Global change and hurricanes;
Linking Holocene sea surface temperatures and hurricane frequency

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Introduction

The effect of global warming on tropical storm activity is a subject of intense scientific debate. Hurricane records of the past couple of decades suggest a causal link between the warming trend of the oceans surface and the increasing intensity and number of storms(1-3). However, also different modes of the multi-annual El Niño southern oscillation (ENSO) have been speculated to affect hurricane frequency (4). Only through extending the records beyond the instrumental measurements by paleo-data, the full range of natural variability inherent to the climate system can be captured.

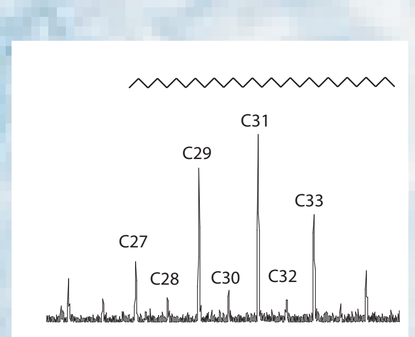
Aim of the project is to reconstruct detailed Holocene precipitation and sea surface temperature records, and to determine the relationship between hurricane activity, sea surface temperature and natural variability in the climate system (e.g. ENSO).

Method

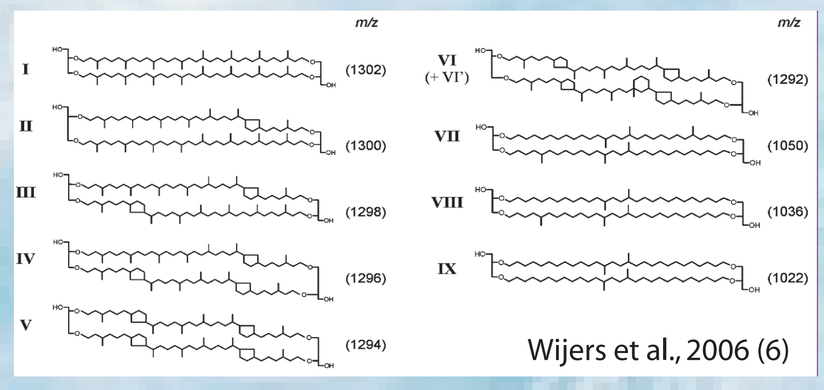
Hurricanes, because of their large convective cells, fractionate several times more strongly compared to regular precipitation. Stable hydrogen isotope records of terrestrial plant molecules, can therefore be used as proxy for past hurricane activity.

Hurricanes in the wider surroundings of the studied transect will be reconstructed from marine sediments, using state of the art organic geochemical techniques (e.g. BIT-index, a measure for influx of terrestrial organic matter in marine sediments). Marine sea surface temperatures in the Gulf of Mexico will be reconstructed with geochemical paleothermometers UK'_{37} and TEX_{86}.

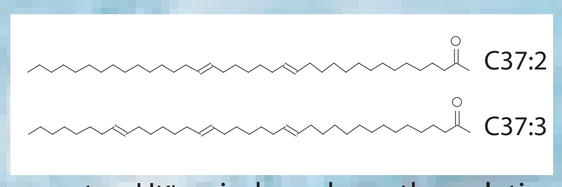
The records will be compared with the occurrence of tropical storm deposits in sedimentary archives. The combination of these records together with a paleohydrological signal obtained from detailed vegetation reconstructions will help to identify periods with increased hurricane activity.



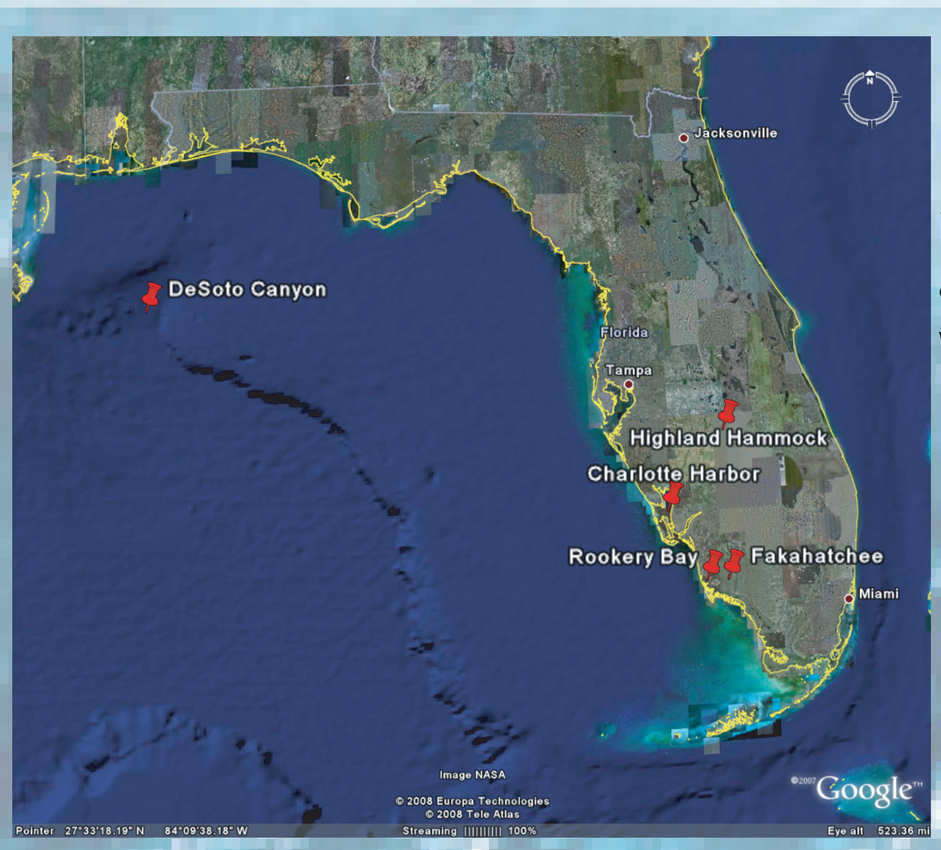
Long chain *n*-alkanes, that show a strong odd-over-even predominance, probably derive from epicuticular waxes from vascular plants. Because hydrogen atoms of these biomarkers ultimately derive from rainwater, they can be used to reconstruct the isotopic signature of precipitation.



Paleothermometer TEX_{86} and the BIT-index are based on the relative abundances of glycerol dialkyl glycerol tetraehters (GDGTs) (7,8)



Paleothermometer UK'_{37} is based on the relative abundance of the C37:2 and C37:3 alkanones, which are biomarkers for Prymnesiophyceae algae like *Emiliania huxleyi* (9)



Fieldwork area: South-West Florida is impacted by both ENSO (5) and hurricane activity. Terrestrial, logoonal and marine sites were selected.

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