NOAA Sea Level Rise and Coastal Flood Predictions

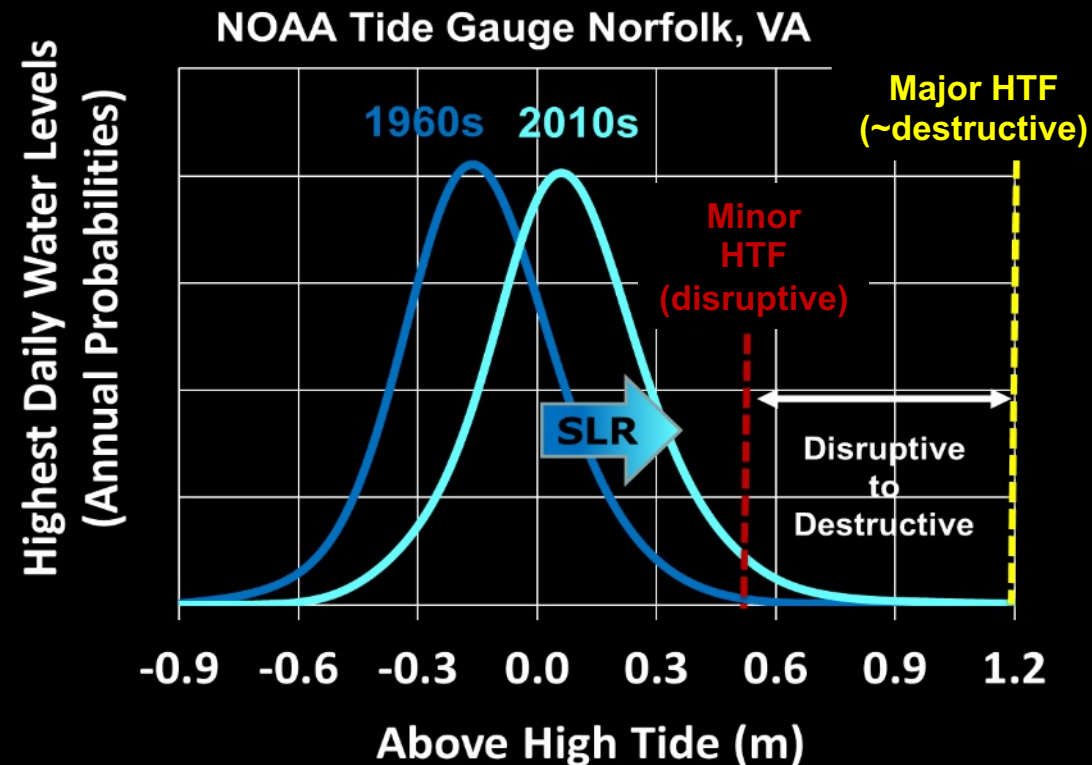## US CLIVAR Multi-Year Workshop
March 28, 2022

