NOAA National Environmental Satellite, Data, and Information Service (NESDIS)

NOAA VIIRS data for coastal and ocean research and applications

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VIIRS User Engagement Workshop

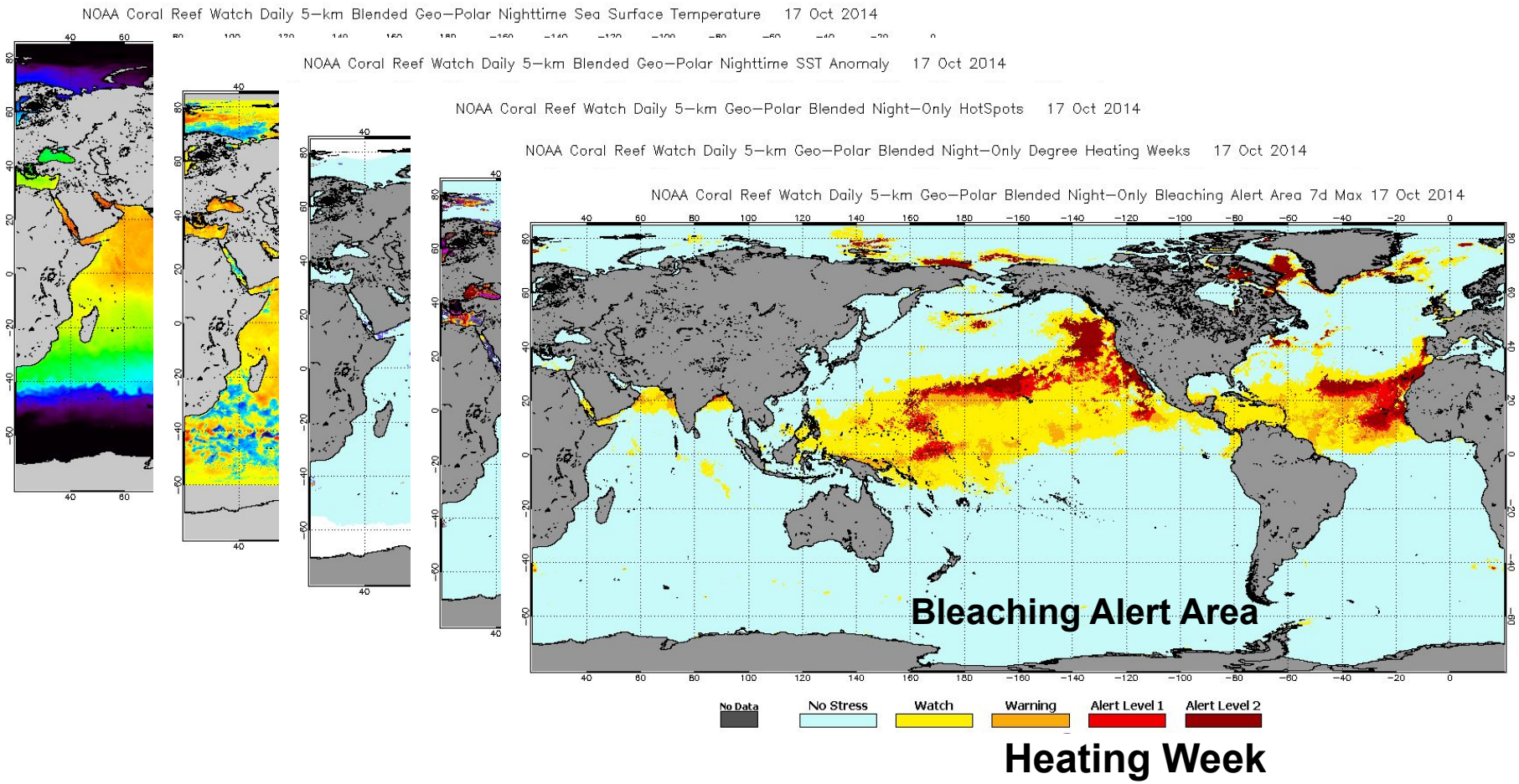
Visible Infrared Imaging Radiometer Suite (VIIRS) for Ocean and Coasts

- Sea Surface Temperature
- Ocean Color
- Sea Ice
- Coastal flood mapping

Coral Reef Watch

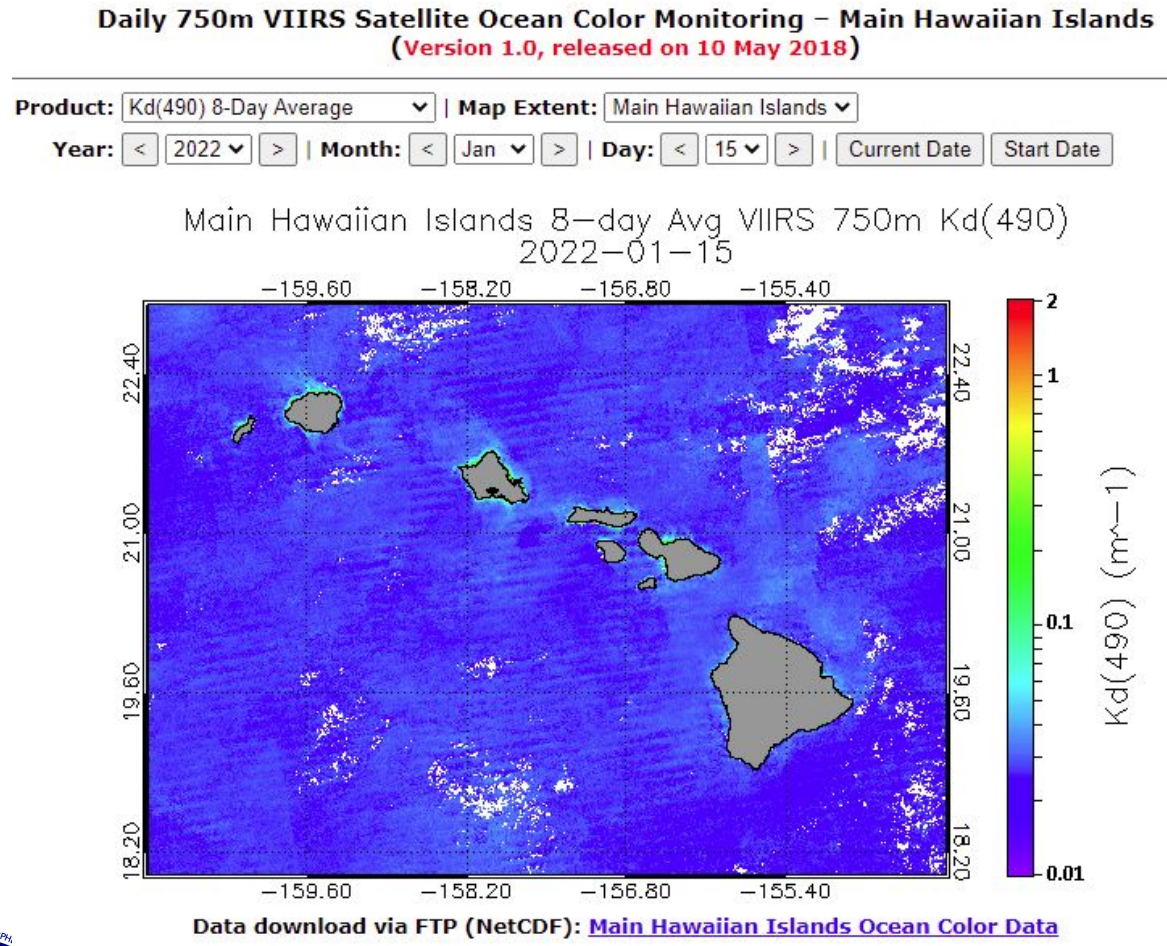
Sea Surface Temperature: Coral Reef Bleaching Alerts

