

DISMEMBERED ARCHEAN OPHIOLITE IN THE SOUTHEASTERN WIND RIVER MOUNTAINS, WYOMING -- REMAINS OF ARCHEAN OCEANIC CRUST. G.D. Harper, Dept. Geological Sciences, State University of New York, Albany, NY 12222

Archean mafic and ultramafic rocks occur in the southeastern Wind River Mountains near Atlantic City, Wyoming (Figure) and are interpreted to represent a dismembered ophiolite suite. The ophiolitic rocks occur in a thin belt intruded by the 2.6 Ga Louis Lake Batholith on the northwest (1, 2). On the southeast they are in fault contact with the Miners Delight Formation comprised primarily of metagraywackes with minor calc-alkaline volcanics.

The ophiolitic and associated metasedimentary rocks (Goldman Meadows Formation) have been multiply deformed and metamorphosed. The most prominent structures are a pronounced steeply plunging stretching lineation and steeply dipping foliation. Pillow lavas are stretched parallel to the lineation and typically have aspect ratios of 10:3:1. Bedding in banded iron formation shows polyphase folding with fold axes parallel to the stretching lineation; sheath folds are locally well developed. The intrusive contact of the Louis Lake batholith with the ophiolitic rocks has been extensively modified by deformation; the batholith becomes progressively more deformed as the contact is approached, and at the contact the batholith is strongly lineated and mylonitic. The contact between the ophiolitic rocks and the Miners Delight Formation is a major fault zone (Roundtop Fault) containing amphibolite-facies mylonites overprinted by greenschist-facies brittle cataclasites (3). These structural data indicate that the ophiolitic and associated metasedimentary rocks have been deformed by simple shear when the Miners Delight was emplaced over the Louis Lake batholith and its ophiolitic wall rocks.

The ophiolitic rocks include ultramafics, metagabbros, metadiabases, and pillow lavas. Relict structures and textures are often well preserved. However, an ophiolite "stratigraphy" is not present; the ophiolitic rocks consist of tectonic slices, from northwest to southeast, of (1) metadiabase, (2) metagabbro and ultramafics, (3) pelitic schists, quartzite, and banded iron formation (Goldman Meadows Formation), and (4) greenschist and amphibolite (Roundtop Mountain Greenstone) locally containing pillows and massive flows or sills. In addition, a thin sliver of pillow lavas occurs between the metadiabase and ultramafic rocks at one locality, but is separated from the metadiabase by a strongly foliated talc-actinolite-chlorite schist.

The ultramafic rocks are largely serpentinites, but some have amphibole-chlorite assemblages and one clinopyroxenite was found. Many of the ultramafic rocks and associated metagabbros have well-preserved relict cumulus textures, and igneous layering is visible in a few outcrops. The ultramafic rocks and associated metagabbros are only weakly deformed, in contrast to the highly deformed mafic and metasedimentary rocks.

Metadiabase occurs in a wide belt along the margin of the Louis Lake batholith, and much of it occurs as large xenoliths within the margin of the batholith. The metadiabase unit locally contains numerous parallel dikes, some of which show one-way chilling. Medium to coarse-grained

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metagabbro occurs locally within the metadiabase; some of the metagabbro occurs as thin screens between fine-grained metadiabase dikes. These features suggest that the metadiabase unit represents a deformed sheeted dike complex.

The Roundtop Mountain Greenstone contains common pillow structures with well-preserved chilled rims. Massive lavas or sills comprise a significant portion of the formation, and gray phyllites occur rarely.

Rare isolated outcrops of black and foliated "basaltic komatiites," consisting primarily of actinolite and chlorite, occur in both the Roundtop Mountain Greenstone and metadiabase. However, they are chemically very different from the pillow lavas and metadiabases and possibly represent younger alkaline dikes.

