Detecting anomalous sea level rise events

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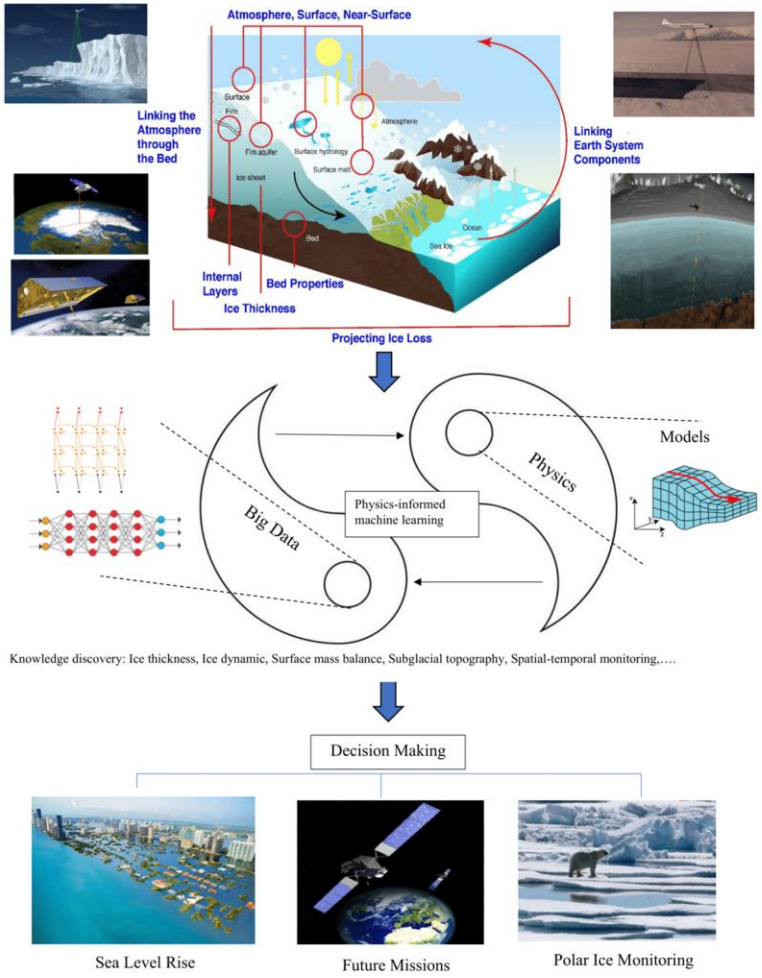
iHARP
NSF HDR INSTITUTE

iHARP Vision

iHARP advances our understanding of the response of polar regions to climate change and its global impacts by deeply integrating data science and polar science to spur physics-informed, data-driven discoveries.

iHARP Mission

iHARP conducts data intensive research, education, outreach, and cyberinfrastructure development that will transform understanding of the effects of climate change in polar regions. This institute brings together stakeholders and leading scholars in data science and polar science to reduce uncertainties in projecting Greenland and Antarctica's future mass balance, associated sea-level rise, and impacts on global communities.



AS OUR OCEAN WARMS, SEA LEVEL RISES

We know seas are rising and we know why. The urgent questions are by how much and how quickly.

Sea levels have risen about **8 inches** since the beginning of the 20th century. The ocean is projected to rise by as much as **3 feet or more** by the end of this century.

Earth's climate history shows there have been times when ice sheets rapidly changed and created multiple meters of sea level rise in a century. As Earth's ice sheets continue to change, a key question facing scientists now is: Could human-caused global warming be pushing us toward one of those times?

SEA LEVEL RISE AFFECTS US ALL

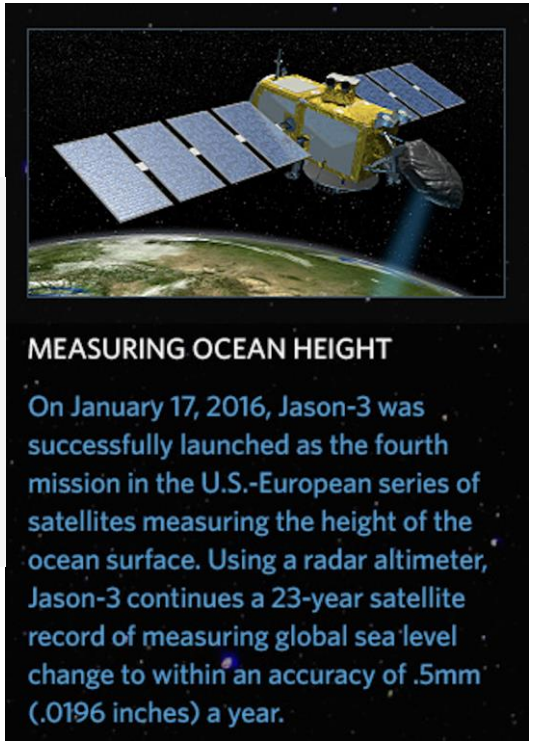
More than **160 million people** live along coasts in the U.S., about half the nation's population. **Eleven of the world's 15 largest cities** lie along shores, including New York City. Sea level rise means the ocean will gradually inundate low-lying areas, and storms like hurricanes, bolstered by even higher seas, will extend their reach inland. All of society bears the burden for storm damage and those costs are expected to rise: Annual losses from flooding in the world's biggest coastal cities could rise from about **$6 billion a year** today to **$1 trillion a year** by 2050.

