

MISSISSIPPI SOUND WATER RESOURCES

Synthesizing Trends in Water Quality
Parameters Affecting Oyster Reef
Health in the Mississippi Sound Using
NASA Earth Observations

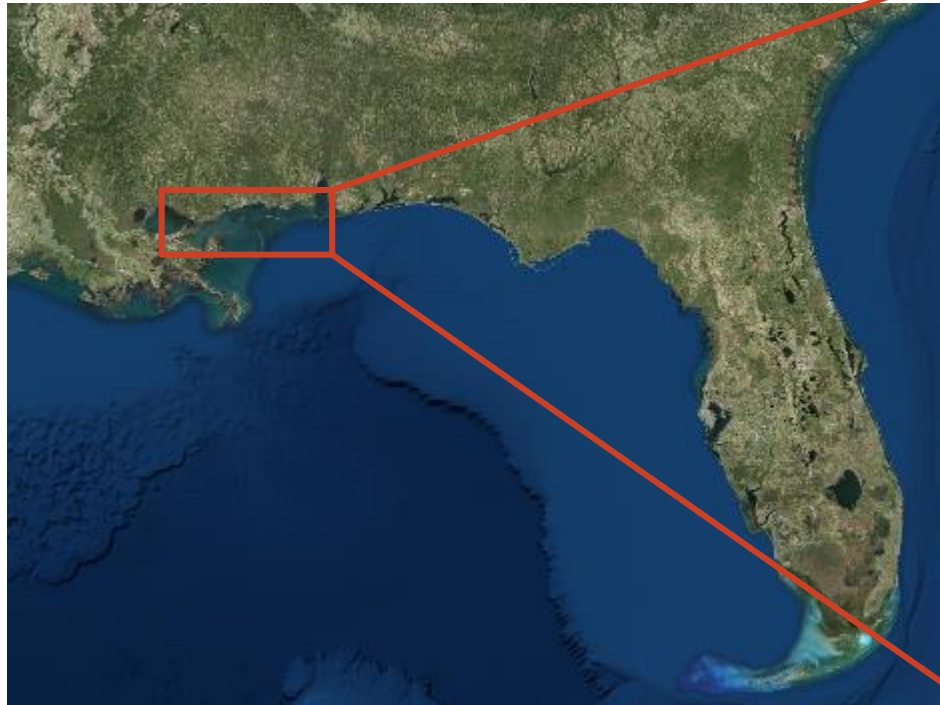
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**NASA Langley Research Center and
NASA Jet Propulsion Lab**
2017 Spring





Study Area: The Mississippi Sound



0 50 100 200 300
Kilometers



0 5 10 20 30
Kilometers

Earth Observations

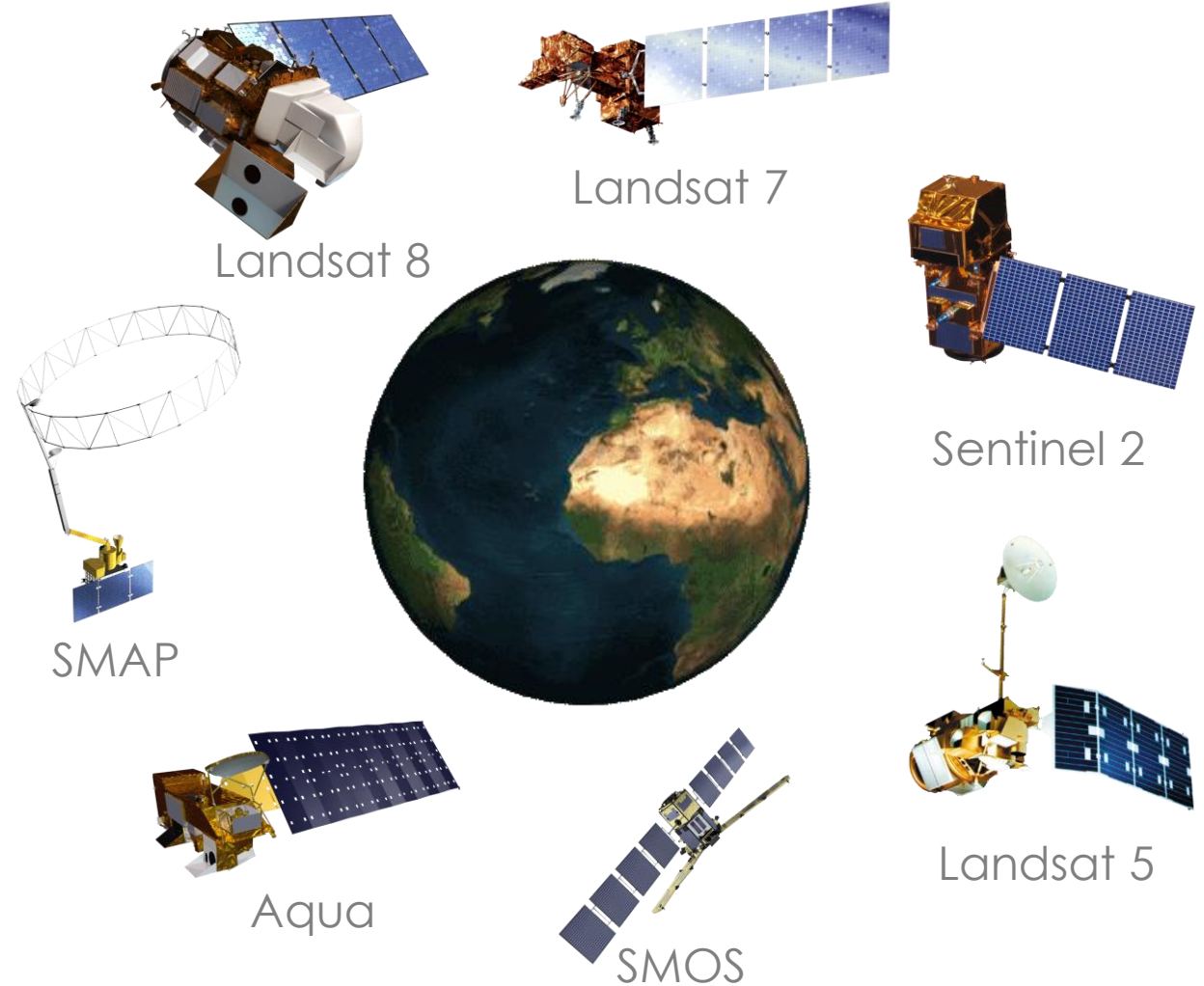


NASA

- ▶ Aqua
- ▶ SMAP
- ▶ Landsat 5, 7, 8
- ▶ MUR

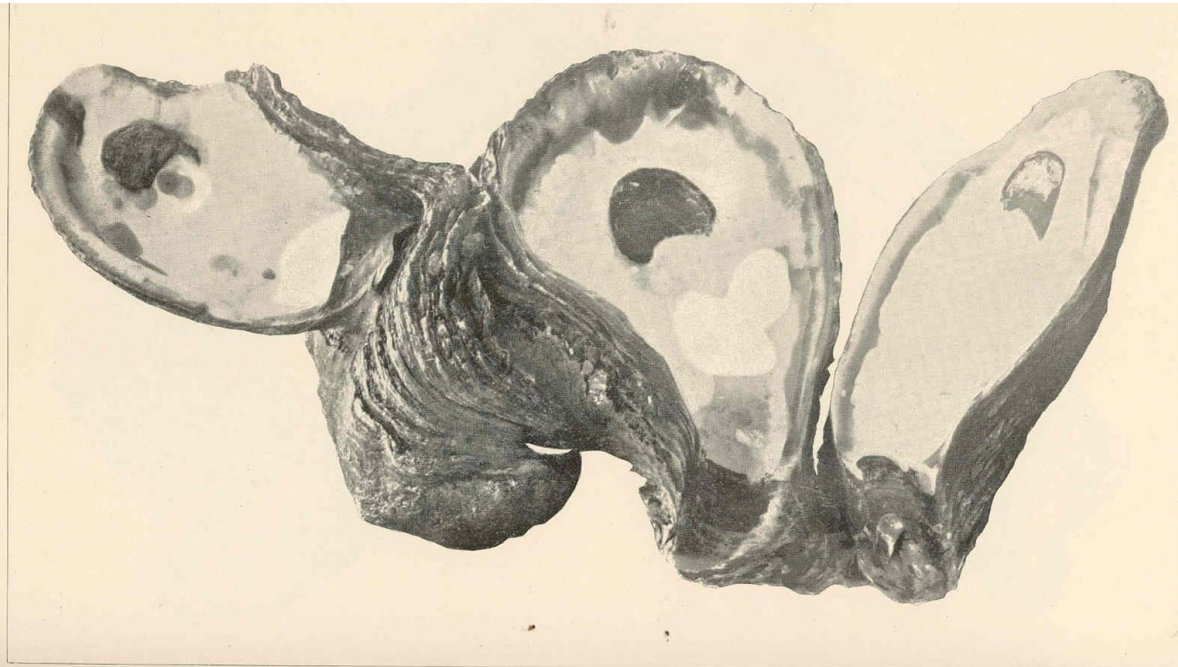
ESA

- ▶ SMOS
- ▶ Sentinel-2



Community Concerns

- ▶ Reefs provide a vital habitat and improve water quality
- ▶ 97% harvested from the Western Sound



SHELLS OF SPECIMENS OF CULTIVATED OYSTERS FROM PLANT BEDS OF MAJ. F. S. PARKER, SITUATED AT MOUTH OF FOWL RIVER, MISSISSIPPI SOUND, ALABAMA.

Length of oyster, right-hand specimen, 5½ inches; width, 4 inches; thickness, 2 inches. Caught in December 1904.

