

PALEOTEMPESTOLOGY OF THE CARIBBEAN REGION: A MULTI-PROXY, MULTI-SITE STUDY OF THE SPATIAL AND TEMPORAL VARIABILITY OF CARIBBEAN HURRICANE ACTIVITY

The pan-Caribbean region, including Central America, the Caribbean islands, and the U.S. Gulf coast, is one of the most hurricane-prone regions of the world. Hurricane impacts are of enormous societal relevance. This project analyzes the spatial and temporal variability of Caribbean hurricane activity across multiple timescales from the interannual to the millennial using paleotempestology, i.e. the study of past tropical cyclone activity by means of geological and archival techniques.

GOALS

- Produce proxy records of past hurricane activity at multiple sites across the Caribbean region by analyzing coastal sediments and isotopic records from stalagmites, tree-rings, and corals
- Understand the climate mechanisms affecting Caribbean hurricane activity through statistical analysis and computer modeling of modern climatic data and historical hurricane records from the region
- Assess the vulnerability of the Caribbean region to past and future hurricane strikes by developing a historical database on the impacts of past hurricanes on Caribbean societies

ACTIVITIES

- Collect sediment cores and stalagmite samples in Yucatan and Quitana Roo, Mexico; the Dominican Republic; Nicaragua; Cuba; during 2007 and 2008 and in Belize, Cuba, and other Caribbean and Gulf Coast locations in 2008-2009
- Laboratory analyses of these geological samples to produce proxy records of past hurricane strikes
- Conduct numerical analysis of modern and historical climatic and meteorological data to understand the hurricane climatology of the Caribbean region, with special attention on links to ENSO, sea surface temperature (SST), the intra-American low level jet, and the teleconnection between Atlantic hurricane and Pacific typhoon activities
- Develop a historical database on the socio-economic impacts of past hurricanes on Caribbean societies
- Develop a geographic information system (GIS) that links hurricane risks to potential loss of life, economic damages, and post-hurricane environmental and health hazards in the region

Lead agency and principal investigator

Louisiana State University, Dept. of Oceanography and Coastal Sciences (USA)

Kam-biu Liu (PI) - kliu1@lsu.edu

Co-Investigators

Nina Lam (Louisiana State University, USA), Amy Frappier (Boston College, USA), Claudia Mora (University of Tennessee, USA), Jeff Donnelly (Woods Hole Oceanographic Institution, USA), Tom Webb III (Brown University, USA), Anne Cohen (Woods Hole Oceanographic Institution, USA), Sam Bentley (Memorial University of Newfoundland, Canada), Matthew Peros (University of Ottawa, Canada), Joe Desloges (University of Toronto, Canada), Jorge Sanchez-Sesma (IMTA, Mexico), Jorge Amador (University of Costa Rica, Costa Rica), Eric Alfaro (University of Costa Rica, Costa Rica)



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)