William Sweet
NOAA Oceanographer

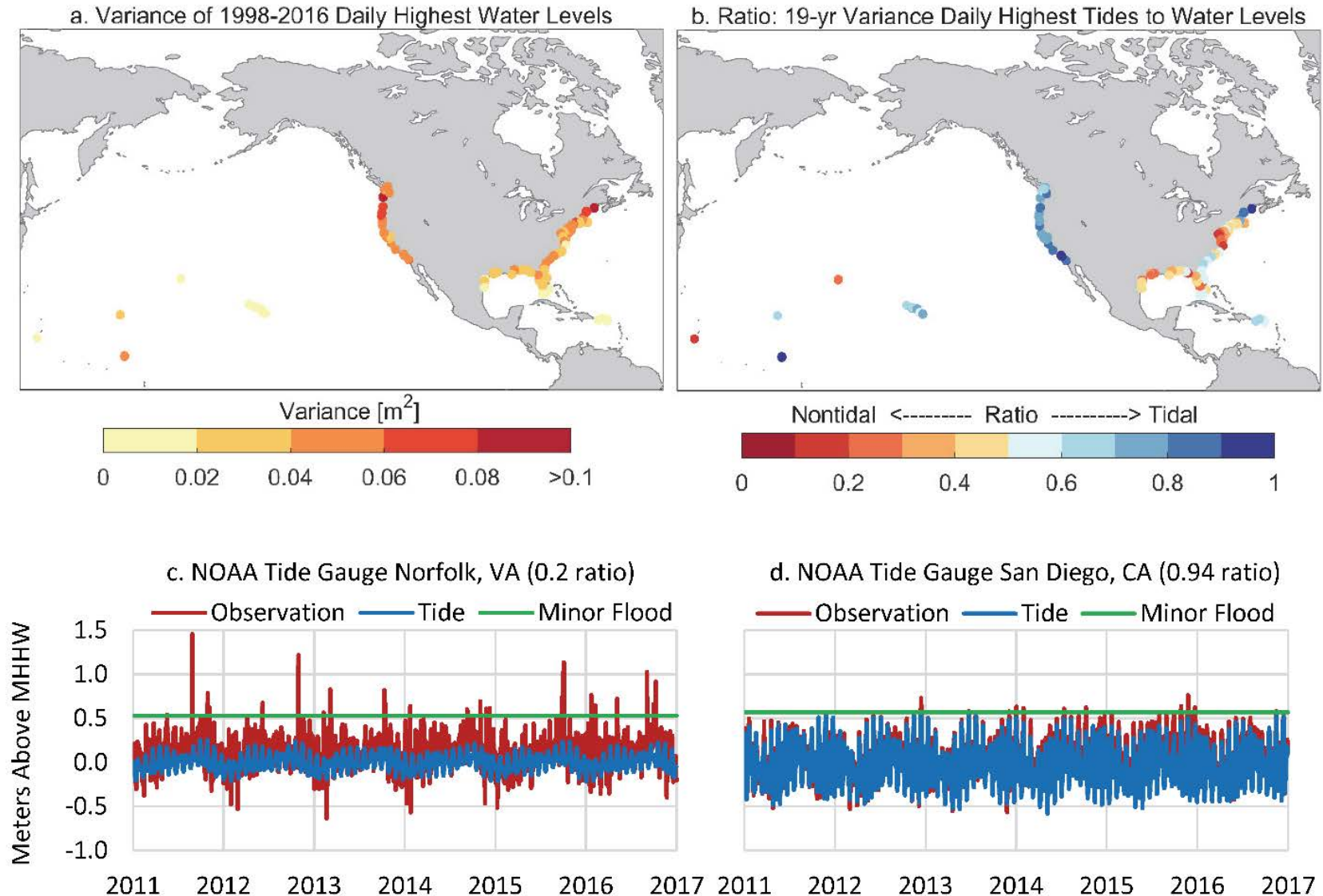# Coastal Flooding and Sea Level Rise

Problem: Coastal Communities are flooding more often due to decades of sea level rise.

- When during the year is likely to be the most problematic (for preparedness)?

- How many 'next year' (for smart response budgeting, e.g., people, pumps, other stop-gap measures)?

Image: Greg Allen/NPR

NOAA Tide Gauge Norfolk, VA

Highest Daily Water Levels (Annual Probabilities)

1960s 2010s

Major HTF (~destructive)

Minor HTF (disruptive)

SLR

Disruptive to Destructive

-0.9 -0.6 -0.3 0.0 0.3 0.6 0.9 1.2

Above High Tide (m)

The tides are key where tide range is large and storm surges are small.

a. Variance of 1998-2016 Daily Highest Water Levels

b. Ratio: 19-yr Variance Daily Highest Tides to Water Levels

c. NOAA Tide Gauge Norfolk, VA (0.2 ratio)

d. NOAA Tide Gauge San Diego, CA (0.94 ratio)

Sweet et al., 2018

NOAA Seasonal High Tide Bulletin

National Ocean Service
National Oceanic and Atmospheric Administration
U.S. Department of Commerce

Search

HOME OCEAN FACTS TOPICS ▾ EDUCATION NEWS PODCASTS VIDEO IMAGES ABOUT US

Home / News / High Tide Flooding Archive / High Tide Bulletin: Winter 2020

High Tide Bulletin: Winter 2020

When you may experience higher than normal tides between December 2020 and February 2021.