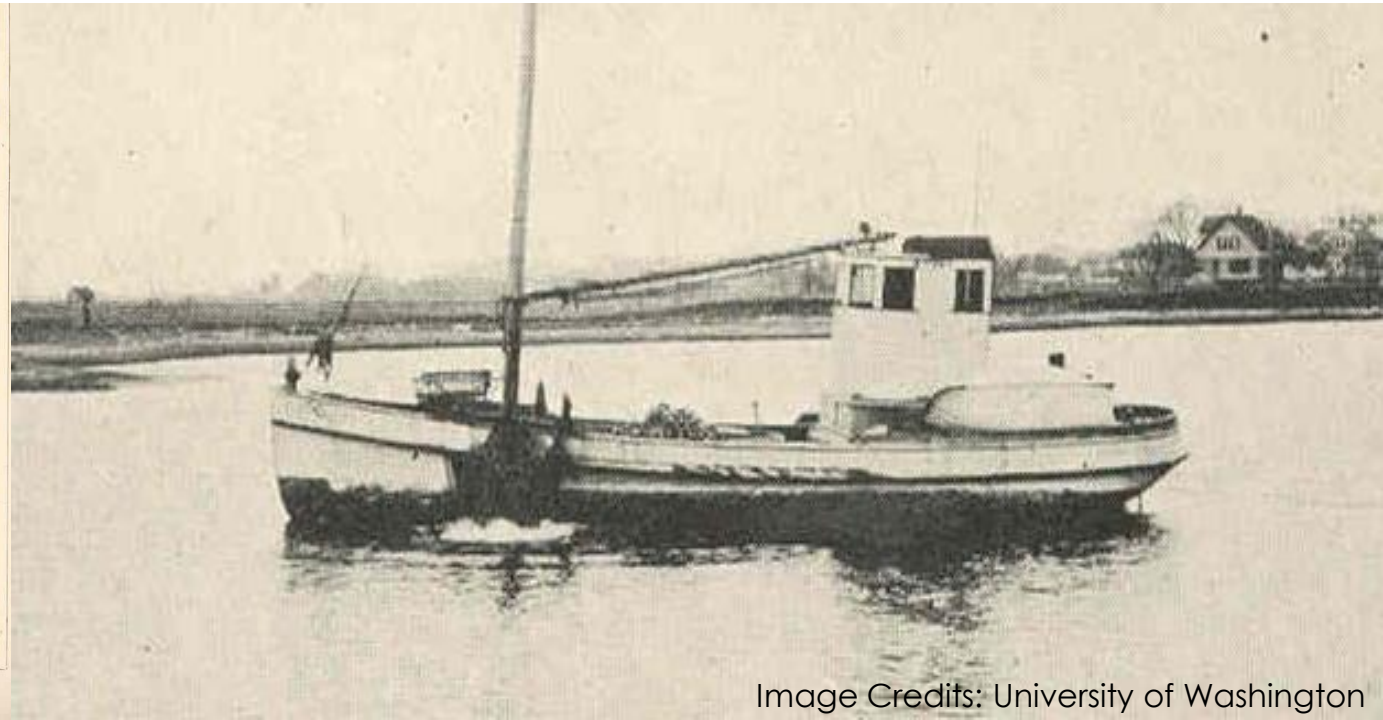


Image Credits: University of Washington

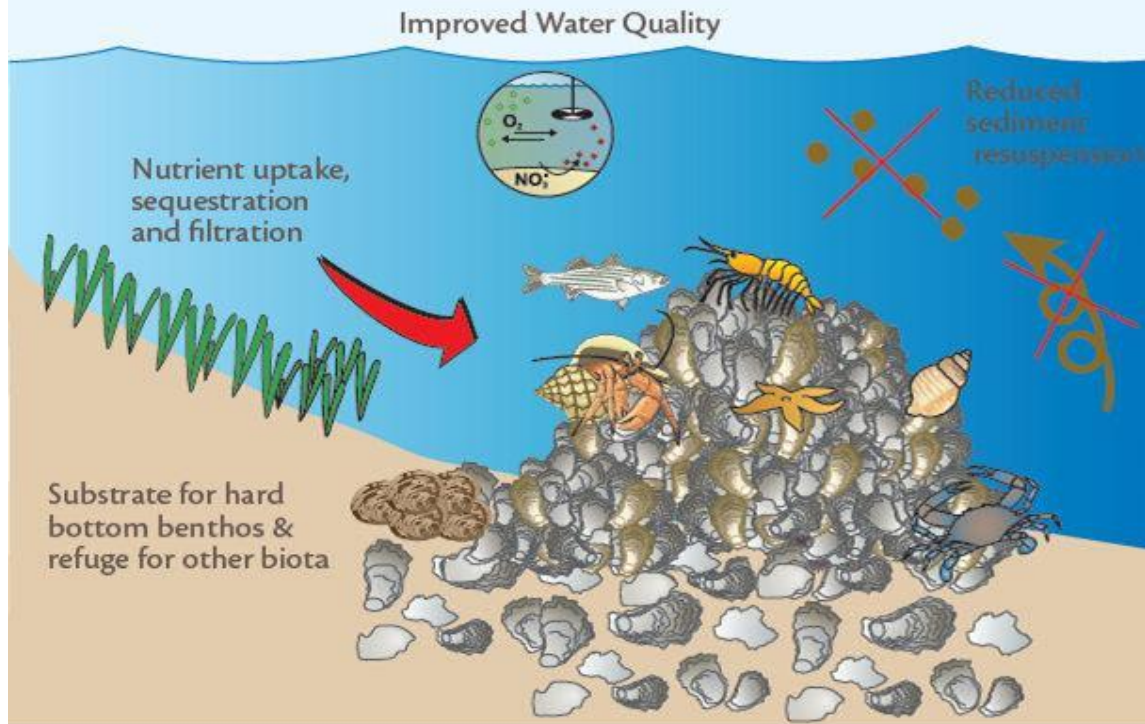


Image Credits: Mississippi Department of Marine Resources Marine Fisheries

Oyster Decline

- ▶ Harvest has declined 83% since 2004
- ▶ Reef habitat declined 90%
- ▶ 2015 Establishment of the Governor's Oyster Council

Ecosystem benefits provided by Oysters



Ecosystem stressors to Oysters

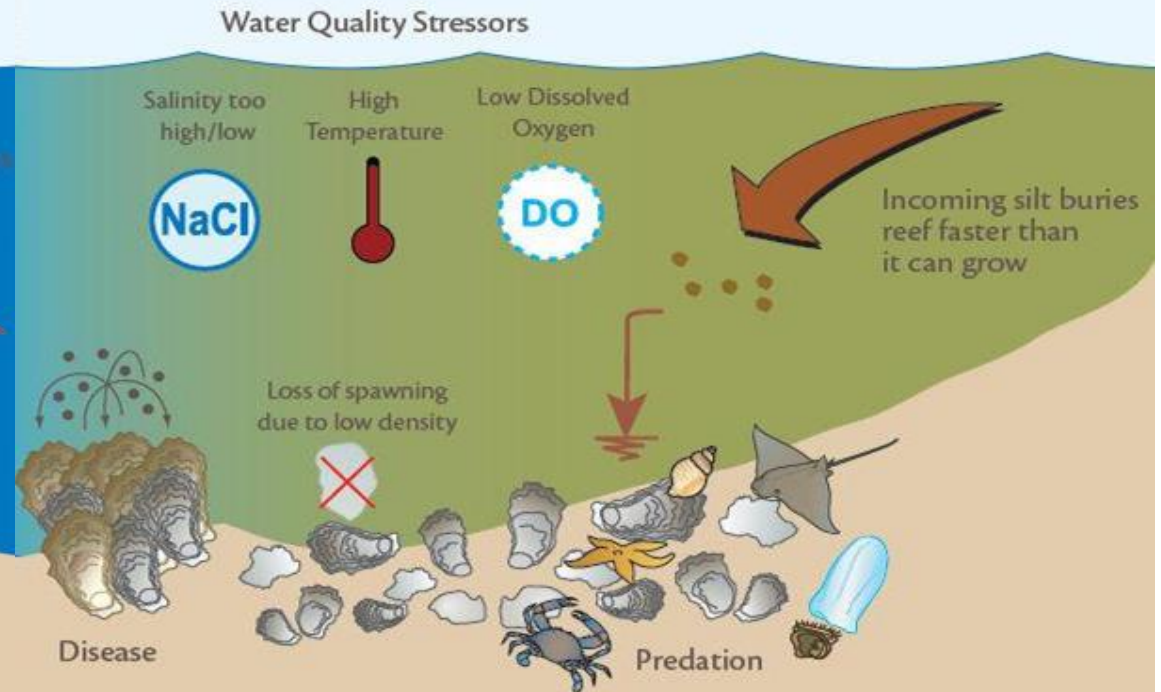


Image Credit: NOAA

Ecosystem Changes

- ▶ Several environmental factors have been linked to declining oyster reef health
- ▶ Stressors can be triggered in multiple ways



Community Concerns

Large Regional Impacts

- ▶ Hurricane Katrina: August 2005
- ▶ Mississippi River Flooding: 2011

Smaller Local Impacts

- ▶ Water quality changes
- ▶ Reduced marsh land





Image Credit: WLOX

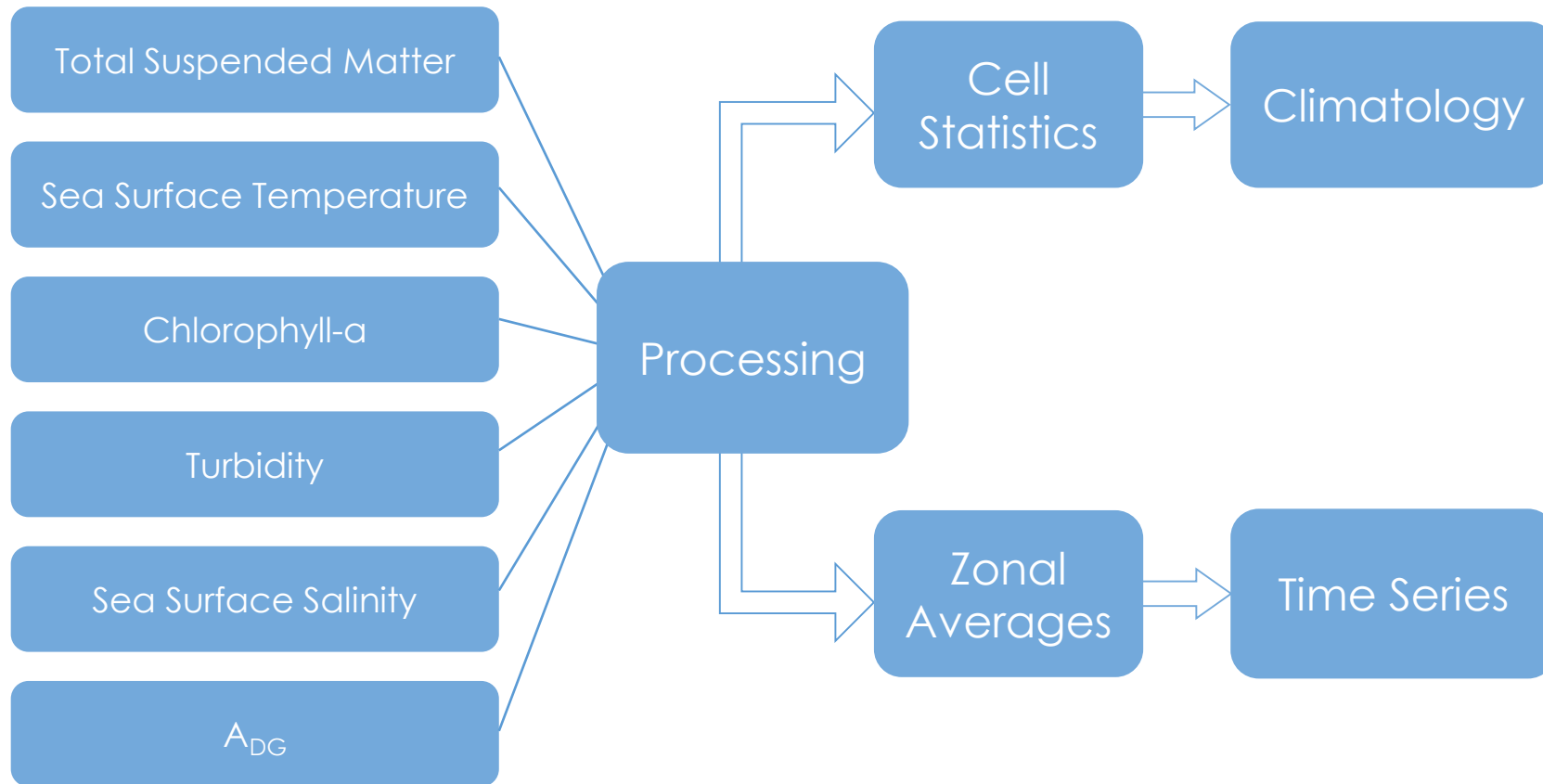
Objectives

- ▶ **Develop** a short-term climatology and time series of water quality variables affecting the production of oyster reefs
- ▶ **Distinguish** between large, episodic and more subtle events affecting water quality

