

IMPROVING THE PREDICTION OF HURRICANE OCCURRENCE THROUGH THE RECONSTRUCTION OF ANCIENT STORM HISTORY IN THE NORTH ATLANTIC

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Existing historical records of tropical cyclones in the North Atlantic are inadequate to assess the skill of numerical models forecasting hurricane occurrence in the future. Although the identity and the relative influence of meteorological forces responsible for the development of hurricanes continue to be debated, most scientists agree that many of these key processes vary over decadal and longer time periods. Discerning relevant climate variables that drive hurricane development using traditional harmonic analysis techniques therefore requires a much longer, high-resolution time series, particularly when attempting to tune predictive models for long-term forecasts related to global warming. We present a new methodology for reconstructing an ancient storm history for the North Atlantic. Flood deposits resulting from heavy rainfalls spawned by passing tropical systems (tropical wave – hurricane) are examined at multiple locations across the Eastern Caribbean. Criteria used to select study sites include 1) geographic location across traditional hurricane paths, 2) predominant rainfall events derived from tropical systems, and 3) natural catchment ponds. Findings reveal that hurricanes transiting within 75km of Antigua and St. Croix provide a highly correlated proxy for hurricane occurrence in the entire North Atlantic basin. Sediment cores collected from natural catchment ponds show layers of flood deposits, defined by oxidation bands and grain size, that strongly correlate to documented hurricanes. Chronological control over the last century is obtained using both traditional radioisotopes as well as a more novel technique that quantifies the relative abundance of black carbon preserved in the sediment. Using black carbon for age constraint will be crucial for accurately reconstructing storm history over century-millennia time scales.

BIOGRAPHY

Dr. Jesse McNinch received his Ph.D. in Geological Oceanography from the University of North Carolina-Chapel Hill in 1997. He is a tenured professor in the School of Marine Sciences at the College of William and Mary, and currently serves as the Director at the Field Research Facility, US Army Corps of Engineers in Duck, North Carolina.