



Introduction to ERDDAP

NOAA CoastWatch Satellite Course

Last Updated: 5/27/2021



NOAA CoastWatch Satellite Courses

CoastWatch regularly organizes 1-week or shorter classes.

- Targeted at NOAA and university scientists and students but open to everyone
- Used to be taught in-person, now available 100% virtually as well
- Designed to teach participants how to access ocean satellite data and use it in the environment they are used to working in:
 - Self-paced tutorials and scripts for R, Python, ArcGIS and Matlab users
 - Pre-recorded lectures on remote sensing and the main ocean satellite parameters
- All materials available online: <https://coastwatch.gitbook.io/satellite-course/>
- QUESTIONS: COASTWATCH.INFO@NOAA.GOV



NOAA CoastWatch Satellite course at AFSC/ABL in Juneau, AK, March 2019



ERDDAP¹ – designed to make data access easier

DATA AGGREGATION

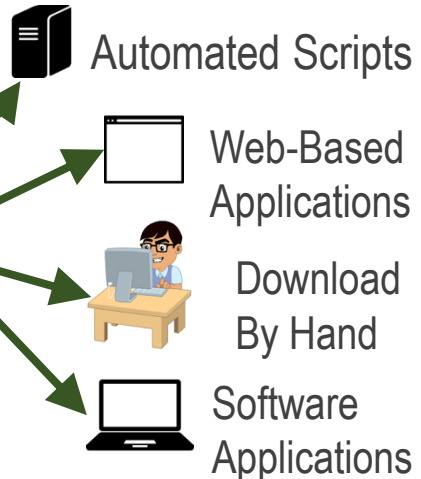
LOCAL STORAGE



REMOTE SERVERS



DATA DISTRIBUTION



ERDDAP provides a simple, consistent way to:

- Subset datasets temporally and spatially
- Download data in > 30 formats
- Data requests defined within URLs, allowing:
 - Access data within analysis tools (R, Matlab, python)
 - Machine-to-machine data exchange

Over 85 ERDDAPs exist in 14 countries

Over a dozen different ERDDAPs in NOAA

ERDDAP is one of the recommended data servers in NOAA's Data Access Procedural Directive

Search for data across multiple ERDDAPs at erddap.com

¹ERDDAP was developed at NOAA SWFSC/ERD by Bob Simons



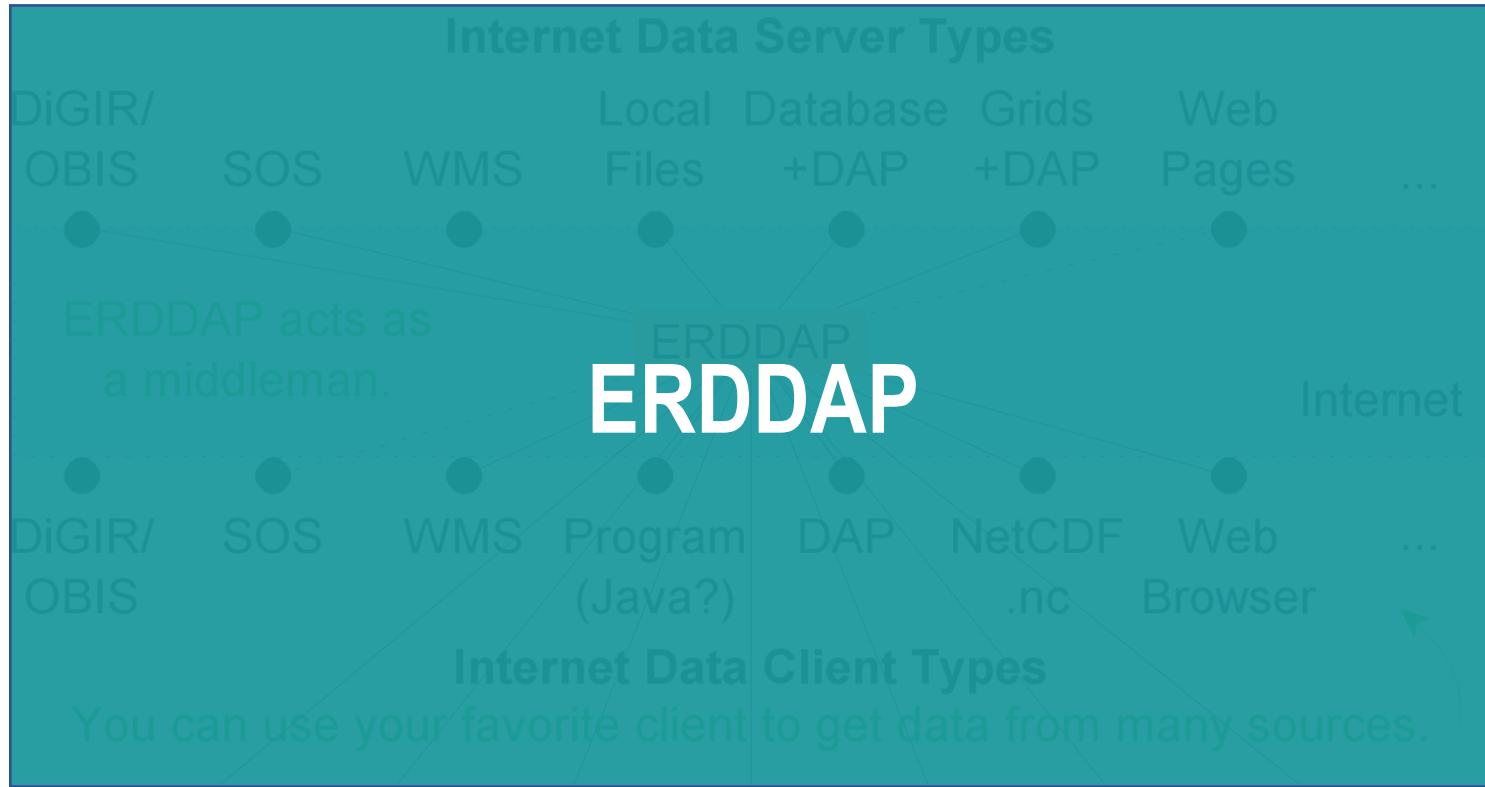
Data Dissemination - ERDDAP

Data file types:

- .asc
- .csv
- .csvp
- .csv0
- .das
- .dds
- .dods
- .esriAscii
- .fgdc
- .graph
- .html
- .htmlTable
- .iso19115
- .json
- .mat
- .nc
- .ncHeader
- .ncml
- .odvTxt
- .tsv
- .xhtml

Image file types:

- .geotif
- .kml
- .smallPdf
- .pdf
- .largePdf
- .smallPng
- .png
- .largePng
- .transPng





You can get data into many common programs and file types.

RESTful services

Bob.simons@noaa.gov



The web interface for the ERDDAP data catalog


ERDDAP at OceanWatch Central Pacific
Easier access to scientific data


ERDDAP > griddap

Griddap lets you use the OPeNDAP hyperslab protocol to request data subsets, graphs, and maps from gridded datasets (for example, satellite data and climate model data). For details, see [ERDDAP's griddap Documentation](#).

100 matching datasets, listed in alphabetical order. (Or, refine this search with [Advanced Search](#))

Grid DAP Data	Sub-set	Table DAP Data	Make A Graph	W M S	Source Data Files	Title	Summary	FGDC, ISO, Metadata	Back-ground Info	RSS	E mail	Institution
data			graph	M		8_Day Global Seascapes (Lon:0_360)	?	F I M	background	RSS	✉	NOAA CoastWatch, ... ?
data			graph	M		Chlorophyll a Concentration, Aqua MODIS - 8-day, 2002-present. v.2018.0	?	F I M	background	RSS	✉	NASA/GSFC OBPG ?
data			graph	M		Chlorophyll a Concentration, Aqua MODIS - Cumulative Mean, January 2003 -February 2019. v. 2018.0	?	F I M	background	RSS	✉	NASA/GSFC OBPG ?
data			graph	M		Chlorophyll a Concentration, Aqua MODIS - Daily, 2002-present. v.2018.0	?	F I M	background	RSS	✉	NASA/GSFC OBPG ?
data			graph	M		Chlorophyll a Concentration, Aqua MODIS - Monthly, 2002-present. v.2018.0	?	F I M	background	RSS	✉	NASA/GSFC OBPG ?
data			graph	M		Chlorophyll a concentration, ESA OC CCI - 8-Day, 1997-2019. v4.2	?	F I M	background	RSS	✉	Plymouth Marine L... ?
data			graph	M		Chlorophyll a concentration, ESA OC CCI - Cumulative Mean, 1998-2008. v4.2	?	F I M	background	RSS	✉	Plymouth Marine L... ?
data			graph	M		Chlorophyll a concentration, ESA OC CCI - Cumulative Mean, 1998-2018. v4.2	?	F I M	background	RSS	✉	Plymouth Marine L... ?
data			graph	M		Chlorophyll a concentration, ESA OC CCI - Cumulative Mean, 2009-2018. v4.2	?	F I M	background	RSS	✉	Plymouth Marine L... ?
data			graph	M		Chlorophyll a concentration, ESA OC CCI - Cumulative Mean, 2019. v4.2	?	F I M	background	RSS	✉	Plymouth Marine L... ?
data			graph	M		Chlorophyll a concentration, ESA OC CCI - Monthly, 1997-2019. v4.2	?	F I M	background	RSS	✉	Plymouth Marine L... ?



Search multiple ERDDAP servers for datasets

You can use this search engine if you don't know which ERDDAP server hosts the data you want

ERDDAP Dataset Discovery



Search Datasets

"sea surface temperature"

Type some words about the dataset you seek, then press the green button

Search

Clear

Searched 32 ERDDAP servers; found 1676 datasets from 21 servers; total search time 1588ms.

	Title	Institution	Dataset
	Navy Adaptive Ecosystem Climatology GoMEX satellite SST and CHL	Naval Research Laboratory	AEC_gomex_satellite_climo ecowatch.ncddc.noaa.gov
	Navy Adaptive Ecosystem Climatology USEAST satellite SST and CHL	Naval Research Laboratory	AEC_useast_satellite_climo ecowatch.ncddc.noaa.gov
	Navy Adaptive Ecosystem Climatology USWEST satellite SST and CHL	Naval Research Laboratory	AEC_uswest_satellite_climo ecowatch.ncddc.noaa.gov

