

Changing Tides, Constant Sea Level: Comparing the 19th and 21st century Lower Columbia River Estuary

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Abstract

During the mid-19th century, the U.S. Coastal Survey measured tides and water temperature in Astoria, OR (1853-1876) and surveyed the entire Lower Columbia River Estuary (1868 and 1877). In this talk I will discuss our ongoing efforts to recover and digitize these analog data from the US National Archives, and discuss our progress in developing a '19th century hydrodynamic model' of the Columbia using Delft3D. Initial results suggest that relative sea-level has remained nearly constant since the 1850s due to land uplift, but that tidal properties have been altered on the order of 10% by anthropogenic changes. The historic data also suggest that the Dec. 1861 flood was 20-30% larger than any subsequent winter flood, and that water temperatures were significantly less than today. Because these data provide a snapshot of the Columbia River region before wide-spread anthropogenic development and climate change, they comprise a unique opportunity to determine the magnitude—and causes—of secular change.

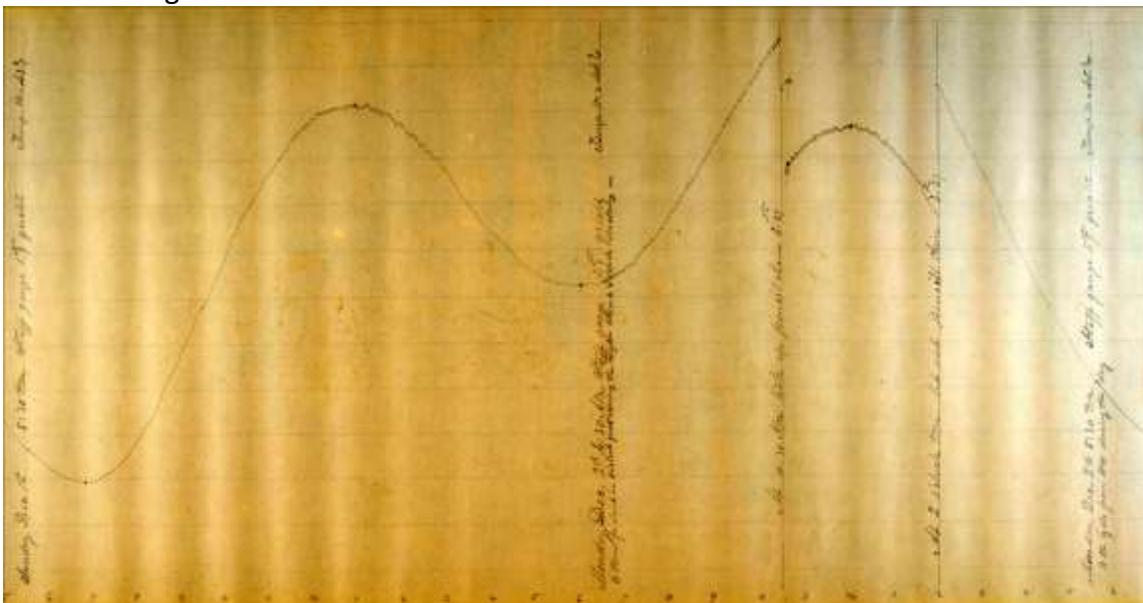


Fig. 1: A tidal trace (marigram) from Dec. 2nd, 1861, measured in Astoria, OR. The storm surge/flood levels from the storm were literally 'off the chart'.