

DIGITAL MAPPING TECHNIQUES 2015

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See Presentations and Proceedings
from the DMT Meetings (1997-2015)

<http://ngmdb.usgs.gov/info/dmt/>

An Analysis of Stereoscopic 3D Geological Mapping Methods Using Cardinal and Esri Systems

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Access to new technology has allowed increased accuracy and precision in enhancing the field scientists ability to create geological maps. One new mapping method, used by the Utah Geological Survey and a limited number of colleges across the intermountain west including Southern Utah University, is the creation of geological maps through the VrOne and VrTwo 3D software using stereo models. Using software from Cardinal Systems, it is possible to explore, map, and edit an area of interest while viewing the terrain in stereoscopic 3D. This allows the ability to observe elevation and physical features from a unique viewpoint. Using this software, a map will be created of the Quail Creek Reservoir as well as Little Purgatory Dome that lies behind it. The map will be digitized in 3D, edited, and then finished in Esri ArcMap resulting in a 2D geological map. The map will then be field checked for accuracy and a final map will be created as a result. These maps will then be compared for accuracy and precision to other geological maps that have been created through other methods. By using this new stereoscopic 3D method we intend to show a new accurate and efficient way of mapping an area that can be used by cartographers and scientists alike.

How did this system improve the mapping of the target area and how accurate is it?

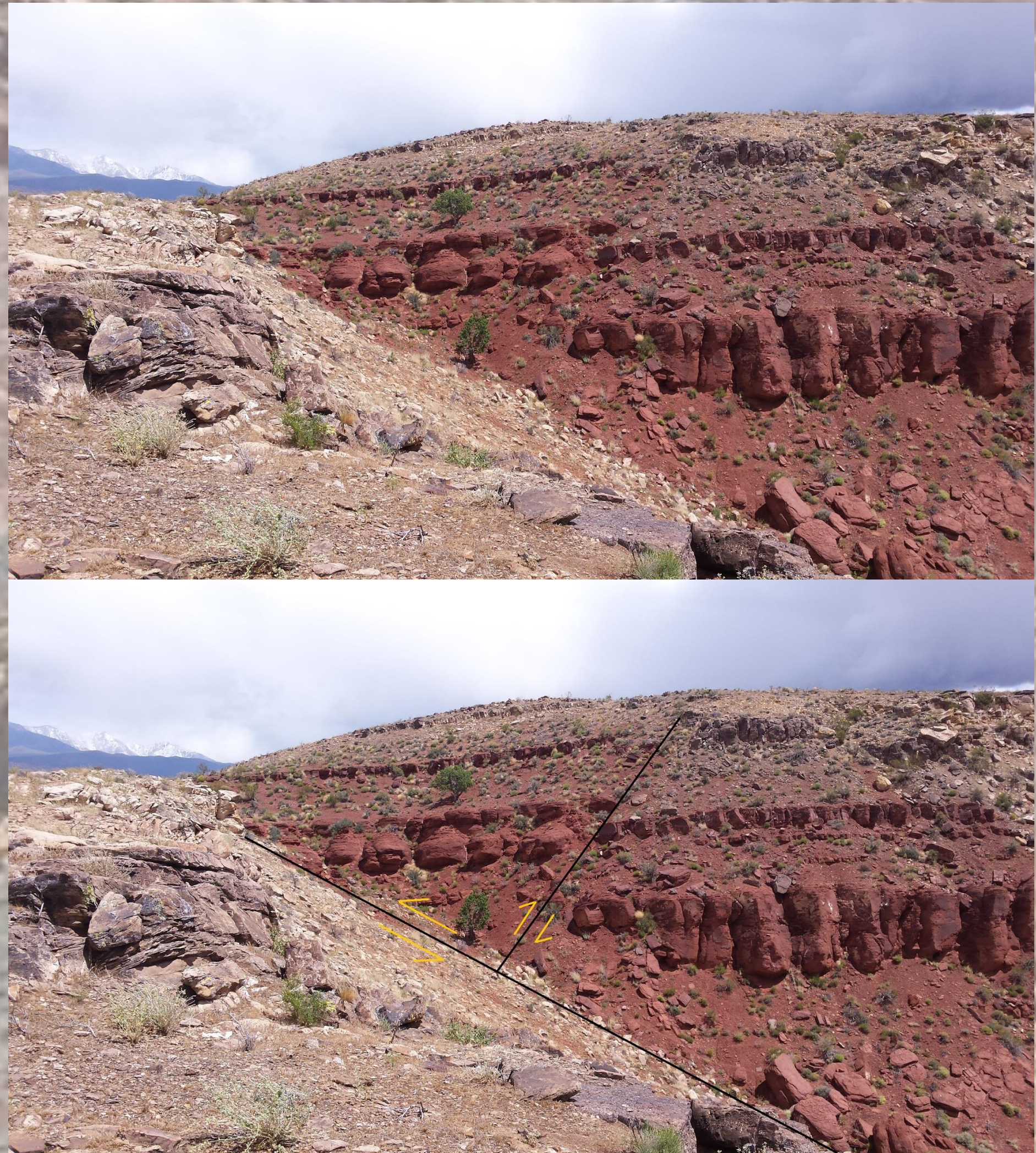


Mapping Methods Using Cardinal System

- Study site chosen for accuracy and familiarity
- Maps contain the members within each formation for mapping relationships
- Access to inaccessible field areas
- Extensive site exploration
- Contrast and Brightness usage
- Map geologic features based on; Lineation, Color, Texture, Elevation, Crosscutting relationships, 3-Point problems

Field Methods

- Compared to published geological maps
- Direct qualitative observations
- Brunton compass



Thrust faulting on the northern end of Little Purgatory Dome

A special thank you to
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Editing Methods

- Edit errors on the 3D system
- Transfer files from different software
- Topology
- Cartography and map standards
- Review

Results in mapping with the Cardinal 3D System

- Observation and exploration of areas that are difficult to reach for study purposes.
- Extensive observations of study areas prior to any field work.
- The ability to focus field studies in a direct and efficient manner to verify areas of alternative hypothesis.
- The ability to use multiple programs at once to observe areas from multiple angles and points of view.
- Quick spatial orientation in the field
- Cardinal system give very accurate lines that when edited for aesthetic purposes become less accurate
- The Cardinal software is sensitive and errors occur often from user error.
- Limited spatial resolution.
- Time is required for a users eyes to adjust to the 3D environment.
- Time and experience is required to map accurately using the 3D stealth Z mouse.

Map Accuracy

- Due to the nature of having a z-axis, x-y shifts were thought to be problematic with line accuracy
- Shifts were found to be a minimal issue



Test done at Arches National Park, lines were drawn above, below, and on the ground. In a 2D environment the x-y shift was negligible, especially when compared with user precision.