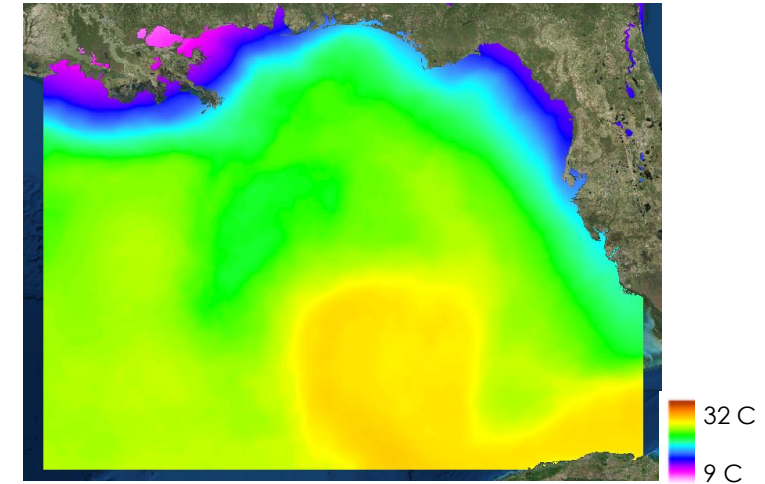
Methodology



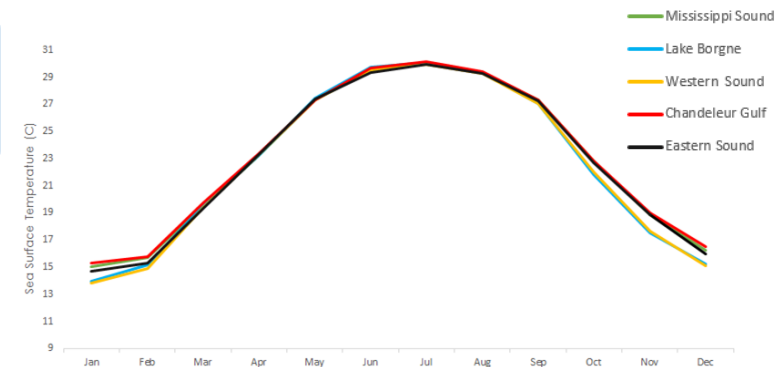
Data Acquisition



Average January Sea Surface Temperature 2003-2016

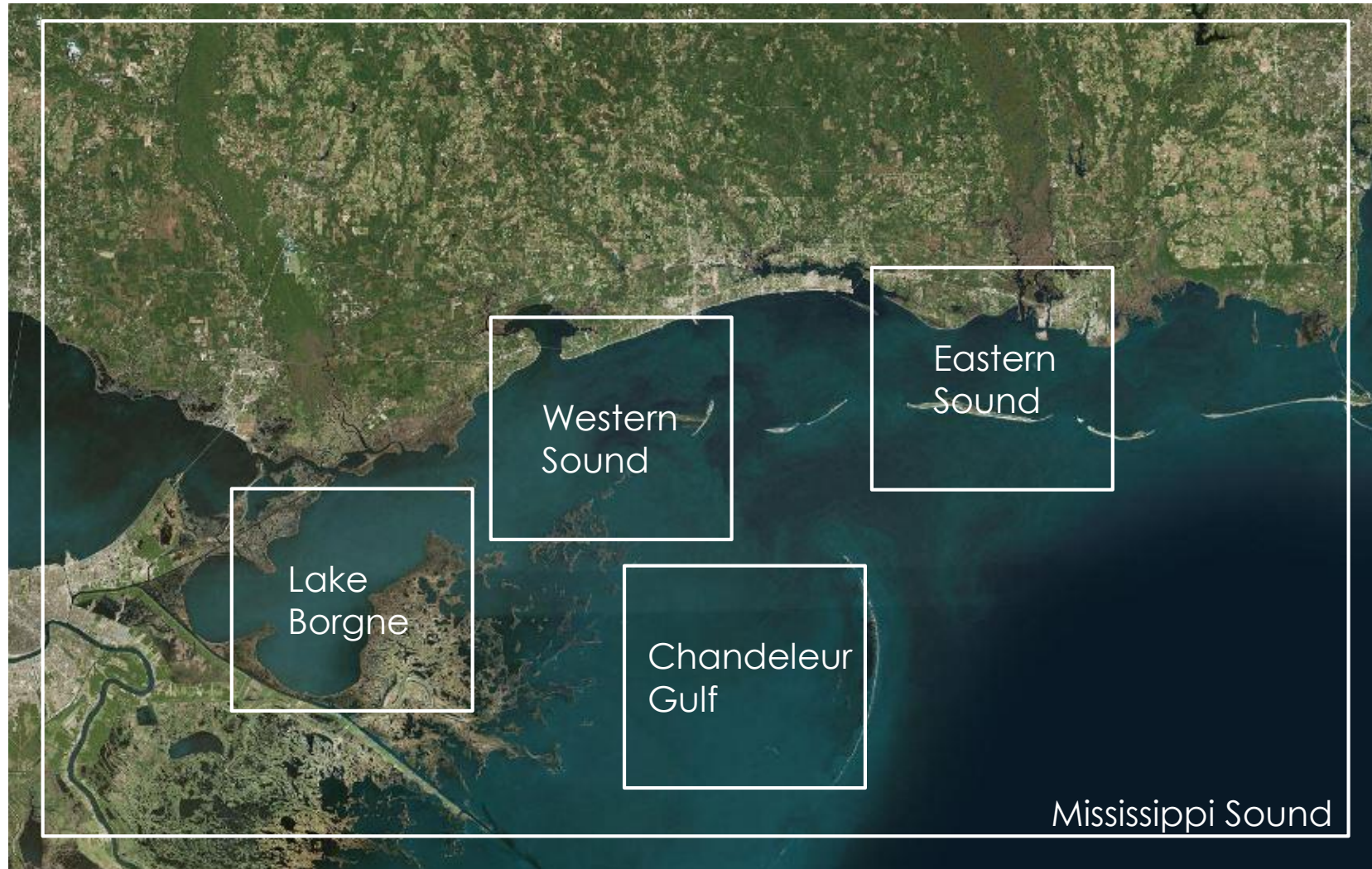


Monthly Sea Surface Temperature 2003-2016



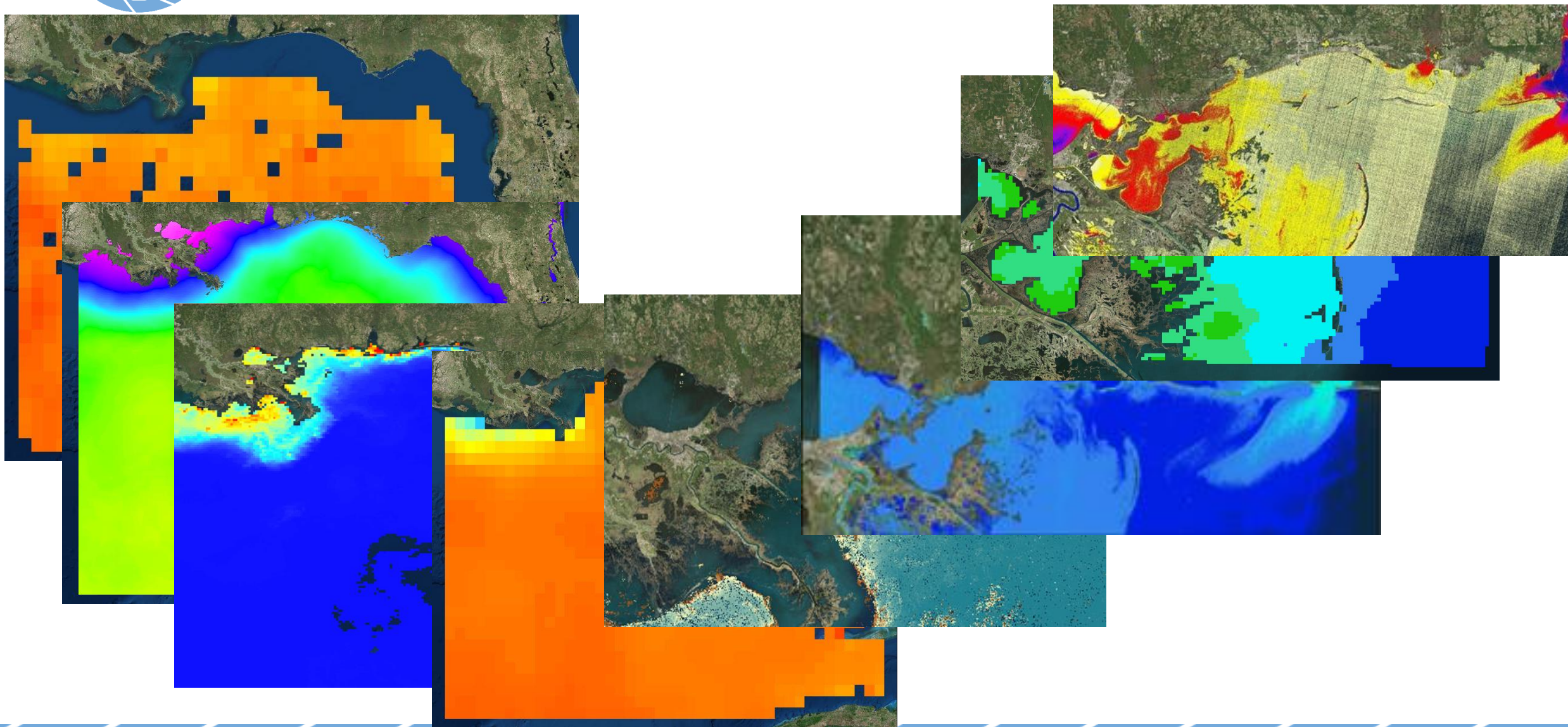


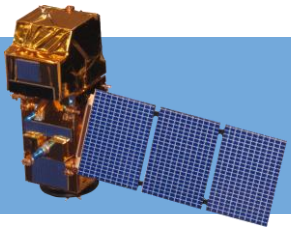
Zonal Time Series





Climatology

