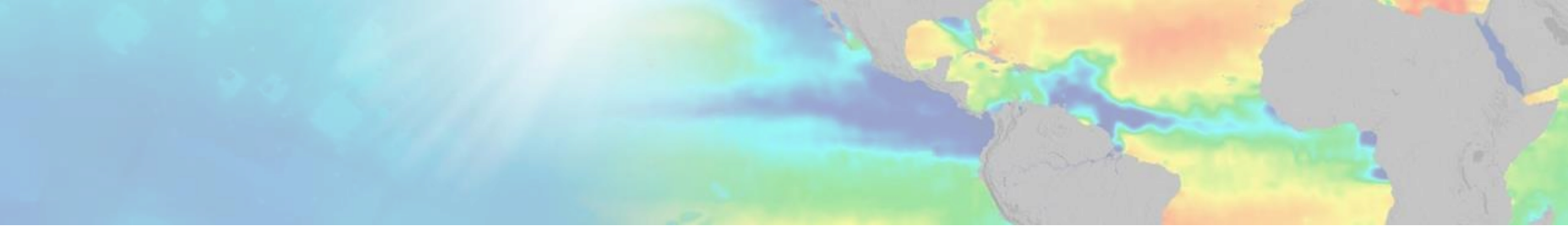


Societal Relevance of NASA Salinity

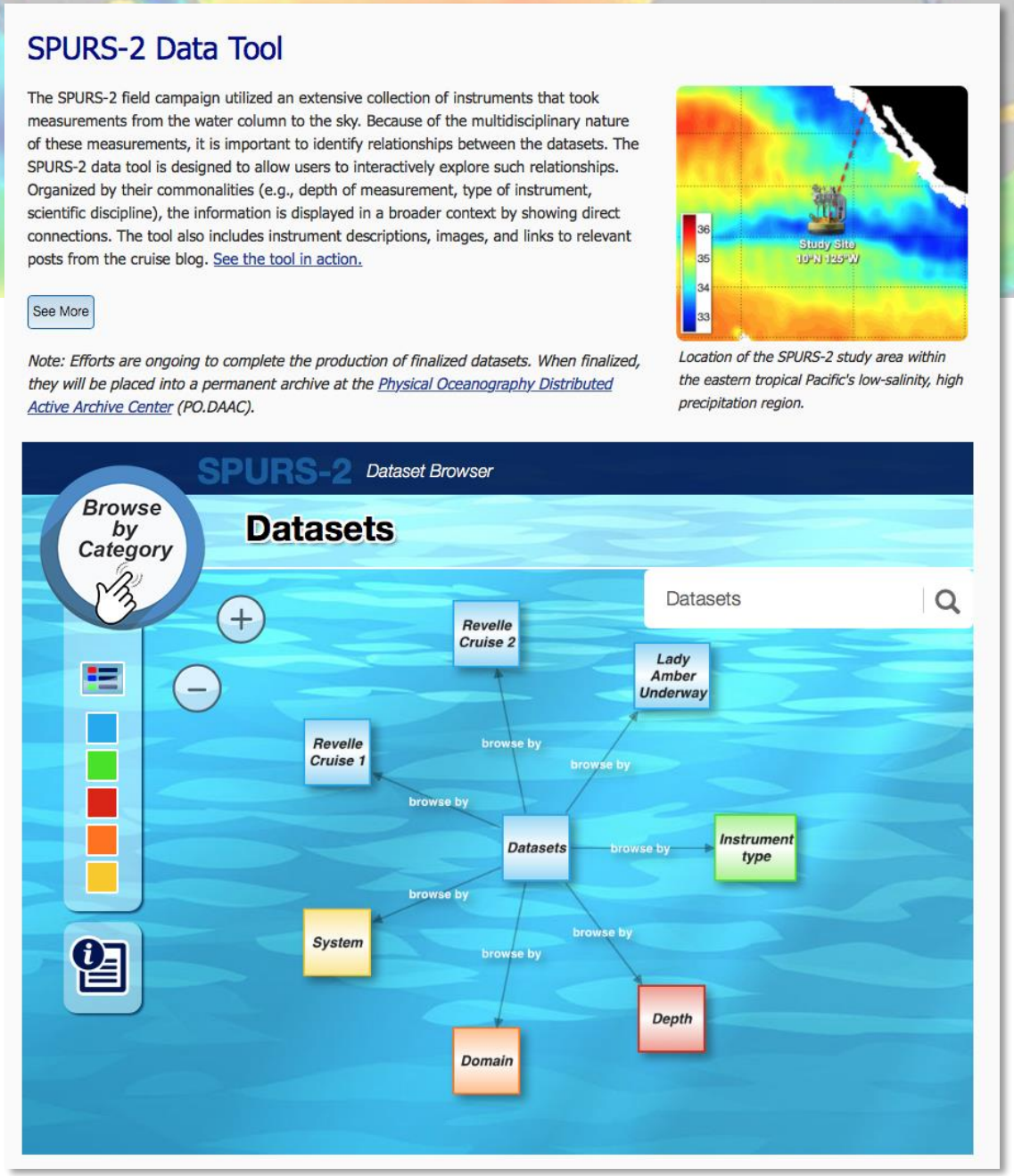
Annette deCharon (ODYSEA LLC)

Presentation Overview

- SPURS-2 Data Tool
- “Learn More”
- “Highlights”
- Example Communication Materials
- Discussion

SPURS-2 Data Tool

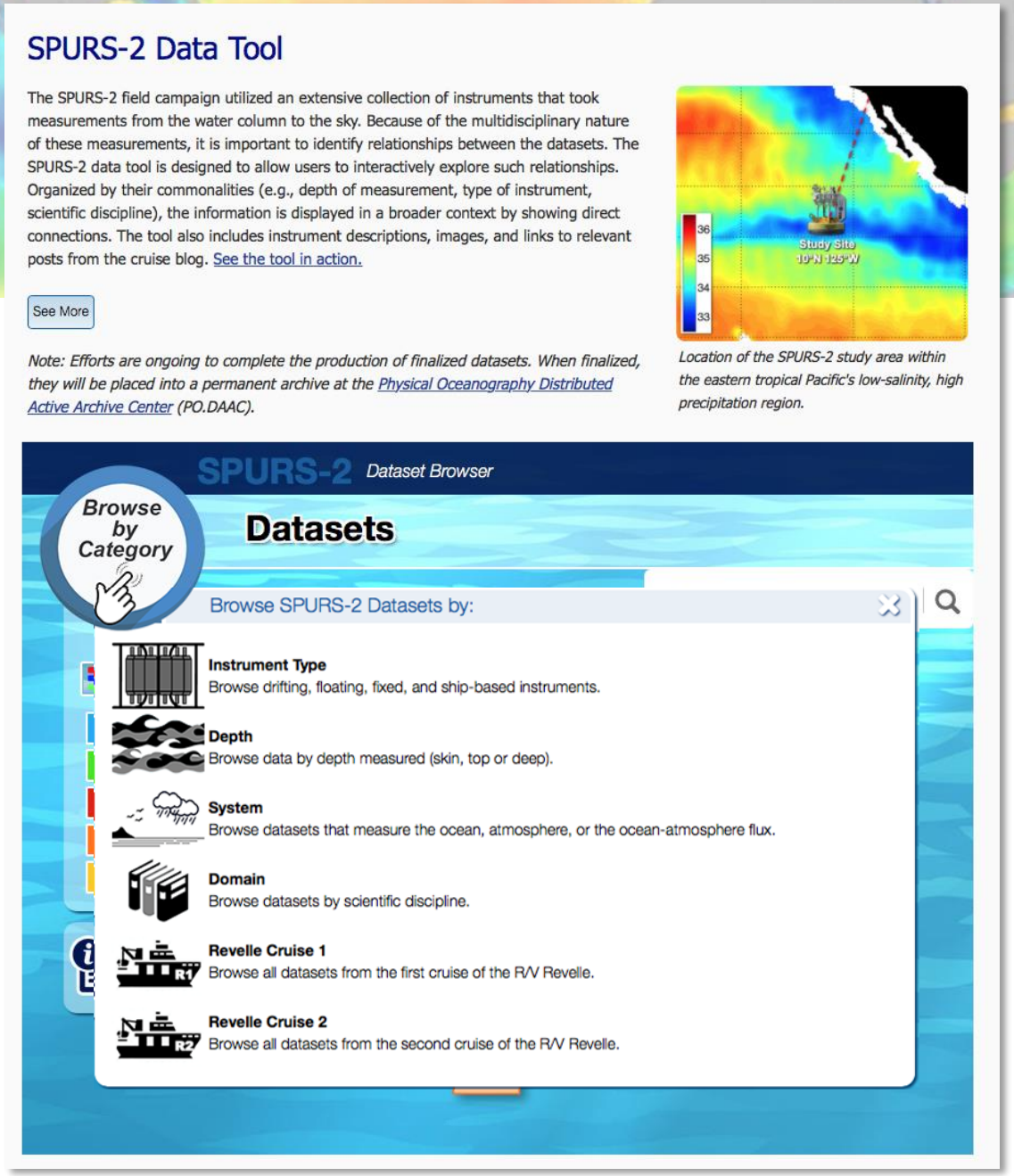
- SPURS-2 Data Tool
  - Developed in collaboration with Fred Bingham and Vardis Tsontos to make data access more interactive and intuitive
  - Tool is described by Bingham et al. article in “Oceanography” special issue



https://salinity.oceansciences.org/science-spurs-datatool.htm

SPURS-2 Data Tool

- SPURS-2 Dataset Browser Tool
  - Developed in collaboration with Fred Bingham and Vardis Tsontos to make data access more interactive and intuitive
  - Tool is described by Bingham et al. article in “Oceanography” special issue



https://salinity.oceansciences.org/science-spurs-datatool.htm

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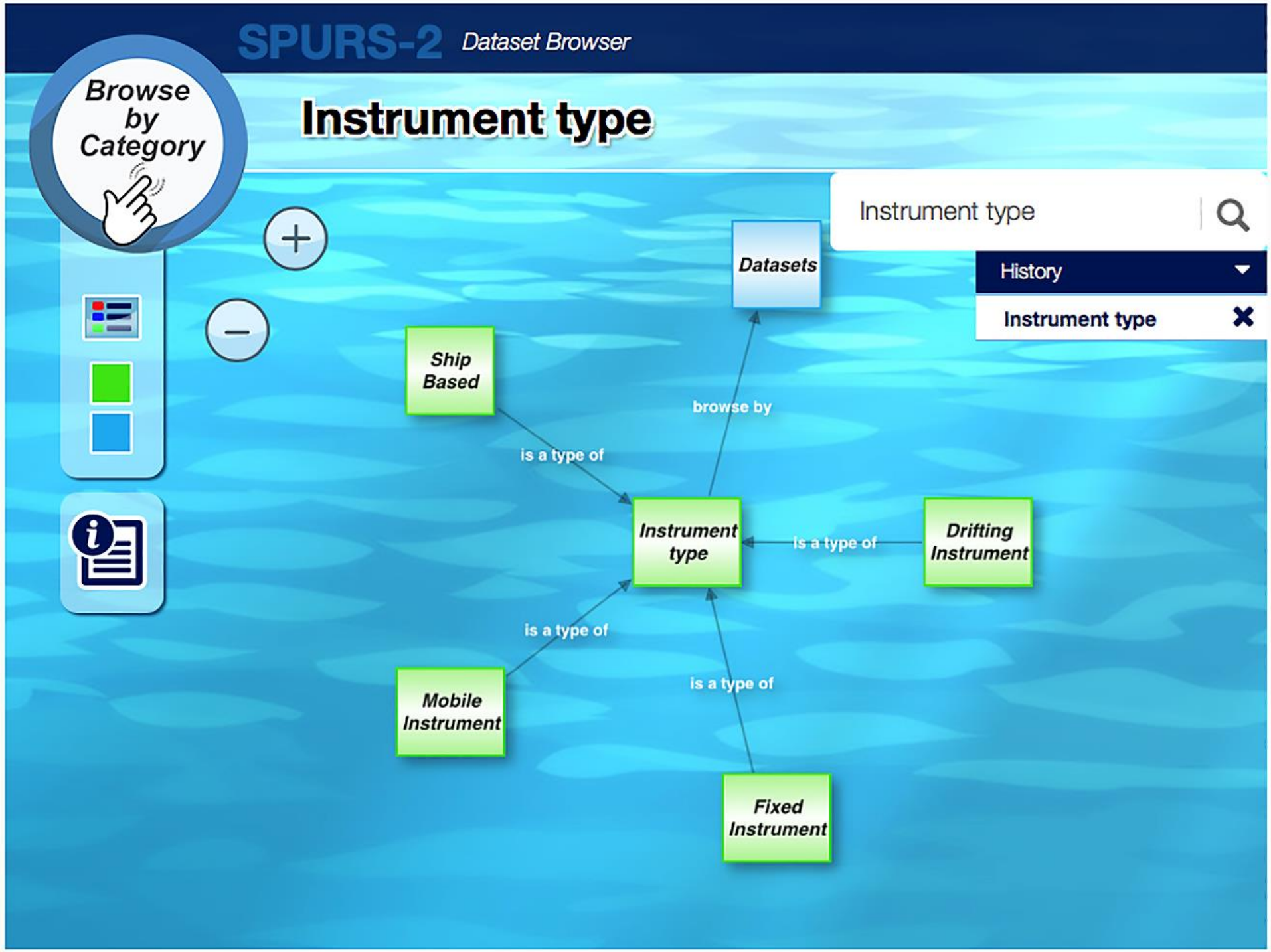

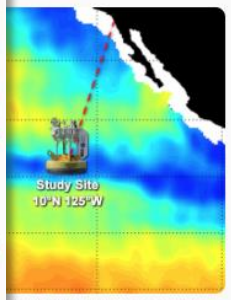

SPURS-2 study area within
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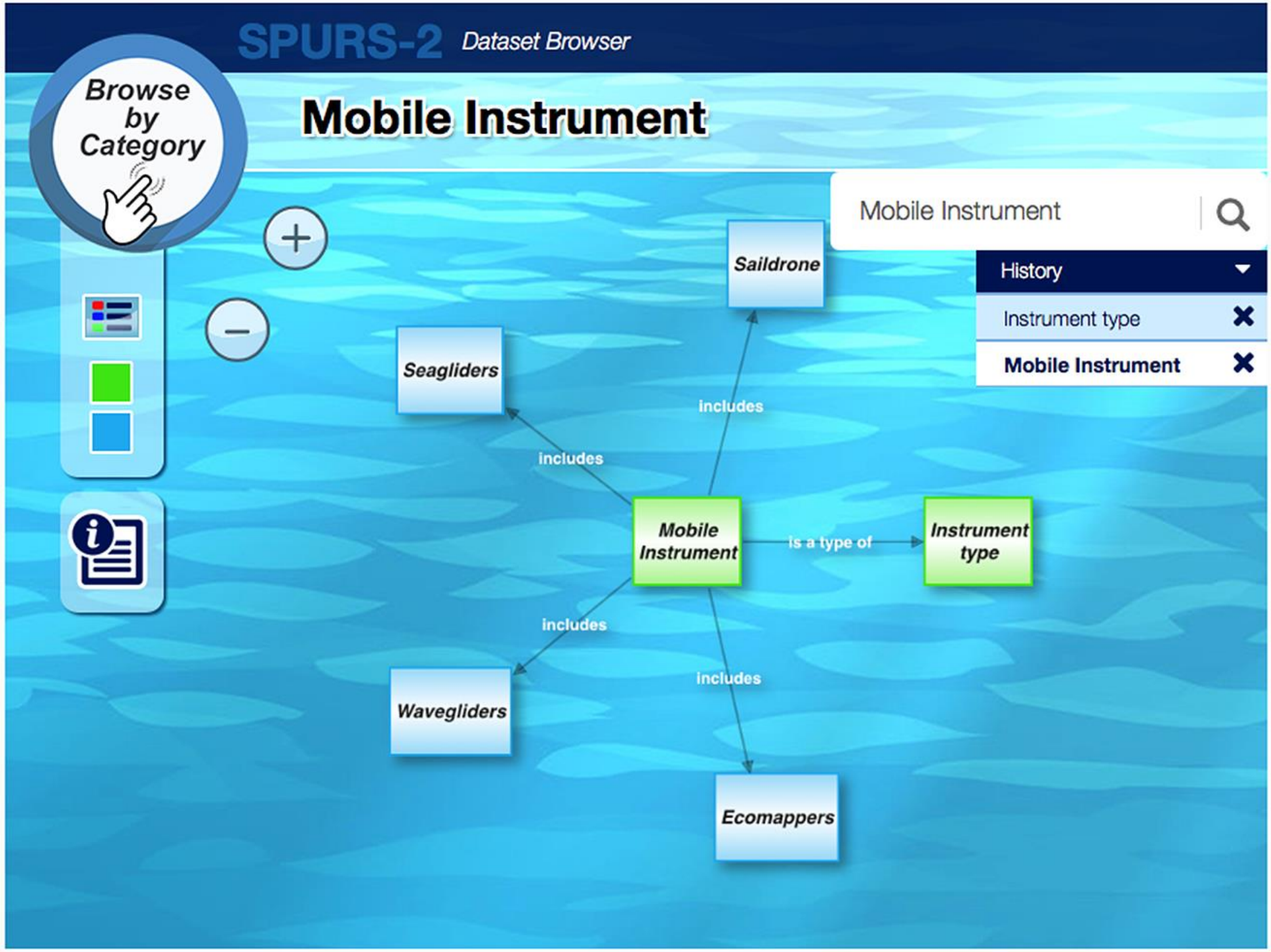

