

# Gravimetric Studies of In-filled Karst Structures in the Cobleskill Plateau, **Central New York**

The Cobleskill Plateau of central New York is part of the larger Helderberg Plateau, comprised of Silurian and Devonian limestones which display excellent caves and karst landforms, subsequently altered by glaciation. The glacially mantled and in-filled pre-existing karst topography of the area caused hydrologic changes that affect current karst flow paths. Determining the nature of the antecedent topography, and the location of cave passages, is critical to a full hydrologic analysis of the Cobleskill Plateau. A series of gravity traverses were conducted using a Worden Gravity traverses were conducted using a passage connecting Howe Caverns and McFail's Cave near Cobleskill, New York. The importance of finding or not finding or not finding the abandon trunk passage is to increase the understanding of subsurface geology, potential hazards and controls on pre-glacial groundwater flow in the region. Gravimetric analysis has been used successfully to locate a glacially in-filled valley, and how that valley relates to known cave passages in the area, but this investigation is the first to attempt to locate the link between the two cave system segments. The findings of this study conclude that subsurface anomalies do exist at the expected locations and can be identified through the use of gravity surveys. The exact shape, size, or type of anomaly cannot be definitively determined by this study but can be fit to various models which support the existence of a void. The exact nature of the anomalies may be determined by further exploration of the subsurface in the region and from within the caverns, if access becomes possible.



Ver Straeten, C.A., 2009, The Classic Devonian of the Catskill Front: A Foreland Basin Record of Acadian Orogenesis in New York State

Geological Association, 81st Annual Field Trip Guidebook, p. 7-1 to 7-54.

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### Abstract

## **Geographic and Geologic Setting**

The Southeast Passage of McFail's Cave (Fig. 1) and the West Passage of Howe Caverns (Fig. 2) are the upstream and downstream continuations of an abandoned trunk passage obstructed on both sides by fill. The major cave and karst-forming lithologies of the Helderberg Plateau are the Silurian-Devonian carbonates of the Helderberg Group (Fig. 3). The exact age of the two caverns and the trunk passage is unknown, however; interpretation of the work conducted by Lauritzen and Mylroie (2000) suggests that the caves must at least predate the Wisconsinan glaciation due to the existence of glacial transported sediment within the caves and U/Th stalagmite dates from regional caves. McFail's Cave, is located in Carsile, New York (Fig. 4), the cave is privately owned and maintained by the National Speleological Society. The current mapped length of the cave is 10.7 km (6.6 mi.), according to Palmer et al., (2003), making it the longest cave in New York State. McFail's Cave consists of three primary passages; the Main Passage, the Northwest Passage, and the Southeast Passage (Fig. 1) all of which exist largely within the Manlius Limestone (Fig. 3).

Howe Caverns, is located within the hamlet of Howes Cave, New York (Fig. 4), and is the largest commercial cave in the Northeast. Howe Caverns is a single strike-oriented phreatic passage with a vadose canyon cut into the floor, as result of a change in base level, with some tributary passages feeding it (Fig. 2). The mapped length of the cave is approximately 3.2 km (2.0 mi.) prior to commercial cement quarrying which destroyed the downstream portion of the cave (Palmer et al., 2003).



**Figure 4:** Map showing the location of caves in the Cobleskill area in relation to surface topography and also shows the general locale of gravity surveys conducted in this study (re-drawn from Dumont, 1995).

**B':** Lat: 42°41.980'N Long: 074°24.328'W **B:** Lat: 42°41.922'N Vdt Sink Long: 074°24.351'W JACK PATRICKS Woodlot Sink SECRET-BENSONS

**Gravity Transects**  $A-A^{"} = Doc Schaul's Spring$ **B-B'** = Barnerville Rd. **C-C**<sup>I</sup> = Myers Rd. **D-D'** = Lykers Rd.

# Methods

### **Field Methods:**

- Field methods were conducted from 11/11/10 to 12/4/10 and 4/7/11 to 4/9/11.

- between each station.



**Bedrock Profile #2** 

Bedrock Profile #1

Base
Station

Station

Station

Station 3

Station 4

Fill = Station 5

Texas Instruments Worden

Gravity Meter and

Aluminum Base Plate







but can be fit to various models through interpretation of Figures 5.1 through 5.4.

### **Data Filtering/Reduction Methods:**

1. Each gravity reading was multiplied by 0.0997 to covert gals to milligals (mgals).

2. Drift curves were created in Microsoft Excel, specific to the locations in which gravity surveys were conducted, using only the