Introduction to ERDDAP

(Environmental Research Division's Data Access Program)

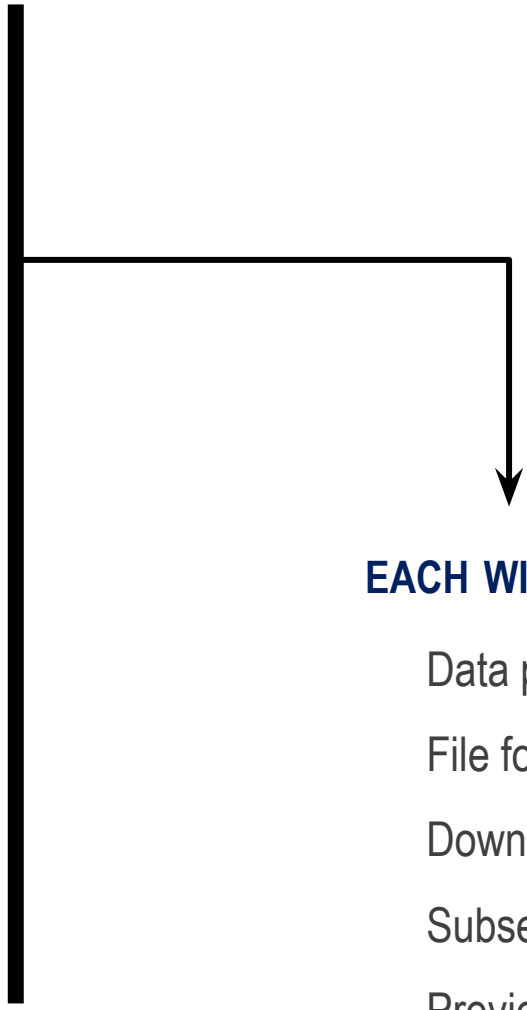
NOAA CoastWatch Satellite Course

coastwatch.info@noaa.gov

Accessing satellite data can be challenging

A SHORT LIST OF DATA SERVERS

- NOAA CoastWatch Central Operations
- NOAA Center for Satellite Applications and Res.
- NOAA Office of Satellite and Products
- NOAA National Centers for Environmental Info.
- NOAA Comprehensive Large Array-data Stewardship System (CLASS)
- NASA Jet Propulsion Laboratory PO.DAAC
- NASA Ocean Biology (OB.DAAC)
- NASA Goddard Space Flight Center
- European Space Agency
- EUMETSAT
- Japan Aerospace Exploration Agency



EACH WITH ITS OWN

- Data products
- File formats
- Download protocols
- Subsetting abilities
- Previewing abilities

ERDDAP – designed to make data access easier

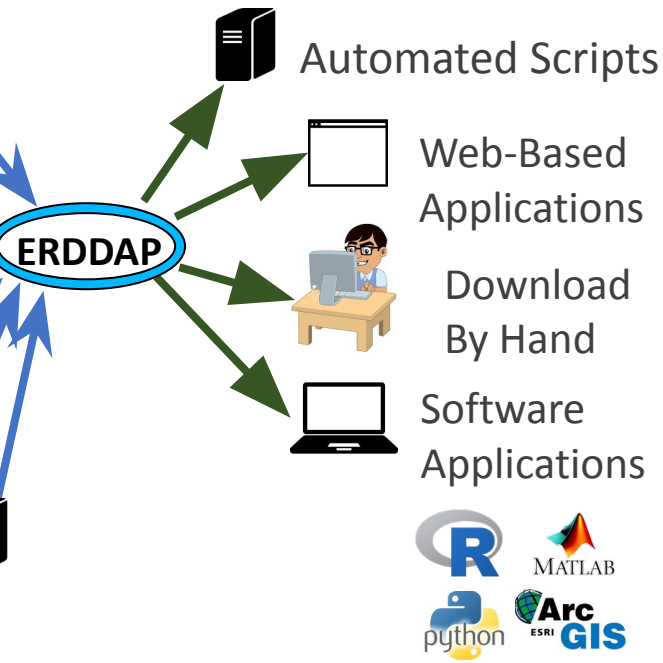
DATA AGGREGATION

Local Storage

- Internal Servers
- Database
- RAID

Remote Servers

- NSIDC
- NCEI
- JPL PO.DAAC
- NESDIS STAR



DATA DISTRIBUTION

- Automated Scripts
- Web-Based Applications
- Download By Hand
- Software Applications

R, MATLAB, python, ArcGIS

ERDDAP was developed at NOAA NMFS SWFSC Environmental Research Division (ERD) by Bob Simons

ERDDAP provides a simple, consistent way to:

- Subset datasets temporally and spatially
- Distribute both gridded and non-gridded (tabular) data
- Download data in > 30 formats
- A graphical interface for humans with browsers
- Data requests defined within URLs, allowing:
  - Machine-to-machine data exchange and access data within analysis tools (R, Matlab, python)

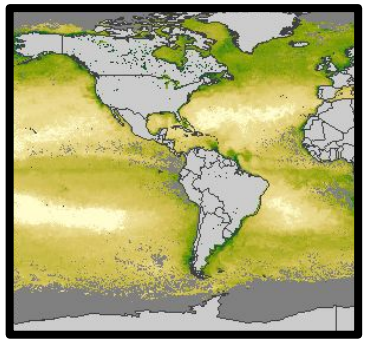
Over 85 ERDDAPs exist worldwide

Over a dozen different ERDDAPs in NOAA

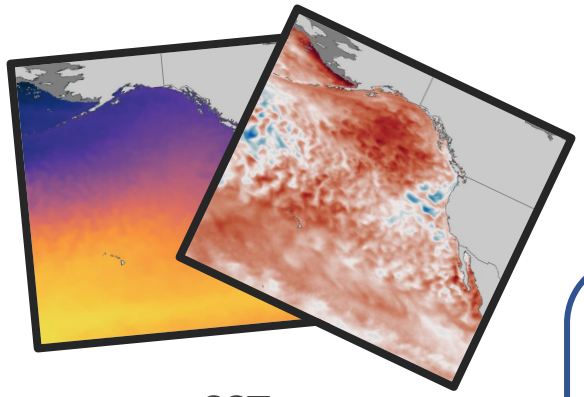
ERDDAP is one of the recommended data servers in NOAA's Data Access Procedural Directive

