Introduction to Datatset

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Anomaly Detection: Hybrid Butterflies

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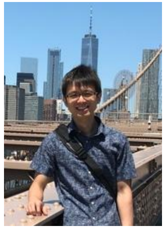
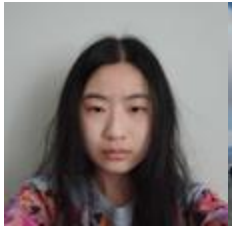
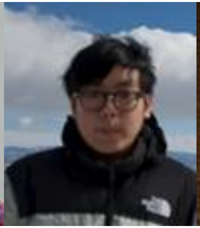
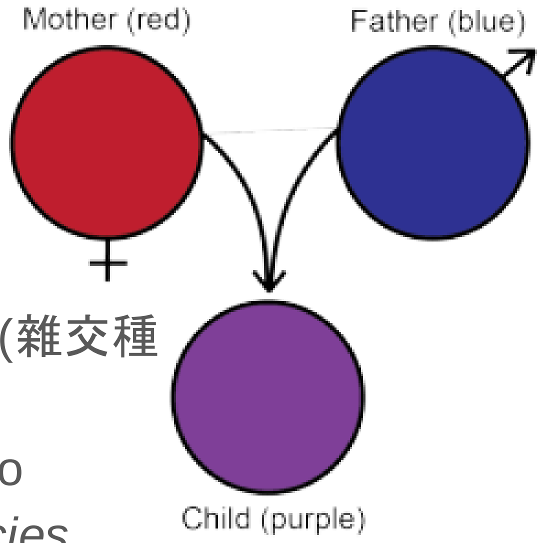





Hybrid Detection

A brief history

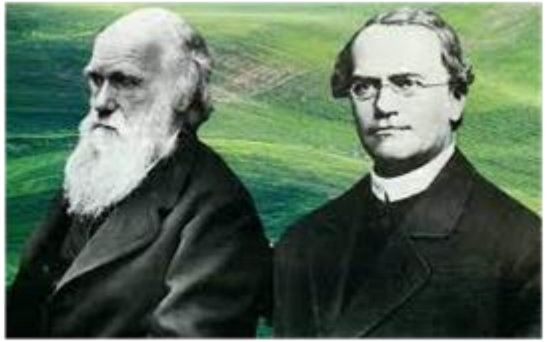
Hybrid Detection



- Researchers have sought a means to detect hybrids (雜交種) since the creation of the field of taxonomy (分類學).
- Detecting hybrids would give taxonomists the ability to determine what constitutes a true *species* or *subspecies.*
- The question is ***how***?
  - *How* do we recognize a hybrid?
  - What does a hybrid look like?

Hybrid Detection: History

- Darwin first posed this question of “What does a hybrid look like?”
- Mendel answered with his pea plant experiment.



Hybrid Detection: History

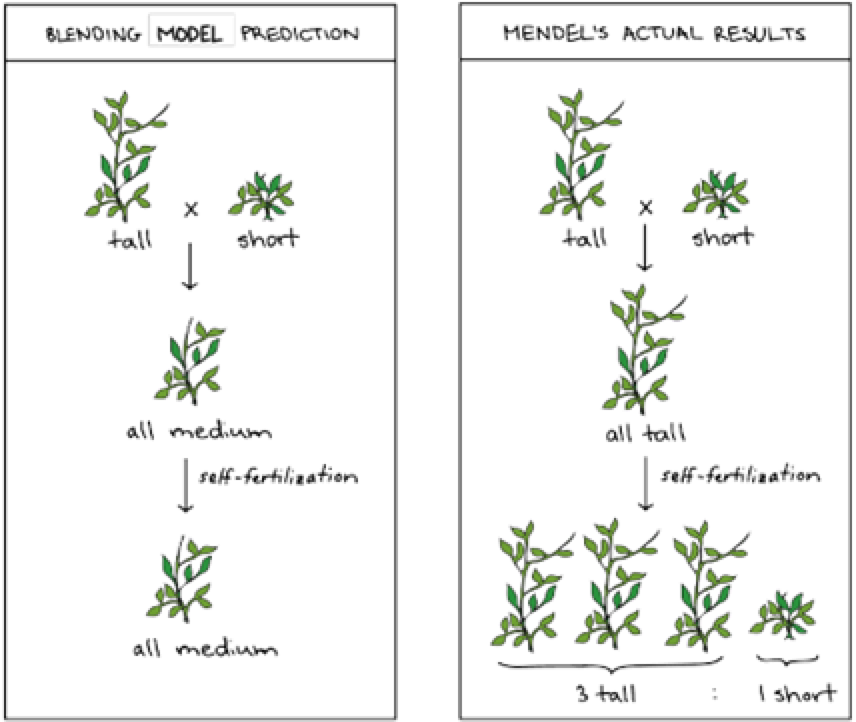
Mendel's *Hypothesis*:

Blending Inheritance

- Inheritance of traits is ***continuous***.

Mendel's *Results*:

Inheritance is often ***discrete***.



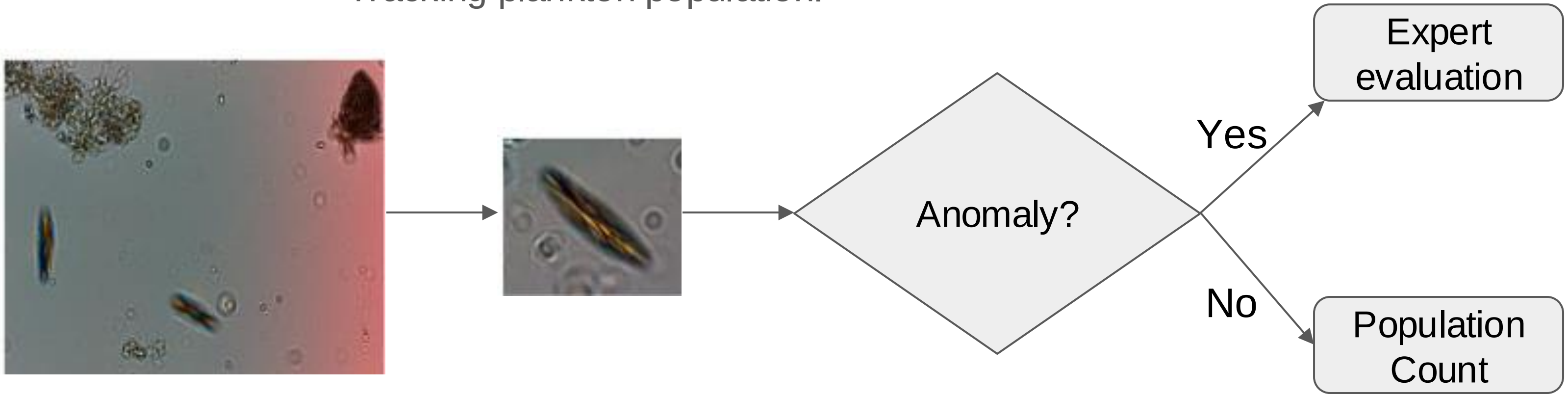
Hybrid Detection: Butterflies

- Consider these two species:
- Hybridization may lead to a variety of resulting patterns.

- There are several [dominant] genes that control color pattern on wings.
  - Ex: red on hindwings is a dominant trait.
- Dominance: hybrids may look like one parent.
- In practice, identifying hybrids requires knowledge of their parent species/subspecies.

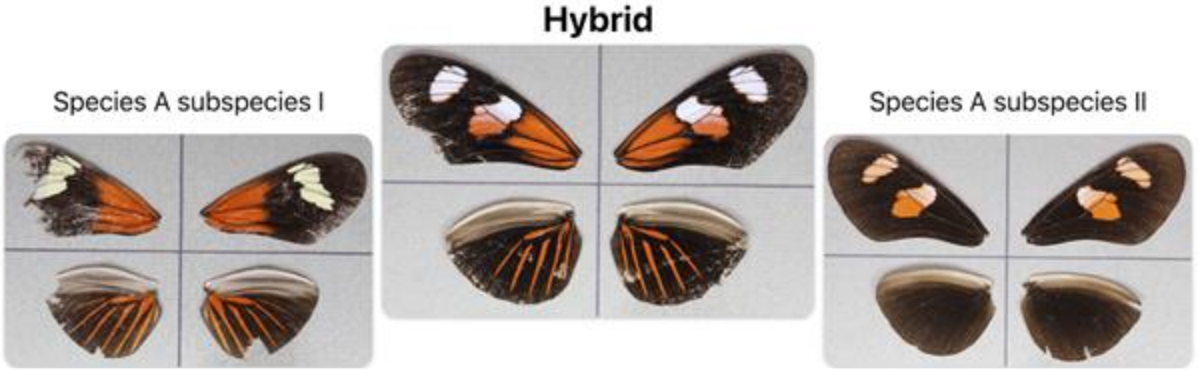
Anomaly Detection: History

- In Biology, questions on:
  - Gene function identification [1]
    - What phenotype anomaly resulted from a gene knockout?
  - Ecosystem health monitoring [2]
    - Tracking plankton population.



