HIGH-RESOLUTION SEISMIC EVIDENCE FOR CHANGING SEDIMENTARY CONDITIONS IN THE HUDSON RIVER ESTUARY, PIERMONT, NY

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SUMMARY OF KEY DATA

1. Sparkill Creek Delta Deposit
   - Sedimentation rate of 3-4 mm/yr, compared to 1-2 mm/yr average rate for the estuary
   - Youngest deltaic sediments deposited 2520 yr B.P.
   - Glacial dated horizon (H11-14) deposited 3370 yr B.P.
   - At 1’90’ sediments deposited in ~950 yr; this would require 1.5 m of erosion from entire watered-in that time.
   - Preliminary data indicate higher organic carbon content in deltaic sediments (see Figs. 2a, 4b, 9b).

2. Sedimentary Environment
   - During deltaic intervals, Piermont area is actively depositions, delta front is pushing channel eastward, and loading the fall out west of the channel.
   - In modern environment, only localized regions of erosion and deposition are found (associated with geomorphic structures, e.g., Piermont Pier, Tappan Zee Bridge).

3. Evidence of Other Events
   - Glacio-lacustrine clays sitting below estuarine sediments record differential flooding of the shoreline by marine waters (see Fig. 8a-b).
   - flora-oyster beds (exposed, buried and eroded) show changes in morphology and sedimentary conditions in the river (see Fig. 9).

ABSTRACT

A detailed analysis of high-resolution seismic reflection data from the Piermont area of the Hudson River Estuary indicates major changes in sedimentation during the Holocene. The dominant depositional feature is a delta formed from Sparkill Creek, which enters the river from the west through the Piermont Marsh. Integration of seismic data with sediment cores provides spatial and temporal boundaries for the delta. Preliminary analysis of 14C data indicates that the most recent period of deposition occurred between 3370 and 2520 yr B.P. Truncation reflections at the exposed surface of the delta demonstrate that the delta is degrading by avulsion and that the interface of delta deposition was followed by a period of erosion. However, the reasons for the onset and termination of this deposition are not yet clear. These dramatic changes in sedimentary environment may be related to variations in sediment supply from the Sparkill Creek, modification of the watershed, or changes in estuary morphology.

Additional evidence of major change has been preserved and identified in other areas of the Hudson River Estuary. Examples of two such events found in Piermont and other areas are the presence of relic oyster beds that have changed in depth and morphology, and evidence of glacio-lacustrine clay layers underlying estuarine sediments, indicating that parts of the area were subaerially exposed while other had already been flooded. Further investigation of these events will lead to better distinction between local events that affect only part of the estuary and regional or global events that affect the entire estuarine system.

ACKNOWLEDGEMENTS

Research for this project is supported by the New York Department of Environmental Conservation and the Estuarine Reserves Division, Office of Ocean and Coastal Resource Management, National Ocean Service, National Oceanic and Atmospheric Administration.

SUMMARY DIAGRAMS FOR CD01-01, CD02-C10, CD02-C11, CD02-C12. Reflectors: green (H12-1 to H12-4), red (H02-1 to H02-3), black (H10-1 to H10-5), yellow (H30-1 to H30-5). Ages and seismics shown as above.