GEOSTATISTICAL ANALYSIS OF DIAGENETIC MODIFICATION OF THE MIAMI OOLITE

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PROJECT OBJECTIVES

- Continued investigation of the co-occurrence of surfical karst pits (dolines) and shallow stratiform caves in the Miami oolite.
- Analysis of the relationship between diagenetic modification, stratigraphy, and facies, with respect to potential fluid flow through a Pleistocene sand body.

PROJECT RATIONALE

To date, a LiDAR bare-earth terrain model has been used to explore the preservation potential of various aspects of grainy carbonate systems, including tidal bars and channels (Purkis and Harris, 2017). We further used the LiDAR surface to develop a statistical understanding of the distribution of dolines across the sand body (Purkis et al., 2017). What has not been integrated, however, is the relationship between the dolines and the many shallow cave systems that have been recognized in the Miami oolite (e.g. (Cresseler, 1993; Florea et al, 2015).

SCOPE OF WORK

The project will proceed with an integration of the LiDAR terrain model, our existing maps of doline distribution, and locations of caves as harvested from the literature and our field examination (Fig. 1). An effort will be made to seek congruencies between the surficial karstic overprint (i.e. the dolines) and the better developed cave systems, which, in a subsurface setting would have a meaningful impact on fluid flow. Further effort will be dedicated to examining how both types of karst relate to stratigraphy, facies, and hydrogeography.

SIGNIFICANCE

The Miami oolite is an example of eogenetic karst wherein a dual porosity/permeability system has developed. During the last 125 kyr of meteoric diagenesis, the patterns of porosity and permeability as related to depositional facies have been modified. For instance, core-measured porosity averages 43% but ranges from 17– 67% (Robinson, 1967; Halley and Evans, 1983; Hester and Schmoker, 1985). Facies still clearly influence dissolution pathways, however, within the grainstone deposit to produce a connected vug-cave network preferentially situated in the *Ophiomorpha* ichnofabric (the “burrowed” facies) which mimics a “super’K” zone. Since the Miami oolite is the uppermost portion of the Biscayne Aquifer, a highly transmissive unconfined aquifer, which provides the bulk of potable water for the region, a rich understanding of fluid flow through the deposit already exists and can be integrated into this project.

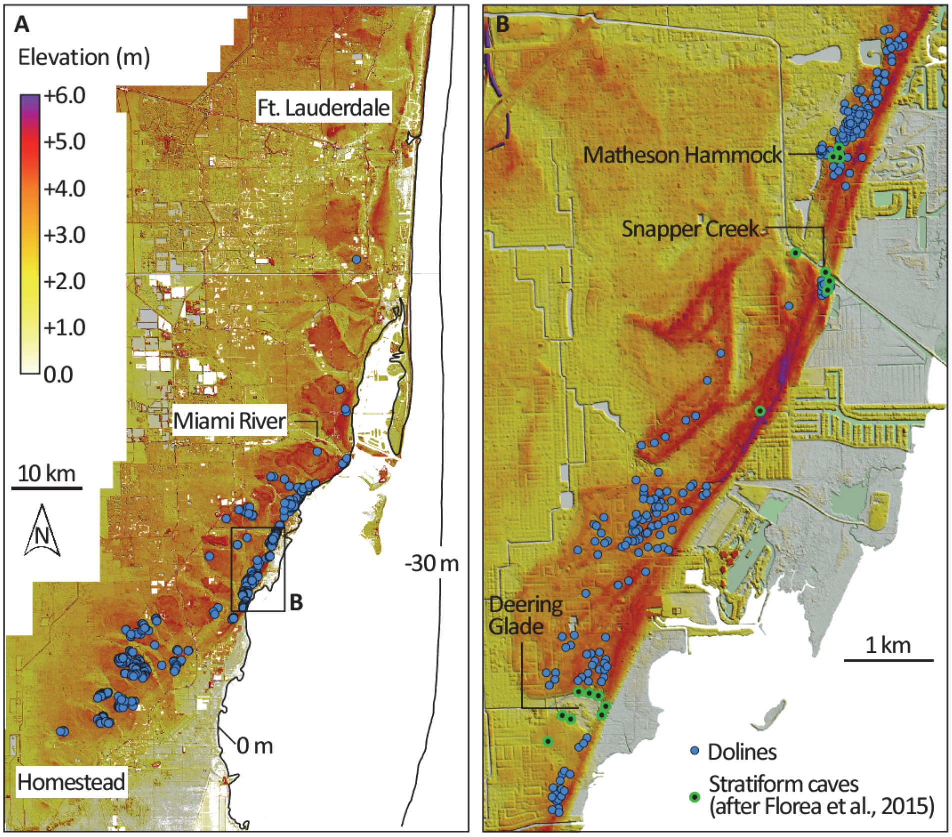

Figure 1. (A) LiDAR topography of the Pleistocene Miami oolite (Purkis and Harris, 2017). Dolines (n = 735) digitized from the LiDAR surface and validated in the field (blue dots) variably develop throughout the deposit. (B) Focuses on an area of the barrier bar spanning Deering Glade through Snapper Creek to Matheson Hammock and highlights locations of dolines and stratiform caves (green circles, as mapped by Florea et al., 2015).

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