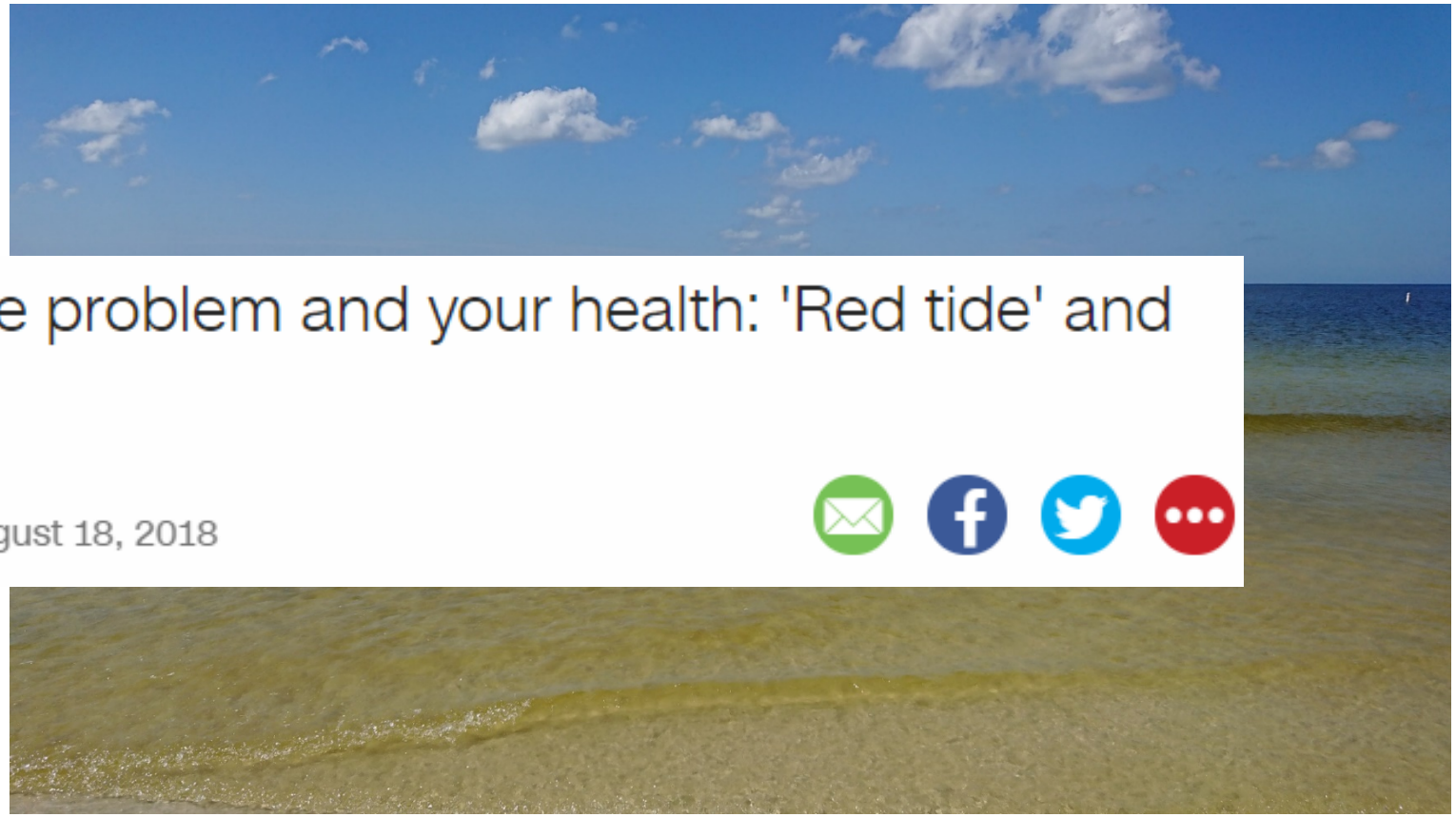
Use of Satellite to Identify and Quantify Cyanobacteria and “Red Tide”

Richard P. Stumpf
NOAA National Ocean Service

credit: Nicholas Aumen, USGS



credit: Rick Stumpf, NOAA, Oct 03, 2018

NCCOS NATIONAL CENTERS FOR COASTAL OCEAN SCIENCE

Cyanos: widespread problem

Lake Okeechobee algae bloom threatens to worsen water woes

SunSentinel

Algae bloom, bacterial spike close several South Florida beaches

BUSINESS By Jennifer Sorentrue - Palm Beach Post Staff Writer

Updated: 5:39 p.m. Tuesday, June 28, 2016 | Posted: 5:27 p.m. Tuesday, June 28, 2016

Caloosahatchee slimed: Seasonal nuisance or toxic warning?

Amy Bennett Williams, AWILLIAMS@NEWS-PRESS.COM Published 4:29 p.m. ET May 24, 2016 | Updated 12:02 p.m. ET May 25, 2016

The New York Times

Algae Bloom in Florida Prompts Fears About Harm to Health and Economy

Algal blooms reach toxic levels on the St. Johns

THE ST. AUGUSTINE RECORD staugustine.com COVERING THE ANCIENT CITY AND ST. JOHNS COUNTY SINCE 1874

By Steve Patterson

Posted Oct 11, 2013 at 12:49 AM

Be smart and respect toxic algae in lakes

Orlando Sentinel News / Lake County News

By Lauren Ritchie · Contact Reporter

COMMENTARY

The New York Times

Karenia brevis "red tide"

(CNN) — When Marcy Cornell's toddler son "couldn't breathe" on the first day of their recent Florida vacation, she took him straight to the emergency room.

"Before they even asked me anything else ... they said, 'Did you go to the beach today?' " she recalled.

Doctors said her son had upper airway inflammation

The New York Times

UPDATE

A Red Tide on Florida's Gulf Coast Has Been a Huge Hit to Tourism

Though an algae bloom on the coast is improving, locals and business owners say it may be too little, too late.

where are the blooms?

Historical satellite/sensor

Envisat-1 MERIS

May 2002- Apr 2012

3 days/week, 300-m pixel

New satellites (replacement)

