KARST CHARACTERISTICS OF THE USF GEOLOGY PARK, TAMPA, FLORIDA

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GEOLOGICAL SETTING

The USF Geology Park lies within the Atlantic Coastal Plain (ACP). The ACP is characterized by very low relief and typically has a shallow water table. In Florida a blanket of Miocene and post-Miocene siliciclastic deposits covers a thick sequence of Tertiary carbonates. The Florida peninsula was depositionally isolated from the North American continent during the early Tertiary, allowing a thick sequence of relatively pure shallow-water carbonates to be deposited.

The Floridan Aquifer is composed of Eocene to Miocene limestone and dolostone. The maximum freshwater-saturated thickness is about 700 m, and averages 300-400 m. The Eocene and Oligocene rocks are relatively pure carbonates, but Miocene units contain considerable siliciclastic material. The siliciclastic units of the Miocene Hawthorn Formation and the weathering residuum of the “dirty” Tampa limestone member form a semiconfining unit over the early Tertiary carbonates. Quaternary aeolian activity has reworked some of the shallow marine sediments, creating an uppermost layer of very fine, very well sorted sand.

KARST PROCESSES

West-central Florida does exhibit some classical fluvio-karst features, but the karst cover, especially the dune sands, has subdued the surface expression of all but the largest features. Many karst features are relict, apparently formed when the water table was considerably lower than its present position. Many of the first-order springs of west Florida discharge through conduits formed by downward moving water when the water table was 100 m or more below land surface.

The insoluble residue of the Tampa Limestone and the fine-grained units of the Hawthorn Formation form a stiff clay cap over the underlying limestone. This cap is competent enough to bridge small cavities, but collapse of the clay into larger pre-existing cavities creates an upward raveling through the unconsolidated sediments, forming a cover-collapse sinkhole. The result can be a vertical column of surficial sand extending from the surface into the limestone, through the semiconfining layer. The cover collapse can be slow, episodic or catastrophic. At the USF site, there is one mappable subsidence feature for every 625 m^2 (25 x 25 m) of land surface.

The USF area is an active cover-collapse sinkhole region. The USF campus has experienced more than 30 cover-collapse events in its 40 years of operation. This results in a frequency of about one cover-collapse sinkhole per square mile per year. The small cover-collapse feature at well 4A has collapsed three times since about 1980.

HYDROGEOLOGY

Because of the presence of the cover-collapse features and the downward hydraulic gradient, the lateral flow of shallow ground water is limited. At the USF site, and probably in much of the Tampa Bay region, shallow ground water flows only a few tens of meters or less until it either discharges into a surface water body or recharges the Floridan Aquifer through a cover-collapse sinkhole. By far, the greatest volume of recharge at the USF site moves through the karst conduits and not the semiconfining layer. The study site is 12,000 m^2 , and the sand columns contribute 16 m^3/d of recharge, while about 1 m^3/d is estimated to leak through the semiconfining layer. The sand columns constitute about 1% of the surface area of the site, but contribute 95% of the recharge to the Floridan Aquifer. The cover-collapse features appear to be the dominant hydrostratigraphic features in west-central Florida. For more details see:

PARKER, J. W., 1992, Surficial Aquifer Hydrogeology in a Covered-Karst Terrane, Masters Thesis, University of South Florida, 228pp.

STEWART, M., PARKER, J., 1992, Localization and Seasonal Variation of Recharge in a Covered Karst Aquifer System, Florida, USA, International Contributions to Hydrogeology, vol. 13, Spinger-Verlag, pp. 433-460.