When will the tides be higher than normal?

- December 12 - 17
- January 11 - 13

Why will they be higher than normal?

- A perigean spring tide will be occurring in December. This is when the moon is either new or full and closest to earth. Higher than normal high tides and lower than normal low tides will occur.
- The increased angle of the sun relative to the Earth, which reaches a maximum during the Winter Solstice (December 21).
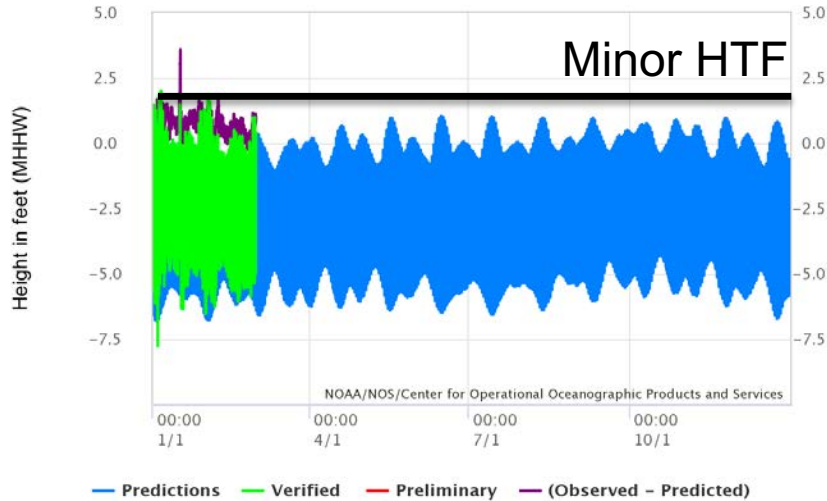
What kind of impact might I expect along the coast?
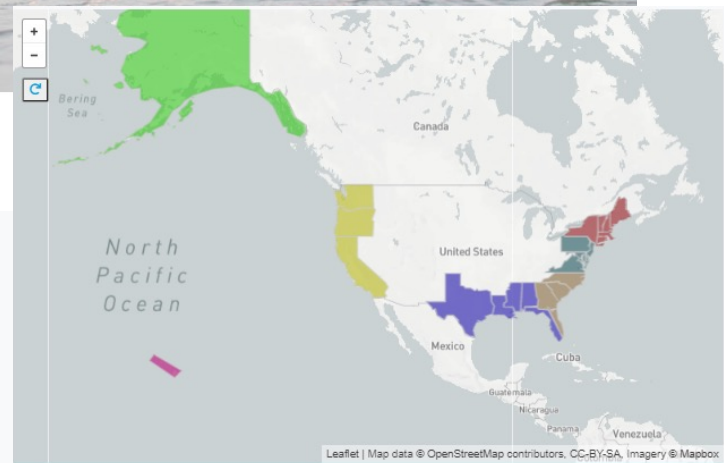
Leaflet | Map data © OpenStreetMap contributors, CC-BY-SA, Imagery © Mapbox

NOAA Seasonal High Tide Bulletin V2

Daily Likelihood (Dusek et al., In Review)