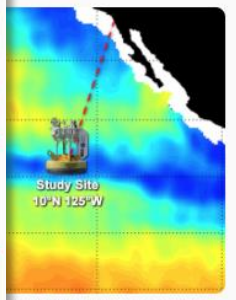

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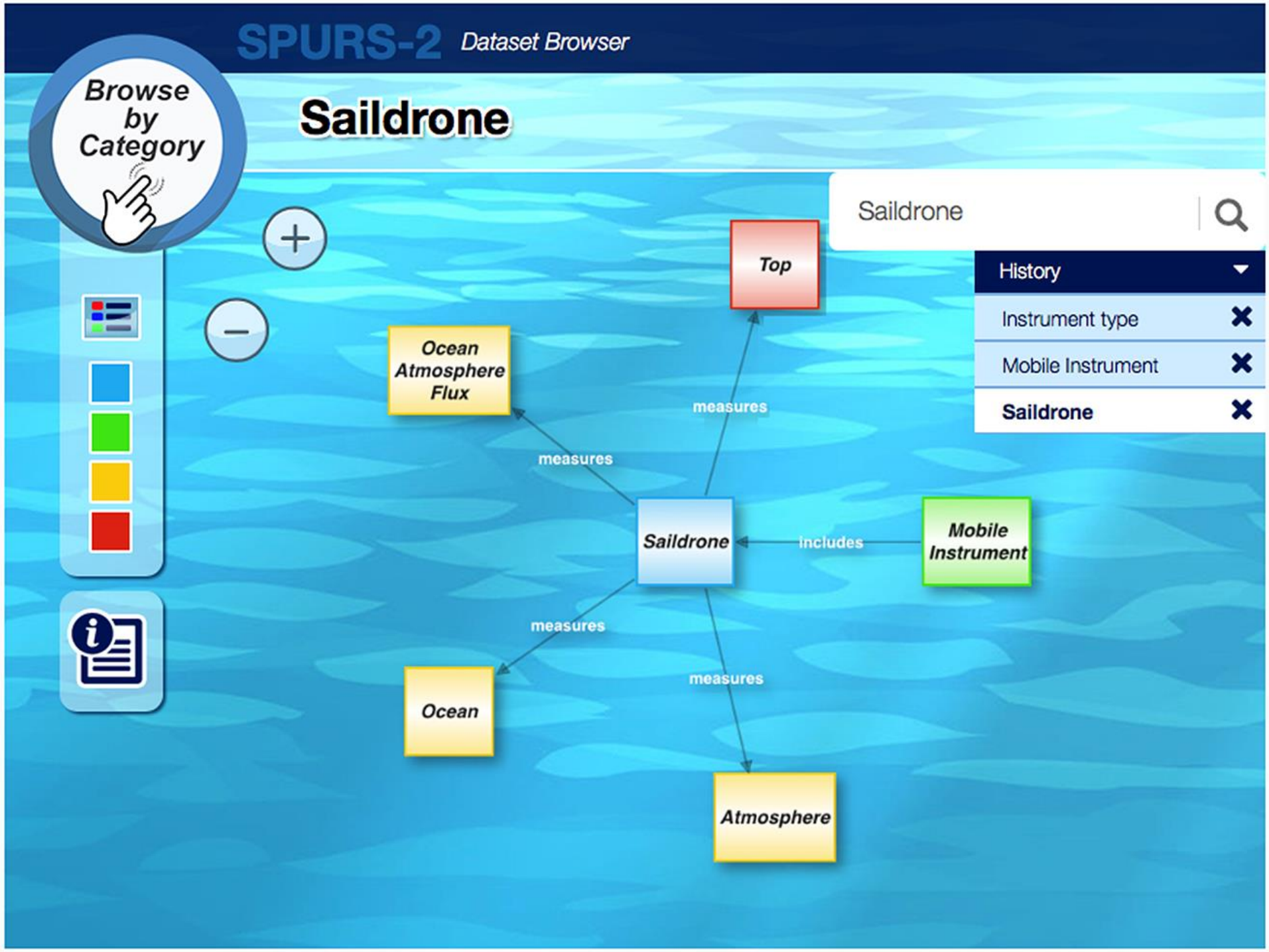

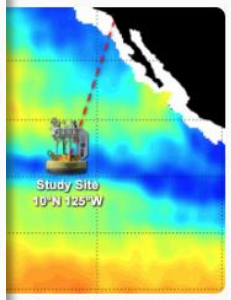

SPURS-2 study area within
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SPURS-2 Dataset Browser

Browse by Category

Saildrone

Saildrone

History

Instrument type

Mobile Instrument

Saildrone

Top

Ocean Atmosphere Flux

measures

measures

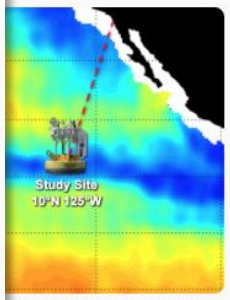
Saildrone

includes

Mobile Instrument

Saildrone is a wind and solar powered, unmanned surface vehicle capable of long distance deployments lasting up to 12 months. The drone is autonomous in that it may be guided remotely from land while being completely wind driven. This novel sampling platform is equipped with a suite of instruments and sensors providing high quality, georeferenced, near real-time, multi-parameter surface ocean and atmospheric observations while transiting at typical speeds of 3-5 knots.

Dataset Access - doi: https://dx.doi.org/10.5067/SPUR2-SDRON



SPURS-2 study area within
pical Pacific's low-salinity, high
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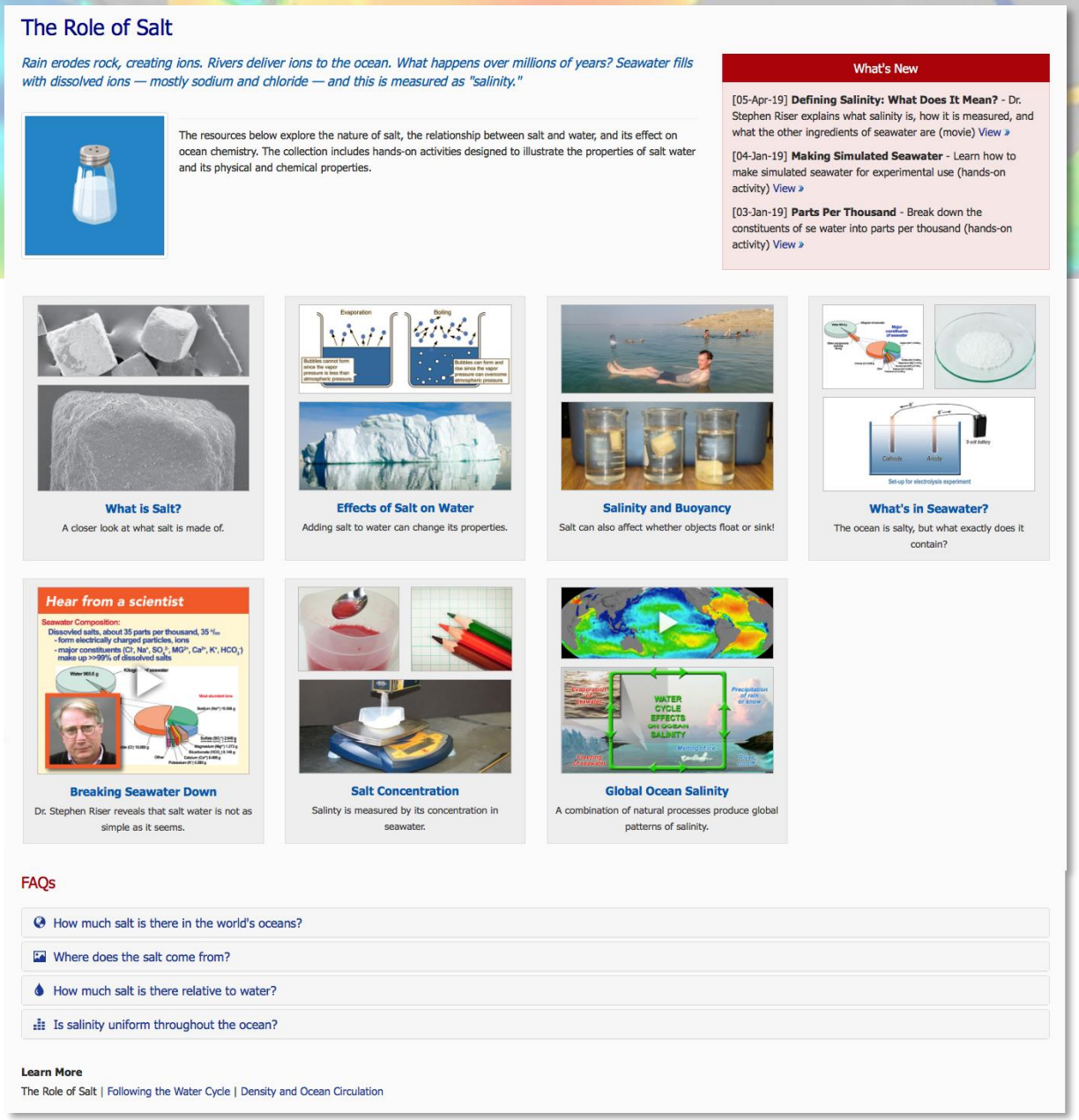
“Learn More”

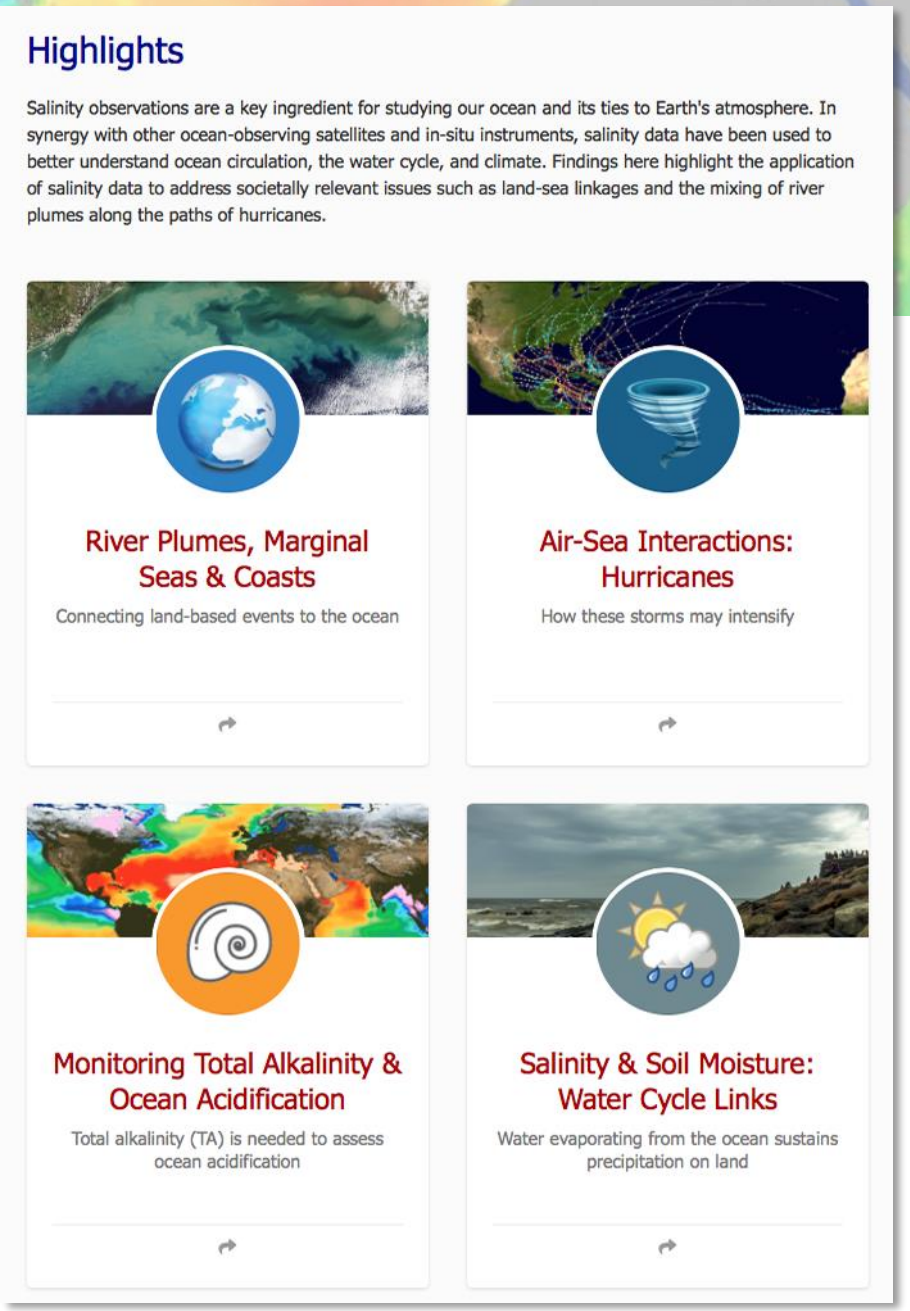
- Revamping “Education” section
  - The Role of Salt
  - Following the Water Cycle
  - Density and Ocean Circulation
  - More to come…



https://salinity.odyseallc.net/learn-salt.htm

“Highlights”

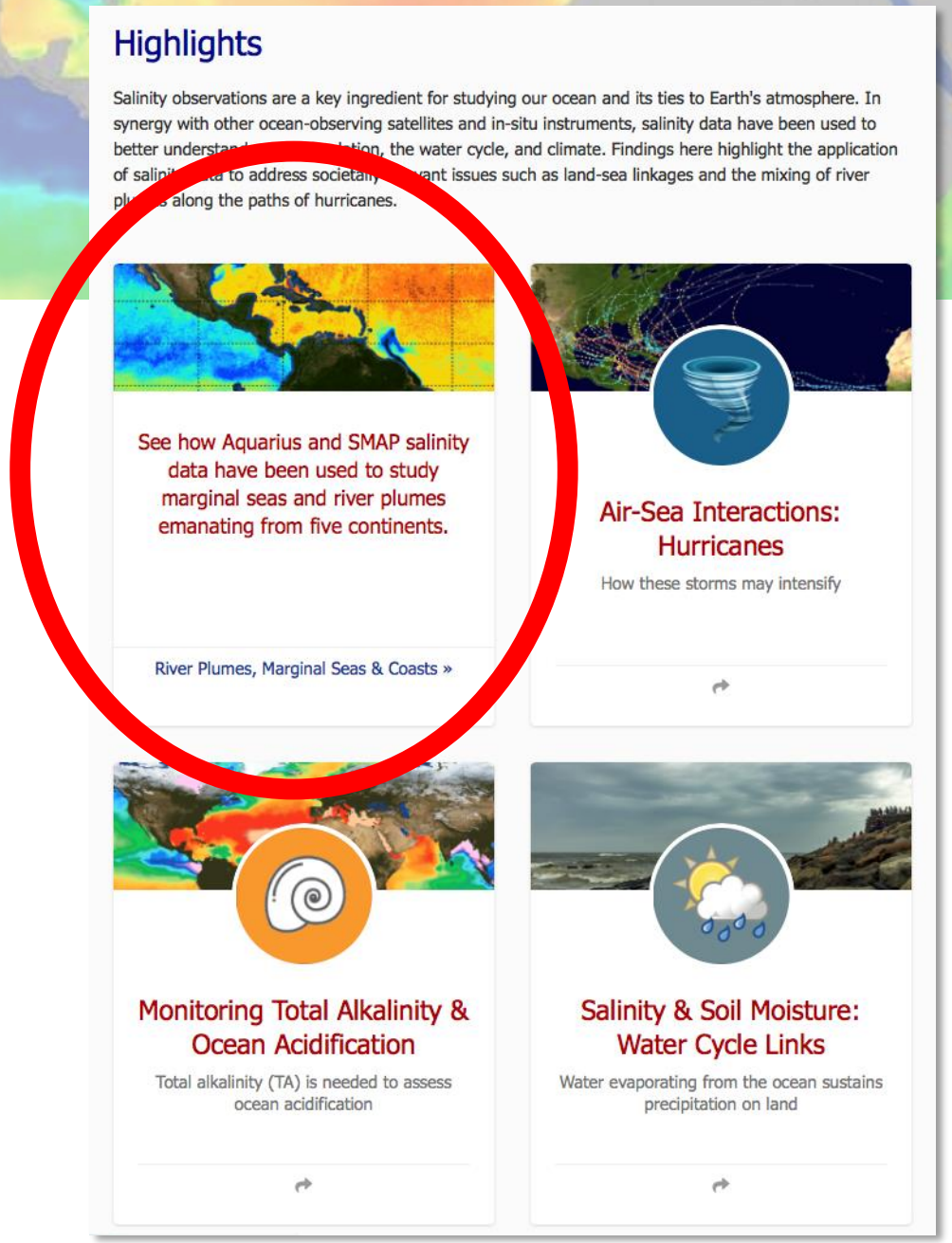
- Last OSST meeting (Aug 2018)
  - We discussed ways to better highlight the societal relevance of salinity measurements
- New “Highlights” section on website
  - Content is currently targeted at scientists
  - Could be repurposed into communications materials



https://salinity.oceansciences.org/highlights.htm

“Highlights”

