GLACIALLY-INFLUENCED SEDIMENT CYCLES IN THE LIME CREEK KARST, EAGLE COUNTY, COLORADO

Paul A. Burger

ABSTRACT

Cave sediments in the Lime Creek area of Eagle County, Colorado were classified by composition and texture and were plotted on detailed maps of cave geomorphology. These maps were used to relate cave sediments to surface deposits and to assemble a depositional history of the caves.

Speleogenesis and karst development was strongly controlled by the advances and retreats of Pleistocene glaciers and advances of Holocene rock glaciers. Cave development probably began about 95-130 ka and continues to the present. During glacial periods, caves overrun by glacial ice were characterized by calcite deposition and roof breakdown. Periglacial caves were marked by active stream erosion and deposition, and calcite deposition in abandoned passages. Meltwater from glaciers increased stream energy and transported glacial materials completely filling some passages. During interglacial periods, speleogenesis in most of the caves was limited to roof collapse, calcite precipitation, and sediment deposition.

1. INTRODUCTION

Most cave sediment studies have focused on data obtained from sediment cores (i.e. Luiszer, 1987; Lauritzen, 1996) or sections of speleothems (Lauritzen, 1996). Paleomagnetic data and analyses of stable and unstable isotopes have been used to determine paleoclimate and long-term depositional history, but these techniques are expensive and not widely available. In some wilderness areas, coring, trenching, and speleothem removal may be prohibited, requiring alternative techniques.

The objectives of this study were to develop a method for cave sediment mapping, and to use that method to develop a sedimentary history for the caves of Lime Creek. Cave deposits were mapped using techniques generally applied to unconsolidated surface deposits. Correlation between surface glacial deposits and cave deposits allowed some

---

* Paul A. Burger, Carlsbad Caverns National Park, 3225 National Parks Highway, Carlsbad, NM 88220, paul_burger@nps.gov.
interpretation of how glacial processes affected cave development and sedimentation. Detailed classification and mapping of cave sediments were accomplished with very little cave disturbance.

2. GEOLOGIC SETTING

The Lime Creek drainage is an alpine karst system developed in Mississippian Leadville Limestone on the west slope of the Sawatch Range, approximately 20 kilometers (12 miles) northeast of Aspen, Colorado (Fig. 1). The mapped area is approximately 23 km$^2$ (9 mi$^2$), at elevations between 2,740 and 3,350 m (9,000 to 11,000 ft). The area is bounded by tributary valleys of the Fryingpan River on the north, south, and west. The eastern extent of the study area is defined by uplifted and exposed Precambrian granite, gneiss, and schist (Fig. 2).

The Leadville Limestone is part of a carbonate shelf northwest of the Sawatch Uplift (Fig. 1). In Lime Creek, the Leadville is a massive to well-bedded, fossiliferous limestone