Our Challenge

How ***you*** can contribute to answering this important biological question



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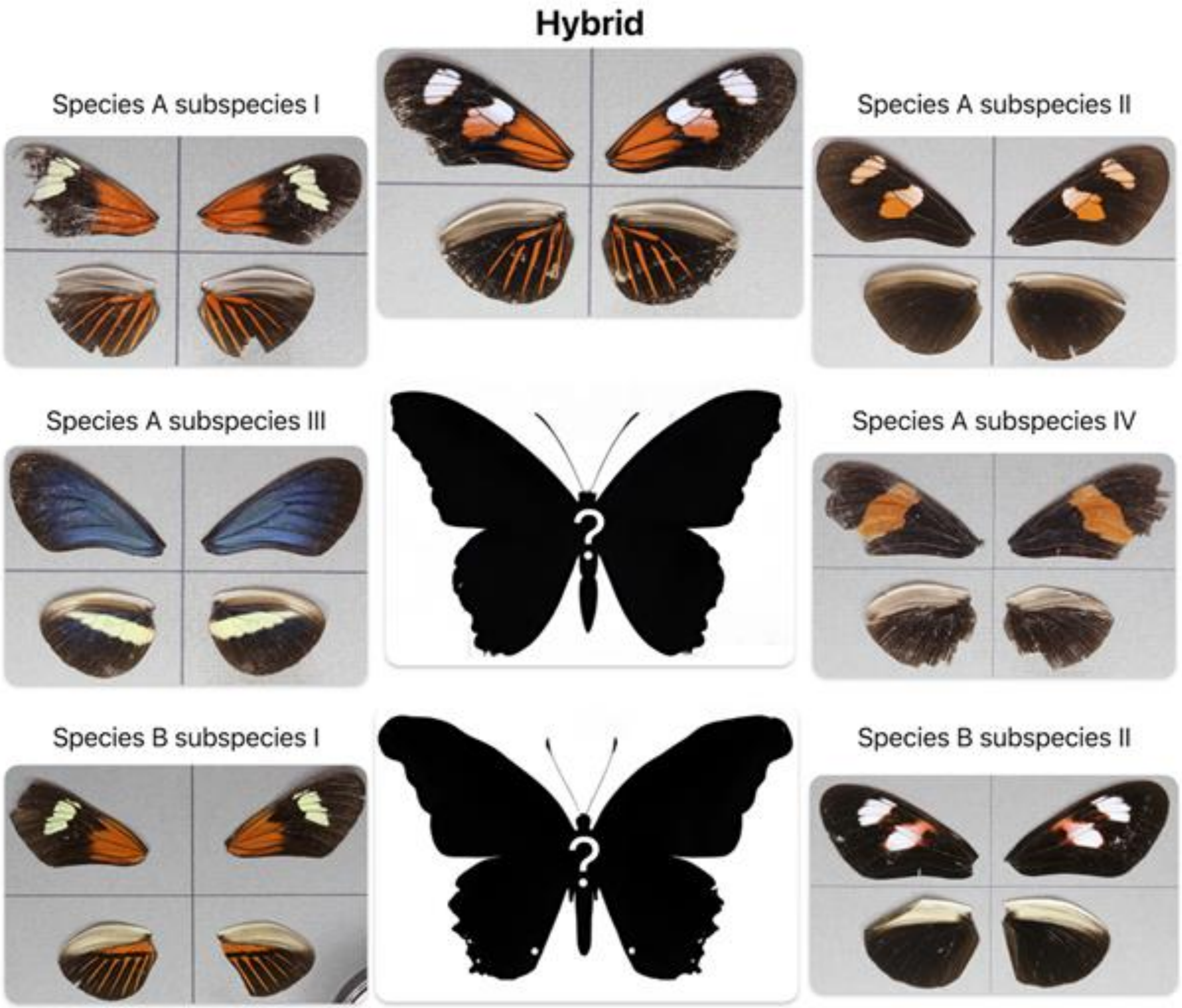
Hybrid graphic generated using Canva Magic Media AI, then manually edited.