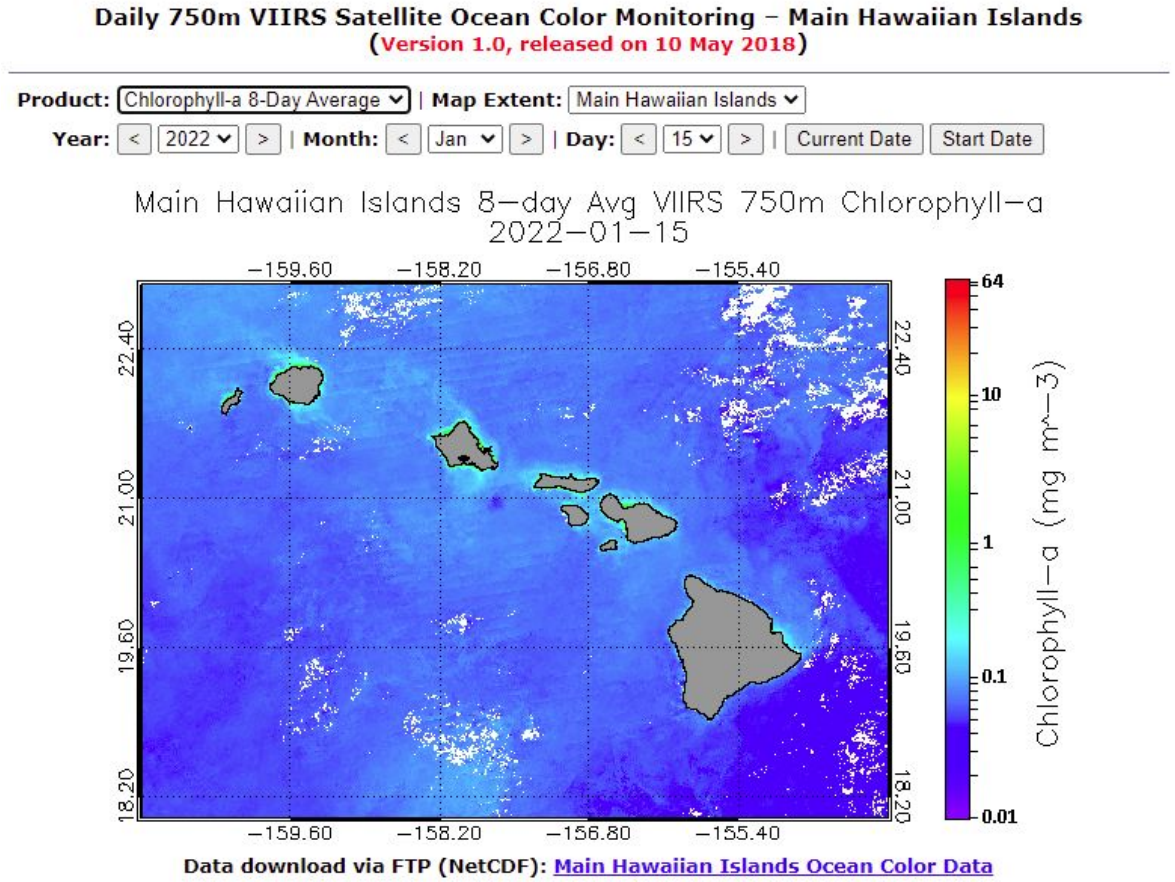
NOAA Geo-polar Blended Sea Surface Temperature Product (Imager + AVHRR + VIIRS)