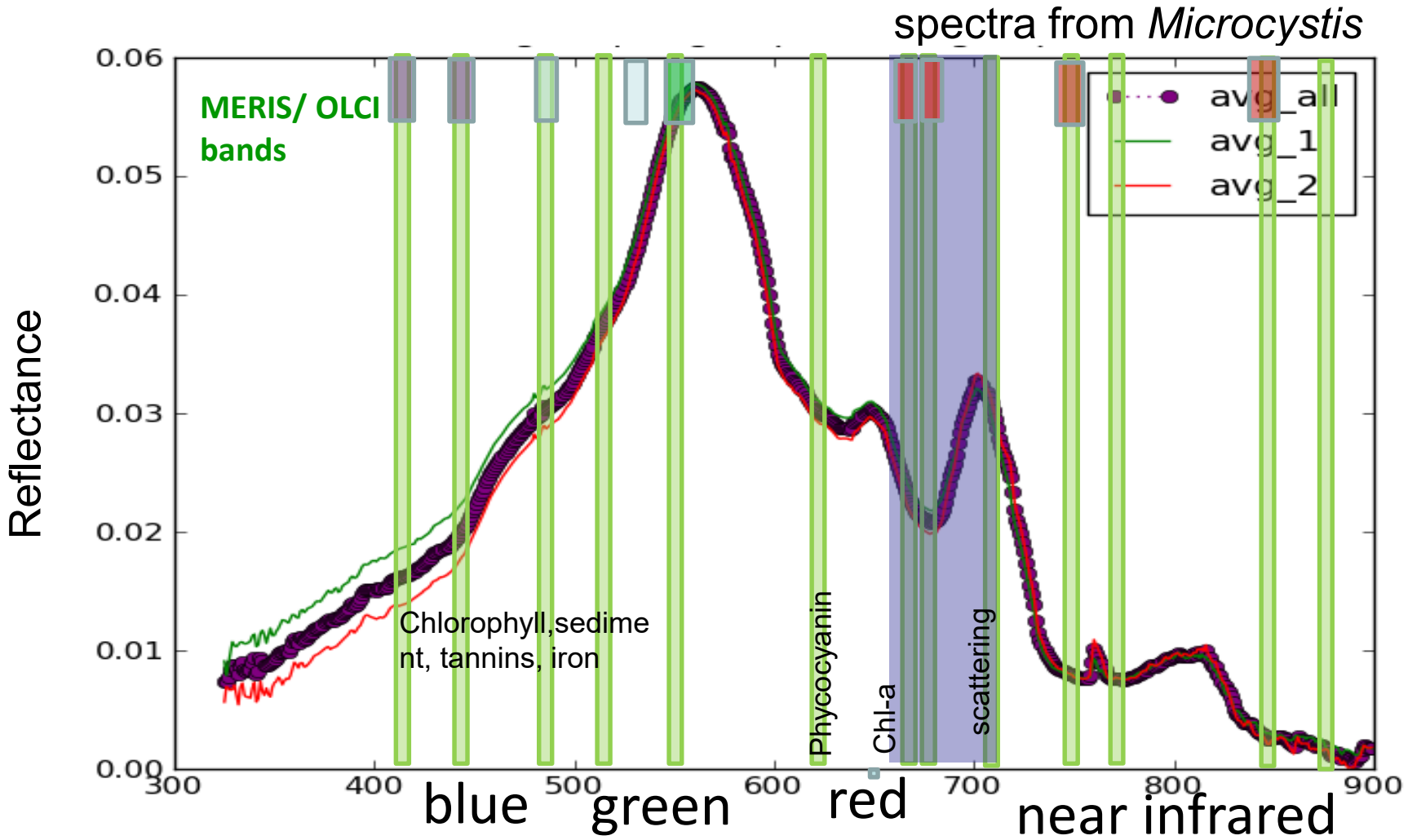
Sentinel-3a/3b European Union

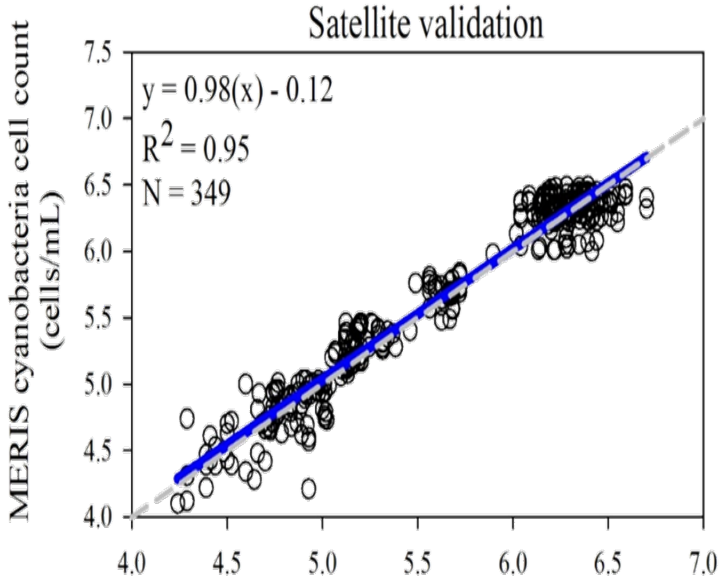
Copernicus Program 2016 – into future

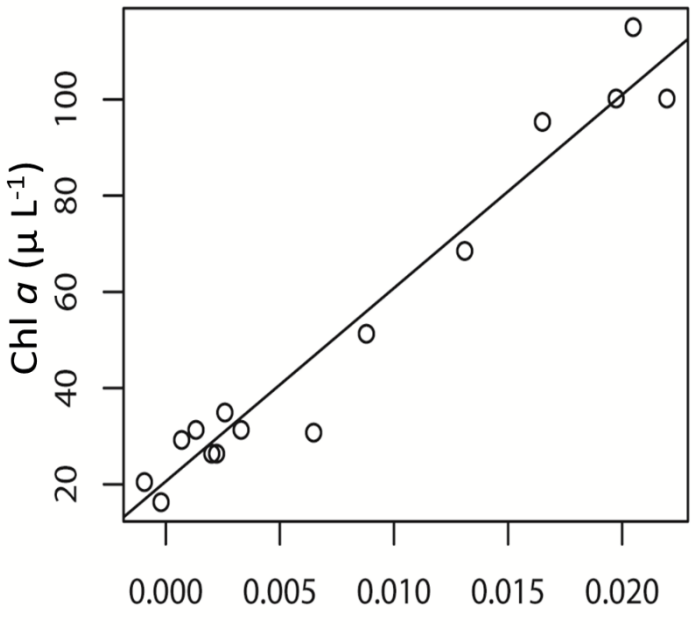
Nearly daily

300 m pixel (small stadium size)

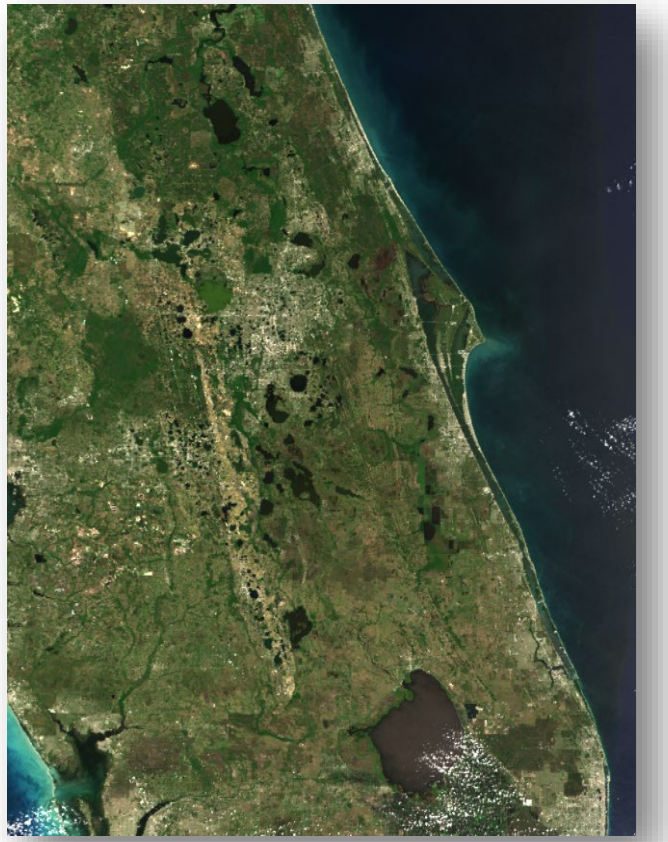
Spectral Bands
Much more sensitive than our eye.





