ION MICROPROBE DATING OF MONAZITE FROM PRECAMBRIAN METAMORPHIC SUITES, TOBACCO ROOT MOUNTAINS, MONTANA

Alexander Webb
Department of Geology, Amherst College
Amherst, MA 01002-5000
aawebb@amherst.edu

The Precambrian rocks of the Tobacco Root Mountains are divided into three metamorphic suites: the Pony-Middle Mountain Metamorphic Suite (PMMMS), Indian Creek Metamorphic Suite (ICMS), and Spuhler Peak Metamorphic Suite (SPMS). The PMMMS and ICMS are dominated by quartzofeldspathic gneisses with sedimentary and igneous protoliths. The SPMS is dominated by various kinds of amphibolite and may represent ocean crust. Mafic sills and dikes (MMDS) intruded the PMMMS and the ICMS at 2100-2000 Ma, but are absent in the SPMS, suggesting juxtaposition of the SPMS with the other suites after the intrusion of the MMDS (Burger et al., 1999). Rocks from all suites record similar pressures and temperatures of 7-9 kbars and 650-750˚C. The ICMS and SPMS contain relict minerals and reaction textures indicating earlier metamorphism at P >10 kbars.

Ages of monazites from seven PMMMS, eight ICMS, and fifteen SPMS samples have been obtained from the UCLA ion microprobe. Four dating systems were utilized: 207Pb/ 206Pb, 232Th/ 208Pb, 238U/ 206Pb, and 235U/ 207Pb. Two to ten spot ages were aquired from one to five monazite grains per sample. Concordia plots for SPMS monazites show an approximate age of 1775 Ma, whereas the PMMMS and ICMS monazites have a generally bimodal age distribution of ~2450 Ma and ~1775 Ma. Some ICMS and PMMMS monazite grains have age zoning, with ~2450 Ma cores and ~1775 rims. The occurance of ~1775 Ma ages in all three suites and presence of significantly older ages only in the PMMMS and ICMS are consistent with the assembly of the SPMS with the supracrustal suites during a 1775 Ma collisional event.

Three PMMMS samples and two ICMS samples record only the ~1775 Ma age; if these may be reinterpreted as displaced slices of the SPMS, then all dated ICMS and PMMMS rocks record the ~2450 Ma metamorphism. This study also examines age distributions on both grain and terrane scales, and relationships between the textural occurance of monazite grains and their ages.