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Would the transmission of orogenic stress in cratonic forelands depend on structural style? Case of Sevier versus Early Laramide stress magnitude in the Bighorn Basin (Wyoming, USA).

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Stylolites that develop commonly in carbonates are stress-related pressure solution features of which roughness signal can be used as a paleopiezometer. While sedimentary stylolites records the depth of burial reached by strata as long as the maximum principal stress remains vertical, tectonic stylolites records the absolute horizontal stress magnitudes during the contraction phase they formed.
This contribution reports the paleopiezometric inversion of the roughness of bedding-parallel and systematic tectonic stylolites to reconstruct the long-term stress magnitude history that prevailed from strata burial to early Laramide layer-parallel shortening in the Paleozoic carbonates of the Bighorn basin, Wyoming, USA. Our quantitative stress estimates are combined with the results of earlier microstructural, paleostress and thermochronological studies to refine the scenario of stress evolution in both the western part (Rattlesnake Mountain) and the eastern part (Sheep Mountain, Little Sheep Mountain Anticlines, Bighorn Mountains) of the basin.
Tectonic stylolite paleopiezometry yields differential stress magnitudes in the range 15-50 MPa for the ∼E-W directed Sevier layer-parallel shortening and in the range 3-27 MPa for the NE-directed early Laramide layer-parallel shortening. This results therefore unravels a systematic difference in the level of differential stress sustained by sedimentary cover rocks, with unexpected higher magnitude during thin-skinned Sevier shortening than during thick-skinned Laramide shortening.
When integrated with U-Pb absolute ages of calcite veins kinematically related to these two stages of layer-parallel shortening, our results illustrate how distinctively deformation propagates and stress build-up occurs in thin-skinned and thick-skinned tectonics, and how the tectonic style affects the magnitude of the orogenic stress transmitted towards the continental interior.