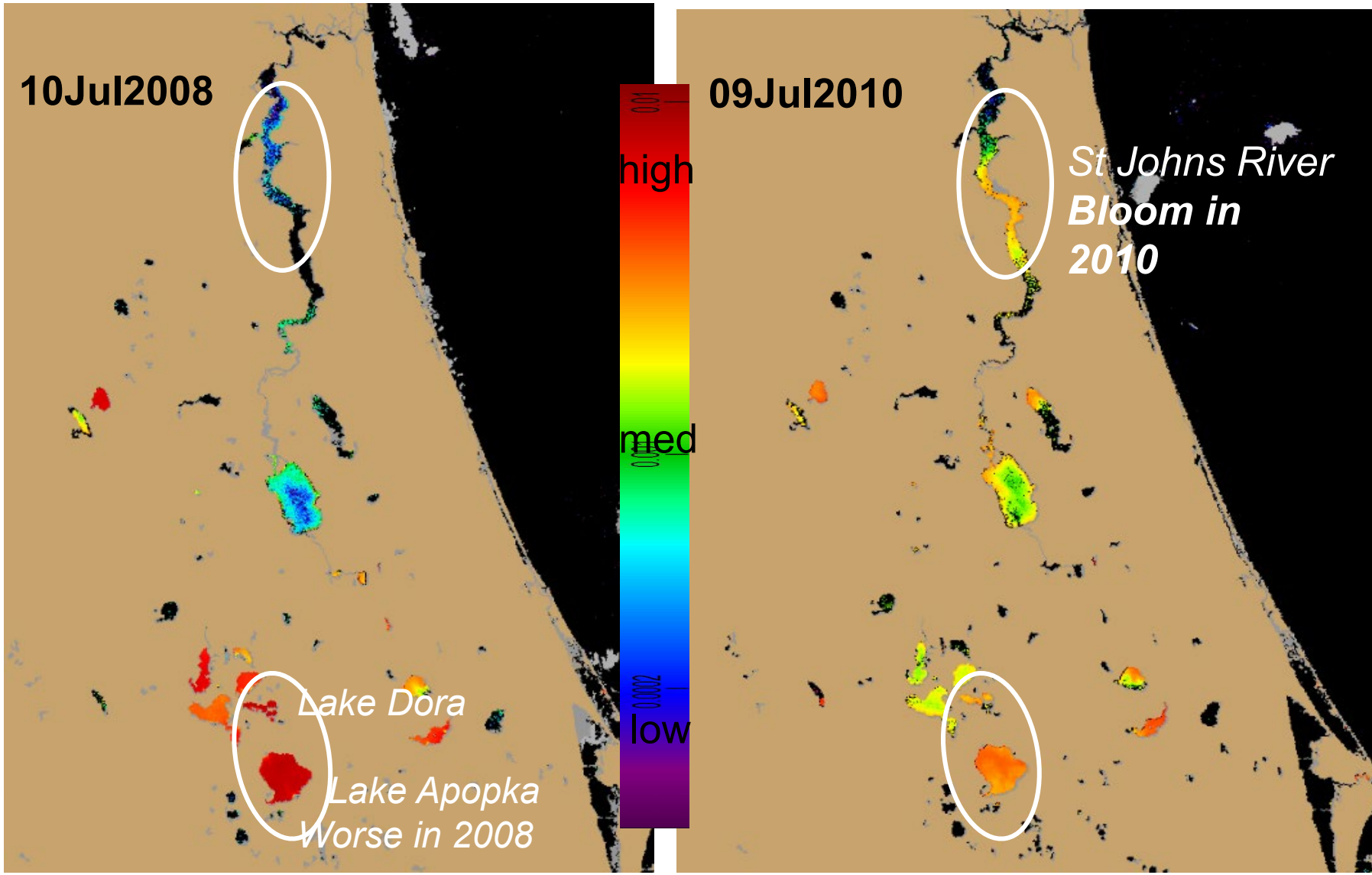


Apply algorithm, examples from MERIS

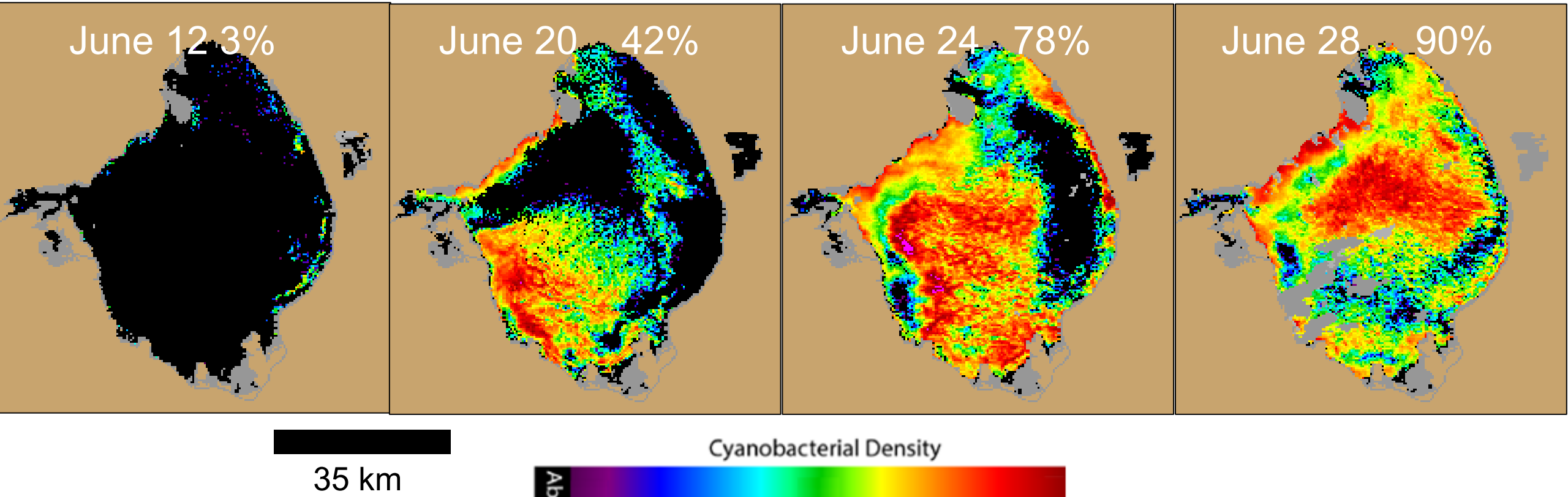


True Color MERIS Image

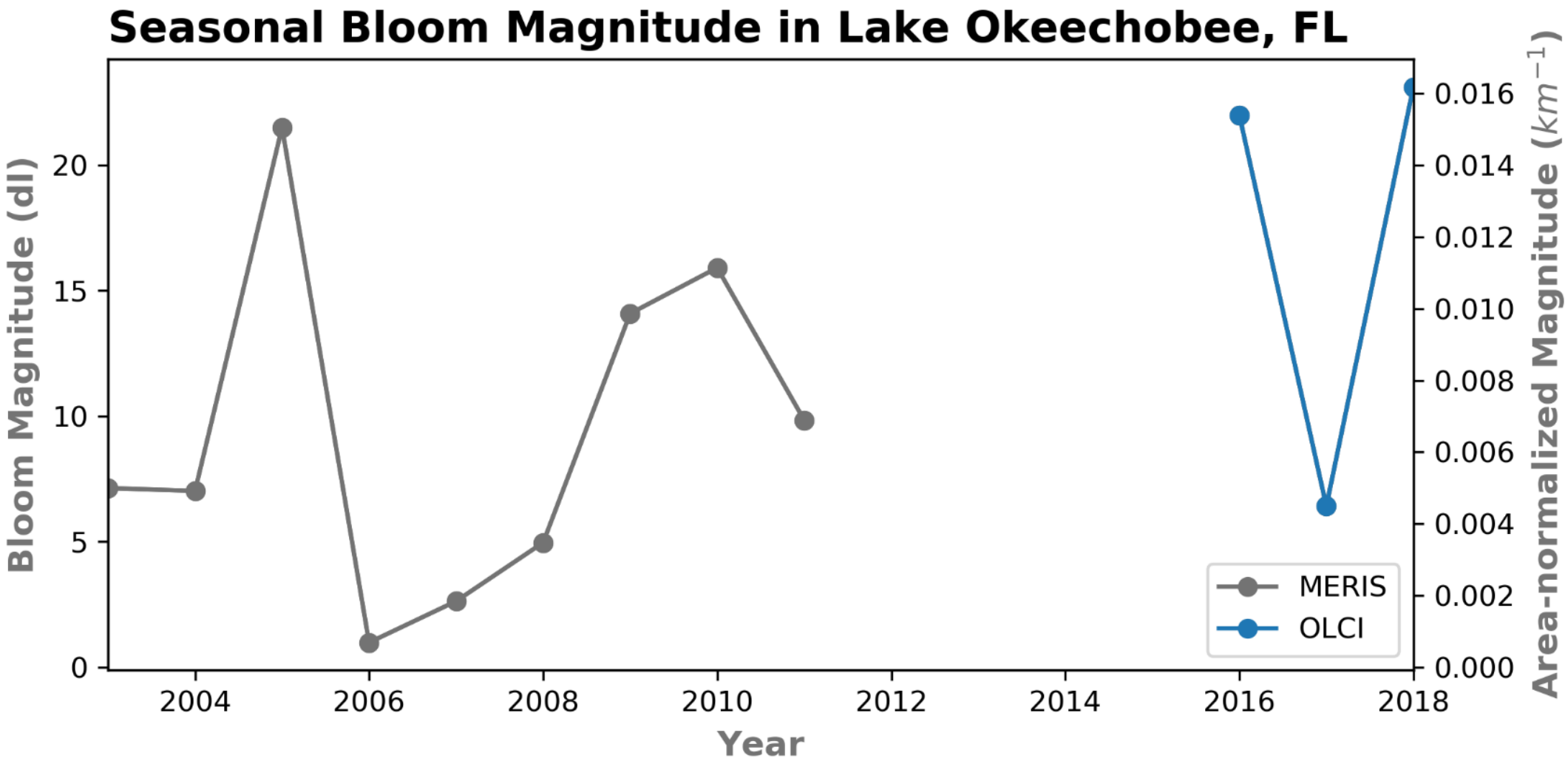
(300mx300m)