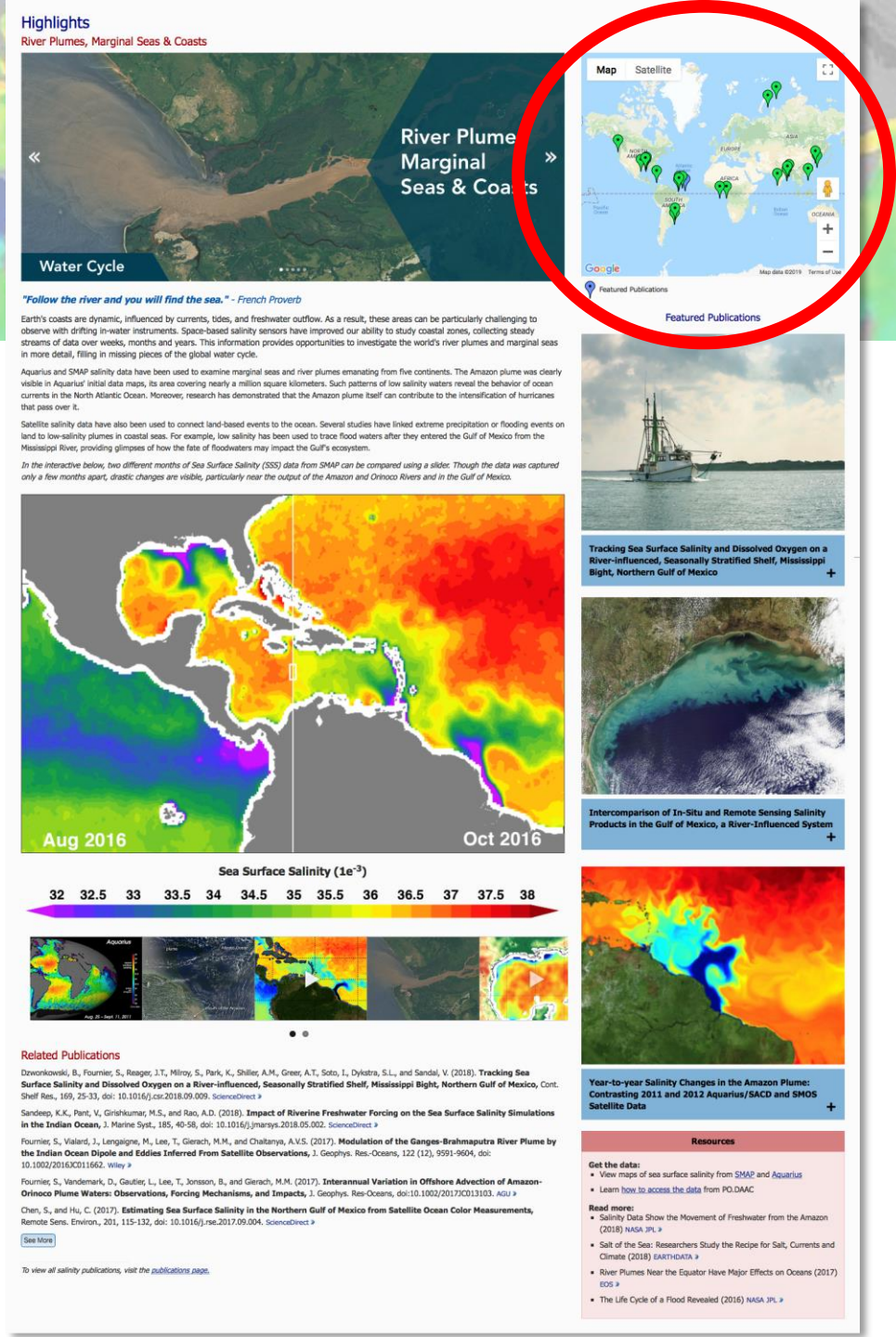
- River Plumes, Marginal Seas & Coasts



https://salinity.oceansciences.org/highlights.htm

“Highlights”

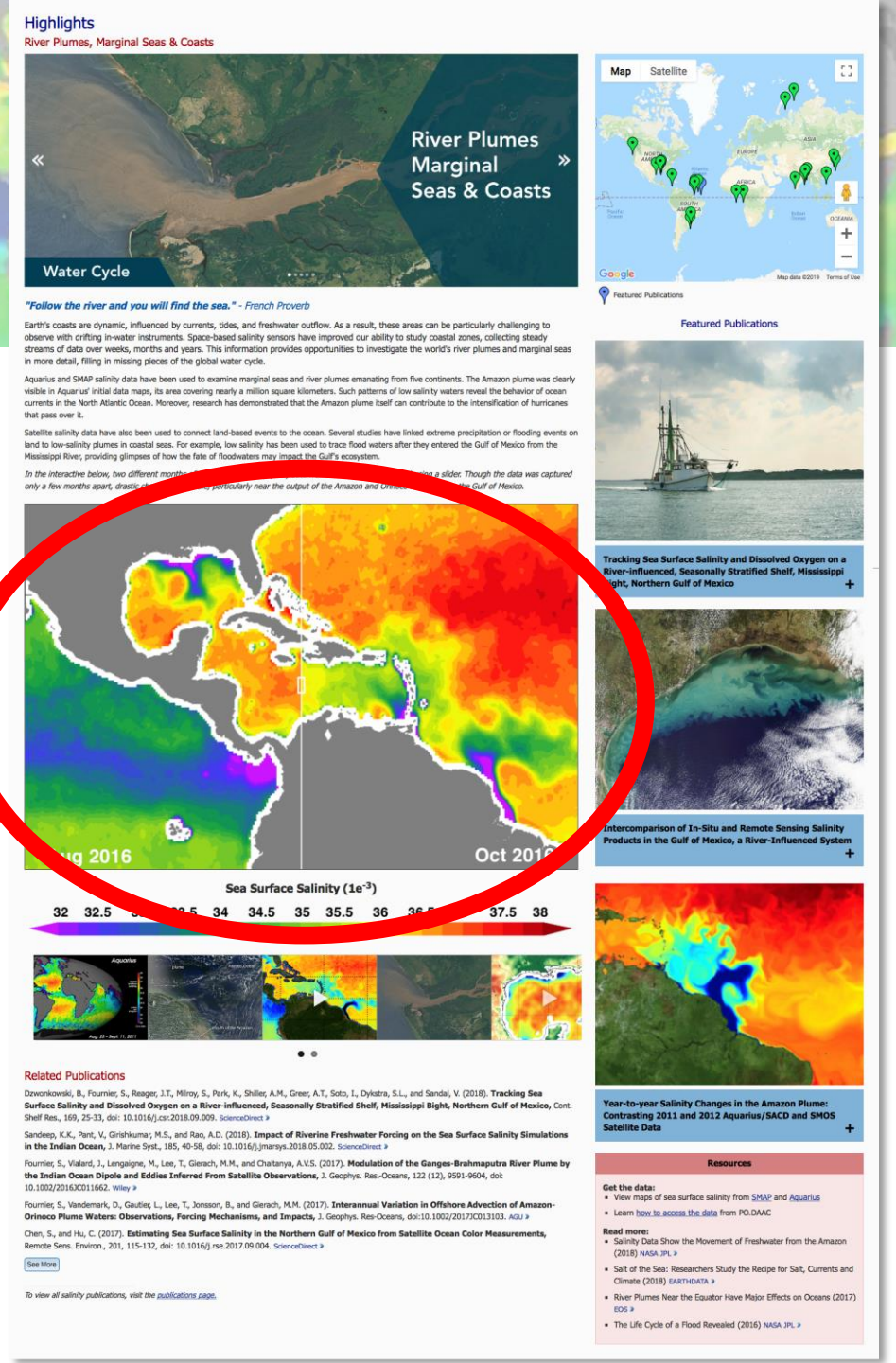
- Each topic includes:
  - Rotator at top
  - Description of societal relevance
  - Small interactive “app”
    - In this case, an interactive GoogleMap shows locations of river plumes, marginal seas, and coasts, which link to specific publications



https://salinity.oceansciences.org/highlights01.htm

“Highlights”

- Each topic includes:
  - Rotator at top
  - Description of societal relevance
  - Small interactive “app”
  - Large interactive “app”
    - In this case, a before/after slides showing changes in the Gulf of Mexico and Amazon plumes



https://salinity.oceansciences.org/highlights01.htm

“Highlights”

- Each topic includes:
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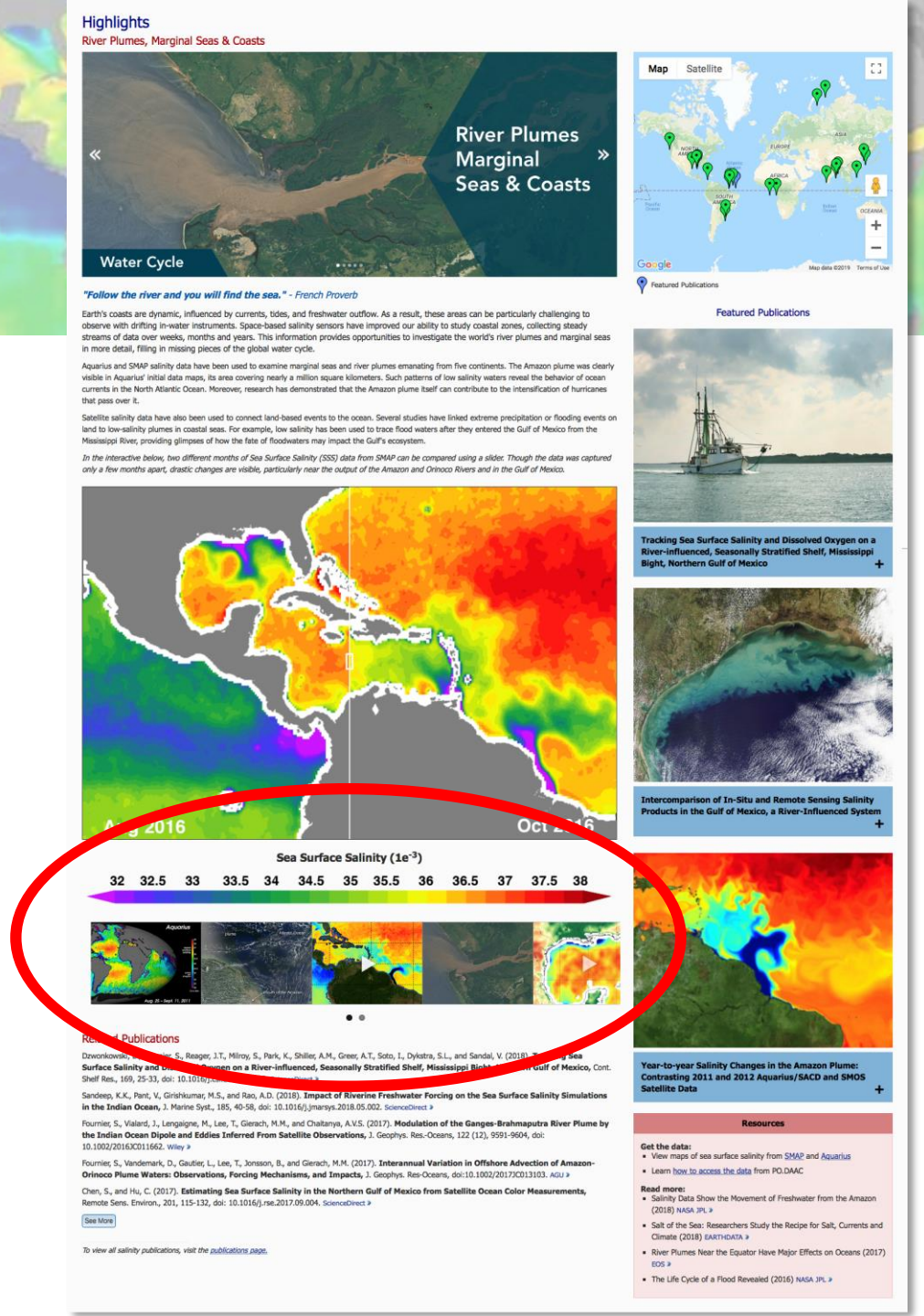
  - Small interactive “app”
  - Large interactive “app”
  - Image/video slider that tells a “mini” story on the topic



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- Each topic includes:
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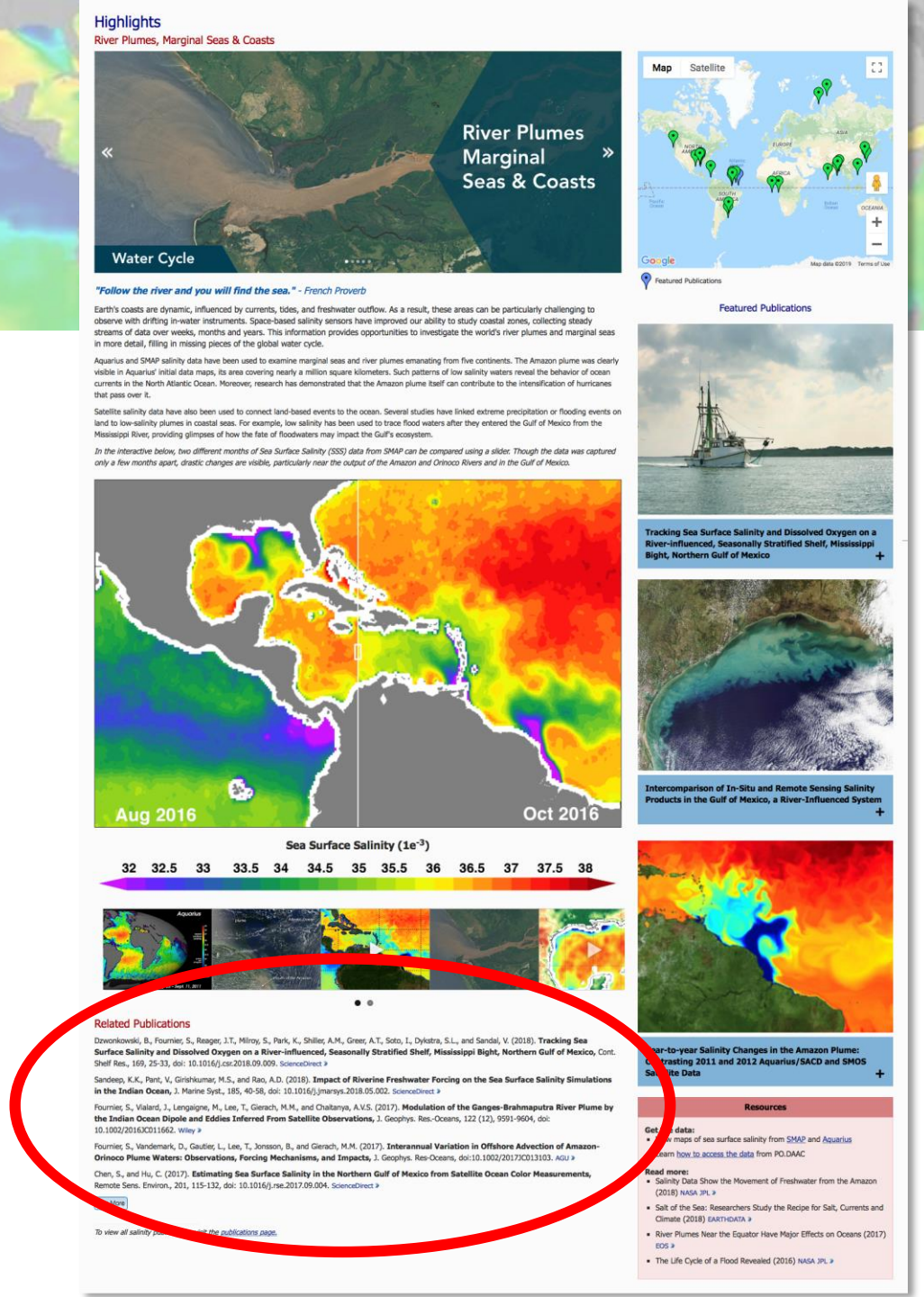
  - Small interactive “app”
  - Large interactive “app”
  - Image/video slider that tells a “mini” story on the topic
  - Related Publications (all)



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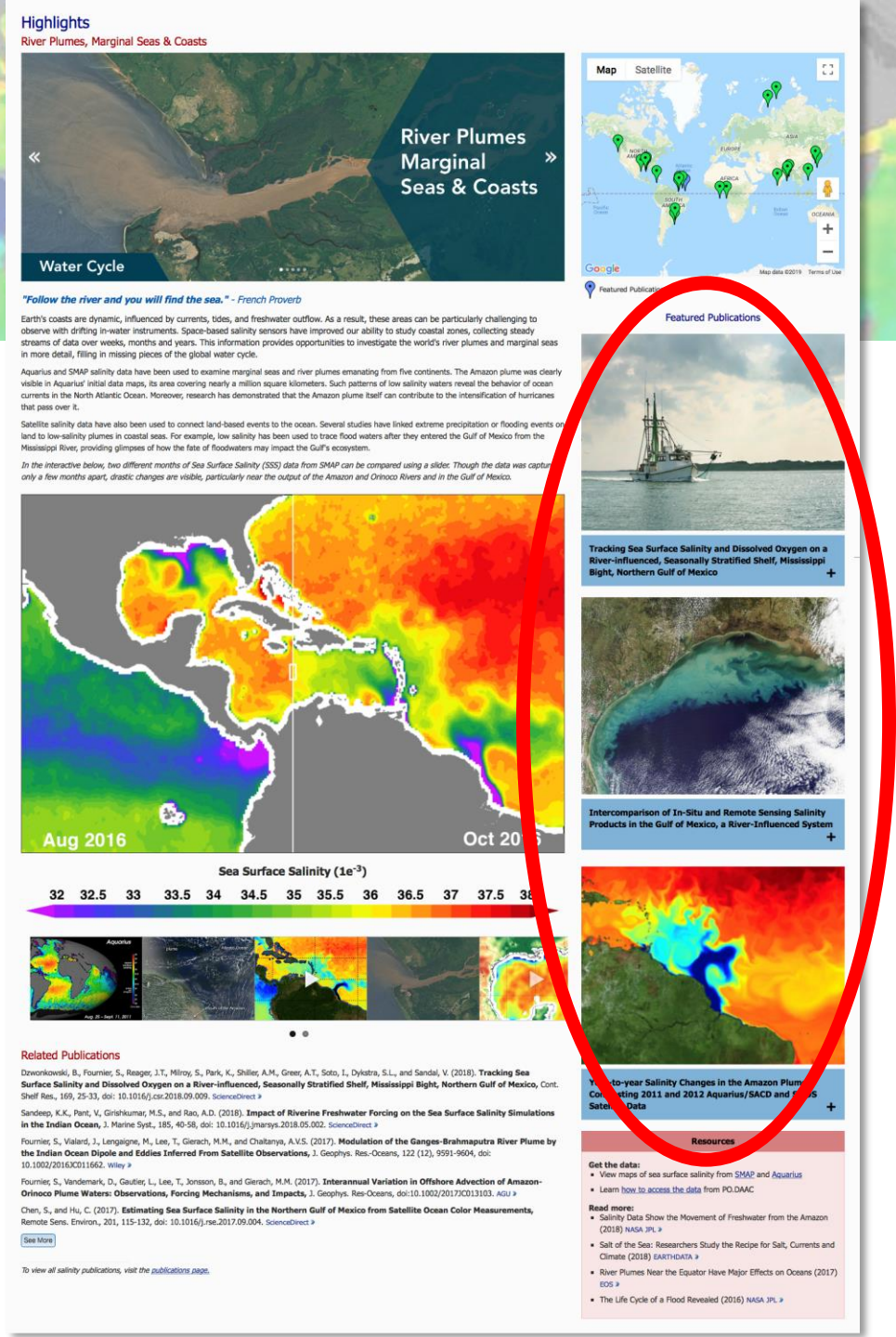
  - Large interactive “app”
  - Image/video slider that tells a “mini” story on the topic
  - Related Publications (all)
  - Featured Publications that open/close to reveal more information



