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During Sea-Level Highstands:
A Global Synthesis with implications
for management of future coastal change

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Isochron reconstruction from saltmarsh sediments: the potential of pollen analysis. A case study from Menunketesuck River Marsh, Connecticut, USA

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Abstract

Saltmarshes hold considerable potential for reconstructing sea-level changes during the last few thousand years and offer a direct basis for comparing measured sea-level observations (e.g., from tide gauges) with those of the recent geological past.

However, dating recent saltmarsh sediments, particularly via radiocarbon methodologies, can be problematic, particularly for the last *ca*. 200-300 years. This paper details the findings of a study aimed at evaluating the use of historically-delimited pollen 'markers', for dating recent saltmarsh sediments.

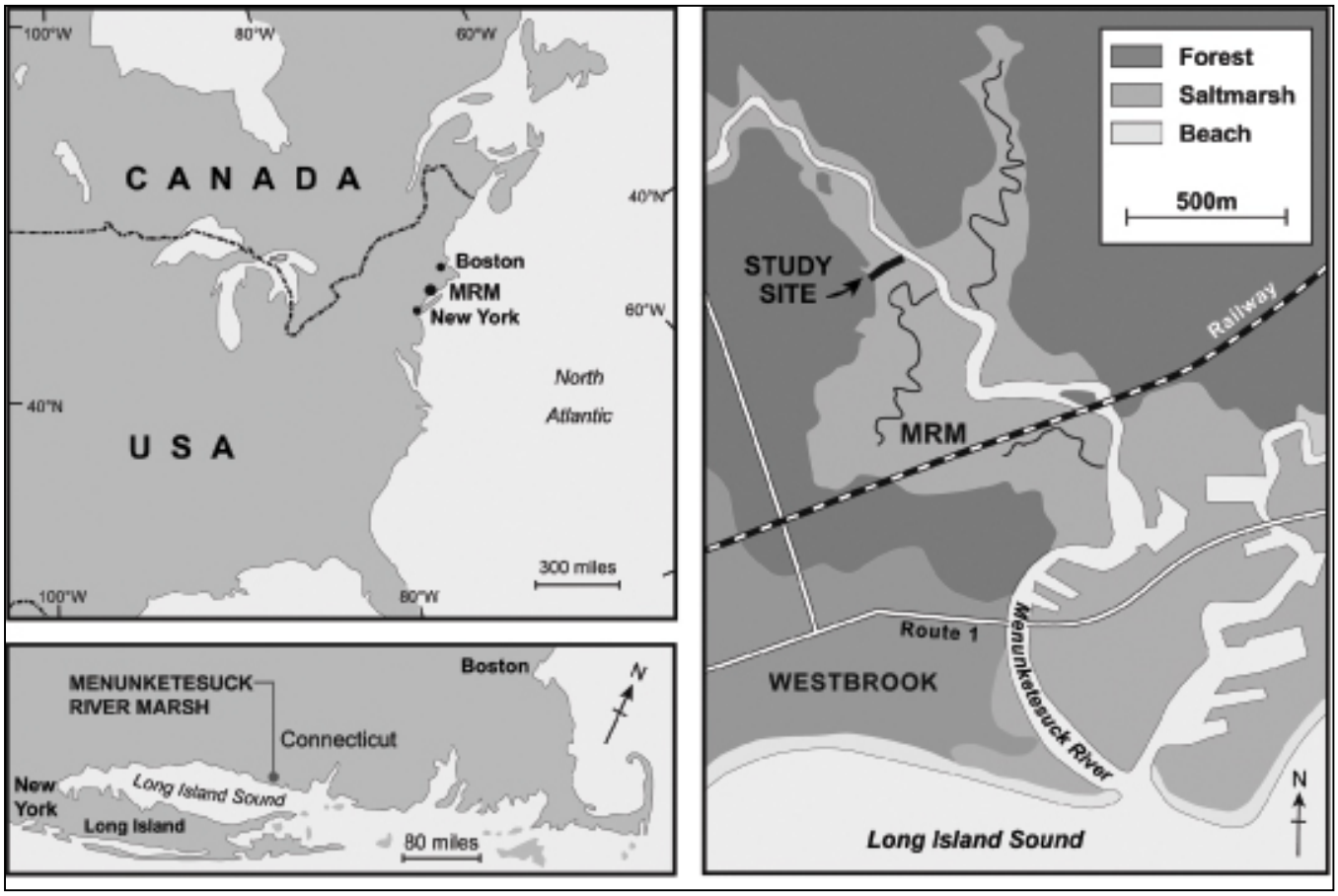

Figure 1. Menunketesuck River Marsh: location map

The study focuses on a saltmarsh, Menunketesuck River Marsh (MRM) in Connecticut, New England (Figs. 1 & 2) which was chosen because i) it is located in an area with a well documented local history of landscape and vegetation change; ii) the organic character of the sediments has resulted in excellent pollen preservation; iii) prior investigations have shown that the marsh is a particularly sensitive recording site for the study of sea-level change. Pollen was investigated from four closely (8 – 58 m) spaced cores in a sheltered area of the marsh, approximately 1.5 km from the coast. Careful analysis of local historical documents pertaining both to land use and forest change have enabled the ages of nine palynological and other 'markers' to be constrained.

Figure 2. View across Menunketesuck River Marsh and adjacent forested upland.

These include: 1) a decline in birch pollen dating from the 1940's-1950's; 2) a chestnut pollen decline dated at *ca.* 1915; 3) an expansion in 'opaque spheres' (cf. Clark and Patterson, 1984) which probably reflects the industrial development of two local towns or the expansion of the local railroad during the latter quarter of the nineteenth century; 4) a decline in *Quercus* pollen associated with the extensive felling of timber in the Menunketesuck River and adjacent catchments in the early to mid nineteenth century; and 5) an initial rise in *Ambrosia* (ragweed) pollen and pollen of other ruderals (e.g., *Rumex*) resulting from land clearance in the mid eighteenth century.

To shed further light on the taphonomy of pollen in the marsh environment and hence aid in the interpretation of the fossil datasets, pollen samples were also collected from three surface transects from MRM.

The analyses have shown that regional pollen taxa have a reasonably even distribution across the contemporary marsh surface, although some pollen grains (e.g., *Fagus*) are consistently over-represented in deposits near the upland border, whilst bissacchate grains (e.g. *Pinus*) show localised over-representation in creek sediments. This clearly has implications for interpreting the fossil assemblages.

The study has confirmed that historically defined pollen markers hold considerable potential for dating the highly peaty saltmarsh sediments of New England, confirming observations made previously in the region (e.g., Brugham, 1978; Clark and Patterson, 1984).

In contrast to these previous studies, this study has highlighted the need to obtain local, catchment-specific historical data to improve the accuracy of the age determinations. The study has also shown that through the analysis of multiple cores, pollen markers can be used to construct isochrons ('timelines') for a single marsh site. They thus provide an excellent framework for i) establishing local marsh accretion rates; ii) examining temporal changes in microfossil (e.g., diatom) distribution which are integral to the study of sea-level change; and iii) independent cross-validation of AMS radiocarbon and Lead-210 datasets.

References

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