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Will speak on:
Preliminary geophysical investigation of Cenozoic Tectonic Events along the Northwest Uncompahgre Plateau in Western Colorado, USA

Abstract

For many years since 1980, CMU geoscience students and professors have conducted geological and geophysical study in the northwestern part of the Uncompahgre Plateau near Grand Junction, Colorado. The Uncompahgre Plateau is a NW-SE striking, Laramide-age crustal arch modified by syn-kinematic strike-slip faults. Also, earlier geomagnetic data gathered in the Pinon Mesa and Unaweep Canyon areas indicates the likely presence of a shallow, unexposed igneous intrusions that could be Precambrian gabbroic intrusions or Oligocene porphyritic diorite intrusions in origin. Elsewhere in the vicinity of these research areas, similar igneous rocks of Precambrian or Oligocene age have been identified; thus, it is possible that analogous intrusive features may exist in the study area. Our presentation is focused in the Devil's Canyon area where, recently, we observed a local magnetic high along the Redlands Fault Zone, which also indicates these types of sources in the subsurface. The igneous intrusion may be one viable explanation for the initially observed magnetic anomalies since fault-displaced basement rock may also cause a measurable magnetic signature. The application of ground-based, high-resolution magnetic surveying coupled with forward modeling of likely subsurface geometries may be instrumental in identifying undiscovered intrusions or bedrock faulting. Multiple strike and dip measurements of fractures were conducted to determine the orientation of local stress fields. The data shows uplift events have produced large oblique strike-slip faults, such as the Redlands Fault in the Redlands Fault Zone. Previous studies have found that faults along the Colorado Plateau display deformation kinematics that are consistent with two uplift periods: the Permo-Pennsylvanian Ancestral Rockies Orogeny and the Late Cretaceous-Paleogene Laramide Orogeny. Fault zones with plumes are characterized by widespread development of hydrothermal breccias, syn-kinematic mineralization, and extensive silicification of permeable sandstones adjacent to these faults. Carbon-bearing minerals such as calcite, malachite, and azurite are common in the mineralized fracture fill through Mesozoic sedimentary rocks, suggesting that deeply penetrating left-lateral strike-slip faults created in the Laramide served as fluid pathways for influx of mantle CO2. Seismic tomography maps representing "fast" and "slow" seismic propagation velocity ratios are used in this research to elucidate the potential deep-seated origin of the intrusions into the Uncompahgre Plateau. The high-magnetic anomaly, further magnetic analysis, structural analysis, tomography data, and the presence of hydrothermal mineralization all indicate a possible porphyritic diorite intrusion that is Oligocene in age within the northwestern slope of the Uncompahgre Plateau.