https://salinity.oceansciences.org/highlights01.htm

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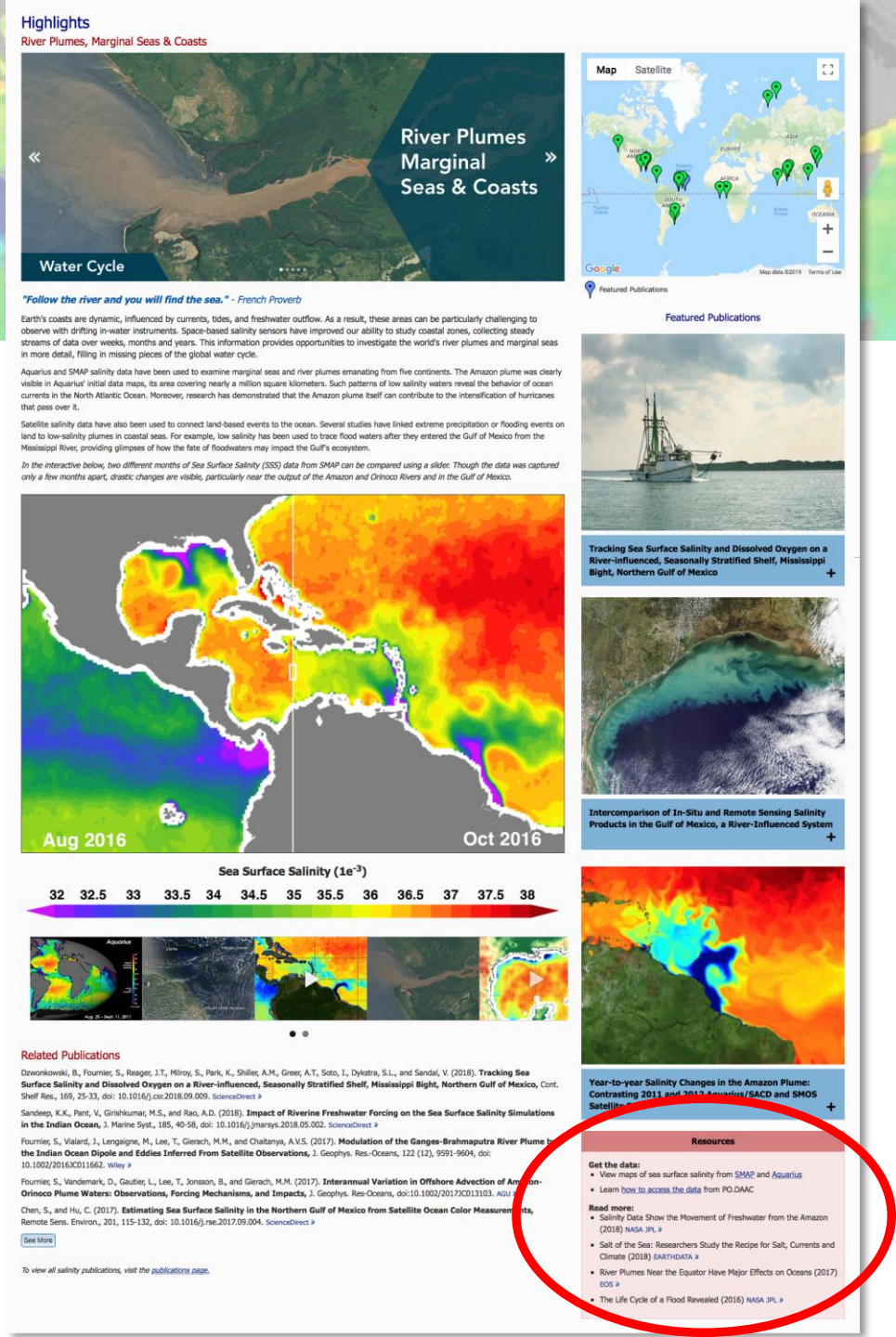
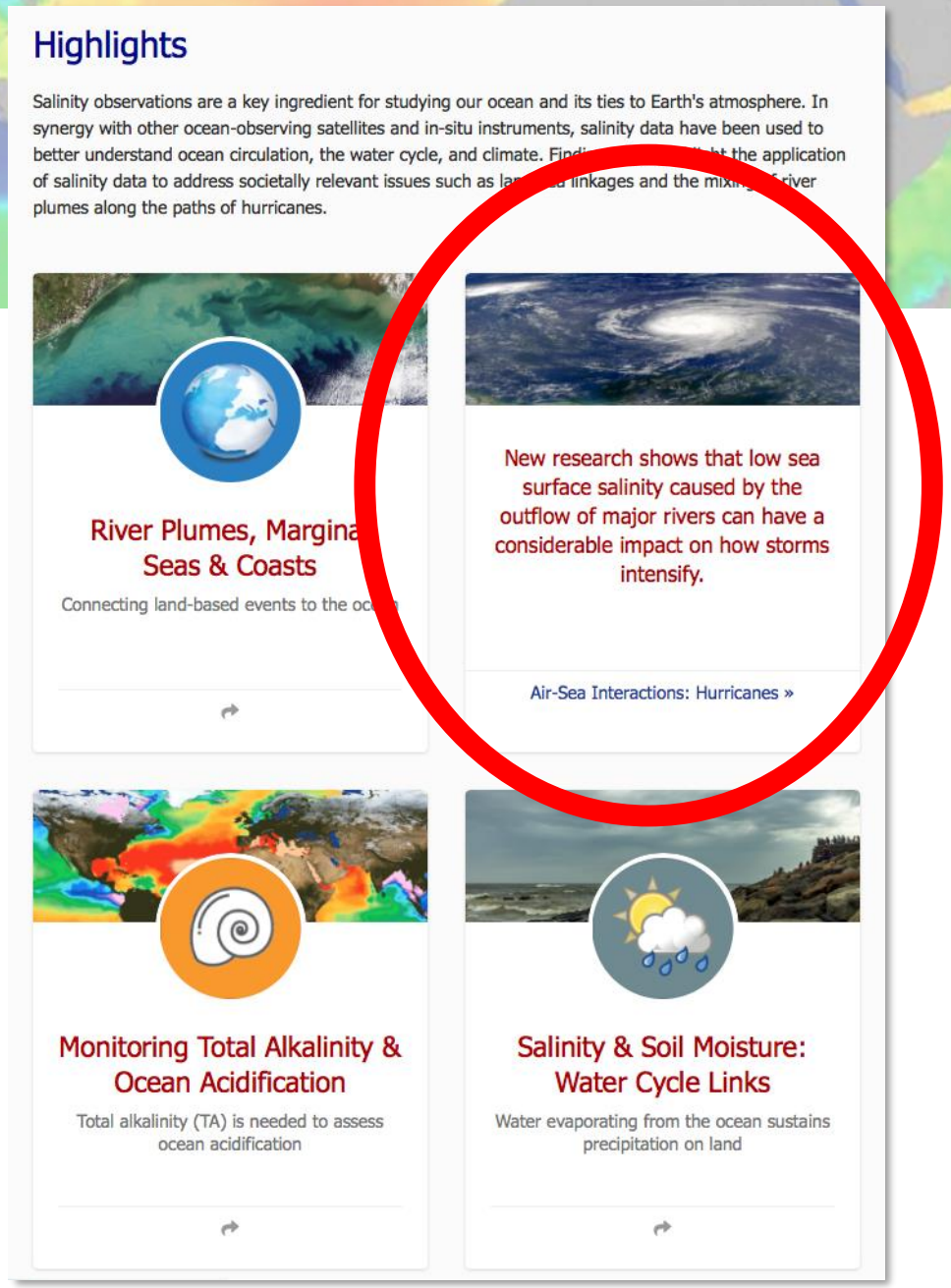
  - Large interactive “app”
  - Image/video slider that tells a “mini” story on the topic
  - Related Publications (all)
  - Featured Publications that open/close to reveal more information
  - Resources
    - Links to PO.DAAC, NASA articles, etc.

https://salinity.oceansciences.org/highlights01.htm



“Highlights”

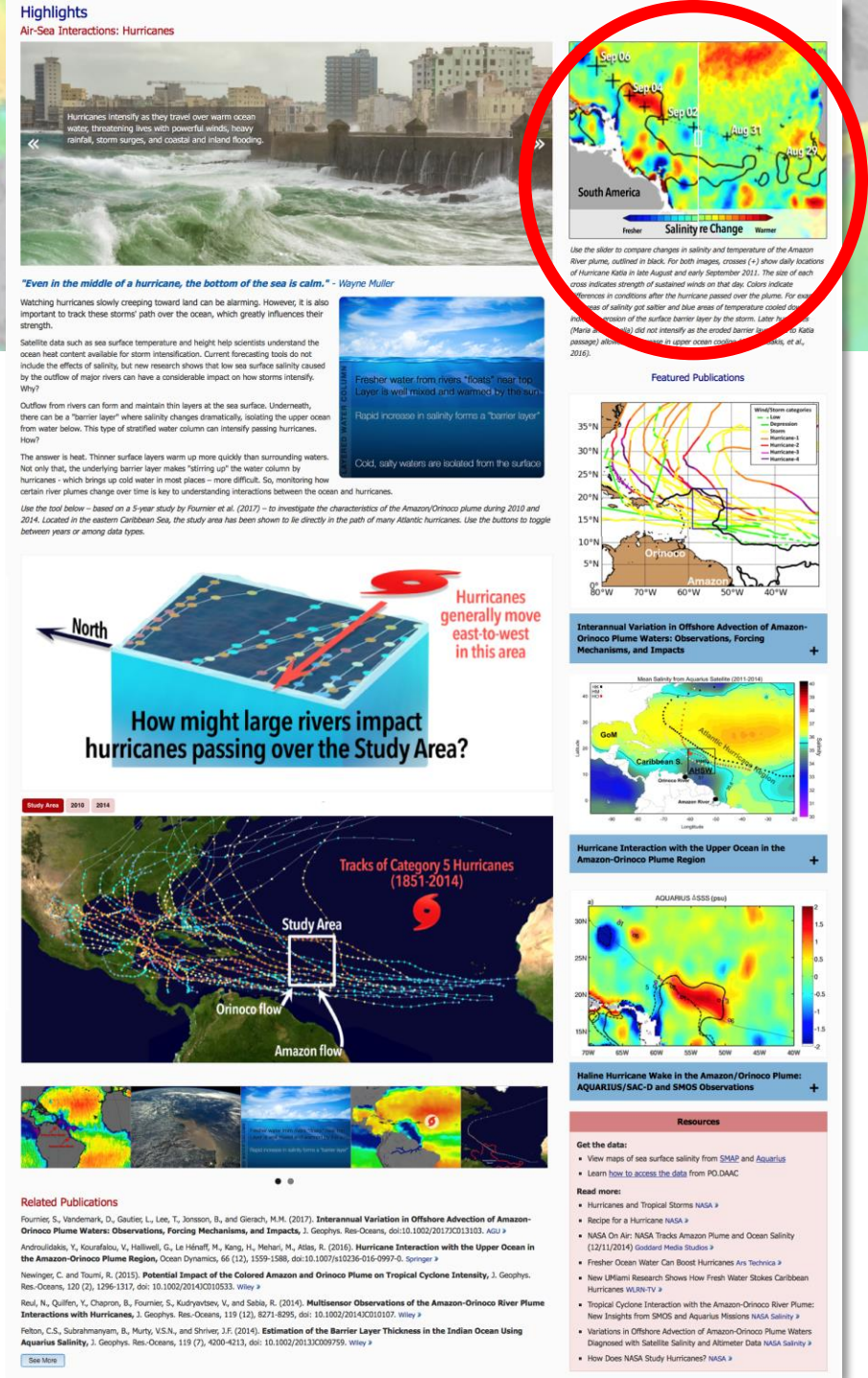
- Air-Sea Interactions: Hurricanes



https://salinity.oceansciences.org/highlights.htm

“Highlights”

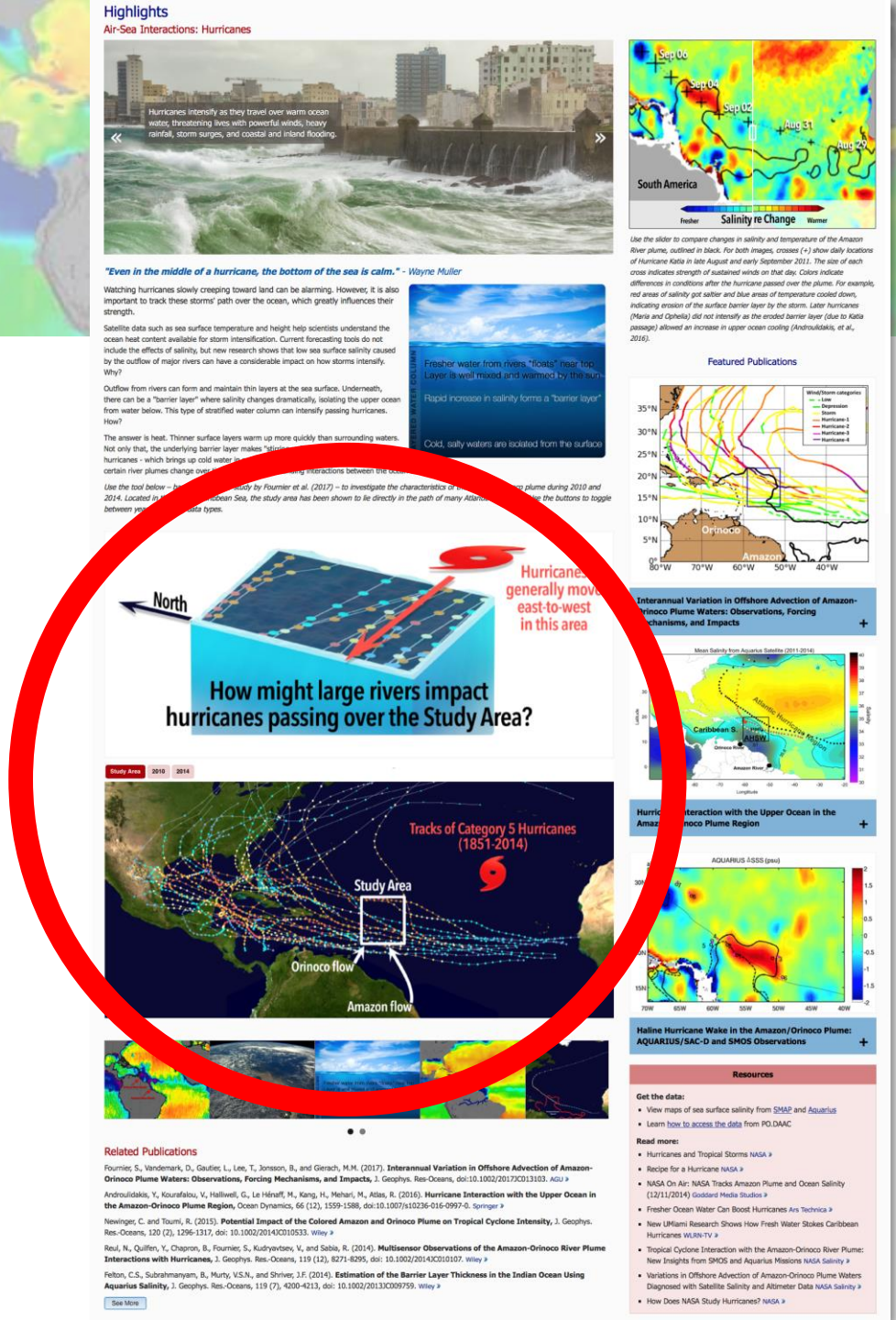
- This topic includes:
  - Before/after slides that show how Hurricane Katia changed salinity and temperature based on Grodsky et al. (2012)



https://salinity.oceansciences.org/highlights02.htm

“Highlights”

- This topic includes:
  - Before/after slides that show how Hurricane Katia changed salinity and temperature based on Grodsky et al. (2012)
  - Interactive that compares two years of data from Fournier et al. (2017)
    - Sea surface salinity
    - Sea surface temperature
    - Winds
    - Mixed layer depth
    - Dissolved organic matter