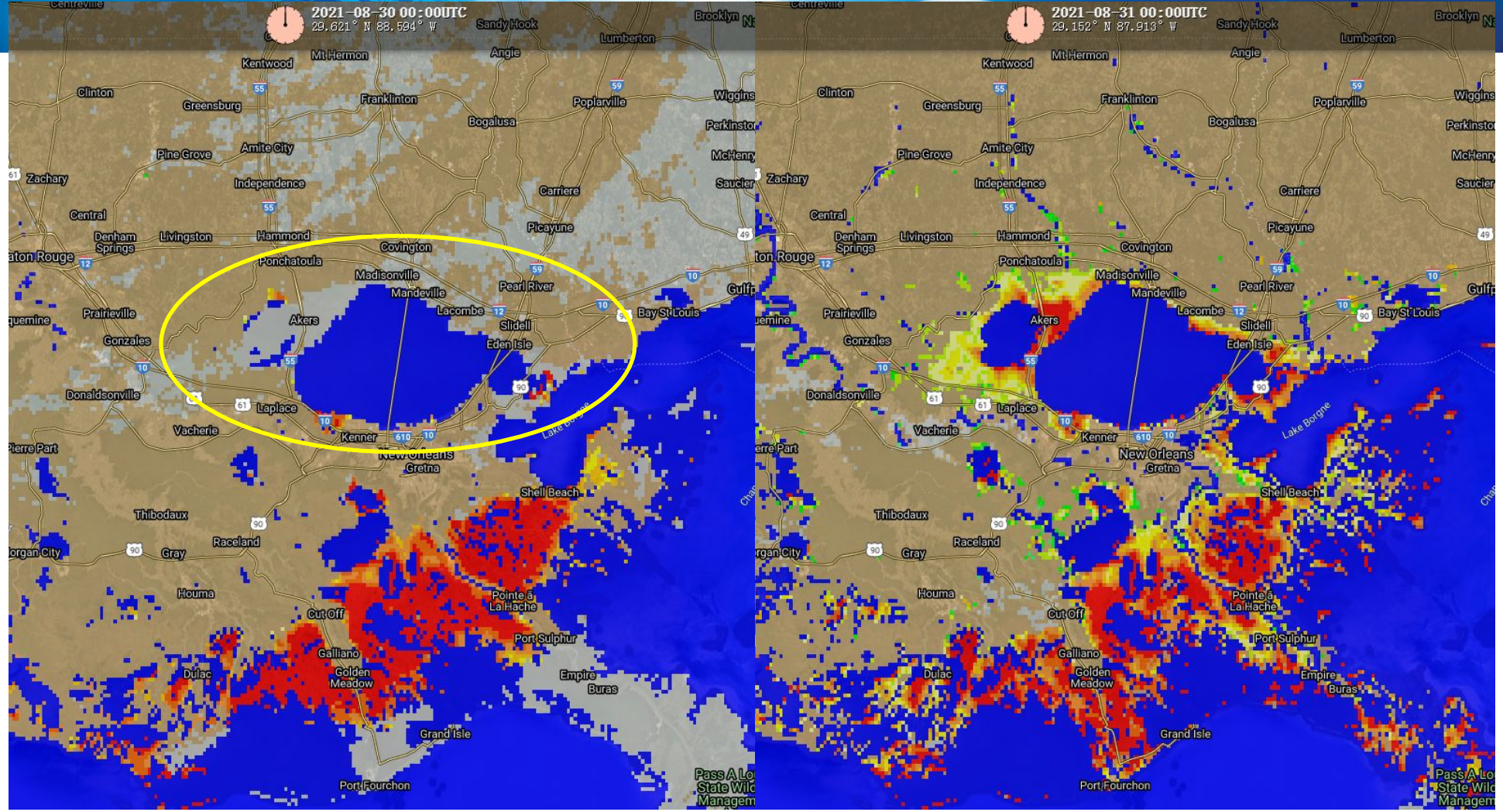
Ocean Color: Coral Reef Land-Based Sources of Pollution

