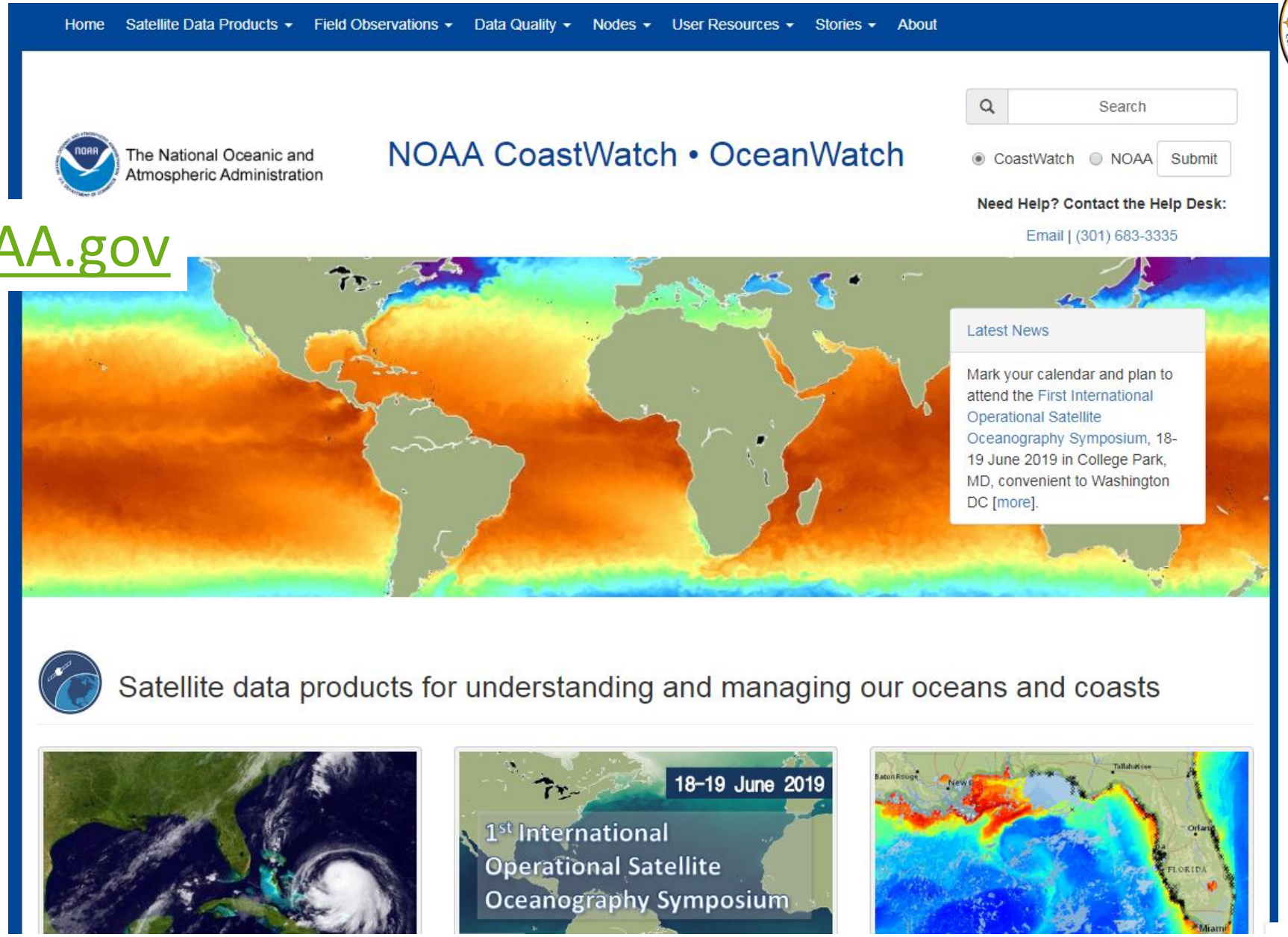
CoastWatch.NOAA.gov

Facilitating the use of ocean/aquatic* satellite data in the value chain from observations to decision-making

***Not just ocean/coastal, but increasingly data for inland waters as well!**

Also polar coverage: Polarwatch.noaa.gov



NOAA/STAR-Oceans & CoastWatch/OceanWatch

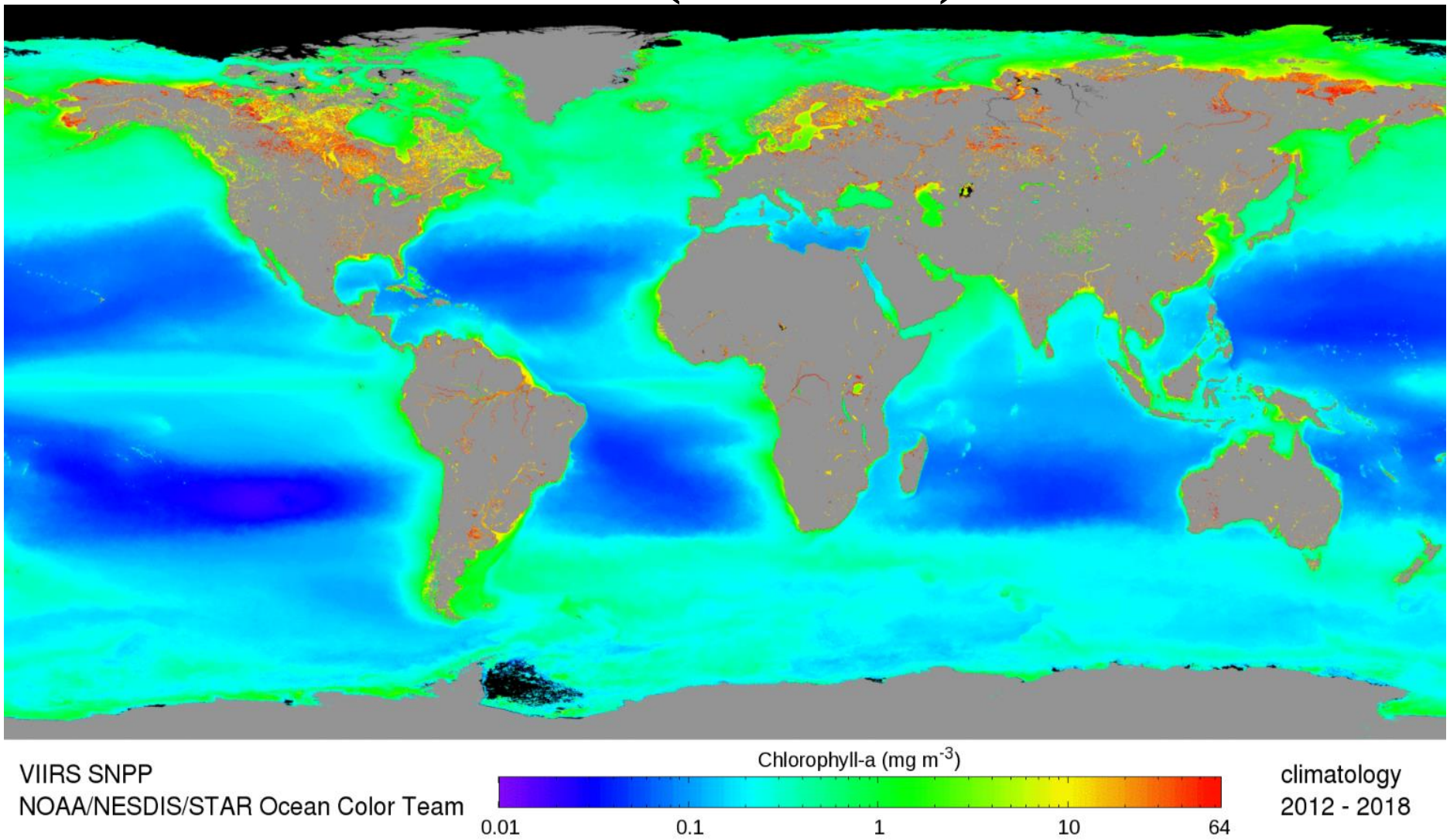
CoastWatch/OceanWatch Data Sets include:

