

2003 Seattle Annual Meeting (November 2–5, 2003)

Paper No. 239-12

Presentation Time: 4:15 PM-4:30 PM

PROTOLITH AND TECTONIC SETTING FOR PRECAMBRIAN METAMORPHIC ROCKS, TOBACCO ROOT MOUNTAINS, MONTANA: AN INTEGRATED VIEW

[BRADY, John B.](#)¹, BURGER, H. Robert¹, CHENEY, John T.², HARMS, Tekla A.², MOGK, David W.³, and PECK, William H.⁴, (1) Department of Geology, Smith College, Northampton, MA 01063, jbrady@science.smith.edu, (2) Department of Geology, Amherst College, Amherst, MA 01002, (3) Department of Earth Sciences, Montana State Univ, Bozeman, MT 59717, (4) Department of Geology, Colgate Univ, 13 Oak Drive, Hamilton, NY 13346

Extensive geochronologic data, analysis of an internally consistent structure set, a detailed metamorphic P-T history, and geochemical analysis of 360 samples make possible an integrated interpretation of the origin of the Precambrian metamorphic rocks of the Tobacco Root Mountains. Quartzofeldspathic gneisses and hornblende amphibolites of the Pony-Middle Mountain Metamorphic Suite (PMMMS) and the Indian Creek Metamorphic Suite (ICMS) were formed from a bi-modal volcanic suite in a subduction-related, continental arc setting at approximately 3.35 – 3.2 Ga. Metasupracrustal rocks common in the ICMS (marble, aluminous schists, banded iron formation, and quartzite) were deposited on this gneiss-amphibolite basement in an epicontinental sedimentary basin between 3.13 and 2.45 Ga, when they were all metamorphosed. Metamorphosed, mafic dikes and sills (MMDS) represent a subalkaline, tholeiitic basalt protolith that intruded the relatively brittle, stable continental crust of the ICMS and PMMMS at 2.06 Ga, presumably during a continental rifting event. The small podiform bodies of meta-ultramafic rocks that occur throughout the Tobacco Root Mountains arose from an ultramafic cumulate, rich in orthopyroxene. These likely formed in a continental setting from basalt enriched in silica and are possibly associated with the MMDS. The Spuhler Peak Metamorphic Suite (SPMS) is dominated by amphibolite, orthoamphibole-garnet gneiss and hornblende gneiss but also contains minor intercalations of metasedimentary rocks. We suggest that the SPMS formed from variably altered tholeiitic basalts, chert, and mudstones in a back-arc basin. Available evidence suggests that the SPMS is much younger (2.45 – 1.78 Ga) than the ICMS and PMMMS and was transported to its present location during the Big Sky orogeny at 1.78 Ga.

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