Daily 750m VIIRS Ocean Color – Kd(490) & chlorophyll-a





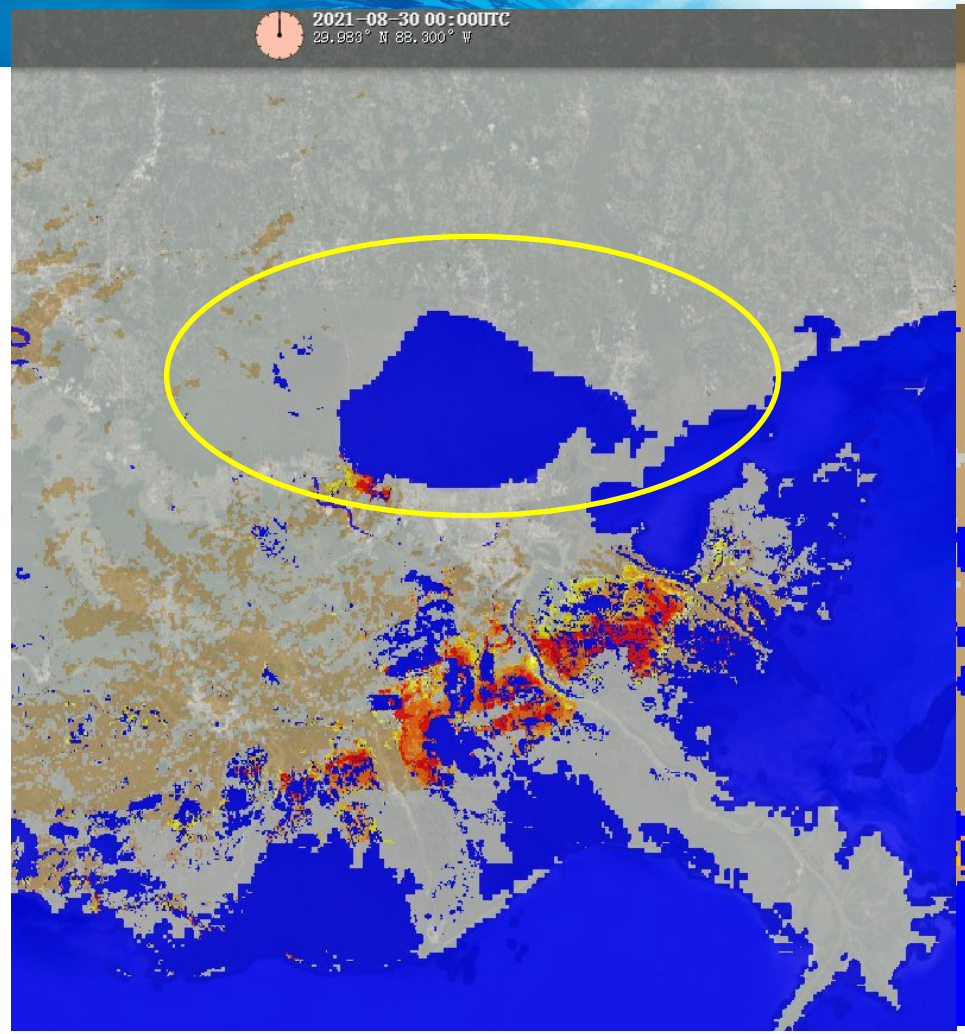
Coastal Flooding



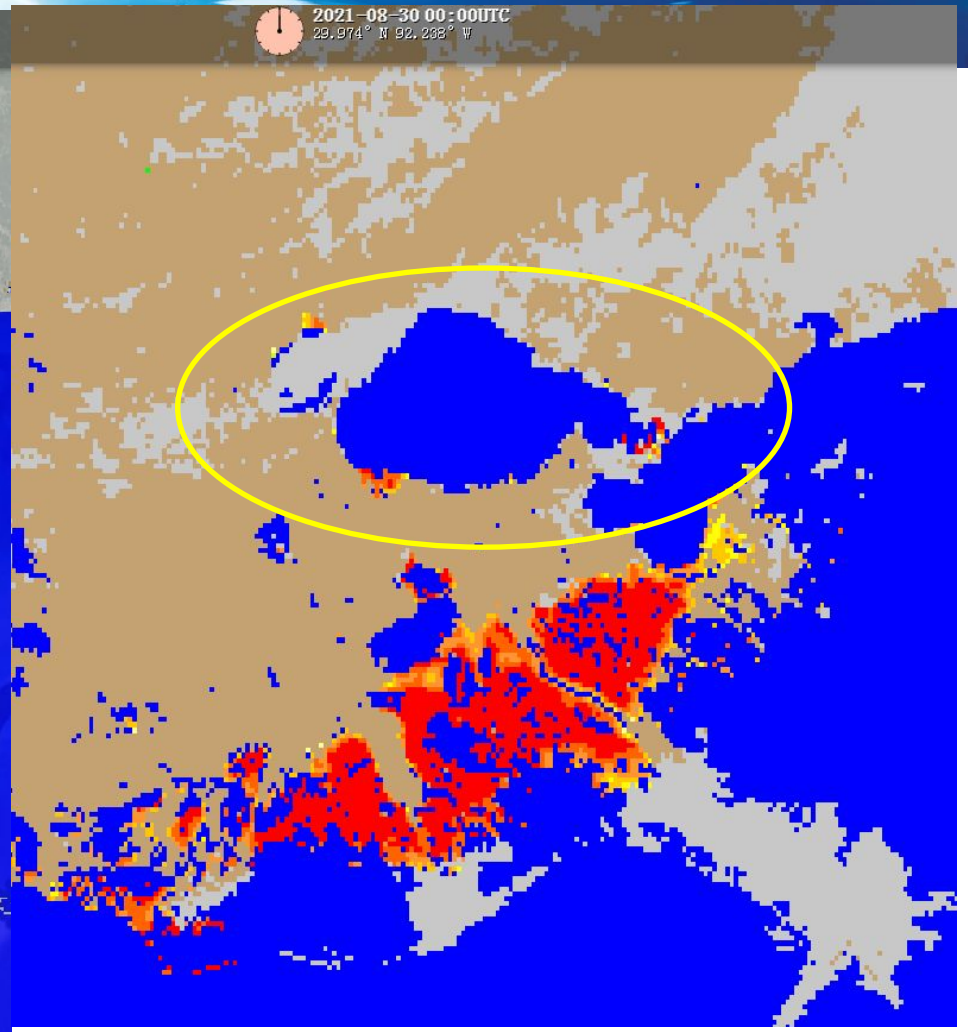
ABI flood map on Aug. 30, 2021

ABI flood map on Aug. 31, 2021

The circled region on Aug. 30, 2021 is actually with some cloud cover, but is mostly detected as clear-sky land.



