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A HIGH-RESOLUTION GEOCHEMICAL RECORD OF SEVERE STORMS FROM LAKE SHELBY, ALABAMA, USA

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The brevity of the historic coastal severe storm record (about 120 years) does not allow for statistically significant predictions of severe storm frequency and intensity caused by ongoing global climate changes. In this study we used shifts in C and N concentrations and $\delta^{13}C$, $\delta^{15}N$ values from the sediment of Lake Shelby, AL, as multiple proxies for detecting severe storm-induced marine influxes. Positive shifts in $\delta^{13}C$ and $\delta^{15}N$ are likely caused by brief changes in early microbial diagenetic alteration of the lake organics triggered by destratification of the lake's water column during a severe storm event. Negative shifts in organic C and N concentrations are the result of dilution of the fine-grained organic-rich lake sediment by organic-depleted marine sediment. Geochemical-based storm records enhance the resolution of conventional sand-layer based severe storm records.

The morphology, geochronology, and water chemistry attributes of Lake Shelby were constrained using sediment cores, seismic "chirp" data, radiocarbon dates, and water chemistry measurements. An 800-year severe storm record was derived from lake sediment cored at a water depth where anoxic water conditions persist. Geochemical data suggest an increase in storm frequency and/or intensity for the Alabama Coast during the Little Ice Age (1400-1900 A.D.), which is consistent with other investigations that document increased Atlantic storm activity during global cooling events. The methodology presented here may be applied to other coastal environments in the Gulf of Mexico to gain a better understanding of past climate change relation to severe storm frequency and intensity.

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