



Nov 5: Sea Level Rise

Foci of the Day

- Why is global sea level rising?
- How fast is sea level rising?
- What are the consequences?
- Group exercise (SLR of interested locations)

Reading:

1) EPA, Climate Change Indicators: Sea Level (<https://www.epa.gov/climate-indicators/climate-change-indicators-sea-level#:~:text=Relative%20sea%20level%20data%20are%20available%20from,to%20detailed%20data%20for%20each%20tide%20gauge>)

2) Sweet, W. V., Hamlington, B. D., Kopp, R. E., Weaver, C. P., Barnard, P. L., Bekaert, D., Brooks, W., Craghan, M., Dusek, G., Frederikse, T., Garner, G., Genz, A. S., Krasting, J. P., Larour, E., Marcy, D., Marra, J. J., Obeysekera, J., Osler, M., Pendleton, M., ... Zuzak, C. (2022). Global and regional sea level rise scenarios for the United States: Updated mean projections and extreme water level probabilities along U.S. coastlines (NOAA Technical Report NOS 01). National Oceanic and Atmospheric Administration. (**Pages Xii – XiV**)
<https://oceanservice.noaa.gov/hazards/sealevelrise/sealevelrise-tech-report.html>



Student Presentations

Quiz 4

Average: 5.2

Min: 3

Max: 8

The presentation order for each day will be determined by a new random draw on **November 26, 2025.**

Random No	Student Name
1-Dec	Abraham, Dahlia Bijou
1-Dec	Adams, Paul Quincy
1-Dec	Crossley, Zoey Kay
1-Dec	Dannenberg, Chase Andrew
1-Dec	Hazel, Amber Elizabeth
1-Dec	Hurst, Noah Evan
1-Dec	Johnson, Jake Alexander
1-Dec	Ogilvie, Joshua Morgan Missmer
1-Dec	Olson, Annika
1-Dec	Petrosky, Ryan Jeffrey
1-Dec	Rasizzi, Rianna
1-Dec	Thomas, Sophie
3-Dec	Crawley, Lauryn A.
3-Dec	Frielink, Caroline Deborah
3-Dec	Fuess, Harry Mitchell
3-Dec	Guzek, Evan Quentin
3-Dec	Pruder, David Thomas
3-Dec	Raleigh, Quinn A
3-Dec	Sherwin, Benjamin James
12/1/2025 or	Spohn, Rainah Marie



Why is global sea level rising?

Melting land ice: Changes in the volume of water and ice on land (i.e., glaciers and ice sheets) can increase or decrease the volume of water in the ocean

Thermal expansion: As water warms, it expands slightly—an effect that is cumulative over the entire depth of the oceans

How fast is sea level rising?