Search for data across multiple ERDDAPs at erddap.com

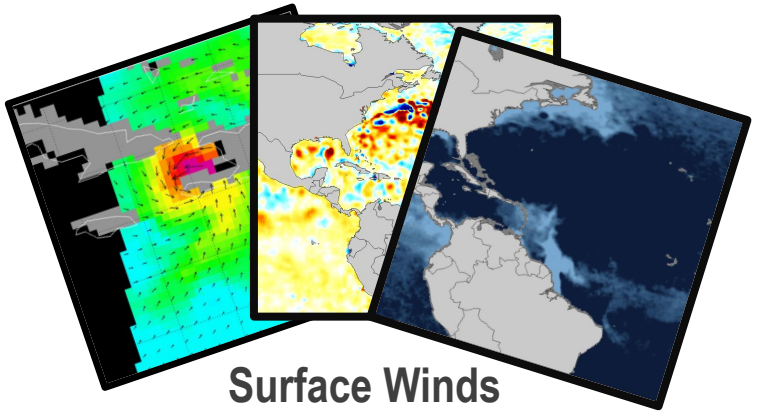
NOAA/ERD ERDDAP contains > 1000 satellite datasets



Chlorophyll
Primary Productivity



SST
SST Anomaly



Surface Winds
Sea Surface Salinity
Sea Surface Height and Anomaly

0.5 – 1 million data requests per day

- Daily, weekly, and monthly composites
- Blended products
- Interpolated products (gap free)
- All level 3 or 4 products (i.e. on a regular XY grid)

This ERDDAP is maintained jointly by the SWFSC Environmental Research Division and the West Coast Node of NOAA's CoastWatch program

ERD ERDDAP data catalog has >400 non-satellite datasets

In Situ Measurements

- Animal Telemetry Network
- ARGO floats
- TAO/TRITON, RAMA, & PIRATA Buoys
- IOOS In Situ Sensors
- Glider Data
- Global Temperature and Salinity Profile Programme
- HF Radar Currents
- GLOBEC Northeast Pacific
- NOAA CO-OPS Sensors
- NDBC buoys

Field Sampling

- CalCOFI
- California Fish Landings
- Farallon Island Seabirds
- NWFSC Habitat Use
- SWFSC Rockfish

Underway Data

- NOAA Vessels
- UNOLS Vessels

Models, Climatologies

- OSCAR Sea Surface Velocity
- SODA Model

Models, Climatologies (cont.)

- NOAA Coastal Relief Model
- NOAA RTOFS Forecast Model
- NOAA RTOFS Nowcast Model
- NOAA World Ocean Atlas
- NOAA Seafloor Topography
- SWFSC Upwelling Index
- Navy NAVGEM Model
- Navy NOGAPS Model
- NCEP/NCAR Reanalysis
- USGS Topography
- NASA/NOAA CCMP Wind Atlas
- Navy HYCOM Model
- Navy FNMOC Forecast Model

The ERDDAP interface is functionally beautiful

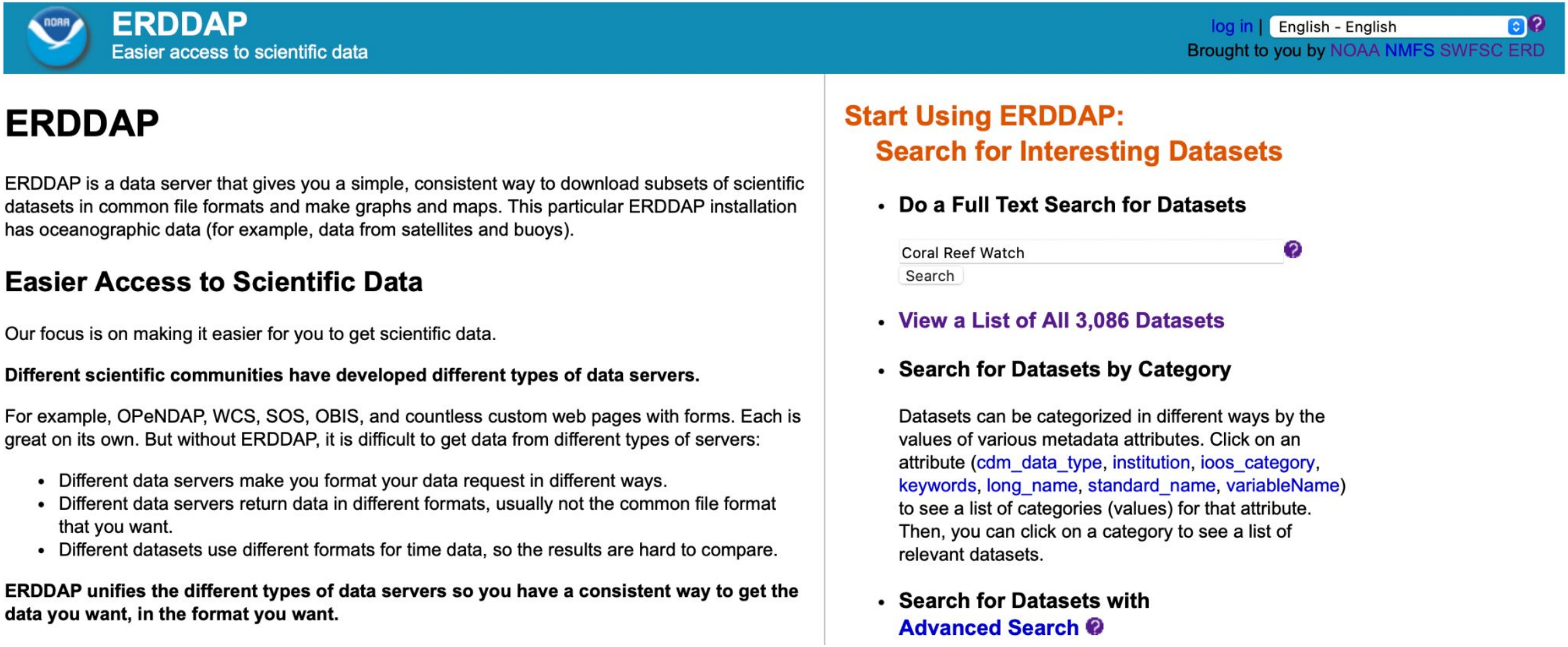
ERDDAP
Easier access to scientific data

ERDDAP > List of All Datasets

1392 matching datasets, listed in alphabetical order. View page: 1 (current) 2 .