<http://erddap.com/>



ERDDAP URL: The URL describes the entire data request and can be used in scripts

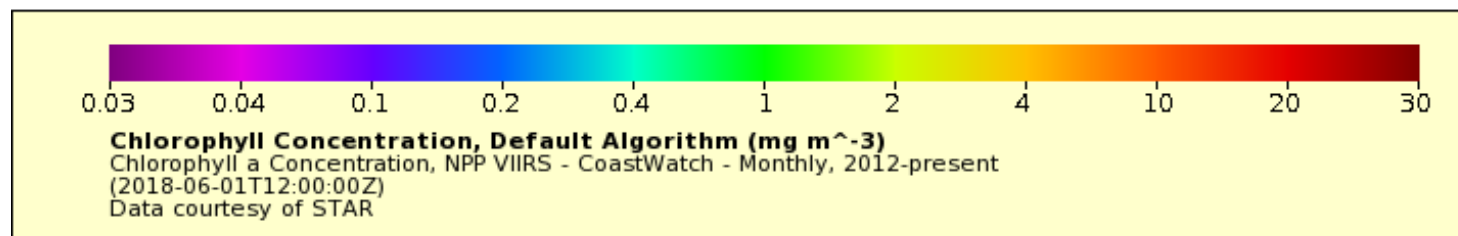
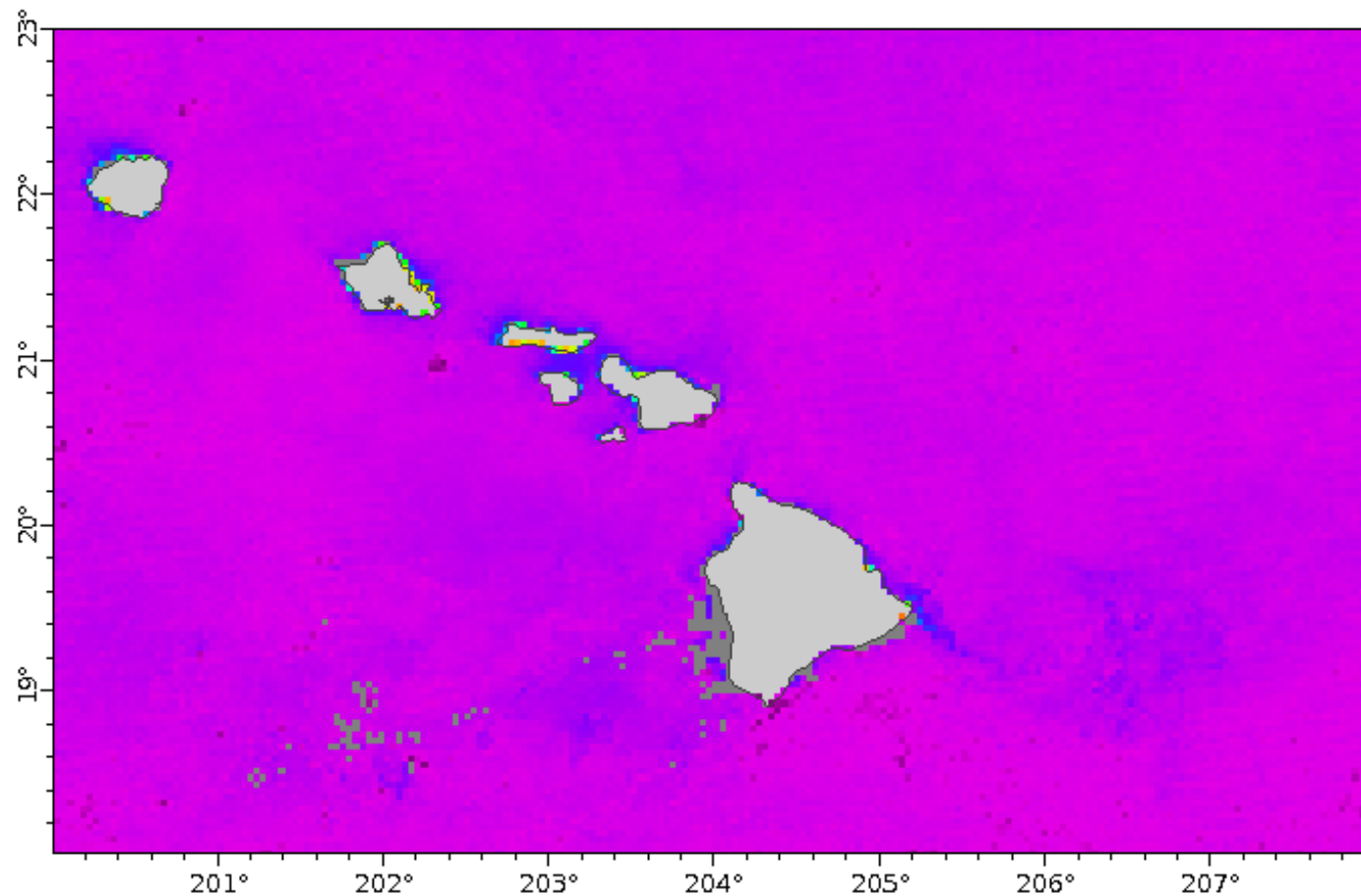
Deconstruct the following data request:

[https://oceanwatch.pifsc.noaa.gov/erddap/griddap/noaa_snpp_chla_monthly.png?chlor_a\[\(2018-06-02T12:00:00Z\)\]\[\(23\):\(18\)\]\[\(200\):\(208\)\]](https://oceanwatch.pifsc.noaa.gov/erddap/griddap/noaa_snpp_chla_monthly.png?chlor_a[(2018-06-02T12:00:00Z)][(23):(18)][(200):(208)])

