

Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

The effect of changing topography on coastal tides and storm surge: a historical perspective¹ STEFAN TALKE, DAVID JAY, LUMAS HELAIRE, RAMIN FAMILKHALILI, Portland State University — Over decadal and century time scales, the topography of coastal harbors changes due to natural and anthropogenic factors. These changes alter the mass and momentum balances of incoming waves, producing measureable changes to tides and surge. Here we use recently recovered archival data, historic bathymetric charts, and numerical models to assess changes in multiple estuaries. In the Columbia River estuary, Ems estuary, and Cape Fear Estuary, channel deepening has increased the M2 tide between 10 to 100% since the 19th century, due to both reduced frictional effects and altered resonance. The bathymetric perturbations also affect the propagation of other long-period waves: in Wilmington (NC), the worst-case scenario CAT-5 storm surge is modeled to increase by 50% since 19th century conditions. Similarly, in New York harbor, the 10 year storm-tide level has outpaced sea-level rise by nearly 30 cm since 1850. In the Columbia River, reduced friction has decreased the river slope (reducing water levels), but also led to amplification of both tides and flood waves. Going forward, historical bathymetric change may provide a clue to the future effects of climate change and continued anthropogenic development.

¹National Science Foundation; US Army Corp of Engineers

Stefan Talke
Portland State Univ

Date submitted: 11 Aug 2016

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