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Melinda G. Shaw-Faulkner

College of Sciences and Mathematics, Department of Geology, Stephen F. Austin State University,
mgshaw@sfasu.edu

Kevin W. Stafford

College of Sciences and Mathematics, Department of Geology, Stephen F. Austin State University,
staffordk@sfasu.edu

Aaron W. Bryant

College of Sciences and Mathematics, Department of Geology, Stephen F. Austin State University

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Geoanalytical analysis of speleogenetic development in the Owl Mountain and Nolan Creek Provinces: Fort Hood Military Installation, Texas (Abstract)

Research on terrain-related surface features is highly dependent on terrain data collection and the generation of digital models. The increasing capabilities of GIS (Geographic Information Systems) and accuracy of geographically referenced data has provided the basis for more detailed terrain analysis and modeling. Airborne Light Detection and Ranging (LiDAR) provides an alternative for high-density and high-accuracy three-dimensional terrain point data collection. Speleogenetic development of karst landscapes can be interpreted and modeled by the use of this data, particularly in areas where land use and dense vegetation inhibit the use of traditional karst survey inventories.

The Fort Hood Military Installation is characterized by Cretaceous-age limestone plateaus and canyons stratigraphically defined by exposures of the Fredericksburg Group. The installation is located in the Lampasas Cut Plain region of the Edwards Plateau in Bell and Coryell Counties, Texas. Using available LiDAR data, spatial interpolation of 195 km² of the Fort Hood Military Installation provided an initial data set of 17,516 depressions. These features were delineated and classified using geoanalytical methods; depressions that were classified as interfering or related to natural and anthropogenic features such as roads, water bodies and stream channels, were removed from the data set. The remaining 2,066 depressions were used to create a karst depression density map to determine spatial relationships of speleogenetic development. Although the availability of high density data makes it possible to represent terrain in great detail, the high density data significantly increases data volume, necessitating the use of filter mechanisms to characterize major natural and anthropogenic terrain modifications resulting from military use, road construction and maintenance, and the natural influence of water bodies throughout the study area.