Summary of Research in the Apalachicola – Port St. Joe Region
(Gulf and Franklin Counties, Florida)
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Past research (2002-2007)

Main Research Component

The barrier islands and spit that form the Apalachicola Barrier Island Complex, located on the Florida Panhandle, on the northeast Gulf of Mexico, preserve suits of well-developed beach and dune ridges that are generally believed to have begun to form around 6,000 years ago (Mid-Holocene time).

The research that I conducted from 2002 until 2007 was part of my Ph.D. at McMaster University (Canada). The purpose of the research was to understand the geological evolution of this system but also, and most importantly, to determine the precise ages of several of the beach and dune ridges that decorate / form the barriers / islands. The ages were obtained using optical stimulated luminescence (OSL). St. Joseph Peninsula, Cape San Blas, St. Vincent Island and Little St. George Island were cored at 31 different localities using a vibra-core and OSL was used to obtain the ages of samples extracted at two depth intervals within each sediment core. It was the first time long continuous cores (> 3m long sediment cores) were used for OSL dating purposes. After a series of chemical treatments and mechanical separation, quartz grains extracted from each sample were analyzed for their OSL signal. This signal is used to calculate the age of the sample (since it was last buried).

In general, the OSL ages obtained showed an increase in value from the shores to the interior of the barriers/islands, corresponding to young sediments to old, as one would expect. They also increased from south to north along St. Joseph Peninsula. However, I found that this Peninsula may have grown northward and seaward simultaneously from at least 3 smaller pre-existing islands (or nuclei) as old as 5,000 to 2,000 years ago. The oldest of these "islands" is Richardson's Hammock, an ancient First Nations land. As for the youngest ages obtained along the peninsula, two mature foredunes, one located in the northern part of St. Joseph beach and the other in the south, have yielded ages as young as 70 and 20 years respectively.

Cape San Blas, a tombolo that attaches the southern end of St. Joseph Peninsula to the mainland was dated to a much younger time, evolving westward from the mainland from around at least 1,000 years ago to 300 years ago.

Beautiful St. Vincent Island, which is decorated by a superb sequence of truncated beach ridges, was found to be as old as 3,000 years old. Ages around that time were found to be linked to presently semi-submerged ridges on the North side of the island. The youngest of the ridges dated on St. Vincent, the first well-formed ridge on the present beach, is 300 years old.

As for Little St. George Island, the oldest beach ridge dated yielded an age of 1,600 years ago and the youngest mature ridge found on the Gulf shoreline was only developed 30 years ago, making this island the youngest system of the Apalachicola complex.

Besides dating these Holocene barrier islands, a much older ridge located on the mainland (Buffer Preserve) was also targeted for this research. It is believe to pertain to the Gulfport group of barriers that once dominated the Gulf Coast shores, during the Late Pleistocene, when sea level was higher than

at present. An age of 170,000 years was obtained, making it the oldest Gulfport age ever been published.

My studies have also served to quantify rates of coastal lateral progradation (growth) and vertical accretion (accumulation) of sand through time. All the OSL ages I have obtained have been carefully compared against other previously reported ages (few radiocarbon ages) and any other geochronometric data obtained from archaeological and geological materials. Studies such as this one serve to reconstruct the morphology of a coastal land over the last several thousand years.

Secondary Research Component (Ph.D. and post-Ph.D.)

The Gulf and Franklin Counties are known for their beautiful and pristine beaches. However, these environments are constantly being accreted and eroded due to the natural hydrodynamics reigning in this Gulf of Mexico region, but also due to the cyclical storm/hurricane phenomenon.

Beach profile surveys and beach/littoral sands have been collected during each field season at several locations along St. Joseph Peninsula, Cape San Blas, Little St. George Island and St. Vincent Island to better understand the current processes affecting the growth of the nearshore zone: to obtain the approximate volume of sediment transported along shore, establish the potential equilibrium of the beach system, evaluate the response of the system to severe storms/hurricanes besides obtaining ages on the sands forming these coastal barriers.

The field observations and data is being used to evaluate the equilibrium conditions of the beach and processes occurring in the nearshore zone, as well as the most recent evolutionary history of these coastal barriers:

- The configuration of the beach, before and after hurricane season.
- The volume of sediment involved in the erosion/accretion process onto the beach.
- The relevance of hurricane deposits for the equilibrium & evolution of the Peninsula.
- The understanding of sediment transport along shore applying a new analytical technique.
- To determine the possible sources of sediment grains forming these beaches.

Present and Future Research (2008-present)

The only islands missing in the puzzle of my Ph.D. research were St. George and Dog islands. Being St. George the longest island of the two, it is important to sample and date as it would give a more complete view of the entire evolution of the Apalachicola Barrier Island System. The coring of St. George Island was done in 2008 as part of my on-going investigations post-Ph.D., which I continue to maintain in the area. Adding St. George Island to the results obtained during my Ph.D. will allow for a better understanding of the evolution of the whole Apalachicola Complex and elucidate future coastal management plans for all the systems, based on a complete history of their past, since their time of formation.

The analyses of the cores collected are still on-going and the OSL measurements and age determinations will soon be obtained and published.

As for Dog Island, several cores were collected during a field expedition in 2009 but are yet to be analyzed.

In summary...

"When" did a system start to form and "for how long" did it maintain itself are fundamental questions related to the evolution of any coastal environment. These questions may be answered in an absolute manner by using optical dating (or luminescence dating), a young dating method that measures the luminescence signal preserved in minerals such as quartz and feldspar. Understanding the formation and evolution of a coastal system is necessary to better understand the present and future of the system.

I recently completed a detailed re-evaluation of the supra-tidal evolutionary history of the central-western Apalachicola barriers, based on new optical ages and sedimentological, geomorphological and historical analyses. I have proved that optical dating is the best dating method to be used in these quartz-rich sandy coastal environments of the Florida Panhandle (using vertical and horizontal sediment cores). I will continue my investigations of the eastern region of the Apalachicola Complex as well as my on-going investigations related to coastal accretion and erosion rates, sediment transport, and storm/hurricane impact along all these beautiful Apalachicola – Port St. Joe shores.