

Storm-related Changes in the Hudson River Estuary

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Introduction

Recent storms, Irene, Sandy, and Lee, significantly affected the watershed of the Hudson River Estuary, causing substantial sediment redistribution. Many different factors can affect sedimentary processes in estuaries and coastal regions. In order to understand the effects of storms on these processes, effective and repeated monitoring is necessary. The purpose of this research is to quantify storm-related impacts on sediment redistribution in the Hudson River Estuary, and thereby further understanding on sediment estuarine processes.

Methodology

Repeated bathymetric surveying of the Hudson River Estuary has enabled a comparison of sub-bottom data collected before and after these extreme storm events. The initial data was collected between 1998 and 2004 in the Hudson River Estuary Mapping project, and selected areas where resurveyed in 2014 after the storms. Furthermore, sediment cores were collected for a further analysis of these storm-related changes. The Kingdom Suite Seismic and Geological Interpretation Software was utilized to digitize bathymetric data to enable an accurate comparison of the data. Thereafter, data was projected on a common line for the derivation of vertical adjustment parameters to ensure the accuracy of the comparison. Finally, the calculated differences in depth values were imported into ArcGIS for a further analysis.

Results

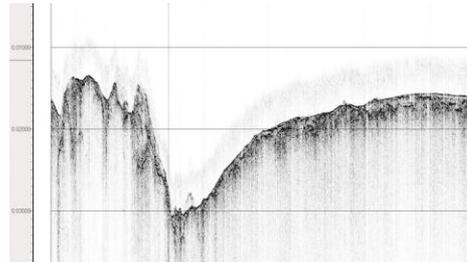


Figure 1: One of many sub-bottom profiles that were digitized using the SMT Kingdom Suite software. This particular profile was collected in the earlier survey, and designated the number b4n011a.

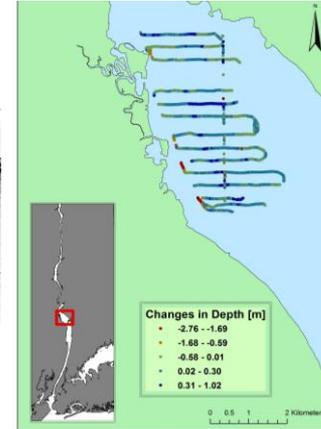


Figure 2: A comparison of old and new bathymetry data in the Hudson River Estuary. Changes in depth values are indicated by color dots, where red dots show erosion and blue show deposition.

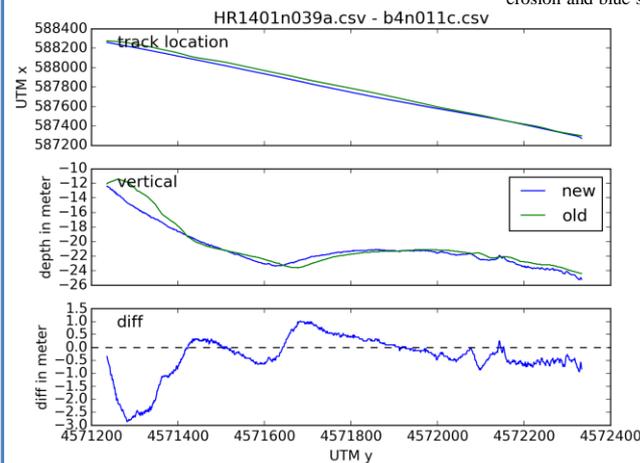


Figure 3: A comparison of digitized river bottoms from the two different surveys. The top graph shows where the two different profiles were collected, indicating the lines were collected in the same area. The second graph shows depth values for the two different lines. The third graph shows the differences in depth values between the two lines. From these graphs, the vertical adjustment parameter is derived.



Figure 4: Photo of sediment core collected in the Hudson River Basin.

Discussions

Due to the complexity of sediment estuarine processes, it can be difficult to quantify the exact impact of storms Irene, Sandy, and Lee. Repeated sub-bottom surveys have enabled an analysis of bathymetric change in the Hudson River Estuary. An analysis has shown sediment redistribution possibly caused by these storm events. However, it is important to recognize the limitations of this sort of analysis. These include limitations in data collection, such as difficulties in collecting data in the exact same location and limitations of equipment. The purpose of the vertical adjustment parameter is to correct for water level and tidal differences, however this parameter can be set incorrectly. Despite these limitations, storm-related impacts on the sediment are observable. A further analysis of data collected, including a comparison with sediment cores collected, will produce even more robust results.

Acknowledgements

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References

Nitsche, F.O., and Kenna, T., 2014, Detection of Changes in Sediment Distribution in the Hudson River Estuary with Repeated Subbottom Profiling, Fall AGU Meeting 2014, NS21A-3871.