

CE394K
GIS in Water Resources
Term Project
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Project Goals

This project is a spatial analysis of Texas karst terrain using geological features to indicate the presence of groundwater. The geological features include aligned sinkholes, subsidence, lineaments, and faults. Geographical information includes geologic maps showing the locations of these features and data on water wells located near these features. The goal of the project is to determine if this methodology might lead to successful water exploration in karst areas, particularly arid areas.

This study is part of my PhD research on Abbé Paramelle (1790-1875) a self-taught geologist who found groundwater on the dry limestone plateaux of southwestern France (Causses du Quercy). Years of observation led Paramelle to conclude that sinkholes channeled rainwater to springs that flowed into the region's few major rivers. He understood sinkholes to be linked by conduits and devised a method for finding groundwater between aligned sinkholes.

Over time, sinkholes enlarge through dissolution, collapse, and subsidence. Subsidence areas overlie one or more sinkholes and commonly enlarge over time. Water that infiltrates and widens faults that intersect sinkholes, aligned sinkholes, or subsidence areas may provide large quantities of water.

GIS provides a way of analyzing the application of Paramelle's ideas to karst areas in Texas. The study area is near New Braunfels, Texas, within the Balcones fault zone, where numerous sinkholes and subsidence features have been mapped (Collins, 2000). The study area is a parallelogram; its NE corner at 98°00W 30°N and its SW corner at 98°30W 29°30N.

Datasets

Datasets to be used in this study include:

- (1) Lidar data to examine topography and to locate subsidence areas. The TNRIS website lists 2011 FEMA Lidar data for Comal county that may cover most of the study area. I plan to talk to a TNRIS representative before purchasing the data.
- (2) Geologic maps to indicate surface lithology and lineament/fault locations. TNRIS has the Geologic Atlas of Texas. A Bureau of Economic Geology miscellaneous map and report (E. Collins, 2000) shows subsidence areas.
- (3) Data on locations and productivity of water wells in the vicinity of subsidence areas and their intersections with faults/lineaments. The Texas Water Development Board maintains two databases: groundwater <http://www.twdb.texas.gov/groundwater/data/gwdbbrpt> and submitted drillers reports <http://www.twdb.texas.gov/groundwater/data/driller>

This project is hopefully a preliminary step to conducting similar analyses elsewhere in Texas and the US, so I'm interested in developing a methodology that can be repeated.