Paleotempestology — The Science of Reconstructing Paleohurricane Catastrophes

Kam-biu Liu

Department of Geography and Anthropology, Louisiana State University, Baton Rouge, LA 70803

ABSTRACT

Tropical cyclones (hurricanes and typhoons) are a major cause of Holocene environmental catastrophes in many coastal regions of the world. For many coastal societies, uncertainty about the risk of a hurricane catastrophe is exacerbated by the lack of reliable information on the return period of the rare but most extreme hurricanes. For example, for New Orleans, is Hurricane Katrina a 50-year, 100-year, or 500-year event? The development of paleotempestology—a new field of science that studies past tropical cyclone activities by means of geological and archival techniques—suggests that this question can be answered by studying the overwash sand layers preserved in the sedimentary records of lakes and marshes along the Gulf of Mexico and Atlantic coasts. Paleotempestological records suggest that during a "hyperactive period" about 3,800-1,000 years ago, the Gulf Coast was impacted by catastrophic hurricanes three to five times more often than during the recent millennium. The Bermuda High hypothesis postulates that this millennial-scale variability was controlled by long-term changes in the Bermuda High and the North Atlantic Oscillation, which were related to the broader patterns of global to regional climate changes. This hypothesis predicts that catastrophic hurricane activities exhibit an anti-phase pattern between the U.S. Gulf Coast and the Atlantic Coast. New data from Cape Cod seem to support the Bermuda High hypothesis. Paleotempestology has also contributed to a better understanding of the interactions between catastrophic hurricanes and major wildfires.

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