Scarp Morphology Along the Alamogordo Fault, Sacramento Mountains From a High-Resolution Aerial Topographic Survey

Lynn A. Acosta and Reed J. Burge't

1New Mexico State University, Geological Sciences MSC 3AB, PO Box 30001, Las Cruces, NM, New Mexico, 88003, United States

The Alamogordo fault bounds the Sacramento Mountains in the south-central portion of New Mexico. The Sacramento Mountains are a fault-block range that extends north and south for 137 km as well as 68 km wide. We investigated a prominent scarp at the mouth of Mule Canyon, ~7.5 km south of the city of Alamogordo, a site that was the subject of earlier paleoseismic reconnaissance. The height of the scarp and its form indicates the magnitude and recency of earthquake slip along this fault in the southern Rio Grande rift. In this study we show the promise of recent advances in high-resolution topographic surveying for characterizing late Quaternary deformation along active faults in the landscape of southern New Mexico.

We have collected two high-resolution topographic datasets from the Mule Canyon site on the Alamogordo fault through field projects conducted by the NMSU Neotectonics course. A terrestrial lidar scan of the site collected in 2013 yielded a dense point cloud and a digital elevation model gridded at 10 cm resolution. This presentation focuses on analysis of the second survey conducted with Structure-from-Motion (SfM) photogrammetry. Fall of 2017 a survey was conducted using photos collected from a camera on a helium balloon accompanied by GPS surveying to provide ground control points. The aerial images were processed with the ground control information using Agisoft Photoscan SfM software. Products generated include a point cloud with 39 million points, and a DEM and orthophoto gridded at 4 cm and 1 cm resolutions, respectively. These products were output and the ArcMap Geographic Information System (GIS) software will be used to analyze the topographic data and output profiles for numerical models of scarp evolution. Analysis of the scarp using a hillslope diffusion model will be completed in Matlab to assess spatial variations in scarp form and the temporal evolution of the scarp. Comparison with the previous terrestrial lidar data will be used to assess the precision and accuracy of the surveying techniques in this environment. Preliminary analysis of the SfM DEM shows a ~7 m vertical separation of an alluvial fan surface across the scarp. This evidence of late Quaternary deformation indicates ongoing extension in the southern Rio Grande rift and associated earthquake hazard for southern New Mexico.

pp. 11, https://doi.org/10.56577/SM-2018.758

2018 New Mexico Geological Society Annual Spring Meeting
April 13, 2018, Macey Center, New Mexico Tech campus, Socorro, NM
Online ISSN: 2834-5800