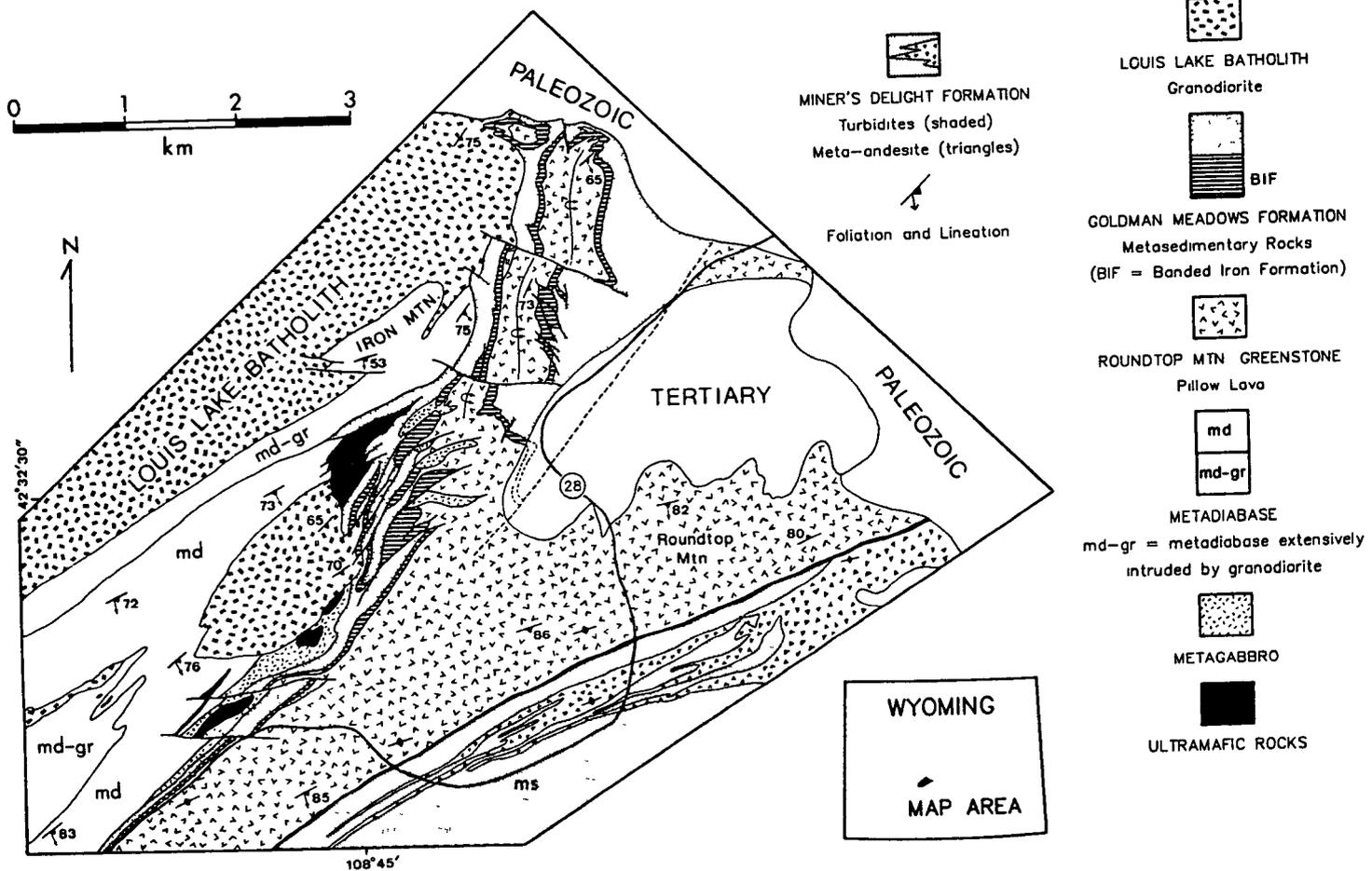
Metasedimentary rocks of the Goldman Meadows Formation overlying(?) the Roundtop Mountain Greenstone consist of pelitic schist, quartzite, and banded iron formation (1). The banded iron formation possibly formed by precipitation from hydrothermal vents in a manner similar to modern metalliferous sediments formed at spreading centers (4). Mafic sills and dikes (amphibolites) intrude the metasedimentary rocks, and are themselves deformed and metamorphosed.

Geochemical analyses were made of the metadiabase and pillow lavas to determine whether they are genetically related (5). "Immobile" trace element compositions (Ti, V, Cr, Ni, Zr, Y, Nb) are very similar in both units, consistent with the interpretation that they comprise different parts of a dismembered ophiolite. These rocks are similar to modern enriched mid-ocean ridge basalts.

The ophiolitic rocks are interpreted as the remains of Archean oceanic crust, probably formed at either a mid-ocean ridge or back-arc basin. All the units of a complete ophiolite are present except for upper mantle peridotites. The absence of upper mantle rocks may be the result of detachment within the crust, rather than within the upper mantle, during emplacement. This could have been the result of a steeper geothermal gradient in the Archean oceanic lithosphere, or may have resulted from a thicker oceanic crust in the Archean (6).

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