

ARSET

Applied Remote Sensing Training

<http://arset.gsfc.nasa.gov>

 @NASAARSET

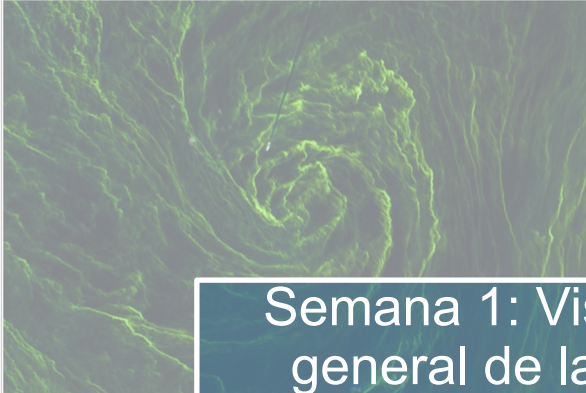
Plataformas y Sensores para Observaciones Oceánicas, Acceso a Datos y Herramientas de Procesamiento

Semana 2, 12 de septiembre de 2017

Capacitadoras: Sherry Palacios

Amita Mehta

Reseña del Curso



Semana 1: Vista general de las Floraciones de Algas Nocivas



Semana 2: Plataformas y sensores, acceso a datos y procesamiento de datos



Semana 3: Las HABs en el ambiente costero

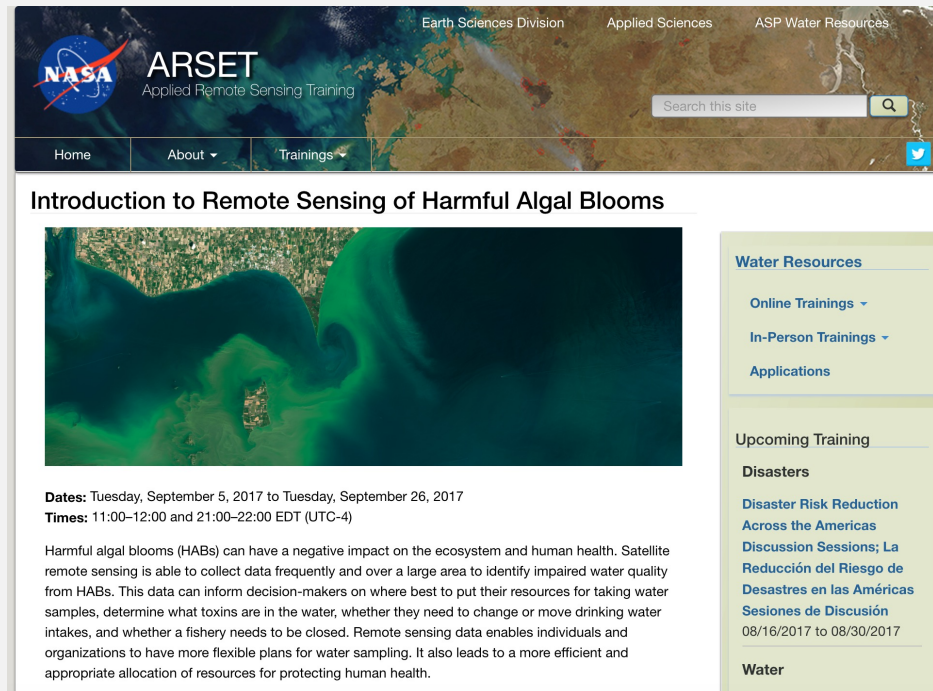
Credit: Paul Hillman/NOAA



Semana 4: El monitoreo a gran escala

Material del curso

Las grabaciones de las sesiones, las presentaciones y las tareas para la casa están disponibles en: <https://arset.gsfc.nasa.gov/water/webinars/HABs17>



The screenshot shows the ARSET (Applied Remote Sensing Training) website. The header includes the NASA logo, the text 'ARSET Applied Remote Sensing Training', and navigation links for 'Home', 'About', and 'Trainings'. A search bar is also present. The main content area features a satellite image of a coastal area with a greenish tint, indicating algal blooms. Below the image, the training title 'Introduction to Remote Sensing of Harmful Algal Blooms' is displayed. The dates are 'Tuesday, September 5, 2017 to Tuesday, September 26, 2017' and the times are '11:00-12:00 and 21:00-22:00 EDT (UTC-4)'. A paragraph of text describes the impact of HABs and how satellite remote sensing can be used to monitor and manage them. On the right side, there are navigation menus for 'Water Resources' (Online Trainings, In-Person Trainings, Applications), 'Upcoming Training' (Disasters, Disaster Risk Reduction Across the Americas Discussion Sessions; La Reducción del Riesgo de Desastres en las Américas Sesiones de Discusión, 08/16/2017 to 08/30/2017), and 'Water'.

Learning Objectives:

By the end of the training, attendees will be able to:

- identify NASA's Earth Science remote sensing data products for the identification and monitoring of HABs
- describe how coupled remote sensing and modeling approaches are used in decision support tools
- use a selection of NASA Earth Science data tools to monitor HABs

Course Format:

- Four, one hour sessions
- Sessions will be held on Tuesdays in September: September 5, 12, 19, and 26 at 11:00 a.m.-12:00 p.m. or 21:00-22:00 p.m. EDT (UTC-4)
 - [Convert to your local time »](#)
- A certificate of completion will be provided to participants that attend all live webinars and complete all homework assignments

Prerequisites:

Complete [Session 2C: Fundamentals of Aquatic Remote Sensing](#) or have equivalent experience. Attendees that do not complete prerequisites may not be properly prepared for the pace during the training.

Audience:

Local, regional, state, federal, and international organizations interested in using satellite imagery for coastal and ocean applications. Governmental and non-governmental organizations in the public and private sectors engaged in environmental management and monitoring will be given preference over organizations focused primarily on research.

Registration Information:

There is no cost for the webinar, but you must register. Space is limited, and preference will be given to...

Introduction to Remote Sensing of Harmful Algal Blooms

09/05/2017 to 09/26/2017

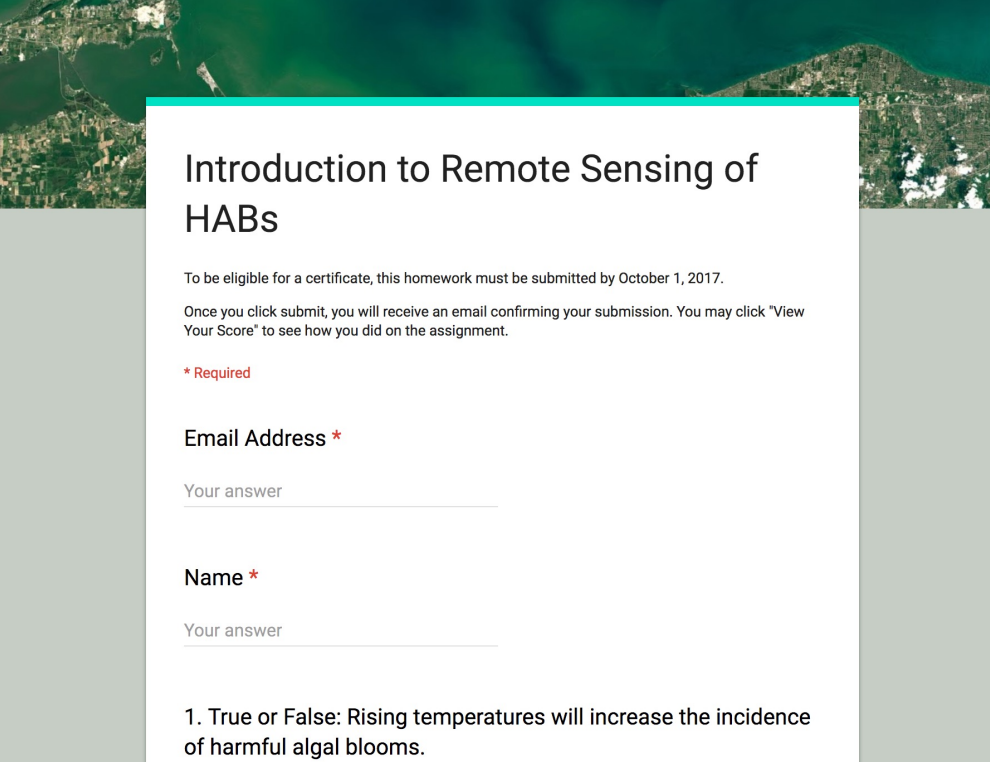
Land

Introduction to Remote Sensing for Scenario-Based Ecoforecasting

09/07/2017 to 09/28/2017

Tarea y certificados

- Tarea
 - **Debe enviar sus respuestas vía Google Form**
- Certificado de Terminación:
 - Asista a todas las sesiones
 - Complete las tareas asignadas dentro del plazo estipulado (accesibles desde la página en línea de ARSET)
 - **Fechas límite de entrega: El 1^{ro} y el 15 de octubre**
 - Ud. recibirá su certificado aproximadamente dos meses después de la conclusión del curso de:
marines.martins@ssaihq.com



Introduction to Remote Sensing of HABs

To be eligible for a certificate, this homework must be submitted by October 1, 2017.

Once you click submit, you will receive an email confirming your submission. You may click "View Your Score" to see how you did on the assignment.

*** Required**

Email Address *

Your answer _____

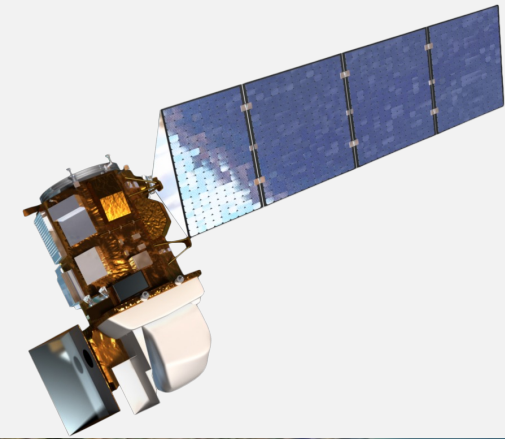
Name *

Your answer _____

1. True or False: Rising temperatures will increase the incidence of harmful algal blooms.

Reseña: Sesión 2

- Repaso de la Semana 1
- La Detección de HABs por medio de la Teledetección
- Vista General de Satélites y Sensores para el Monitoreo de HABs
- Vista General de Herramientas de Acceso a Datos del Color Oceánico en base a Satélites
- Ejemplos de Herramientas para el Monitoreo de HABs



A Landsat 8 image acquired on Aug. 1, 2014 showing algal blooms in Lake Erie just north of Toledo, Ohio.

Image credit: USGS/[NASA Earth Observatory](#)

An aerial photograph of a river delta, likely the Mississippi River delta, showing a complex network of channels and distributaries. The water is a deep blue-green color. The surrounding land is a patchwork of green and brown agricultural fields. A semi-transparent map overlay is centered on the image, showing the same geographical features in a lighter, more schematic style. The text 'Repaso de la Semana 1' is overlaid on the map in a black, sans-serif font, with a horizontal line underneath it.

Repaso de la Semana 1

¿Qué son las Floraciones de Algas Nocivas?

“Las floraciones de algas nocivas (Harmful algal blooms, HABs) ocurren cuando las colonias de algas — plantas simples que viven en el mar o en el agua dulce — crecen fuera de control y producen efectos tóxicos o nocivos en las personas, peces, mariscos, mamíferos y aves marinas. Las enfermedades humanas causadas por las HABs, aunque raras, pueden ser debilitantes y hasta mortales.”

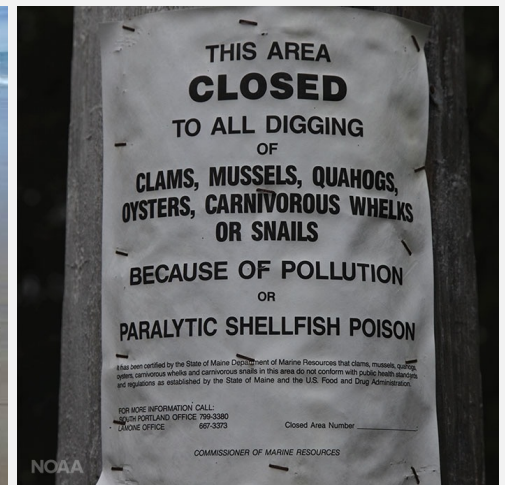
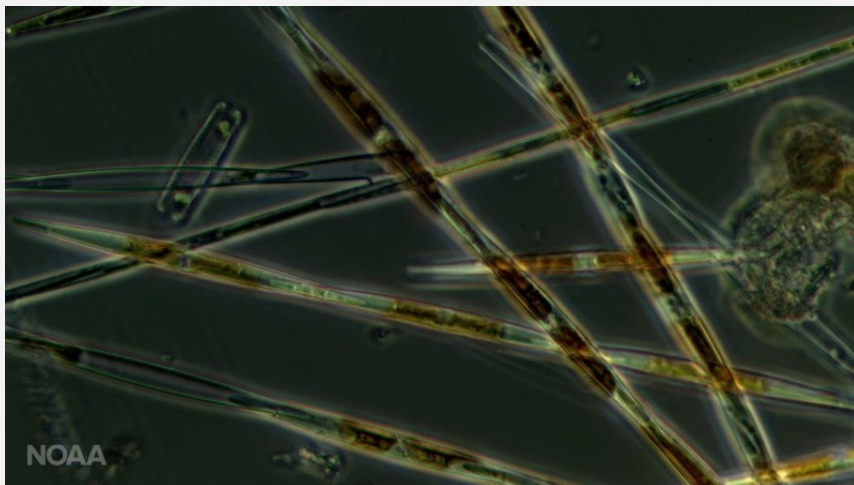


Image credit: <http://www.noaa.gov/what-is-harmful-algal-bloom>

Cómo la HABs Pueden Ser Nocivas

- Producen toxinas
- Causan pérdidas económicas
- Contaminan el agua potable
- Asfixian organismos bentónicos
- Agotan el oxígeno
- Impiden a depredadores visuales
- Atenúan la luz que llega a la vegetación subacuática y a los corales

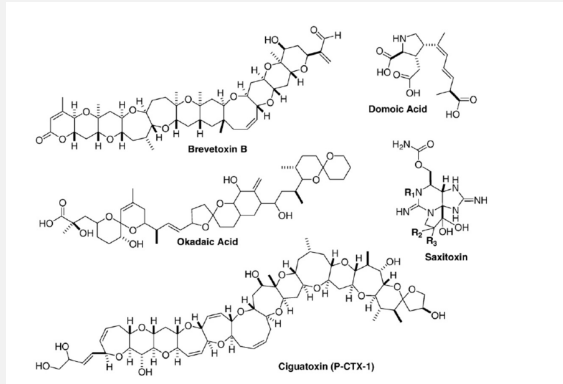


Photo Credits (clockwise from top left) Karina Cardozo (Cardozo et al., 2007); NASA Earth Observatory; NOAA Northwest Fisheries Science Center; Linda Preskitt

¿Qué causa las HABs?

- Carga de nutrientes-- “eutrofización”
- Contaminación
- Agua tibia
- Cambios en la red alimentaria
- Especies introducidas
- Cambios en el flujo de agua
 - e.g., después de eventos como huracanes, sequías o inundaciones
- Otros factores aún desconocidos

Propiedades Ópticas de las HABs

- Algunas especies de HAB tienen propiedades únicas que afectan sus cualidades ópticas – y por lo tanto la teledetección de floraciones (e.g., *Microcystis aeruginosa* y *Karenia brevis*)
- Las HABs a veces pueden cambiar el color del agua (e.g. mareas rojas), pero no toda marea roja es dañina y no toda floración nociva cambia el color del agua
- Las anomalías de clorofila sirven para detectar y monitorear eventos de HABs para floraciones de alta productividad de biomasa

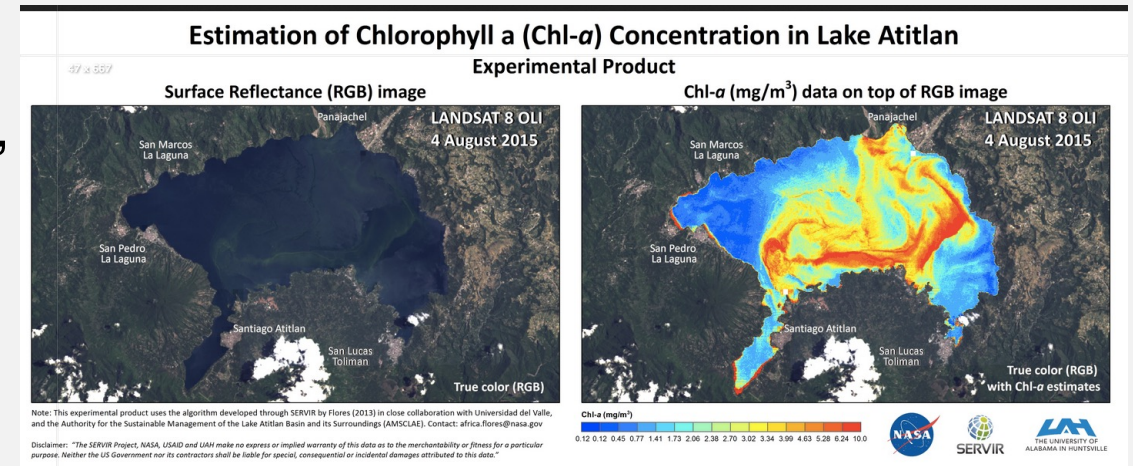
An aerial photograph showing a coastal region. On the left, there is a dense urban area with a grid of streets. To the right, there is a large, flat agricultural area with a regular grid of fields. A large body of water, possibly a bay or estuary, is visible in the center, with a river or inlet flowing into it from the top. The water has a greenish tint, suggesting the presence of phytoplankton or other biological activity. A semi-transparent grey box is overlaid on the water and agricultural areas, containing the title text.