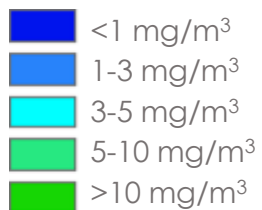
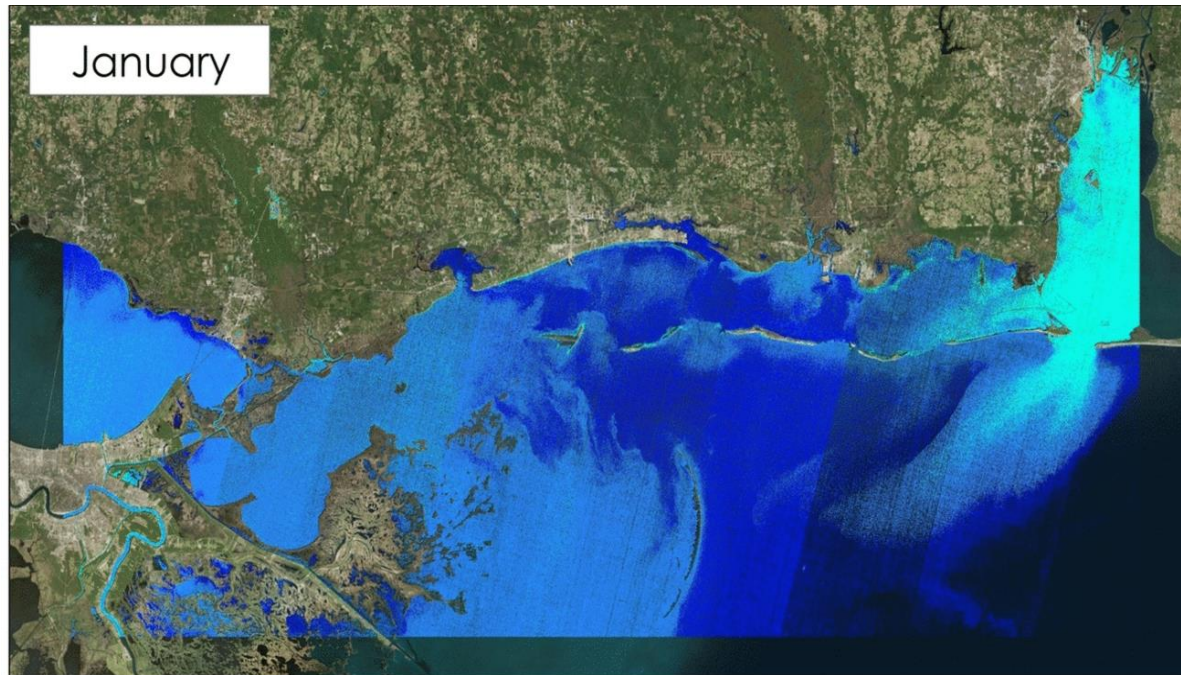




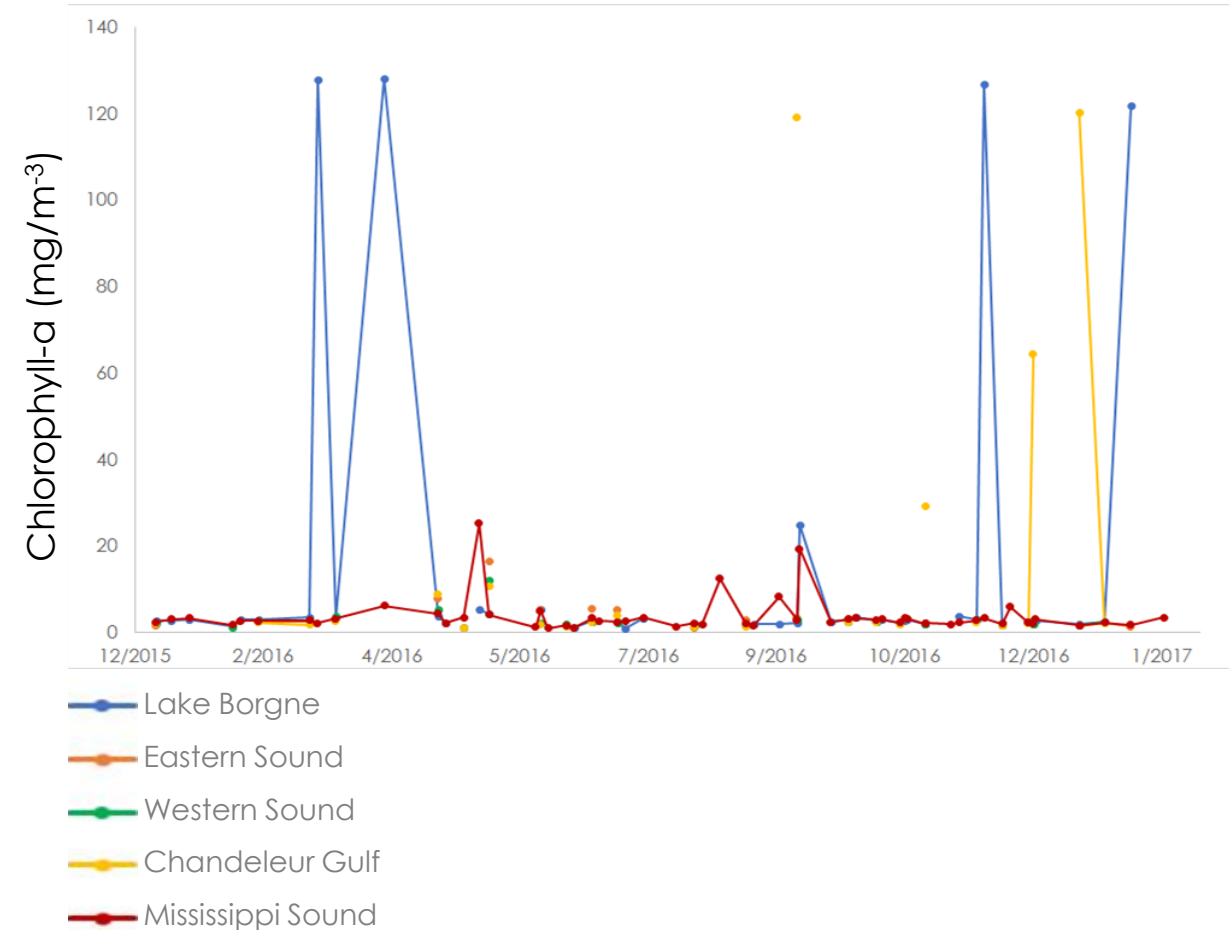
Chlorophyll-a: Sentinel-2

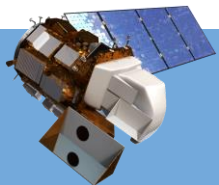


Average 2016 Chlorophyll-a Concentration



Monthly Average Chlorophyll-a Concentration

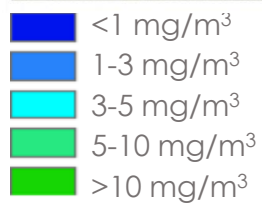
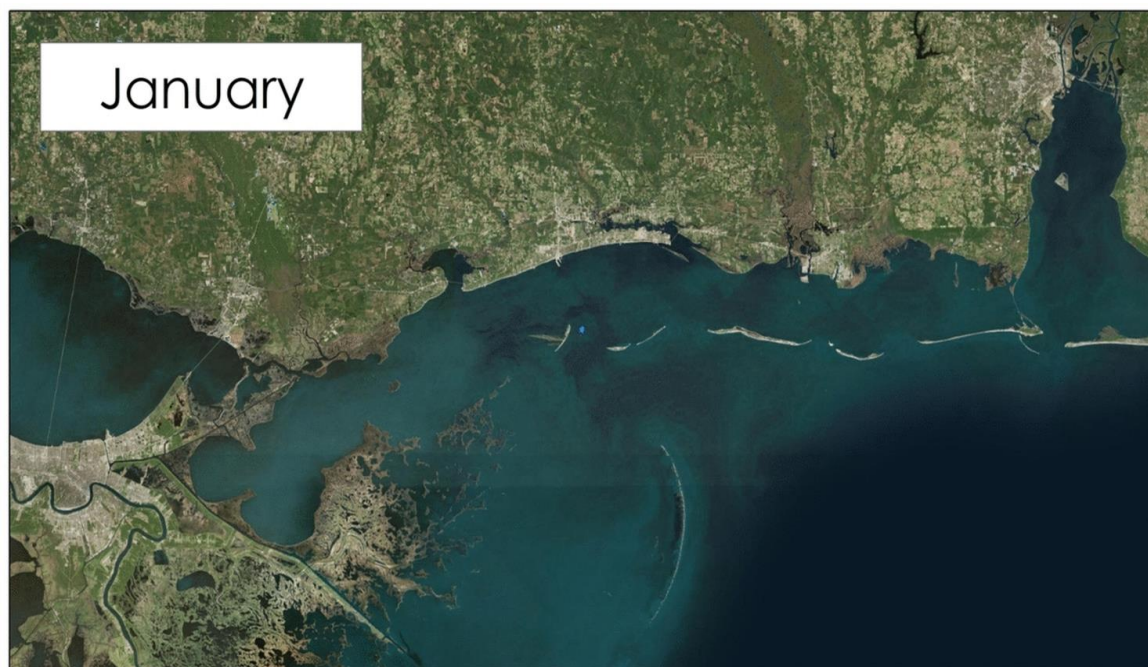