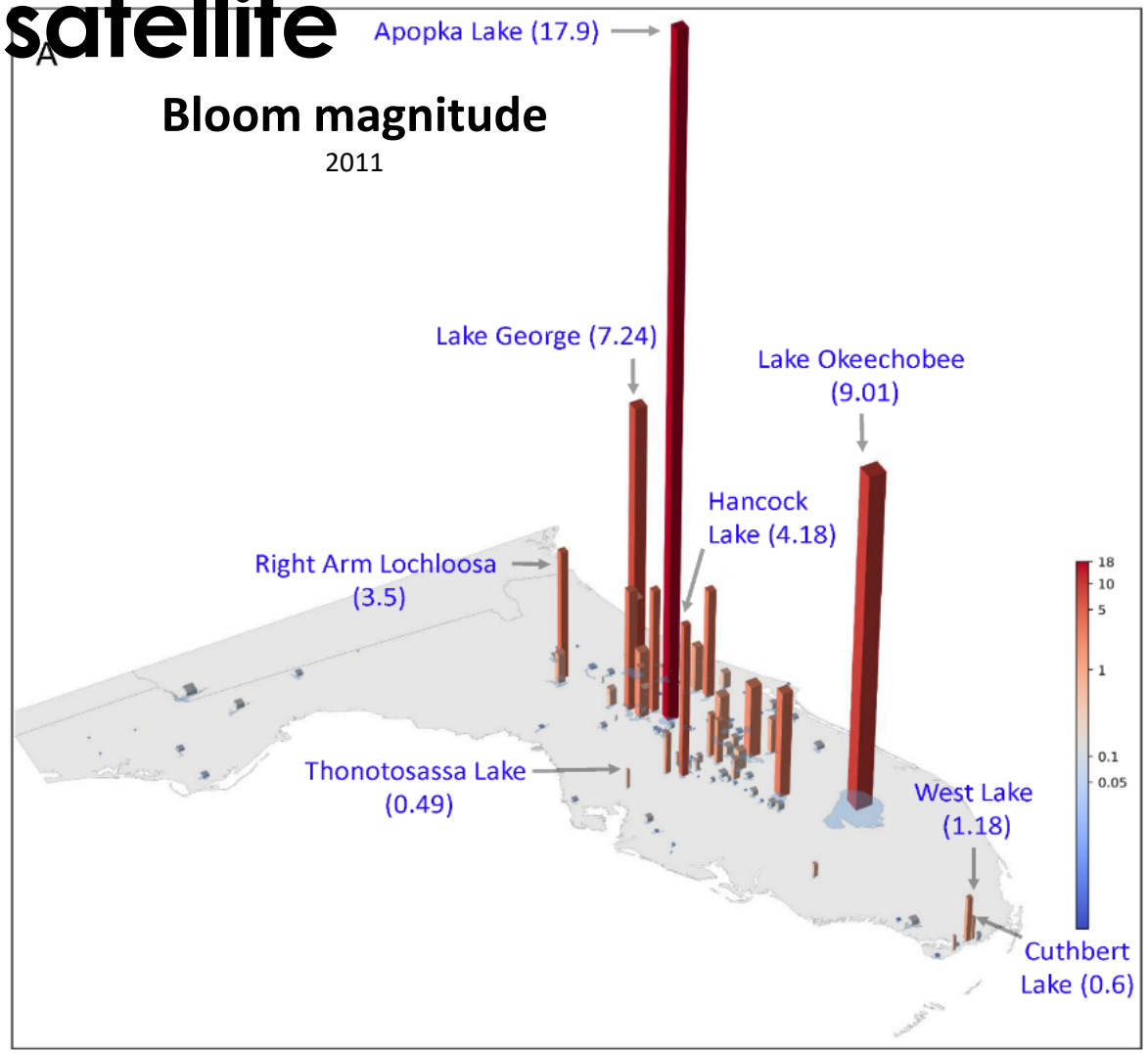
Lake Okeechobee, 2018, areal coverage

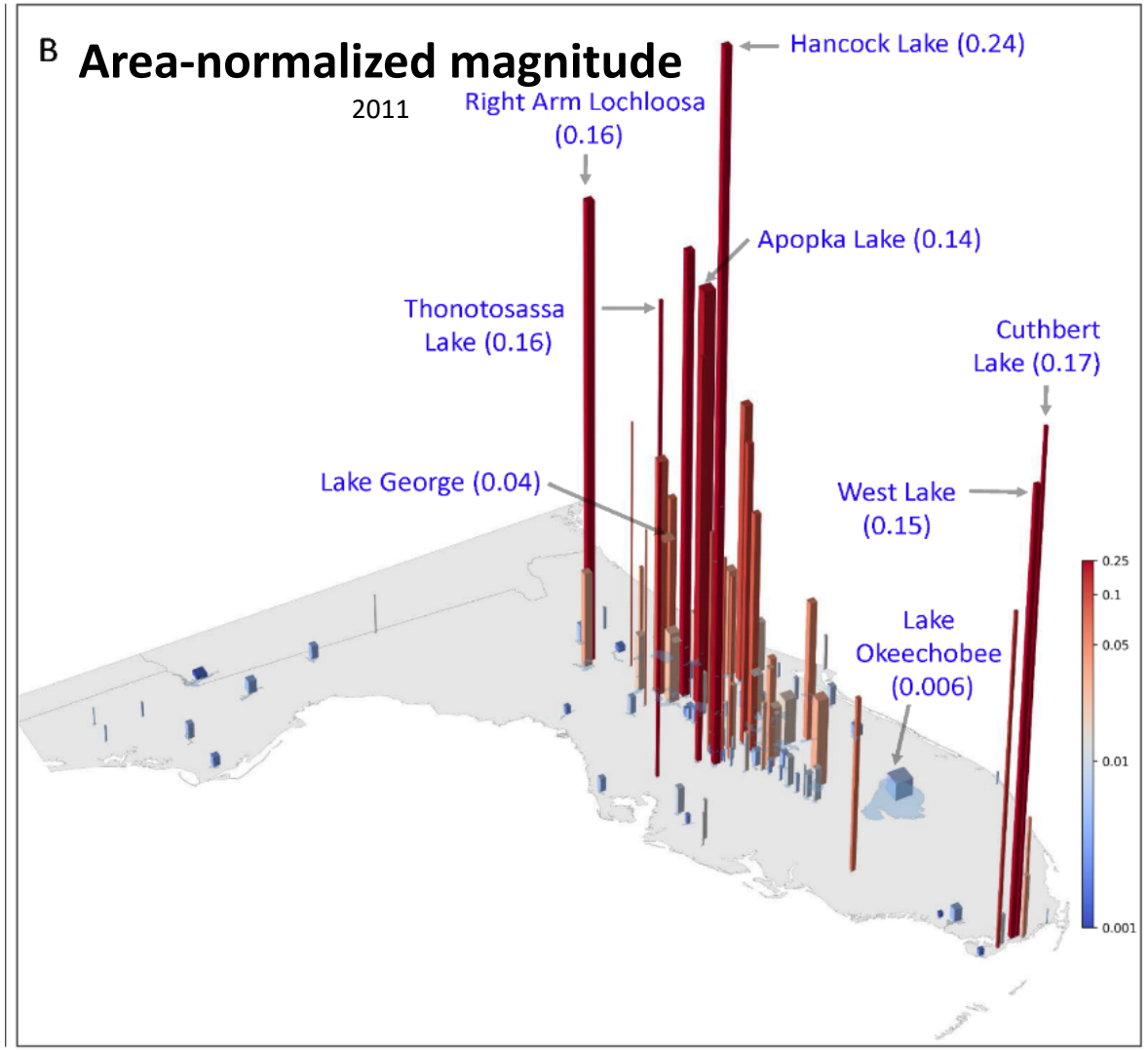


We can examine the annual magnitude (seasonal average)