La Detección de HABs por medio de la Teledetección

Parámetros Relevantes para la Detección de HABs

- Los siguientes parámetros, disponibles a partir de las observaciones de teledetección, se utilizan comúnmente para detectar la presencia de floraciones algales:
 - Concentración de Clorofila-a (Chl-a)
 - Anomalías en la Concentración de Clorofila-a*
 - Temperatura Marina Superficial (Sea Surface Temperature o SST)
 - Características Ópticas (absorción, retrodispersión)

*Normalmente se comparan respecto a 2 o 3 meses, lo que significa que Chl-a puede ayudar a detectar nuevas HABs



Source: [SERVIR](#)

Teledetección para la Detección de HABs

- Se usa la radiación solar reflejada en varias bandas visibles a casi-infrarrojas (NIR) para derivar las propiedades de los constituyentes del agua ópticamente activos, incluso Chl-a

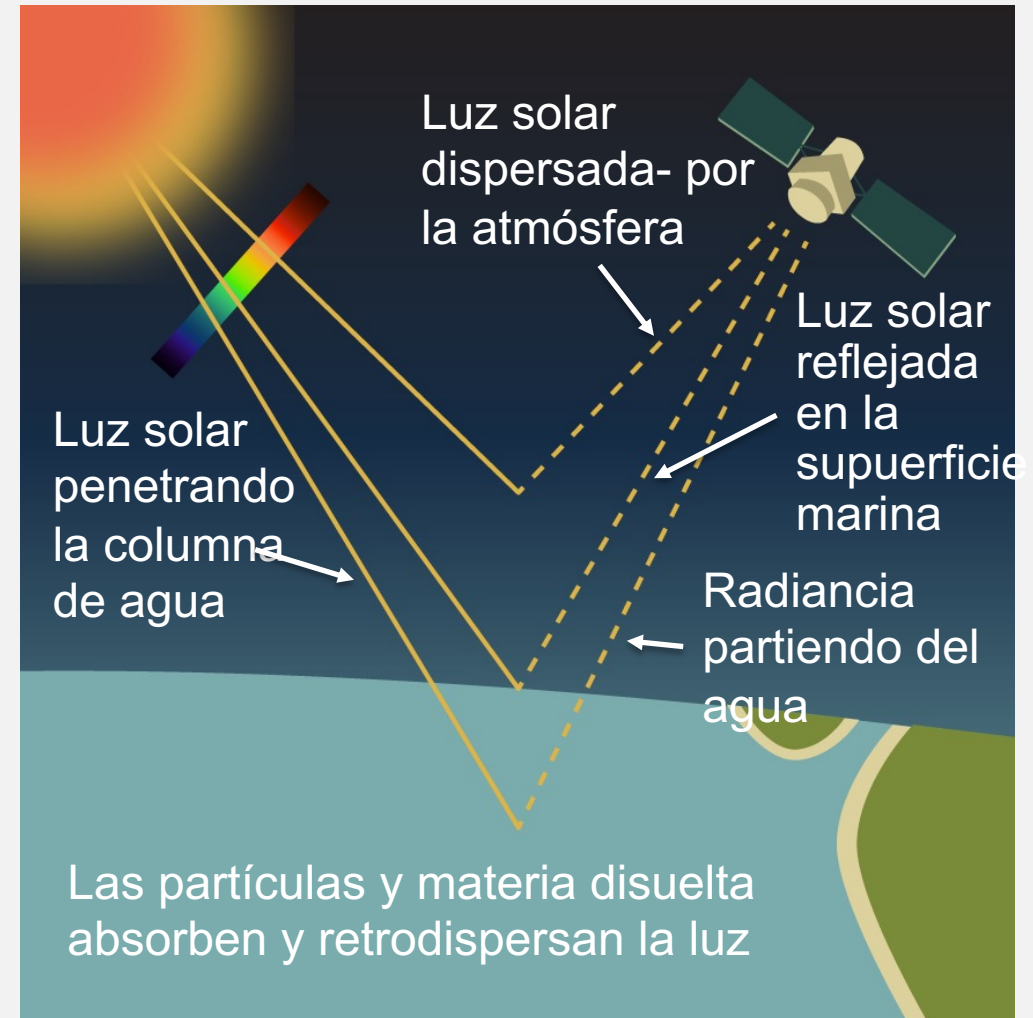
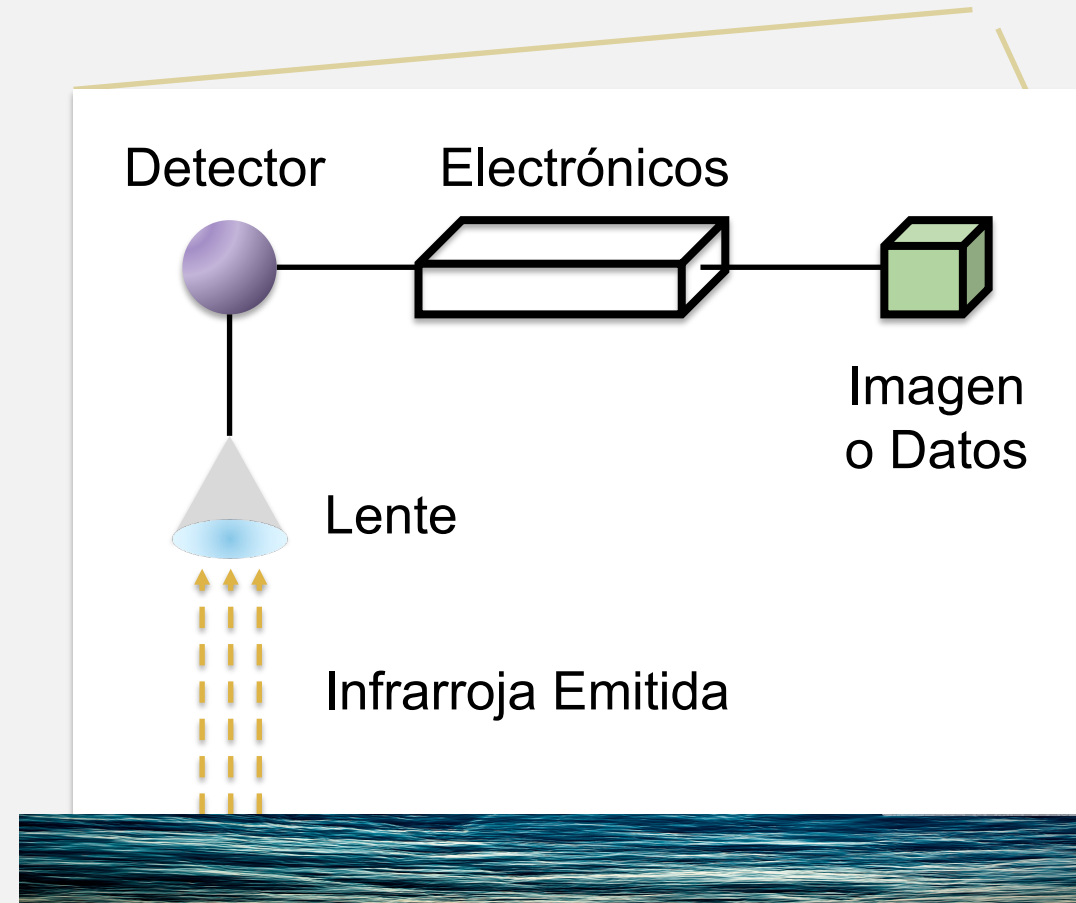


Image based on image from X

Teledetección para la Detección de HABs

- La radiación termal infrarroja (TIR) emitida se usa para derivar la temperatura en la superficie de las masas de agua
- Varios satélites de la NASA y de la Agencia Espacial Europea (ESA) llevan sensores que miden radiación reflejada en VIS-NIR (reflectancia de banda) y TIR emitida



Based on an image from CCRS/CCT



Resumen General de Satélites y Sensores para el Monitoreo de HABs

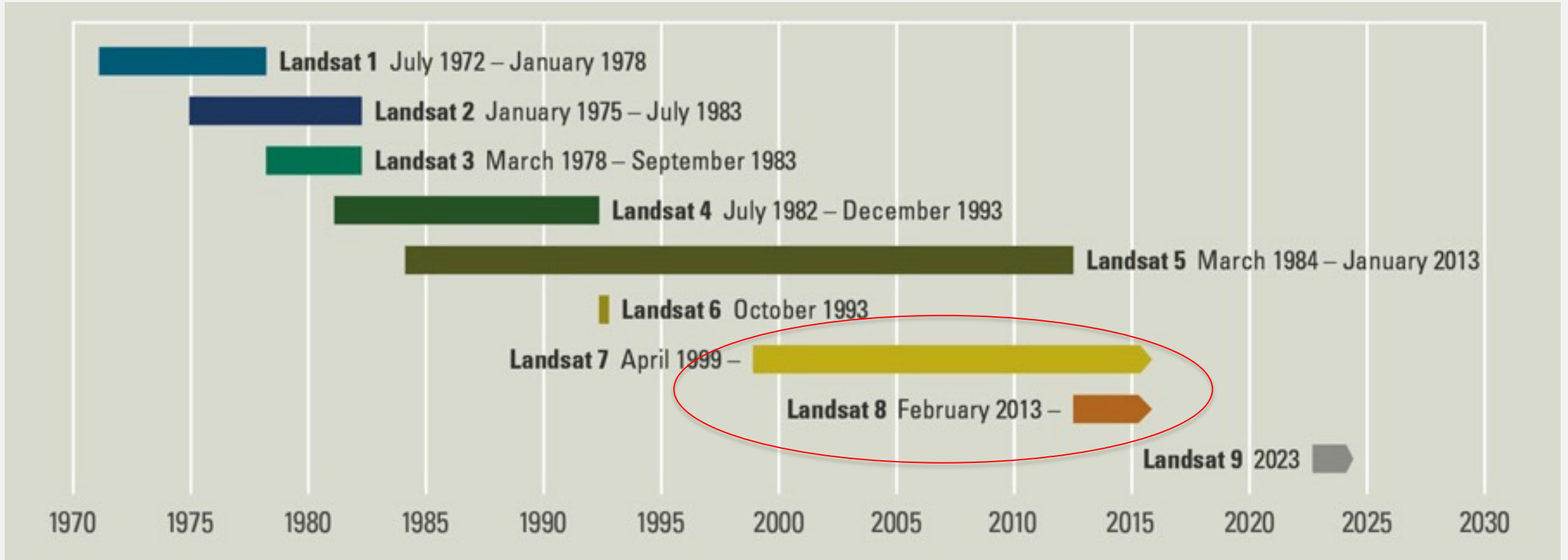
Satélites para el Monitoreo de HABs

- Misiones Satelitales Actuales:
 - Landsat 7 y Landsat 8
 - Terra
 - Aqua
 - Suomi National Polar Partnership (SNPP)
 - Sentinel-2 y Sentinel-3



Landsat- Satélites y Sensores

<http://landsat.gsfc.nasa.gov/>

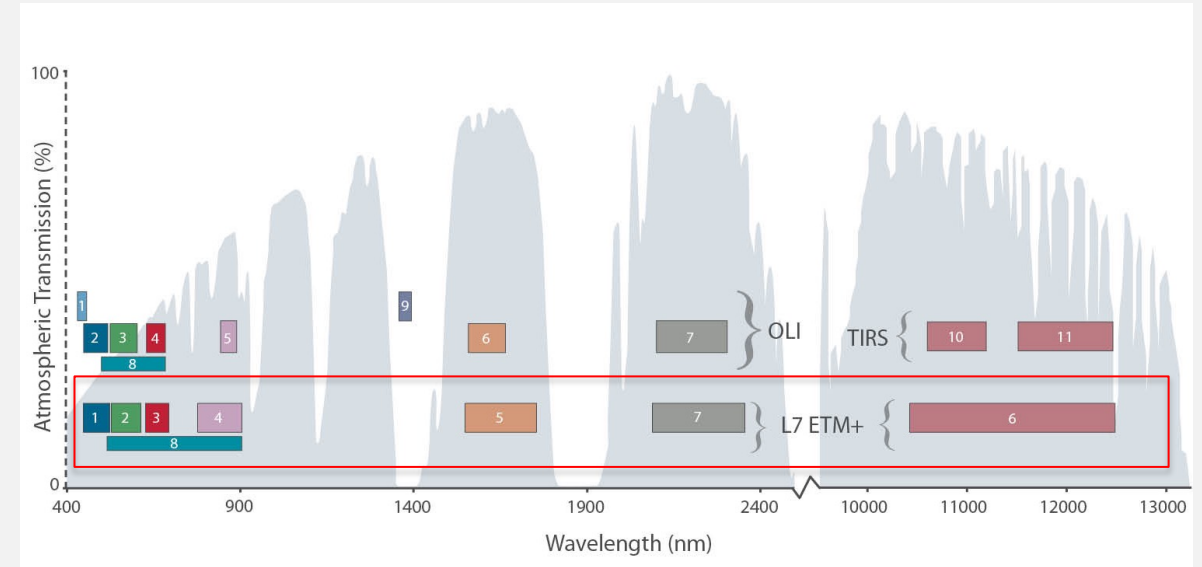


Enhanced Thematic Mapper (ETM+)

(Mapeador temático mejorado)

<http://landsat.gsfc.nasa.gov/landsat-7/>

- Abordo de **Landsat 7**
- Satélite de órbita polar
- Cobertura y resolución espacial:
 - Mundial, Barrido: 185 km
 - Resolución espacial:
 - 15 m, 30 m, 60 m
- Cobertura y Resolución Temporal:
 - 15 de abril de 199 – presente
 - Tiempo de revisita de 16 días



Bandas Espectrales: 8

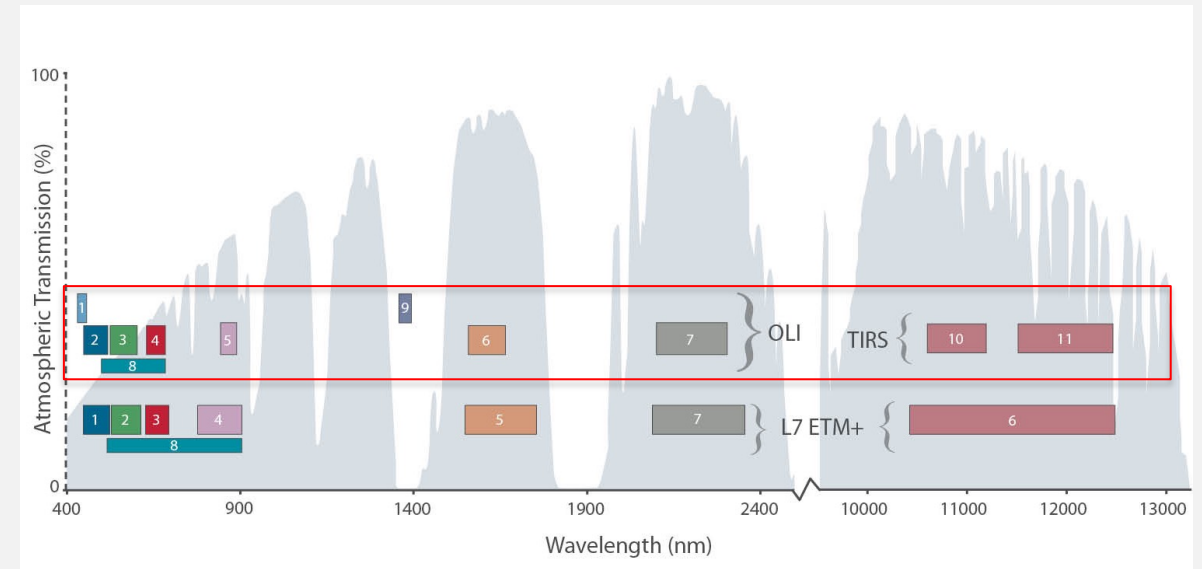
- Bandas principales: azul-verde, verde, roja, termal IR, pancromática
- Bandas 1-5, 7: 30 m; Banda 6: 60 m; Banda 8: 15 m

Operational Land Imager (OLI)

(Captador de imágenes de la tierra operativo)

<http://landsat.gsfc.nasa.gov/landsat-8/>

- Abordo de **Landsat 8**
- Satélite de órbita polar
- Cobertura y Resolución Espacial
 - Mundial, Barrido: 185 km
 - Resolución Espacial: 15 m, 30 m
- Cobertura y Resolución Temporal:
 - 11 feb 2013 – presente
 - tiempo de revisita de 16 días



Bandas Espectrales: 9

- Bandas Principales: azul, azul-verde, roja, casi IR, onda corta, pancromática
- Bandas 1-7, 9: 30 m
- Banda 8: 15 m

Landsat- Bandas

Landsat 7 ETM+

Banda	Gama de Banda (μm)	Resolución Espacial (m)
1	0.45 – 0.515	30
2	0.525 – 0.605	
3	0.63 – 0.69	
4	0.775 – 0.90	
5	1.55 – 1.75	
6	10.4 – 12.5	60
7	2.08 – 2.35	30
8	0.52 – 0.9	15

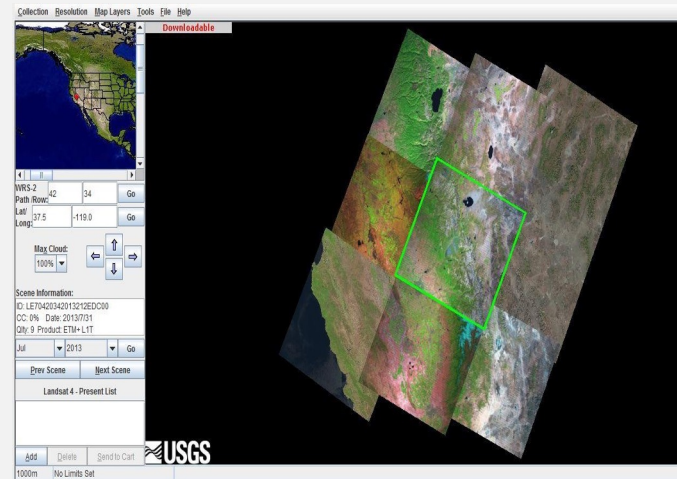
Landsat 8 OLI

Banda	Gama de Banda (μm)	Resolución Espacial (m)
1	0.433 – 0.453	30
2	0.450 – 0.515	
3	0.525 – 0.60	
4	0.630 – 0.680	
5	0.845 – 0.885	
6	2.10 – 2.30	
7	0.500 – 0.680	
8	2.08 – 2.35	15
9	1.36 – 1.39	30

Dónde Conseguir Imágenes y Reflectancia de Bandas Landsat



Earth Explorer:
<http://earthexplorer.usgs.gov/>



GloVis
<http://glovis.usgs.gov/>



LandsatLook Viewer:
<http://landsatlook.usgs.gov/>

Terra y Aqua- Satélites y Sensores

Terra, <http://terra.nasa.gov>

- Órbita polar, hora de cruce ecuatorial 10h30
- Cobertura Global
- 18 dic 1999 – Presente
- 1 a 2 observaciones al día
- Sensores:
 - **ASTER**, CERES, MISR, **MODIS**, MOPITT

Aqua, <http://aqua.nasa.gov/>

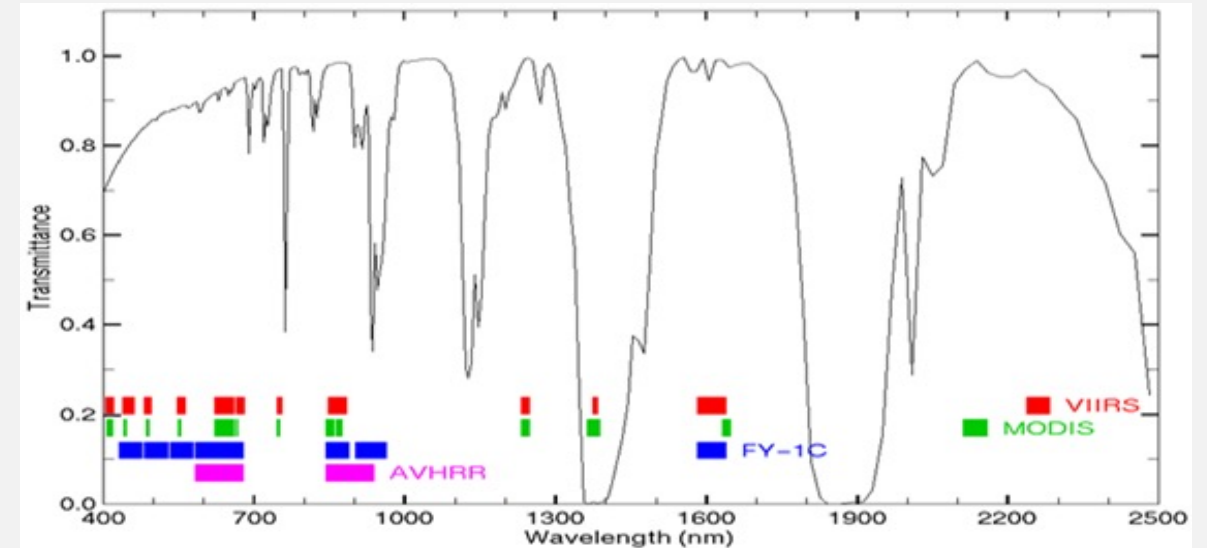
- Órbita polar, hora de cruce ecuatorial 13h30
- Cobertura Global
- 4 may 2002 – Presente
- 1 a 2 observaciones al día
- Sensores:
 - AIRS, AMSU, CERES, **MODIS**, AMSR-E

MODerate Resolution Imaging Spectroradiometer (MODIS)

(Espectrorradiómetro de imágenes de resolución moderada)