Making Better Predictions of Sea Level Rise

As the ocean rises, the ability to provide even more precise information about coastal sea level rise is crucial

The Next 30 Years

Sea level along the U.S. coastline is projected to rise, on average, 10 - 12 inches (0.25 - 0.30 meters) in the next 30 years (2020 - 2050), which will be as much as the rise measured over the last 100 years (1920 - 2020). Sea level rise will vary regionally along U.S. coasts because of changes in both land and ocean height.



Making Better Predictions of Sea Level Rise

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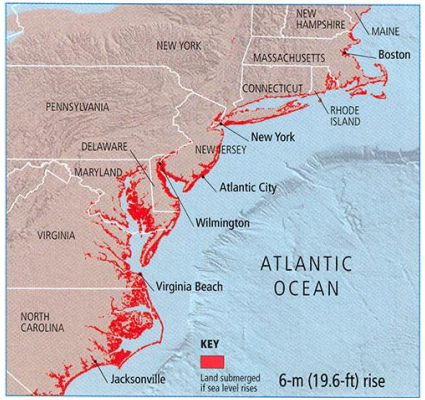
More Damaging Flooding

Sea level rise will create a profound shift in coastal flooding over the next 30 years by causing tide and storm surge heights to increase and reach further inland. By 2050, “moderate” (typically damaging) flooding is expected to occur, on average, more than 10 times as often as it does today, and can be intensified by local factors.

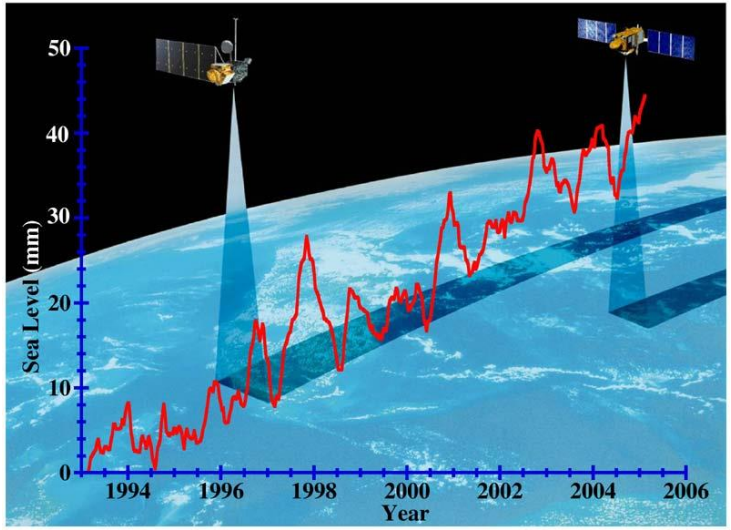
NORTHEAST COASTLINE

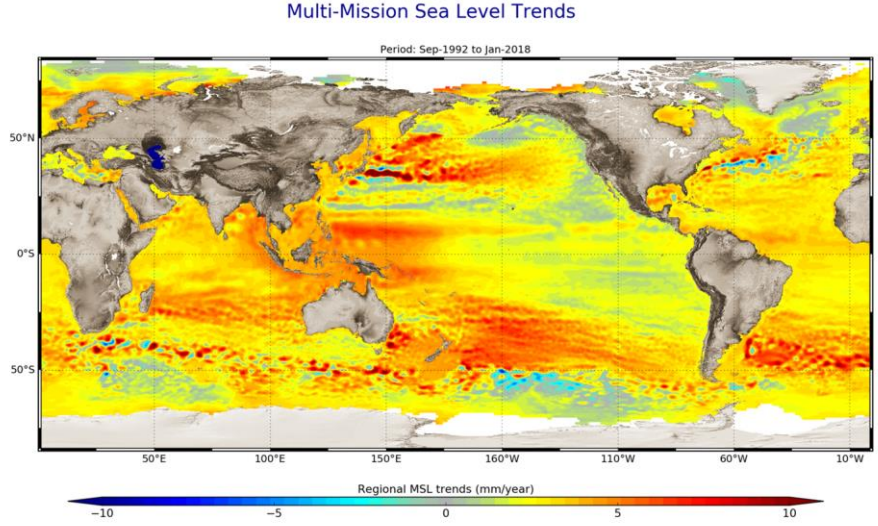
Most of New York City and Boston would be submerged if sea level were to rise by 6 m (19.6 ft).