- Base ERDDAP URL: <https://oceanwatch.pifsc.noaa.gov/erddap/griddap/> → change to access another ERDDAP
- Dataset ID: [noaa_snpp_chla_monthly](#) → change to [noaa_snpp_chla_weekly](#) for weekly data.
- File type: [.png](#) → Create a png file of the image
 - Changing [.png](#) to [.graph](#) → Access form to modify the graph
 - Changing [.png](#) to [.csv](#) → Download a CSV file to your computer
 - Changing [.png](#) to [.html](#) → Access form to download the data
- Variable name: [chlor_a](#) → [Change the variable name for dataset containing more than one variable](#)
- Time: [\[\(2018-06-02T12:00:00Z\)\]](#) → Change to [\[\(last\)\]](#) to access the most recent data
- Latitude range: [\[\(23\):\(18\)\]](#) → Specify the latitude bounds
- Longitude range: [\[\(200\):\(208\)\]](#) → Specify the longitude bounds

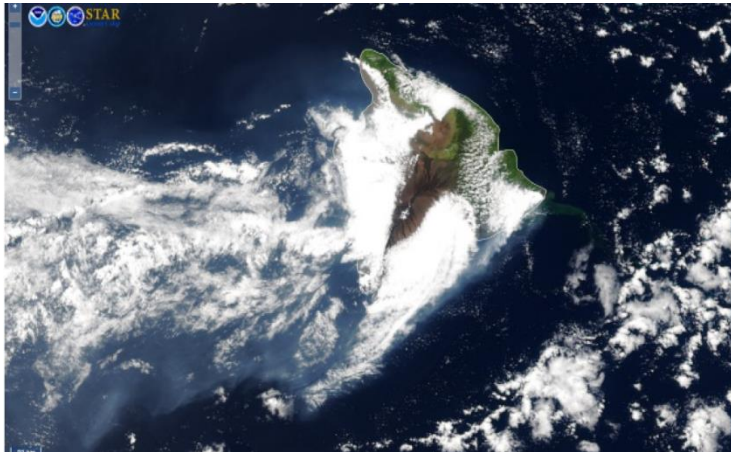


Image produced by the URL



Visualization examples using ERDDAP

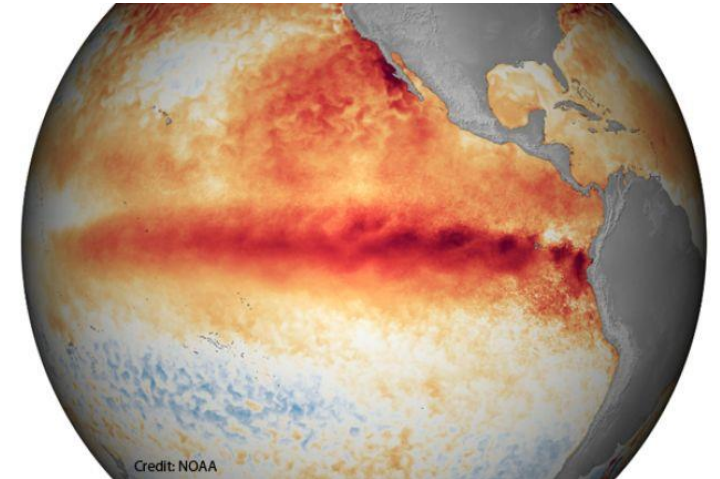
Kilauea algae bloom



Hurricane Katrina



1998 El Niño



Example #1 - Visualize the Kilauea algae bloom

ERDDAP > griddap > Make A Graph

Dataset Title: **Chlorophyll a Concentration, NPP VIIRS - CoastWatch - Weekly, 2012-present**  

Institution: STAR (Dataset ID: noaa_snpp_chla_weekly)

Information: [Summary](#) | [License](#) | [FGDC](#) | [ISO 19115](#) | [Metadata](#) | [Background](#) | [Data Access Form](#)

Graph Type:

X Axis:

Y Axis:

Color:

Click on the map to specify a new center point.

Zoom:

Dimensions

time (UTC) specify just 1 value →

altitude (m) specify just 1 value →

latitude (degrees_north)

longitude (degrees_east)

Graph Settings

Color Bar: Continuity: Scale:

Minimum: Maximum: N Sections:

Draw land mask:

Y Axis Minimum: Maximum:

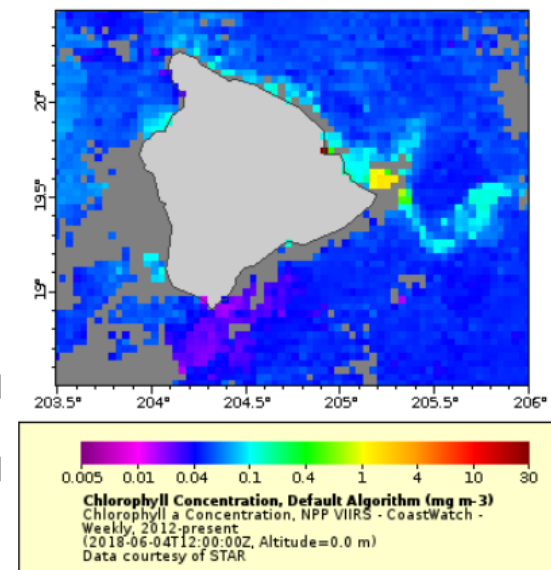
Redraw the Graph (Please be patient. It may take a while to get the data.)