<http://modis.gsfc.nasa.gov/>

- Abordo de **Terra y Aqua**
- Diseñado para observaciones de la tierra, atmósfera, océano y criósfera
- Cobertura y Resolución Espacial:
 - Global, barrido: 2,330 km
 - Resolución espacial varía: 250 m, 500 m, 1 km
- Cobertura y Resolución Temporal:
 - 2000 – presente
 - 1 a 2 veces por día



Bandas Espectrales: 36

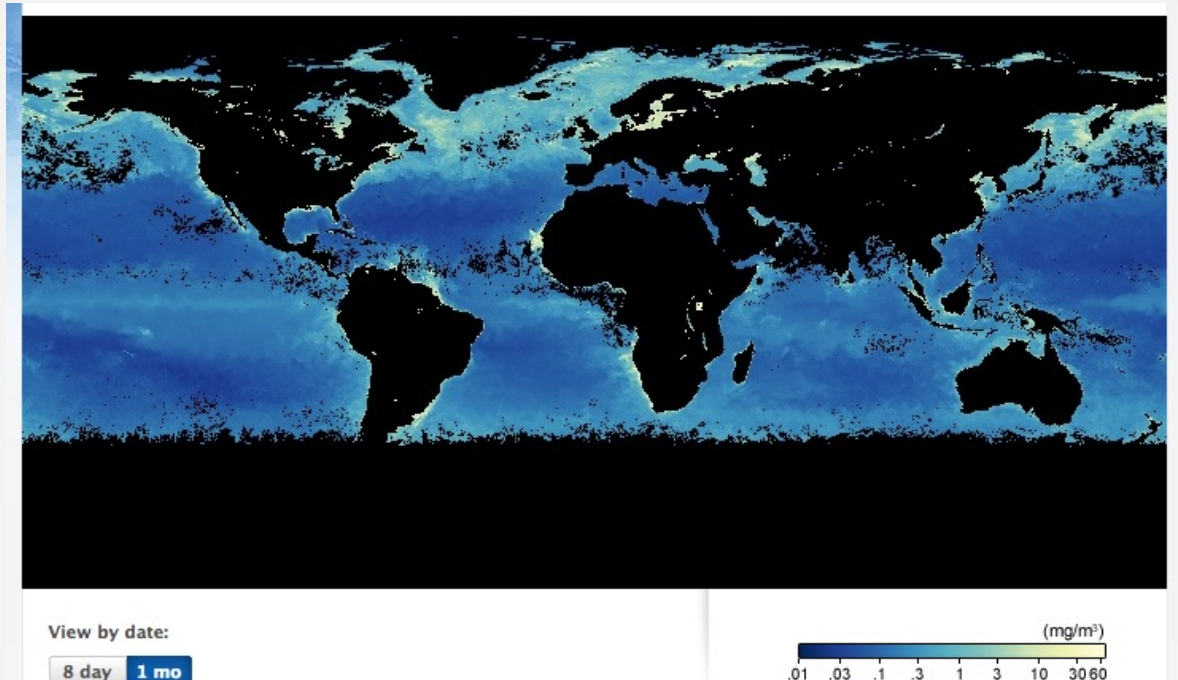
- Bandas de Reflexión y Emisión (Bandas Principales: roja, azul, IR, NIR, MIR)
- Bandas 1-2: 250 m; Bandas 3-7: 500 m; Bandas 8-36: 1,000 m

MODIS- Bandas Relevantes para el Monitoreo de HABs

Banda	Gama de Banda μm
8	0.405-0.420
9	0.438-0.448
10	0.483-0.493
11	0.526-0.536
12	0.546-0.556
13	0.662-0.672
14	0.673-0.683
15	0.743-0.753

Resolución espacial: 1 km

Concentración de Clorofila de Aqua MODIS, junio 2017



Dónde Conseguir Datos de Reflectancia de Bandas MODIS Data

Land Processing Distributed Active
Archive Center

http://lpdaac.usgs.gov/dataset_discovery/modis/modis_products_table/

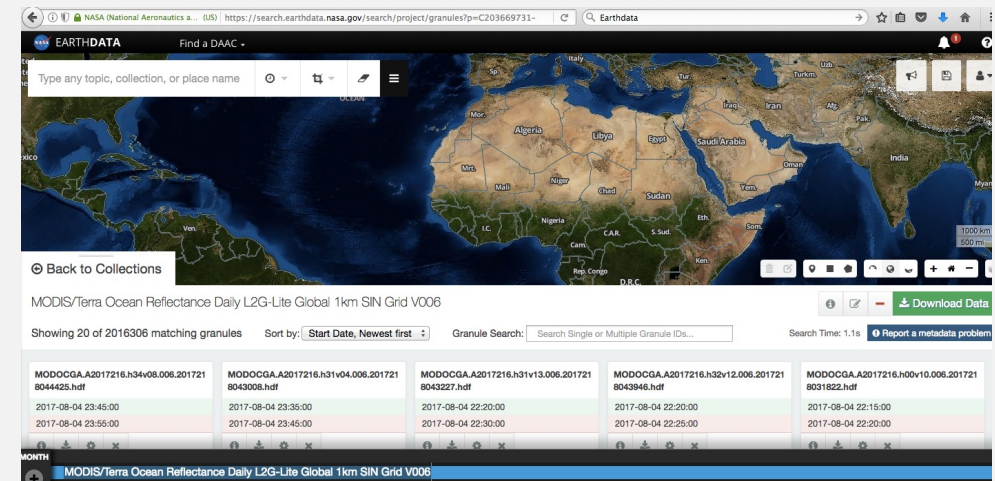
Name	Dataset	Product	Pixel Size	Temporal Granularity
MOD09A1	Terra MODIS	Reflectance	500	Composites
MOD09CMG	Terra MODIS	Reflectance	5600	Daily
MOD09GA	Terra MODIS	Reflectance	500, 1000	Daily
MOD09GQ	Terra MODIS	Reflectance	250	Daily
MOD09G1	Terra MODIS	Reflectance	250	Composites
MODOCGA	Terra MODIS	Reflectance	1000	Daily
MODTBGA	Terra MODIS	Reflectance	1000	Daily
MYD09A1	Aqua MODIS	Reflectance	500	Composites
MYD09CMG	Aqua MODIS	Reflectance	5600	Daily
MYD09GA	Aqua MODIS	Reflectance	500, 1000	Daily
MYD09GQ	Aqua MODIS	Reflectance	250	Daily
MYD09G1	Aqua MODIS	Reflectance	250	Composites
MYDOCGA	Aqua MODIS	Reflectance	1000	Daily
MYDTBGA	Aqua MODIS	Reflectance	1000	Daily

Reflectancia de Bandas MODIS para Océanos,
Bandas 8-16

Nombre de Producto: MODOCGA (Terra),
MYDOCGA (Aqua)

NASA Earthdata

<http://earthdata.nasa.gov/>

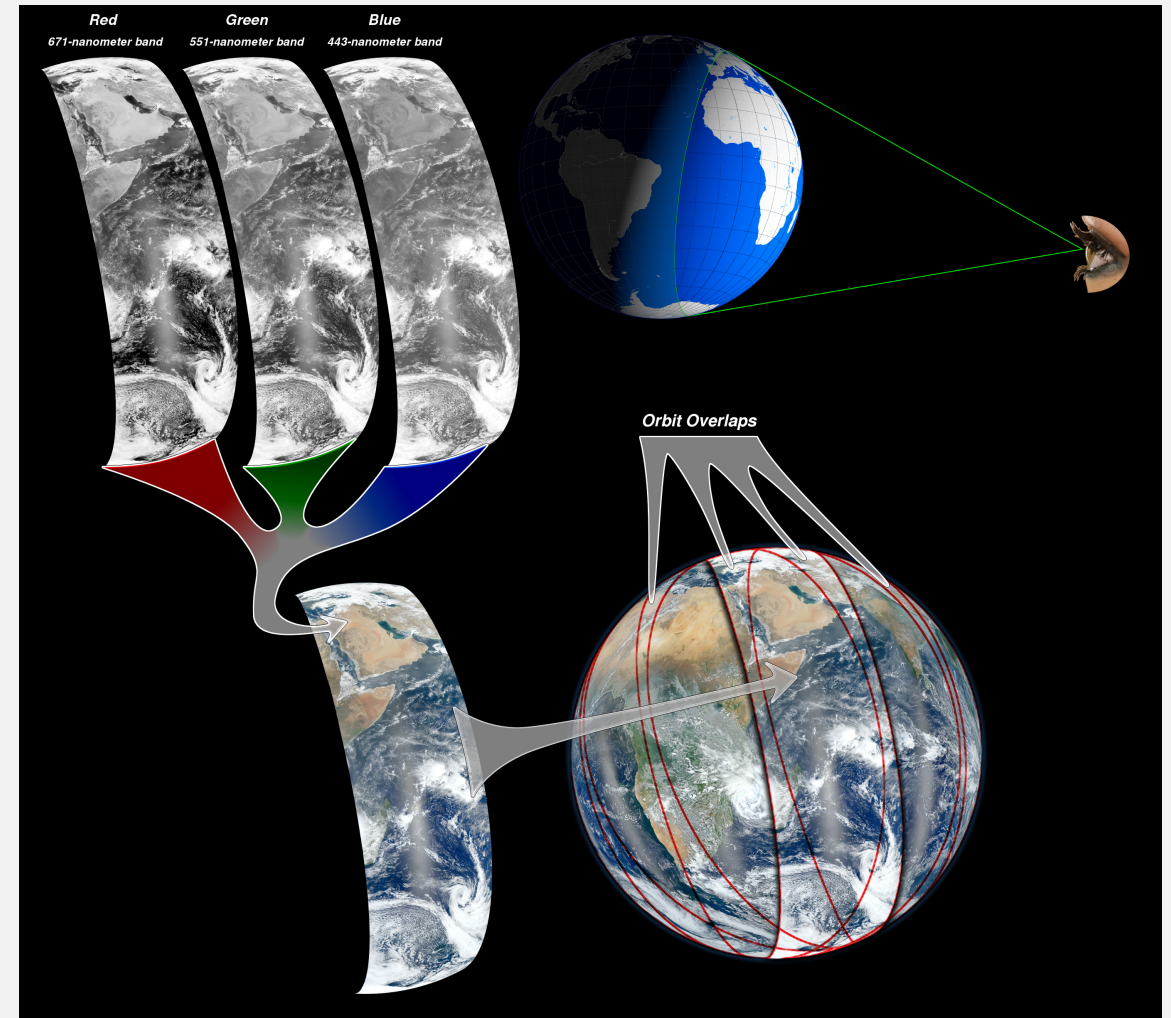


Suomi National Polar Partnership (SNPP)

(Programa Nacional de Colaboración Polar)

http://nasa.gov/mission_pages/NPP/

- Órbita polar, hora de cruce ecuatorial 13h30
- Cobertura Global
- 21 nov 2011 – presente
- Sensores:
 - VIIRS, ATMS, CrIS, OMPS, CERES



Visible Infrared Imaging Radiometer Suite (VIIRS)

(Suite de radiómetro de imágenes visibles e infrarrojas)

<http://jointmission.gsfc.nasa.gov/viirs.html>

- Abordo de **Suomi NPP**
- Satélite de órbita polar
- Funcionalidad similar a la de MODIS
- Cobertura y Resolución Espacial:
 - Global, Ancho de Barrido: 3,040 km
 - Resolución Espacial: 375 – 750 m
- Cobertura y Resolución Temporal:
 - Oct 2011 – presente
 - 1 a 2 veces por día

Imagen VIIRS de color real mostrando algas en el Mar Caspio, 18 de mayo de 2014

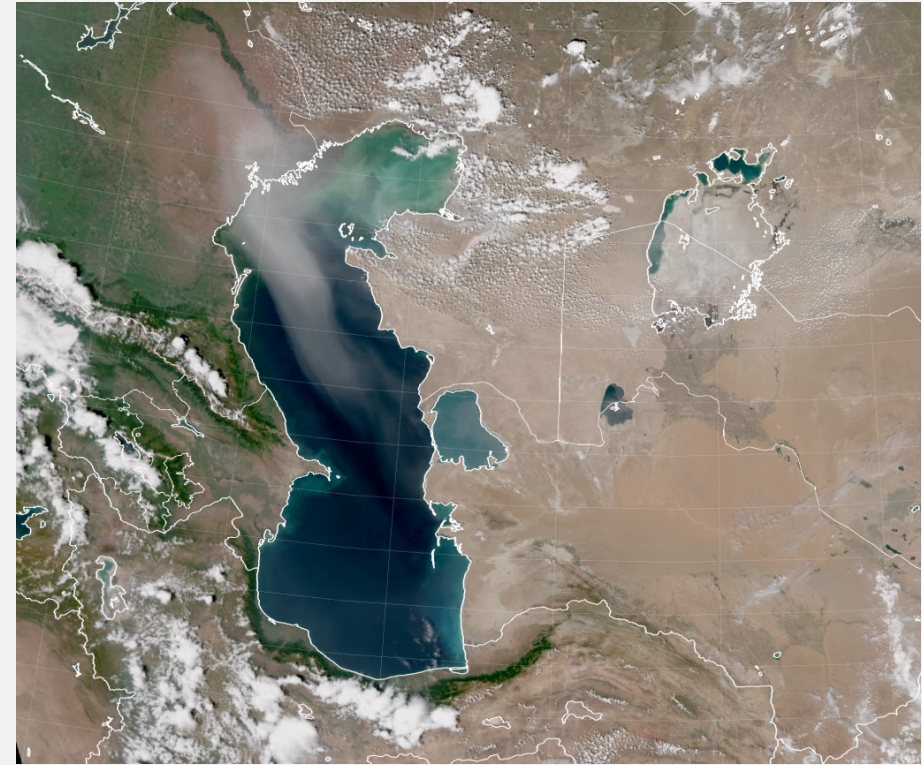


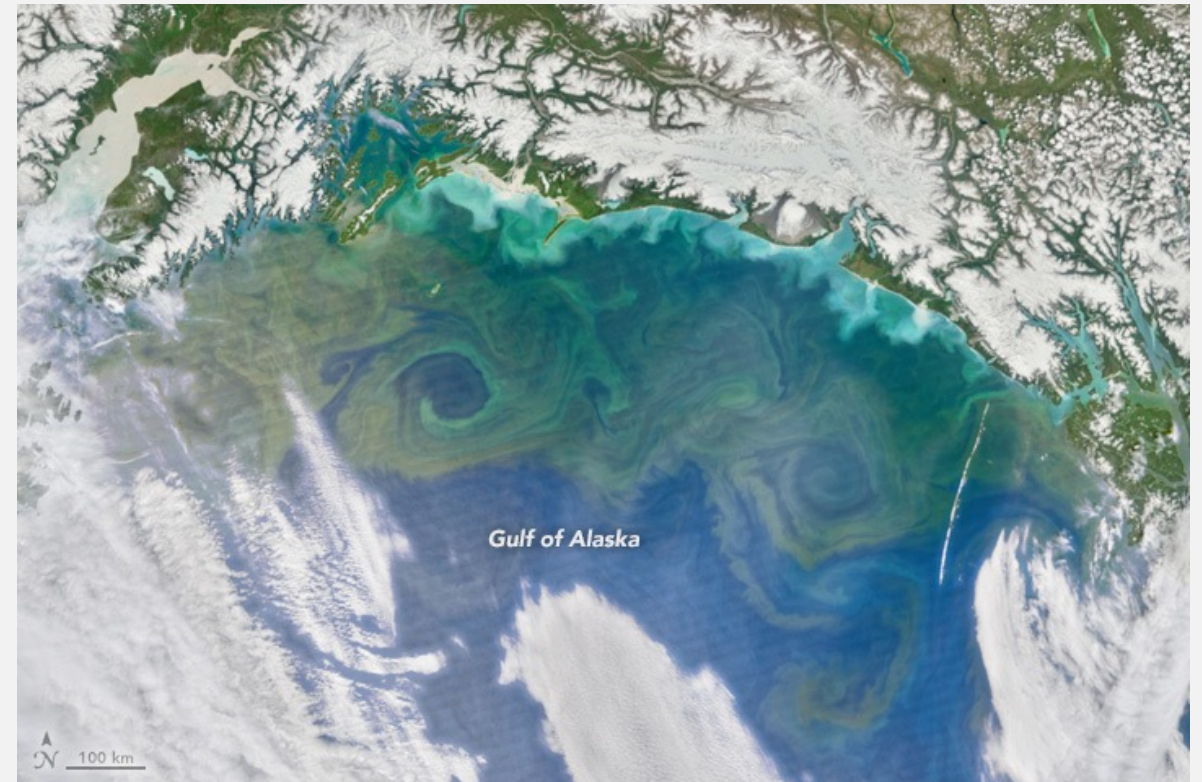
Image Credit: [VIIRS Imagery and Visualization Team Blog](#)

VIIRS- Bandas Relevantantes para el Monitoreo de HABs

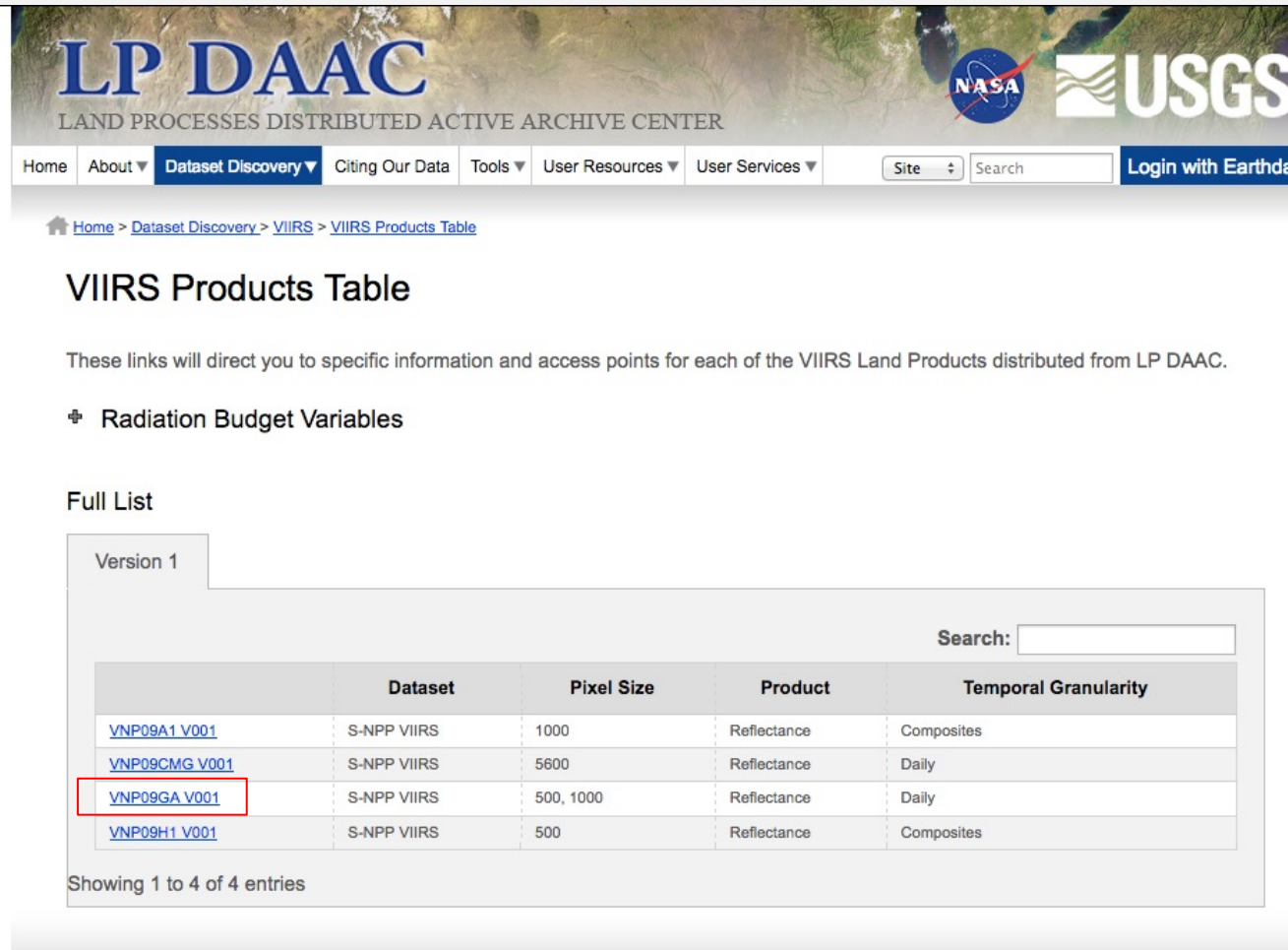
Banda	Gama de Banda μm
M1	0.402-0.422
M2	0.436-0.454
M3	0.478-0.488
M4	0.545-0.565
M5	0.662-0.682
M6	0.739-0.745

Resolución Espacial: 750 m

Floración de Fitoplancton en el Golfo de Alaska, de VIIRS, 9 de junio de 2016



Donde Conseguir Datos de Reflectancia de Bandas VIIRS



LP DAAC
LAND PROCESSES DISTRIBUTED ACTIVE ARCHIVE CENTER

Home About Dataset Discovery Citing Our Data Tools User Resources User Services Site Search Login with Earthdata

Home > Dataset Discovery > VIIRS > VIIRS Products Table

VIIRS Products Table

These links will direct you to specific information and access points for each of the VIIRS Land Products distributed from LP DAAC.