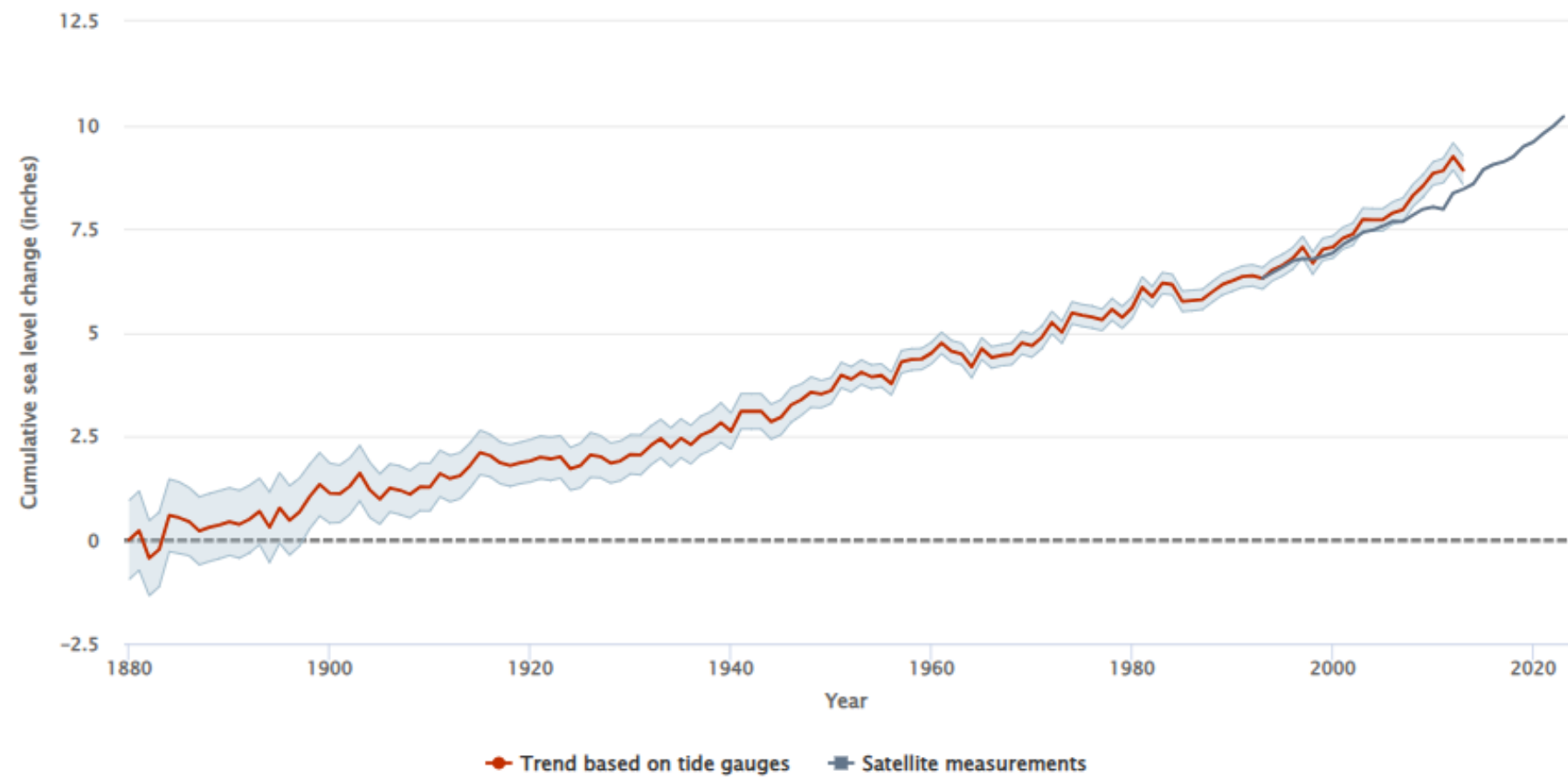
Climate Change Indicators: Sea Level (EPA)

(<https://www.epa.gov/climate-indicators/climate-change-indicators-sea-level#:~:text=Relative%20sea%20level%20data%20are%20available%20from,to%20detailed%20data%20for%20each%20tide%20gauge>)

After a period of ~2,000 years of little change, global average sea level rose throughout the 20th century, and the rate of change has accelerated in recent years. When averaged over all of the world's oceans, absolute sea level rose **0.06"/year** during 1880-2013. Since 1993, average sea level rose at a rate of **0.12"/year**—roughly twice as fast as the long-term trend.