Grid DAP Data	Sub-set	Table DAP Data	Make A Graph	WMS	Source Data Files	Acces-sible	Title	Sum-mary	FGDC, ISO, Metadata	Back-ground Info	RSS	E mail	Institution	Dataset ID
	set	data	graph			public	* The List of All Active Datasets in this ERDDAP *		M	background			NOAA NMFS SWFSC E...	allDatasets
data			graph			public	AMSRE Model Output, obs4MIPs NASA-JPL, Global, 1 Degree, 2002-2010, Monthly		F I M	background	RSS		Remote Sensing Sy...	jplAmsreSstMon
data			graph	M		public	AMSRE Model Output, obs4MIPs NASA-JPL, Global, 1 Degree, 2002-2010, Monthly, Lon+/-180		F I M	background	RSS		Remote Sensing Sy...	jplAmsreSstMon_LonPM180
		data	graph		files	public	AN EXPERIMENTAL DATASET: Underway Sea Surface Temperature and Salinity Aboard the Oleander, 2007-2010		F I M	background	RSS		NOAA OAR AOML	nodcPJJU
	set	data	graph			public	Animal Telemetry Network (ATN)		F I M	background	RSS		Animal Telemetry ...	gtoppAT
data			graph	M		public	Aquarius Sea Surface Salinity, L3 SMI, Version 5, 1.0°, Global, 2011-2015, 3-Month		F I M	background	RSS		NASA/GSFC OBPG	jplAquariusSSS3MonthV5
data			graph	M		public	Aquarius Sea Surface Salinity, L3 SMI, Version 5, 1.0°, Global, 2011-2015, 7-Day		F I M	background	RSS		NASA/GSFC OBPG	jplAquariusSSS7DayV5
data			graph	M		public	Aquarius Sea Surface Salinity, L3 SMI, Version 5, 1.0°, Global, 2011-2015, Daily		F I M	background	RSS		NASA/GSFC OBPG	jplAquariusSSSDailyV5
data			graph	M		public	Aquarius Sea Surface Salinity, L3 SMI, Version 5, 1.0°, Global, 2011-2015, Monthly		F I M	background	RSS		NASA/GSFC OBPG	jplAquariusSSSMonthlyV5
data			graph		files	public	Audio data from a local source.		M	background	RSS		???	testGridWav
	set	data	graph		files	public	Audio data from a local source.		M	background	RSS		???	testTableWav
data			graph	M		public	AVHRR Pathfinder Version 5.3 L3-Collated (L3C) SST, Global, 0.0417°, 1981-present, Daytime (1 Day Composite)		F I M	background	RSS		NCEI	nceiPH53sstd1day
data			graph	M		public	AVHRR Pathfinder Version 5.3 L3-Collated (L3C) SST, Global, 0.0417°, 1981-present, Nighttime (1 Day Composite)		F I M	background	RSS		NCEI	nceiPH53sstn1day
data			graph			public	AVISO Model Output, obs4MIPs NASA-JPL, Global, 1 Degree, 1992-2010, Monthly		F I M	background	RSS		Centre National d...	jplAvisoSshMon
data			graph	M		public	AVISO Model Output, obs4MIPs NASA-JPL, Global, 1 Degree, 1992-2010, Monthly, Lon+/-180		F I M	background	RSS		Centre National d...	jplAvisoSshMon_LonPM180
data			graph	M	files	public	C-HARM 1-Day Advanced Forecast: Pseudo-Nitzschia, cellular domoic acid, and particulate domoic acid probability, California and Southern Oregon coast		F I M	background	RSS		UCSC, UCSD	charmForecast1day
data			graph	M	files	public	C-HARM 2-Day Advanced Forecast: Pseudo-Nitzschia, cellular domoic acid, and particulate domoic acid probability, California and Southern Oregon coast		F I M	background	RSS		UCSC, UCSD	charmForecast2day
data			graph	M	files	public	C-HARM 3-Day Advanced Forecast: Pseudo-Nitzschia, cellular domoic acid, and particulate domoic acid probability, California and Southern Oregon coast		F I M	background	RSS		UCSC, UCSD	charmForecast3day
data			graph	M	files	public	C-HARM Nowcast: Pseudo-Nitzschia, cellular domoic acid, and particulate domoic acid probability, California and Southern Oregon coast		F I M	background	RSS		UCSC, UCSD	charmForecast0day
	set	data	graph			public	CalCOFI Continuous Underway Fish-Egg Sampler		F I M	background	RSS		NOAA SWFSC	erdCalCOFIcufes
	set	data	graph			public	CalCOFI Cruises		M	background	RSS		NOAA SWFSC	erdCalCOFIcruises

Finding datasets on ERDDAP



ERDDAP
Easier access to scientific data

log in | English - English
Brought to you by NOAA NMFS SWFSC ERD

ERDDAP

ERDDAP is a data server that gives you a simple, consistent way to download subsets of scientific datasets in common file formats and make graphs and maps. This particular ERDDAP installation has oceanographic data (for example, data from satellites and buoys).

Easier Access to Scientific Data

Our focus is on making it easier for you to get scientific data.

Different scientific communities have developed different types of data servers.

For example, OPeNDAP, WCS, SOS, OBIS, and countless custom web pages with forms. Each is great on its own. But without ERDDAP, it is difficult to get data from different types of servers:

- Different data servers make you format your data request in different ways.
- Different data servers return data in different formats, usually not the common file format that you want.
- Different datasets use different formats for time data, so the results are hard to compare.

ERDDAP unifies the different types of data servers so you have a consistent way to get the data you want, in the format you want.

Start Using ERDDAP: Search for Interesting Datasets

- **Do a Full Text Search for Datasets**

  Coral Reef Watch
  Search

- **View a List of All 3,086 Datasets**
- **Search for Datasets by Category**

  Datasets can be categorized in different ways by the values of various metadata attributes. Click on an attribute (cdm_data_type, institution, ioos_category, keywords, long_name, standard_name, variableName) to see a list of categories (values) for that attribute. Then, you can click on a category to see a list of relevant datasets.