- Ocean/Aquatic Color: VIIRS/NPP, VIIRS/NOAA-20, OLCI, Sentinel-2; L2 and 3; full-res and reduced-res products
- SST: variety of polar, geo and global blended products; L2, 3 and 4; full-res and reduced-res products
- Synthetic Aperture Radar (SAR): multiple sensors, high-res coastal winds, normalized radar cross section data/products
- Ocean Winds: multiple sensors (active/passive); L2, 3; various formats/resolutions available
- Altimetry products: multiple sensors; new processing techniques to provide high spatial res; good for coastal/inland waters!
- Sea ice: multiple sensors, formats, resolutions; also see https://polarwatch.noaa.gov

CoastWatch.NOAA.gov

VIIRS Climatology Ocean Color Product Image

SNPP (2012–2018)

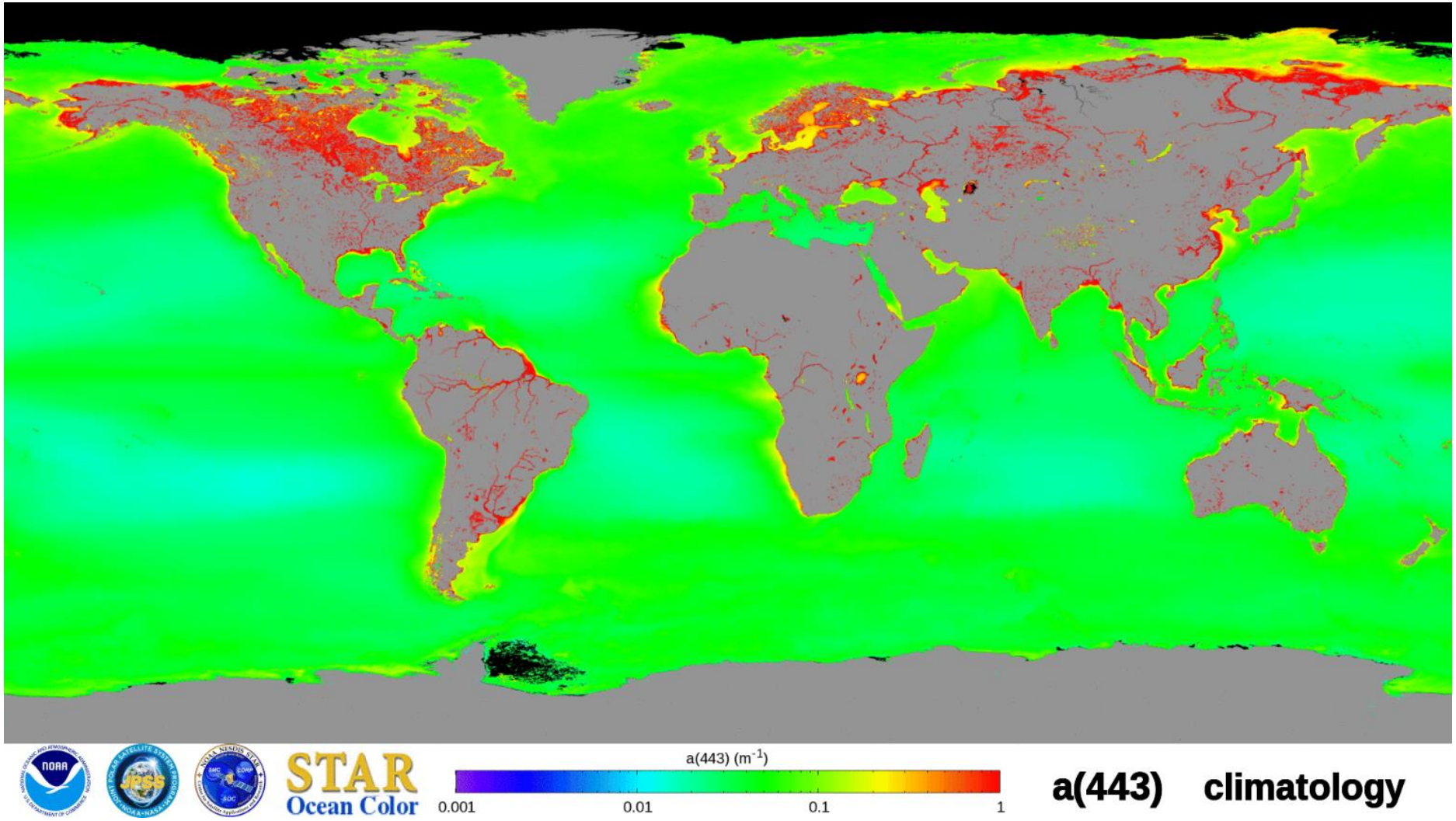


MSL12 with the NIR-SWIR data processing system is used for VIIRS

Menghua Wang, NOAA/NESDIS/STAR

Experimental Ocean Color Product Image (Selected)

SNPP (2012–2018)



MSL12 with the NIR-SWIR data processing system is used for VIIRS

Menghua Wang, NOAA/NESDIS/STAR

Summary of VIIRS Ocean Color EDR Products (Updates)

- **Inputs**:
  - VIIRS M1-M7, I1, and the **SWIR** M8, M10, and M11 bands SDR data
  - Terrain-corrected geo-location file
  - Ancillary meteorology and ozone data
- **Operational (Standard) Products (10)**:
  - Normalized water-leaving radiance (nL_w's) at VIIRS visible bands M1-M5, and **I1 (638 nm)**
  - Chlorophyll-a (Chl-a) concentration
  - Diffuse attenuation coefficient for the downwelling spectral irradiance at the wavelength of 490 nm, $K_d(490)$
  - Diffuse attenuation coefficient of the downwelling photosynthetically available radiation (PAR), $K_d(PAR)$
  - **QA Score** for data quality ($nL_w(\lambda)$ spectra) (*Wei et al.*, 2016)
  - Level-2 quality flags
- **Experimental Products (29):**
  - Inherent Optical Properties (IOP-a, IOP-a_{ph}, IOP-a_{dg}, IOP-b_b, IOP-b_{bp}) at VIIRS M2 or other visible bands (M1-M5) from the Quasi-Analytical Algorithm (QAA) (*Lee et al.*, 2002)
  - Photosynthetically Available Radiation (PAR) (*R. Frouin*)
  - Chl-a from ocean color index (OCI) method (*Hu et al.*, 2012; *Wang and Son*, 2016)
  - Others, e.g., user specific products (e.g., **Chl-a anomaly** and **Chl-a anomaly ratio**)