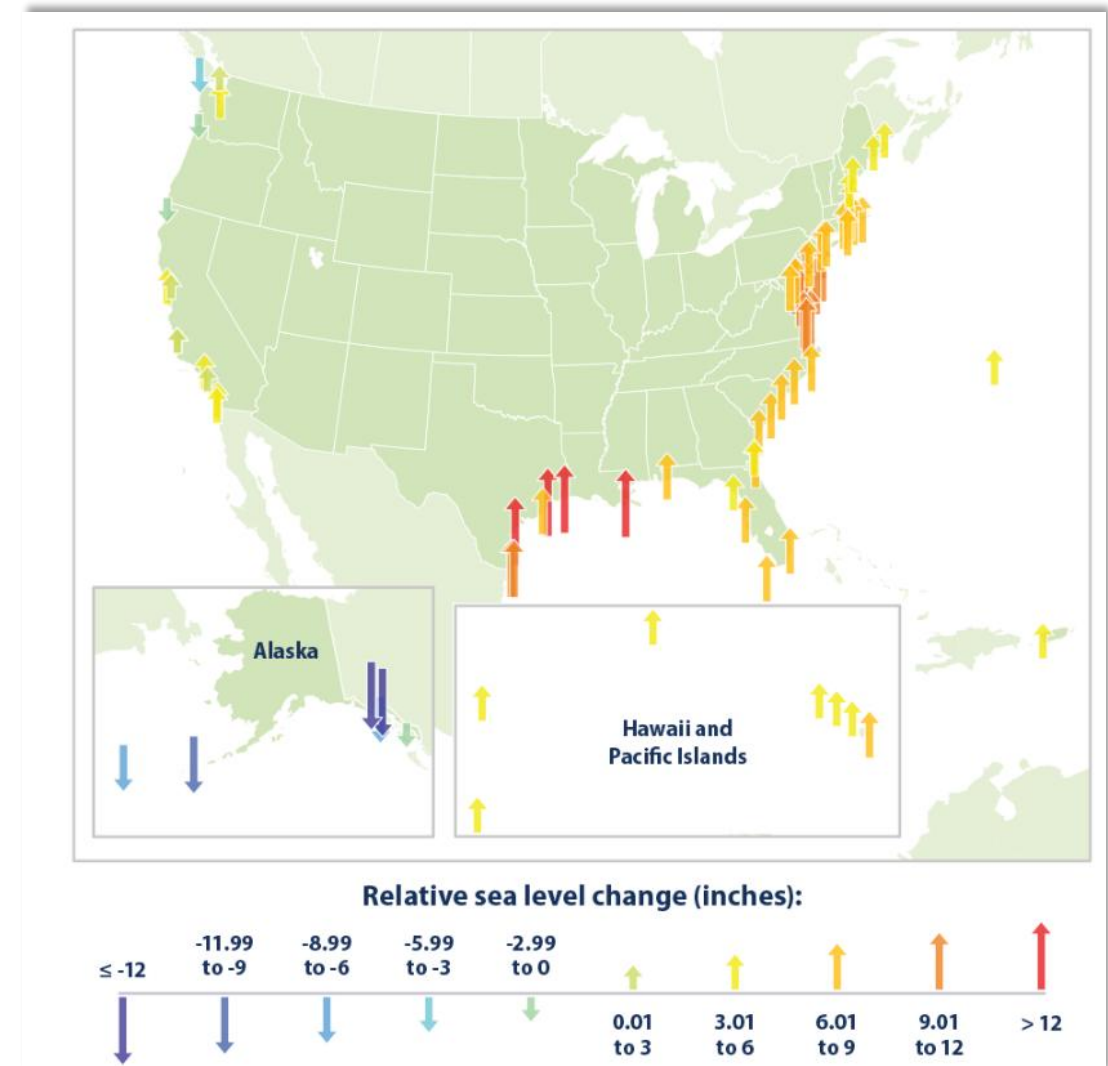


Figure 1. Global Average Absolute Sea Level Change, 1880–2023



Cumulative changes in relative sea level from 1960 to 2023 at tide gauge stations along U.S. coasts. Relative sea level reflects changes in sea level as well as land elevation.

While absolute sea level has increased steadily overall, particularly in recent decades, regional trends vary, and absolute sea level has decreased in some places. Relative sea level also has not risen uniformly because of regional and local changes in land movement and long-term changes in coastal circulation patterns.





What are the consequences?

Sea level rise carries many kinds of risks for people, ecosystems and infrastructure:

- **Increased flooding & coastal inundation:** Higher sea levels mean that high tides can reach further inland and that storm surges become more damaging.
- **Erosion of beaches and coastlines:** As sea levels rise, waves reach further and erode land more quickly.
- **Saltwater intrusion:** Seawater can move into freshwater systems (aquifers, estuaries), threatening drinking water supplies, agriculture, and ecosystems.
- **Impacts on ecosystems:** Wetlands, mangroves and other coastal habitats may be drowned or reduced, affecting species and reducing natural protection against storms.
- **Infrastructure and economic impacts:** Roads, power plants, sewage systems, buildings near the coast are exposed to greater risk and higher maintenance/adaptation costs.



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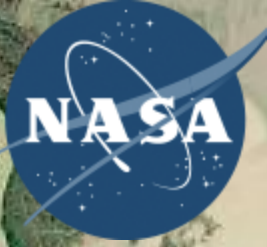
Nearly 200,000 homes in England could be lost to rising sea in next 30 years, study warns

(<https://www.independent.co.uk/climate-change/news/sea-level-rise-homes-coastal-erosion-b2101359.html>)





Reshaping Coastal Louisiana



Visible Earth

(<https://visibleearth.nasa.gov/collection/1684/sea-level-rise>)





In many locations along the U.S. coastline, the rate of local sea level rise is greater than the global average due to land processes like erosion, oil and groundwater pumping, and subsidence.



**NEARLY 30% OF THE U.S. POPULATION LIVES IN A COASTAL AREA
THAT MAY BE VULNERABLE TO SEA LEVEL RISE**



Children play on a fortified beach in Temwaiku, a village on the Tarawa atoll, the capital of the Pacific island nation of Kiribati.