- **Search for Datasets with Advanced Search**

https://coastwatch.pfeg.noaa.gov/erddap/index.html

Finding datasets on ERDDAP

ERDDAP > Search

Do a Full Text Search for Datasets:

Coral Reef Watch Search

7 matching datasets, with the most relevant ones listed first.
(Or, refine this search with Advanced Search)

Grid DAP Data	Sub-set	Table DAP Data	Make A Graph	WMS	Source Data Files	Acces-sible	Title	Sum-mary	FGDC, ISO, Metadata	Back-ground Info
data			graph	M		public	NOAA Coral Reef Watch Operational Daily Near-Real-Time Global 5-km Satellite Coral Bleaching Monitoring Products		F I M	background
data			graph	M		public	NOAA Coral Reef Watch Operational Daily Near-Real-Time Global 5-km Satellite Coral Bleaching Monitoring Products, Lon0360		F I M	background
data			graph	M	files	public	SST and SST Anomaly, NOAA Global Coral Bleaching Monitoring, 5km, V.3.1, Monthly, 1985-Present		F I M	background
data			graph	M	files	public	SST and SST Anomaly, NOAA Global Coral Bleaching Monitoring, 5km, V.3.1, Monthly, 1985-Present, Lon0360		F I M	background
data			graph	M	files	public	Relative Bycatch:Target Catch Probability Product (daily), EcoCast Project		F I M	background
data			graph	M	files	public	Relative Bycatch:Target Catch Probability Product (daily), EcoCast Project, Lon0360		F I M	background
		data	graph		files	public	Ecocast species weightings and environmental data dates		M	background

The information in the table above is also available in other file formats (.csv, .htmlTable, .itx, .json, .jsonlCSV1, .jsonlCSV, .jsonlKVP, .mat, .nc, .nccsv, .tsv, .xhtml) via a RESTful web service.

Visualizing datasets

Graph Type:
- Maps (surface)
- Time-series (lines)
- Hovmöller (surface)
- Vectors (vectors)

Color:
- Choose variable in dataset

Scale:
- Choose linear or log

Color Bar:
- Choose from > 40 color palettes

File Type:
- Choose from > 40 file formats (data and graphics)

ERDDAP > griddap > Make A Graph

Dataset Title: **SST and SST Anomaly, NOAA Global Coral Bleaching Monitoring, 5km, V.3.1, Monthly, 1985-Present, Lon0360**

Institution: NOAA/NESDIS/STAR Coral Reef Watch program (Dataset ID: NOAA_DHW_monthly_Lon0360)

Information: Summary | License | FGDC | ISO 19115 | Metadata | Background | Data Access Form | Files

Graph Type: surface
X Axis: longitude
Y Axis: latitude
Color: sea_surface_temperature

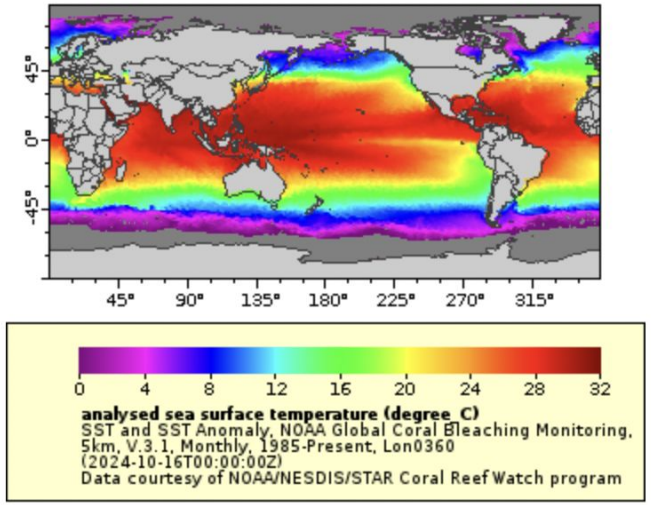
Dimensions	Start	Stop
time (UTC)	specify just 1 value →	2024-10-16T00:00:00Z
latitude (degrees_north)	89.975	-89.975
longitude (degrees_east)	0.025	359.975

Graph Settings
Color Bar: Continuity: Scale:
Minimum: Maximum: N Sections:
Draw land mask:
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://coastwatch.pfeg.noaa.gov/erddap/griddap/NOAA_DHW_monthly_Lon036
(Documentation / Bypass this form)

Click on the map to specify a new center point.
Zoom: Data | Out 8x | Out 2x | Out | In | In 2x | In 8x