✦ Radiation Budget Variables

Full List

Version 1

Search:

	Dataset	Pixel Size	Product	Temporal Granularity
VNP09A1_V001	S-NPP VIIRS	1000	Reflectance	Composites
VNP09CMG_V001	S-NPP VIIRS	5600	Reflectance	Daily
VNP09GA_V001	S-NPP VIIRS	500, 1000	Reflectance	Daily
VNP09H1_V001	S-NPP VIIRS	500	Reflectance	Composites

Showing 1 to 4 of 4 entries

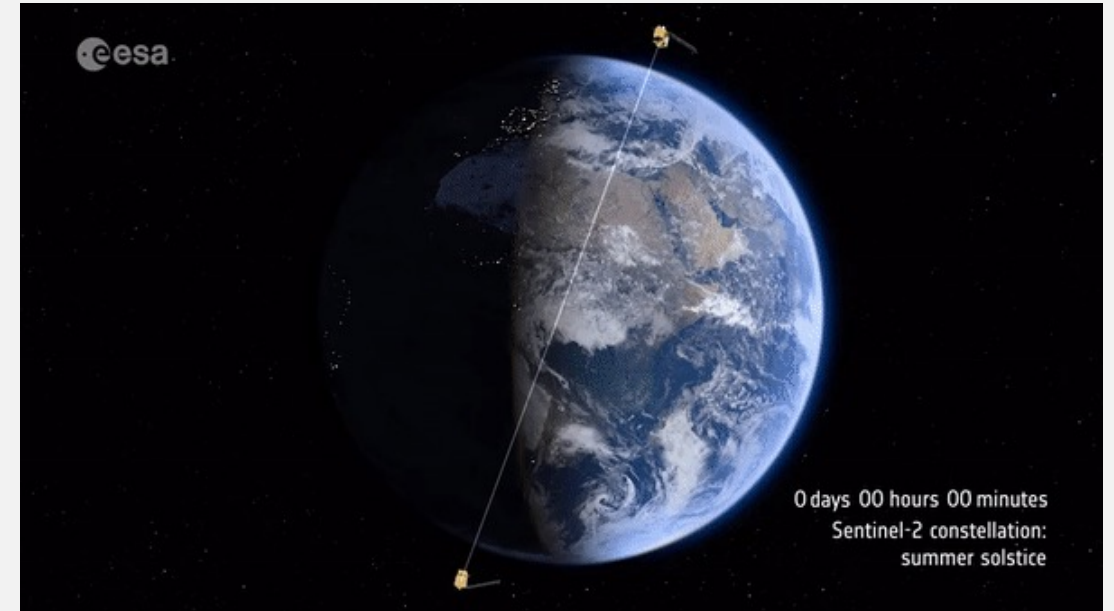
Land Process Distributed Active Archive Center

- https://lpdaac.usgs.gov/dataset_discovery/viirs/viirs_products_table
- Nombre de Producto:
VNP09GA_V001

Sentinel-2A y Sentinel-2B

http://www.esa.int/Our_Activities/Observing_the_Earth/Copernicus/Sentinel-2/

- Lanzados por la **ESA**
- Dos satélites, 180° aparte, ambos en órbita polar
- Cobertura Global
- Cobertura Temporal:
 - Sentinel-2A: 23 jun 2015 – presente
 - Sentinel-2B: 7 mar 2017 – presente
- Tiempo de revisita de 5 días
- Sensores
 - Multispectral Imager (MSI)

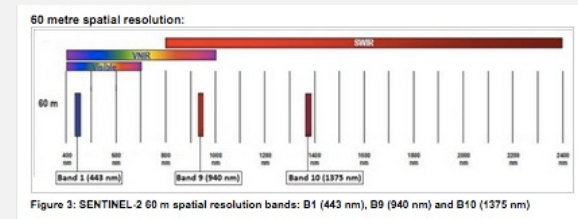
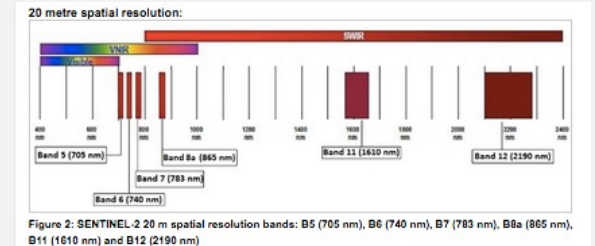
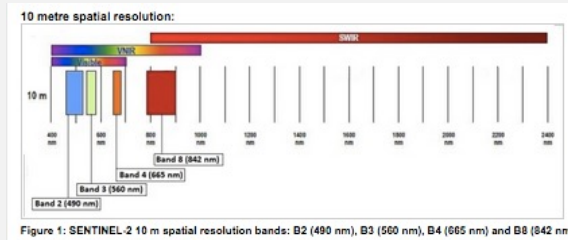


Multispectral Imager (MSI)

(Captador de imágenes multispectral)

<https://earth.esa.int/web/sentinel/user-guides/sentinel-2-msi>

- Abordo de **Sentinel-2**
- Diseñado para observar la superficie terrestre y oceánica
- Cobertura y Resolución Espacial :
 - Global, barrido: 290 km
 - Resolución espacial varía según la banda: 10 m, 20 m, 60 m
- Cobertura y Resolución Temporal:
 - Junio 2015 y marzo 2017 – presente
 - Tiempo de revisita de 5 días



Bandas Espectrales: 13

- 4 visibles y NIR: 10 m
- 6 roja-limite/infrarroja onda corta: 20 m
- 3 de corrección atmosférica: 60 m

MSI- Bandas

<https://earth.esa.int/web/sentinel/user-guides/sentinel-2-msi>

Band Number	S2A		S2B		Spatial resolution (m)
	Central wavelength (nm)	Bandwidth (nm)	Central wavelength (nm)	Bandwidth (nm)	
1	443.9	27	442.3	45	60
2	496.6	98	492.1	98	10
3	560.0	45	559	46	10
4	664.5	38	665	39	10
5	703.9	19	703.8	20	20
6	740.2	18	739.1	18	20
7	782.5	28	779.7	28	20
8	835.1	145	833	133	10
8a	864.8	33	864	32	20
9	945.0	26	943.2	27	60
10	1373.5	75	1376.9	76	60
11	1613.7	143	1610.4	141	20
12	2202.4	242	2185.7	238	20

Floración de Algas en medio del Mar Báltico, Sentinel-2 MSI, 7 ago 2015

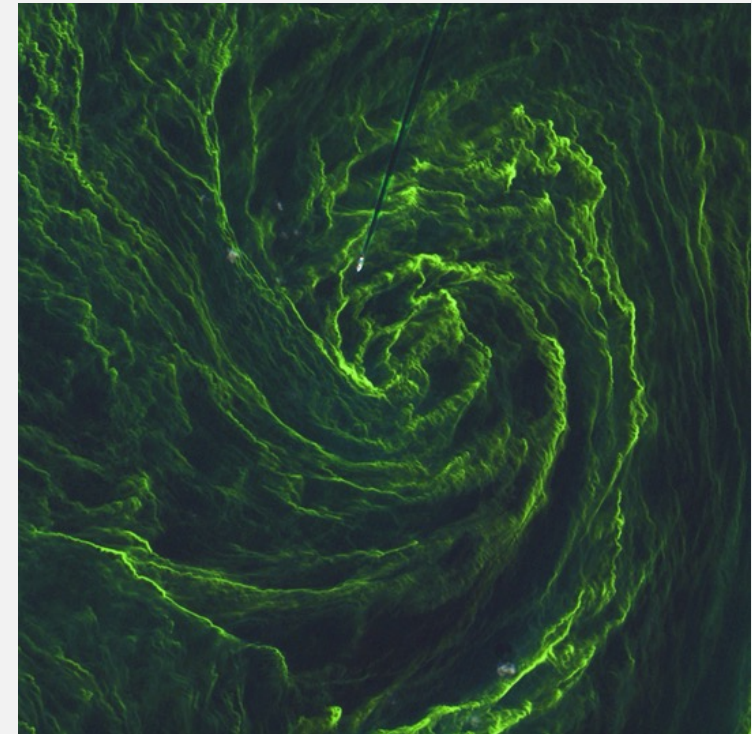
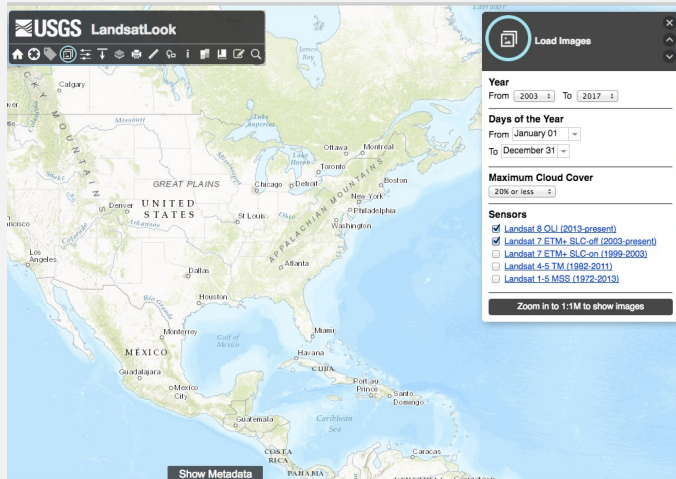


Image Credit: ESA

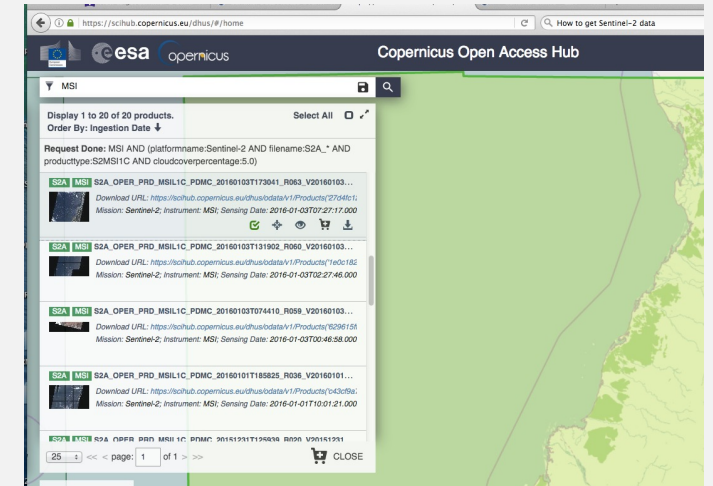
Donde Conseguir Datos de MSI



USGS Sentinel-2
Look Viewer
<https://landsatlook.usgs.gov/sentinel2/viewer.html>



Earth Explorer:
<http://earthexplorer.usgs.gov/>

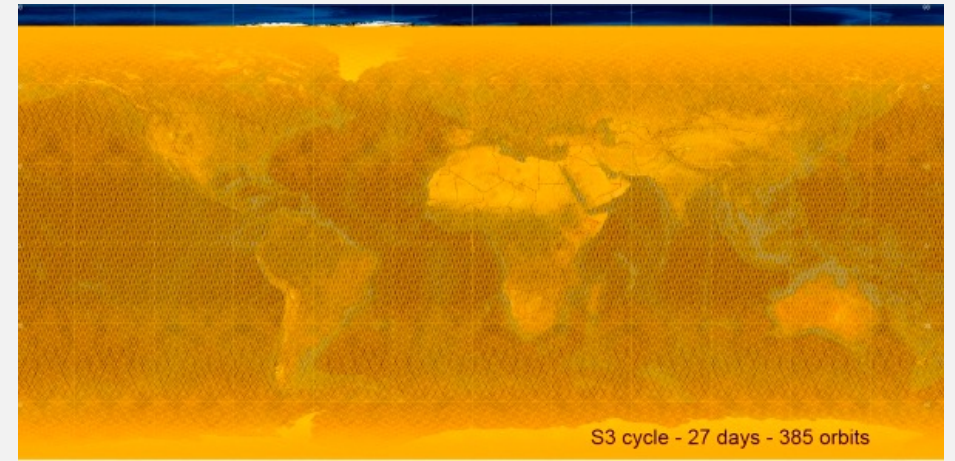


ESA Copernicus
Open Hub
<http://sentinel.esa.int/web/sentinel/sentinel-data-access>

Sentinel-3

www.esa.int/Our_Activities/Observing_the_Earth/Copernicus/Sentinel-3/

- Lanzado por la **ESA**
- Consistirá en un sistema bisatelital
 - Sentinel-3A: 16 feb 2016 - presente
 - Sentinel-3B: Aún no se ha lanzado
- Cobertura global
- Tiempo de revisita de 27 días
- Sensores:
 - **OCLI**, SLSTR, SRAL, MWR



Ocean and Land Color Instrument (OLCI)

<https://sentinel.esa.int/web/sentinel/user-guides/sentinel-3-olci>

- Abordo de **Sentinel-3**
- Basado en el legado del Medium Resolution Imaging Spectrometer (MERIS) del satélite ENVISAT
- Cobertura y Resolución:
 - Global, barrido: 1,270 m
 - Resolución espacial: 300 m, también disponible a 1.2 km
- Cobertura Temporal
 - Feb 2016 – presente
 - Tiempo de revisita cada 27 días

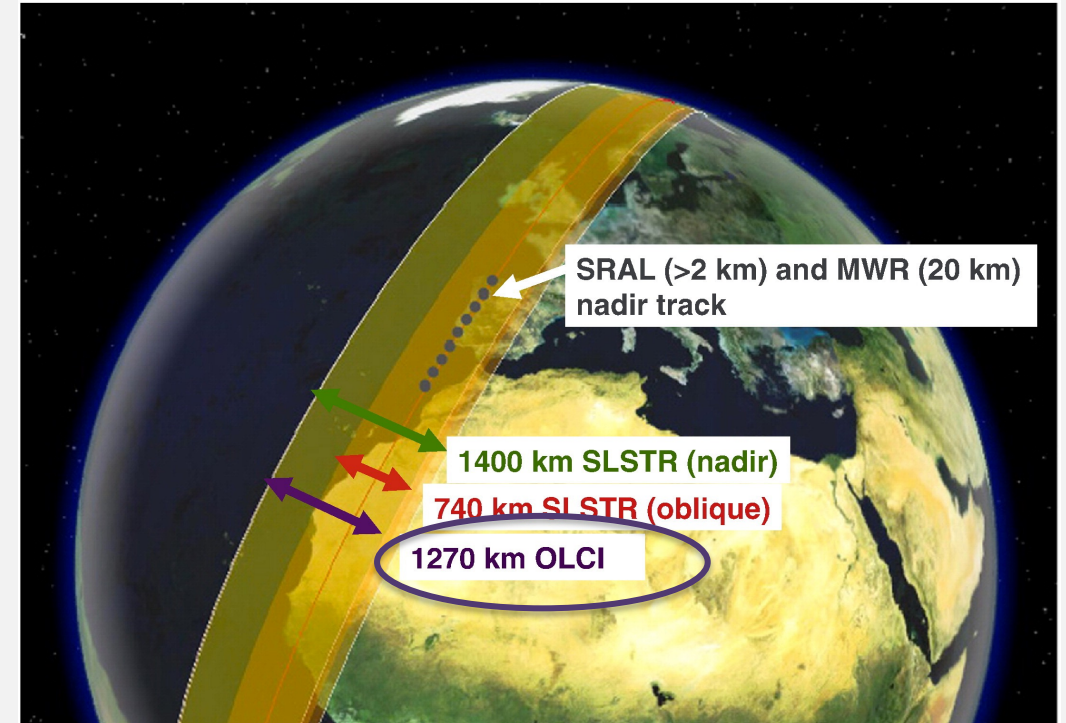


Image Credit: ESA

Bandas Espectrales: 21

- 4 visibles a casi-infrarroja: 300m

OLCI- Bandas

<https://sentinel.esa.int/web/sentinel/user-guides/sentinel-3-olci>

Band	λ centre (nm)	Width (nm)	Band	λ centre (nm)	Width (nm)
Oa1	400	15	Oa13	761.25	2.5
Oa2	412.5	10	Oa14	764.375	3.75
Oa3	442.5	10	Oa15	767.5	2.5
Oa4	490	10	Oa16	778.75	15
Oa5	510	10	Oa17	865	20
Oa6	560	10	Oa18	885	10
Oa7	620	10			
Oa8	665	10	Oa19	900	10
Oa9	673.75	7.5	Oa20	940	20
Oa10	681.25	7.5	Oa21	1 020	40
Oa11	708.75	10			
Oa12	753.75	7.5			

Concentración de Clorofila Basada en Sentinel-3 OCL

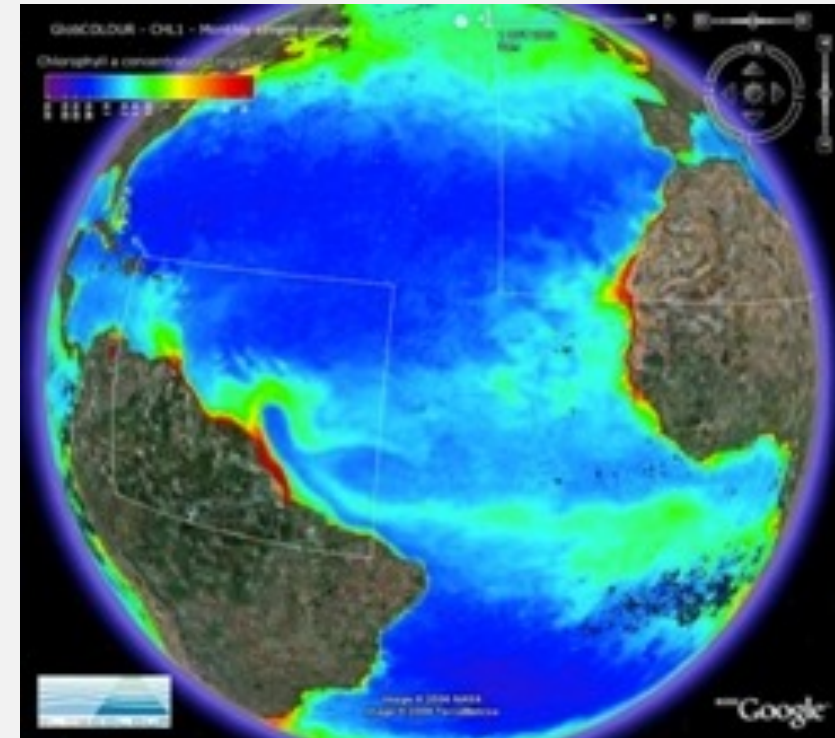


Image Credit: ESA/ACRI-ST

Donde Conseguir Datos de OLCI

The NOAA CoastWatch granule selector enables a user to select a Level-1 or Level-2 dataset by selecting a date and clicking on the granule that covers the user's area of interest. For VIIRS near real-time data is available for the last 15 days and science quality data is available from 2012 up to near real-time coverage. Clicking a granule will open an information window containing a link to the preview image and/or data file. If multiple files are desired (each file can be 18 to 550 MB), clicking on the download icon (⊕) will add the selected granule to a list that can be downloaded and used to retrieve files using local software.