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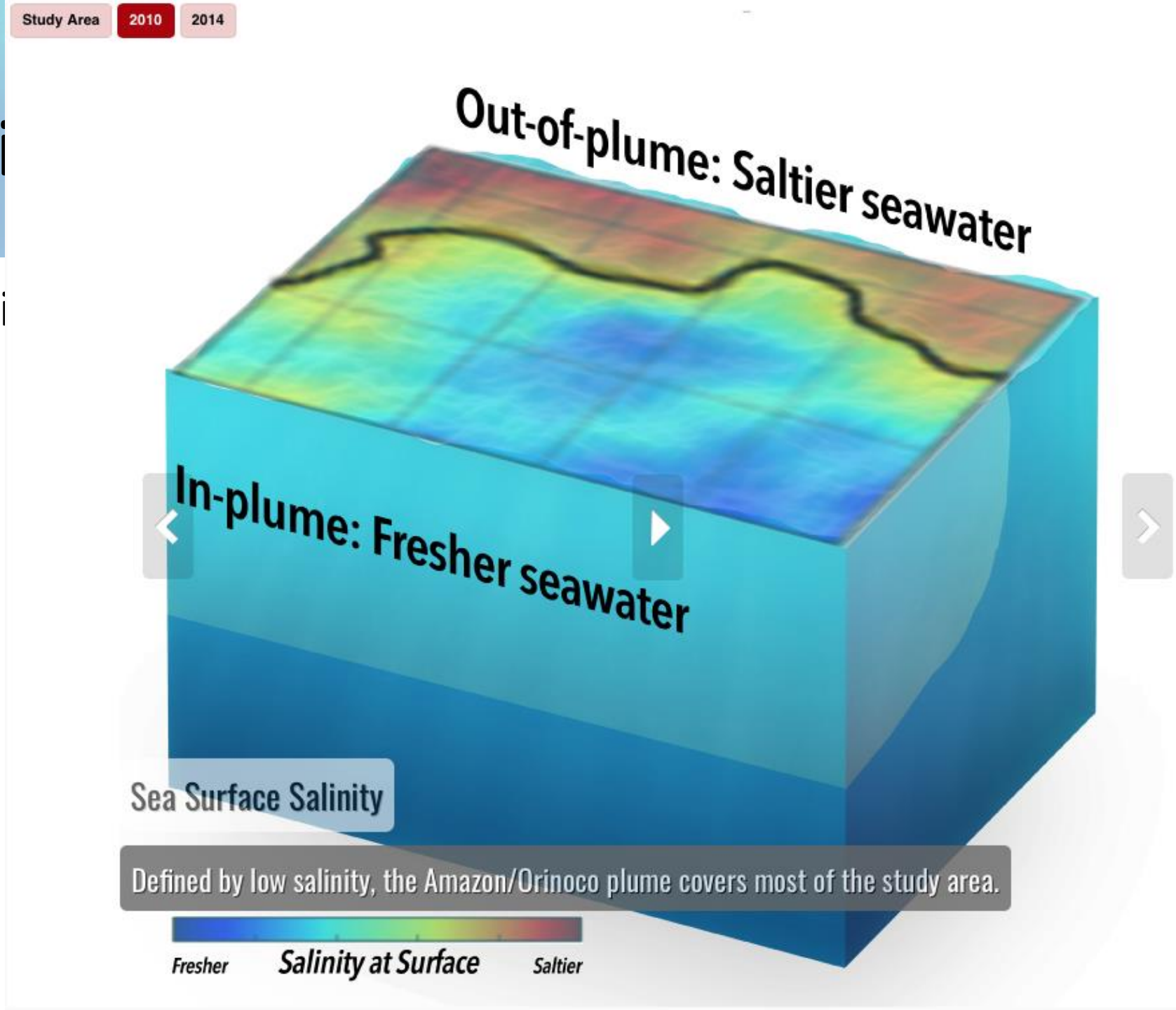
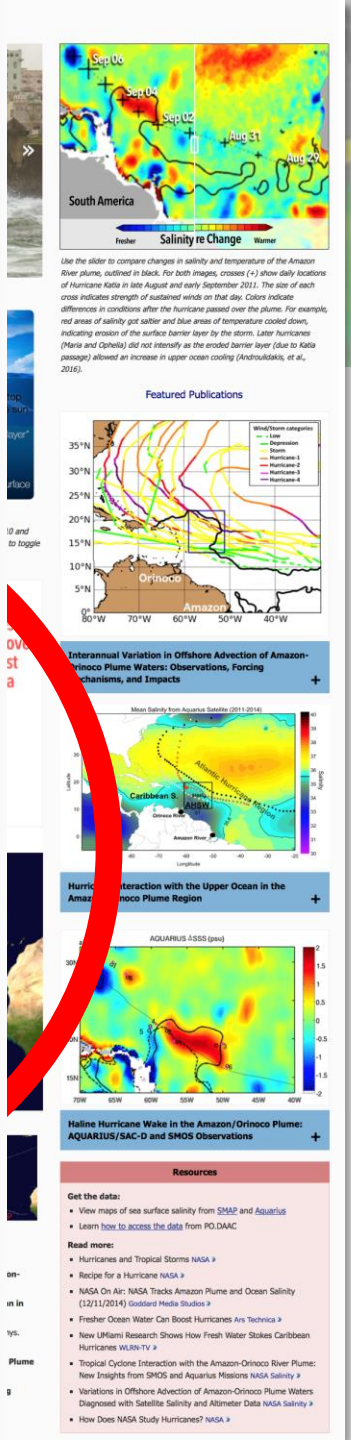

Study Area
2010
2014
Out-of-plume: Saltier seawater
In-plume: Fresher seawater
Sea Surface Salinity
Defined by low salinity, the Amazon/Orinoco plume covers most of the study area.
Fresher
Salinity at Surface
Saltier


South America
Salinity re Change
Featured Publications
Orinoco
Amazon
Interannual Variation in Offshore Advection of Amazon-Orinoco Plume Waters: Observations, Forcing Mechanisms, and Impacts
Caribbean S.
Hurricane Interaction with the Upper Ocean in the Amazon-Orinoco Plume Region
AQUARIUS ASSS (psu)
Haline Hurricane Wake in the Amazon/Orinoco Plume: AQUARIUS/SAC-D and SMOS Observations
Resources
Get the data:
View maps of sea surface salinity from SMAP and Aquarius
Learn how to access the data from PO.DAAC
Read more:
Hurricanes and Tropical Storms NASA
Recipe for a Hurricane NASA
NASA On Air: NASA Tracks Amazon Plume and Ocean Salinity (12/11/2014) Goddard Media Studios
Fresher Ocean Water Can Boost Hurricanes Ars Technica
New UMiami Research Shows How Fresh Water Stokes Caribbean Hurricanes WLRN-TV
Tropical Cyclone Interaction with the Amazon-Orinoco River Plume: New Insights from SMOS and Aquarius Missions NASA Salinity
Variations in Offshore Advection of Amazon-Orinoco Plume Waters Diagnosed with Satellite Salinity and Altimeter Data NASA Salinity
How Does NASA Study Hurricanes? NASA

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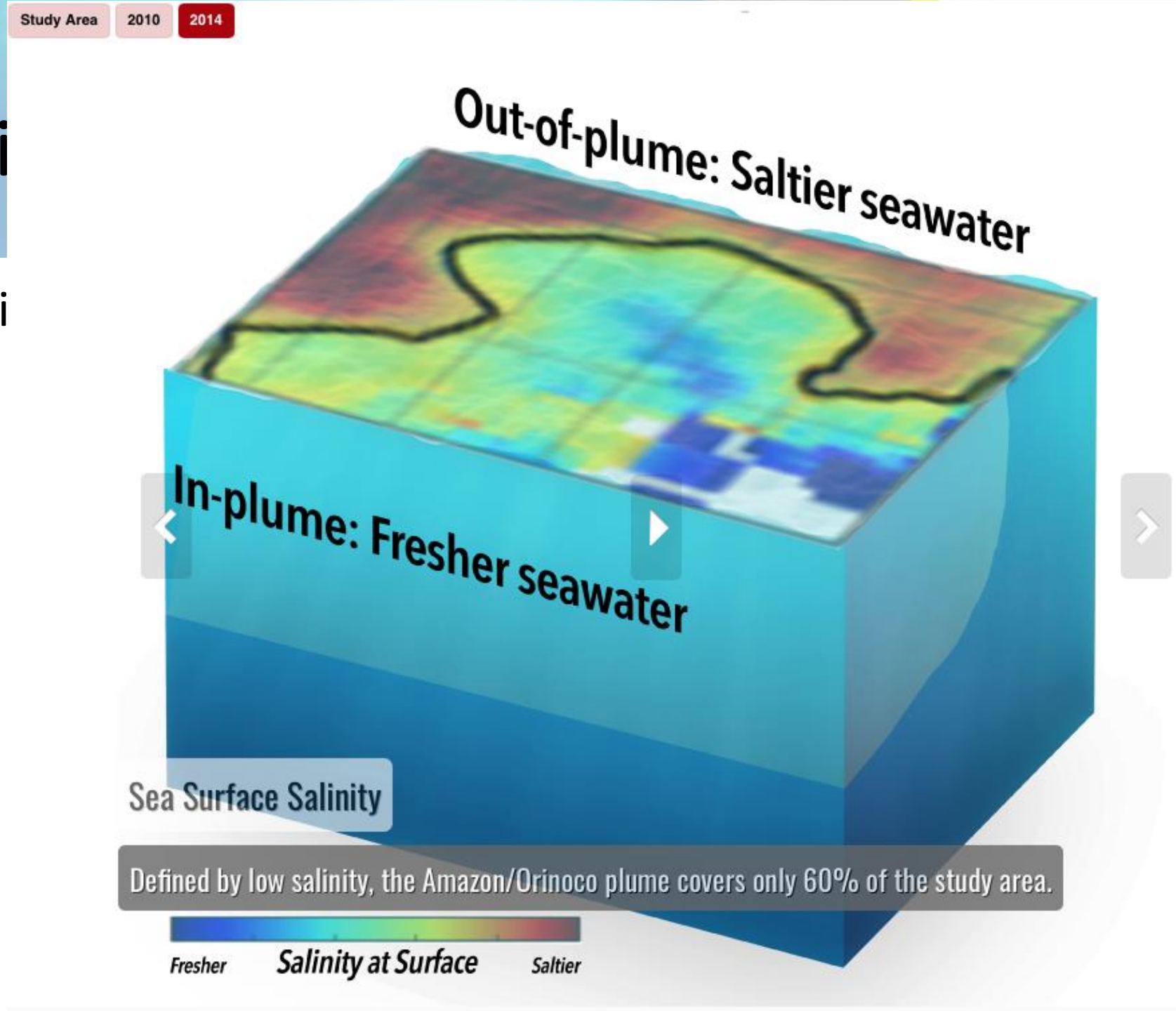
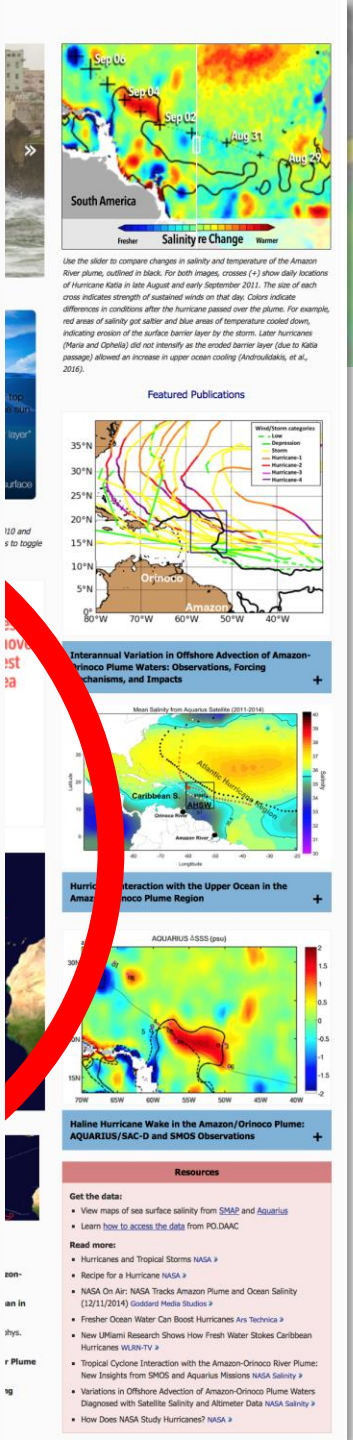
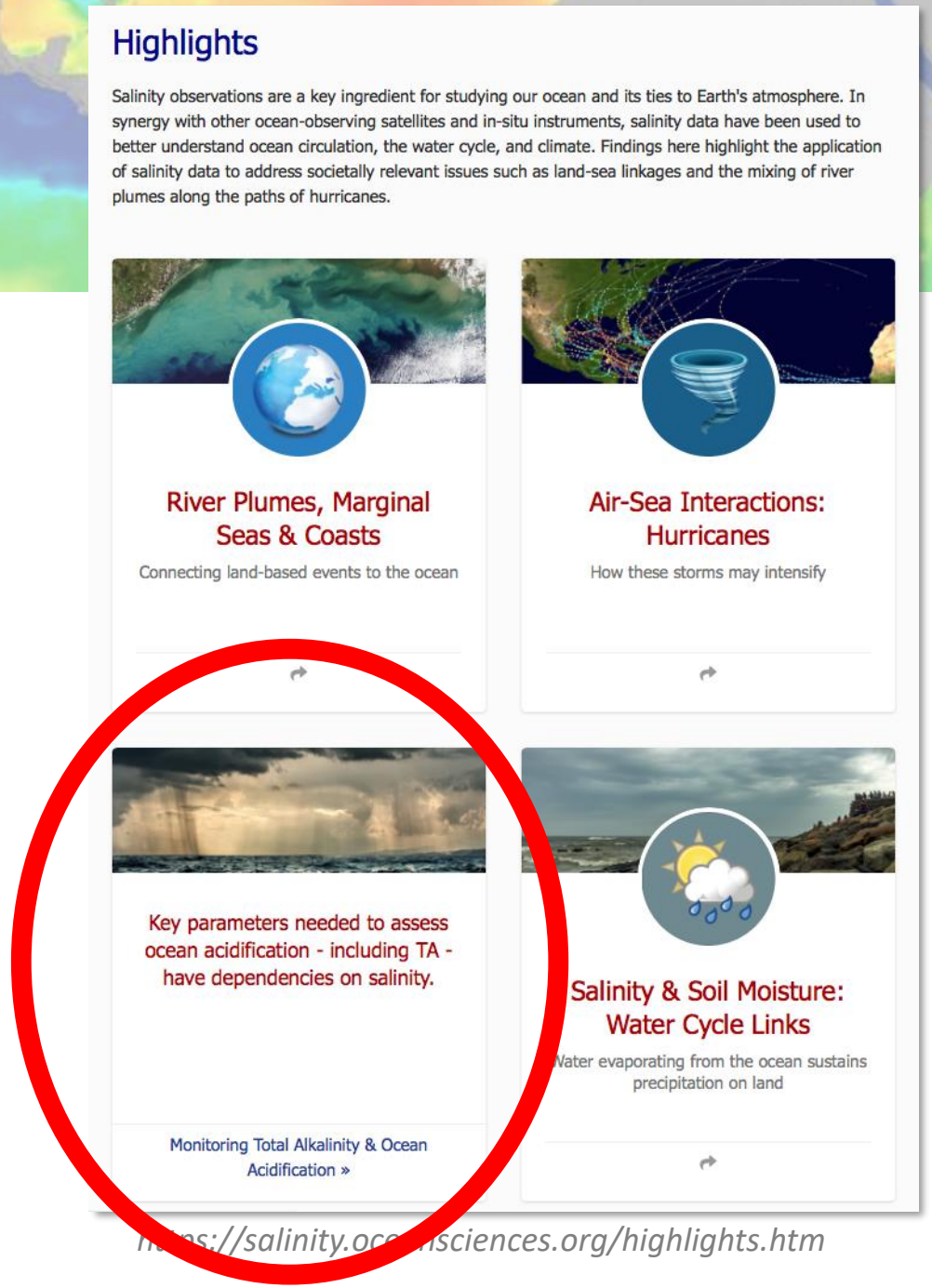

Study Area
2010
2014
Out-of-plume: Saltier seawater
In-plume: Fresher seawater
Sea Surface Salinity
Defined by low salinity, the Amazon/Orinoco plume covers only 60% of the study area.
Fresher
Salinity at Surface
Saltier


South America
Salinity re Change
Featured Publications
Orinoco
Amazon
Resources

“Highlights”

