

Variation In Tectonic Style Along The Beartooth Mountains Front Laramide Triangle Zone, South-Central Montana

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ABSTRACT

The Stillwater Complex (SC) portion of the Beartooth Mountains front Laramide triangle zone provides a unique opportunity to observe the resultant structural behavior of crystalline basement. The beautifully layered Archean SC has a distinctive "igneous stratigraphy" that allows for unraveling structural and stratigraphic relationships not normally observed in crystalline terrain. Prominent marker units in both the SC section and Phanerozoic sedimentary section record interpreted west-northwest-trending forethrusts (southwest over northeast) and backthrusts (northeast over southwest), as well as lateral ramping in both the sedimentary and crystalline sections. Classic triangle zone geometries have been interpreted for over 45 km (28 mi) along strike on the basis of detailed surface outcrop and underground drift mapping coupled with abundant underground and surface drill holes. Regional forethrusts and backthrusts tip out and are replaced along strike by other fore and backthrusts that conserve shortening. Numerous transverse, "strike-slip faults that don't go anywhere" are interpreted as lateral ramps present in both the crystalline and sedimentary section. Dramatic variation in structural architecture is observed at some transverse faults. In one instance, a forethrust with 3.2 km (2 mi) of estimated dip-slip offset tips out and is immediately replaced to the east by backthrusts that stack and repeat the Cambrian/Archean Great Unconformity up to 11 times. Oblique slip (left lateral) is significant; up to 50% is estimated from surface mapping interpretation. The east-west variation in architecture is accompanied by vertical variation (stacking of thrusts and individual, discrete triangle zone packages) over 3.2 km (2 mi).