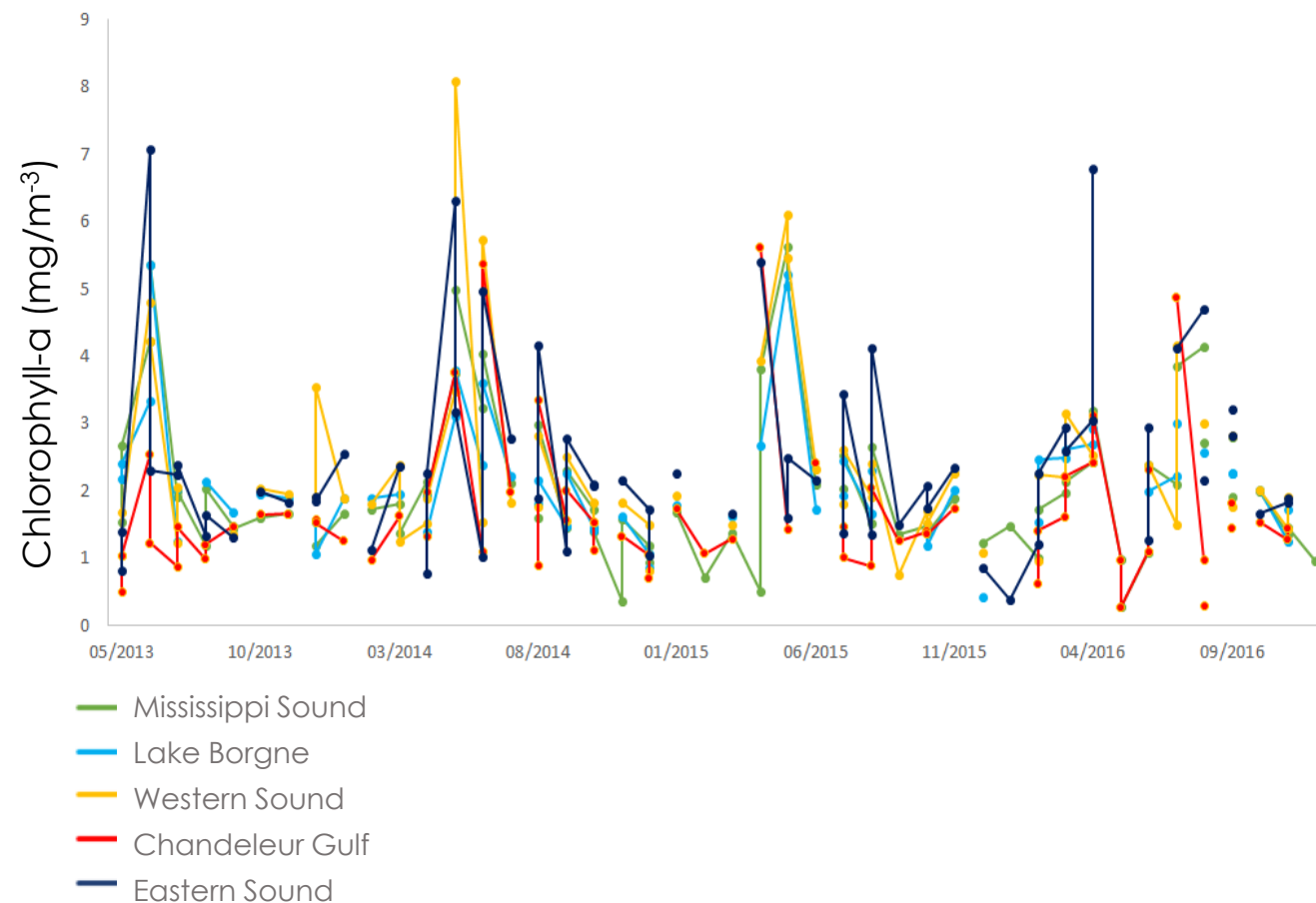
Chlorophyll-a: Landsat 8

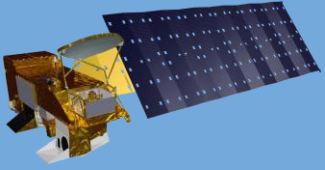


Average 2016 Chlorophyll-a Concentration



2016 Chlorophyll-a Concentration

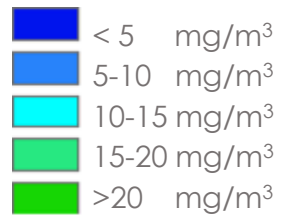
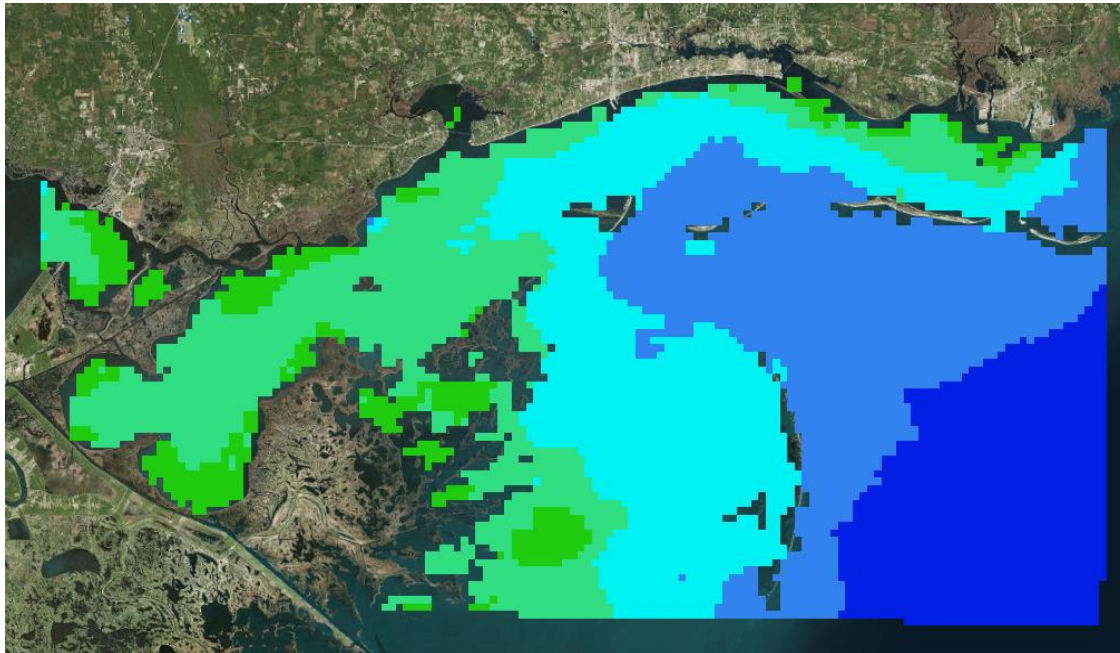