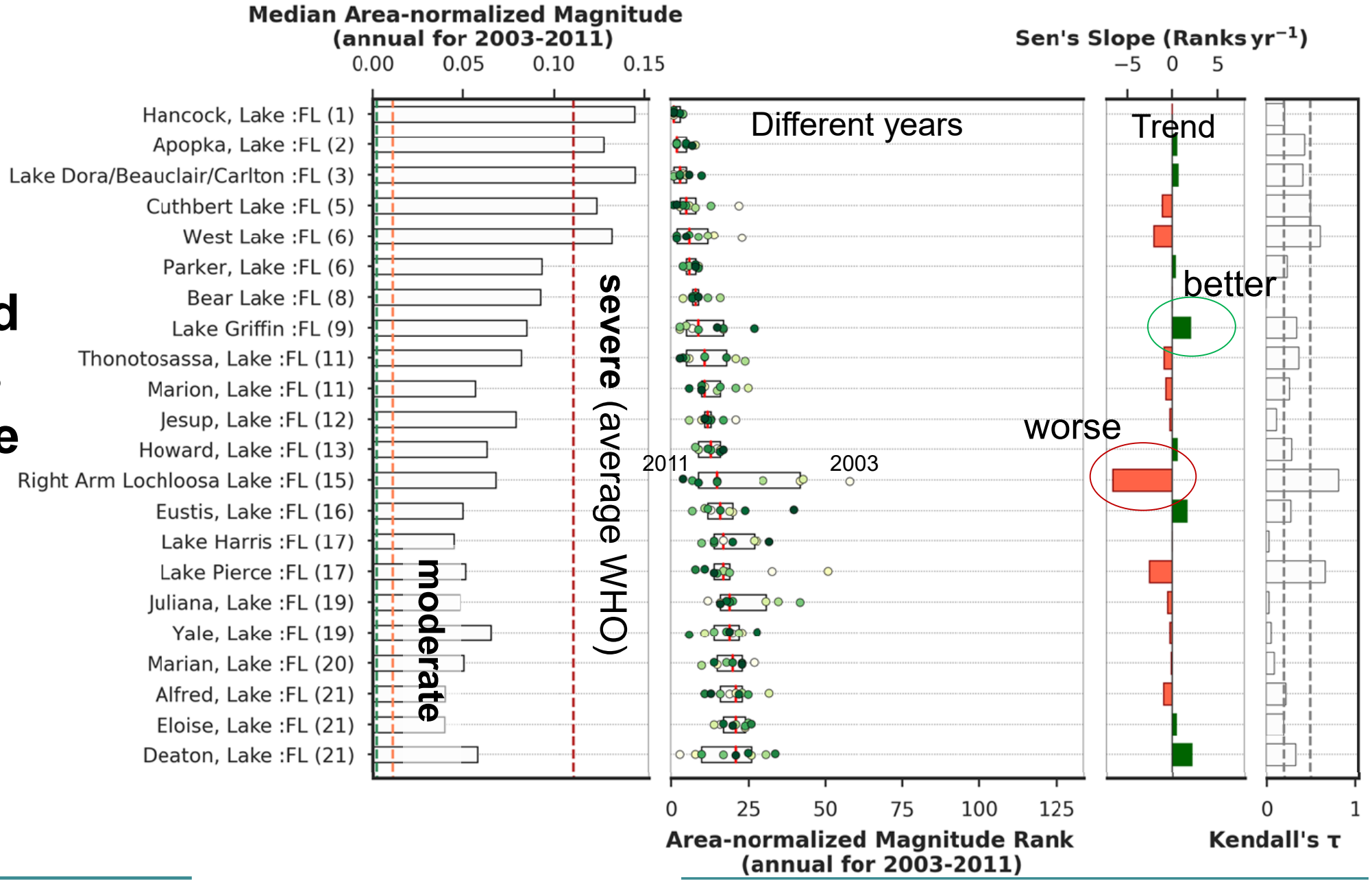
Different lakes: Bloom magnitude from satellite





Nature Scientific Reports, Mishra, Stumpf et al. 2019

Assess and rank lakes and relative trends



Karenia brevis "red tide"

The New York Times

UPDATE

A Red Tide on Florida's Gulf Coast Has Been a Huge Hit to Tourism

Though an algae bloom on the coast is improving, locals and business owners say it may be too little, too late.

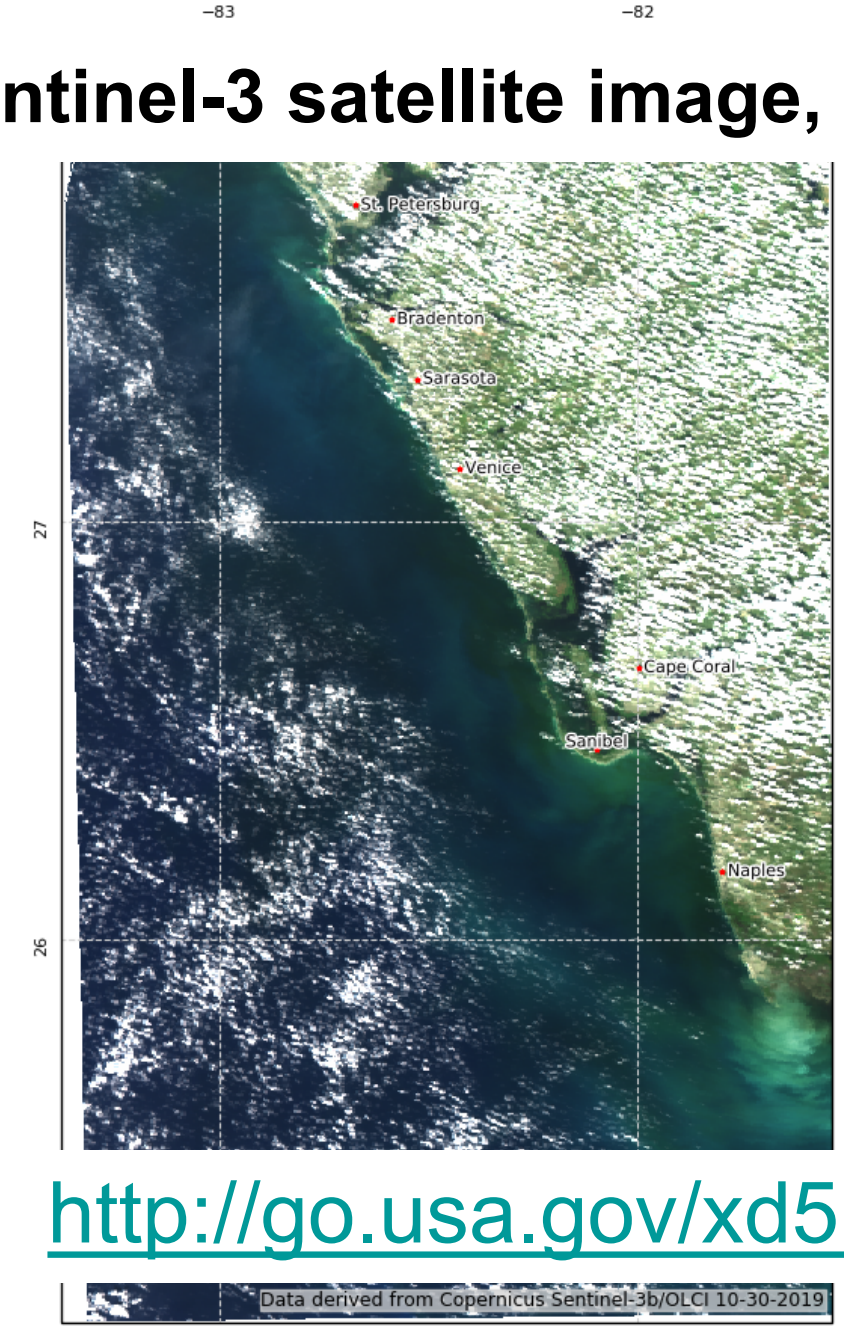
Example Sentinel-3 satellite image, Oct 30, 2019

We use chlorophyll-a fluorescence as primary indicator of bloom.

