

OPHIOLITE EMPLACEMENT, WESTERN BROOKS RANGE, NORTHERN ALASKA*

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ABSTRACT

The western Brooks Range ophiolites are comprised of lower thrust sheets of mafic to intermediate intrusive and volcanic rocks and upper thrust sheets of ultramafic and gabbroic rocks. The sheets have been inferred to be erosional remnants of large allochthons transported northward from the Angayucham Terrain of the southern Brooks Range. Our observations of cumulate layer orientations suggest, however, that the upper sheets are not remnants of a laterally continuous, intact allochthon.

Cumulate layers at Asik Mountain and the northeastern part of Avan Hills are nearly vertical, trending north-south. The cumulate sequences (Bird, et al., this volume) face eastward. Nelson (1982) also describes generally vertical layers at Siniktanneyak Mountain, but there the sequence faces west. The layering is apparently truncated by the basal thrust of the upper sheet at all three localities. This truncation, the vertical attitude, and the facing sense of the layering require that the cumulate sequence, if originally near horizontal, was disrupted prior to emplacement. There is a complex, steep fault zone, truncated by the basal thrust, along the eastern margin of Asik Mountain. This fault zone might have originally been part of an oceanic transform fault system, a possible site for disruption of the cumulate layering.

An aureole along the basal thrust of the upper sheet consists of <1 m of tightly folded, mafic mylonite that grades into amphibole(?) - biotite-garnet schist (<1 m to >20 m). Blocks of the mylonite and segregations of anatectic granite occur within the schist. The mineralogy of the aureole indicates that the ultramafic-gabbroic sheet was relatively cool at the time of thrusting over the mafic-intermediate sheet.

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BROOKS RANGE OPHIOLITE CRYSTALLIZATION AND EMPLACEMENT AGES FROM $^{40}\text{Ar}/^{39}\text{Ar}$ DATA*

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ABSTRACT

$^{40}\text{Ar}/^{39}\text{Ar}$ data from hornblende, biotite, and K-feldspar from western Brooks Range ophiolites, northern Alaska, constrain crystallization and emplacement ages. Release spectra from hornblende from two Asik Mountain layered gabbros yield minimum crystallization ages of 177 ± 4 and 179 ± 3 Ma. Release spectra from hornblende and biotite from a thrust fault metamorphic sole between upper, layered, peridotite and gabbro, and lower pillow basalt, at Avan Hills, indicate that metamorphism occurred at 164-169 Ma, the likely age of emplacement. Monzonite within the metamorphic sole yields plateau ages of 165 ± 1 Ma for biotite and 146 ± 1 Ma for K-feldspar. The ^{40}Ar diffusive loss profile of the K-feldspar is complex but is compatible with continuous Ar loss until 110 Ma, the age of uplift of the Brooks Range interpreted from previously published K/Ar ages. The release spectra from lineated amphibolite from below the thrust contact at Asik Mountain yields an age of 158 Ma, and is consistent with the age of metamorphism and thrusting at Avan Hills.

The metamorphic samples are from some of the structurally highest and by interpretation oldest, thrusts in the Brooks Range. $^{40}\text{Ar}/^{39}\text{Ar}$ ages for crystallization of the gabbro and metamorphism during thrusting are each approximately 10 Ma older than previously reported K/Ar ages from other western Brooks Range ophiolites. The minimum time-span between crystallization and thrusting was approximately 10 Ma; other ophiolites are known to have similarly short time-spans between crystallization and emplacement.

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