SLR since last epoch (trend) +
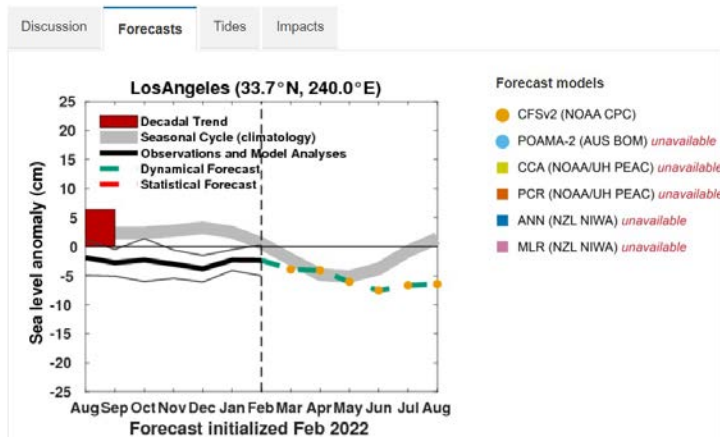**sea level anomaly prediction (RISE/OAR)**
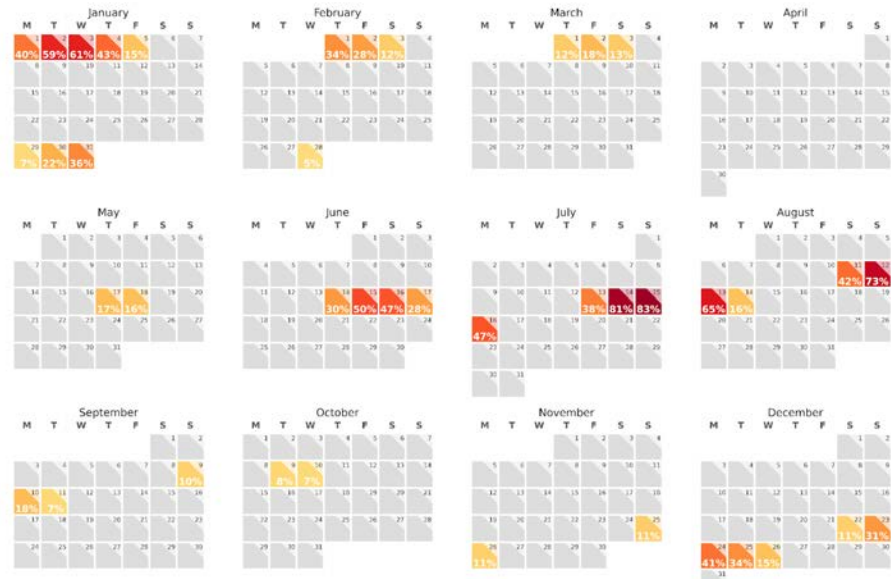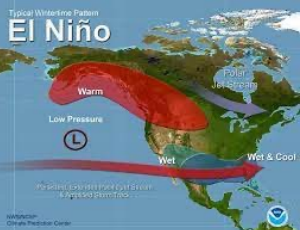+
predicted tide
+
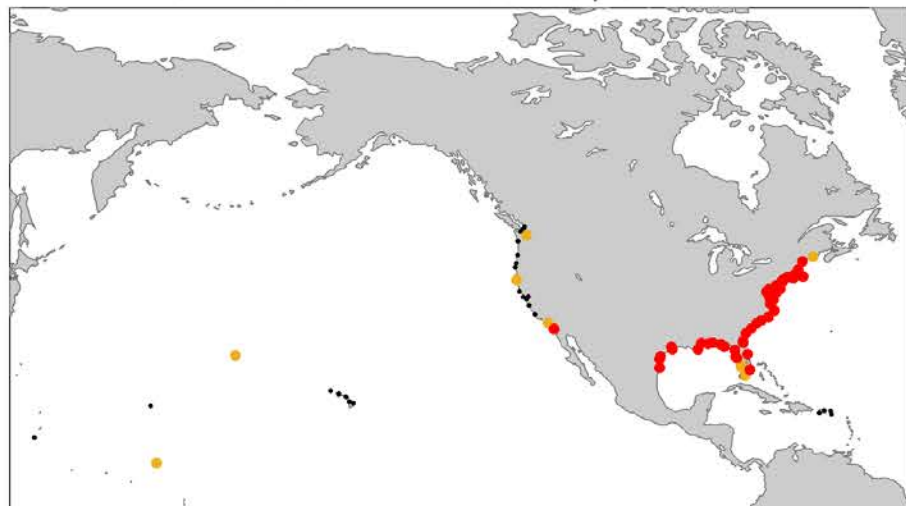**nontidal climatology probability**