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Hybrid graphic generated using Canva Magic Media AI, then manually edited.

Our Challenge: Training Data

Training Data

- ~2200 images of Species A:
  - Multiple ***sub***species.
  - Selected signal hybrids of two ***sub***species.

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Our Challenge: Dev & Test Data

- Includes:
  - All Species A subspecies.
  - Signal hybrids from training data.
- Further introduces:
  - Other Species A hybrids (non-signal).
  - Species B: Mimics of Species A signal hybrid parents (& their hybrids).
- The numbers:
  - Validation Data (Dev): ~1100 images
  - Test Data: ~2200 images

The Challenge: Find the Hybrids

- Among Species A & B, can your algorithm find…
  - Species A signal hybrids?
  - Species A non-signal hybrids?
  - Species B hybrids (mimics of Species A signal hybrids)?

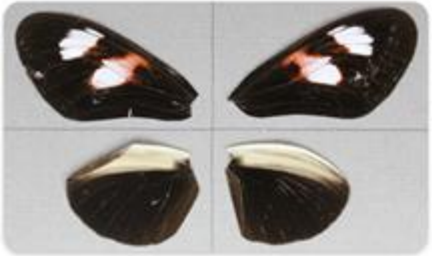
Species A subspecies I

Species A subspecies II

Species A subspecies III

Species A subspecies IV

Species B subspecies II



Species B subspecies I

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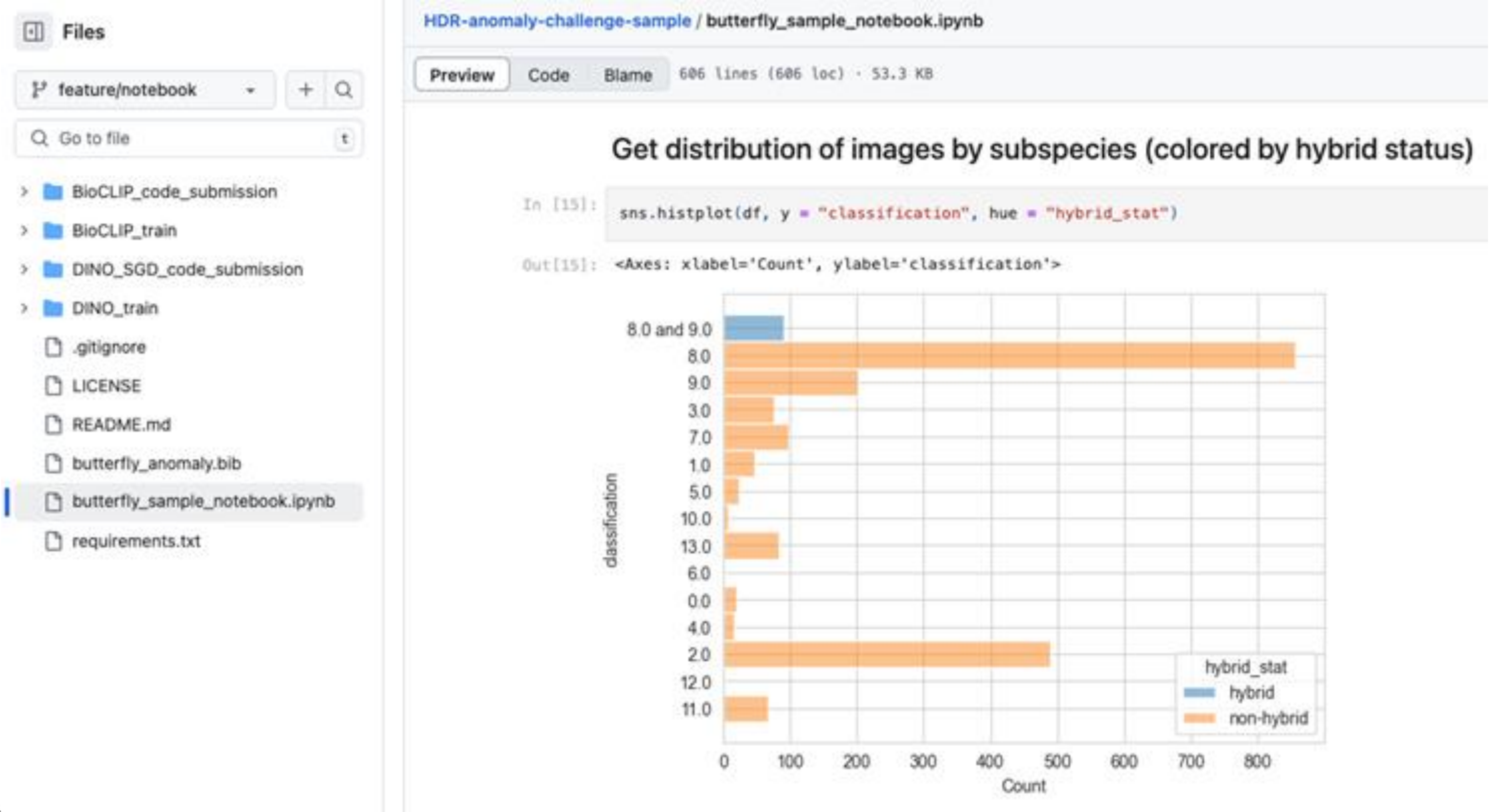
Sample Submissions Repository