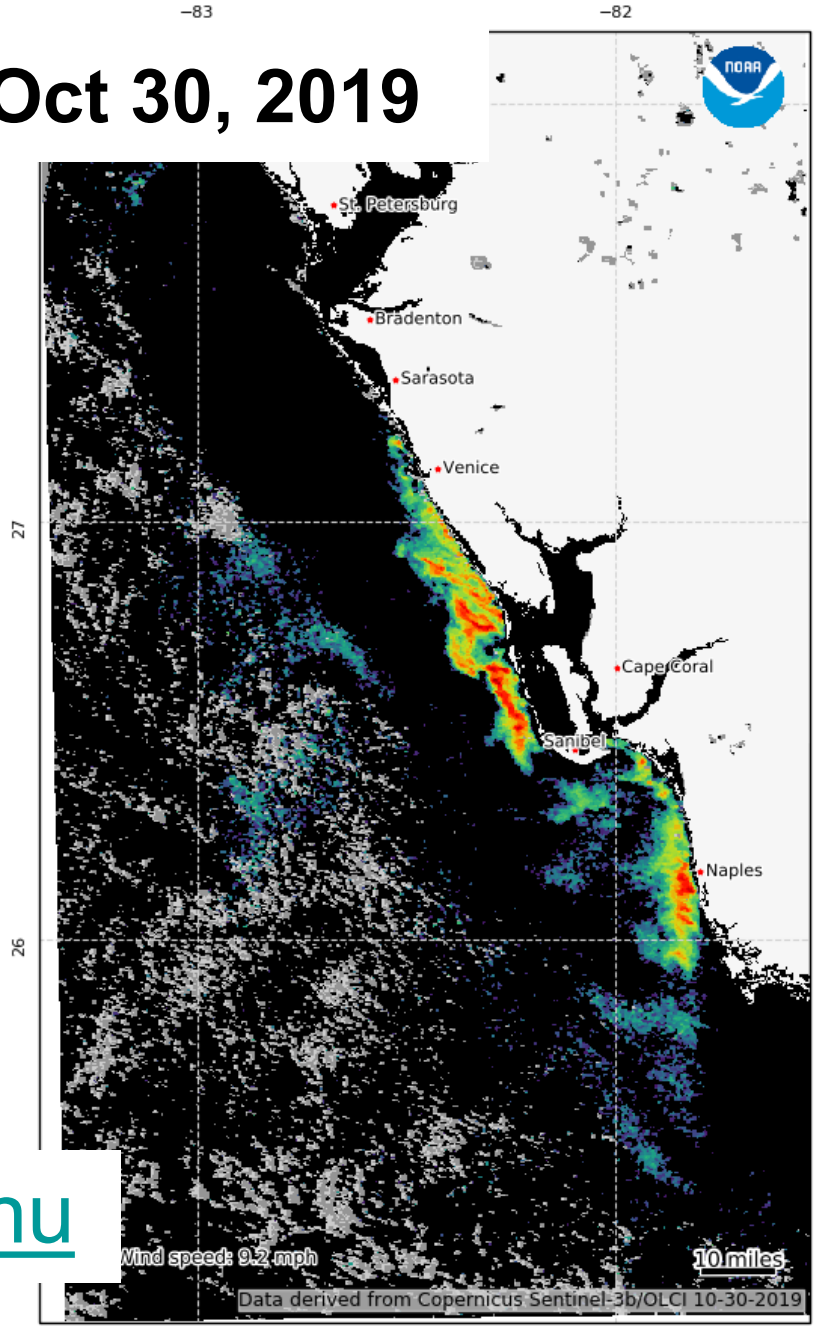
Excludes cyanobacteria

Not specific to *Karenia brevis*.

But summer/fall blooms in Gulf are usually *Karenia*.



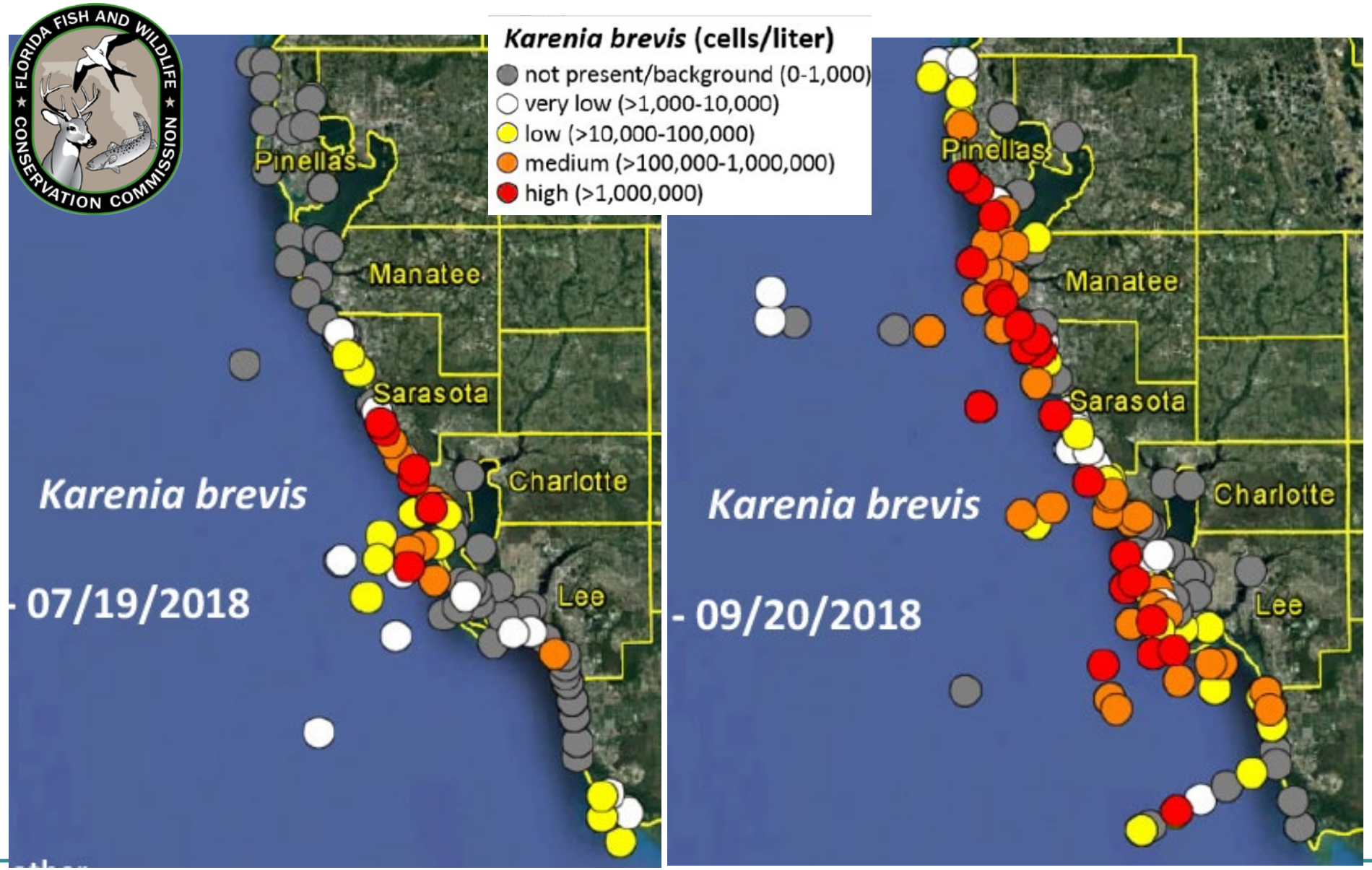
Southwest Flordia true color image derived from the OLCI sensor on Copernicus Sentinel-3b obtained from EUMETSAT.