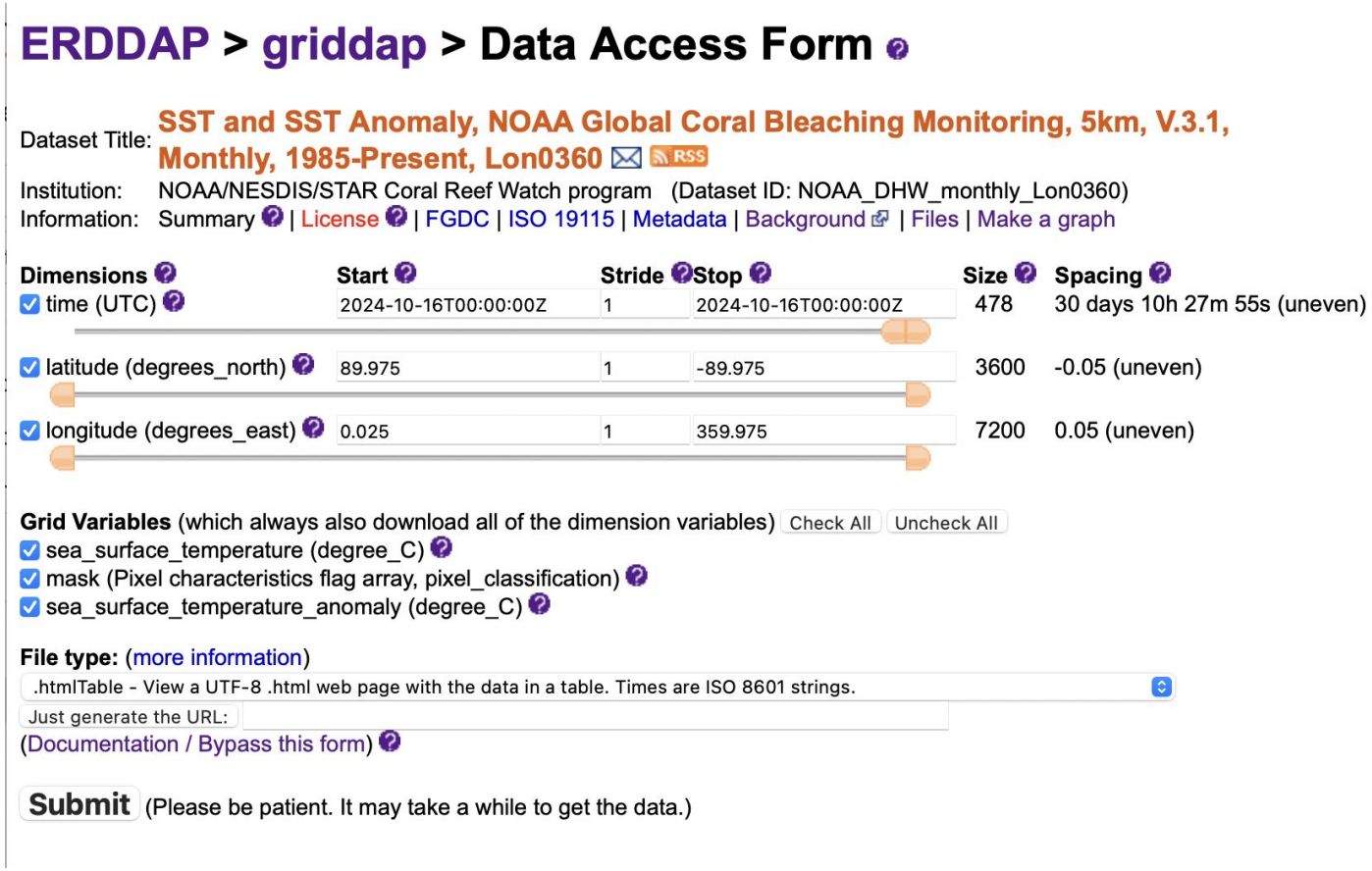


Downloading datasets to a format of your choice

Can subset by time, latitude or longitude (for gridded datasets)

File Type:

Choose from > 40 file formats (data and graphics)



ERDDAP > griddap > Data Access Form

Dataset Title: **SST and SST Anomaly, NOAA Global Coral Bleaching Monitoring, 5km, V.3.1, Monthly, 1985-Present, Lon0360** ✉ RSS

Institution: NOAA/NESDIS/STAR Coral Reef Watch program (Dataset ID: NOAA_DHW_monthly_Lon0360)

Information: Summary | License | FGDC | ISO 19115 | Metadata | Background | Files | Make a graph

Dimensions	Start	Stride	Stop	Size	Spacing
☑ time (UTC)	2024-10-16T00:00:00Z	1	2024-10-16T00:00:00Z	478	30 days 10h 27m 55s (uneven)
☑ latitude (degrees_north)	89.975	1	-89.975	3600	-0.05 (uneven)
☑ longitude (degrees_east)	0.025	1	359.975	7200	0.05 (uneven)

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

☑ sea_surface_temperature (degree_C)
☑ mask (Pixel characteristics flag array, pixel_classification)
☑ sea_surface_temperature_anomaly (degree_C)

File type: (more information)

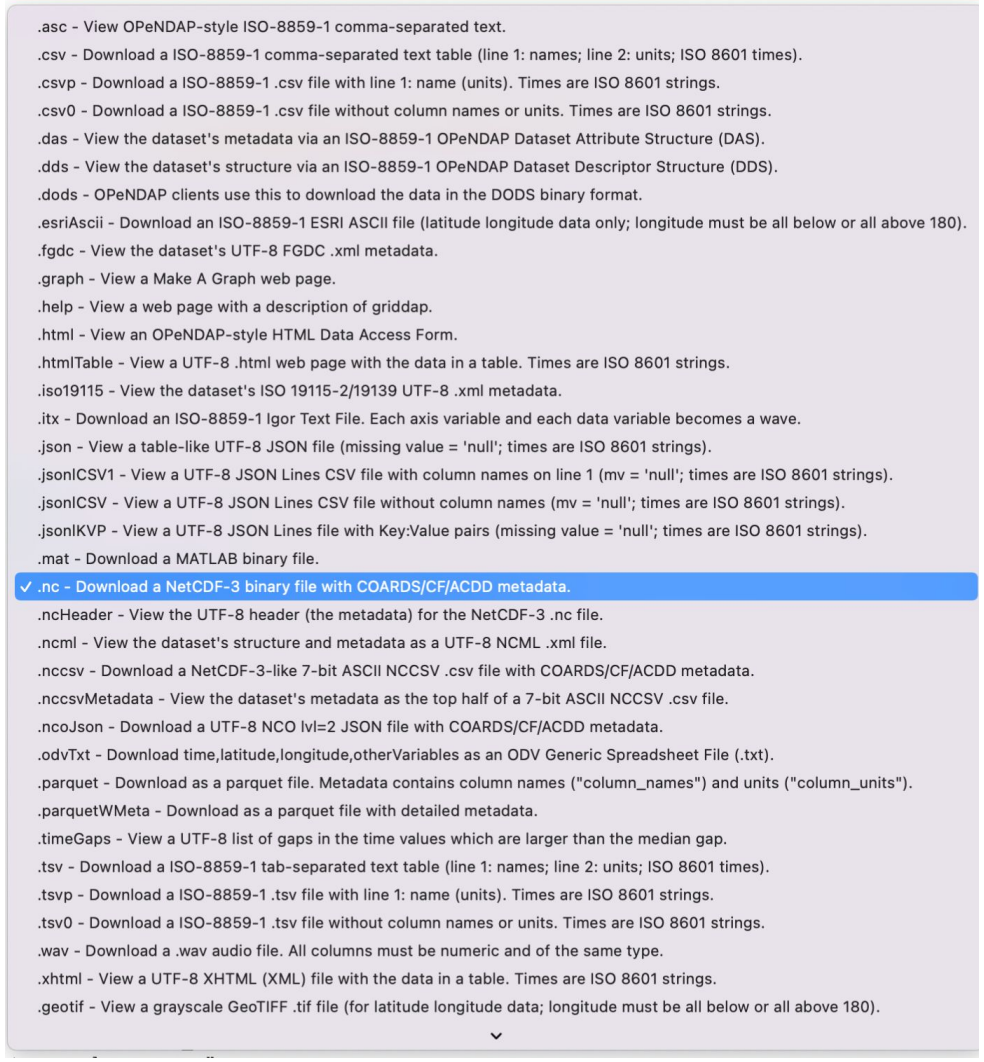
.htmlTable - View a UTF-8 .html web page with the data in a table. Times are ISO 8601 strings.