Detecting anomalous sea level rise events

prepared by Subhankar Ghosh & Aneesh Subramanian

w/ Shashi Shekhar, Vandana Janeja, Josephine Namayanja

NSF HDR INSTITUTE


NASA
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 LEVEL RISE: 1880 - 2017
243.5 mm
2017
0 mm
1880
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?
CSIRO, updated Church and White (2011);
GSFC (2017), Global Mean Sea Level Trend from Integrated Multi-Mission Ocean Altimeters, Ver. 4.

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.

MEASURING OCEAN HEIGHT

On January 17, 2016, Jason-3 was successfully launched as the fourth mission in the U.S.-European series of satellites measuring the height of the ocean surface. Using a radar altimeter, Jason-3 continues a 23-year satellite record of measuring global sea level change to within an accuracy of .5mm (.0196 inches) a year.

Making Better Predictions of Sea Level Rise

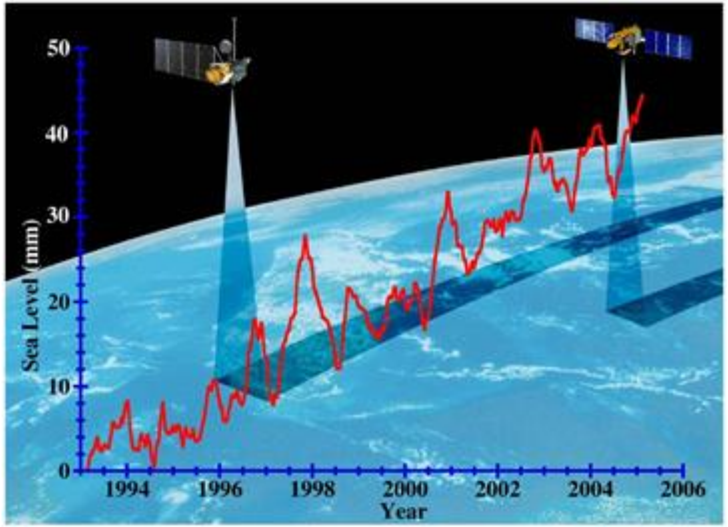
As the ocean rises, the ability to provide even more precise information about coastal sea level rise is crucial

