

THE IMPORTANCE OF CAVES AND MINES TO THE EVOLUTION OF THE GRAND CANYON, ARIZONA, USA

Carol A. HILL and Victor POLYAK

Geologic and mineralogic features in Grand Canyon caves and mines preserve a record of late Tertiary events, including the descent of the water table and rate of canyon down cutting. The mineral alunite and calcite mammillary crusts are especially important in this regard because they can be dated and their stable-isotope geochemistry can determine the environment in which they formed as canyon down cutting progressed. All Grand Canyon caves studied so far occur in the Redwall Limestone and contain replacement gypsum rinds and/or blocks. Sulfur isotope analyses demonstrate that this gypsum is *speleogenetic*, rather than *speleo~~them~~ic* in origin; that is, the gypsum formed by a sulfuric acid reaction involving the possible ascension of H₂S along faults/master joints from hydrocarbon sources in the Precambrian basement.