a. Trends in Annual Flood Frequencies

b. ENSO Effects on Flood Frequency Trends

Trend Characterization

Increasing — Accelerating
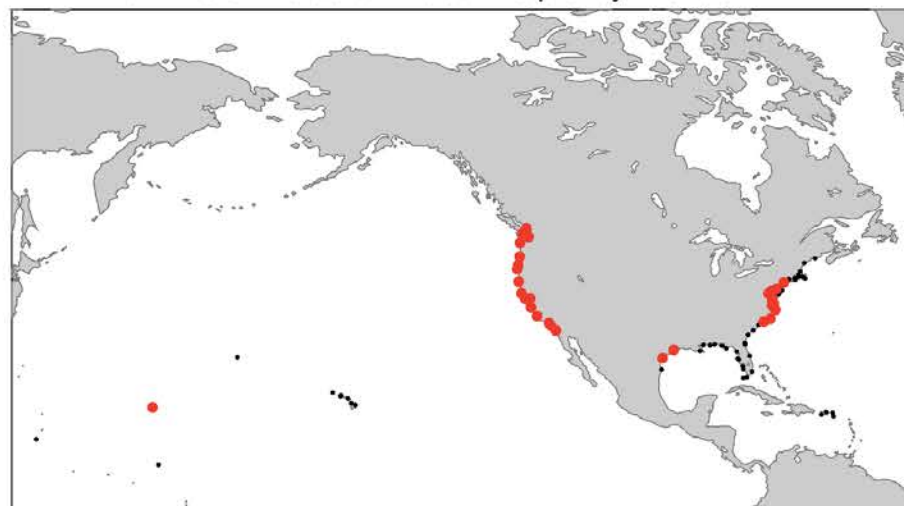
La Nina Higher — El Nino Higher