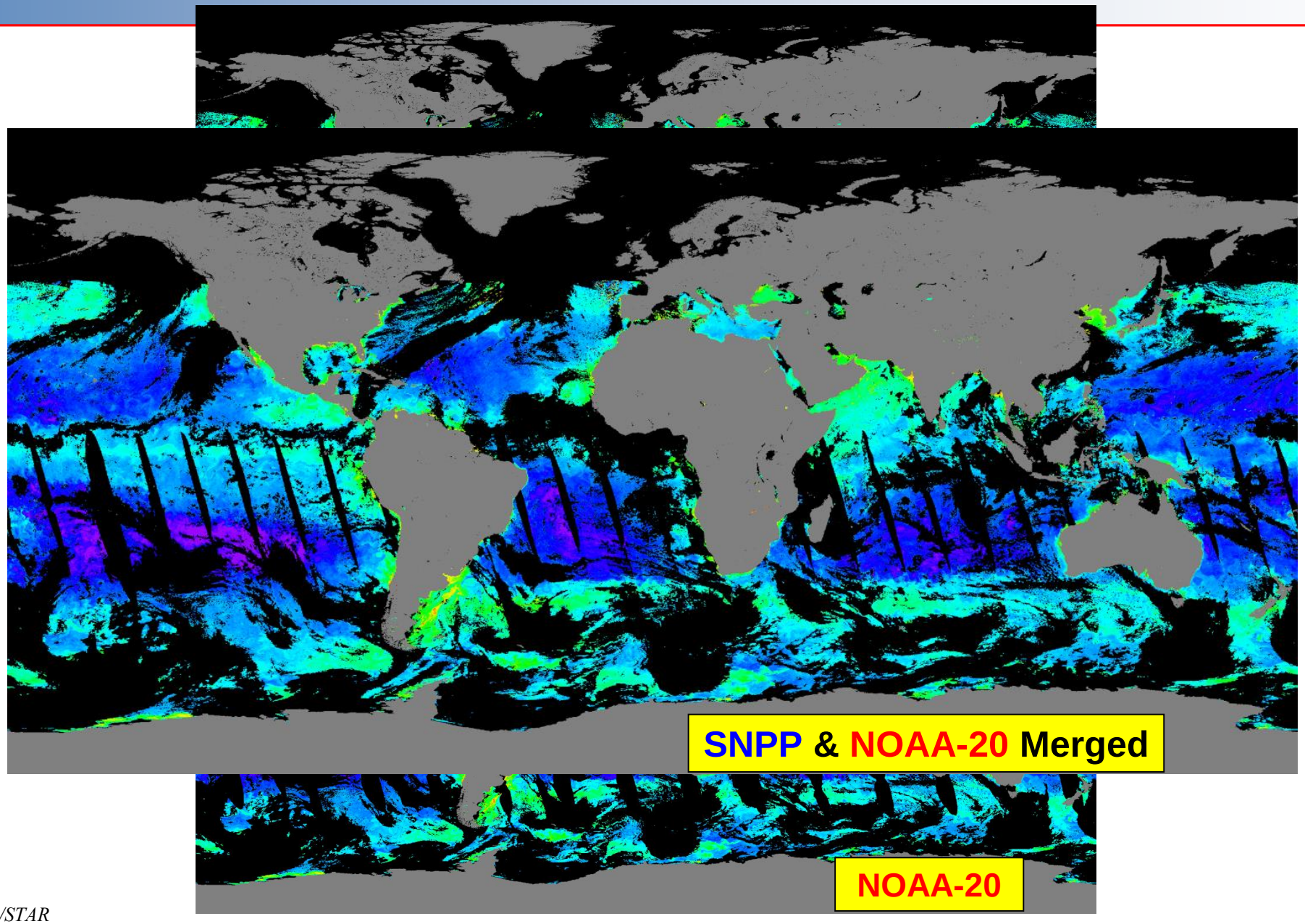
Two Data Streams for VIIRS Ocean Color EDR

To meet requirements from **All** users (operational, research, modeling, etc.), we have been routinely producing VIIRS global ocean color products in **two data streams**: Near-Real-Time (NRT) and Delayed Science-Quality data.

Attribute	Near-Real Time (NRT)	Delayed Science-Quality
Latency:	Best effort, as soon as possible (~12-24h)	Best effort, on 1-2-week delay
Processing System:	MSL12	MSL12
SDR:	IDPS Operational SDR	OC-Improved SDR
Ancillary Data:	Global Forecast System (GFS) Model	Science quality (assimilated; GDAS) from NCEP
Coverage:	May have gaps due to various issues	Complete global coverage
Processed by:	NOAA CoastWatch, transferring to OSPO (operational)	NOAA/STAR
Distributed by:	NOAA CoastWatch, OSPO	NOAA CoastWatch, NCEI
Archive Plans:	Yes, from OSPO to NCEI	Yes, from CoastWatch to NCEI
Full Mission Reprocessing:	No	Yes, every ~2-3 years or as needed

VIIRS-SNPP and NOAA-20 Chl-a Images

(January 6, 2018)



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Phytoplankton Functional Types for Chesapeake Bay

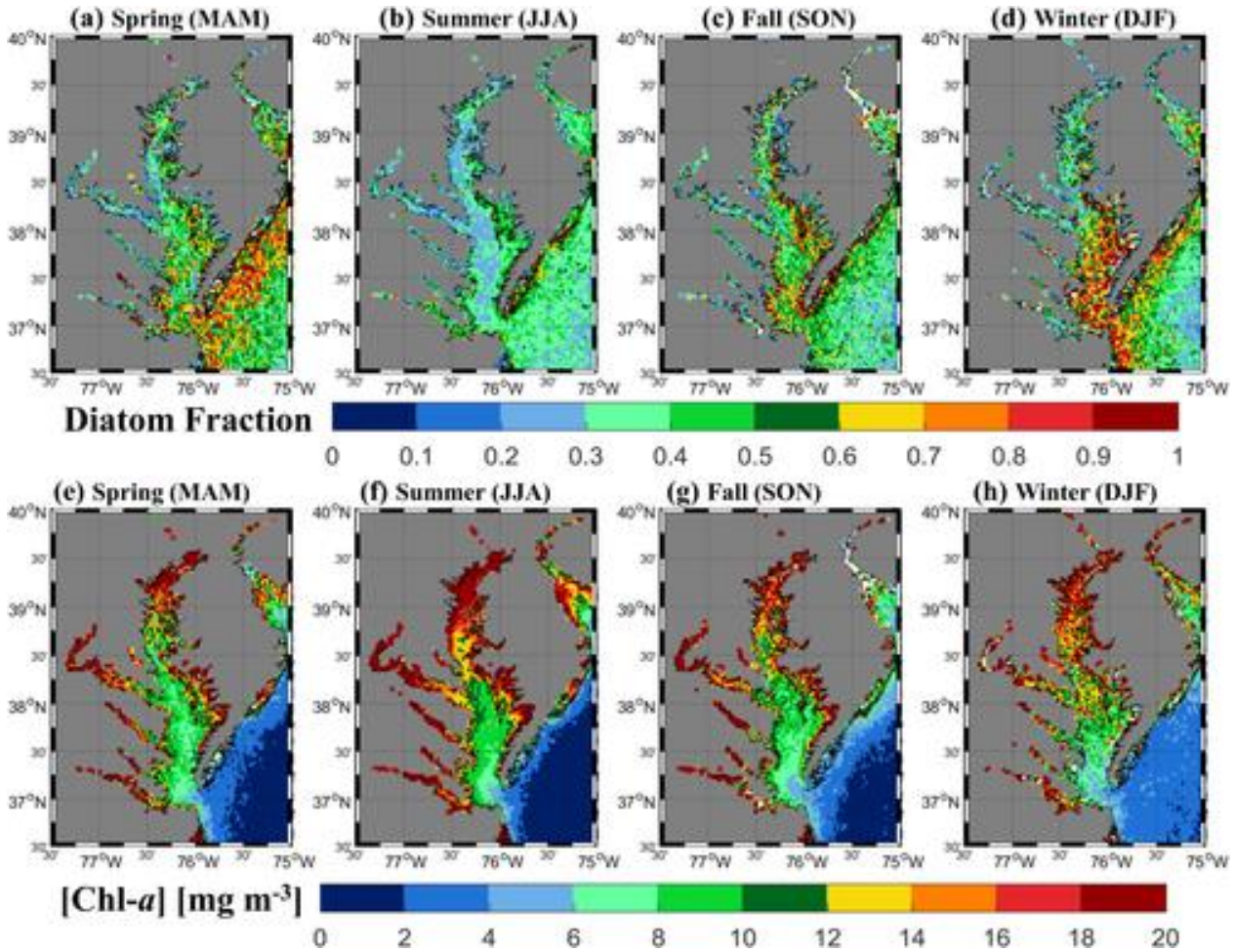

Fig. 5 from paper: Seasonal climatology of diatom fraction (a–d) and [Chl a] (e–h) in the Chesapeake Bay derived from VIIRS data during the period of 2012–2016. The diatom fraction is calculated from GSCM-derived aph(670)/aph(440) ratio using Eq. 1. The [Chl a] is calculated based on GSCM-derived aph(670) using Eq. 2.