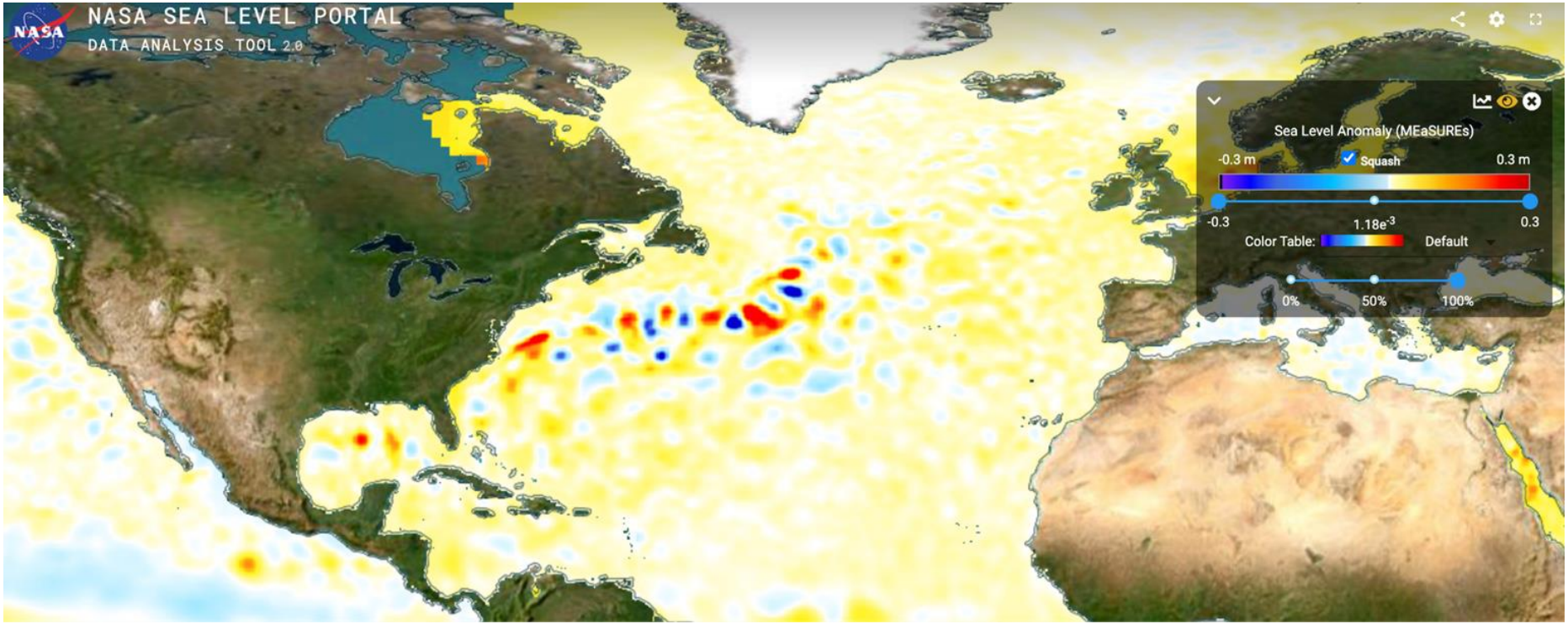
Continual Tracking

Continuously tracking how and why sea level is changing is an important part of informing plans for adaptation. Our ability to monitor and understand the individual factors that contribute to sea level rise allows us to track sea level changes in a way that has never before been possible (e.g., using satellites to track global ocean levels and ice sheet thickness). Ongoing and expanded monitoring will be critical as sea levels continue to rise.





Machine Learning Challenge: Detect anomalous flooding events from satellite sea level maps



Machine Learning Challenge: Detect anomalous flooding events from satellite sea level maps

- We provide daily satellite sea level anomaly data over the North Atlantic for the past 30 years
- We provide dates of anomalous flooding along US East coast stations for the past 30 years
- Challenge is to detect anomalous flooding events along the US East Coast with the maps of sea level over the North Atlantic