Sensor: Layers: MGRS Grid for S-2 regions CoastWatch Regions

Date: 2017-08-08 Time: 1348
 Download Data:

SELECT PRODUCT

Search Term:

Products **Sentinel 3 DataSets**

- Meteosat Surface Albedo - MFG - 0 degree
- Meteosat Surface Albedo - MFG - Atlantic Ocean 50 W
- Meteosat Surface Albedo - MFG - Atlantic Ocean 75 W
- Meteosat Surface Albedo - MFG - Indian Ocean 57 E
- Meteosat Surface Albedo - MFG - Indian Ocean 63 E
- Multi-Sensor Precipitation Estimate (GRIB) - MFG - Indian Ocean
- Multi-Sensor Precipitation Estimate (GRIB) - MSG - 0 degree
- Multi-Sensor Precipitation Estimate (GRIB) - MSG - Indian Ocean
- Multi-Sensor Precipitation Estimate (JPEG) - MSG - 0 degree
- Multi-Sensor Precipitation Estimate (JPEG) - MSG - Indian Ocean
- Multi-Sensor Precipitation Estimate in GRIB - Reprocessed
- NAR Sea Surface Temperature in NetCDF
- Near Surface Wind Speed
- Normalised Difference Vegetation Index - MSG - 0 degree
- Normalised Difference Vegetation Index - MSG - Indian Ocean
- Normalised Difference Vegetation Index Decadal - MSG - 0 degree
- Normalised Difference Vegetation Index Decadal - MSG - Indian Ocean
- North Atlantic and Regional Sea Surface Temperature (NAR SST) - NOAA
- OLCI Level 1B Full Resolution in NRT - Sentinel-3
- OLCI Level 1B Full Resolution in NTC - Sentinel-3
- OLCI Level 1B Reduced Resolution in NTC - Sentinel-3
- OLCI Level 1B Reduced Resolution in NTC - Sentinel-3
- OLCI Ocean Colour Full Resolution in NRT - Sentinel-3
- OLCI Ocean Colour Full Resolution in NTC - Sentinel-3
- OLCI Ocean Colour Reduced Resolution in NRT - Sentinel-3
- OLCI Ocean Colour Reduced Resolution in NTC - Sentinel-3
- OSQAT Winds at 50 km Swath Grid - OceanSat

Thematic Filter

- Marine
- Land
- Atmosphere
- Aerosol
- Analysis
- Cloud
- Fire
- Forecast
- Humidity
- Model
- Observation
- Ocean
- Precipitation
- Pressure
- Radar Backscatter NRCS
- Radiation
- Soil Moisture Index
- Sea Ice
- Sea Surface Temperature
- Snow and Ice
- Temperature
- Vegetation
- Wave
- Wind

Selected Product
 OLCI Level 1B Reduced Resolution in NTC - Sentinel-3

OLCI (Ocean and Land Colour Instrument) Reduced resolution: 1200m at nadir. All Sentinel-3 Non Time Critical (NTC) products are available at pick-up point in less than 30 days. Level 1 products are calibrated Top Of Atmosphere radiances values at OLCI 21 spectral bands. Radiances are computed from the instrument digital counts by applying geo-referencing, radiometric processing (non-linearity correction, smear correction, dark offset correction, absolute gain calibration adjusted for gain evolution with time), and stray-light correction for straylight effects in OLCI camera's spectrometer and ground imager. Additionally, spatial resampling of OLCI pixels to the 'ideal' instrument grid, initial pixel classification, and annotation at tie points with auxiliary

NOAA CoastWatch

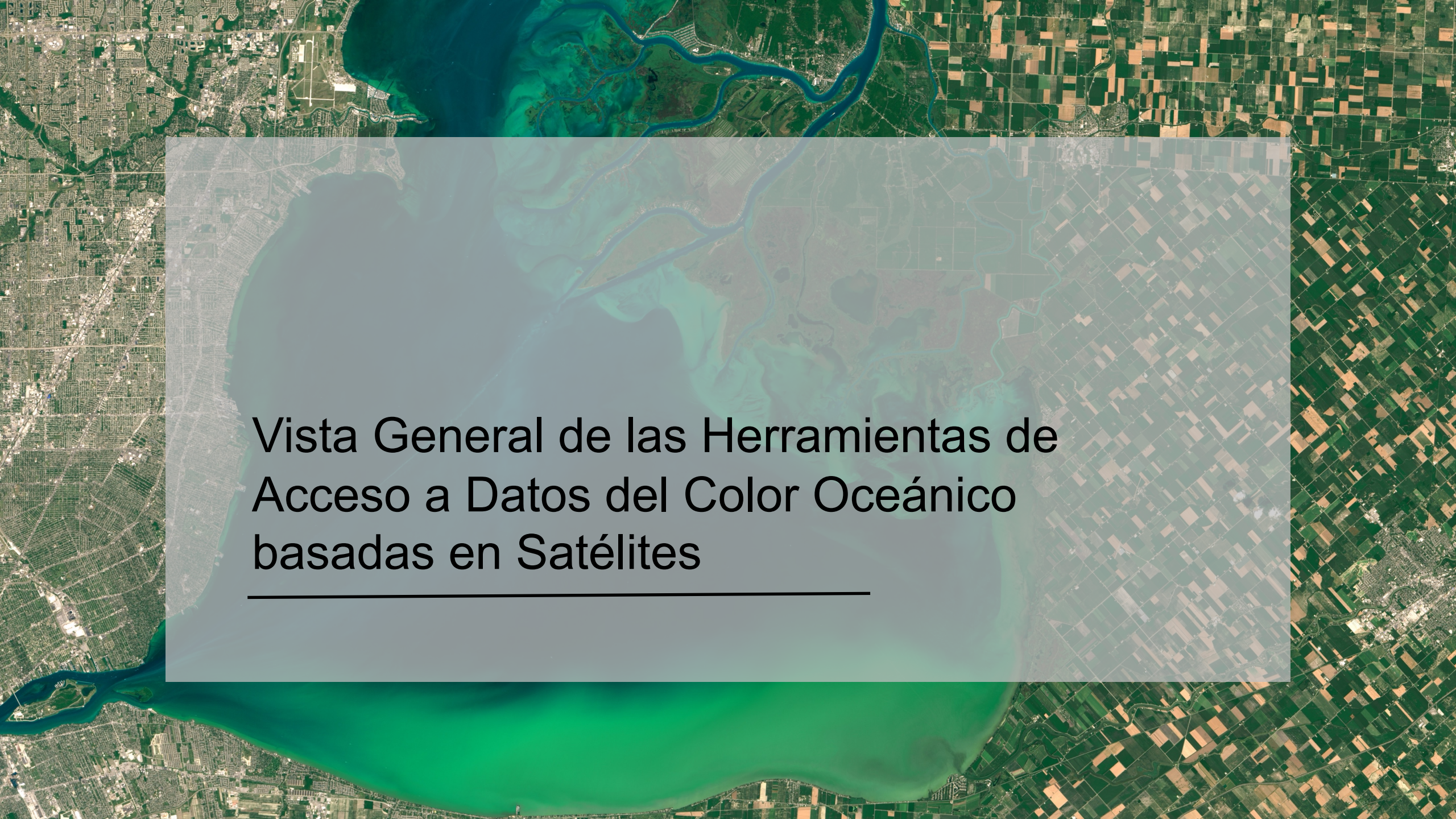
https://coastwatch.noaa.gov/cw_html/cw_granule_selector.html?sensor=OLCI

EUMETSAT

<http://archive.eumetsat.int/usc/#sp;;delm=O;noti=1;udsp=OPE;qqov=ALL;seev=0>

Limitaciones de la Observaciones de la Teledetección para el Monitoreo de HABs

- Para un monitoreo exacto y cuantitativo se requiere un análisis de mediciones *in situ* y observaciones satelitales co-localizadas espacial y temporalmente
- Es difícil separar los cambios en el color del océano debido a sedimentos, materia disuelta y Chl-a cuando todos están presentes
- No es posible caracterizar los tipos de algas o toxinas sólo con observaciones de la teledetección
- La factibilidad del monitoreo de HABs en masas de agua costeras e interiores depende de las resoluciones espacial, temporal y espectral de las observaciones de la teledetección
- La reflectancia de teledetección debe corregirse para poder tomar en cuenta las contribuciones de los constituyentes atmosféricos, tales como aerosoles
- Las observaciones de la teledetección óptica no pueden visualizar la superficie en la presencia de nubes

An aerial photograph of a coastal region, likely the Chesapeake Bay area, showing a mix of urban development, agricultural fields, and water bodies. A semi-transparent map overlay is centered on the water, displaying ocean color data in shades of green and blue. The text is overlaid on this map.

Vista General de las Herramientas de Acceso a Datos del Color Oceánico basadas en Satélites

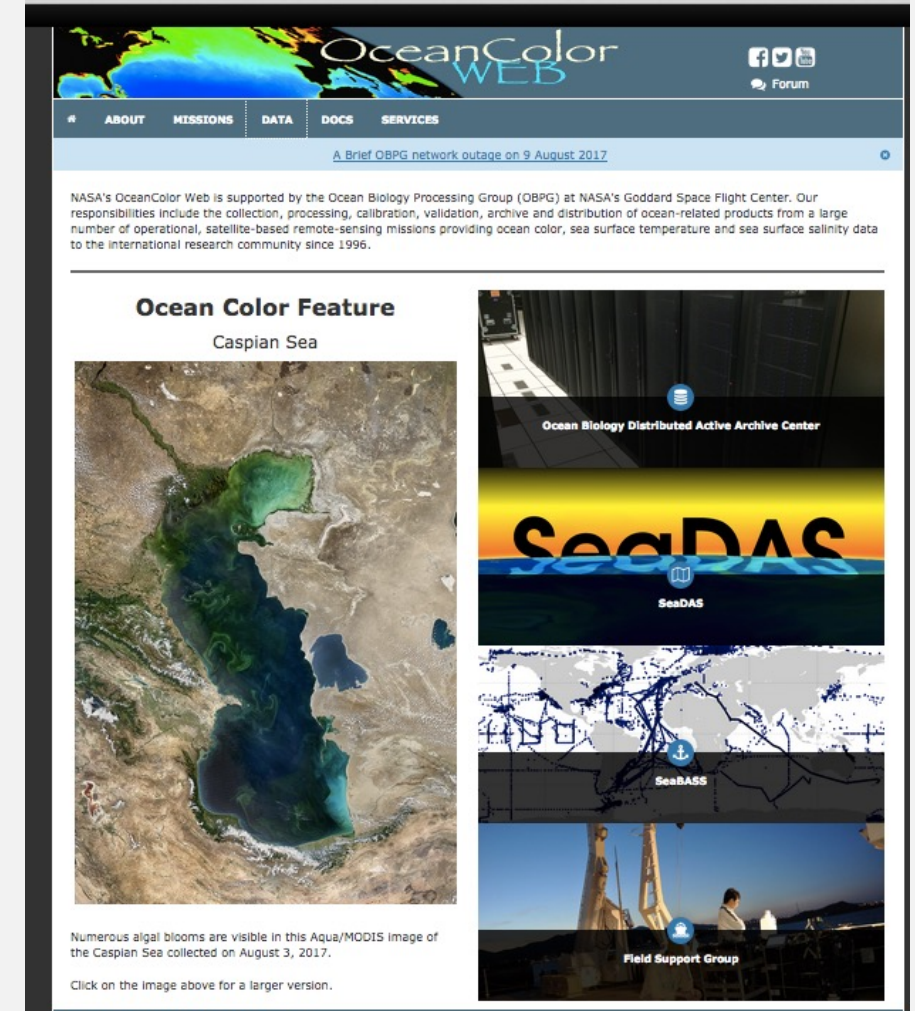
Acceso a datos de Chl-a y SST para el Monitoreo de HABs

- Estas herramientas ofrecen búsqueda de datos, formación de conjuntos espaciales y temporales, análisis y visualización:
 - OceanColor Web:
<https://oceancolor.gsfc.nasa.gov/>
 - Giovanni:
<http://giovanni.gsfc.nasa.gov/giovanni/>
- Software de Procesamiento y Visualización de Imágenes:
 - SeaDAS:
<http://seadas.gsfc.nasa.gov/>

OceanColor Web

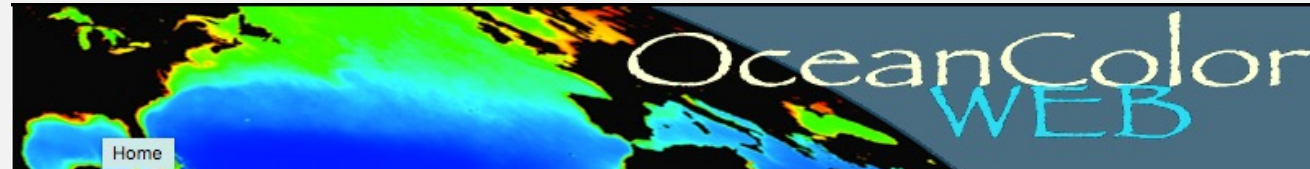
<https://oceancolor.gsfc.nasa.gov/>

- Desarrollado para la colección, procesamiento, validación y distribución de productos relacionados con el océano de observaciones de la teledetección e in situ
- Útil para el monitoreo de masas de agua costeras e interiores así como estuarios
- Ofrece la capacidad de navegación visual para datos de N1, N2 y N3 (Concentración de Clorofila, Temperatura Superficial Marina) de sensores seleccionados
- Avanza la capacidad de procesamiento de imágenes de teledetección usando SeaDAS



OceanColor Web: Búsqueda y Acceso a Datos

<https://oceancolor.gsfc.nasa.gov/>

A screenshot of the OceanColor WEB navigation menu. The "MISSIONS" tab is highlighted with an orange box. Below it, a list of satellite missions is shown, with "MODIS Terra", "OCTS", "OLCI-S3A", "SeaWiFS", and "VIIRS-SNPP" highlighted by orange boxes. Other missions listed include Aquarius, CZCS, GOCI, HICO, MERIS, and MODIS Aqua.

- Home
- ABOUT
- MISSIONS**
- DATA
- DOCS
- SERVICES

- Aquarius
- CZCS
- GOCI
- HICO
- MERIS
- MODIS Aqua
- MODIS Terra**
- OCTS**
- OLCI-S3A**
- PACE
- SeaWiFS
- VIIRS-SNPP**

A screenshot of the OceanColor WEB navigation menu. The "DATA" tab is highlighted with an orange box. Below it, a list of data access options is shown, with "Data Browsers", "Level 1&2 Browser", and "Level 3 Browser" highlighted by orange boxes. Other options include Overview, Direct Data Access, Data File Search, Data Subscription, OPeNDAP, SeaBASS Field Data, How to Cite, and Other Resources. Two small screenshots of data browser interfaces are also shown.

- Home
- ABOUT
- MISSIONS
- DATA**
- DOCS
- SERVICES

- Overview
- Data Browsers**
- Level 1&2 Browser**
- Level 3 Browser
- Direct Data Access
- Data File Search
- Data Subscription
- OPeNDAP
- SeaBASS Field Data
- How to Cite
- Other Resources

OceanColor Web: Imágenes N1 y Visualización de Datos N2

<https://oceancolor.gsfc.nasa.gov/>

Selección de Parámetros

Ampliación de región

Datos de Clorofila en Tiempo Casi Real y Pasados de MODIS y VIIRS

Regiones predefinidas

Selección Temporal (Mes y Día)

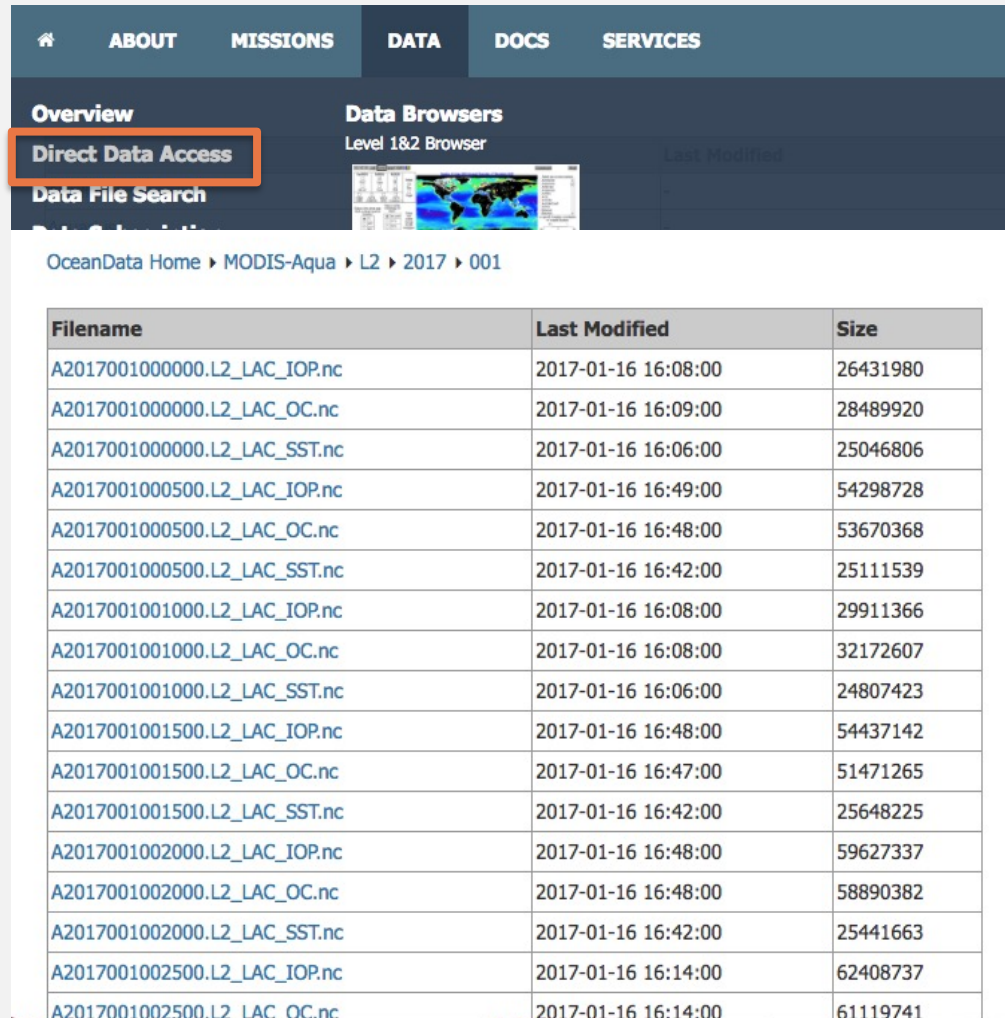
Selecciones de Área y Tamaño de Barrido

Selección Temporal (Año)

