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Water Over the Bridge: Can We Connect Tree Rings and Overwash Deposits to Understand Regional Tropical Cyclone Variability?

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Despite significant advances in methods, reconstructions using multiple proxies are uncommon in paleotempestology. Studies employing multiproxy techniques often rely on homologous proxies (e.g., grain-size distribution and organic content, or total ring width and maximum latewood density) that complement one another as they often reflect similar processes occurring within tropical cyclones. Unifying seemingly diametric proxies (i.e., tree rings and overwash deposits) receives less attention as they typically record different aspects of a tropical cyclone over substantially different temporal resolutions. However, given the spatial characteristics of storm-related hazards, tree rings and overwash might be far more complementary than previously thought. Here, I present work reconstructing tropical cyclone rainfall using tree rings, from which I develop frequency curves based on the number of years receiving tropical cyclone rainfall amounts ≥75th percentile. Using this new metric, I compare tree-ring-based reconstructions with near-annually- to decadally-resolved sediment records from Florida and The Bahamas. Through this comparison, I demonstrate both synchronous and asynchronous behavior between records, highlighting the possible presence of regional signatures and climate controls in storm activity. While there remain numerous discrepancies between these records, this comparison serves as an example that these proxies augment one another when viewed through the lens of regional shifts in the hurricane climate. Given that trees respond to the widespread footprint of tropical cyclone rainfall, independent of storm intensity, tree rings may better capture regional changes in storm activity. As such, turning to the shorter, yet higher-resolution tree-ring record can provide additional context to active and quiescent intervals observed in overwash records, especially at sites with a higher sensitivity threshold. Comparing these two proxies is still in its infancy; however, we can use techniques unique to a particular proxy to produce analogous records of tropical cyclone activity. In addition to developing analogous records, is important to explore nontraditional signals of tropical cyclones in these proxies. In particular, I will discuss two approaches that could be key for developing holistic records of storm activity in the Gulf of Mexico. The first uses growth suppressions and geochemical signals in coastal trees in response to saltwater intrusion, while the second examines the sedimentary and geochemical signature of inland flooding from tropical cyclones. The advancement of paleotempestology necessitates

developing multiproxy reconstructions. All of these novel approaches and proxies complement records of overwash, which is one of the few proxies able to provide a quantitative estimate of storm magnitude. Moreover, using these proxies in conjunction with one another is critical for understanding changes in the regional hurricane climate and reducing the manifold risks associated with tropical cyclones.