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The role of rainfall in producing karst depressions in Florida

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Internally drained closed depressions are the main surface landforms in karst environments. Generally indicated as dolines or sinkholes, they are formed and evolve in response to rainfall and runoff. Karst depressions are produced by a number of processes, and are related to many triggering mechanisms such as groundwater inputs or withdrawals, loading, and extreme precipitation events. Florida is a very well-known karst area where wide sectors of the state are dotted with high density of karst depressions, extremely variable in size and affecting even the urban environment. In order to assess the role of precipitation in the formation of sinkholes in the active Florida karst plain, we conducted analyses on two databases: i) the Florida sinkhole database, and ii) the Lexus/Nexus database of newspaper articles on sinkhole occurrences in Florida.

The first database is a listing of reported sinkholes maintained by the Florida Geological Survey. It was started in the early 1980's and the available record covers a twenty-five year period. While this database has its flaws, it is the only comprehensive public listing of sinkhole events in the state. The second database was examined to find the date of the formation of notable sinkholes in the state. While this database is skewed to those sinkholes that form in large urban areas, it provides supplementary information to the first database. Our analysis focused particularly on two metropolitan areas (Tampa and Orlando). Recorded sinkhole events (for which date and timing of occurrence were known) were scrutinized and evaluated with relation to the available rainfall data (hourly or daily amount of rainfall, antecedent rainfall, etc.). This analysis allowed us to evaluate the role played by rainfall, together with the characteristics of the meteoric events (duration, amount) in triggering the sinkholes. The results indicate that there are particular times of the year, notably early summer and fall during which sinkholes are more likely to form. Nevertheless, sinkholes may be registered any time

of the year, with their formation more likely to occur during a drought or during extreme rainfall events. Some case studies are eventually illustrated to describe the direct links existing between rainfall events and occurrence of sinkholes in Florida.