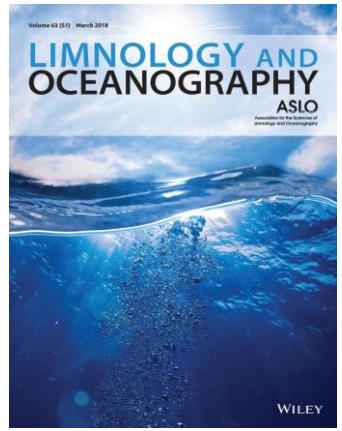

Fig. 5 from Zheng and DiGiacomo, Detecting phytoplankton diatom fraction based on the spectral shape of satellite-derived algal light absorption coefficient, Limnology and Oceanography, Volume: 63, Issue: S1, Pages: S85-S98, First published: 23 October 2017, DOI: (10.1002/lno.10725)

Recent Satellite Water Quality Review from NOAA/STAR-Oceans

Progress in Oceanography 159 (2017) 45–72

Contents lists available at ScienceDirect

Progress in Oceanography

journal homepage: www.elsevier.com/locate/pocean

Review

Uncertainties and applications of satellite-derived coastal water quality products

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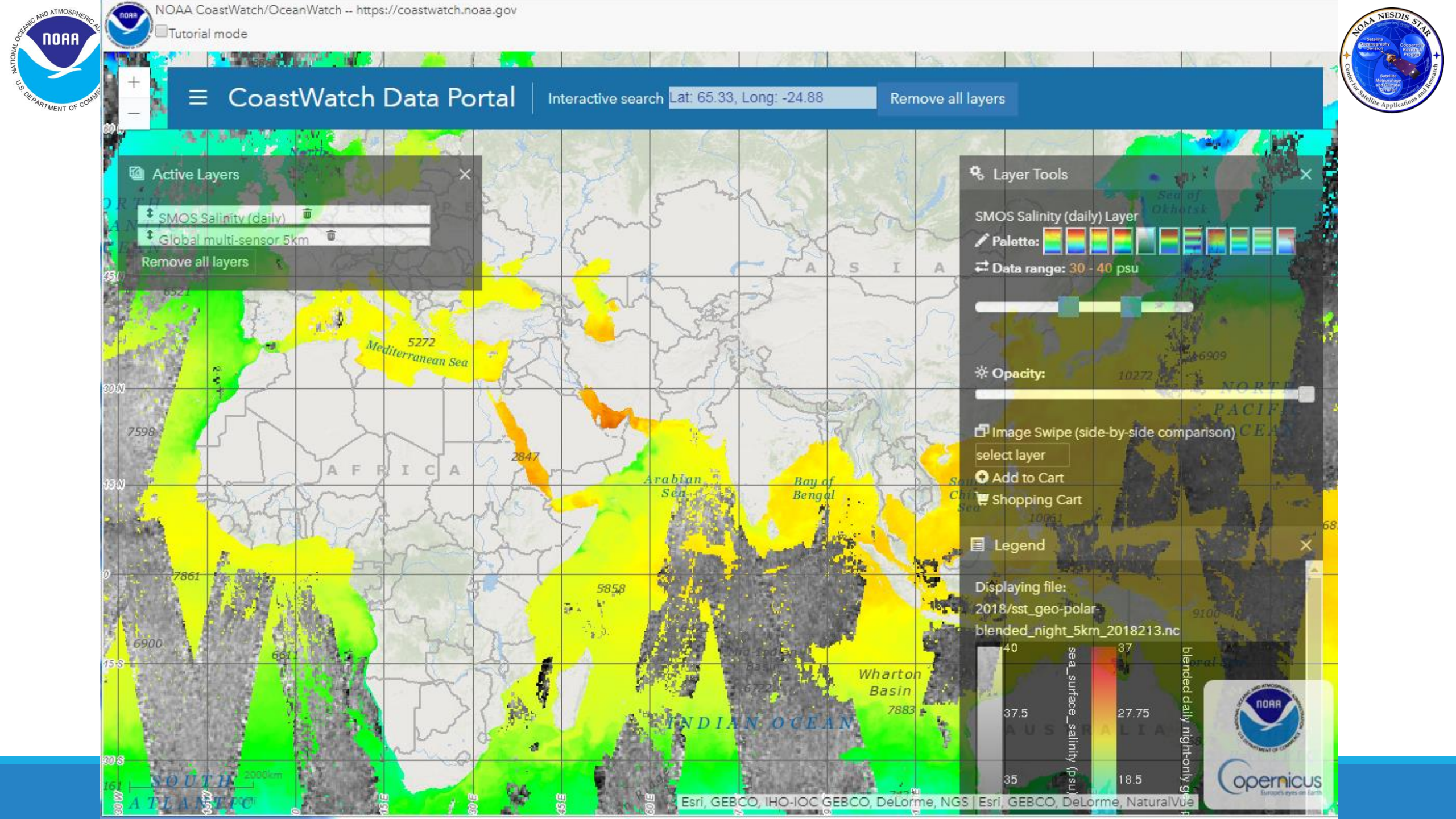
[b] Global Science & Technology, Inc., 7855 Walker Drive, Suite 200, Greenbelt, MD 20770, USA

ARTICLE INFO

Keywords:
Light absorption
Light scattering
Light backscattering
Water leaving radiance
Remote-sensing reflectance
Water quality
Pollutants
Pathogens
Chlorophyll
Suspended particles

ABSTRACT

Recent and forthcoming launches of a plethora of ocean color radiometry sensors, coupled with increasingly adopted free and open data policies are expected to boost usage of satellite ocean color data and drive the demand to use these data in a quantitative and routine manner. Here we review factors that introduce uncertainties to various satellite-derived water quality products and recommend approaches to minimize the uncertainty of a specific product. We show that the regression relationships between remote-sensing reflectance and water turbidity (in terms of nephelometric units) established for different regions tend to converge and therefore it is plausible to develop a global satellite water turbidity product derived using a single algorithm. In contrast, solutions to derive suspended particulate matter concentration are much less generalizable; in one case it might be more accurate to estimate this parameter based on satellite-derived particulate backscattering coefficient, whereas in another the nonagal particulate absorption coefficient might be a better proxy. Regarding


NOAA CoastWatch/OceanWatch -- https://coastwatch.noaa.gov
Tutorial mode
CoastWatch Data Portal
Interactive search
Lat: 65.33, Long: -24.88
Remove all layers
Active Layers
SMOS Salinity (daily)
Global multi-sensor 5km
Remove all layers
Layer Tools
SMOS Salinity (daily) Layer
Palette:
Data range: 30 - 40 psu
Opacity:
Image Swipe (side-by-side comparison)
select layer
Add to Cart
Shopping Cart
Legend
Displaying file:
2018/sst_geo-polar-blended_night_5km_2018213.nc
40
37.5
35
37
27.75
18.5
sea_surface_salinity (psu)
blended daily night-only g
Mediterranean Sea
Arabian Sea
Bay of Bengal
Wharton Basin
INDIAN OCEAN
AFRICA
ASIA
SOUTH ATLANTIC
Esri, GEBCO, IHO-IOC GEBCO, DeLorme, NGS | Esri, GEBCO, DeLorme, NaturalVue

National Oceanic and Atmospheric Administration
U.S. Department of Commerce

Oceanwatch Monitor (OM)

Satellite data products for understanding and managing our oceans and coasts

Oceanwatch | Ocean Color | Sea Surface Height | Sea Surface Salinity | Sea Surface Temperature | Sea Surface Wind | About

