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Title: Using Drone-Based Photogrammetry to Analyze Fold Geometry in the Bigfork Chert, Crystal Springs, Arkansas

This project uses drone-based Structure-from-Motion photogrammetry to construct a high-resolution virtual outcrop model (VOM) to digitally analyze the geometry and structural features of folded bedding in the Bigfork Chert Formation. The study area lies in the southeastern Ouachita Mountains, approximately 0.3 miles south of Crystal Springs, Arkansas, in a former chert quarry exposing folded Middle Ordovician chert, deposited in a deep marine basin. Using a DJI MAVIC 2 drone, 401 images were collected and processed in Agisoft Metashape. The resulting point cloud was cleaned to remove vegetation and low-confidence points, then georeferenced in CloudCompare using six ground control points. This process enabled accurate digital orientation measurements from the model. Field observations and model data reveal a prominent plunging anticline with an “M-fold” on the quarry’s southern-most wall, mirrored by a similar fold to the northwest, suggesting structural continuity. Bedding measurements on both limbs were extracted and plotted on stereonet, revealing varying plunge directions indicative of a shift in fold axis orientation. The shortening direction was interpreted as northwest–southeast, which is consistent with regional deformation patterns associated with the Ouachita orogeny and the thrust faults in the area. Traced folds were imported into MOVE and projected based on their plunge and trend values, to model and visualize fold geometry and orientation throughout the study area. The Crystal Springs Quarry presents an ideal case study for applying remote sensing technologies to structurally complex localities to be studied without the need to be in the field for long periods of time. Furthermore, this study demonstrates how VOMs can enhance accessibility, enable reproducibility, and provide detailed structural datasets.