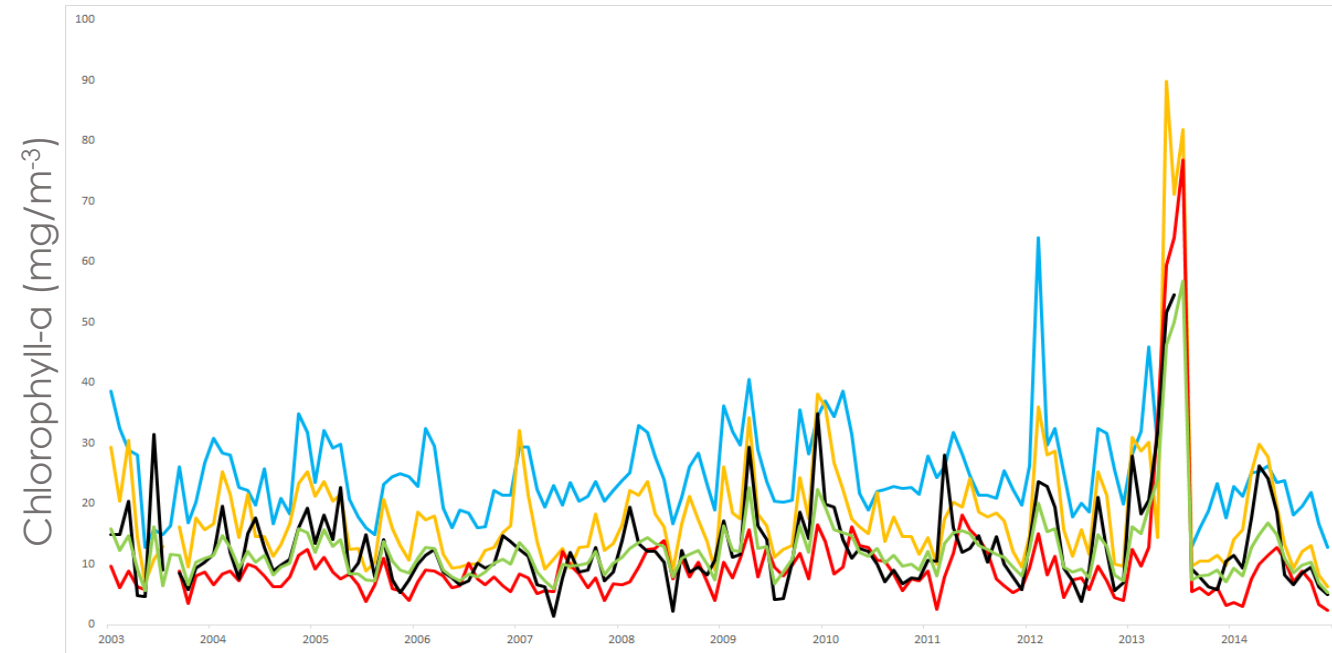
Chlorophyll-a: Aqua MODIS

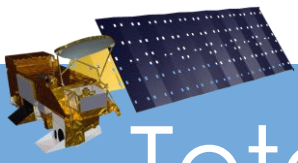


Average Chlorophyll-a for June 2010



Monthly Average Chlorophyll-a Concentration

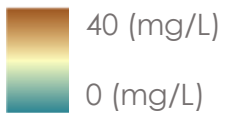




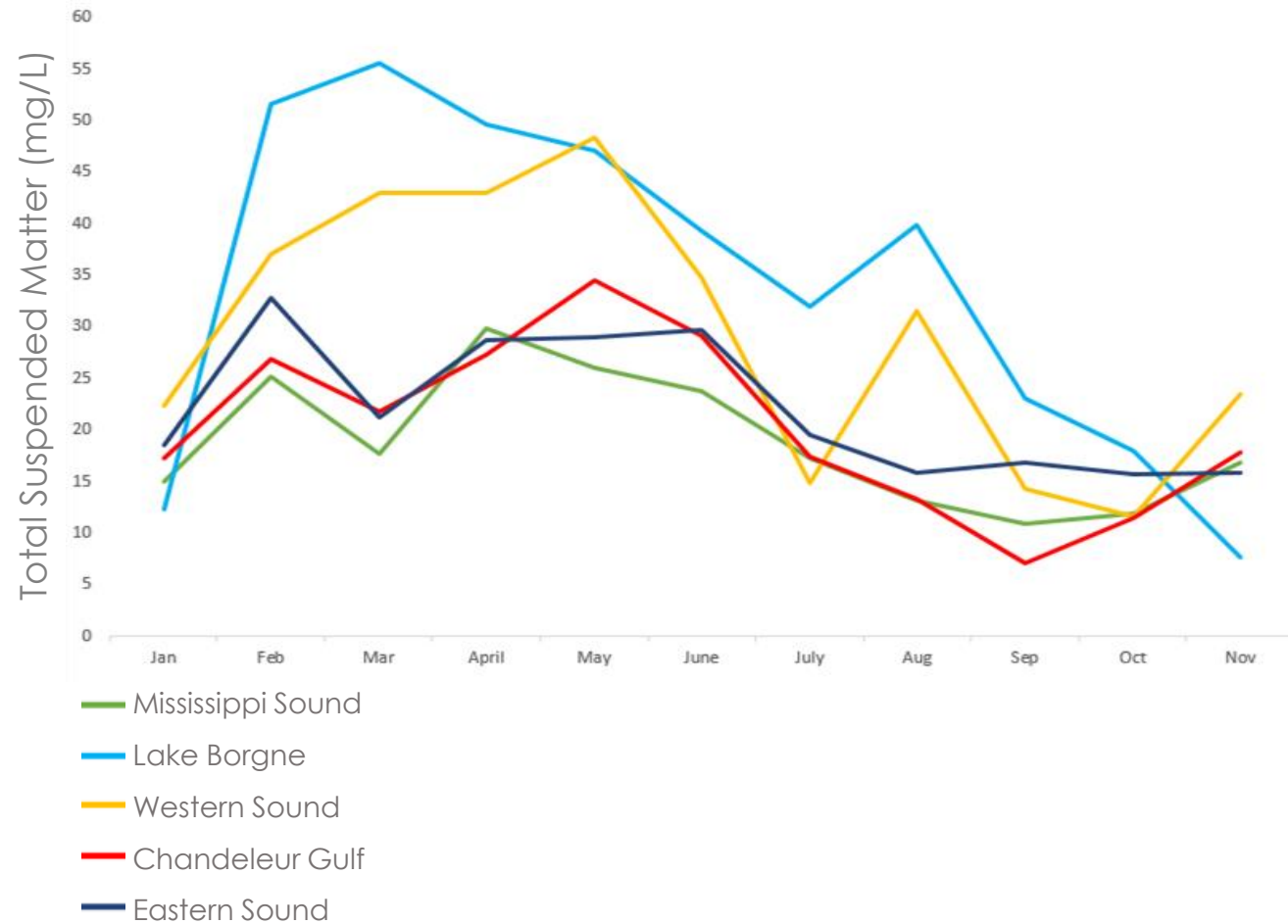
Total Suspended Matter: Aqua MODIS

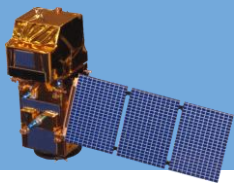


Average Monthly Total Suspended Matter



2015 Average Monthly Total Suspended Matter



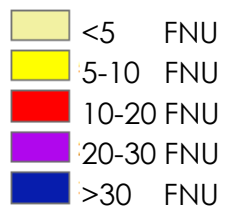
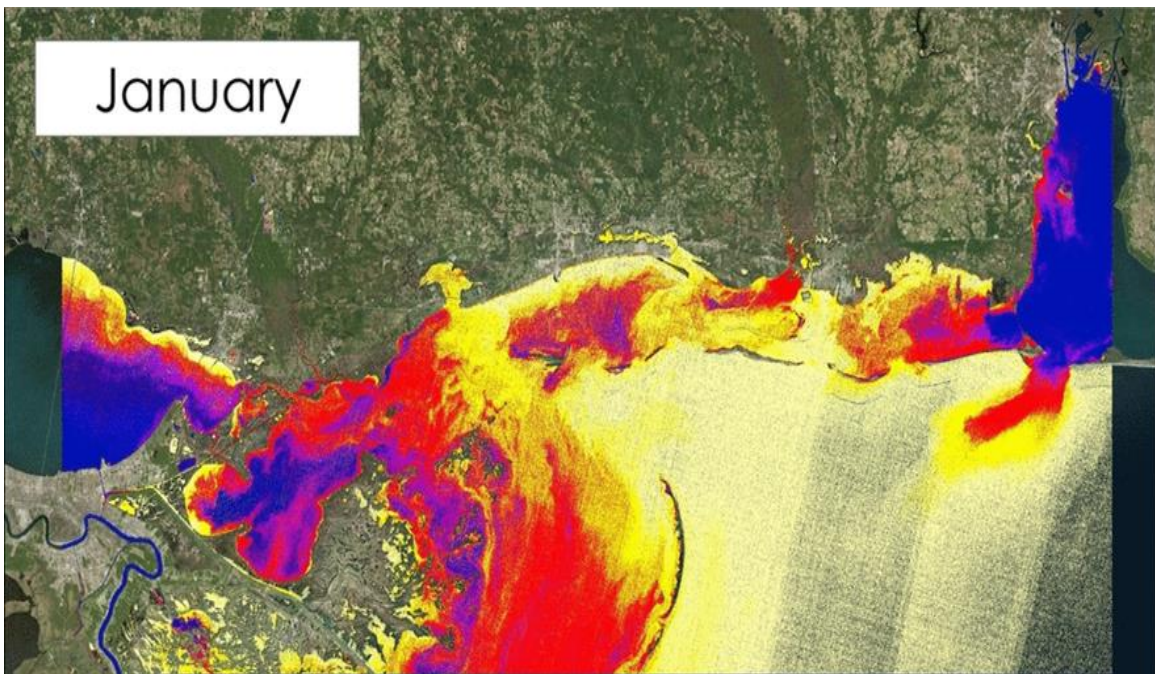


Turbidity: Sentinel-2

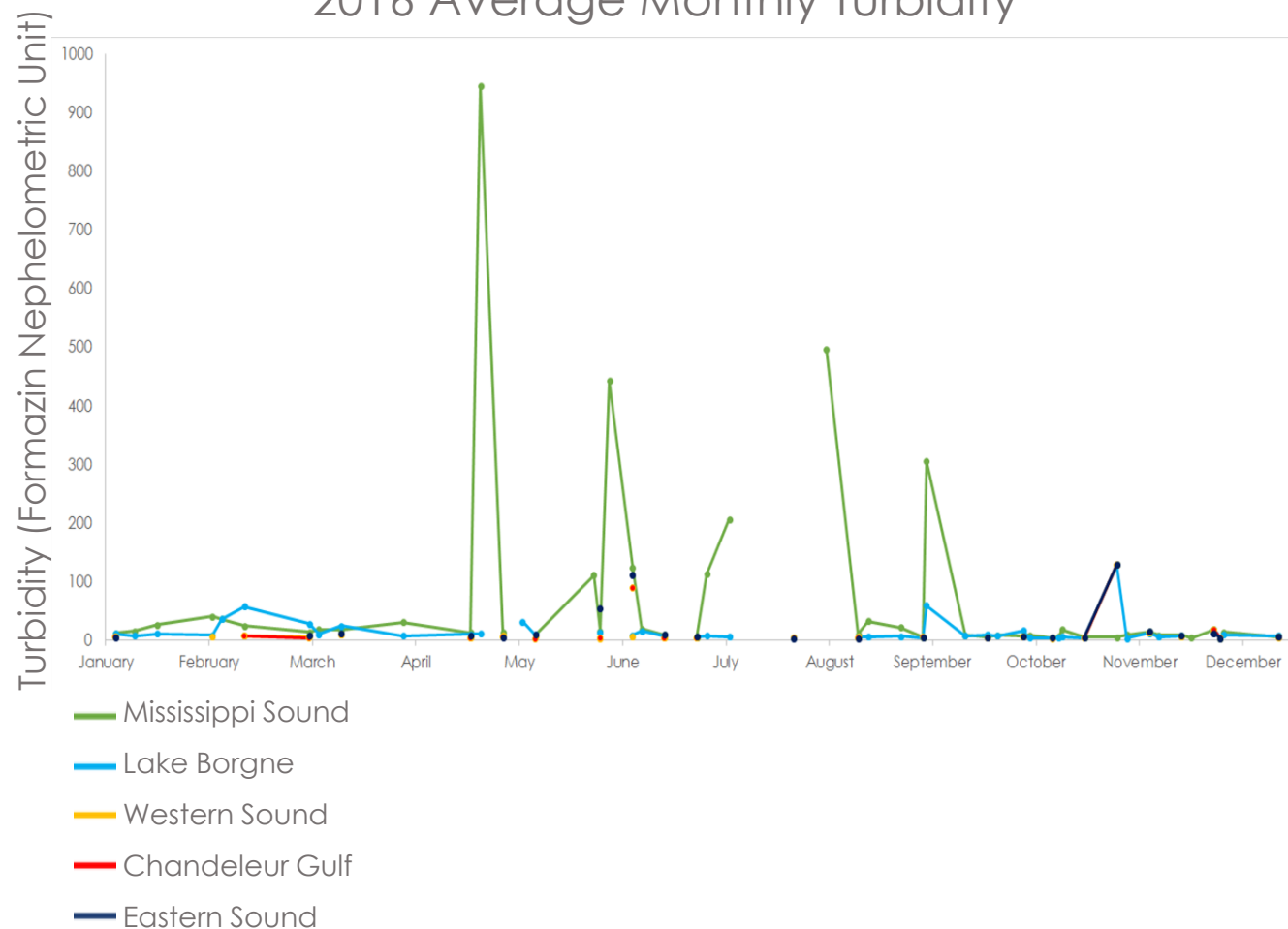


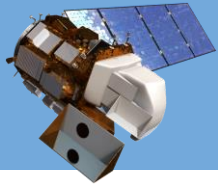
2016 Average Monthly Turbidity

January



2016 Average Monthly Turbidity

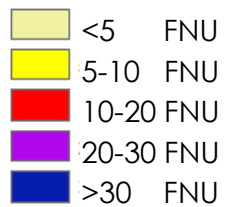
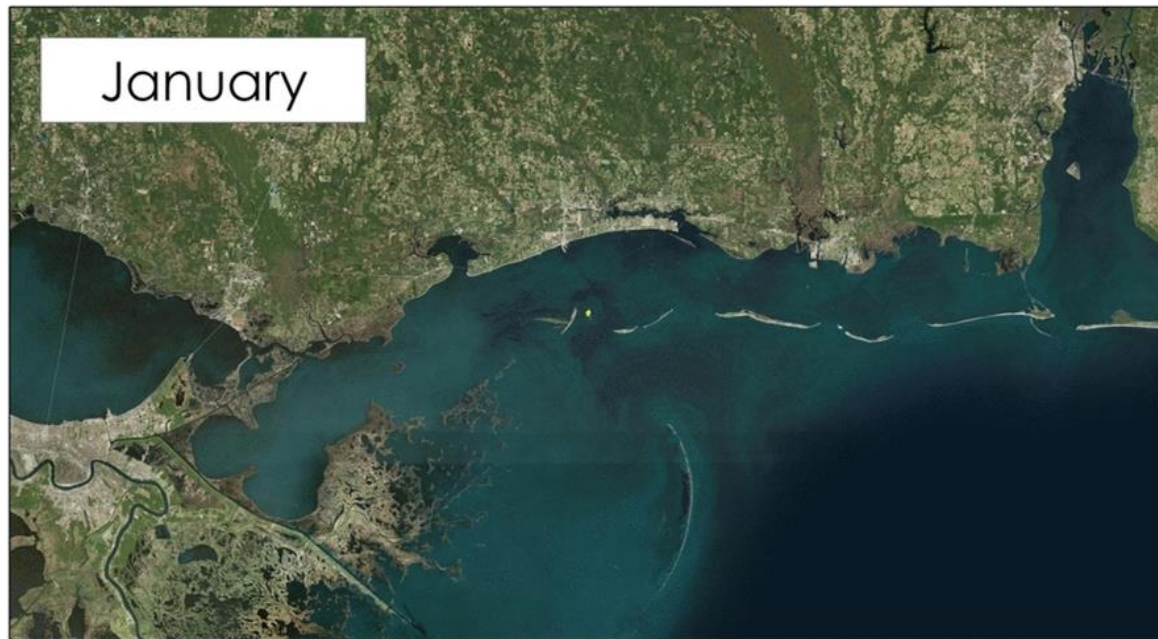




