Evolution of Mixed Siliciclastic/Carbonate Aquifer Containing Metastable Components

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Background
Freshwater aquifers in Florida are commonly formed by the elevation of marine sediment deposits above sea level. These siliciclastic/carbonate deposits are composed of quartz sand and aragonite in the form of shells. The aragonite components in these type of soils tend to dissolve over time in freshwater aquifers, which leaves only the siliciclastic constituent. Throughout the dissolution process, changes in the properties of the aquifer such as the hydraulic conductivity occur.

Purpose
It is the purpose of this research to measure changes in the estimated hydraulic conductivity of these aquifers when the carbonate sediments are removed. This information is relevant due to the current lack of research data on permeability changes of coastal sediments as the carbonate component is removed, and shows variations in hydraulic conductivity for a constantly changing environment. This experimental program is part of a larger research agenda focused on the characterization of hydraulic conductivity values due to spatial and temporal variations in natural aquifer systems.

Design/Method
In order to accomplish this assessment, over 38 samples of mixed siliciclastic and carbonate sediments were collected from several locations in beach areas of the Cayo Costa state park, in Fort Myers, Florida. Laboratory testing includes the grain size characteristics, porosity and hydraulic conductivity of the sediments both before and after the removal of the carbonate component with the purpose of analyzing the differences after dissolution takes place.

Results
Preliminary results indicate all samples are primarily sands with a relatively low silt content, including the ones gathered up to 21 feet from the shore. Additionally, the samples that were collected closer to the seashore displayed a higher shell content when compared to the inland samples.

Conclusions
The resulting differences show a general assessment of anticipated changes in hydraulic conductivity during aquifer evolution. The inherent assumption is that the sediments are essentially homogenized and not bedded. This is commonly caused by bioturbation within shallow subtidal environments.