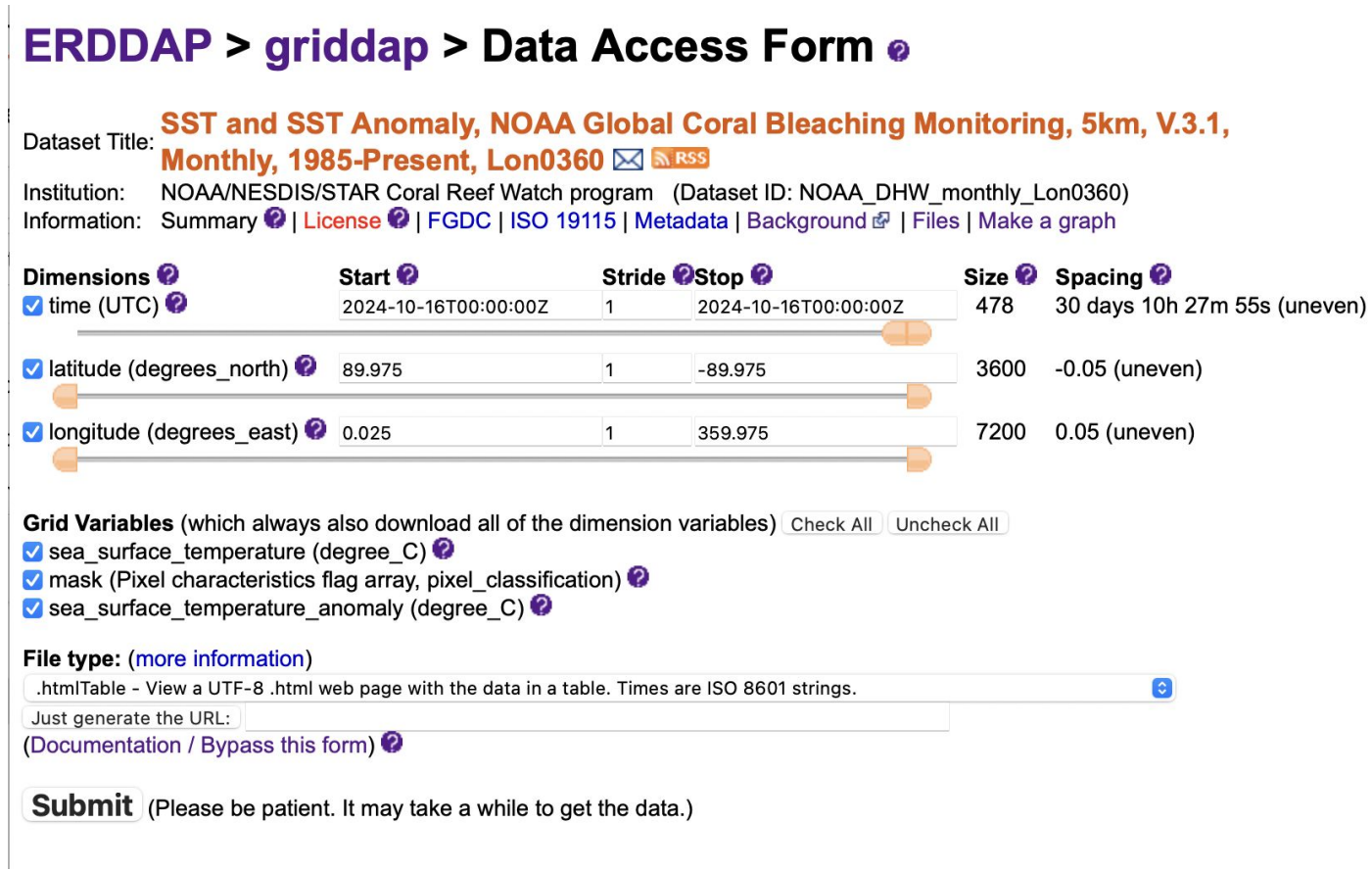
Just generate the URL:

(Documentation / Bypass this form)

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

Downloading datasets to a format of your choice





Marine heat event in the southwest Pacific during Feb. 2016

ERDDAP > griddap > Make A Graph

https://coastwatch.pfeg.noaa.gov/erddap/griddap/NOAA_DHW_monthly_Lon0360.graph?sea_surface_temperature_anomaly

Dataset Title: **SST and SST Anomaly, NOAA Global Coral Bleaching Mon Monthly, 1985-Present, Lon0360**

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

Information: Summary | License | FGDC | ISO 19115 | Metadata | Background | Data A

