

Subcrop reinterpretation of the Ordovician Bighorn Dolomite and Devonian Darby Formation: Implications for upwarping across the Transcontinental Arch, Southwest Wyoming¹

DONNA S. ANDERSON, Colorado School of Mines, Golden, CO

and

MARK W. LONGMAN, QEP Resources, Denver, CO

ABSTRACT

A new interpretation of the subcrop geometries of the Ordovician Big Horn Dolomite and the overlying Devonian Darby Formation across southwestern Wyoming arises from revising the stratigraphy in a core from the Mountain Fuel Supply UPRR-11-19-104-4 well drilled on the crest of the Rock Springs Uplift in 1962. One of only a few wells to penetrate all or part of the Lower Paleozoic succession in the subsurface of southwestern Wyoming, the well was almost continuously cored through the Devonian-Cambrian succession. From a reinterpretation of the stratigraphy in the core, 22 feet of Bighorn Dolomite is recognized based on the characteristic *Thalassinoides*-bioturbation fabric in skeletal dolowackestone typical of Late Ordovician subtidal carbonate facies ranging from Nevada to Greenland along the western margin of the Great American Carbonate Bank. This lithology is in complete contrast with the alternating dolomitic flat-pebble conglomerate and dolomudstone of the underlying Cambrian Gallatin Limestone and the cyclical units of brecciated anhydritic dolomudstone and quartzose sandstone of the overlying Lower Jefferson member of the Darby Formation.

Stratigraphic reinterpretation yields insights regarding Ordovician-Devonian stratal geometries across the southwestern Wyoming. More widespread than previously portrayed, the Bighorn Dolomite pinches out on the eastern flank of the Rock Springs Uplift. Similar to past interpretations, the Darby Formation pinches out east of the Rock Springs Uplift at Brady Field. A true-geometry multi-dated stratigraphic cross section yields insights not obtainable by mapping. Regionally top-truncation of stratigraphic units below the base-Madison unconformity normally progresses stratigraphically deeper eastward. However, in southwestern Wyoming, the Darby Formation overlaps the older Bighorn Dolomite by marked onlap across the Rock Springs Uplift and then pinches out by top-truncation/onlap near Brady Field, forming an “abnormal” overlap relationship along the northern margin of the Transcontinental Arch. The underlying Bighorn Dolomite shows little to no onlap onto the underlying Cambrian section, but is markedly top-truncated below the Darby Formation.

Comparing proportions of onlap versus top-truncation for the two formations constrains the timing of two successive upwarping episodes along the northern margin of the Transcontinental Arch across southwestern Wyoming. The first is arguably Middle Devonian, and the second spans the Devonian-Mississippian boundary. Two subtle angular unconformities created by these two episodes initiate at successively southeastern positions. They imply a southeastward migrating fold or tilt axis that sequentially was reactivated along the northern margin of the Transcontinental Arch in southwestern Wyoming.