Public Abstract

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Title:LARAMIDE STRESS CONDITIONS AND DEFORMATION MECHANISMS DURING THE FORMATION OF DERBY AND DALLAS DOMES, WEISER PASS QUADRANGLE, WIND RIVER MOUNTAINS, WYOMING

Uplift of the Wind River Mountains during the Laramide orogeny (ca. 80-40 Ma) produced a NNW-SSE series of southwest-verging, asymmetric, doubly plunging folds along the northeastern margin of the range. This fold series, which has a slightly en echelon alignment, includes Dallas Dome, Derby Dome, and Sheep Mountain anticline – referred to here as the DDS fold line. This study will provide a publishable geologic map of the Weiser Pass Quadrangle, WY, which contains the first oil well drilled in Wyoming. This map will contribute to the Educational Mapping Program (EDMap) sponsored by the United States Geological Survey (USGS) in an effort to map economically and structurally significant areas. The research also addresses issues related to the exploration for new and the exploitation of known hydrocarbon producing structures within the United States.

Geologic mapping and structural analysis of the DDS fold line support a regional NE-SW shortening direction. However, progressive development of the fold, fault, and fracture features that deform the DDS fold line is the result of both the regional Laramide stress field and stresses produced more locally by uplift of the adjacent Wind River Mountains along the Wind River thrust. This study analyzed the deformation features in Derby Dome and its en echelon connection to Dallas Dome and Sheep Mountain in an effort to determine: 1) the relative effects of the regional and local stress fields on formation of the DDS and its associated features, 2) the degree to which forced folding and buckle fold mechanisms governed the folding and faulting processes, and 3) the geometry and origin of the en echelon pattern of the folding along the DDS.

This analysis supports an early layer-parallel compressive shortening of the study region, prior to folding, that was dominated by the regional Laramide stress field. Early in the DDS fold history, this shortening produced a basement reverse fault that began deforming parts of the DDS fold line by flexural bulge, forced folding, and thrust mechanisms. This basement thrust became compartmentalized to form independently acting basement blocks that controlled the asymmetry of the fold forms. Basement tear faults, which compartmentalized the basement blocks, define the left-stepping en echelon pattern of the DDS fold line. The interaction of the sedimentary cover with basement flexure or fault offset ultimately defined the process by which each dome formed and the magnitude of asymmetry each dome displays.

On Derby Dome, cross-section interpretations indicate that basement offset was accommodated by buckle folding and layer-parallel slip. Dallas Dome cross sections indicate that basement offset was accommodated by a dual-fault fold-thrust system that ultimately produced a stronger fold asymmetry along Dallas Dome’s west-dipping limb.