Oceanwatch > OM > SSH Home

Oceanwatch Monitor

- Data and Regions 3
  - Satellite Products
  - Reference Data
  - Regions of Interest
- Intra-thematic Plots 4
  - Maps
  - Histograms
  - Timeseries Graphs
  - Dependence Series
- Inter-thematic Plots 3

Event Media (future)
On-Demand (future)
20-min Quickstart Guide

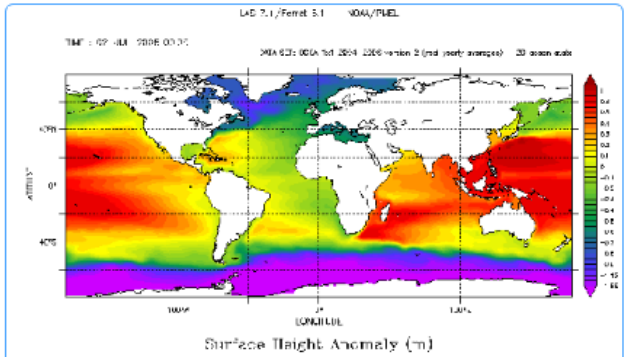
Partners & collaborators

NOAA SOCD Enterprise Oceanwatch Monitor (OM)

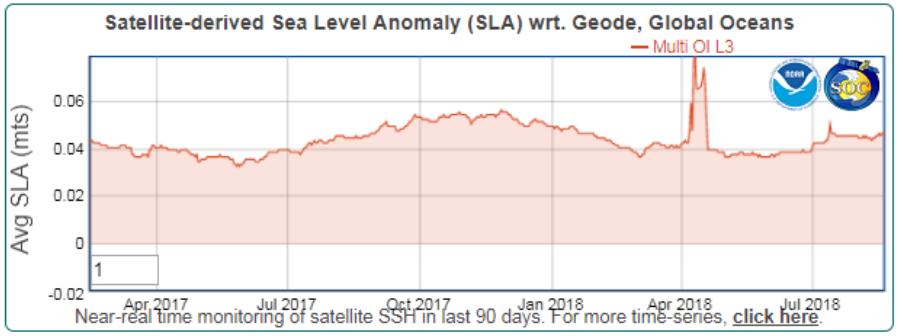
The Oceanwatch Monitor **(OM)** provides a first look at the performances of products ingested in the Oceanwatch systems. These remotely sensed products include: **Sea Surface Temperature (SST)**, **Ocean Color (OC)**, **Sea Surface Height (SSH)**, **Sea Surface Salinity (SSS)** and **Sea Surface Wind (SSW)**.

Sea Surface Height

Satellite altimeters use active radar to observe the surface height of the ocean which is not smooth or flat. Fluid hills and valleys deviate from a reference (mean geoid) height at the ocean surface. These vertical gradients are of interest for sea level rise, storm predictions, ocean currents, ecosystem ecology and other applications.



Latest SSH (click on image to enlarge). More maps, click here.



Near-real time monitoring of satellite SSH in last 90 days. For more time-series, click here.

Ocean Monitor will be incorporated into CoastWatch.NOAA.gov website

The First Operational Satellite Oceanography Symposium

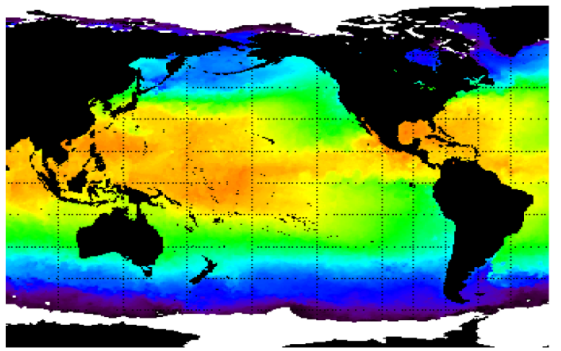
18 & 19 June 2018 here at NCWCP

Aims to

- enable the understanding the barriers (perceived or actual) and
- facilitate the widespread incorporation of satellite ocean observations into the value chain from data to useful information across the range of operational applications.

Satellite operators, information producers and users will exchange facts and ideas to

- understand user needs and expectations, and
- develop interoperability standards and establish best practices that will lead to more universal use of ocean satellite data.
- Not just ocean/coastal but inland waters as well…



18 to 19 June 2019
Washington, DC Area
FIRST INTERNATIONAL OPERATIONAL SATELLITE OCEANOGRAPHY SYMPOSIUM

Satellite remote sensing of ocean properties is a technology of continuously increasing maturity and scope. Sea surface temperature, sea surface height, ocean color, sea ice, ocean winds, roughness-derived parameters (e.g., oil spills) and other measurements are now available on a routine and sustainable basis. Some of these products are integral to operational applications for routine and event-driven environmental assessments, predictions, forecasts and management. Yet ocean satellite data are still underutilized and have a huge potential for contributing further to societal needs and the "blue economy".

The First Operational Satellite Oceanography Symposium aims to enable the understanding the barriers (perceived or actual) and facilitate the widespread incorporation of satellite ocean observations into the value chain from data to useful information across the range of operational applications. In this symposium, an international community of satellite operators, information producers and users will exchange facts and ideas to 1) understand user needs and expectations, and 2) develop interoperability standards and establish best practices that will lead to more universal use of ocean satellite data.

EUMETSAT

NOAA Center for Weather and Climate Prediction

18 & 19 June 2019
College Park, MD USA

Convenient access from Washington DC

HTTPS://CoastWatch.NOAA.gov/OSOSymposium

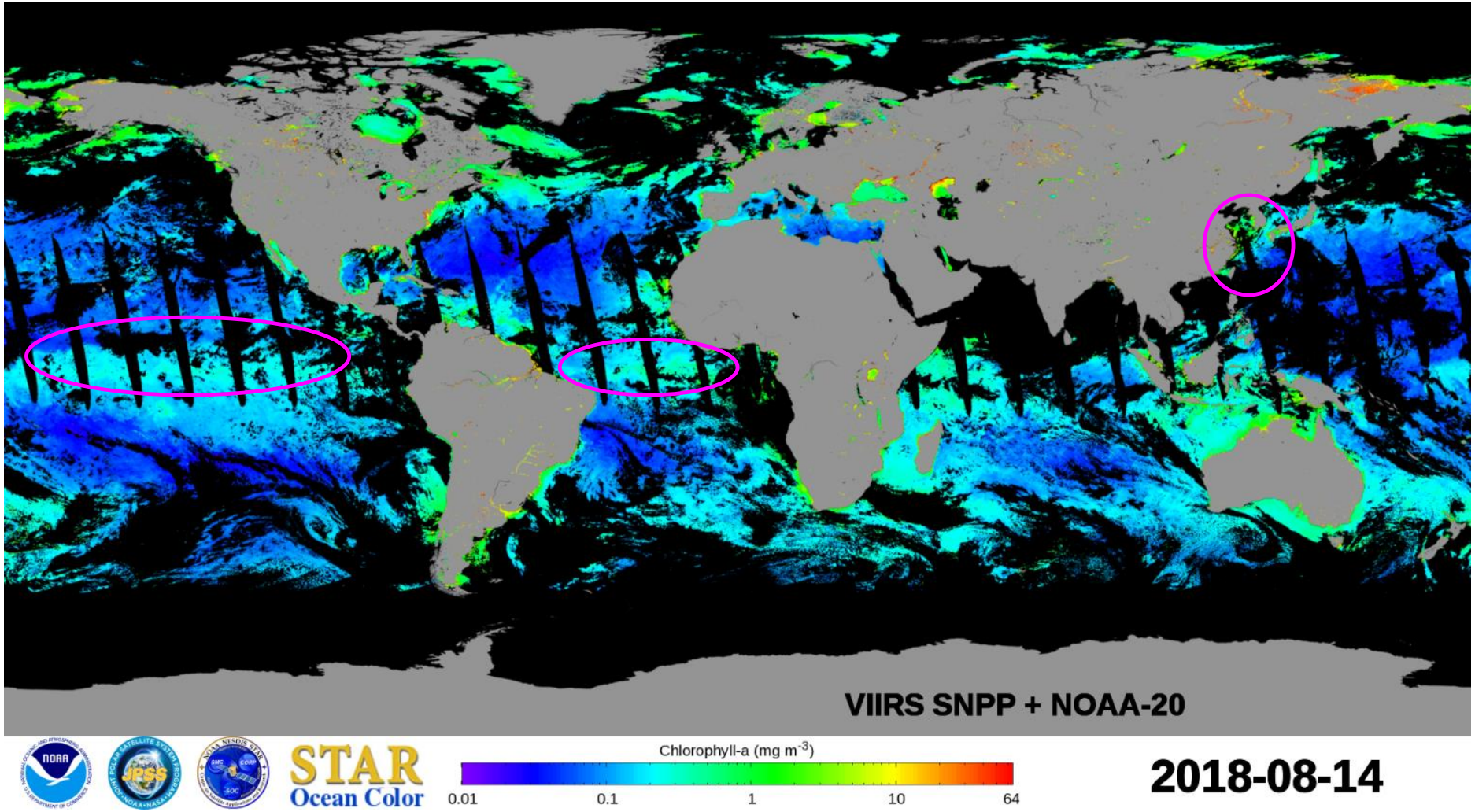
STEERING COMMITTEE
Bojan Bojkov (EUMETSAT)
Christopher Brown (NOAA)
Paul DiGiacomo (NOAA)
Veronica Lance (NOAA)
Francois Montagner (EUMETSAT)