gene carl feldman (gene.c.feldman@nasa.gov) (301) 286-9428

OceanColor Web: Imágenes N1 y Descarga de Datos N2

<https://oceancolor.gsfc.nasa.gov/>



OceanData Home > MODIS-Aqua > L2 > 2017 > 001

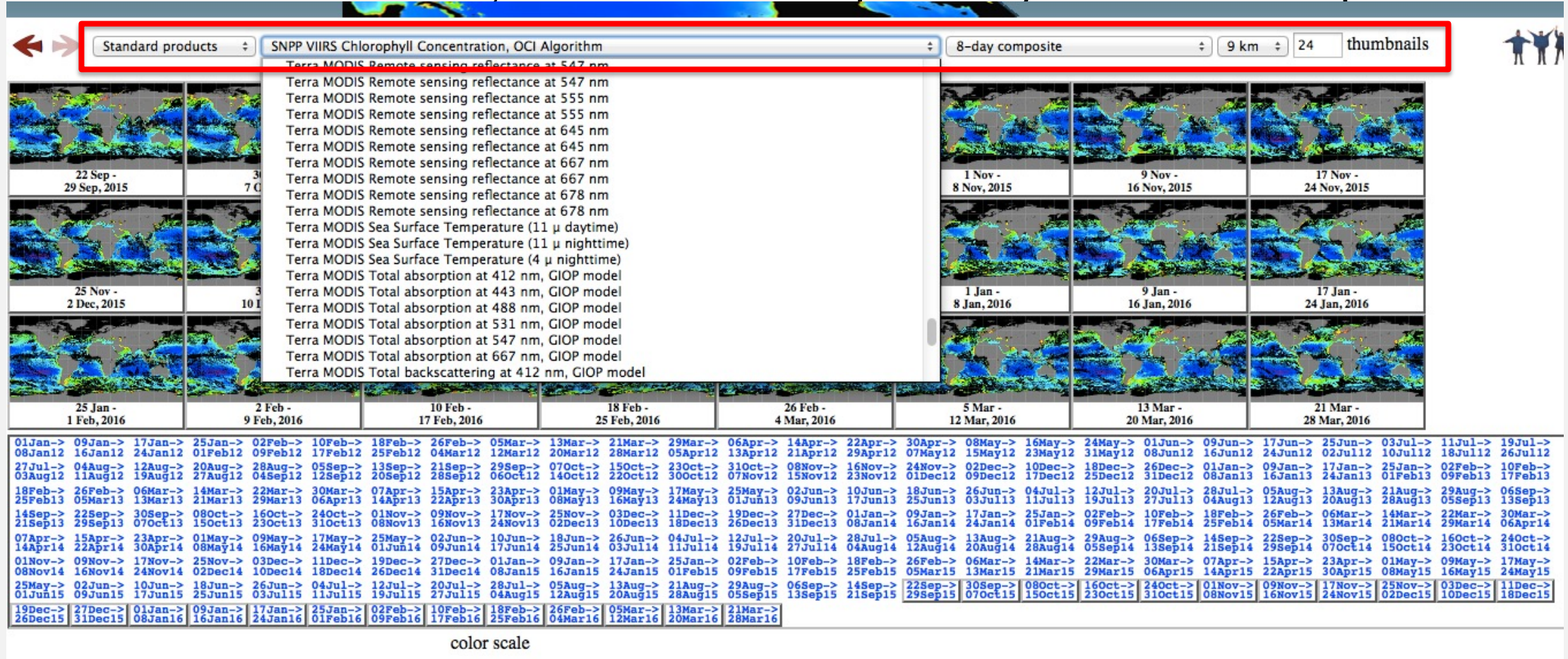
Filename	Last Modified	Size
A2017001000000.L2_LAC_IOP.nc	2017-01-16 16:08:00	26431980
A2017001000000.L2_LAC_OC.nc	2017-01-16 16:09:00	28489920
A2017001000000.L2_LAC_SST.nc	2017-01-16 16:06:00	25046806
A2017001000500.L2_LAC_IOP.nc	2017-01-16 16:49:00	54298728
A2017001000500.L2_LAC_OC.nc	2017-01-16 16:48:00	53670368
A2017001000500.L2_LAC_SST.nc	2017-01-16 16:42:00	25111539
A2017001001000.L2_LAC_IOP.nc	2017-01-16 16:08:00	29911366
A2017001001000.L2_LAC_OC.nc	2017-01-16 16:08:00	32172607
A2017001001000.L2_LAC_SST.nc	2017-01-16 16:06:00	24807423
A2017001001500.L2_LAC_IOP.nc	2017-01-16 16:48:00	54437142
A2017001001500.L2_LAC_OC.nc	2017-01-16 16:47:00	51471265
A2017001001500.L2_LAC_SST.nc	2017-01-16 16:42:00	25648225
A2017001002000.L2_LAC_IOP.nc	2017-01-16 16:48:00	59627337
A2017001002000.L2_LAC_OC.nc	2017-01-16 16:48:00	58890382
A2017001002000.L2_LAC_SST.nc	2017-01-16 16:42:00	25441663
A2017001002500.L2_LAC_IOP.nc	2017-01-16 16:14:00	62408737
A2017001002500.L2_LAC_OC.nc	2017-01-16 16:14:00	61119741

- Datos Disponibles
 - Chl-a
 - SST
 - Propiedades Ópticas Inherentes

OceanColor Web: Visualización de Datos N3

<http://oceancolor.gsfc.nasa.gov/>

Producto de Datos, Selecciones Temporales y Resolución Espacial



Giovanni: Geospatial Interactive Online Visualization ANd aNalysis Infrastructure

<http://giovanni.gsfc.nasa.gov/giovanni/>

The screenshot displays the GIOVANNI web interface. At the top, there is a navigation bar with 'EARTHDATA' and several menu items: 'Data Discovery', 'DAACs', 'Community', and 'Science Disciplines'. Below this is the 'GIOVANNI' logo and the tagline 'The Bridge Between Data and Science v 4.23', along with links for 'Release Notes', 'Browser Compatibility', and 'Known Issues'. A yellow banner at the top left indicates a 'MODIS OPeNDAP server continuing problem ... [1 of 2 messages] Read More'. The main interface is divided into several sections: 'Select Plot' with radio buttons for 'Maps: Time Averaged Map', 'Comparisons', 'Vertical', 'Time Series', and 'Miscellaneous'; 'Select Date Range (UTC)' with input fields for start and end dates and times, and a 'Valid Range: 1948-01-01 to 2017-08-10' note; 'Select Region (Bounding Box or Shape)' with a text input field and a search icon; 'Select Variables' with a list of disciplines and measurements, each with a checkbox and a count in parentheses. The disciplines list includes Aerosols (174), Atmospheric Chemistry (66), Atmospheric Dynamics (356), Cryosphere (15), Hydrology (996), Ocean Biology (44), Oceanography (48), and Water and Energy Cycle (1060). The measurements list includes Aerosol Index (3), Aerosol Optical Depth (80), Air Pressure Anomaly (1), Air Pressure (49), Air Temperature (79), Albedo (17), Altitude (6), Angstrom Exponent (17), Atmospheric Moisture (103), Black Carbon (5), Buoyancy (2), CH4 (12), CO (17), CO2 (2), Canopy Water Storage (6), Chlorophyll (11), Cloud Fraction (30), Cloud Properties (71), Component Aerosol Optical Depth (5), and Diffusivity (1). A search bar with 'Search' and 'Clear' buttons is located below the variable lists. At the bottom right, there are buttons for 'Help', 'Reset', 'Feedback', and a prominent green 'Plot Data' button.

Giovanni: Geospatial Interactive Online Visualization ANd aNalysis Infrastructure

<http://giovanni.gsfc.nasa.gov/giovanni/>

The screenshot shows the GIOVANNI web interface with several key sections highlighted by colored boxes and callouts:

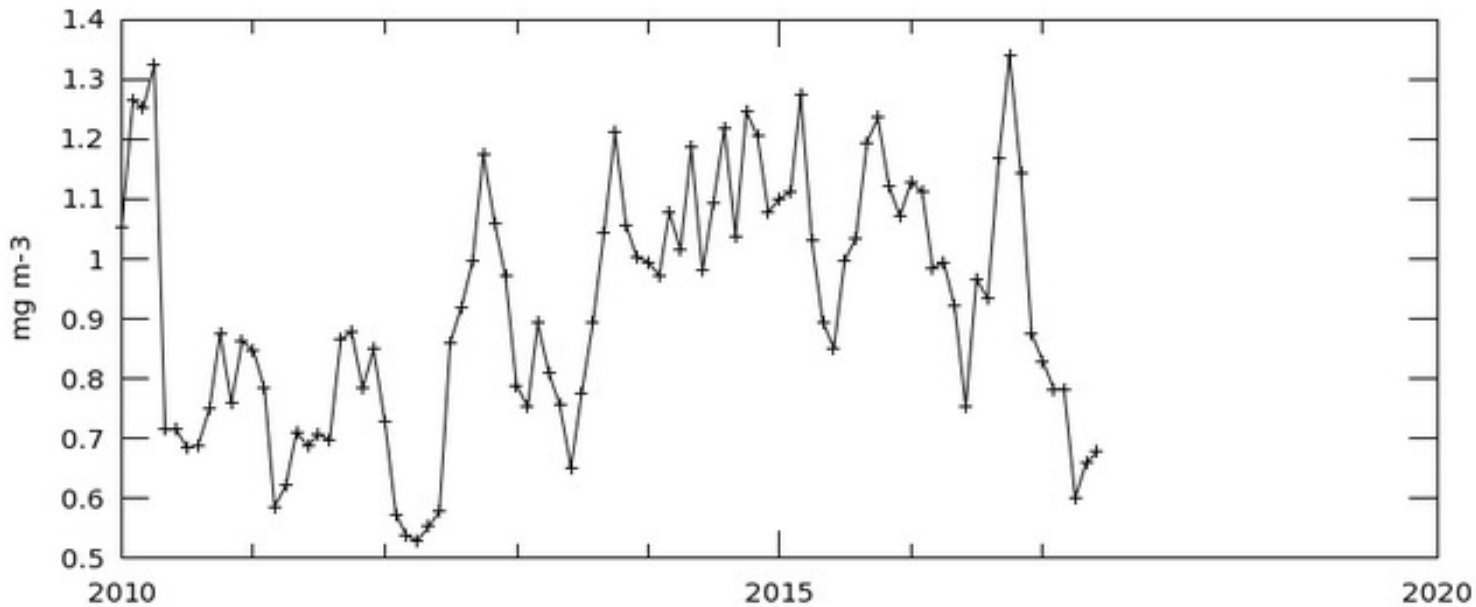
- Análisis y selección gráfica:** A red box highlights the 'Select Plot' section, where 'Time Series: Hovmoller, Longitude-Averaged' is selected.
- Fecha de inicio y fin, selección espacial por mapa, latitud-longitud y shapefile:** A blue box highlights the 'Select Date Range (UTC)' and 'Select Region (Bounding Box or Shape)' sections. The date range is set from 2010-01-01 to 2017-06-30, and the region is defined by bounding box coordinates: -86.6602, 24.8145, -80.332, 31.4941.
- Búsqueda de datos por palabra clave:** A green box highlights the search results table, which lists variables like 'Chlorophyll a Concentration' from various sources (OCTS, MODISA, SeaWiFS).

Variable	Source	Temp.Res.	Spat.Res.	Start Date	End Date	Units
Chlorophyll a Concentration (OCTS L3m_CHL v2014)	OCTS	Monthly	9 km	1998-01-01	2012-12-31	mg chlorophyll/m ³
Chlorophyll a Concentration (NOBM Model)	NOBM Model	Daily	0.667 x 1.25 °	1998-01-01	2012-12-31	mg chlorophyll/m ³
Chlorophyll a concentration (MODISA L3m_CHL v2014)	MODISA-Ac	Monthly	4 km	2002-07-04	2017-06-30	mg m ⁻³
Chlorophyll a Concentration (SeaWiFS L3m_CHL v2014)	SeaWiFS	Monthly	9 km	1997-09-04	2010-12-11	mg m ⁻³
Chlorophyll Concentration, OC3 Algorithm (OCTS L3m_CHL v2014)	OCTS	Monthly	9 km	1996-11-01	1997-06-30	mg m ⁻³
Concentration of Particulate Organic Carbon (OCTS L3m_POC v2014)	OCTS	Monthly	9 km	1996-11-01	1997-06-30	mg m ⁻³
Concentration of Particulate Organic Carbon (MODISA L3m_POC v2014)	MODISA-Ac	Monthly	4 km	2002-07-04	2017-06-30	mg m ⁻³

Giovanni: Concentración de Clorofila en el Golfo de México

<http://giovanni.gsfc.nasa.gov/giovanni/>

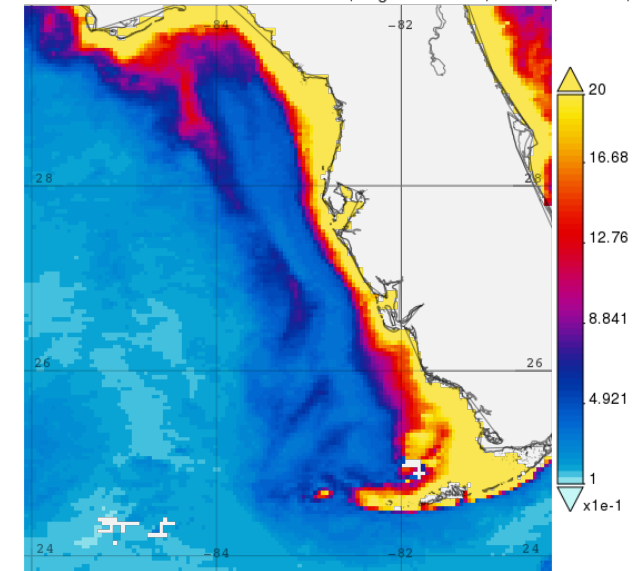
Time Series, Area-Averaged of Chlorophyll a concentration monthly 4 km
[MODIS-Aqua MODISA_L3m_CHL v2014] mg m-3 over 2009-12-31 22:25:08Z -
2017-07-01 02:45:10Z, Region 86.0889W, 23.811N, 80.376W, 29.9634N



- Selected date range was 2010-Jan - 2017-Jul. Title reflects the date range of the granules that went into making this result.

Enero de 2017

Time Averaged Map of Chlorophyll a concentration monthly 4 km [MODIS-Aqua MODISA_L3m_CHL v2014] mg m-3
over 2017-01-01 00:25:11Z - 2017-02-01 02:50:09Z, Region 86.0889W, 23.811N, 80.376W, 29.9634N



Giovanni: Deescarga de Datos

<http://giovanni.gsfc.nasa.gov/giovanni/>

MODIS OPeNDAP server continuing problem ... [1 of 2 messages] [Read More](#)

Browse History

2. Time Averaged Map

- [User Input](#)
- [Plots](#)
- [Plot Options](#)
- **[Downloads](#)**
- [Lineage](#)

1. Time Series, Area-Averaged

- [User Input](#)
- [Plots](#)
- [Plot Options](#)
- **[Downloads](#)**
- [Lineage](#)

Click on file links to download. Files contain data portrayed in the plot images.

NetCDF:

[g4.timeAvgMap.MODISA_L3m_CHL_2014_chlor_a.20170101-20170131.85W_24N_79W_31N.nc](#)

PNG:

[MODISA_L3m_CHL_2014_chlor_a.20170101-20170131.85W_24N_79W_31N.png](#)

GEOTIFF:

[MODISA_L3m_CHL_2014_chlor_a.20170101-20170131.85W_24N_79W_31N.geotif](#)

KMZ:

[MODISA_L3m_CHL_2014_chlor_a.20170101-20170131.85W_24N_79W_31N.kmz](#)

Opciones para
múltiples formatos

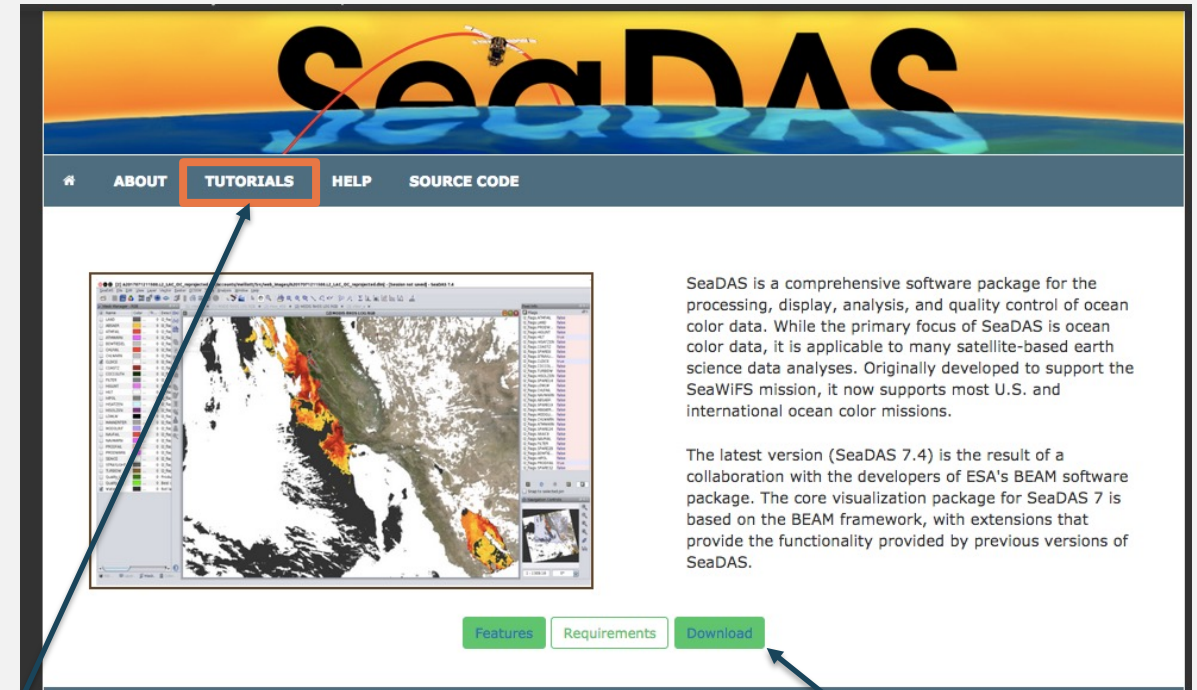
Haga clic para
descargar
archivos

SeaDAS: Paquete de Análisis de Datos

<http://seadas.gsfc.nasa.gov/>

- SeaDAS es un paquete de análisis de imágenes comprensivo desarrollado para el procesamiento, visualización, análisis y control de calidad de datos del color oceánico
- La última versión (SeaDAS 7.4) se desarrolló en colaboración con los que desarrollaron el paquete de software BEAM de la ESA

Video de tutorial y presentaciones sobre SDAS



Descargar software

SeaDAS: Funcionalidades

<http://seadas.gsfc.nasa.gov/>

Visualization

- Very fast image display and navigation even of giga-pixel images
- Advanced layer management allows adding and manipulation of new overlays such as images of other bands, images from WMS servers or ESRI shapefiles
- Rich region-of-interest definitions for statistics and various plotting functions
- Easy bitmask definition and overlay
- Flexible band arithmetic using arbitrary mathematical expressions
- Accurate reprojection and ortho-rectification to common map projections
- Geo-coding and rectification using ground control points
- Coastline, land/water masking for navigated data
- Store and restore the current session including all opened files, views and layers

Data Processing

SeaDAS offers the ability for users to process satellite data from a number of ocean color missions (both U.S. and International) through the various processing levels:

- Level 0 to Level 1 processing is offered for the MODIS sensors onboard the Terra and Aqua spacecraft
- Level 1 to Level 2 (l2gen)
- Level 2 to Level 3 binned (l2bin)
- Temporal binning of Level 3 (l3bin)
- Mapping of Level 1 data (l1mapgen)
- Mapping of Level 2 data (l2mapgen)
- Mapping of Level 3 binned data (smigen)
- Browse file creation (l1brsgen,l2brsgen)

SeaDAS: Requisitos de Sistema

<http://seadas.gsfc.nasa.gov/>

- Versión sólo para visualizar
- Versión para visualizar y procesar datos
- Uno puede analizar múltiples misiones
- Se requiere capacitación avanzada para descargar, instalar y usar SeaDAS

SeaDAS Configuration and Requirements

SeaDAS is currently available for Linux, Mac OS X, and Windows. The Windows version currently does not support the science data processing code. The SeaDAS [source code](#) is publicly available.