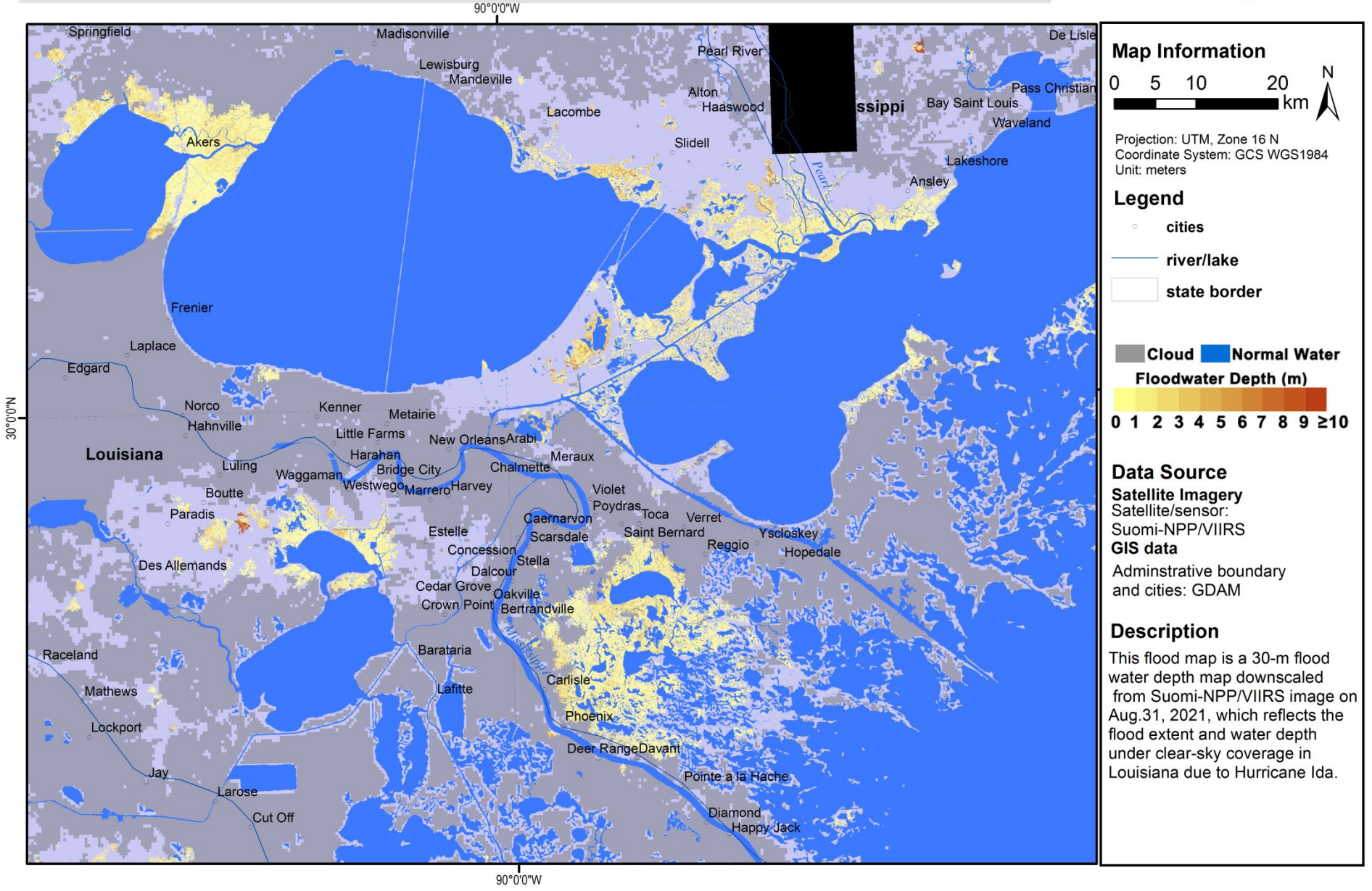
VIIRS on Aug. 30, 2021



ABI on Aug. 30, 2021

Suomi-NPP/VIIRS Downscaled 30-m Flood Map in Louisiana, USA

Downscaled 30-m Floodwater Depth on Aug.31, 2021



Map Information

0 5 10 20 km

N

Projection: UTM, Zone 16 N
Coordinate System: GCS WGS1984
Unit: meters

Legend

- cities
- river/lake
- state border

Cloud Normal Water

Floodwater Depth (m)

0 1 2 3 4 5 6 7 8 9 ≥10

Data Source

Satellite Imagery
Satellite/sensor:
Suomi-NPP/VIIRS

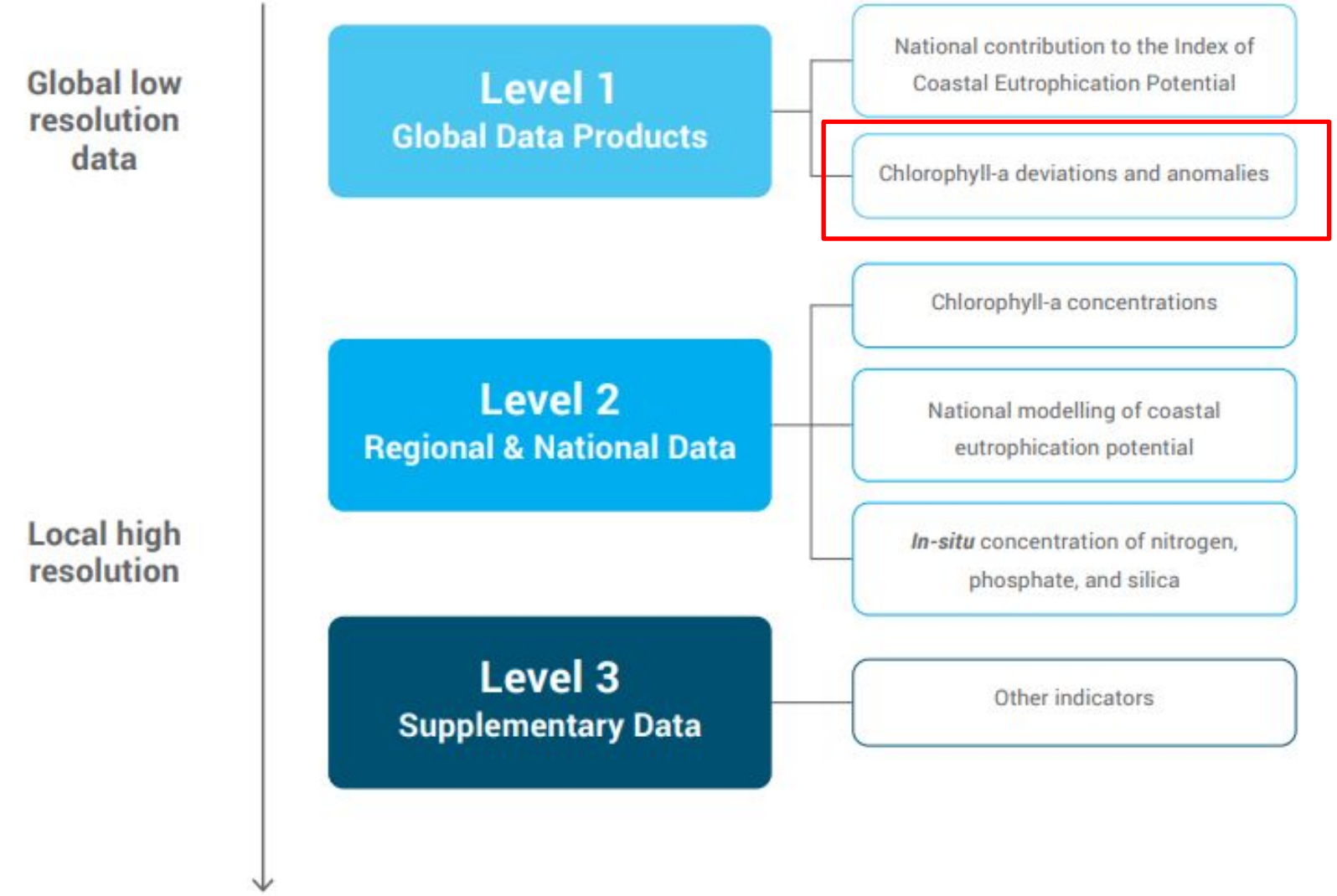
GIS data
Adminstrative boundary and cities: GDAM

Description

This flood map is a 30-m flood water depth map downscaled from Suomi-NPP/VIIRS image on Aug.31, 2021, which reflects the flood extent and water depth under clear-sky coverage in Louisiana due to Hurricane Ida.

