



## INTER-AMERICAN INSTITUTE FOR GLOBAL CHANGE RESEARCH

### Paleotempestology of the Caribbean region: a multi-proxy, multi-site study of the spatial and temporal variability of Caribbean hurricane activity (CRN2050)

The pan-Caribbean region, which includes Central America, the Caribbean islands, and the U.S. Gulf coast, is one of the most hurricane-ridden regions of the world. In spite of the enormous damage they often inflict when making landfall, it is poorly understood how they form and why they chose certain pathways. This project analyzes the variability of Caribbean hurricane activity using paleotempestology, the study of past cyclones, by analyzing 'proxy data' - coastal lagoon sediments, isotopic records from stalagmites, tree-rings, and corals.

#### Goals

- Produce proxy records of past hurricane activity in the Caribbean
- Understand the climate mechanisms that affect Caribbean hurricane activity by analyzing and modeling historical hurricane records and modern climate data
- Use past records to assess the risk of future hurricanes

#### First results

- A new coral-based proxy record of Atlantic sea surface temperatures for the period AD 1552-1991, the longest-ever established, shows that higher hurricane activity before 1550 and after 1750 coincides with warmer sea surfaces. When the Atlantic surface was cooler, there were fewer storms in the Caribbean.
- Caribbean hurricane activity varies following climate patterns such as the Atlantic Multidecadal Oscillation (AMO) and El Niño-Southern Oscillation (ENSO). Proxy data and modeling reveal peaks in Atlantic hurricane activity during Medieval times (AD 900-1100) and again since 1980, explained by the prevalence of warmer sea surface temperatures and La Niña-like conditions.
- Air mass circulations in the Intra-Americas Sea are dominated by the Low-Level Jet (LLJ). A re-analysis of the Jet shows that it critically affects sea surface temperatures and moisture advection – important factors for hurricane strength and storm damage.
- Geographical and demographic (2006) data shows approximately 19 million people living within vulnerable areas less than 1 km from the coast line in the conterminous U.S. and 12 million people live within three-meter elevation along the coast.

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#### Links to other IAI projects

This project collaborates with **Tropical cyclones: current characteristics and potential changes under a warmer climate** (CRN2048).

**Project web page:** <http://www.oceanography.lsu.edu/liu.shtm>

**List of publications:** <http://iaibr.liaii.int/bs/publications/CRN2050.pdf>



Research sites



Google Earth image of Laguna Bailen, a coastal lagoon in Cuba cored for our paleotempestology study; scale bar is 1 km (Photo credit: M. Peros)



A sediment core taken from a coastal lagoon in Sian Kaan, Mexico, containing a clastic layer probably deposited by a hurricane (Photo credit: J. Donnelly)

