U-Pb ages of ~161 Ma and zircon fission-track ages of ~150 Ma. Yet, the spatial and temporal extent of this Late Jurassic magmatic event throughout the CRO is uncertain. Timing of these magmatic and associated thermal events along the western margin of North America during the Mesozoic are primarily constrained using geochronology and thermochronology on igneous rocks. The crystal structure of a mineral such as zircon is damaged during radioactive decay, altering the retention of radiogenic lead and helium, which in turn may influence the determined age. Spectroscopic techniques such as cathodoluminescence (CL), photoluminescence (PL), and Raman spectroscopy provide quantitative characterization of radiation damage and when coupled with geochronology and thermochronology can provide further insight to the timing of magmatism. We use CL, PL, and Raman spectroscopy on zircon from gabbro that is exposed at the surface as part of the upper CRO and granite from the Sierra Nevada basement that was sampled from a borehole to quantify radiation damage in zircon to determine if the measured amount is consistent with the retention of radiation damage following zircon crystallization. Preliminary results indicate radiation damage in zircon calculated using PL and Raman spectroscopy matches the theoretical limit set by the actinide concentration and zircon U-Pb age, implying

that sampled gabbro and granite from the upper CRO and Sierra Nevada basement, respectively, are unannealed. Igneous zircon grains that are unannealed indicate a temperature below the zircon (U-Th)/He partial retention zone and preserve the cooling history of the upper CRO and Sierra Nevada basement since latest Jurassic time.

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Author

R

Mariah Romero
Montana State University

Authors

O

Devon Orme
Montana State University

M

Ryan J. McAleer
U.S. Geological Survey

J

Aaron M. Jubb
U.S. Geological Survey

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THE RELATIONSHIP BETWEEN THE FORMATION AND EVOLUTION OF THE COAST RANGE OPHIOLITE AND GREAT VALLEY FOREARC, NORTHERN AND CENTRAL CALIFORNIA

OLESON, Ethan *and ORME, Devon, Earth Sciences, Montana State University, PO Box 173480, Bozeman, MT 59717-3480*