Optional:

Then set the File Type: (File Type information)

and

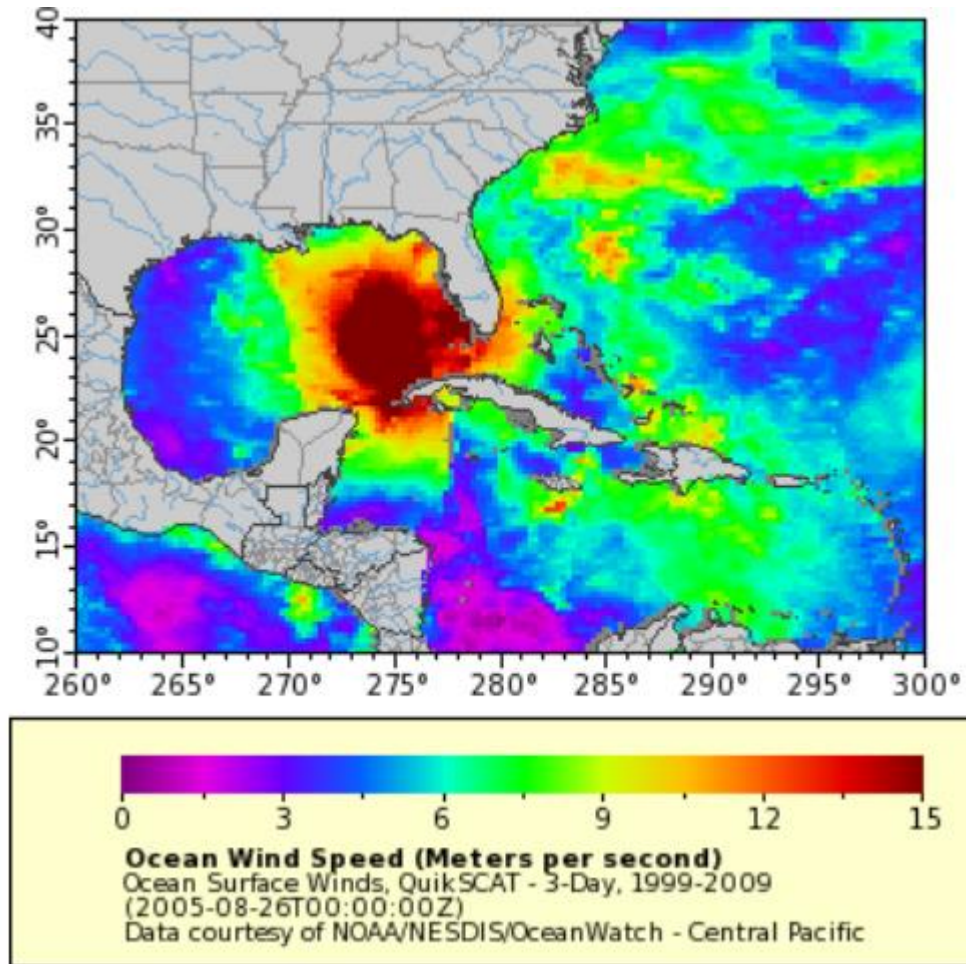
or view the URL: [https://oceanwatch.pifsc.noaa.gov/erddap/griddap/noaa_snpp_chla_weekly.graph?chlor_a%5B\(2018-06-02T12:00:00Z\)%5D%5B\(0.0\)%5D%5B\(20.49375\):\(18.50625\)%5D%5B\(203.4938\):\(206.0063\)%5D&.draw=surface&.vars=longitude%7Clatitude%7Cchlor_a&.colorBar=%7C%7CLog%7C0.005%7C%7C&.bgColor=0xffffffff](https://oceanwatch.pifsc.noaa.gov/erddap/griddap/noaa_snpp_chla_weekly.graph?chlor_a%5B(2018-06-02T12:00:00Z)%5D%5B(0.0)%5D%5B(20.49375):(18.50625)%5D%5B(203.4938):(206.0063)%5D&.draw=surface&.vars=longitude%7Clatitude%7Cchlor_a&.colorBar=%7C%7CLog%7C0.005%7C%7C&.bgColor=0xffffffff)
(Documentation / Bypass this form)



[https://oceanwatch.pifsc.noaa.gov/erddap/griddap/noaa_snpp_chla_weekly.graph?chlor_a%5B\(2018-06-02T12:00:00Z\)%5D%5B\(0.0\)%5D%5B\(20.49375\):\(18.50625\)%5D%5B\(203.4938\):\(206.0063\)%5D&.draw=surface&.vars=longitude%7Clatitude%7Cchlor_a&.colorBar=%7C%7CLog%7C0.005%7C%7C&.bgColor=0xffffffff](https://oceanwatch.pifsc.noaa.gov/erddap/griddap/noaa_snpp_chla_weekly.graph?chlor_a%5B(2018-06-02T12:00:00Z)%5D%5B(0.0)%5D%5B(20.49375):(18.50625)%5D%5B(203.4938):(206.0063)%5D&.draw=surface&.vars=longitude%7Clatitude%7Cchlor_a&.colorBar=%7C%7CLog%7C0.005%7C%7C&.bgColor=0xffffffff)



Example #2 - Visualize wind speeds produced by Hurricane Katrina



[https://oceanwatch.pifsc.noaa.gov/erddap/griddap/OceanWatch_qscat_wind_3day.graph?spd\[\(2005-08-26T00:00:00Z\)\]\[\(10\):\(40\)\]\[\(260\):\(300\)\]](https://oceanwatch.pifsc.noaa.gov/erddap/griddap/OceanWatch_qscat_wind_3day.graph?spd[(2005-08-26T00:00:00Z)][(10):(40)][(260):(300)])