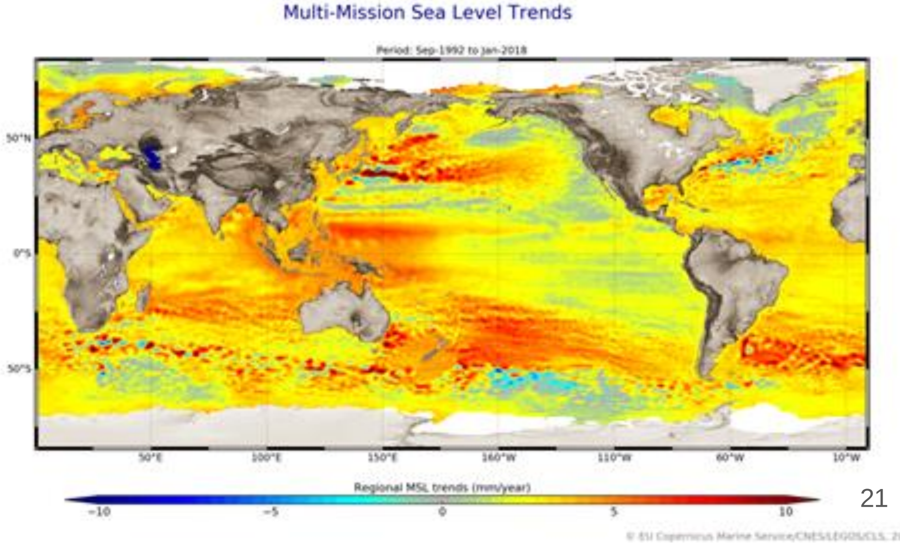
More Damaging Flooding

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.

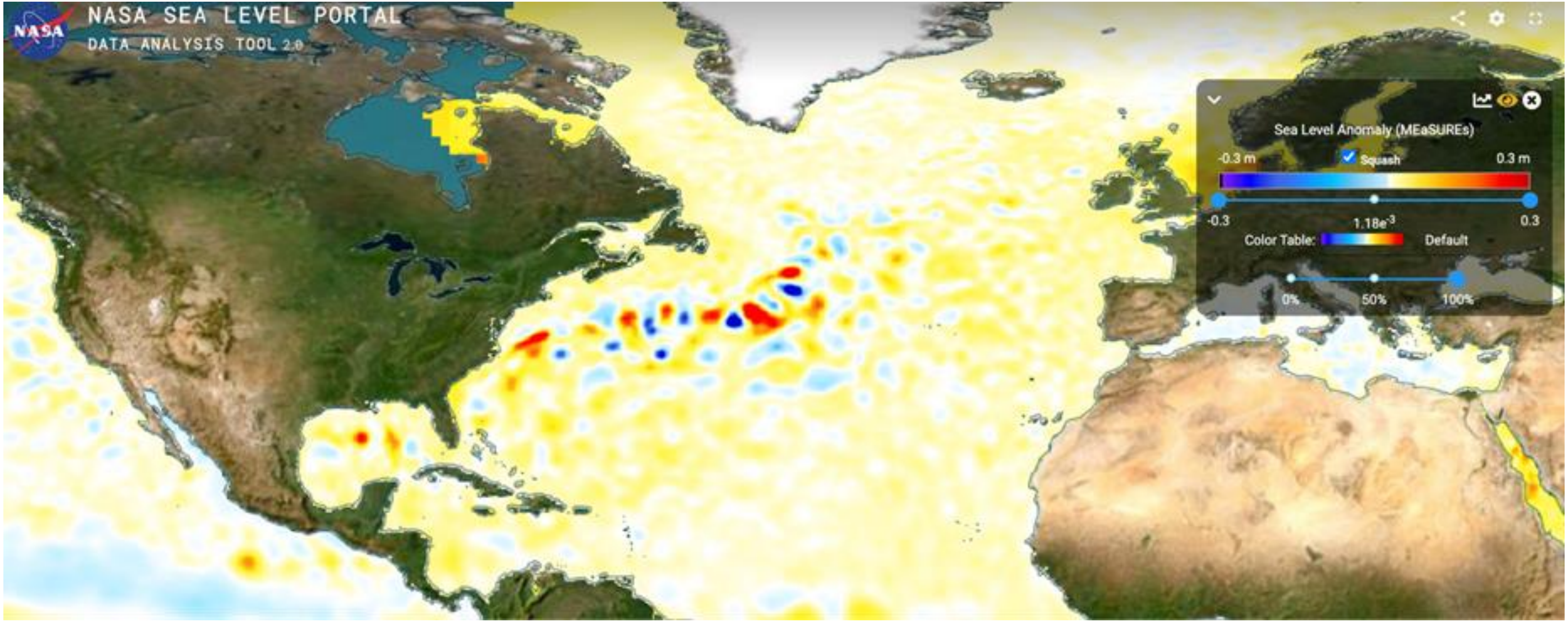
Continual Tracking

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