



The effects of tidal changes on the frequency of nuisance flooding events in the United States

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Nuisance flooding (NF) or high tide flooding describes minor nondestructive flooding which can nonetheless cause substantial negative socio-economic impacts to coastal communities. The frequency of NF events has increased and accelerated over the past decades along the U.S. coast, leading to changes ranging from 300% to 900%. This is mainly a result of sea level rise reducing the gap between high tidal datum and flood thresholds. While long-term relative sea level rise is the main driver for the increased number of NF events, other factors such as variability in the Gulf stream, the storm climate, and infragravity waves can also contribute. Another important driver that is often overlooked is related to changes in coastal and estuary tides, through secular trends in the amplitudes of major tidal constituents. In this presentation we assess the role of tidal changes in modulating the frequency of NF events along the U.S. coastline. We analyze hourly records from 49 U.S. tide gauges for which the National Weather Service has defined NF thresholds. We find that (1) overall across all tide gauges the number of NF days has increased since 1950 due to changes in coastal tides, adding up to 100 NF days in recent years (on top of the increase due to relative sea level rise), (2) more tide gauges experience an increase in NF events than a decrease due to changes in tides, (3) tide gauges in major estuaries which have undergone major anthropogenic alterations experience the strongest changes; in Wilmington (Cape Fear estuary), for example, 10-40% of NF events in recent years can be attributed to tidal changes.

How to cite: Li, S., Wahl, T., Jay, D., Talke, S., and Liu, L.: The effects of tidal changes on the frequency of nuisance flooding events in the United States, EGU General Assembly 2020, Online, 4–8 May 2020, EGU2020-12115, <https://doi.org/10.5194/egusphere-egu2020-12115>, 2020