Visualize wind speed and direction produced by Hurricane Katrina


ERDDAP > griddap > Make A Graph


Dataset Title: **Ocean Surface Winds, QuikSCAT - 3-Day, 1999-2009**  


Institution: NOAA/NESDIS/OceanWatch - Central Pacific (Dataset ID: OceanWatch_qscat_wind_3day)


Information: [Summary](#) | [License](#) | [FGDC](#) | [ISO 19115](#) | [Metadata](#) | [Background](#) | [Data Access Form](#)




Graph Type: 






X Axis: 








Y Axis: 








Vector X: 

Vector Y: 

Dimensions  **Start**  **Stop** 

time (UTC)  specify just 1 value →    

latitude (degrees_north)       

longitude (degrees_east)       


Graph Settings

Color:

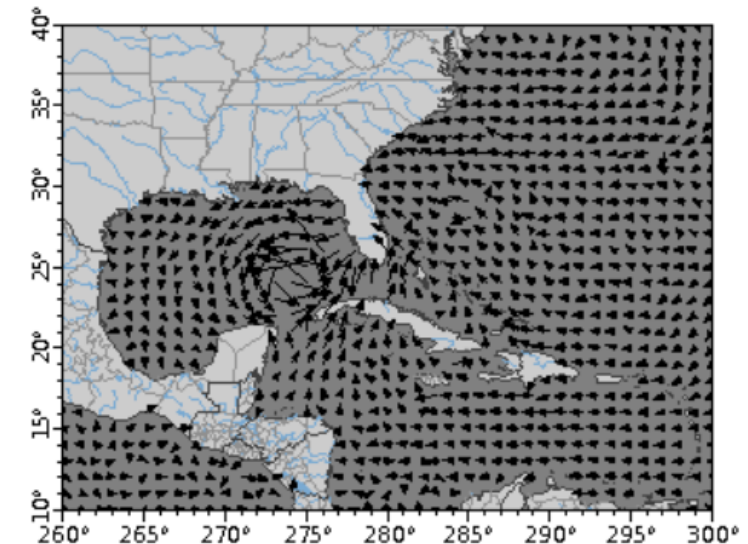
Vector Standard:


Y Axis Minimum: Maximum: Ascending

Redraw the Graph (Please be patient. It may take a while to get the data.)

Click on the map to specify a new center point. 

Zoom:

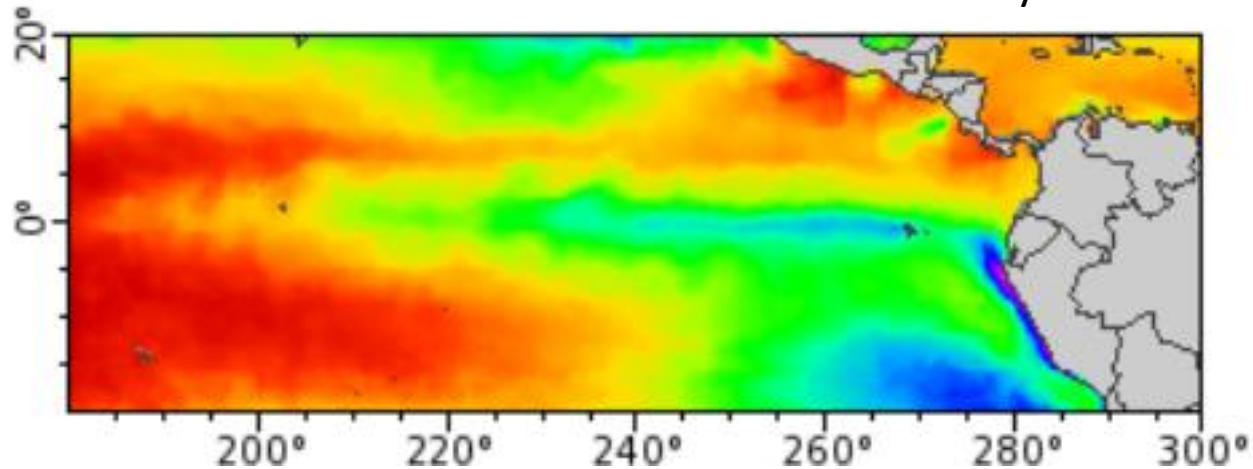


 **Zonal Wind Speed, Meridional Wind Speed (25.0 meter se**
Ocean Surface Winds, QuikSCAT - 3-Day, 1999-2009
(2005-08-26T00:00:00Z)
Data courtesy of NOAA/NESDIS/OceanWatch - Central Pacific