Posted 24 May 2018 – More details to follow

Prior to the symposium, an ocean satellite data training course for users will also be held!

Back-up slides as time permits

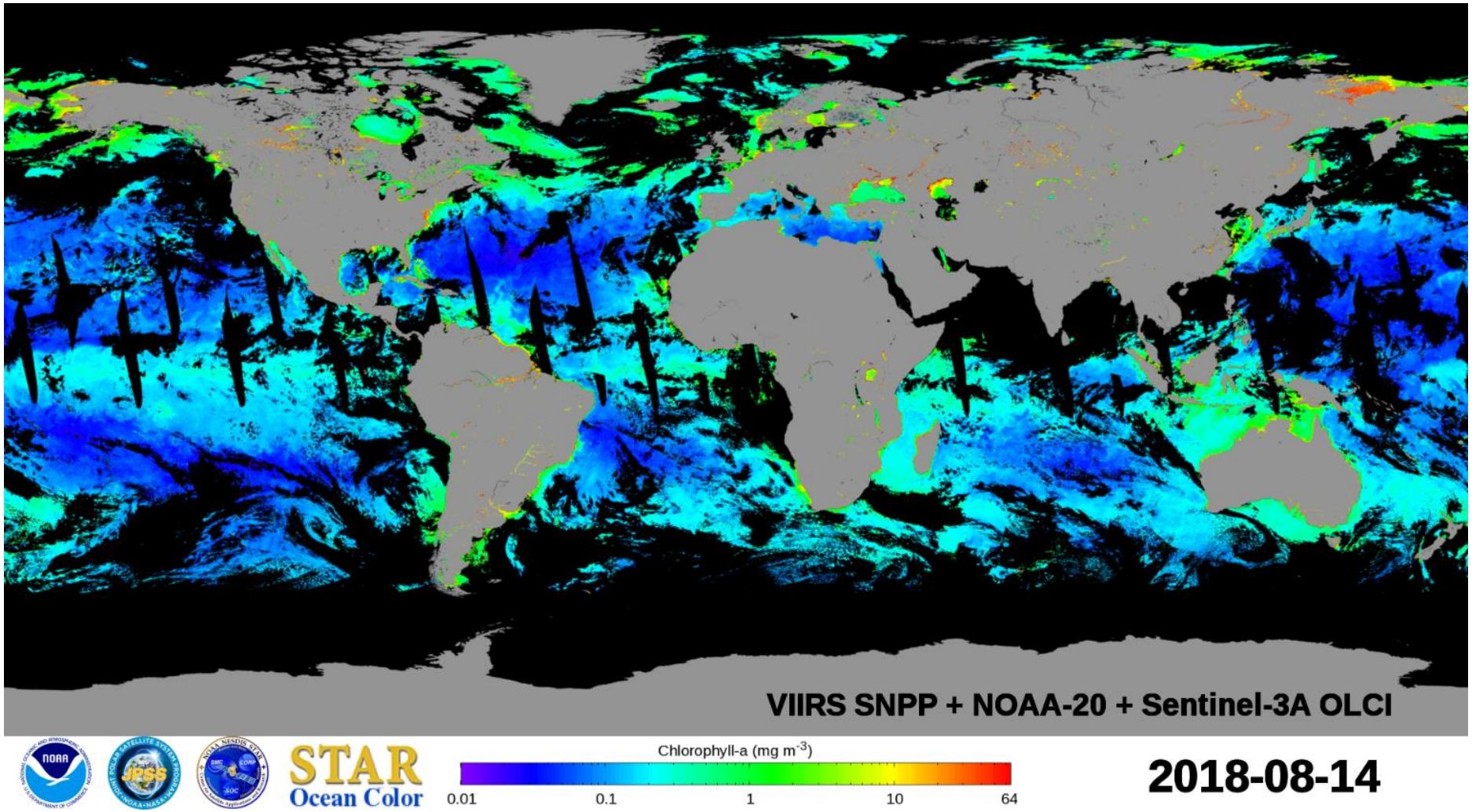
VIIRS SNPP and NOAA-20 Merged Global Chl-a
(August 14, 2018)