San Diego, CA

Norfolk, VA

Sweet et al., 2018
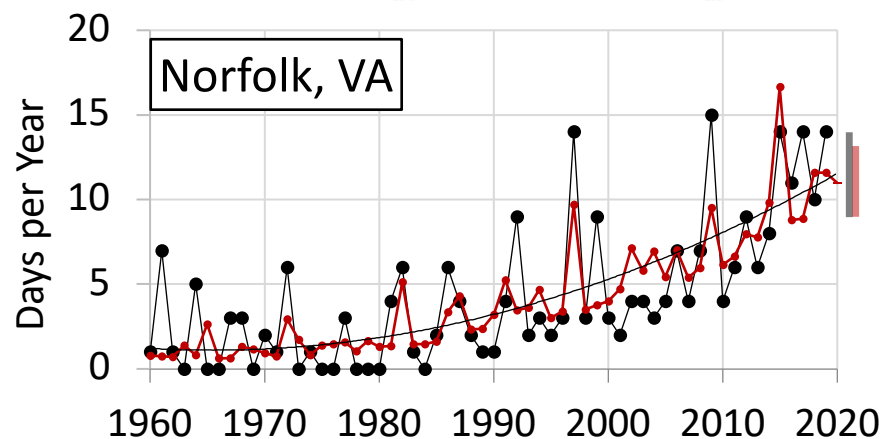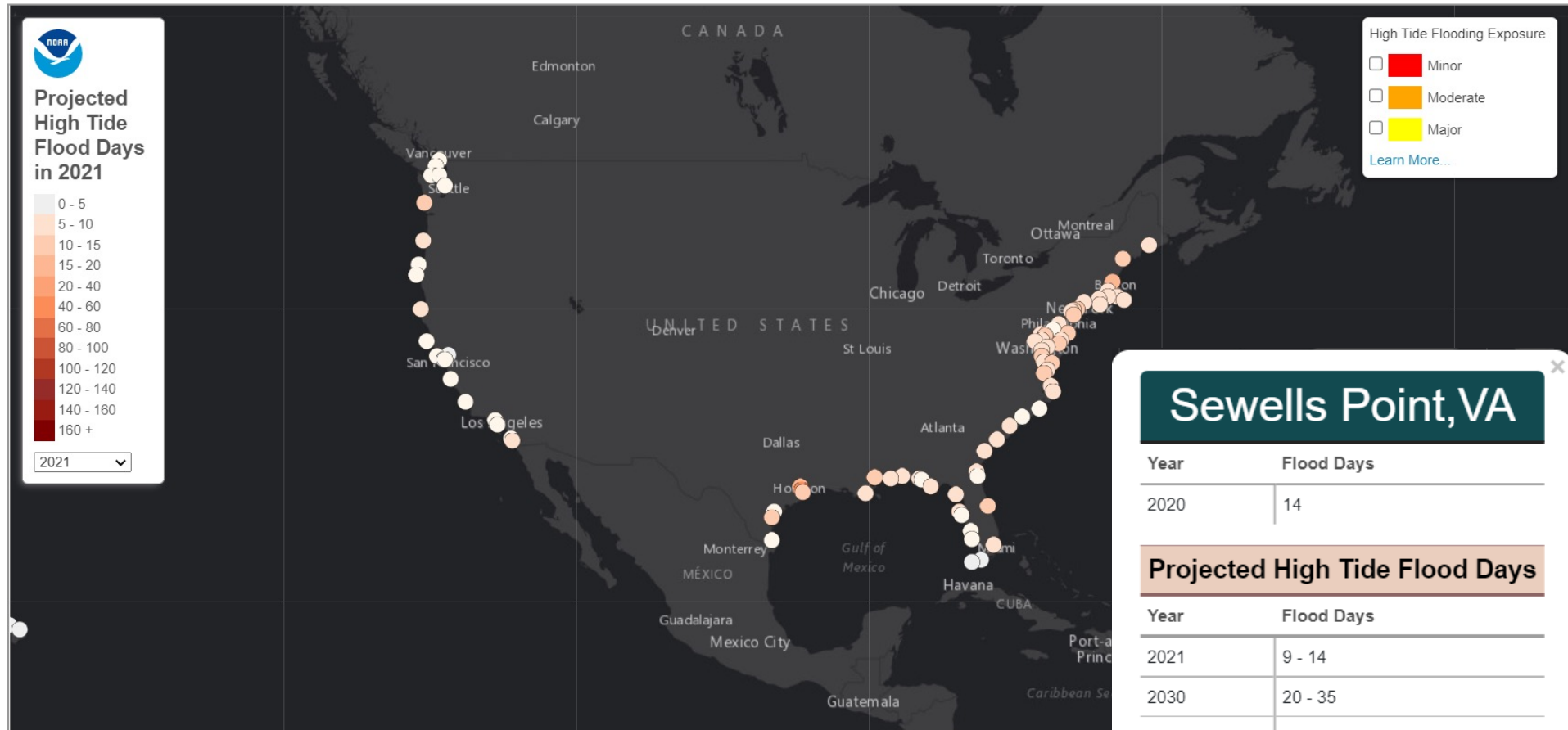
NOAA: Annual High Tide Flood Outlook

See below for the high tide flooding trends and outlooks for each tide station monitored by NOAA.

Projected High Tide Flood Days in 2021

- 0 - 5
- 5 - 10
- 10 - 15
- 15 - 20
- 20 - 40
- 40 - 60
- 60 - 80
- 80 - 100
- 100 - 120
- 120 - 140
- 140 - 160
- 160 +

2021

High Tide Flooding Exposure

- ☐ 🟥 Minor
- ☐ 🟧 Moderate
- ☐ ⬜ Major

Learn More...