Suggested Hardware Requirements:

Platforms:	Linux Intel Mac OS X
Memory:	256MB minimum, 1GB+ suggested
Disk:	SeaDAS software package (display only version): ~200MB SeaDAS software package (with processing capabilities for all sensors): ~5GB 10GB of free space is also suggested for rudimentary data processing and storage.
Display:	15" Console or X-terminal with 20MB memory 1280x1024 resolution 24-bit X display plane depth 256 colors display minimum

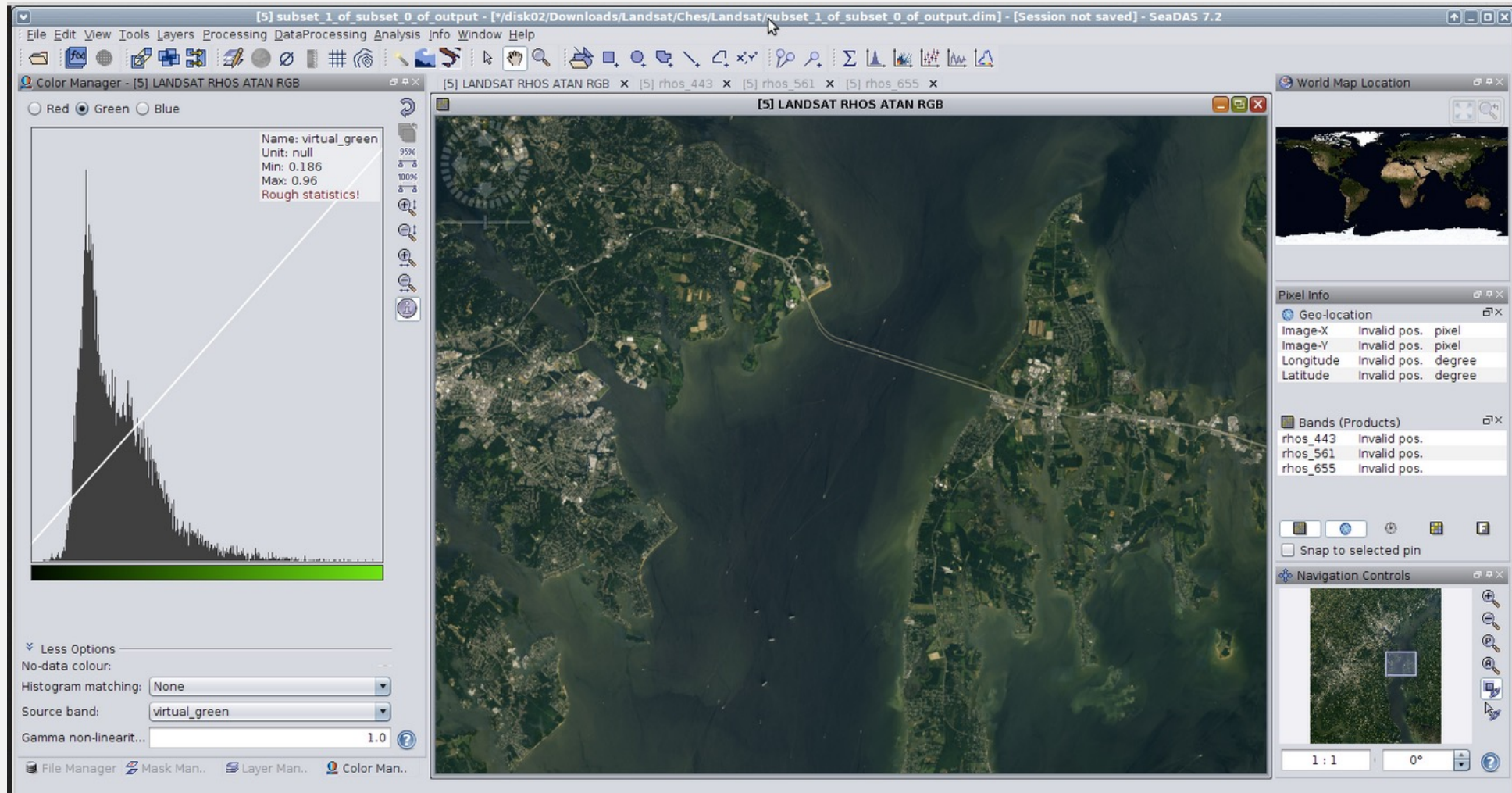
Requirements:

The core visualization package of SeaDAS is written in Java. A minimum Java JRE of version 1.7 is required. A suitable JRE is packaged with the Windows and MacOSX distributions. Linux users will need to separately install a suitable JRE.

Operating Systems:	Linux: tested on various versions of CentOS, Fedora, and Ubuntu Intel Mac: OS X 10.10	
Optional Compilers:	gcc/g++/gfortran (version 4.5 or higher) or Intel Compilers	
Program	Version	Notes
Java	JRE 1.7 or above	Windows and MacOSX distributions come with a suitable JRE Linux users will need to separately install a suitable JRE
Bash	4.x	version 3.x should work, but not tested necessary only for science code, thus not required for Windows distributions
Python	2.6.5 or above	necessary only for science code, thus not required for Windows distributions; not (yet) compatible with version 3 and above
Git	1.7.9 or above	necessary only for science code install/update option, thus not required for Windows distributions
cURL	7.x or above	necessary only for science code install/update option, thus not required for Windows distributions

SeaDAS: Ejemplo

<http://seadas.gsfc.nasa.gov/>





Ejemplos de Herramientas para el Monitoreo de HABs

El Monitoreo de Chl-a y SST Usando MODIS y Landsat 8

<http://optics.marine.usf.edu/>

The screenshot shows the website for the University of South Florida's College of Marine Science, specifically the Optical Oceanography Laboratory. The page features a navigation menu on the left and a main content area on the right. The menu includes categories like 'Home', 'People', 'Projects', 'Satellite Data Products', 'Virtual Buoy Products', 'Publications', 'Events', 'Links', and 'Contact'. The 'Satellite Data Products' category is expanded, showing sub-categories such as 'Caribbean', 'East Asia', 'North America', 'South America', 'South Pacific', 'West Africa', 'Persian Gulf', and 'Landsat 8'. The 'Landsat 8' category is further expanded, showing sub-categories like 'Guadeloupe' and 'Martinique'. The 'Virtual Buoy Products' category is also expanded, showing sub-categories like 'Big Bend', 'Cape Cod', 'Central West Florida', 'Florida Keys', 'Mobile Bay', and 'North Persian Gulf'. The 'Landsat 8' category is highlighted with a red box, and an arrow points from it to the 'Landsat 8' sub-category. Another arrow points from the 'Virtual Buoy Products' category to the 'Virtual Buoy Products' sub-category.

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USF Home | A-Z Index | Directory | myUSF

Marine Science Home | USF St. Pete | Search

College of Marine Science

Optical Oceanography Laboratory

Home

Menu

- Home
- + People
- + Projects
- Satellite Data Products
 - + Caribbean
 - + East Asia
 - + North America
 - + South America
 - + South Pacific
 - + West Africa
 - Persian Gulf
 - + Landsat 8
- + Virtual Buoy Products
- + Publications
- + Events
- + Links
- + Contact

- Landsat 8
 - Guadeloupe
 - Martinique
- Virtual Buoy Products
 - + Big Bend
 - + Cape Cod
 - + Central West Florida
 - + Florida Keys
 - + Mobile Bay
 - + North Persian Gulf

- Datos del color oceánico disponibles de MODIS y Landsat 8 para áreas selectas
- Datos del color oceánico derivados por satélites para ubicaciones de boyas en el Golfo de México y el Golfo Pérsico

Datos del Color Oceánico de Aqua y Terra MODIS

http://optics.marine.usf.edu/cgi-bin/optics_data?roi=ECARIB¤t=1/

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USF Home | A-Z Index | Directory | myUSF
Marine Science Home | USF St. Pete | Search

College of Marine Science

Optical Oceanography Laboratory

Eastern Caribbean Region & Data Description ? Tips Animate

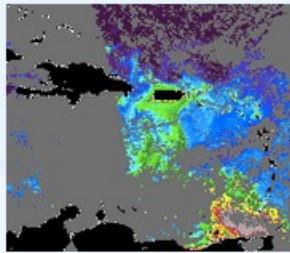
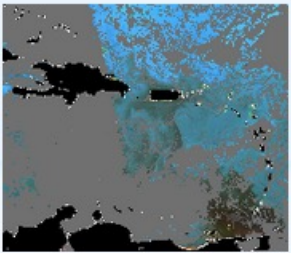
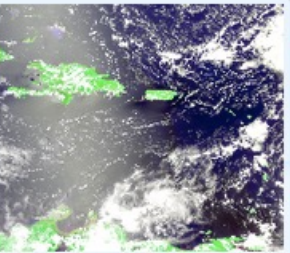
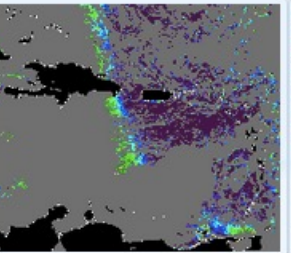
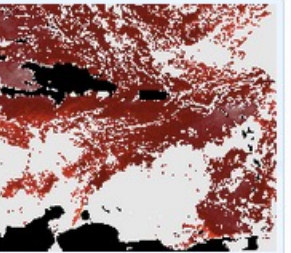
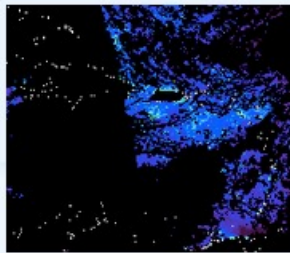
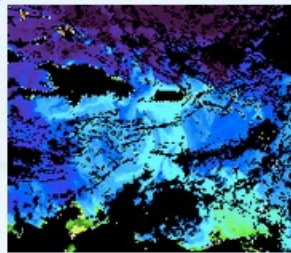
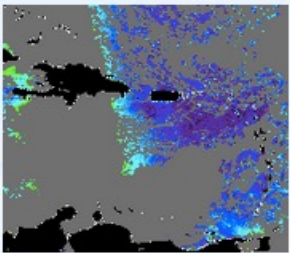

Aug 2017

Su	Mo	Tu	We	Th	Fr	Sa
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

Menu

- Home
- People
- Projects
- Satellite Data Products
- Virtual Buoy Products
- Publications
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- Contact

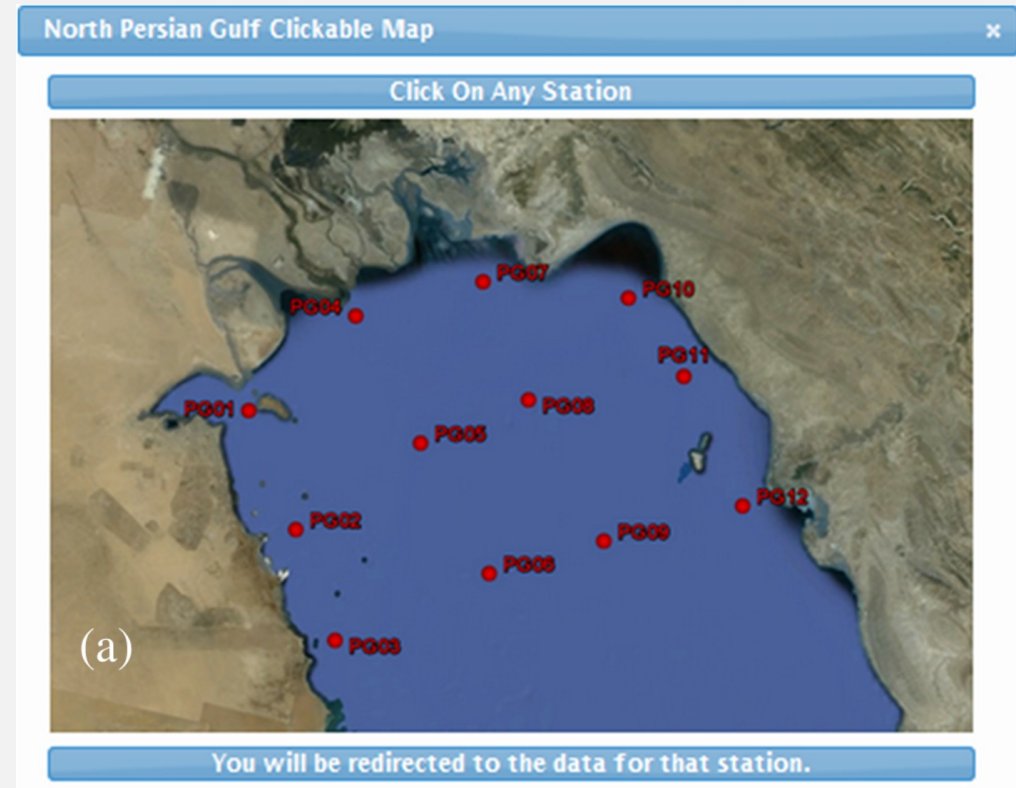
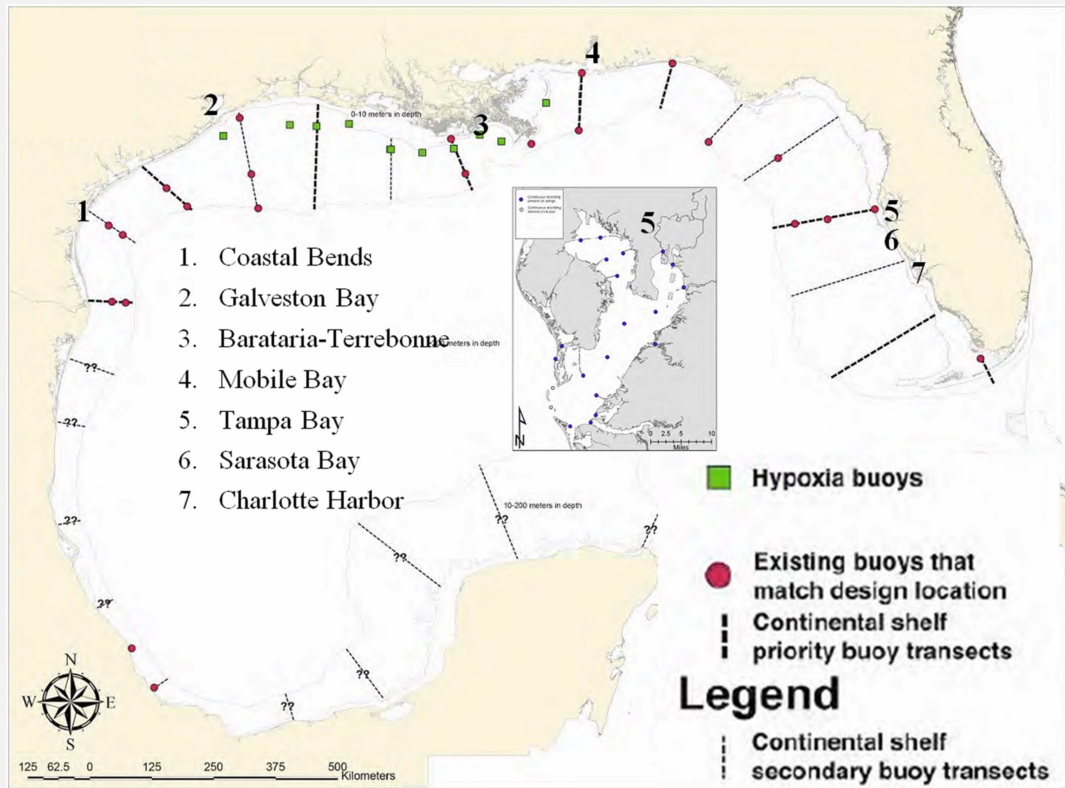
MODIST 14:50 GMT MODISA 17:55 GMT

 <p>CHL L3D Information Get Link Here GE</p>	 <p>ERGB L3D Information Get Link Here GE</p>	 <p>FRGB L3D Information Get Link Here GE</p>	 <p>NFLH L3D Information Get Link Here GE</p>	 <p>SST L3D Information Get Link Here GE</p>
 <p>AFAI L3D_RRC Information Get Link Here GE</p>	 <p>CI L3D_RRC Information Get Link Here GE</p>	 <p>FLH L3D_RRC Information Get Link Here GE</p>	 <p>RGB L3D_RRC Information Get Link Here GE</p>	

El Monitoreo de Chl-a t SST Usando MODIS y Landsat 8

<http://optics.marine.usf.edu/>

Ubicaciones de Boyas en el Golfo de México y el Golfo Pérsico de Hu et al. (2014)



Reference: Hu et al. 2014, Satellite-based virtual buoy system to monitor coastal water quality, Opt. Eng. 2013;53(5):051402. doi:10.1117/1.OE.53.5.051402.

Datos del Color Oceánico de MODIS

<http://optics.marine.usf.edu/>

En la Ubicación de Una Boya en la Bahía de Tampa

Station Name: TB 01 [Tampa Bay Clickable Map](#)

Latitude: 27.9002

Longitude: -82.5920

Depth in Meters: 2.5

Current Imagery: /cgi-bin/optics_data?roi=CWFL¤t=1

The table below shows the current conditions (most recent weekly and monthly means) at station TB 01, derived from MODIS data. Also included are conditions for the current week and month from last year, as well as the long term means (climatologies).

Current conditions which exceed one standard deviation from the climatological mean are considered "anomalies" and are color coded. Positive chlorophyll anomalies, for example, may indicate phytoplankton bloom conditions at the station. Negative SST anomalies in winter might adversely affect several marine organisms (e.g., manatees, fish, corals, and sea turtles).

This table is intended to provide a visual guide to current and developing conditions at this station. However, caution must be used in interpreting anomaly data. Due to limitations of MODIS measurements, the normal climatological conditions for certain stations or time spans may not be fully characterized. As such, truly anomalous conditions may not be identified. Alternatively, detected anomalies may actually be within the climatological norm.

Current week number 31 in the table below is 7/30/2017 through 8/5/2017, current month is July of 2017.

