High Resolution Topography of Normal Faults in the Volcanic Tablelands, near Bishop in Eastern California, March 2018

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Introduction: We present high resolution topography data and orthomosaic imagery along three normal faults in the Volcanic Tablelands of Eastern California. In the Volcanic Tablelands, normal faults create prominent scarps that offset the Bishop Tuff. This area has been the focus of a number of studies on fault zone structural geology and geomorphology.

In this survey, we collected uncrewed aerial vehicle (UAV) digital photography over a number of faults in the Volcanic Tablelands. The point cloud, orthomosaic, and digital surface models (DSMs) are presented as a number of polygons located near road access throughout the Volcanic Tablelands.

Personnel

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Site objectives: Using a UAV, we imaged portions of normal faults in the Volcanic Tablelands.

Dates of Collection: March 5-March 12, 2018

Site Conditions: Conditions varied during the week-long field trip. The light varied between sunny and cloudy, depending upon the presence of storms in the nearby Sierra Nevada Mountains. Some mornings were well below freezing, and in some afternoons the temperature was around 70F. The wind was often moderate, and we stopped UAV missions for one afternoon due to heavy wind.

UAV Equipment and Data Collection Methods: We used a Phantom 4 Pro UAV and a Phantom 4 UAV to collect the aerial photographs. We used the Phantom 4 Pro UAV to begin

each day's surveys and until the batteries in the controller lost their charge. We then switched to the Phantom 4 UAV for the remainder of the day. We used Pix4DMapper to plan the flight missions using 'grid' and 'polygon' settings. We flew the UAV 80-110 m above ground level with a nadir camera angle. We collected aerial photographs on adjacent fault segments on different days with varying light conditions.

Processing:
We processed the photographs collected by the UAV into point clouds, DSMs, and orthomosaics using Agisoft Photoscan often with Medium settings for the sparse and dense point clouds. We processed the orthomosaic and the Digital Surface Models (DSMs) using the suggested resolution. The differing light conditions result in sharp gradients in color in the point clouds and orthomosaic imagery. Because we strictly flew the UAV with takeoff points along the road, we were not always able to image the scarp footwall well, resulting in some holes in the processed data.

Georeferencing: We did not use a GPS for georeferencing. Instead, we initially processed the imagery based on the UAV's GPS positions. We then georeferenced based on four synthetic markers per polygon. For the horizontal positions, we georeferenced the positions based on clear features in ArcMap's World imagery such as road intersections and prominent boulders. For the vertical positions, we georeferenced to 30 m Shuttle Radar Topography Mission (SRTM) elevations. After adding in the georeferencing in Photoscan, we reprocessed from the sparse cloud step giving a 1 m accuracy to the four synthetic markers and a 100 m accuracy to the UAV's GPS positions. We exported the point cloud, DEM, and orthomosaic to the horizontal coordinate system NAD83 UTM zone 11N (EPSG: 26911). For the vertical coordinate system, the data are WGS84 (EMG96 GEOID), the same coordinate system as the SRTM elevations.

Resolution: The resolution of each polygon varies. Typical point cloud resolution is ~100-200pts/m^2, DEM resolution is ~ 8-12 cm/pixel, and orthomosaic resolution is ~2-3 cm/pixel.

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Conditions: We ask for a 6 month embargo on the data release, where the data are released no earlier than November 22, 2020.

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