Global Policy Example – SDG 14

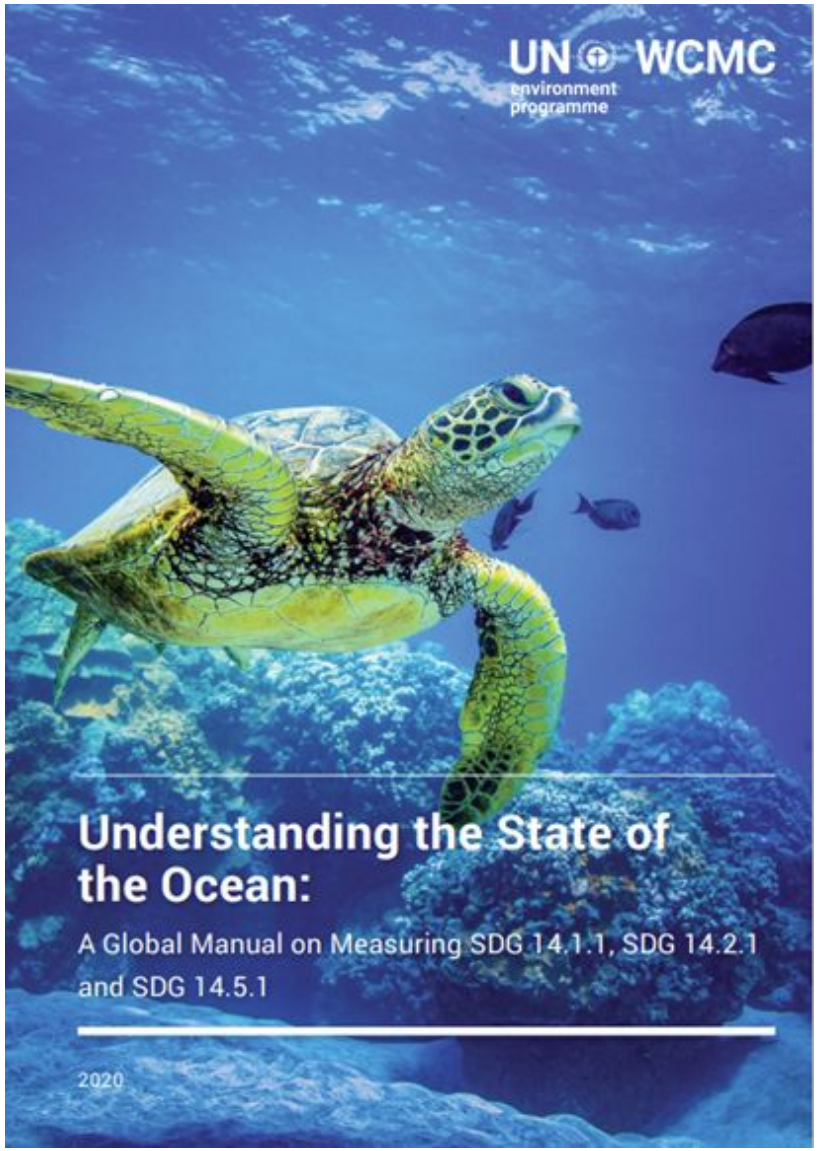
SDG Meth



cgis.com/

SDG Methodology

- Published 14.1 eutrophication indicators methodology for the Global Manual on Ocean Statistics
- Producing statistics for the global indicators for eutrophication to be included in the SDG Progress reports
- Developing a dashboard based on satellite-derived chlorophyll-a products to identify eutrophication hot spots
- Further implementation to be facilitated by CEOS Coastal Observations, Applications, Services & Tools (COAST) Ad Hoc Team - to include AI/Ml approaches



https://chlorophyll-esrioceans.hub.arcgis.com/

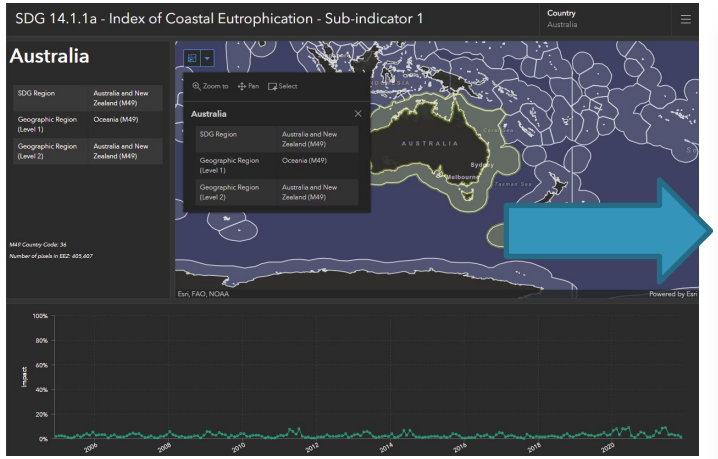
SDG Methodology

1. **Percentage of coastal zone with chlorophyll-a deviations**
   - ESA Ocean Colour CCI (OC_CCI) product, led by the Plymouth Marine Laboratory (PML): consistent, merged chlorophyll-a product from SeaWiFS, MODIS, MERIS and VIIRS, spanning 1997 to 2018.

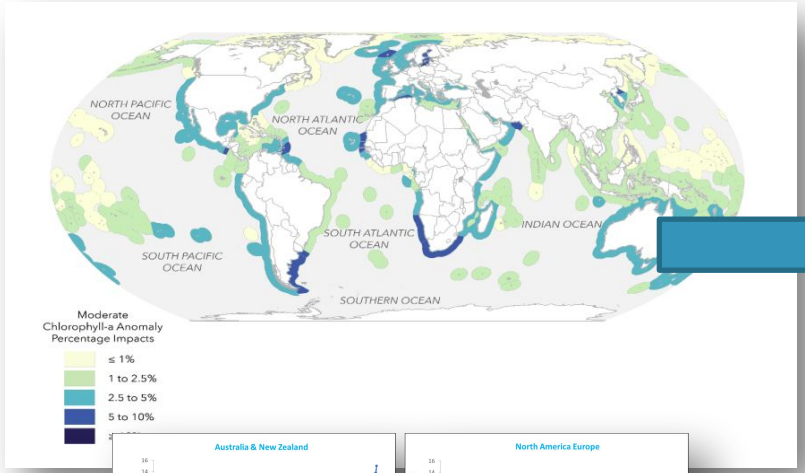
2. **Intra-annual coastal zone chlorophyll-a anomalies**
   - NOAA VIIRS chlorophyll-a anomaly products: 1) the difference anomaly and 2) the anomaly ratio, both calculated using a running 61-day Chl-a median.