Product	Weekly Mean	Monthly Mean	Weekly Last Year	Monthly Last Year	Weekly Climatology	Monthly Climatology
SST (C°)	27.56	29.94	29.80	30.11	30.41	29.85
Chlorophyll-a (mg m ⁻³)	No Data	3.72	No Data	6.67	7.31	5.43
Turbidity (NTU)	No Data	1.47	No Data	3.18	2.58	2.60
Secchi Disk Depth (m)	No Data	1.91	No Data	1.51	1.12	1.44
K _d (488) (m ⁻¹)	No Data	0.50	No Data	0.65	1.13	0.73
Light Penetration (%)	No Data	28.32	No Data	19.17	5.62	15.43

Summary Table Guide

Severe Positive Anomaly	Current data ≥ 2 st. dev. above climatology
Moderate Positive Anomaly	Current data ≥ 1 st. dev. above climatology
No Anomaly	Current data within 1 st. dev. of climatology
Moderate Negative Anomaly	Current data ≤ 1 st. dev. below climatology
Severe Negative Anomaly	Current data ≤ 2 st. dev. below climatology

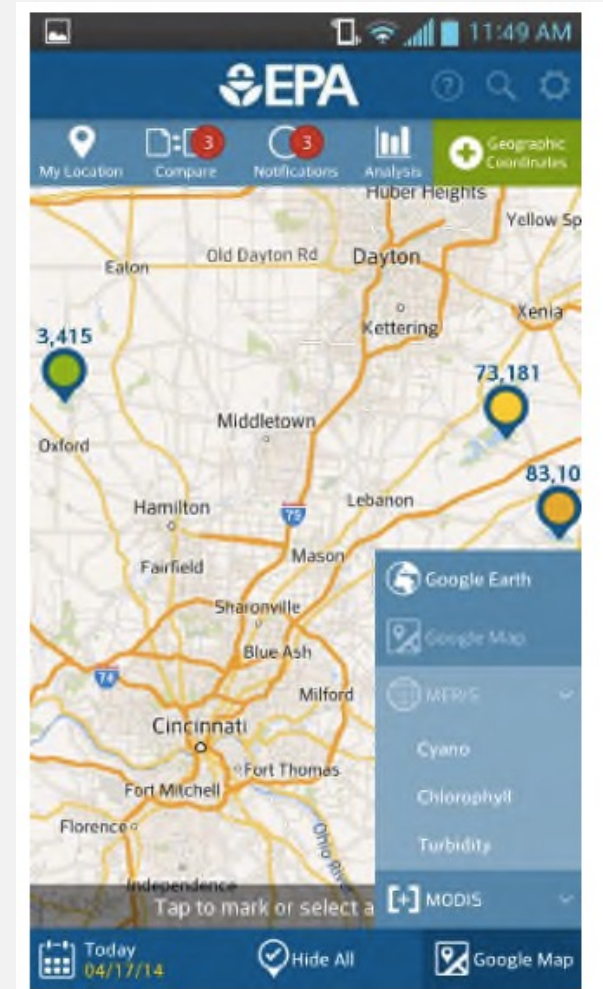
Cyanobacteria Assessment Network (CyAN)

(Red de Evaluación de Cianobacterias)

<https://www.epa.gov/water-research/cyanobacteria-assessment-network-cyan#decision%20support>

- Un programa colaborativo entre la EPA, NOAA, NASA y el USGS
- Enfocado en un método temprano y uniforme de identificación de floraciones algales usando la teledetección satelital de Landsat, Sentinel-2 y Sentinel-3
- Desarrolla un sistema de apoyo a decisiones para partes interesadas

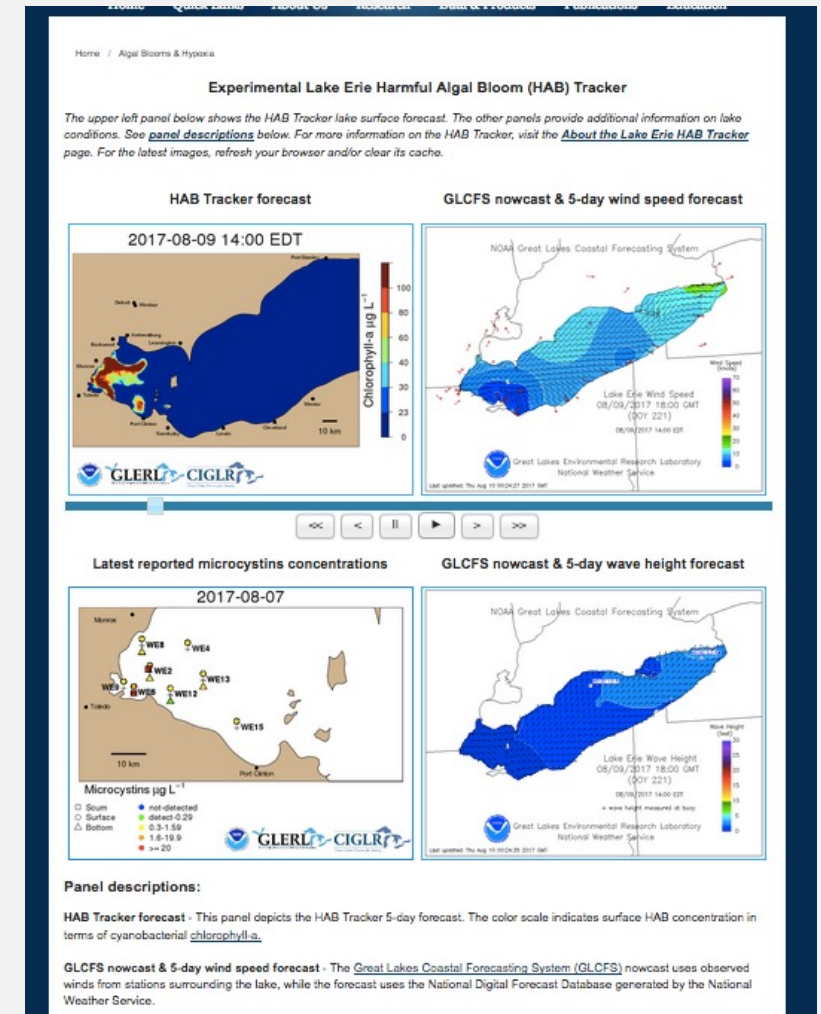
Se presentará más información sobre CyAN en la semana 4



Lake Erie HAB Tracker

https://www.glerl.noaa.gov/res/HABs_and_Hypoxia/habTracker.html

- Un modelo de pronósticos basado en:
 - Imágenes satelitales MODIS
 - Información de pronósticos meteorológicos
 - Corrientes modeladas como en el lago Erie
- Brinda:
 - Mediciones de HABs basadas en la recolección de muestras de agua in situ
 - Pronósticos en tiempo casi real y de 5 días en cuanto a chl-a cianobacterial



Lake Erie HAB Tracker

https://www.glerl.noaa.gov/res/HABs_and_Hypoxia/habTracker.html

Densidad Cianobacterial Derivada por MODIS

Latest satellite-derived data used by the HAB Tracker

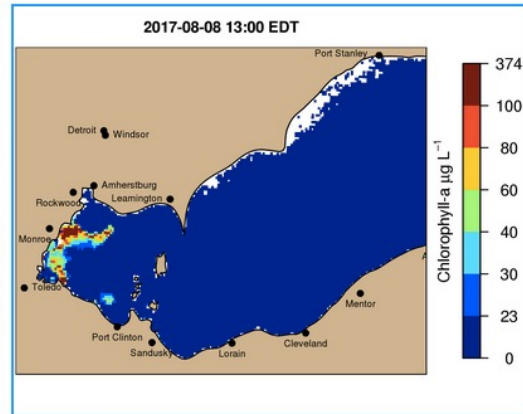
Sensors attached to satellites gather data, which is processed into the cyanobacterial index, an indicator of the abundance, or biomass, of the cyanobacteria associated with HABs. Processed satellite imagery is provided by the [NOAA HAB Operational Forecasting System](#). The cyanobacterial index scale is converted to a cyanobacterial chlorophyll scale for use in the HAB Tracker, a similar indicator of cyanobacterial abundance.

True-color satellite image of Lake Erie



Latest usable (relatively cloud-free) satellite image of Lake Erie. For additional satellite imagery of Lake Erie, visit the [NOAA Great Lakes CoastWatch](#) webpage.

HABs extent analysis



Latest HAB extent analysis from valid satellite imagery above used to update the bloom location in the model.



Photo Credit: NOAA GLERL

NOAA Coast Watch

https://coastwatch.noaa.gov/cw_html/index.html

Multi-sensor sea surface temperature product (March 14, 2017)

Atmospheric Administration
U.S. Department of Commerce

NOAA CoastWatch • OceanWatch

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CoastWatch NOAA
Need Help?
(301) 683-3335

Latest News

- S-NPP VIIRS Life-of-Mission Science Quality Level-2 Ocean Color product reprocessing MSL12 v1.21.
- EUMETSAT OLCI-Sentinel-3A data now available.

Satellite data products for understanding and managing our oceans and coasts

Satellite Data Products

Nodes

How our data are used

Field Observations

Emily's Post

New Tools

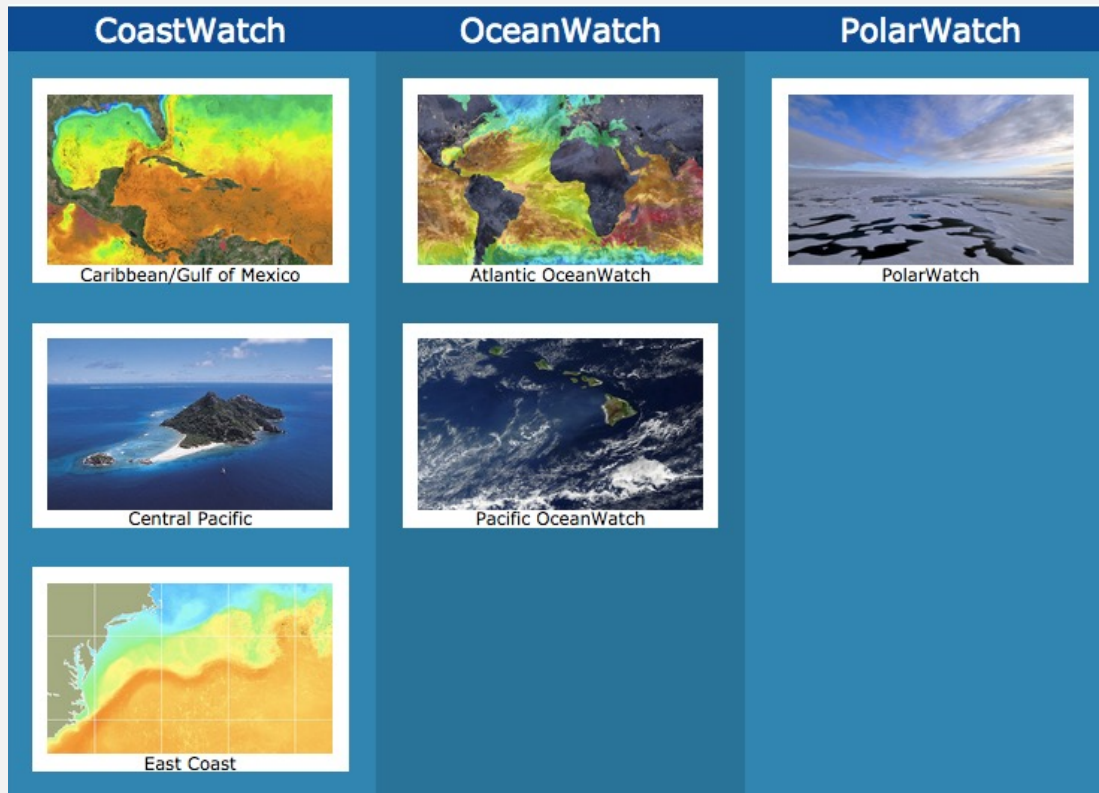
- Utiliza la teledetección para entender y gestionar los océanos
- Ofrece monitoreo de HABs sobre los océanos costeros

NOAA Coast Watch

https://coastwatch.noaa.gov/cw_html/index.html

- Brinda información para múltiples áreas costeras

- Productos satelitales utilizados
 - Imágenes de color real
 - Color Oceánico – Radiancias y Concentración de Clorofila-a
 - Temperatura Superficial Marina
 - Altura Superficial Marina
 - Salinidad Superficial Marina
 - Vientos Superficiales Marinos



NOAA Coast Watch

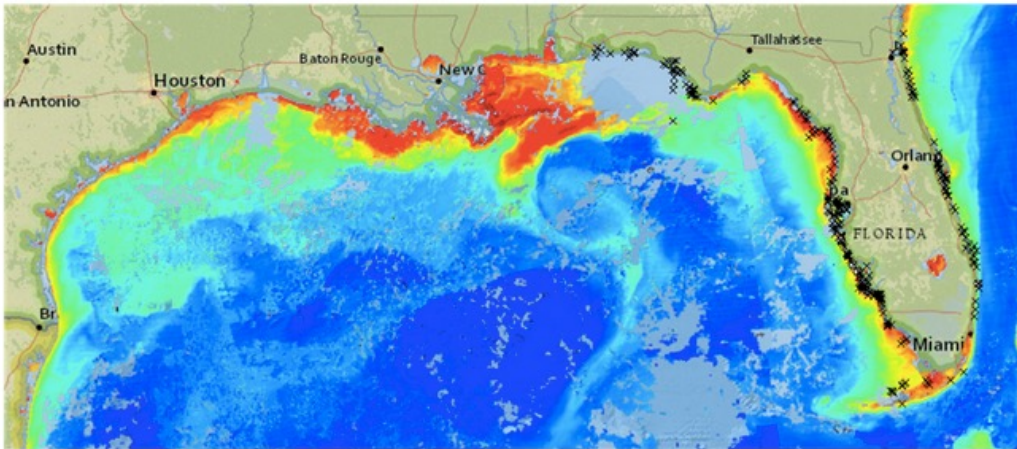
https://coastwatch.noaa.gov/cw_html/OceanColor.html

▼ Harmful Algal Bloom Monitoring and Forecasting in the Gulf of Mexico - 02/17

Harmful Algal Bloom Monitoring and Forecasting in the Gulf of Mexico - 02/17

Harmful algal blooms are a common occurrence in the Gulf of Mexico. Red tide blooms of the neurotoxin producing alga *Karenia brevis* are of particular concern. NOAA's National Ocean Service uses Coast Watch ocean color data along with cell counts and other environmental information to produce a Harmful Algal Blooms Observing System (HABSOS) and a Harmful Algal Bloom Operational Forecast System (HAB-OFS).

HABSOS is a combined data product distributed on an ArcGIS powered map. The system serves as a harmful algal bloom data resource for managers, scientists and the public. CoastWatch data available for visualization in HABSOS include chlorophyll-3 day composite data and chlorophyll anomaly data.



CoastWatch chlorophyll 3-day composite viewed on NOAA's HABSOS.

- Monitoreo de HABs basado en satélites
- Usa datos de teledetección en tiempo casi real de:
 - MODIS Aqua
 - VIIRS S-NPP
 - OLCI Sentinel-3

Copernicus Marine Environment Monitoring Service

<http://marine.copernicus.eu/>

- Se combinan observaciones MODIS y VIIRS para monitorear HABs en el:
 - Atlántico Norte
 - Océano Ártico
 - Mar Báltico
 - Mar Negro
 - Mar Mediterráneo

The screenshot displays the Copernicus Marine Environment Monitoring Service (MEMS) website interface. At the top, the European Commission logo and the MEMS title are visible, along with a search bar and navigation menu. The main content area features an 'ONLINE CATALOGUE' section with a search filter sidebar on the left. The search results show two product entries:

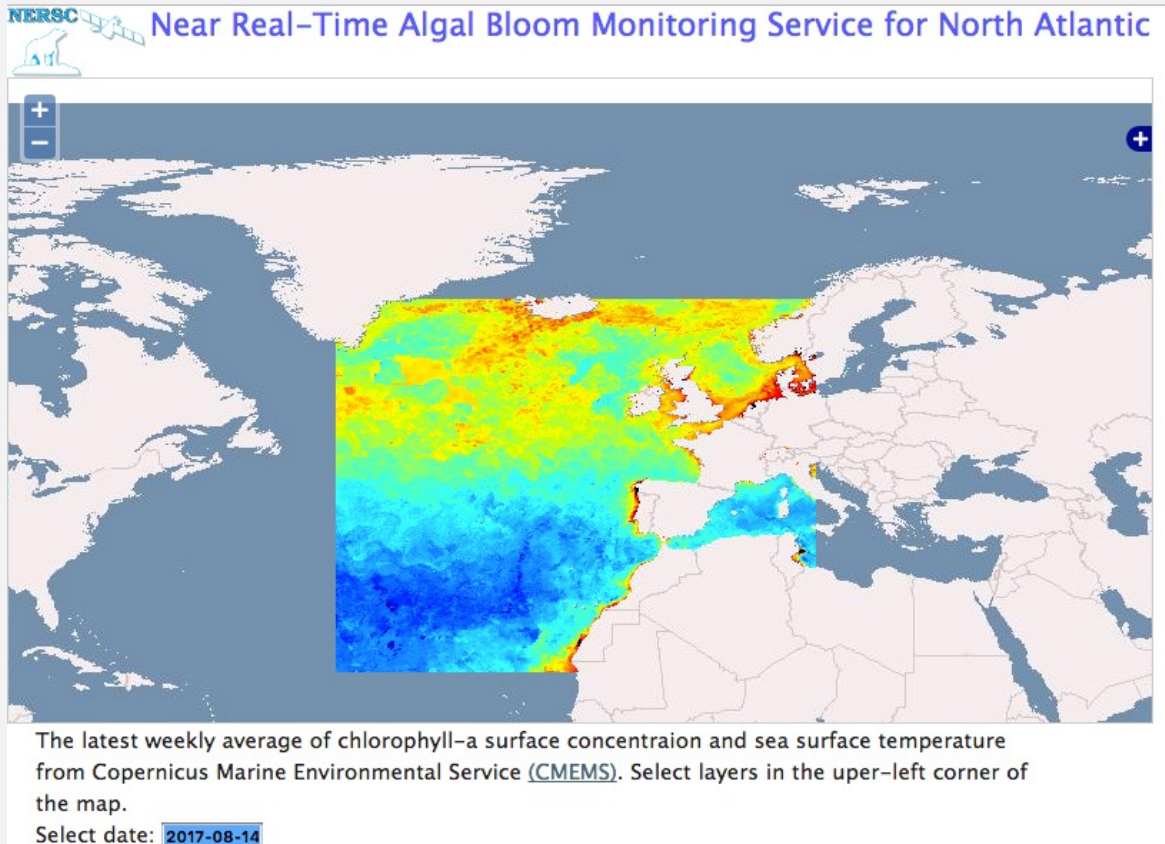
GLOBAL_ANALYSIS_FORECAST_PHY_001_024	
GLOBAL OCEAN 1/12° PHYSICS ANALYSIS AND FORECAST UPDATED DAILY	
MODEL	● ● ● ● ● X X X
MLD SSH 3DUV SIT S SIUV SIC T bottomT	①
0.083 degree x 0.083 degree (50 depth levels)	
From 2006-12-27 to Present	
daily-mean, hourly-mean	
MORE INFO	ADD TO CART WMS Sub-setting

The first product includes a world map visualization showing ocean temperature anomalies. The second product entry is:

GLOBAL_ANALYSIS_FORECAST_BIO_001_014	
GLOBAL OCEAN BIOGEOCHEMISTRY ANALYSIS AND WEEKLY FORECAST	
MODEL	● ● ● X X X
CHL O2 NO3 PO4 SI PHYC FE	①
0.5 degree x 0.5 degree (50 depth levels)	
From 2012-01-01 to Present	

Servicios de Monitoreo de Floraciones de Algas en Tiempo Casi Real en el Atlántico Norte

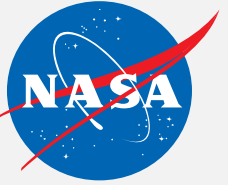
<http://hab.nerisc.no/>



- Basados en datos del color oceánico del Copernicus Marine Environment Monitoring Service

Resumen

- La teledetección ofrece una cobertura global continua con observaciones consistentes comparado con las mediciones de puntos limitados de muestreo en la superficie o en base a naves.
- Las observaciones ópticas y casi infrarrojas de Landsat, Terra/Aqua MODIS, SNPP VIIRS, Sentinel-2 MSI y Sentinel-3 OLCI se usan operativamente para el monitoreo cualitativo y cuantitativo de HABs (Chl, and SST)



ARSET

Applied Remote Sensing Training

<http://arset.gsfc.nasa.gov>

 @NASAARSET

¡Gracias!

La próxima semana:

Entendiendo las HABs en el Ambiente Costero