Paleogene Influence of the Moxa Arch on the Architecture of the Composite Darby-Hogsback-Prospect (DHP) Thrust Sheet near Labarge, Wyoming, USA

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The late Cretaceous to Eocene Laramide orogeny is characterized by coeval basement-involved deformation and eastward-propagating, Sevier-style detached thrusting. The influence of basement-involved deformation on the growth of the thrust belt can be examined at the LaBarge platform, near LaBarge, WY, where the thin-skinned Darby-Hogsback-Prospect (DHP) thrust complex encountered the culmination of the ~3.5 km high thick-skinned Moxa arch.

Mapping of the Campanian unconformity at the base of the Ericson Formation from LaBarge to the Utah border indicates that the Moxa arch included several Late Cretaceous culminations along its length, with approximately 1 km of structural relief. The top of the Ericson Formation, which provides a regional datum at the end of the Maastrictian phase of growth, was elevated an additional 2.5 km at the LaBarge platform in Paleogene time.

Several observations suggest that the Moxa arch created an obstacle for the advancing DHP thrust sheets. Near the Moxa arch, a lateral ramp partitions DHP displacement from the Hogsback thrust northward to the Darby and Prospect thrusts. Near the DHP junction, the Prospect thrust appears to have located its frontal ramp off the forelimb of the west-vergent Moxa arch. Also, both the Prospect and Hogsback thrusts apparently decapitate a pre-existing Moxa structure. The leading edge of the Prospect thrust appears to carry a thickened Triassic section and the leading edge of the Hogsback thrust brings middle Cambrian Gros Ventre Formation to the surface, which is not observed elsewhere in the area. Seismic data reveals that the Moxa arch folded the overlying Hogsback thrust, indicating that the culmination continued to develop until at least the early Eocene.

The relative timing of structures, therefore, implies continued growth by westward propagation of the Moxa arch through the early Eocene, eastward displacement and relay of the Darby and Hogsback thrust sheets, eastward displacement and relay of the Prospect and Hogsback sheets, and some minor late growth on the westward vergent Moxa fault.