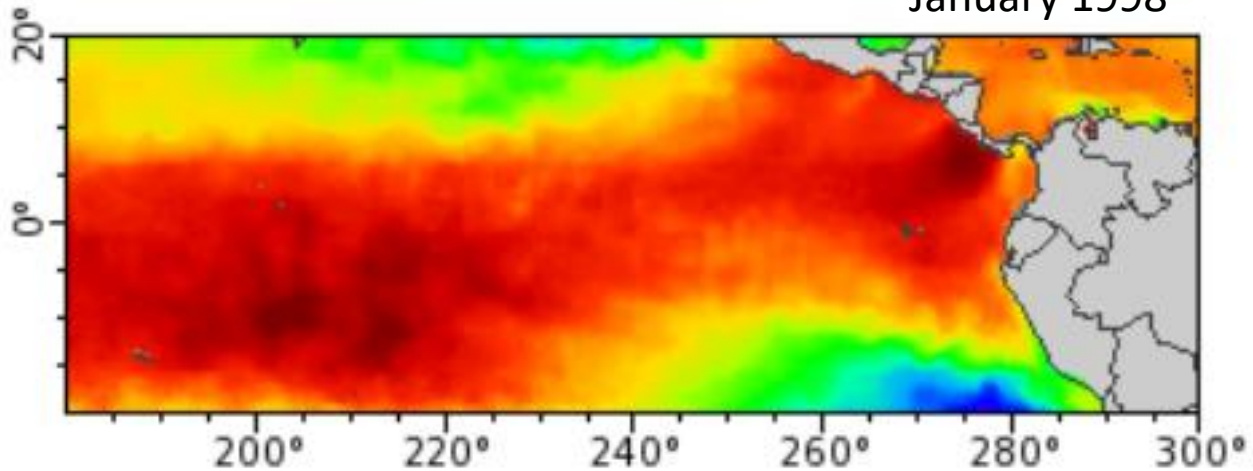
Example #3: Visualize the 1998 El Niño

January 1997



[https://oceanwatch.pifsc.noaa.gov/erddap/griddap/CRW_sst_v3_1_monthly.graph?sea_surface_temperature%5B\(1997-01-31T12:00:00Z\)%5D%5B\(19.975\):\(-20.025\)%5D%5B\(180.025\):\(300.025\)%5D&.draw=surface&.vars=longitude%7Clatitude%7Csea_surface_temperature&.colorBar=%7C%7C%7C18%7C30%7C&.bgColor=0xffffffff](https://oceanwatch.pifsc.noaa.gov/erddap/griddap/CRW_sst_v3_1_monthly.graph?sea_surface_temperature%5B(1997-01-31T12:00:00Z)%5D%5B(19.975):(-20.025)%5D%5B(180.025):(300.025)%5D&.draw=surface&.vars=longitude%7Clatitude%7Csea_surface_temperature&.colorBar=%7C%7C%7C18%7C30%7C&.bgColor=0xffffffff)

January 1998



[https://oceanwatch.pifsc.noaa.gov/erddap/griddap/CRW_sst_v1_0_monthly.graph?analysed_sst%5B\(1998-01-07T12:00:00Z\)%5D%5B\(-19.975\):\(20.025\)%5D%5B\(180.025\):\(300.025\)%5D&.draw=surface&.vars=longitude%7Clatitude%7Canalysed_sst&.colorBar=%7C%7C%7C18%7C30%7C](https://oceanwatch.pifsc.noaa.gov/erddap/griddap/CRW_sst_v1_0_monthly.graph?analysed_sst%5B(1998-01-07T12:00:00Z)%5D%5B(-19.975):(20.025)%5D%5B(180.025):(300.025)%5D&.draw=surface&.vars=longitude%7Clatitude%7Canalysed_sst&.colorBar=%7C%7C%7C18%7C30%7C)



Create a Hovmöller 2-dimensional timeseries plot of the 1998 El Niño

Graph Type: surface
X Axis: longitude
Y Axis: time
Color: analysed_sst

Dimensions

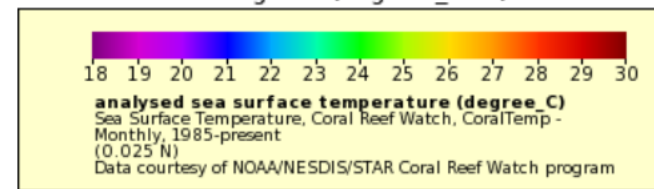
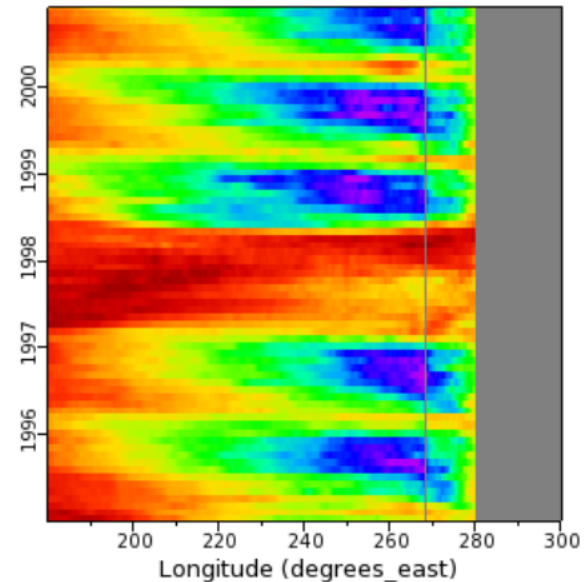
time (UTC) Start: 1995-01-01T12:00:00Z Stop: 2000-12-01T12:00:00Z

latitude (degrees_north) specify just 1 value → 0.025

longitude (degrees_east) 180.025 300.025

Graph Settings

Color Bar: Continuity: Scale:
Minimum: 18 Maximum: 30 N Sections:
Y Axis Minimum: Maximum: Ascending



Redraw the Graph (Please be patient. It may take a while to get the data.)

Optional:
Then set the File Type: .htmlTable (File Type information)
and Download the Data or an Image
or view the URL: https://oceanwatch.pifsc.noaa.gov/erddap/griddap/CRW_sst_v1
(Documentation / Bypass this form ?)