Sewells Point, VA

Year	Flood Days
2020	14

Projected High Tide Flood Days

Year	Flood Days
2021	9 - 14
2030	20 - 35
2050	65 - 170

Average No. of flood days in 2000: 5
Record No. of flood days: 15

Flood threshold is 0.53m above MHHW

If not directly simulating with coastal circulation models, then monthly to annual predictions might also be made using time-dependent statistical models with either guidance of 'mean sea level anomaly' or 'climate mode'.
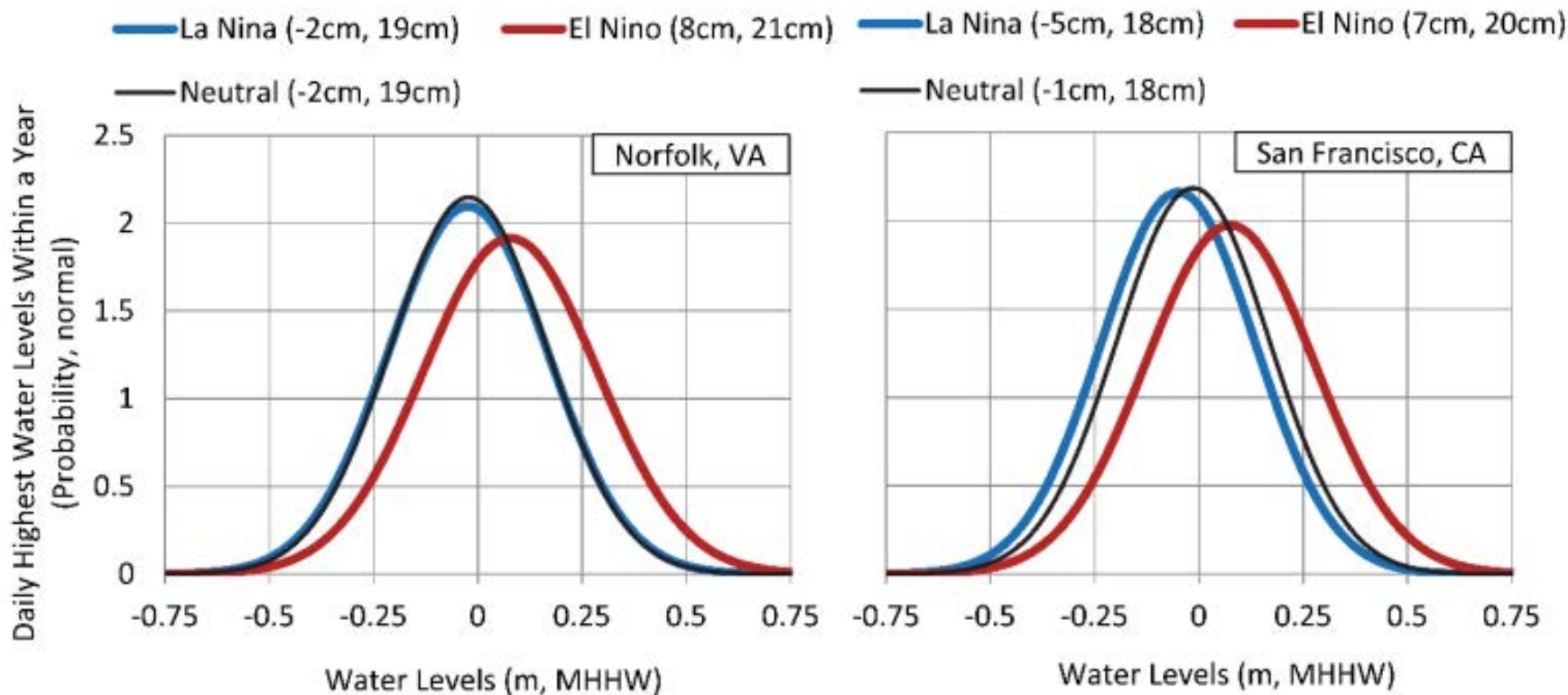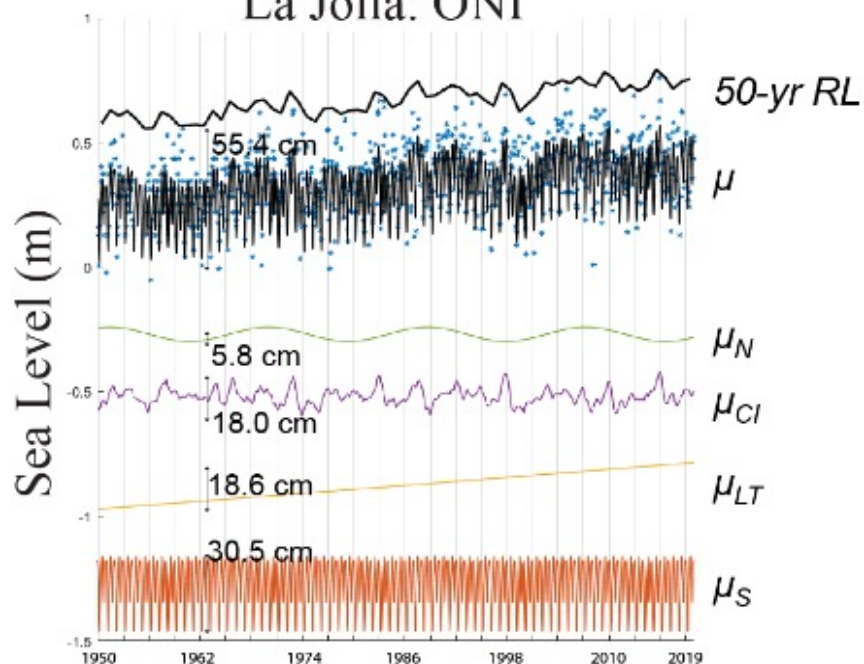
Exceedance probabilities of minor, moderate and major flood levels that have actionable responses associated with them can be produced with skillful sea level anomaly or climate mode predictions (e.g., 1-24 month).
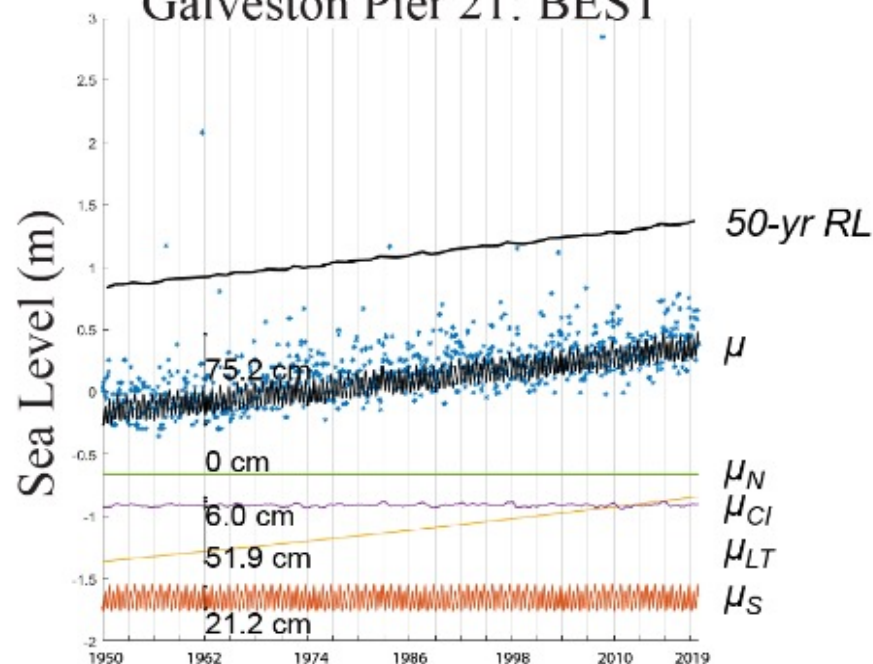
Sweet/Marra et al. (In Prep)

Questions?

Contact:
william.sweet@noaa.gov