Shallow Laramide Thrusting at the Paradox Basin Hamilton Creek Salt Structure in Southwestern Colorado

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[1]Paradox Basin Data

Abstract

Starting in the Late Jurassic, all diapirs and other salt structures in the Paradox Basin (PB) at that time were buried with the overburden thickness reaching several thousands of feet by the end of the Cretaceous and continuing into the Paleogene (until ca. 35 Ma), about 5 million years after the Laramide Orogeny had ended. During the Laramide Orogeny, there was regional west-east shortening (compression) that thrusted and folded the Monument Uplift, slightly folded all PB diapirs and anticlines, and reactivated the southwest thrusting of the Uncompahgre Uplift. Salt within the PB salt structures freely responded to the Laramide lateral shortening that now accounts for much of their present structural shapes at and near the surface. During recent routine tracing of Wolfcampian and Virgilian Hermosa Group fourth-order cyclic sequences from well to well in the Hamilton Creek Field area in San Miguel County, it was noted that several bundles of these younger cycles were repeated and separated by reverse faults. Some wells had cycles that were repeated 3 times and with 2-4 separate reverse faults, and the greatest fault separation was 3900 feet with a Virgilian cycle faulted on top of the Triassic Chinle Formation. Although the youngest Missourian cycles were involved with reverse faults in a few wells, most of the Missourian and older Pennsylvanian strata seen in wells were either unfaulted or cut by normal faults. The current Hamilton Creek structure consists of a salt pillow, cross-cutting normal faults, and a prominent graben, all remnants of salt flowage. Prior to salt flowage, the Hamilton Creek salt structure was the southeast extension of the large Paradox Valley salt structure; the subsequent salt flowage was directed toward Paradox Valley, perhaps during maximum burial in the late Cretaceous or Paleogene, leaving one or more salt pillows with internal salt welds. With continued tracing of cycles and faults in wells, it became apparent that the larger reverse faults were intersections of one to three separate thrust sheets that have sub-horizontal orientations, and the reverse faults were parts of one to three separate thrust faults. The current overall size of the greater thrusted area is just under 100 square miles in the area between the Hamilton Creek salt pillow and the southeast end of the Paradox Valley salt structure. From the orientation of associated smaller thrust faults, the cycles involved, and the sizes of fault separation it is obvious that the direction of thrusting was to the southwest, with the thrusts terminating in the Dry Basin Minibasin before reaching the Cocklebur Draw structure off the southeast end of the Gypsum Valley salt structure. The most likely cause of the thrusting was regional compression during the Laramide Orogeny, with backthrusting having the same direction as the Uncompahgre Thrust.