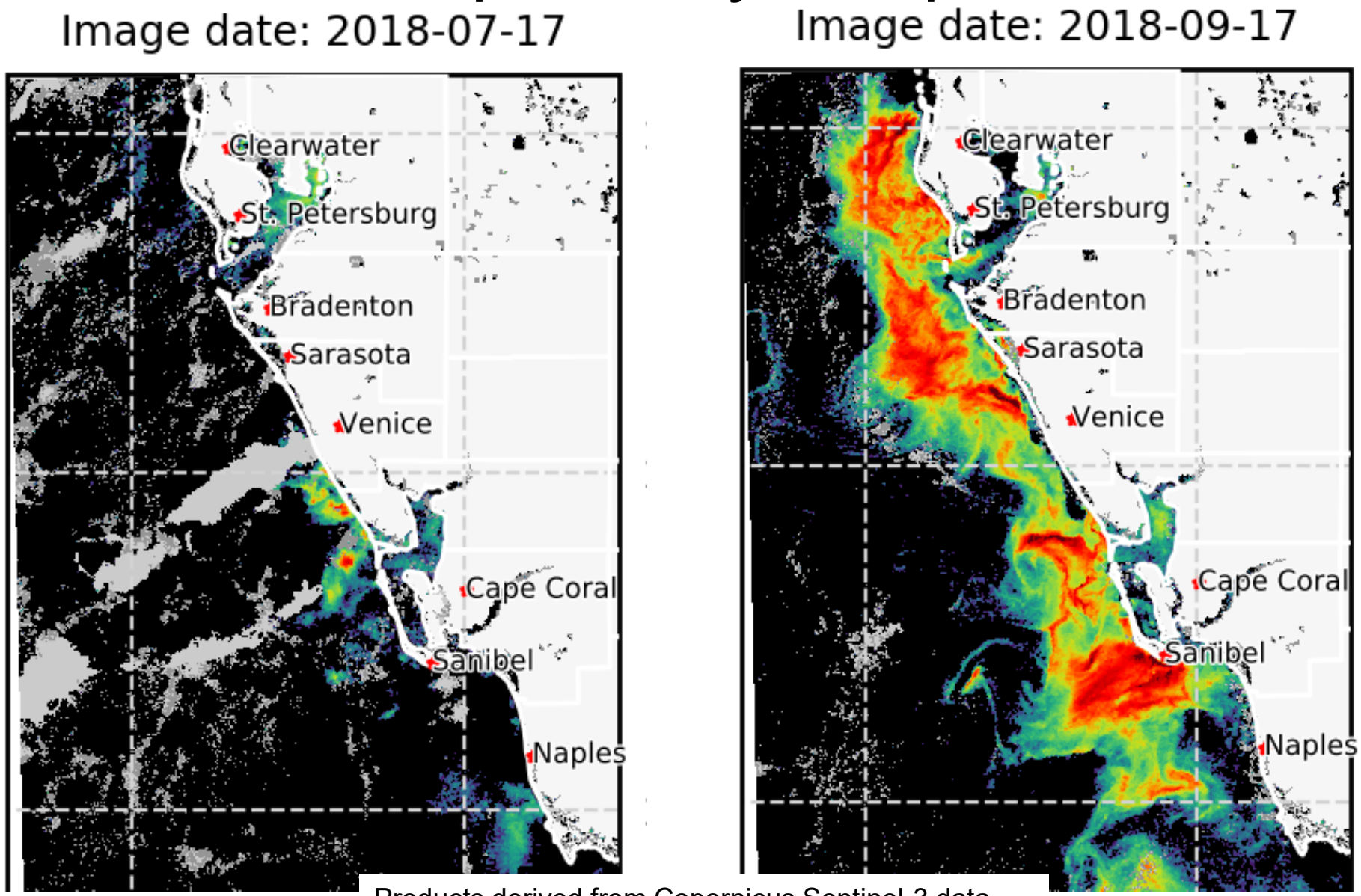
Red Band Difference (RBD) showing relative fluorescence from high (red) to low (violet). A median filter was applied to remove speckle. Winds from NOAA NDBC station VENF1.