(<https://www.nrdc.org/stories/these-photographs-show-how-rising-sea-connects-us-all>)





Rising Sea Levels Putting New York City at Risk (WSJ)

<https://www.youtube.com/watch?v=-xLokKVdk7I>





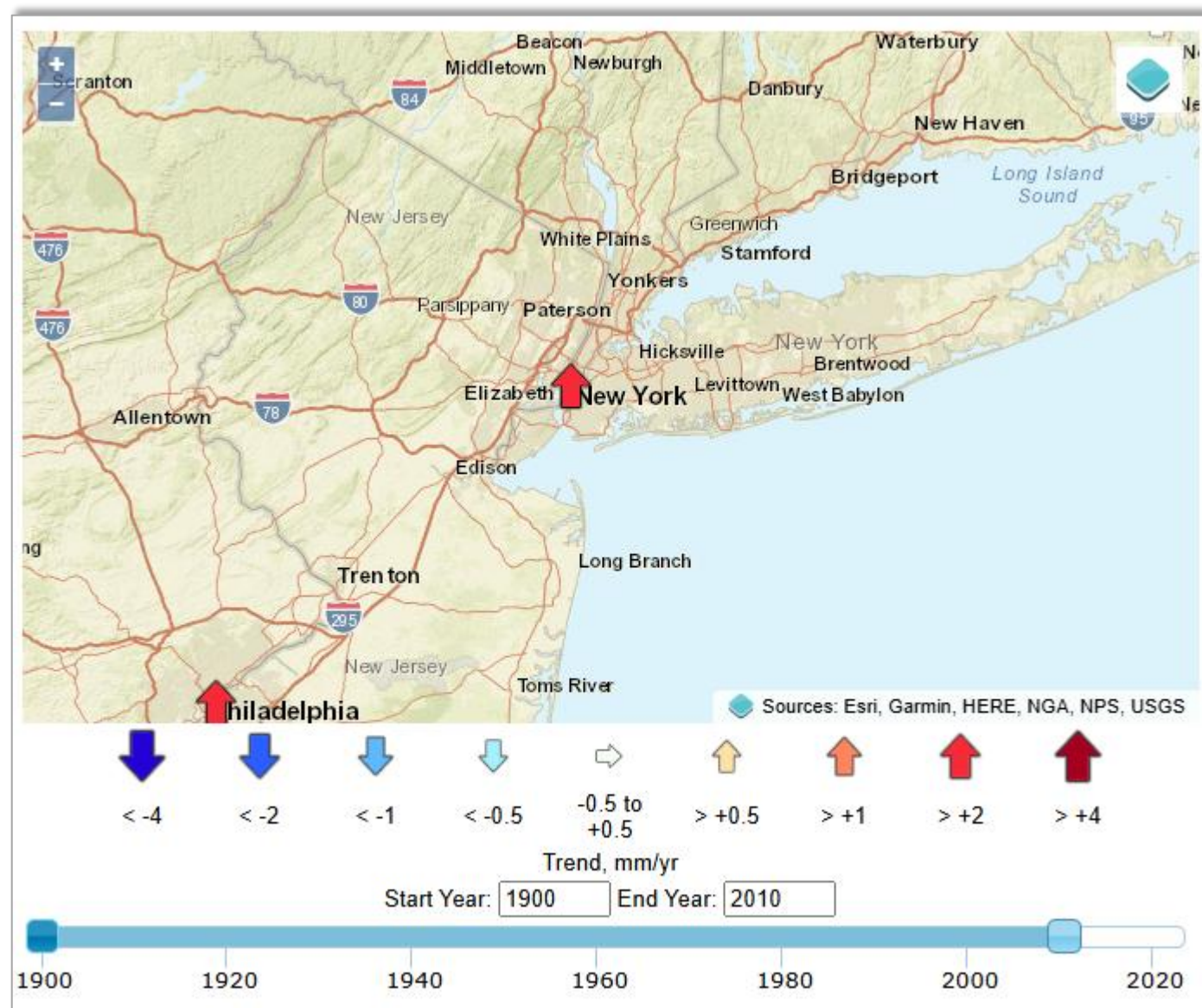
Sea Level Raises

- 1) Group exercise on sea level increase through **Permanent Service for Mean Sea Level (PSMSL)**

<https://psmsl.org/products/trends/>

- 2) Bring your laptop!

- 3) Report findings (group)





Group Exercise

- 1) Go to the Permanent Service for Mean Sea Level (PSMSL) website:
<https://psmsl.org/products/trends/>
- 2) Select at least 3 cities
- 3) Find the sea level rises since **1900 for every 20 years until 2025.**
- 4) Record and report these values to the class (Excel).

Seal Level Rise in major cities since 1900 - GEO 409_2025							
Year	New York						
1930							
1950							
1970							
1990							
2010							
2025							



Key Take-Home Message

- Sea level rise is a **persistent, global phenomenon** driven by warming of the planet and melting of land-ice.
- It is accelerating, and has many cascading impacts on people, nature and infrastructure.
- While the changes may seem gradual in some places, their long-term effects are profound.
- Planning and action now help avoid much larger problems later.



Nov 10: Climate Extremes