GSA Connects 2022 meeting in Denver, Colorado

Paper No. 126-18
Presentation Time: 2:00 PM-6:00 PM

ANALYZING NORMAL FAULT-TIP DAMAGE ZONE GEOMETRIES AND STRUCTURES USING VIRTUAL OUTCROP MODELS

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Fault-tip damage zones develop in response to fault propagation and displacement and are caused by the local amplification of stresses at the fault tip. Understanding the geometry and intensity of damage zones is crucial for evaluating earthquake hazards and assessing the potentials of oil and gas production, geothermal energy, and groundwater resources. Fractures initiate as a result of stresses exceeding rock strength and propagate based on the stress field at the fault tip. We investigate the damage zone of a fault segment within the Sevier normal fault zone near Orderville, Utah, focusing on fractures that developed within the Jurassic Navajo Sandstone, the Temple Cap Formation, and the oldest beds of the Carmel Formation. Because normal faults grow laterally as slip and displacement increase, we focus on the tip zone of a fault segment where fracturing is well-exposed. We executed a series of unmanned aerial vehicle (UAV) flights to capture high-resolution imagery of inaccessible rock exposures. We use these images to construct structure-from-motion (SfM) virtual outcrop models (VOMs) that we georeference and analyze using *Agisoft Metashape*. We collected and analyzed fracture orientation and intensity data in the field and with VOMs. Both types of data reveal a distribution of fracture intensity that is consistent with inner and outer damage zones similar to previous studies of other fault systems. Adjacent to the tip, the inner damage zone has a higher fracture intensity on the hanging wall compared to the footwall. This high fracture intensity on the hanging wall ends 30 meters from the fault core where the intensity of the outer damage zone of the hanging wall becomes similar to that within the inner damage zone of the footwall. Laterally, along strike of the fault tip, intense fracturing ends 60 meters to the south and all fracturing ends 350 meters from the fault tip. Our results have implications for the spatial distribution of fracturing and related permeability in similar normal fault systems.

Session No. 126--Booth# 44

T166. Showcase of Undergraduate Research Posters by 2YC and 4YCU Geoscience Students (Posters)
Monday, 10 October 2022: 2:00 PM-6:00 PM

Exhibit Hall F (Colorado Convention Center)

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