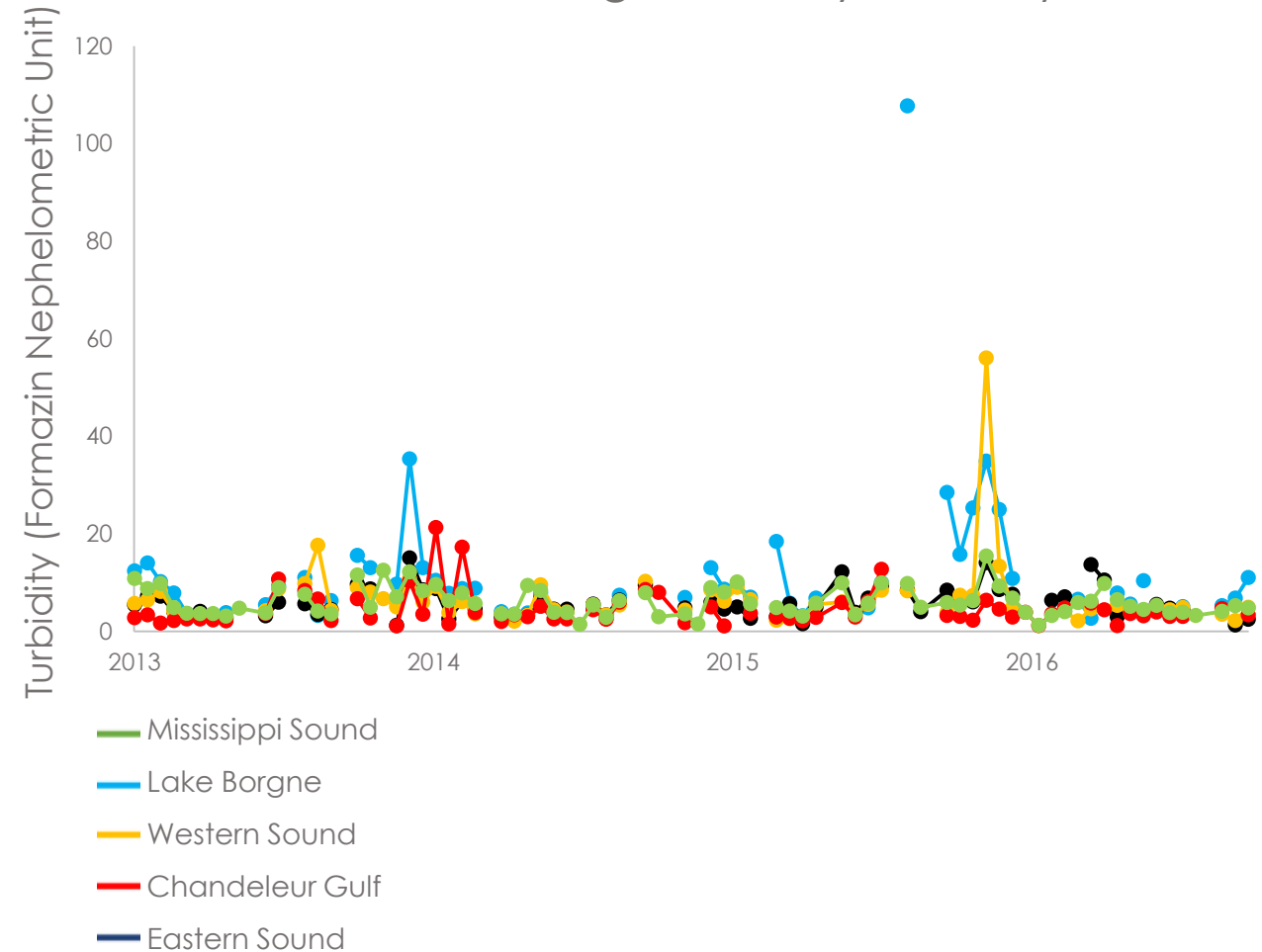
Turbidity: Landsat 8



2016 Average Monthly Turbidity



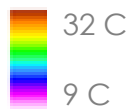
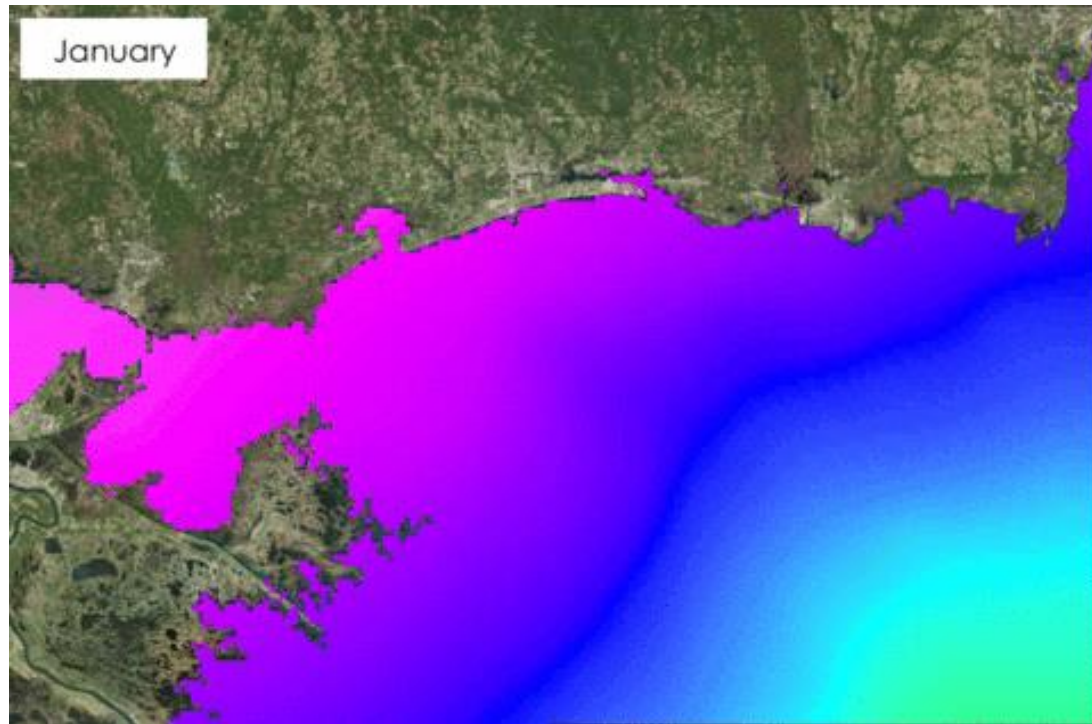
2016 Average Monthly Turbidity