SDG Data Delivery and Use

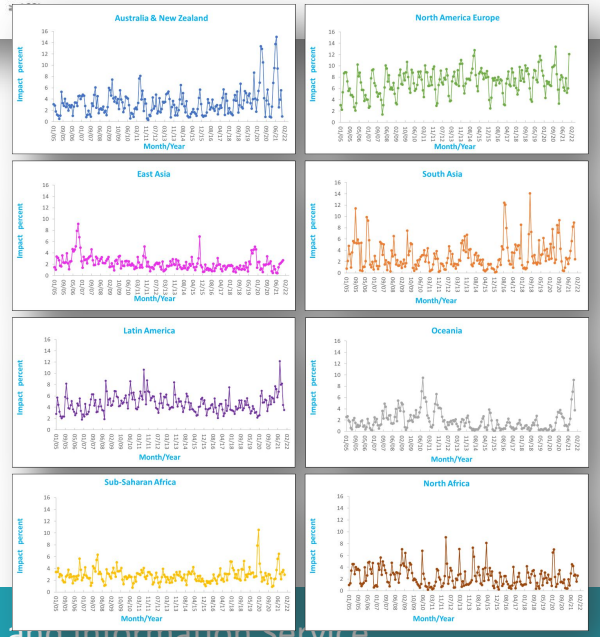
Formal reporting



SDG Storyline



	A	B	C	D	E	F	G
1	Date	Aus_NZ	South Asia	Oceania	Sub-Saharan Africa	Latin America	N.America+Europe
2	January 2005	3.0806477	0.7676488	2.5628958	3.4005618	2.818768	3.0597544
3	February 2005	2.861867	2.1388664	2.6627495	3.4021828	5.6895576	2.246645
4	March 2005	1.8034396	4.7957444	1.918577	4.0475469	4.4136038	5.3370414
5	April 2005	1.2261276	3.3087716	1.7091341	2.5710933	3.1737802	8.6746359
6	May 2005	1.0945755	0.9470416	0.6079934	3.0297327	2.3851588	8.8602352
7	June 2005	0.522848	3.610414	0.3503884	2.8417697	2.0417633	8.8353243
8	July 2005	1.0944749	5.6423798	1.9613351	1.9941082	2.3509769	7.2660427
9	August 2005	5.3012357	5.3462567	2.36834	1.6817092	2.3301973	5.547298
10	September 2005	3.2722661	11.4207115	1.5081393	1.6694181	5.8129449	5.9883938
11	October 2005	2.8120775	5.2552547	0.7705221	2.6505873	8.1767693	4.8324285
12	November 2005	4.0526381	5.8881412	1.1646821	2.8555012	5.5501842	4.8290162
13	December 2005	2.5941513	5.236423	0.8370349	3.8019044	3.8578002	4.5192447
14	January 2006	3.1927445	0.4505424	0.9933365	2.5028532	3.7101033	2.6943583
15	February 2006	1.9607353	5.3093114	1.7863276	2.9929807	4.3536482	2.0751207
16	March 2006	2.9167891	0.3449694	1.9514174	2.6035426	5.0842576	3.4143937
17	April 2006	2.5379977	1.0808444	0.8508912	1.5064267	3.5947087	10.2118797
18	May 2006	2.9346766	1.065678	1.0688897	2.6834078	3.1902966	8.1507368
19	June 2006	1.0372603	2.0725219	0.3561499	1.9918183	2.570116	8.7873068



Making the data useable

Sardine Potential Habitat Mapping

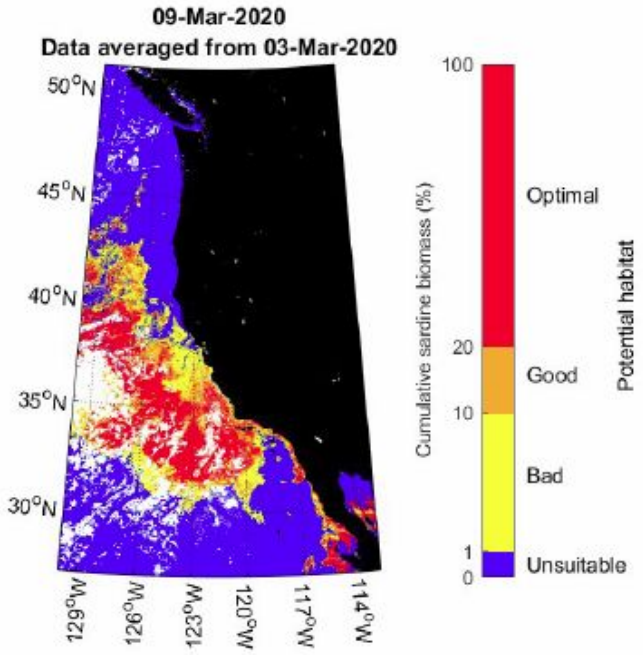
2013 Satellite Course – Seattle, WA

Sea Surface Temperature & Ocean Color: Sardine Potential Habitat

Sardine potential habitat model has been transitioned to use VIIRS

Issues with the product

- Based on MODIS Chl and SST
- Output only as an image (PNG)



Sardine group requirements

- Long timeseries of the model output
- Digital output

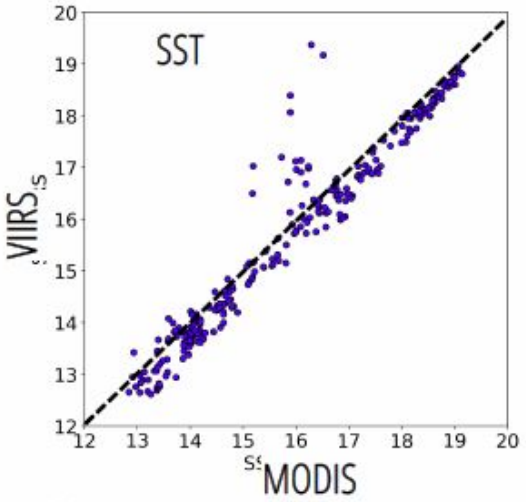
WCN role lowering the activation energy

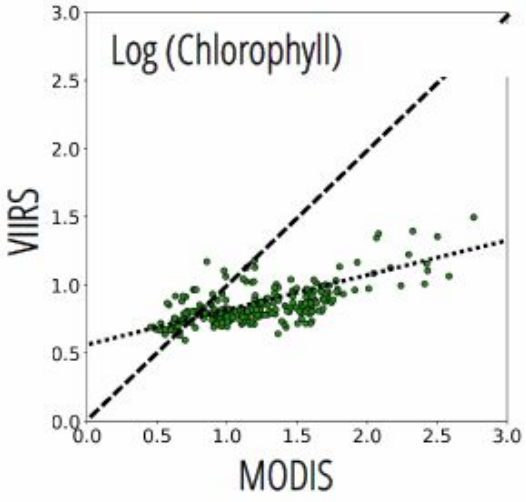
- Converted model from MATLAB to Python 3
- Develop a VIIRS-based version of model
- Run some basic statistics to compare versions
- Hosted output on the WCN ERDDAP server

