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PROTEROZOIC METAMORPHISM IN THE TOBACCO ROOT MOUNTAINS, MONTANA: PTT PATH AND 207PB/206PB ION MICROPROBE AGES OF MONAZITE

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There are three suites of Precambrian rocks in the Tobacco Root Mountains (TRM): the Indian Creek Metamorphic Suite (ICMS), the Pony Middle Mountain Metamorphic Suite (PMMMS), and the Spuhler Peak Metamorphic Suite (SPMS). The ICMS and PMMMS are quatzofeldspathic gneiss suites that contain variable amounts of meta-supracrustal rocks. The SPMS contains primarily mafic volcanic rocks and was possibly ocean crust. Metamorphosed mafic dikes and sills (MMDS) that intruded the ICMS and the PMMMS, but not the SPMS, indicate assembly of the terrane after intrusion of the dikes at ~2060 Ma. Textures and mineral assemblages (ky+opx) are consistent with early metamorphism of all rocks at P >1.0 GPa followed by differential re-equilibration on a clockwise P-T path at lower pressures (0.6-0.8 GPa). Partial to complete overprinting of the coarse-textured, high-pressure assemblages, with lower-pressure assemblages and textures (cord+opx & cord+saph symplectites) occurred across the TRM, especially where assisted by the availability of water. The development of these features appears to require nearly isobaric cooling at pressures near 0.8 GPa, followed by nearly isothermal decompression at temperatures near 700°C. The resulting P-T path is believed to be the result of tectonic denudation late in the orogenic cycle. 207Pb/206Pb spot ages of monazites from 30 rocks have been obtained from the UCLA ion probe. Twenty-six samples, including all SPMS samples, have relatively homogeneous age populations. The spot ages from the SPMS samples vary from 1713 to 1786 Ma. In the 4 heterogeneous PMMMS and ICMS samples, some of the grains are age zoned with up to ~1,000 Ma older grain cores. The more homogenous ICMS and PMMMS samples are of two types. Three samples have only young spot ages similar to the SPMS. A second group of 6 samples has spot ages that form an array near 2450Ma. The near absence of 207Pb/206Pb ages older than 1785 Ma in the SPMS and the common occurrence of these ages in monazites from the ICMS and PMMMS are consistent with assembly of the Tobacco Root suites during a prolonged 65 Ma collision event, the Big Sky orogeny, beginning at ~1785 Ma and culminating at ~1720Ma. These results are consistent with a sequence of early Proterozoic events that significantly overprinted an earlier ~2450 Ma orogenic event. This older event modified pre-existing Archean rocks.

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