A 1,000-Year High-Resolution Hurricane Activity Record for the Boston Area

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ABSTRACT

We have developed a high resolution record of hurricane activity for the Boston area over the last millennium based on the varved sedimentary record archived in the Lower Mystic Lake, a low-elevation (~1 m above sea level), meromictic coastal lake directly connected to Boston Harbor by the Mystic River. Using petrographic thin sections and X-ray thin slab imagery, a 1,000-year-long varve chronology was constructed. A series of occasional, anomalous graded beds were encountered in the stratigraphy. Within the historical portion of the record, these graded beds show excellent correspondence with known hurricanes that have affected the Boston area. We hypothesize that these graded beds are the result of intense, hurricane rains which saturate the watershed, and result in erosive overland flow that entrains sediment, and carries it into the lake where it is deposited as a graded bed. The process is greatly enhanced if hurricane winds disturb vegetation, and uproot trees exposing fresh, loose sediment. By analogy, similar graded beds deposited during the prehistoric portion of the record probably represent prehistoric hurricanes. The Mystic Lake record is then compared with the sedimentary record from Belle Isle Marsh in Boston Harbor. This marsh, just 14 km to the ESE of the lake, contains a series of small siliciclastic layers that are presumably related to storm surge and overwash events associated with the hurricanes that affected the nearby Lower Mystic Lake. The comparison allows us to determine how accurately both environments serve as proxy recorders for such events.