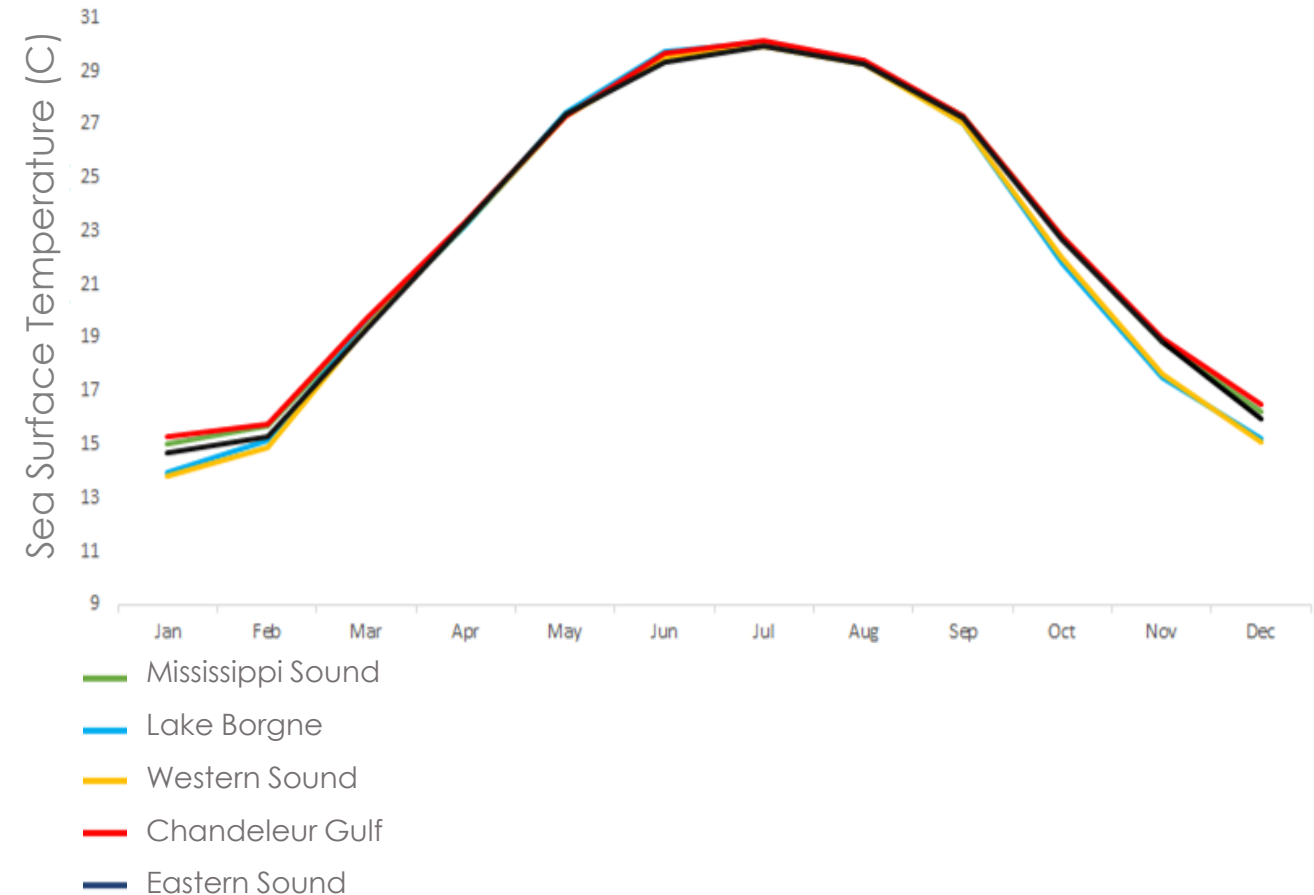
Sea Surface Temperature: MUR

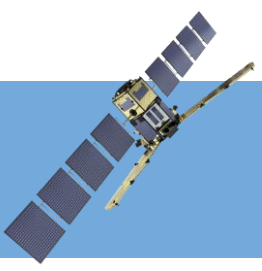


Average Sea Surface Temperature 2003-2016



Average Sea Surface Temperature 2003-2016

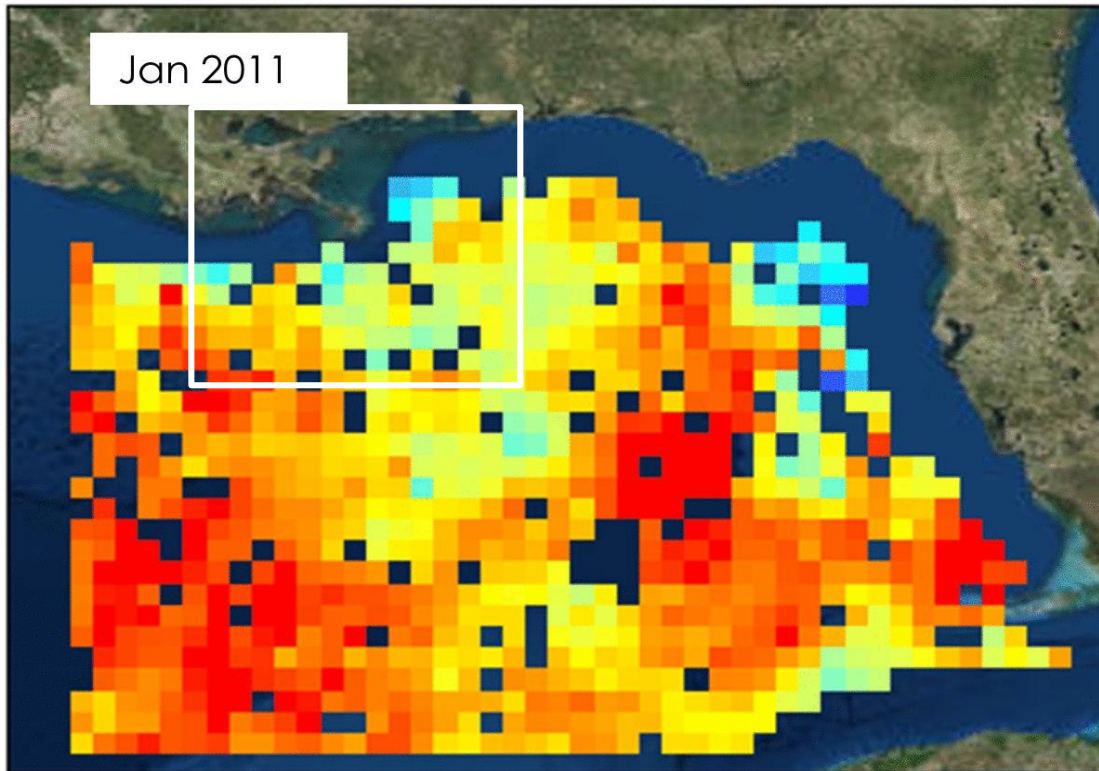




Sea Surface Salinity: SMOS

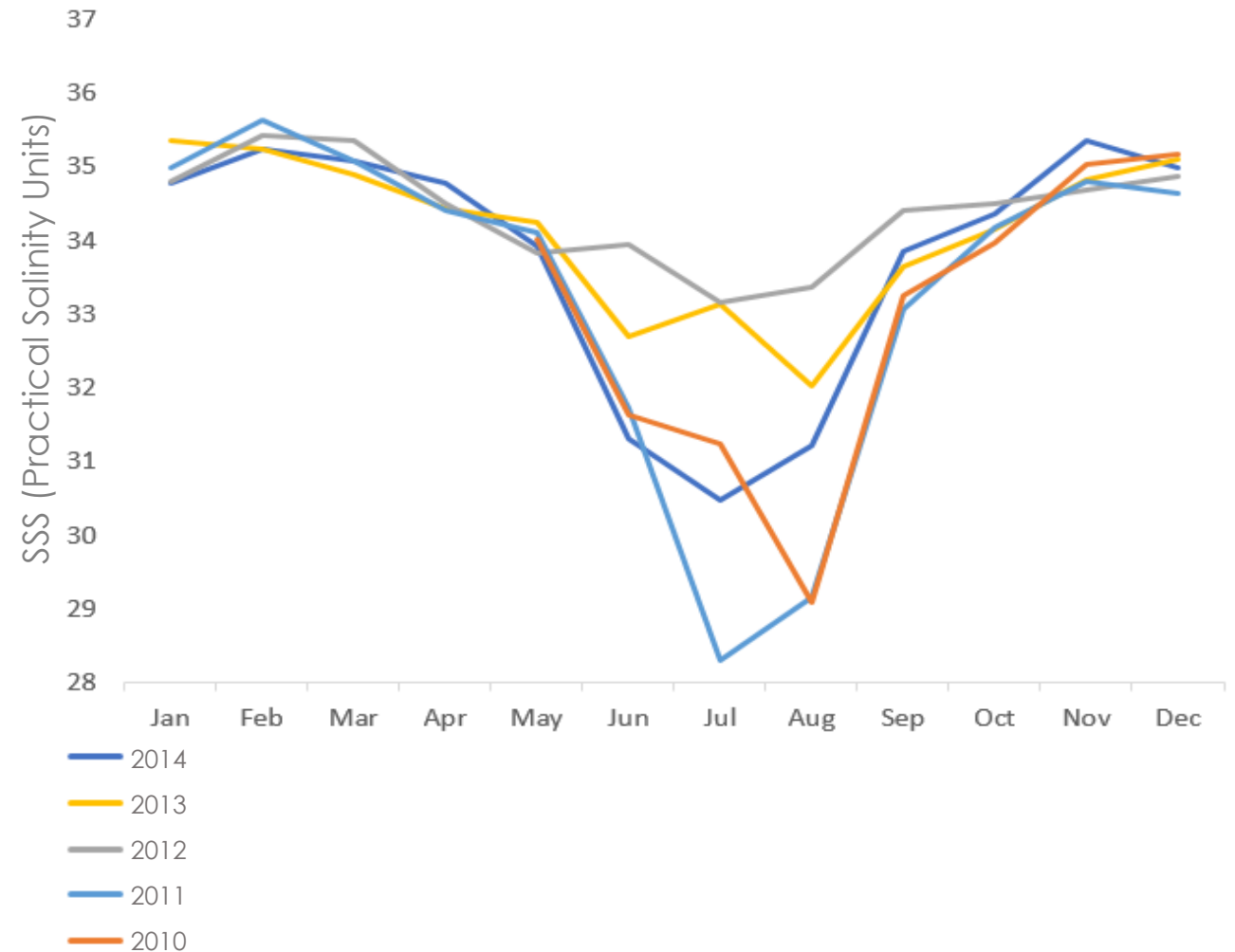


Average Sea Surface Salinity



37 PSU
32 PSU

Average Sea Surface Salinity 2010-2014

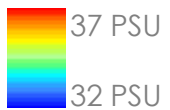
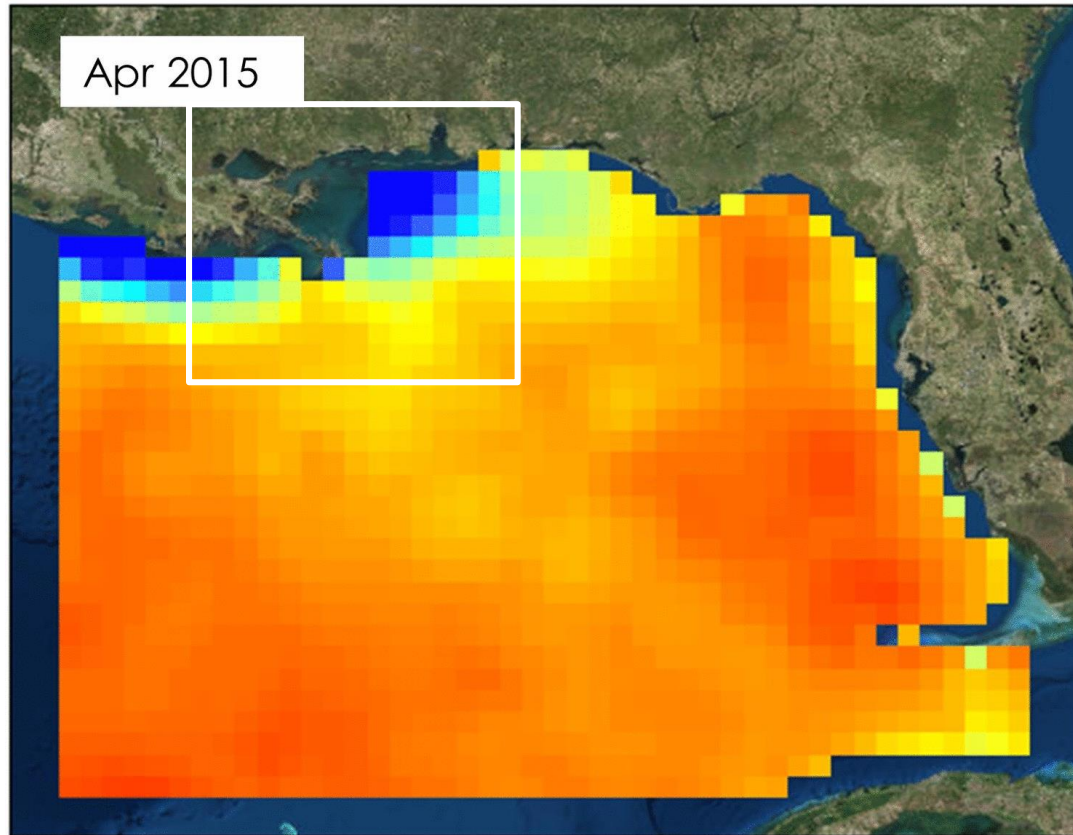




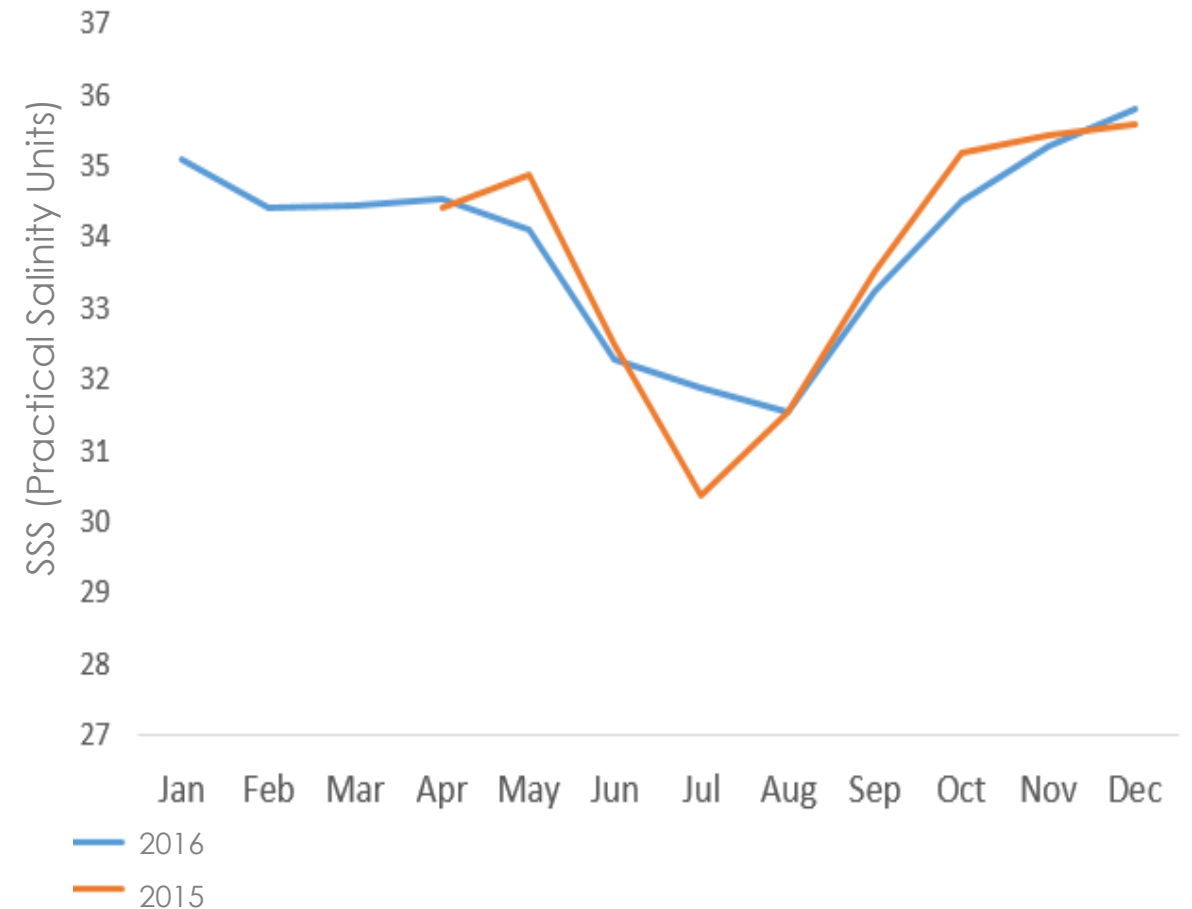
Sea Surface Salinity: SMAP



Average Monthly SSS



Average SSS 2015-2016



Conclusions



- ▶ Differences in data quality
- ▶ Limitations near the coast
- ▶ Processing time and effort



Image Credits: Mississippi Department of Marine Resources

Acknowledgements



Project Partners

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Ben Holt, NASA Jet Propulsion Laboratory

Dr. Severine Fournier, NASA Jet Propulsion Laboratory



Image Credit: MDMR