

TECTONIC SETTING OF PROTEROZOIC METAMORPHIC ROCKS  
IN THE EAST-CENTRAL WET MOUNTAINS, COLORADO

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A sequence of upper-amphibolite facies metamorphic rocks derived from bimodal volcanics and apparently deposited in shallow marine water is exposed along South Hardscrabble Creek, east of the Ilse fault. The presence of two foliations, the second of which is wrapped into isoclinal folds indicates that the area underwent multiple deformation similar to other regions of Colorado, during which most primary textures were destroyed.

Three major units were used for mapping. Amphibolites follow igneous trends on Leake-type plots, fall in the tholeiitic basalt field ( $\text{SiO}_2 \times \text{Zr} / \text{TiO}_2$ ) and plot as either within-plate basalts ( $\text{Zr} \times \text{Ti} / 100 \times \text{Y} \times 3$ ) or ocean-floor basalts ( $\text{Ti} \times \text{Zr}$ ). A meta-gabbroic sill with relict ophitic texture has similar affinities. The biotite gneiss appears to be a shale derivative. Granitic gneisses did not form through partial melting or migmatization events. They contain some evidence of a clay origin (micas, sillimanite) but chemical patterns (Rb-Sr-Zr, K-C-N, Q-AB-Or) all support low-pressure volcanic origin, probably as rhyolitic tuffs. REE analyses should be available by the meeting. A unique quartzite unit with trough-like sillimanite-rich lenses is interpreted as a relict flaser-bedded sandstone and is the primary argument for shallow water (tidal flat) deposition.

The metamorphics are intruded by rhyodacitic sills (1457 m.y., M. E. Bickford), by numerous pegmatites of unknown age, and undated mafic dikes possibly related to the nearby lower Paleozoic alkalic complexes.

The bimodal basaltic and felsic volcanically-derived metamorphics is seen elsewhere in southern and central Colorado. Bimodal volcanism may have occurred in either a continental-rift type setting or back-arc spreading. The shallow marine sedimentation favors the latter environment.