Global VIIRS merged Chl-a from SNPP/NOAA-20 are routinely produced

Menghua Wang, NOAA/NESDIS/STAR

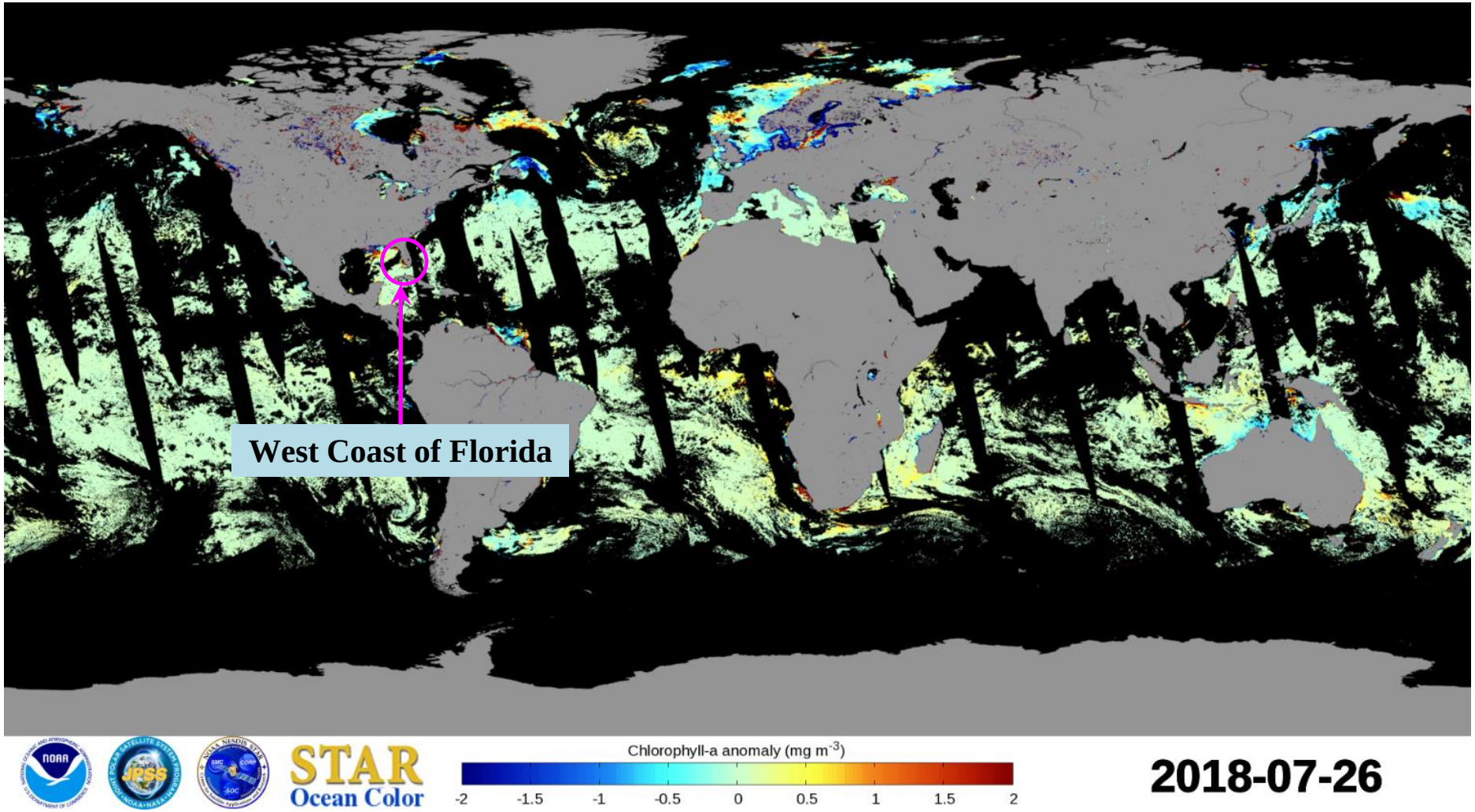
VIIRS SNPP, NOAA-20, Sentinel-3A OLCI Merged Global Chl-a (August 14, 2018)



Ocean color data from the THREE sensors are all derived using the same MSL12!

Menghua Wang, NOAA/NESDIS/STAR

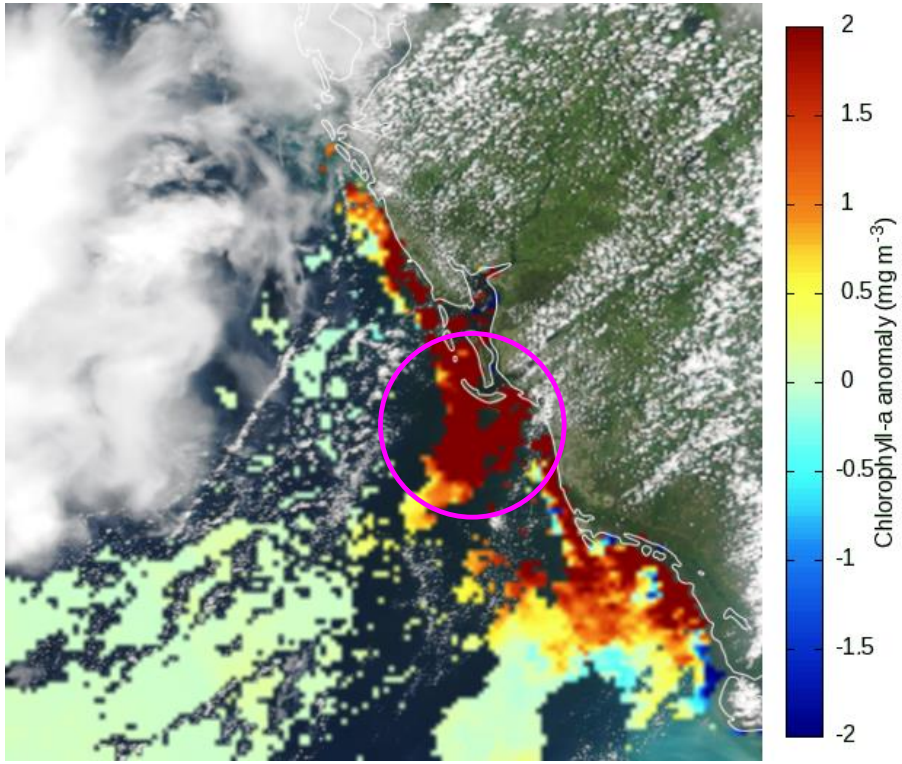
VIIRS-SNPP Chl-a Anomaly
(July 26, 2018)



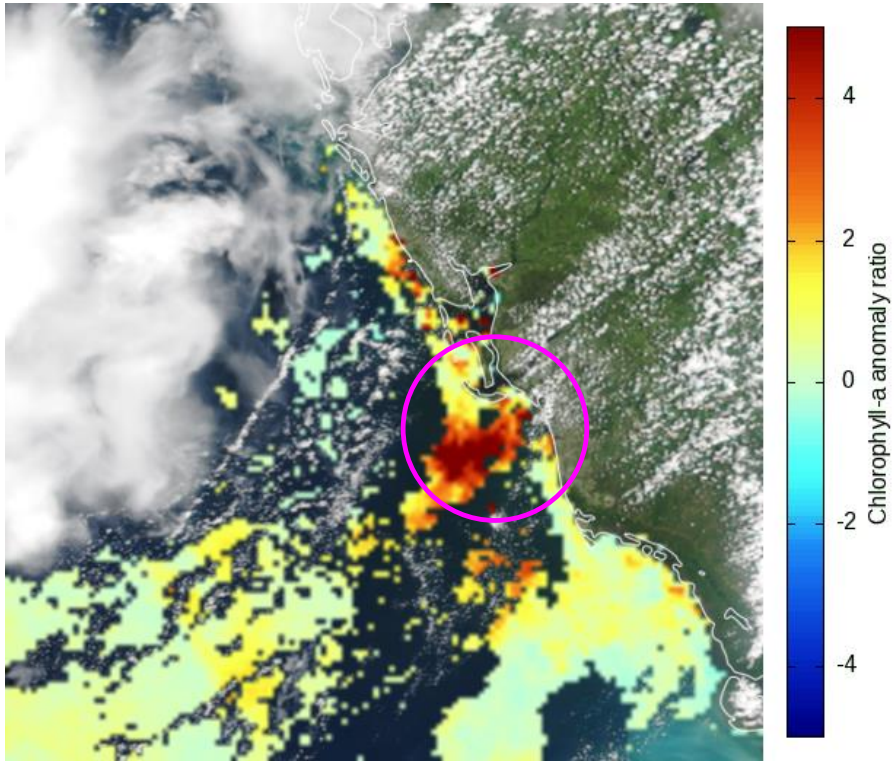
Global daily NRT Chl-a anomaly and anomaly ratio are *Routinely* produced

Menghua Wang, NOAA/NESDIS/STAR

High Chl-a Anomaly Linked to HAB in the West Coast of Florida (July 26, 2018)