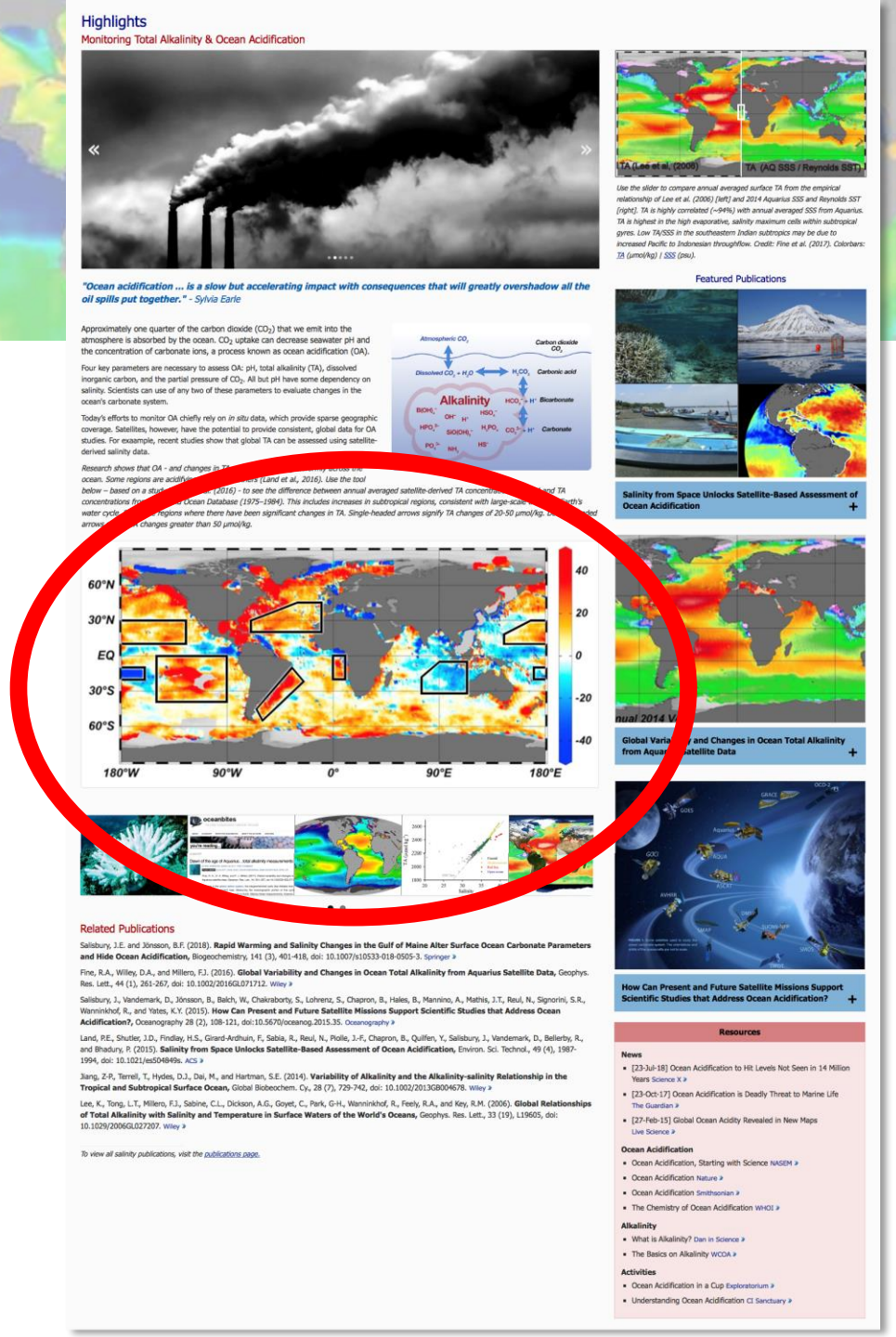
- Monitoring Total Alkalinity & Ocean Acidification



https://salinity.oceansciences.org/highlights.htm

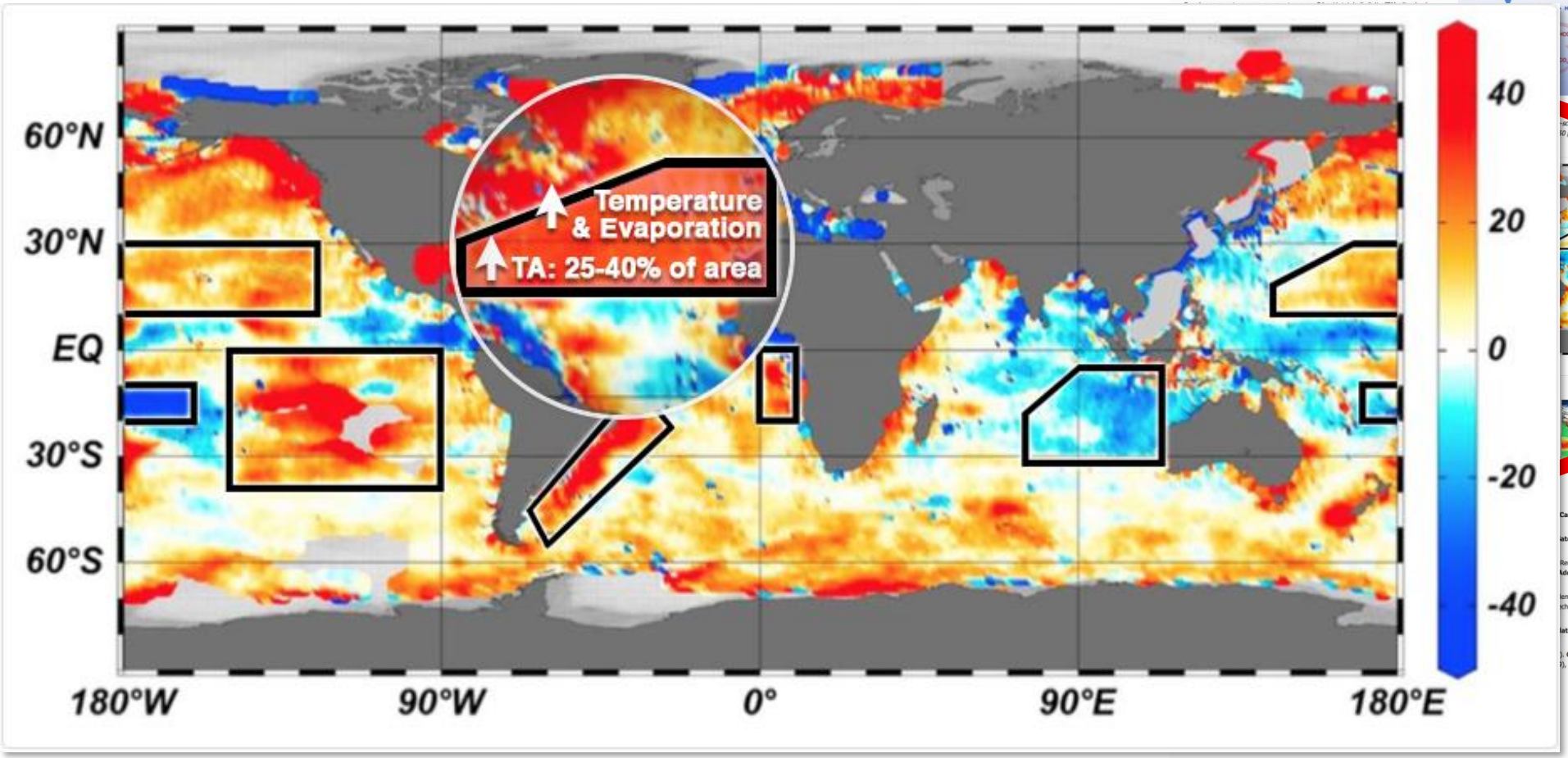
“Highlights”

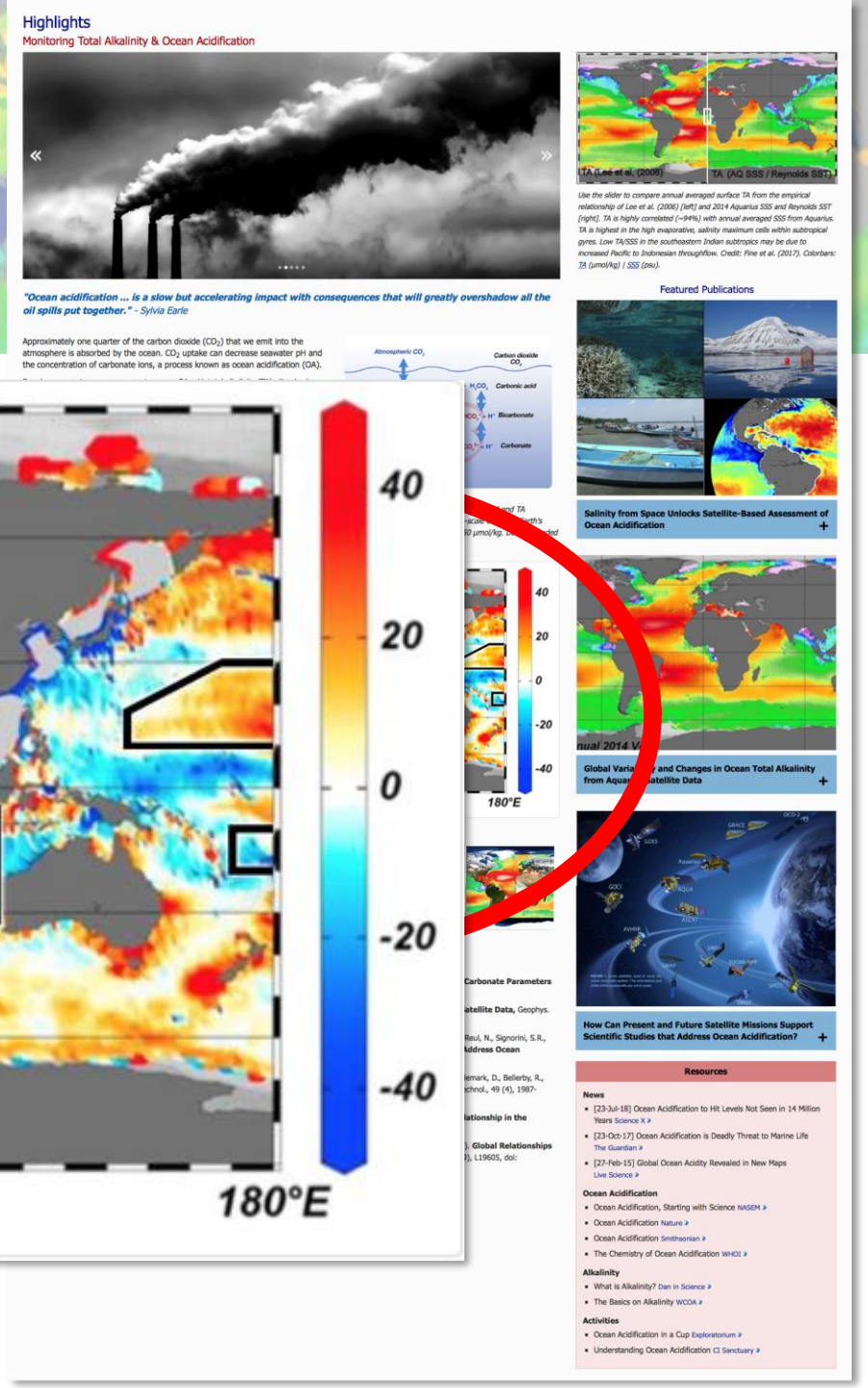
- This topic includes:
  - Interactive image that shows how Total Alkalinity changed in various regions
    - Information is revealed on mouseover



https://salinity.oceansciences.org/highlights03.htm

“Highlights”

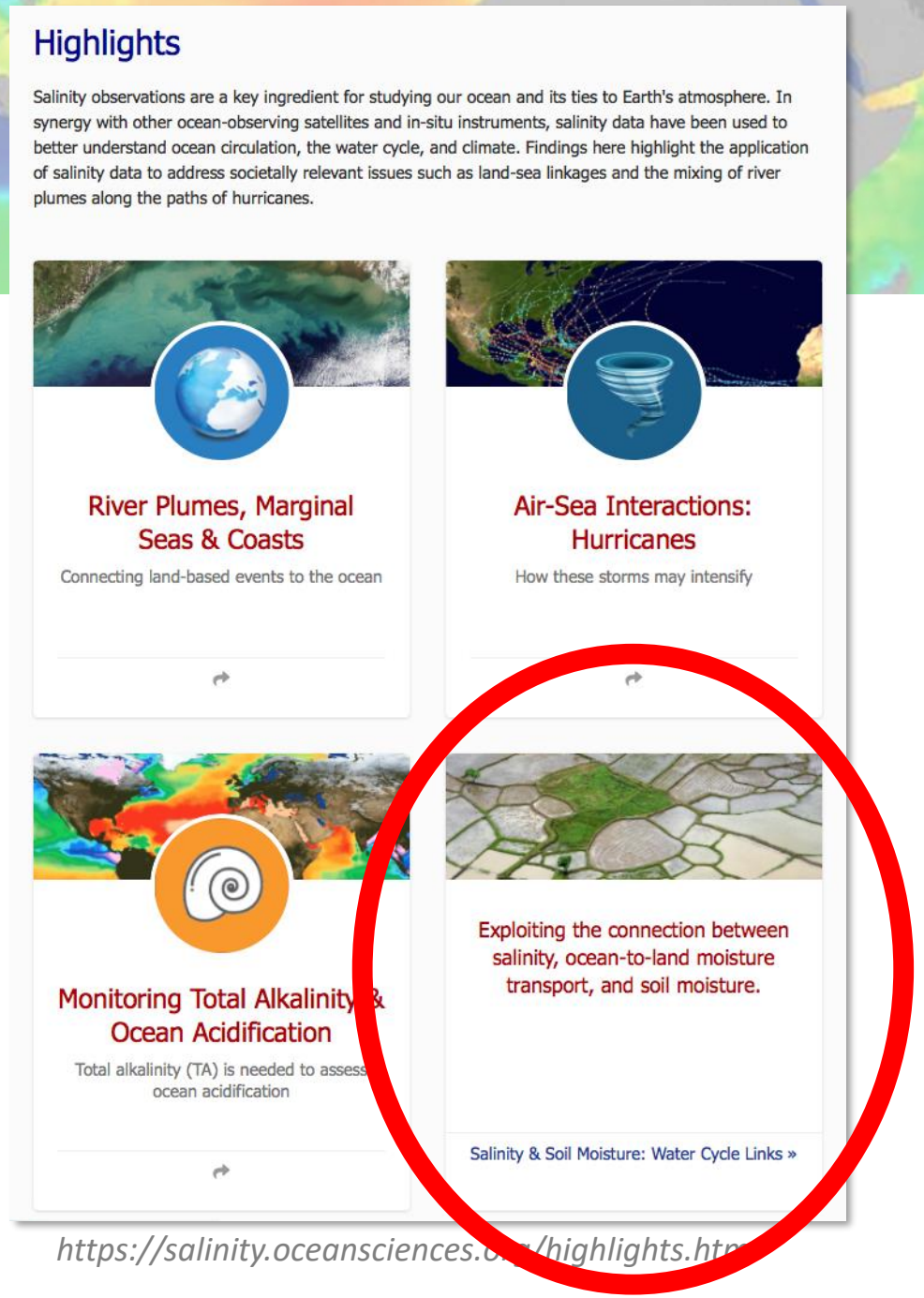




https://salinity.oceansciences.org/highlights03.htm

“Highlights”

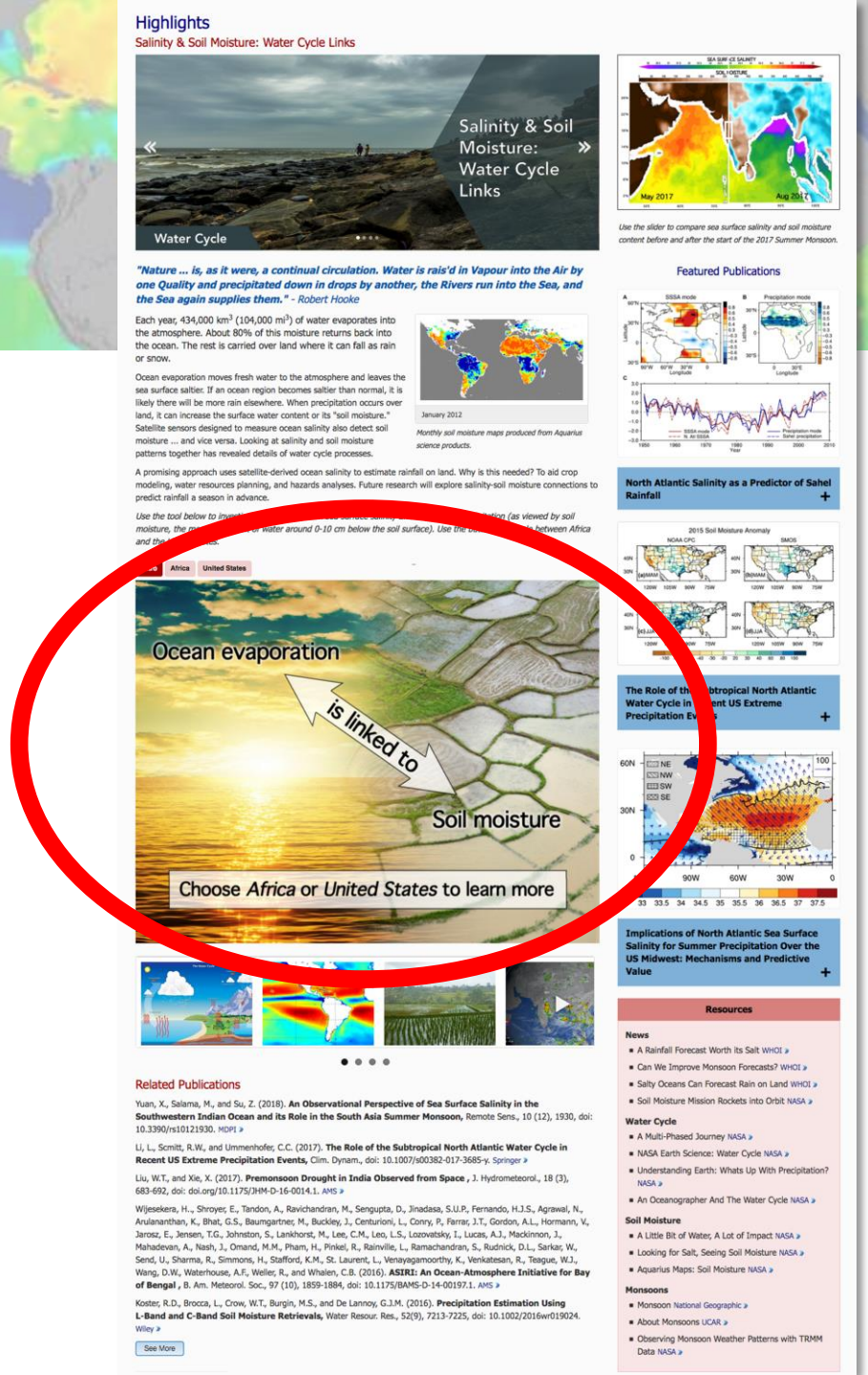
- Salinity & Soil Moisture: Water Cycle Links



https://salinity.oceansciences.org/highlights.htm

“Highlights”

- This topic includes:
  - Image sequences from Africa and the U.S. showing links between salinity and soil moisture based Li et al. (2016, 2017)