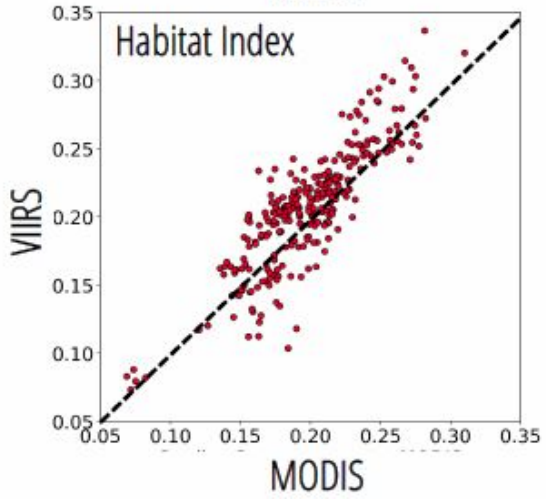
coastwatch.pfeg.noaa.gov/erddap/search/index.html?page=1&itemsPerPage=10&searchFor=sardines

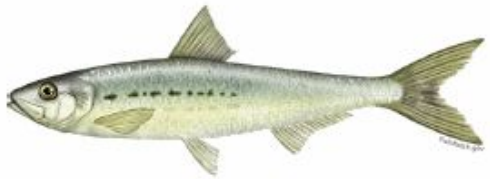
Sea Surface Temperature & Ocean Color: Sardine Potential Habitat

The VIIRS-based results track MODIS-based quite well



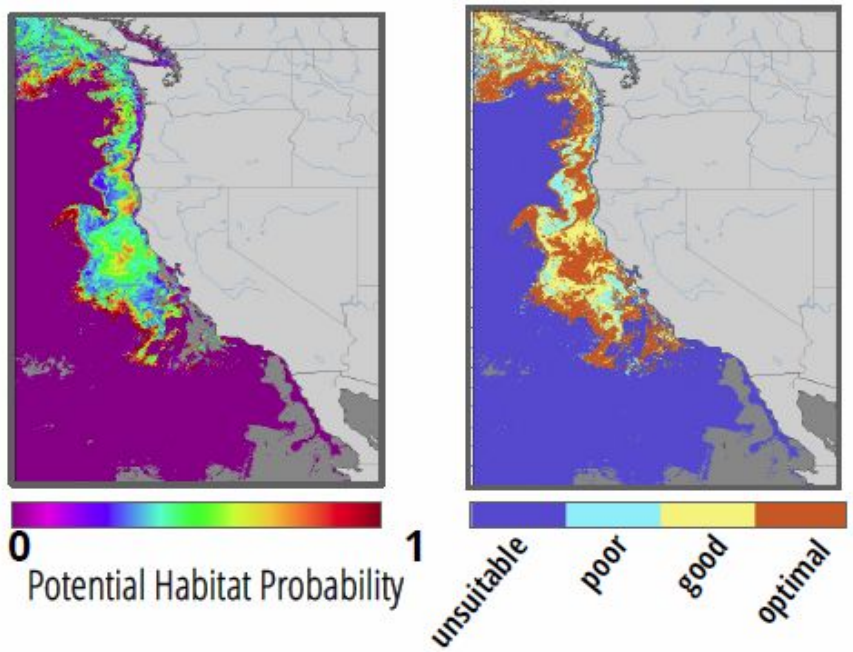






Deliverables

- MODIS-based product backfilled to 2002
- VIIRS-based product backfilled to 2012
- Quantitative layer
- Qualitative layer



Considerations moving forward

Resource Costs

- Algorithm adjustment
- Data reprocessing
- Testing
- Technician time
- Server time
- Hosting the products
- Getting the word out

Transitions to newer datasets require resources.

Most downstream product developers are researchers

- Need external funding to adjustment products
- Must justify where they put their effort

Considerations Moving Forward

- **VIIRS Ocean Color: there are significant differences between NOAA-20 and SNPP in the green and red bands**

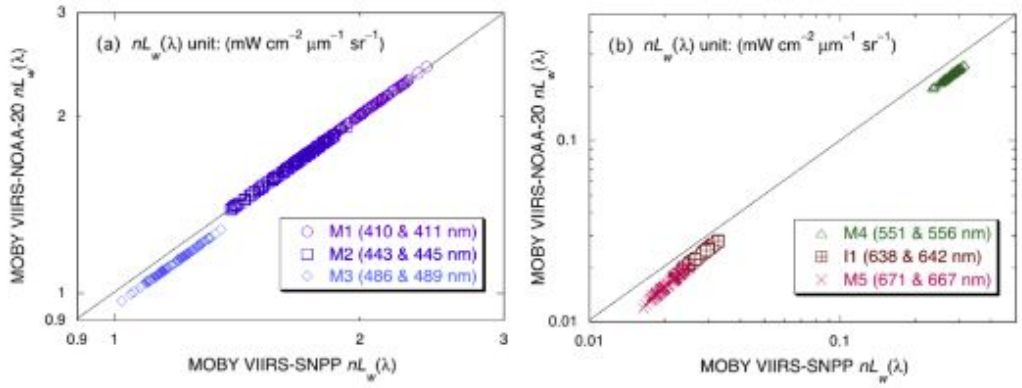


Fig. 1. Scatter plots of MOBY-measured and sensor SRF-weighted $nL_W(\lambda)$ between VIIRS-N20 and VIIRS-SNPP for the VIIRS SNPP and N20 spectral bands of (a) 410 & 411 nm, 443 & 445 nm, and 486 & 489 nm and (b) 551 & 556 nm, 638 & 642 nm, and 671 & 667 nm.

- **VIIRS SST: the SSTs between SNPP and NOAA-20 are not identical but are complimentary.**

Please operate VIIRS-SNPP as long as possible.

Thank you