Chl-a Anomaly



Chl-a Anomaly Ratio

Global NRT Chl-a anomaly and anomaly ratio are routinely produced

Menghua Wang, NOAA/NESDIS/STAR

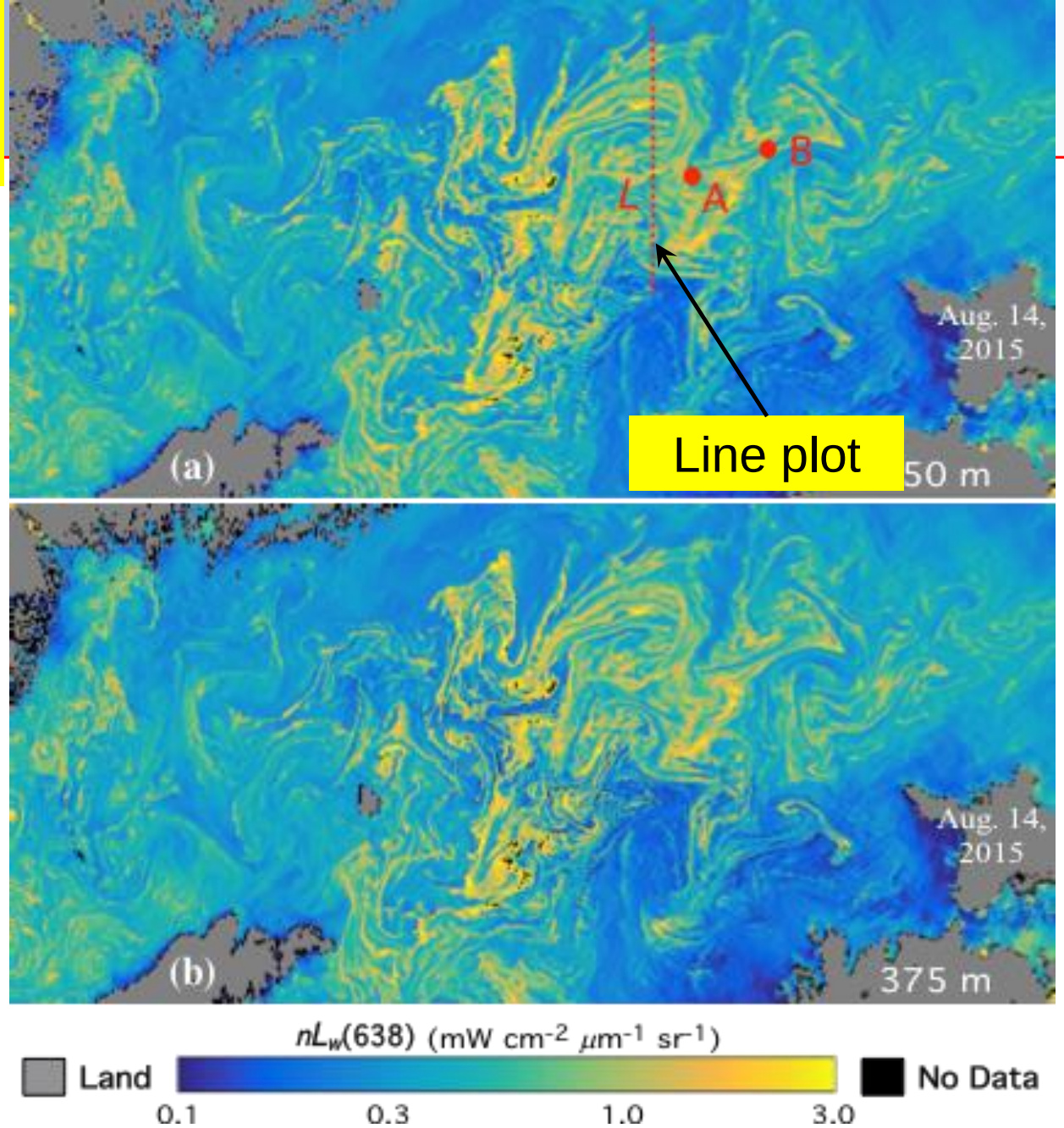
New VIIRS $nL_w(638)$ with Imaging Bands

(Resolution at 375 m)

Example:

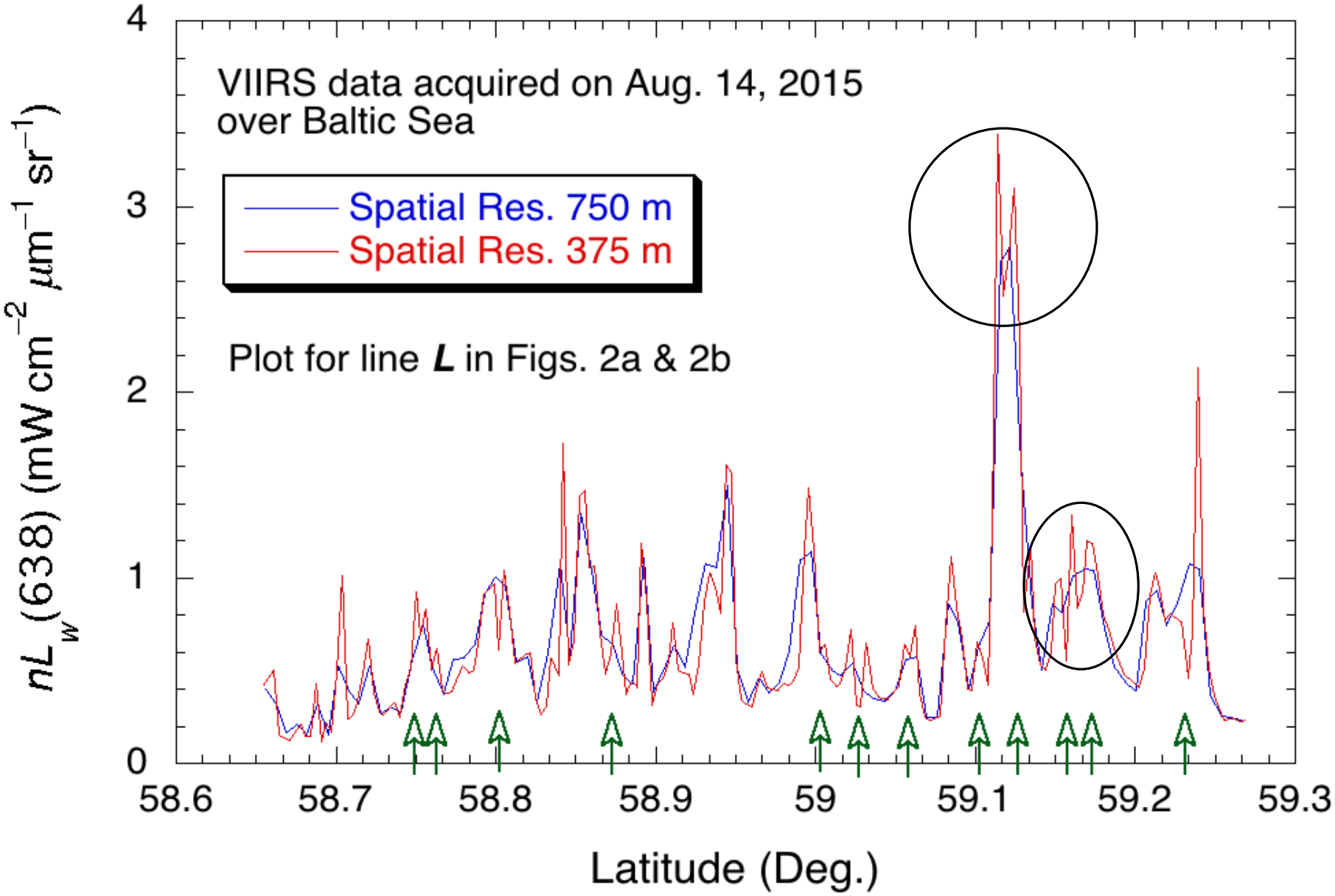
Algae Bloom in the Baltic Sea on August 14, 2015

One can see differences between two images for bloom size < ~500 m, showing high spatial resolution data providing more details for bloom spatial distribution/features



Wang, M. and L. Jiang (2017), "VIIRS-derived ocean color product using the imaging bands", *Remote Sen. Environ.*, **206,** 275–286, 2018. http://dx.doi.org/10.1016/j.rse.2017.12.042

More Detailed Algae Bloom Information Provided by VIIRS High Spatial Resolution (375 m) $nL_w(638)$ Data



Increased spectral coverage with VIIRS new $nL_w(638)$ data, providing important spectral information