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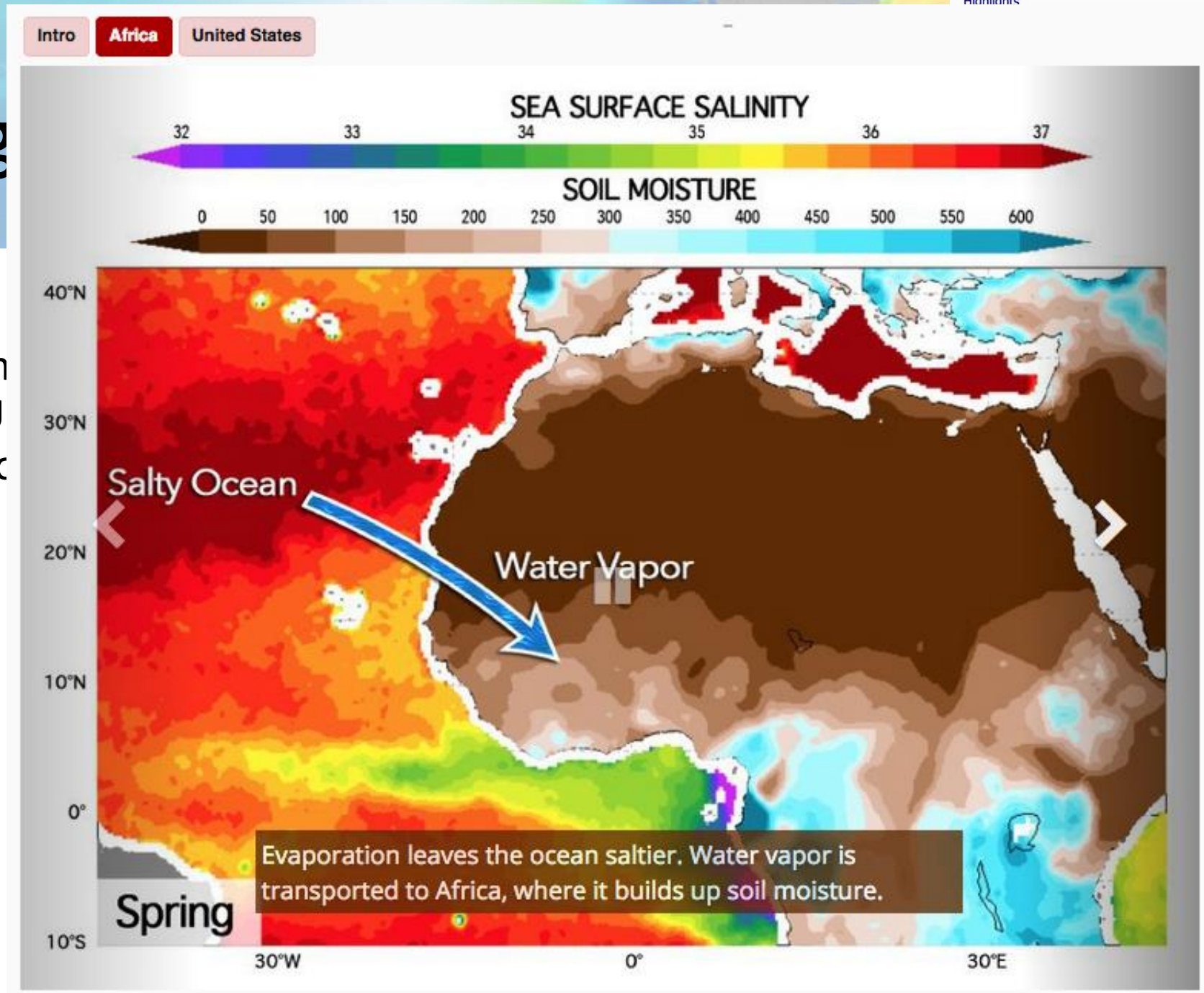

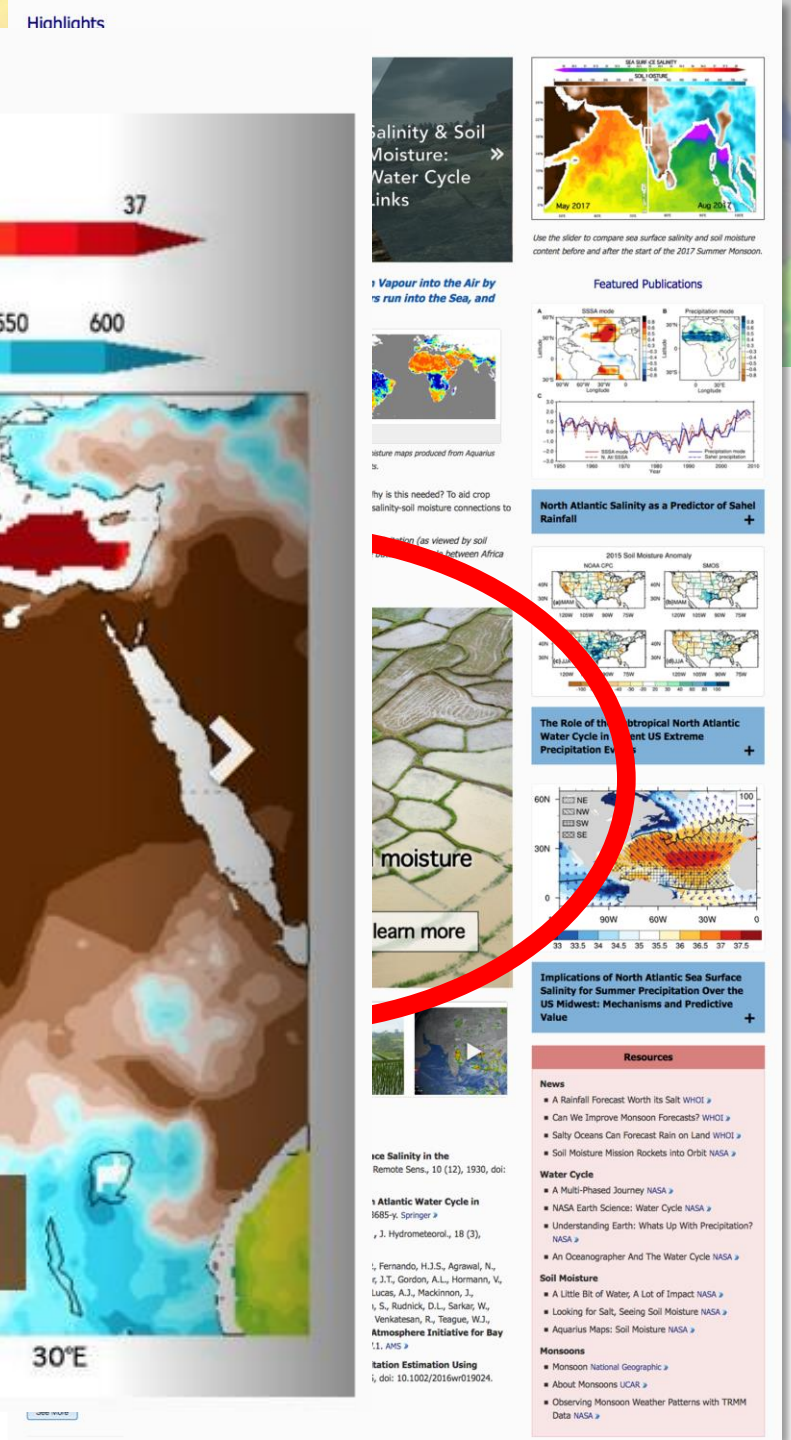

https://salinity.oceansciences.org/highlight304.htm

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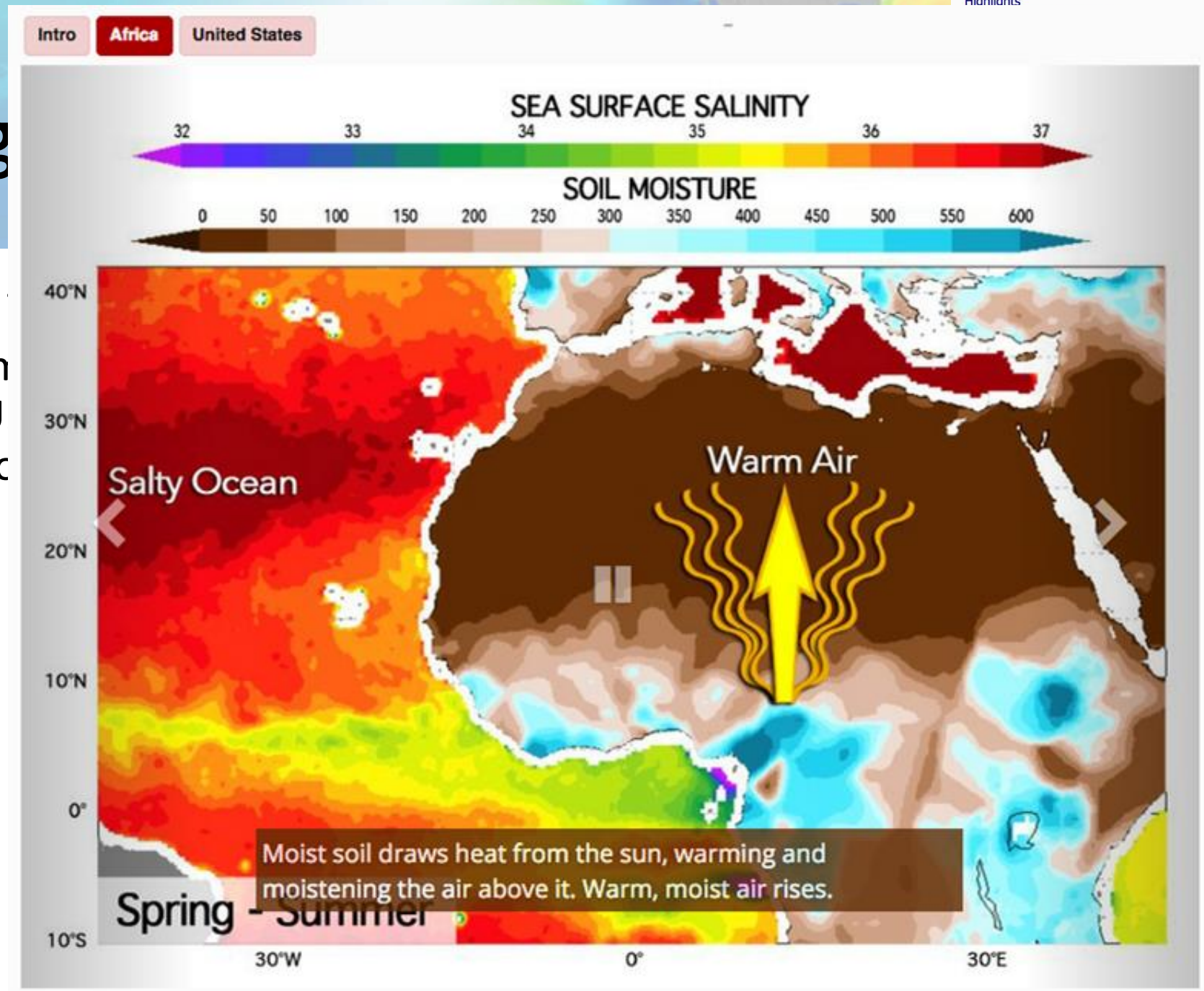

