

2014 GSA Annual Meeting in Vancouver, British Columbia (19–22 October 2014)

Paper No. 141-22

Presentation Time: 9:00 AM-6:30 PM

THE NUCLEATION OF BEDDING PLANE THRUSTS ON GEOMETRICAL IRREGULARITIES: EVIDENCE FROM OIL SHALES IN AN OHIO COAL MINE

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Oil shales form the roof and floor rocks of many coal mines in the Appalachian Basin. These mines offer outstanding 3D exposures of fresh rocks, presenting an excellent opportunity to directly observe pristine *in situ* natural fractures in shale. Small thrust faults are well exposed inside a coal mine in Carroll County, Ohio and predictably develop in areas where gradients of coal-shale contact are steepest, leading to roof rock instability in those areas. We test the hypothesis that sloping bedding-plane contacts serve as natural displacement discontinuities which augment the local stress state, causing localized secondary thrust fault development. Digital recreation of the primary bedding-plane discontinuity using exploration wells and in-mine survey data allowed 3D numerical-mechanical modeling of slip along bedding discontinuities and related stress perturbation. Coulomb stress change shows that shear failure is encouraged in areas in which thrust faults were mapped. This suggests that inherited non-planarity in bedding discontinuities influence the nucleation of thrust faults. Simulation results as constrained by the integrated field and modeling approach taken in this study will help better understand natural fracture distributions in oil shales. In particular, recognizing subsurface stress heterogeneities due to bedding topology can improve our predictive capabilities of underground structural hazards and can also aid in the identification of subseismic faults and fractures.

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[General Information for this Meeting](#)

Session No. 141--Booth# 404

[The Structure of Faults from Top to Bottom: Implication for Fluid Flow, Ore Deposits, and Seismic Hazard \(Posters\)](#)

Vancouver Convention Centre-West: Exhibition Hall C

9:00 AM-6:30 PM, Monday, 20 October 2014

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