[https://oceanwatch.pifsc.noaa.gov/erddap/griddap/CRW_sst_v1_0_monthly.graph?analysed_sst\[\(1995-01-01T12:00:00Z\):\(2000-12-01T12:00:00Z\)\]\[\(0\)\]\[\(180.025\):\(300.025\)\]&.draw=surface&.vars=longitude%7Ctime%7Canalysed_sst&.colorBar=%7C%7C%7C18%7C30%7C&.bgColor=0xffffffff](https://oceanwatch.pifsc.noaa.gov/erddap/griddap/CRW_sst_v1_0_monthly.graph?analysed_sst[(1995-01-01T12:00:00Z):(2000-12-01T12:00:00Z)][(0)][(180.025):(300.025)]&.draw=surface&.vars=longitude%7Ctime%7Canalysed_sst&.colorBar=%7C%7C%7C18%7C30%7C&.bgColor=0xffffffff)



Create a 1-dimensional timeseries of the 1998 El Niño

Graph Type: linesAndMarkers ?

X Axis: time ?

Y Axis: analysed_sst ?

Color: ?

Dimensions

time (UTC) Start Stop

latitude (degrees_north) specify just 1 value →

longitude (degrees_east) specify just 1 value →

Graph Settings

Marker Type: Filled Square Size: 5

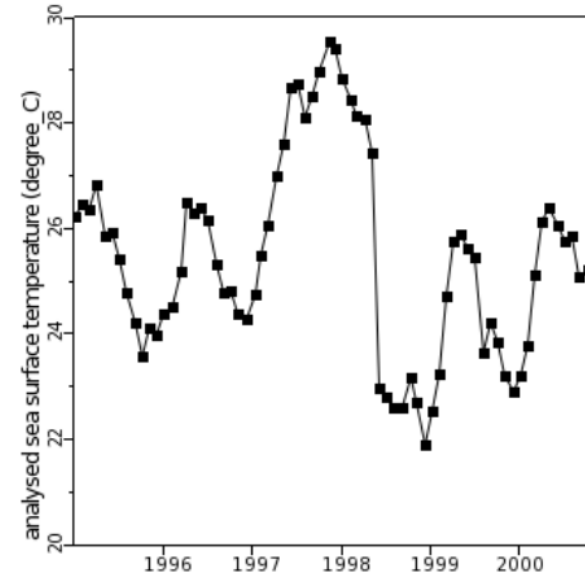
Color:

Color Bar: Continuity: Scale:

Minimum: Maximum: N Sections:

Y Axis Minimum: Maximum: Ascending

Time range: 6 year(s)



■ Sea Surface Temperature, Coral Reef Watch, CoralTemp Monthly, 1985-present (0.025 N, 220.025 E)
Data courtesy of NOAA/NESDIS/STAR Coral Reef Watch program

Redraw the Graph (Please be patient. It may take a while to get the data.)

Optional:

Then set the File Type: .csv (File Type information)

and Download the Data or an Image

or view the URL: https://oceanwatch.pifsc.noaa.gov/erddap/griddap/CRW_sst_v1
(Documentation / Bypass this form ?)

[https://oceanwatch.pifsc.noaa.gov/erddap/griddap/CRW_sst_v1_0_monthly.graph?analysed_sst\[\(1995-01-01T12:00:00Z\):\(2000-12-01T12:00:00Z\)\]\[\(0.025\)\]\[\(220\)\]&.draw=linesAndMarkers&.vars=time|analysed_sst](https://oceanwatch.pifsc.noaa.gov/erddap/griddap/CRW_sst_v1_0_monthly.graph?analysed_sst[(1995-01-01T12:00:00Z):(2000-12-01T12:00:00Z)][(0.025)][(220)]&.draw=linesAndMarkers&.vars=time|analysed_sst)



Download the data as a netCDF file

ERDDAP > griddap > Data Access Form

Dataset Title: **Sea Surface Temperature, Coral Reef Watch, CoralTemp - Monthly, 1985-present**  

Institution: NOAA/NESDIS/STAR Coral Reef Watch program (Dataset ID: CRW_sst_v1_0_monthly)

Information: [Summary](#) | [License](#) | [FGDC](#) | [ISO 19115](#) | [Metadata](#) | [Background](#) | [Make a graph](#)

Dimensions	Start	Stride	Stop	Size	Spacing
<input checked="" type="checkbox"/> time (UTC)	1995-01-01T12:00:00Z	1	2000-12-01T12:00:00Z	428	30 days 10h 27m 16s (uneven)
<input checked="" type="checkbox"/> latitude (degrees_north)	-20	1	20	3600	0.05 (even)
<input checked="" type="checkbox"/> longitude (degrees_east)	180	1	300	7200	0.05 (even)

Grid Variables (which always also download all of the dimension variables)

analysed_sst (analysed sea surface temperature, degree_C)

File type: [\(more info\)](#)

.nc - Download a NetCDF-3 binary file with COARDS/CF/ACDD metadata.

Just generate the URL:

[\(Documentation / Bypass this form\)](#)

Submit (Please be patient. It may take a while to get the data.)

https://oceanwatch.pifsc.noaa.gov/erddap/griddap/CRW_sst_v1_0_monthly.html



ERDDAP and R tutorials

Available at: <https://coastwatch.gitbook.io/satellite-course/tutorials>

- ERDDAP tutorial: how to graph and download data from ERDDAP
<https://oceanwatch.gitbook.io/satellite-course/tutorials/erddap-tutorial>
- R/Python tutorials:
 - Grab data on ERDDAP directly from R and make plots
 - Learn about the rerddap package
 - Extract data within a shapefile using ERDDAP and the rerddapXtracto package
 - Extract data along an animal track

<https://oceanwatch.gitbook.io/satellite-course/tutorials/r-tutorial>

<https://coastwatch.gitbook.io/satellite-course/tutorials/python-tutorial>