http://go.usa.gov/xd5nu

Karenia "red tide" bloom comparison July and Sep 2018

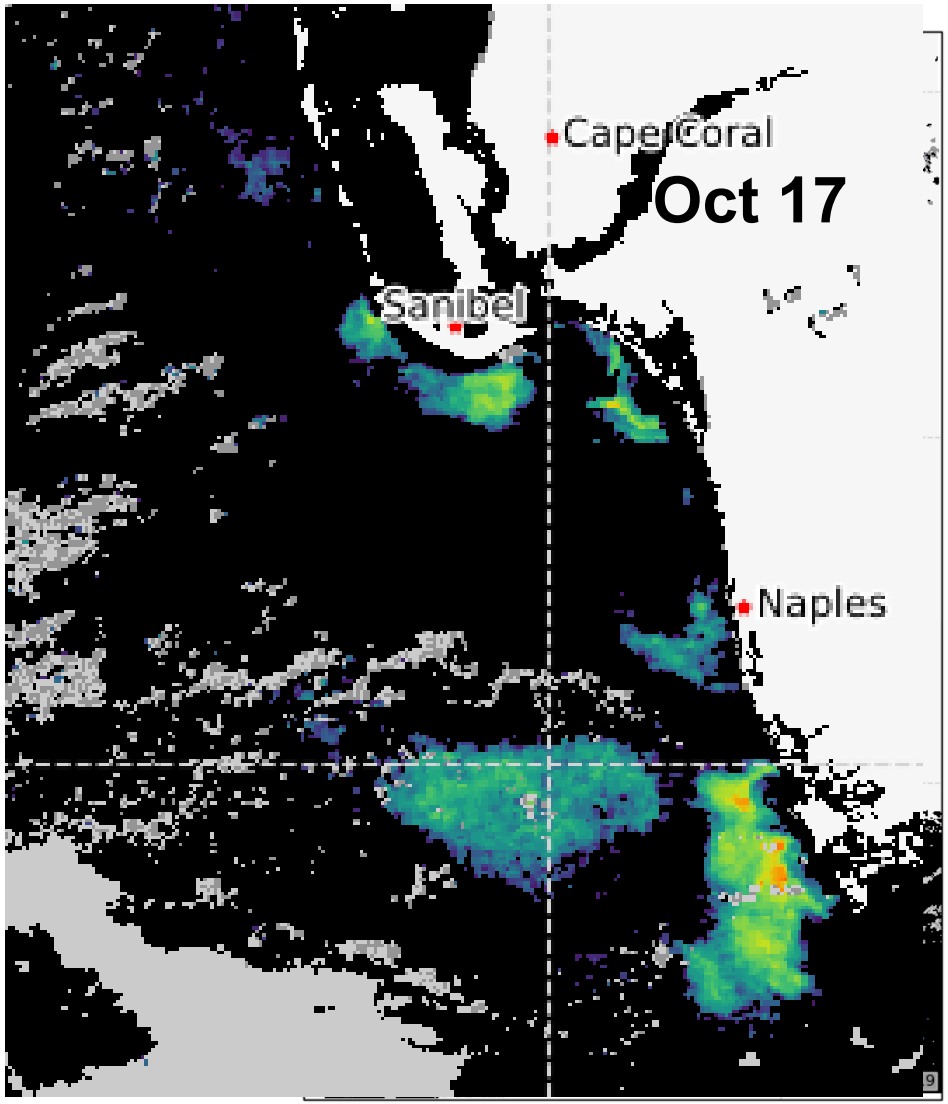


Karenia brevis "red tide" satellite bloom comparison July and Sep 2018

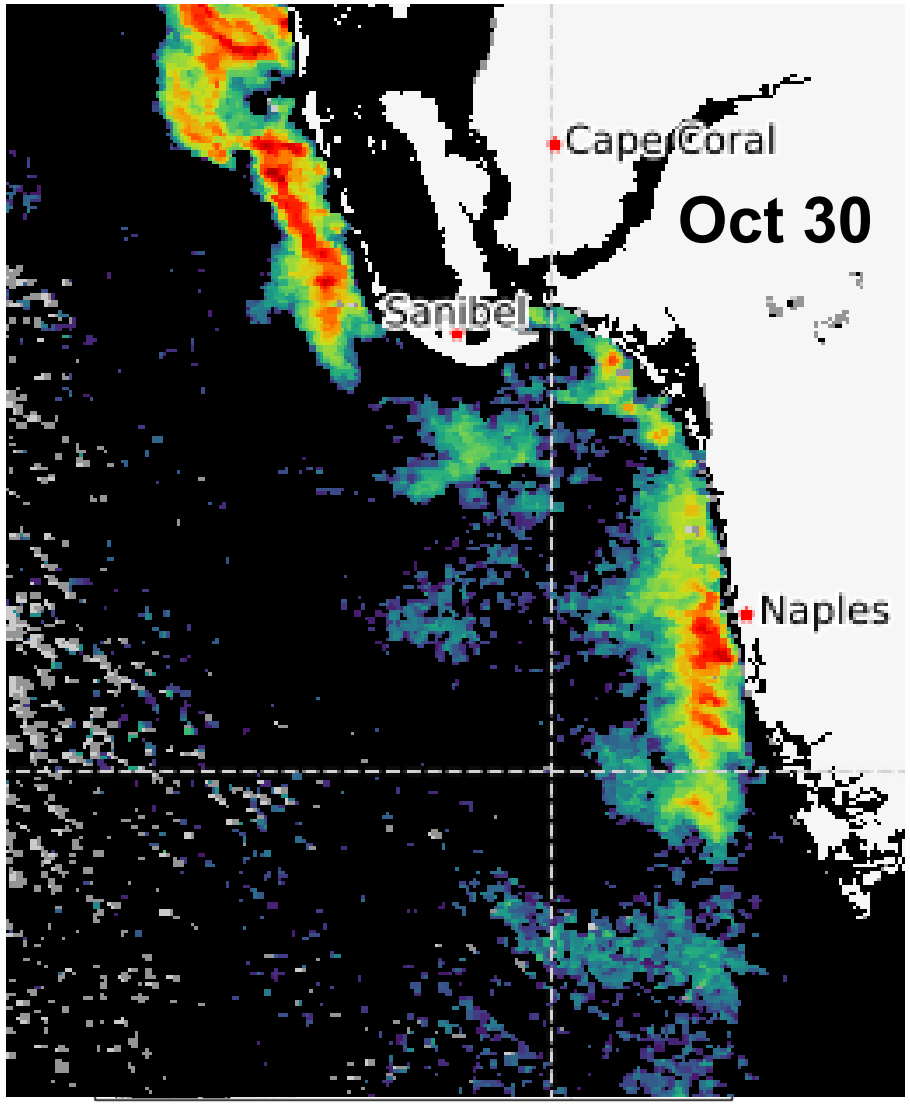


Products derived from Copernicus Sentinel-3 data

Karenia brevis "Red tide" Oct 2019



Red Band Difference (RBD) showing relative fluorescence from high (red) to low (violet). A median filter was applied to remove speckle. Winds from NOAA



Red Band Difference (RBD) showing relative fluorescence from high (red) to low (violet). A from NOAA NDBC station VENF1.

https://go.usa.gov/xd5nu

Nearly daily updates available

coastalscience.noaa.gov/research/stressor-impacts-mitigation/hab-monitoring-system/

Apps | Imported From IE | Links | Chart 14820 | viridis

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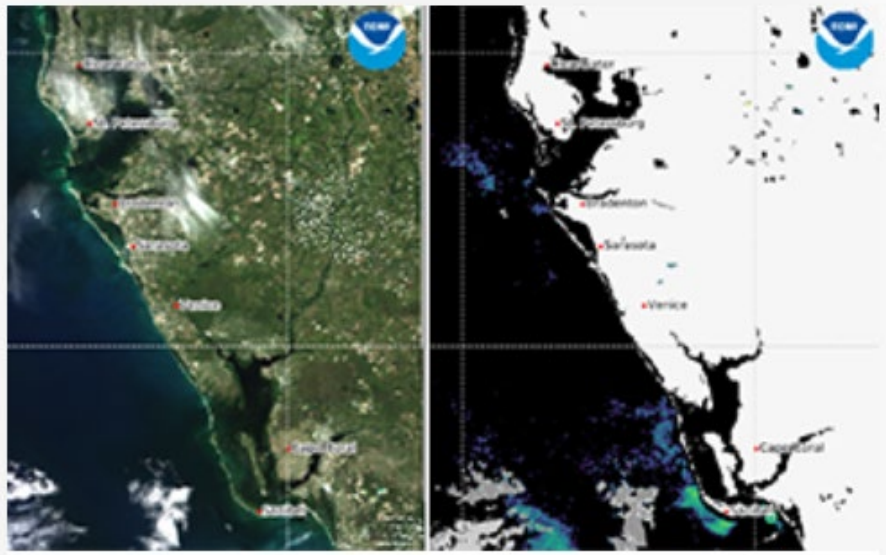
http://go.usa.gov/xd5nu

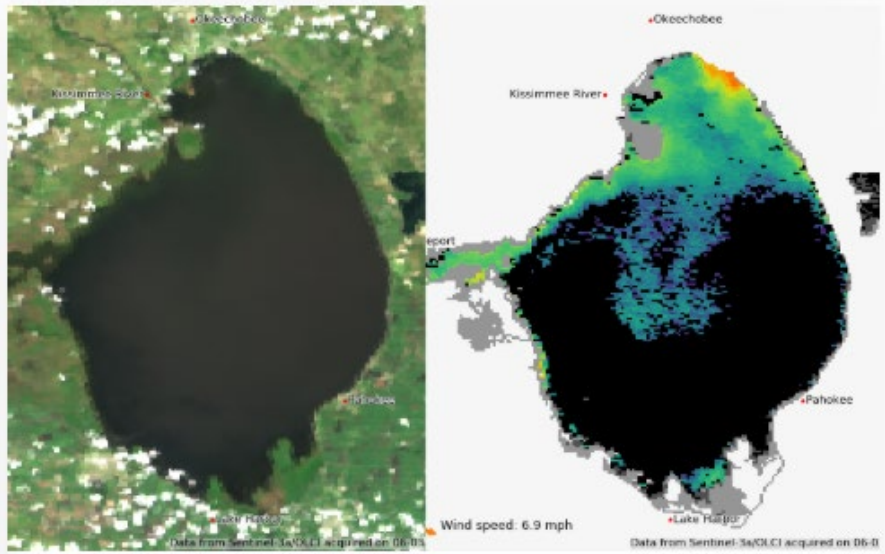
Home > Research > Stressor Impacts and Mitigation > Harmful Algal Bloom Monitoring System

Harmful Algal Bloom Monitoring System

Harmful algal blooms (HABs), sometimes known as "red tide", occur when certain kinds of algae grow very quickly, forming patches, or "blooms", in the water. These blooms can emit powerful toxins which endanger human and animal health. Reported in every coastal state, HABs have caused an estimated $1 billion in losses over the last several decades to coastal economies that rely on recreation, tourism, and seafood harvesting. Blooms can lead to odors that require more costly treatment for public water supplies. NCCOS conducts and funds research that helps communities protect the public and combat blooms in cost-



Southwest Florida



Lake Okeechobee, FL

CYAN

www.epa.gov/water-research/cyanobacteria-assessment-network-cyan

Richard.stumpf@noaa.gov