INTEGRATION OF SM-ND GARNET CHRONOLOGY AND PSEUDOSECTIONS IN METAMORPHIC ROCKS TO UNDERSTANDING OROGENESIS

1STOWELL, H.H. and 1TINKHAM, D.K. 1University of Alabama, Department of Geological Sciences, Tuscaloosa, USA.

Sm-Nd garnet chronology directly dates garnet zone metamorphism; therefore, core and rim ages can identify multi- versus single-stage growth, and for single, estimate growth duration. Integration with thermobarometry allows construction of detailed pressure-temperature-time paths. Results for the high pressure 'loaded' region near the Mt. Stuart Batholith, WA Cascades, indicate postplutonic regional metamorphism. Core and rim ages are indistinguishable and ca. 5 m.y. younger than intrusion ages. Pseudosections are compatible with no significant loading during garnet growth ca. 10 km from the Batholith (supported by elemental exchange barometry on mineral inclusions) and a possible increase of ca. 2-3 kbar in the aureole. Outside the aureole, loading must predate garnet growth; therefore, heating may result from burial. Results for the Alaskan Coast Plutonic Complex, south of Juneau, indicate two events. Core and rim ages differ by ca. 8-34 m.y. reflecting kyanite zone regional followed by a sillimanite zone contact event. Results from near Wrangell, Alaska, constrain the duration of garnet zone metamorphism. Garnet core and rim ages from a polyphase metamorphic pluton pendant are similar and indistinguishable from an igneous cooling age. Therefore, garnet is contact metamorphic and garnet zone metamorphism lasted ca. 1 m.y. Similar contact aureoles, to the west, containing kyanite replacing andalusite were interpreted to indicate a pressure increase. Pseudosections suggest that garnet grew at near constant pressure above andalusite stability, compatible with a fault between aureoles or crustal rotation. Integration of garnet geochronology and pseudosections provides a powerful method for constraining metamorphic pressure-temperature-time paths and evaluating tectonic history.