26-25 - THE INFLUENCE OF PRECAMBRIAN FABRIC REACTIVATION ON FORMATION OF THE LARAMIDE WHITE GATES MONOCLINE, BLACK HILLS, SOUTH DAKOTA

Thursday, 16 May 2024

9:00 AM - 5:30 PM

Grand Ballroom (Davenport Grand Hotel)

Booth No. 46

Abstract

The Black Hills, in western South Dakota and eastern Wyoming, were formed by Laramide orogeny deformation that was focused on a Precambrian suture along the eastern margin of the Wyoming Craton. Uplift of the Black Hills primarily took place by the development of monoclines on the eastern and western flanks of the Black Hills: west-vergent monoclines in the west and east-vergent monoclines in the east. Although the exhumed metamorphic core of the Black Hills contains abundant Precambrian structures that could have been reactivated during the Laramide orogeny, it remains unclear if the monoclines formed above reactivated basement structures. We present new balanced cross section modeling focused on the White Gates monocline along the eastern margin of the Black Hills to test whether it records reactivation of Precambrian basement structures. To better determine the geometry of the White Gates Monocline, we collected 22 bedding attitude measurements from the upper Deadwood and the Pahasapa formations along an 1,723-meter-long transect across the strike of the fold axis. We forward modeled monocline development related to slip on blind thrusts in three dip orientations: 30° (Andersonian thrust fault), 45° (maximum resolved shear stress), and 70° (orientation of nearby basement fabrics). Preliminary model results reveal that the 70° fault dip angle produces fold geometries most consistent with the geometry of the White Gate monocline. This result suggests that the reactivation of Precambrian fabrics during the Laramide orogeny influenced the formation of the White Gates monocline. Elsewhere in the Precambrian core of the Black Hills, conjugate thrust faults inferred to be Laramide age clearly cross-cut basement fabrics, which suggests that the role of structural reactivation in Laramide deformation varies spatially throughout the Black Hills.

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