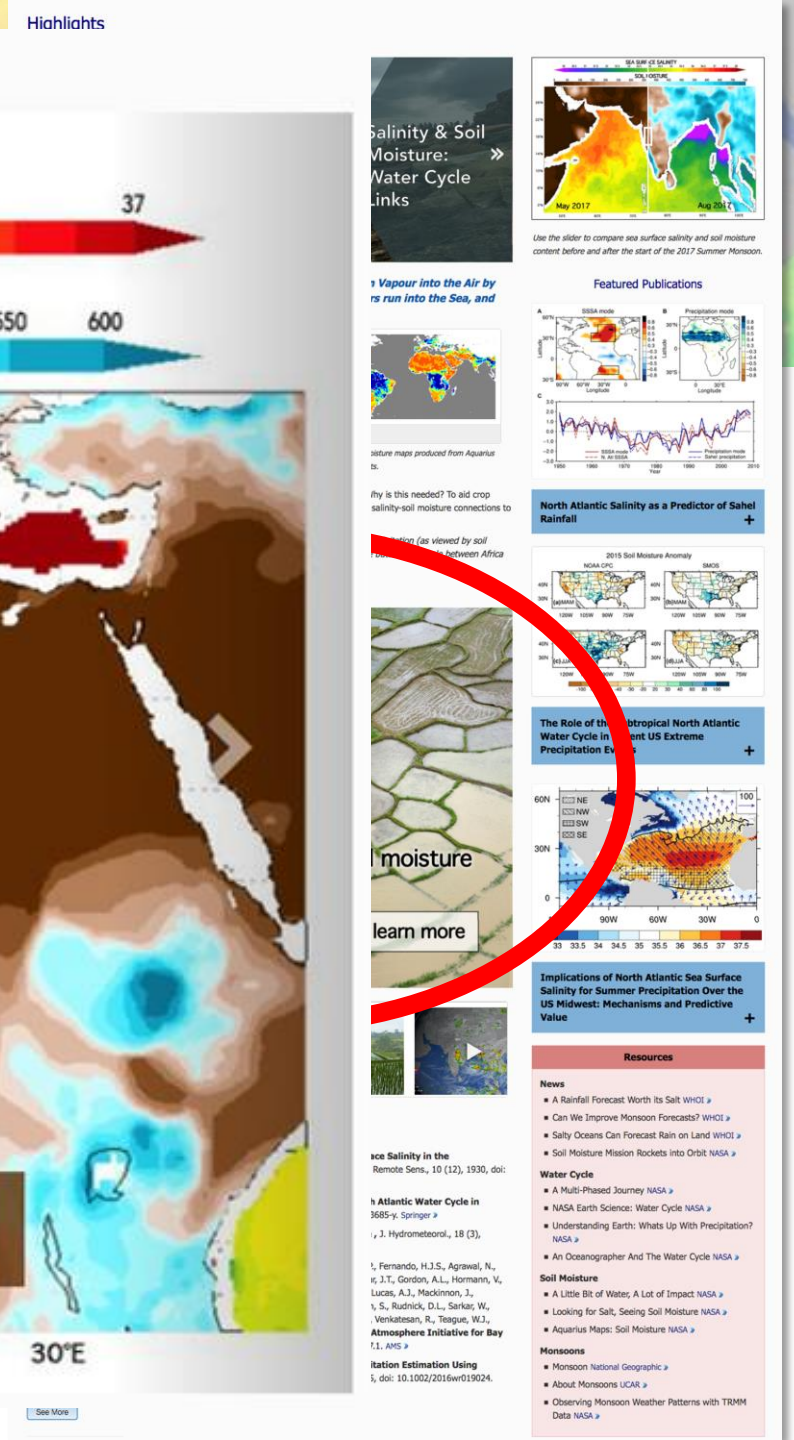

https://salinity.oceansciences.org/highlights04.htm

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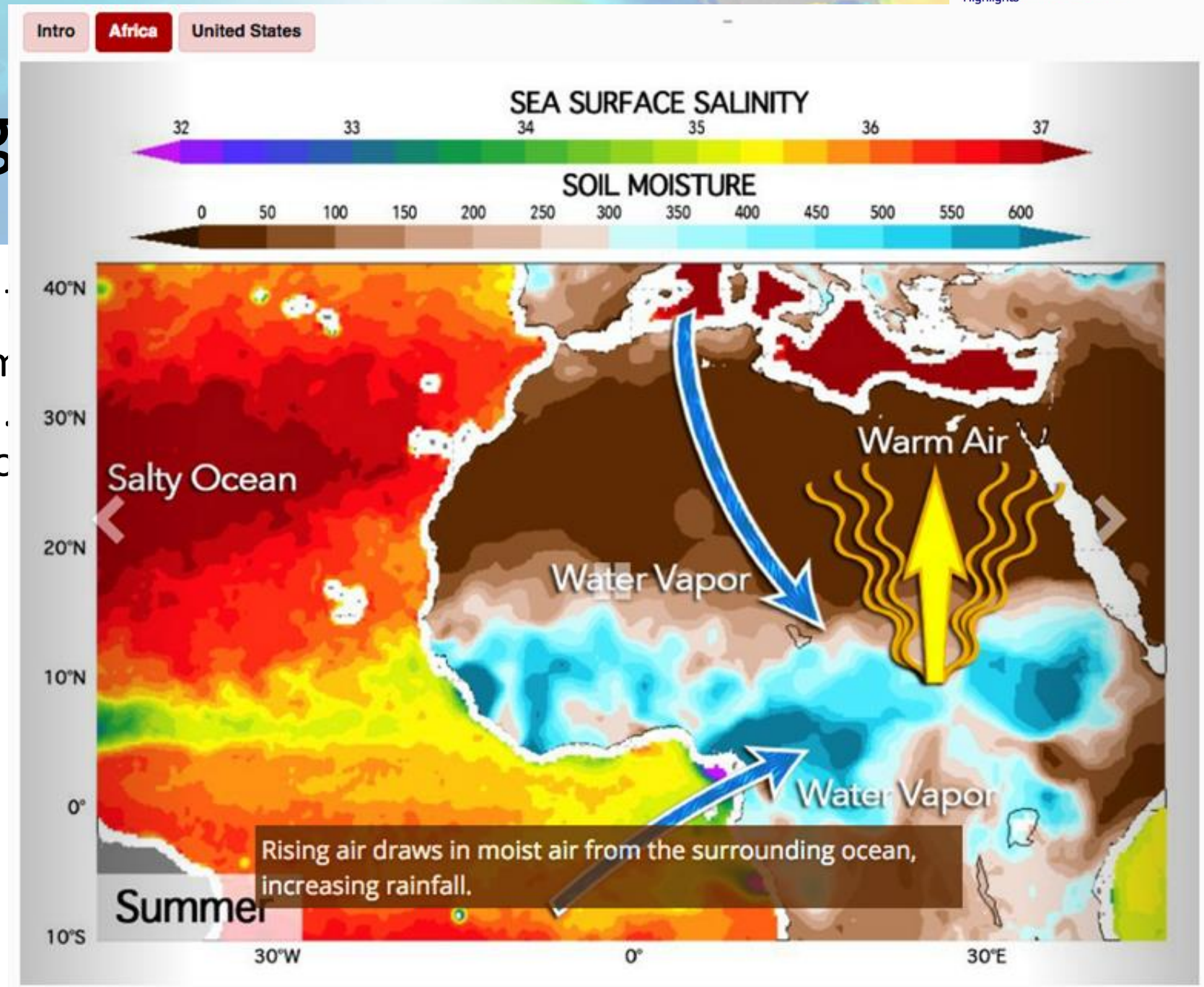
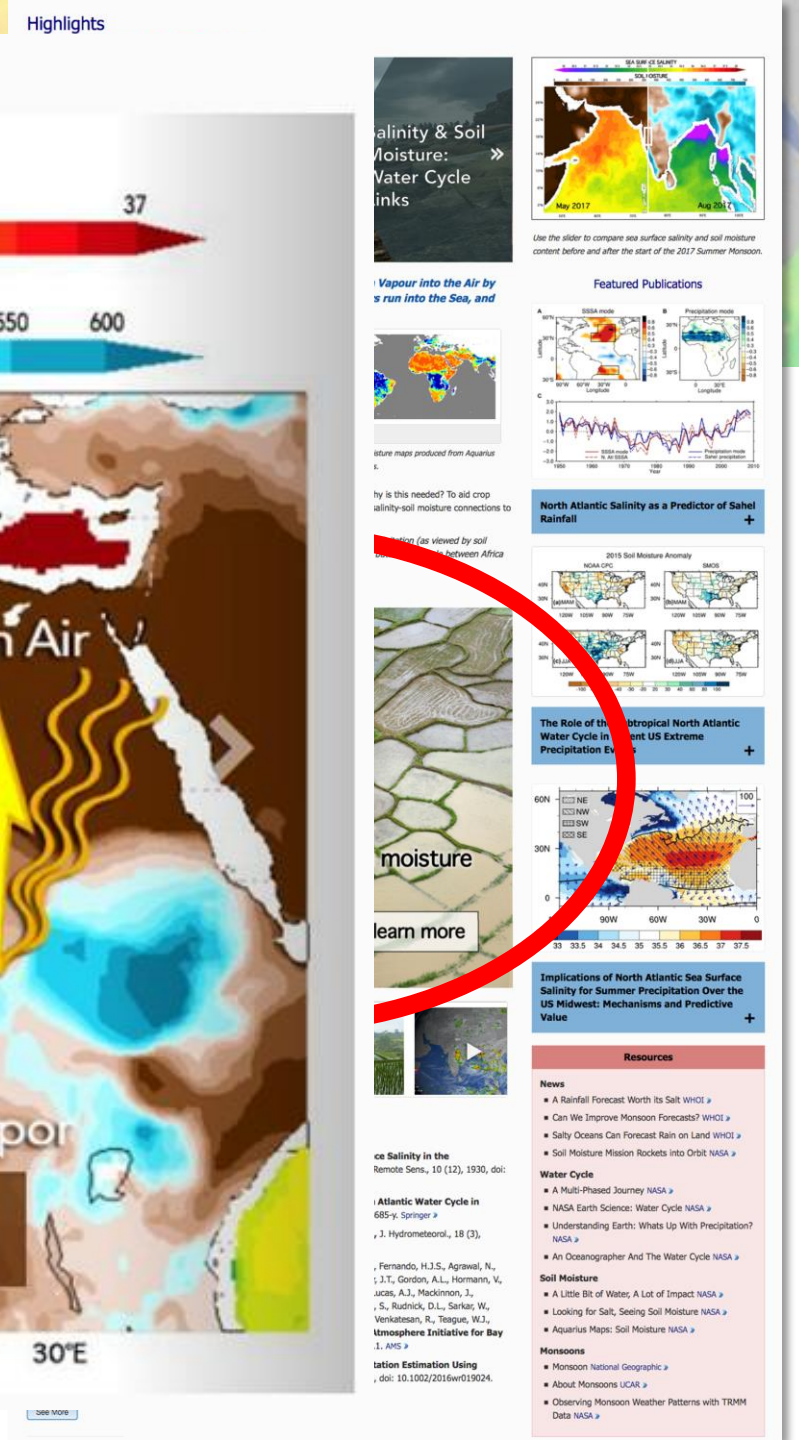
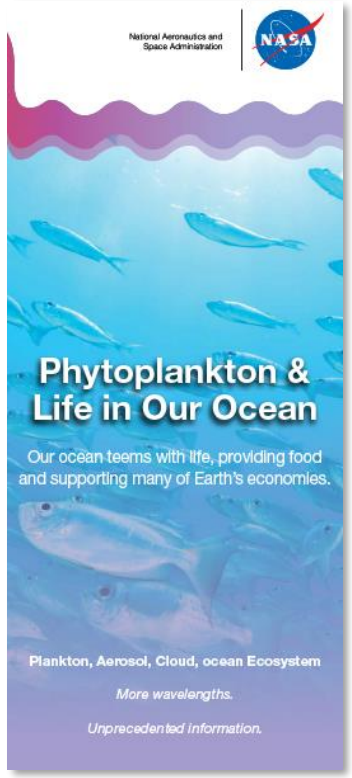


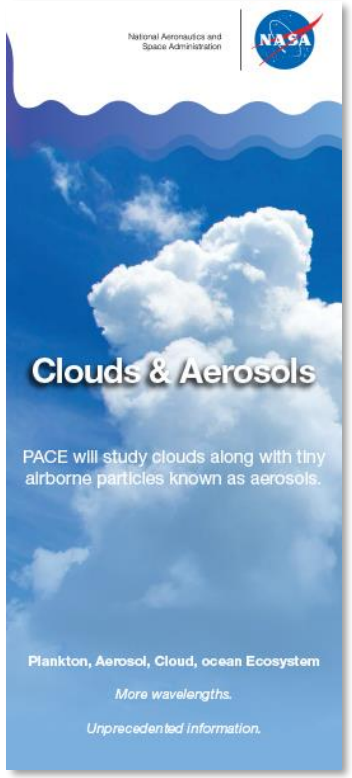


https://salinity.oceansciences.org/highlight304.htm

Example Communication Materials

- Trifold brochures
  - Examples were developed for Plankton, Aerosol, Cloud, ocean Ecosystem (PACE)



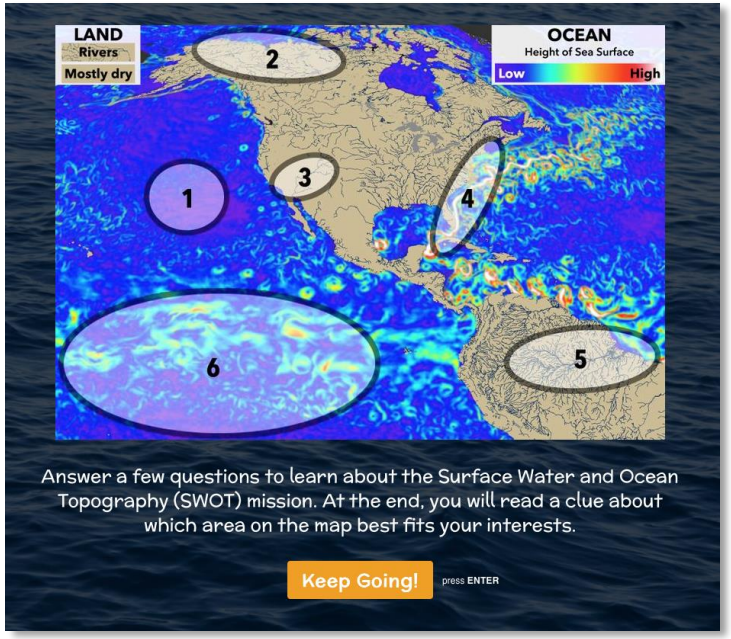


https://pace.oceansciences.org/gallery.htm?id=e-brochure

Example Communication Materials

- Online Quiz
  - Developed for PACE and Surface Water and Ocean Topography (SWOT)

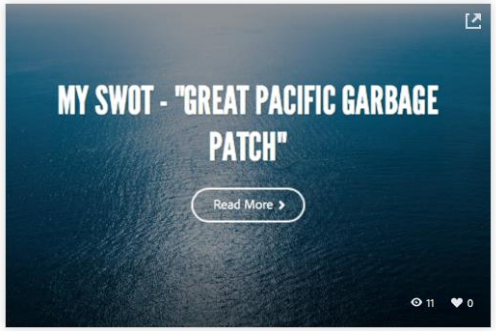
https://pace.gsfc.nasa.gov

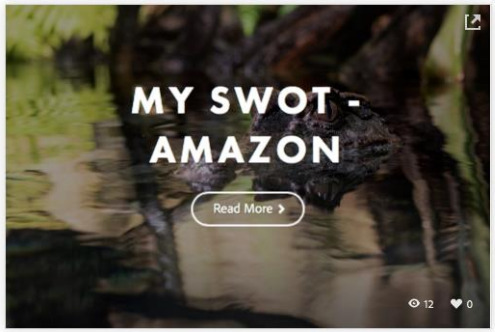


https://swot.odyseallc.net/demo_swotquiz.html

Example Communication Materials

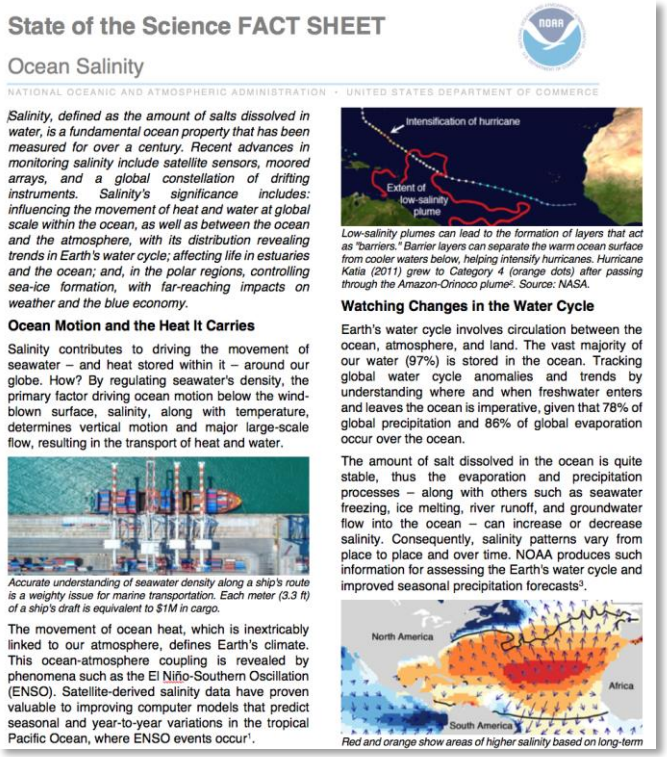
- E-brochures
- Short videos





Example Communication Materials

- Infographics
- “Fact Sheets”



State of the Science FACT SHEET

Ocean Salinity

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION • UNITED STATES DEPARTMENT OF COMMERCE

Salinity, defined as the amount of salts dissolved in water, is a fundamental ocean property that has been measured for over a century. Recent advances in monitoring salinity include satellite sensors, moored arrays, and a global constellation of drifting instruments. Salinity's significance includes: influencing the movement of heat and water at global scale within the ocean, as well as between the ocean and the atmosphere, with its distribution revealing trends in Earth's water cycle; affecting life in estuaries and the ocean; and, in the polar regions, controlling sea-ice formation, with far-reaching impacts on weather and the blue economy.

Ocean Motion and the Heat It Carries

Salinity contributes to driving the movement of seawater – and heat stored within it – around our globe. How? By regulating seawater's density, the primary factor driving ocean motion below the wind-blown surface, salinity, along with temperature, determines vertical motion and major large-scale flow, resulting in the transport of heat and water.

Accurate understanding of seawater density along a ship's route is a weighty issue for marine transportation. Each meter (3.3 ft) of a ship's draft is equivalent to $1M in cargo.

The movement of ocean heat, which is inextricably linked to our atmosphere, defines Earth's climate. This ocean-atmosphere coupling is revealed by phenomena such as the El Niño-Southern Oscillation (ENSO). Satellite-derived salinity data have proven valuable to improving computer models that predict seasonal and year-to-year variations in the tropical Pacific Ocean, where ENSO events occur[1].

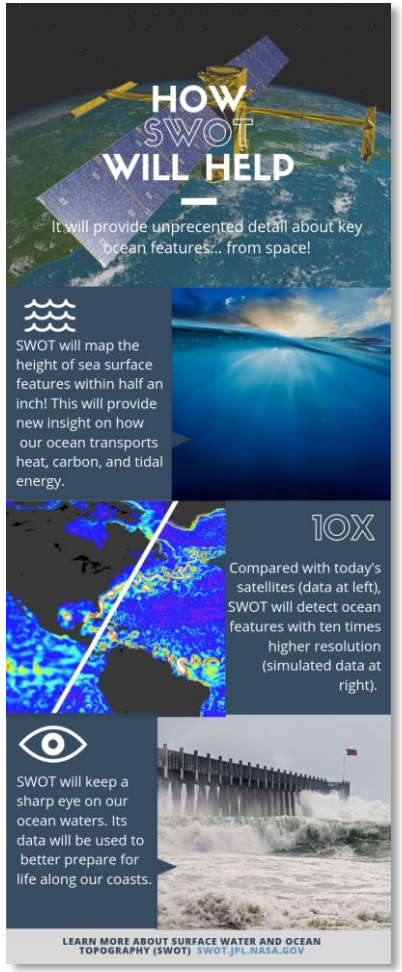
Low-salinity plumes can lead to the formation of layers that act as "barriers." Barrier layers can separate the warm ocean surface from cooler waters below, helping intensify hurricanes. Hurricane Katia (2011) grew to Category 4 (orange dots) after passing through the Amazon-Orinoco plume[2]. Source: NASA.

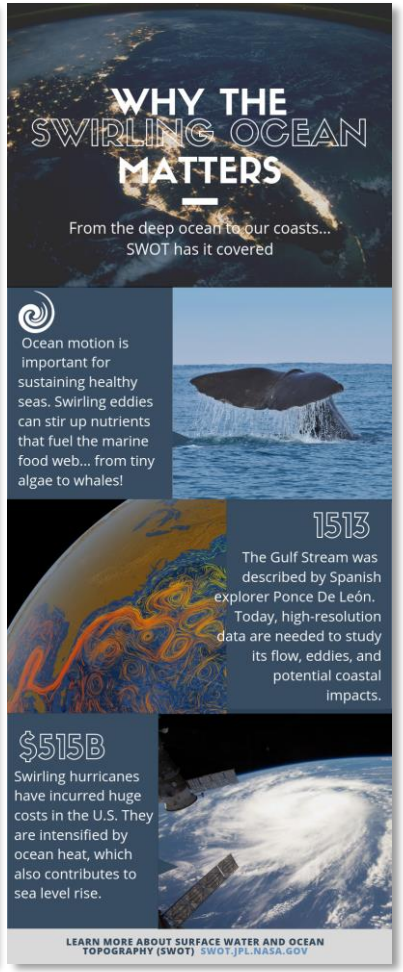
Watching Changes in the Water Cycle

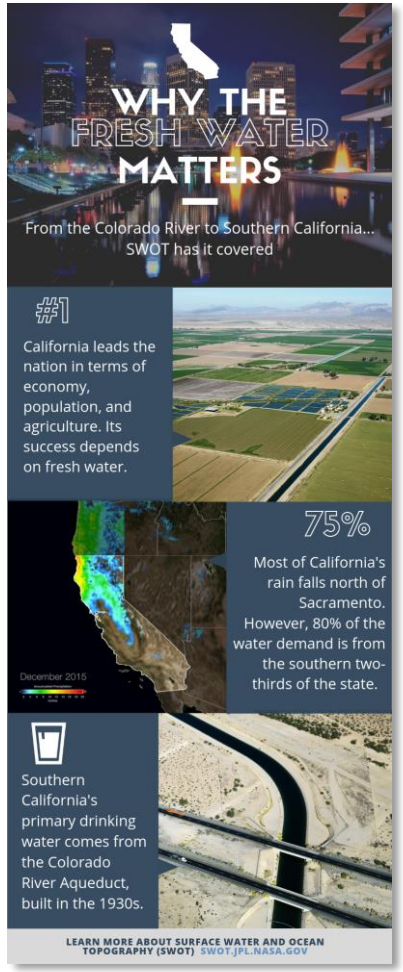
Earth's water cycle involves circulation between the ocean, atmosphere, and land. The vast majority of our water (97%) is stored in the ocean. Tracking global water cycle anomalies and trends by understanding where and when freshwater enters and leaves the ocean is imperative, given that 78% of global precipitation and 86% of global evaporation occur over the ocean.

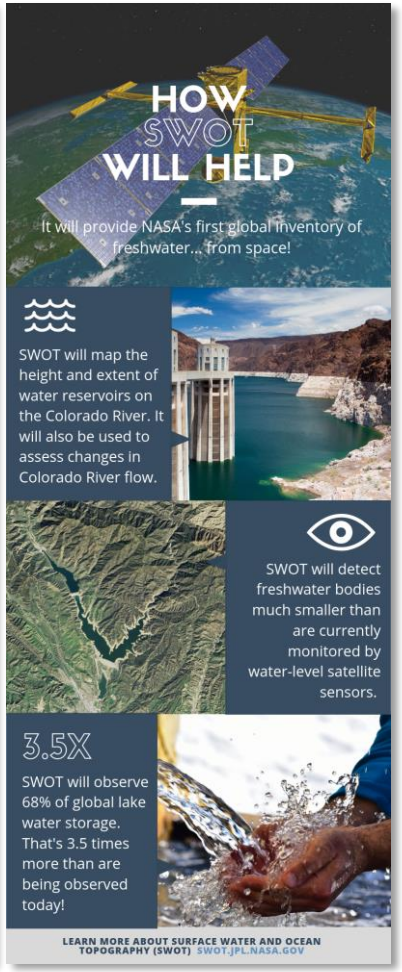
The amount of salt dissolved in the ocean is quite stable, thus the evaporation and precipitation processes – along with others such as seawater freezing, ice melting, river runoff, and groundwater flow into the ocean – can increase or decrease salinity. Consequently, salinity patterns vary from place to place and over time. NOAA produces such information for assessing the Earth's water cycle and improved seasonal precipitation forecasts[3].

Red and orange show areas of higher salinity based on long-term









Example Communication Materials

- Develop salinity materials for OceanObs'19?
- Other opportunities?

OCEAN OBS'19

AN OCEAN OF OPPORTUNITY

September 16-20, 2019

Discussion

- ✓SPURS-2 Data Tool
- ✓“Learn More”
- ✓“Highlights”
- ✓Example Communication Materials
- Let’s Talk!

avdecharon@gmail.com