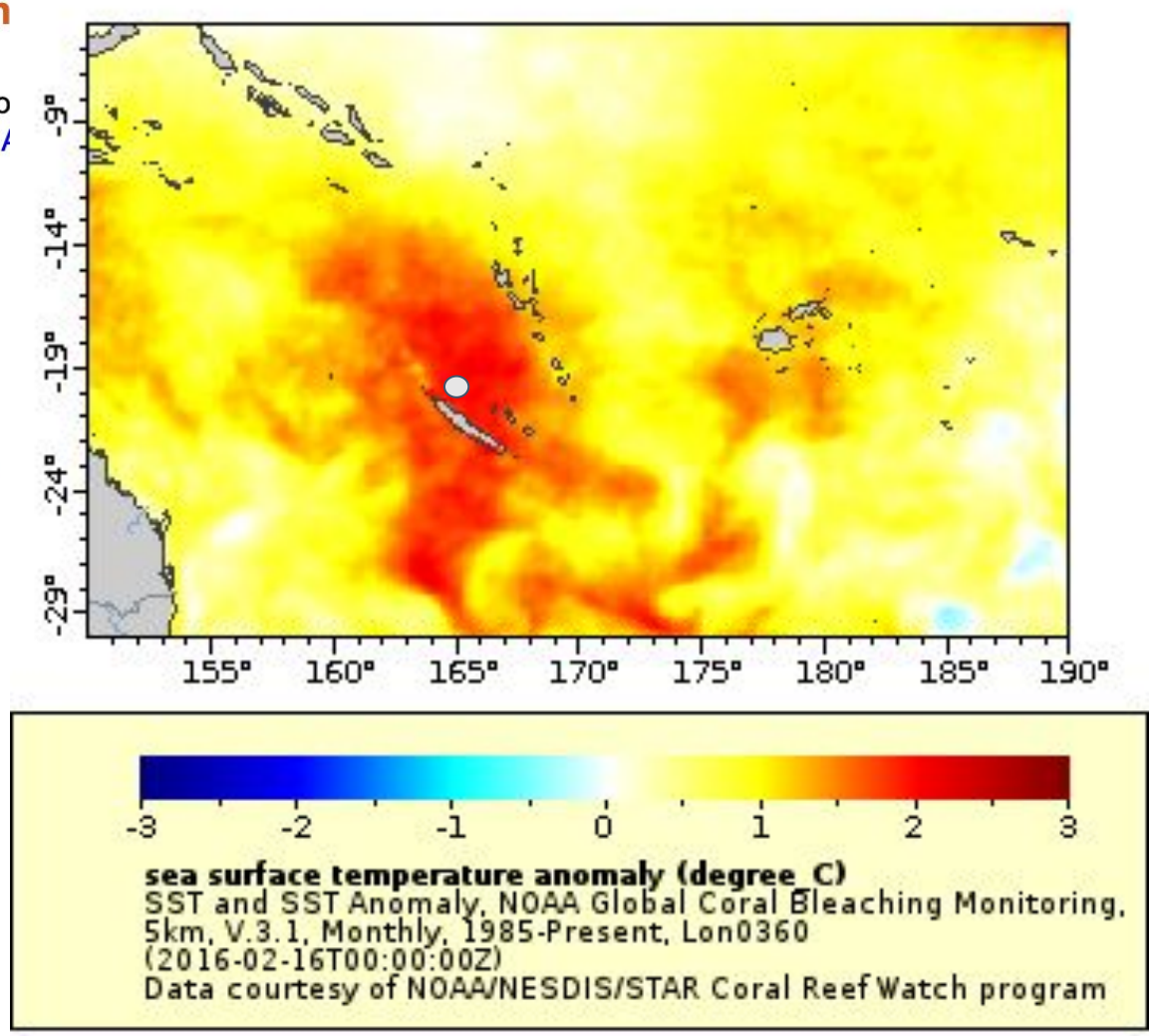
Graph Type: surface
X Axis: longitude
Y Axis: latitude
Color: sea_surface_temperature_anomaly

Dimensions	Start	Stop
time (UTC)	specify just 1 value →	2016-02-16T00:00:00Z
latitude (degrees_north)	-5.024995	-29.975
longitude (degrees_east)	150.025	190.025

Graph Settings

Color Bar: | Continuity: | Scale:
Minimum: | Maximum: | N Sections:
Draw land mask:
Y Axis Minimum: | Maximum: | Ascending

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



Timeseries plot- sea surface temperature (SST) anomalies near New Caledonia

ERDDAP > griddap > Make A Graph

Dataset Title: **SST and SST Anomaly, NOAA Global Coral Bleaching Monitoring Monthly, 1985-Present, Lon0360**

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

Information: Summary | License | FGDC | ISO 19115 | Metadata | Background | Data Access F

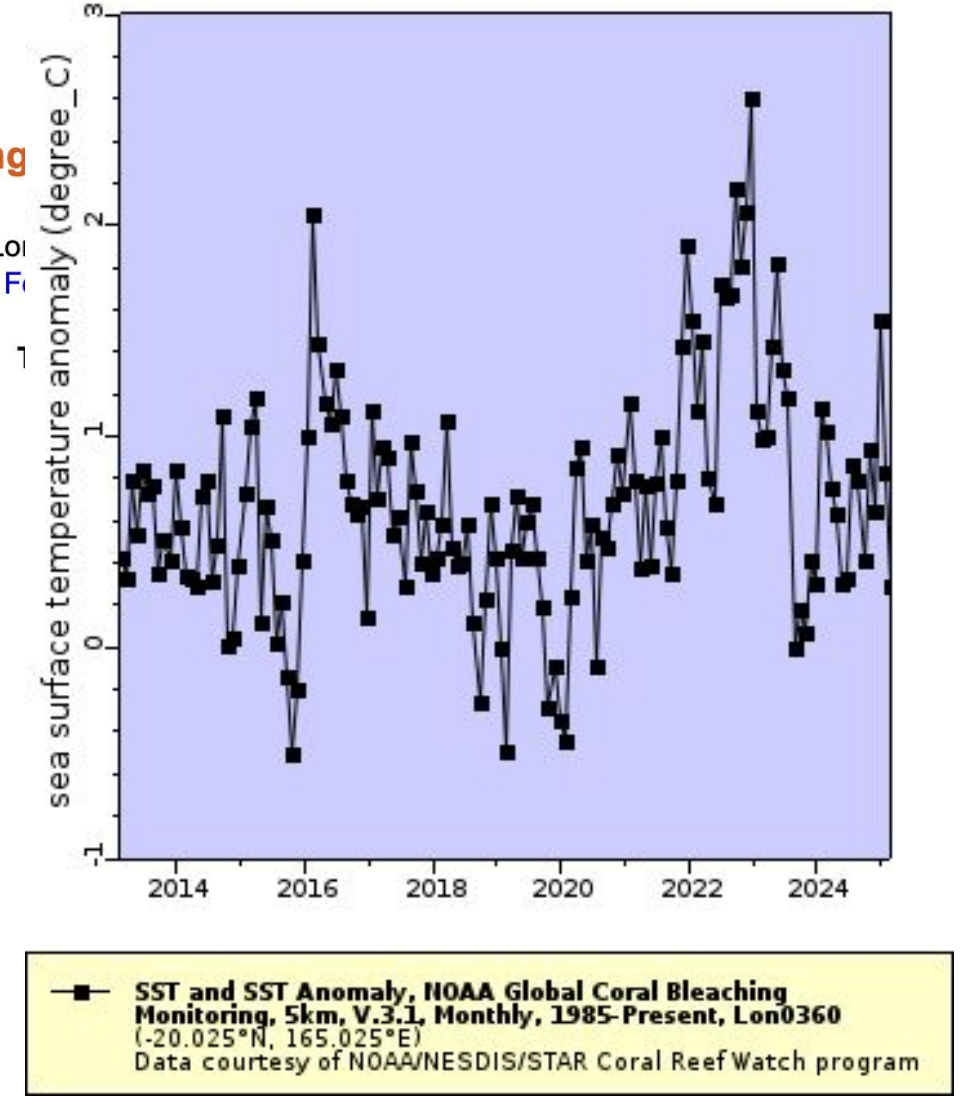
Graph Type: linesAndMarkers

X Axis: time

Y Axis: sea_surface_temperature_anomaly

Color:

Dimensions	Start	Stop
time (UTC)	2013-02-16T00:00:00Z	2025-02-16T00:00:00Z
latitude (degrees_north)	specify just 1 value →	-20.025
longitude (degrees_east)	specify just 1 value →	165.025



Marine heat event in the southwest Pacific during Feb. 2016

ERDDAP > griddap > Make A Graph

https://coastwatch.pfeg.noaa.gov/erddap/griddap/NOAA_DHW_monthly_Lon0360.graph?sea_surface_temperature_anomaly

Dataset Title: **SST and SST Anomaly, NOAA Global Coral Bleaching Mon Monthly, 1985-Present, Lon0360**

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

Information: Summary | License | FGDC | ISO 19115 | Metadata | Background | Data A

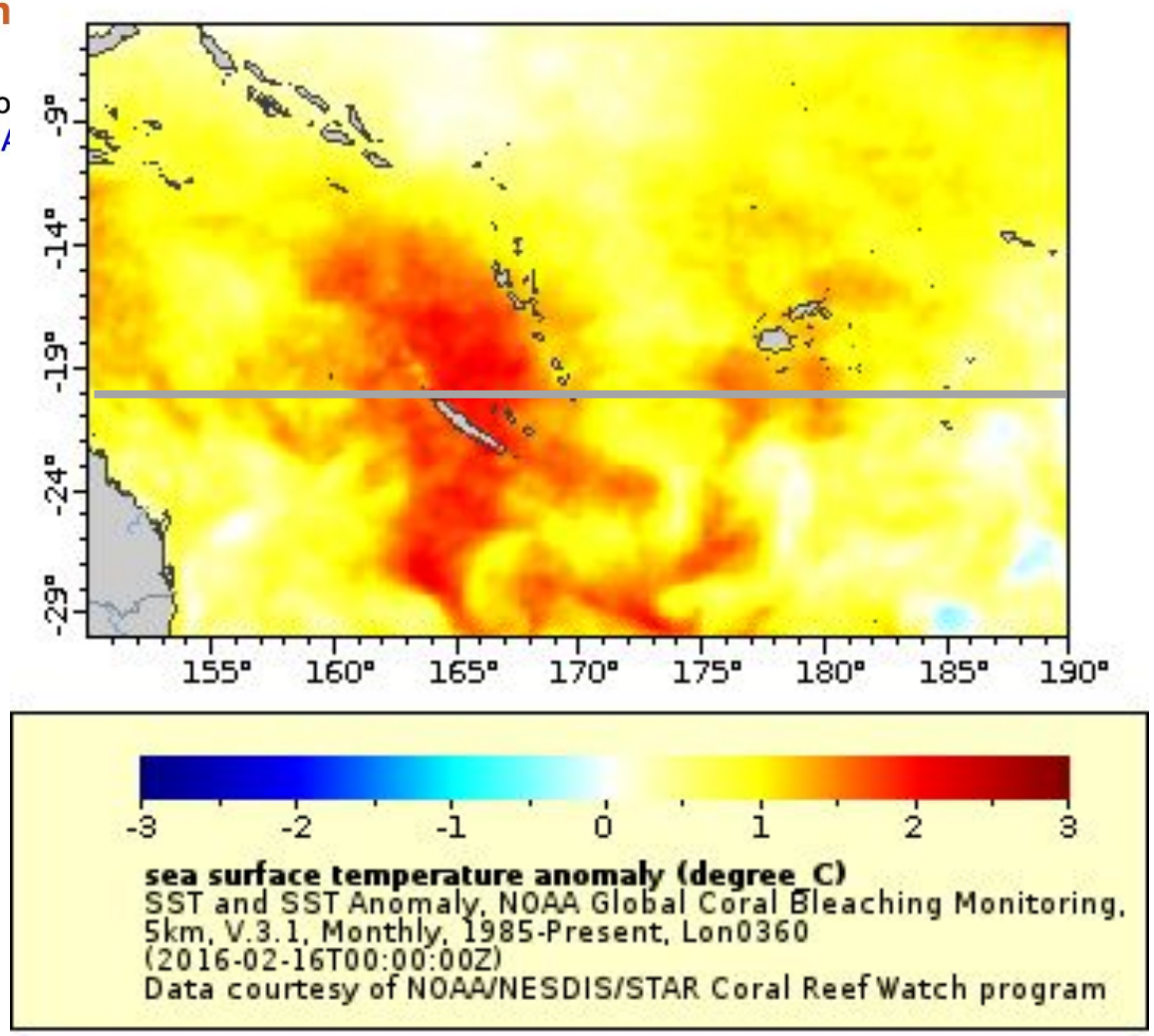
Graph Type: surface
X Axis: longitude
Y Axis: latitude
Color: sea_surface_temperature_anomaly

Dimensions	Start	Stop
time (UTC)	specify just 1 value →	2016-02-16T00:00:00Z
latitude (degrees_north)	-5.024995	-29.975
longitude (degrees_east)	150.025	190.025

Graph Settings

Color Bar: Continuity: Scale:
Minimum: Maximum: N Sections:
Draw land mask:
Y Axis Minimum: Maximum: Ascending

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



Hovmoller diagrams- time evolution of SST anomalies along 20S

ERDDAP > griddap > Make A Graph

Dataset Title: **SST and SST Anomaly, NOAA Global Coral Bleaching Monito Monthly, 1985-Present, Lon0360** ✉ RSS

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

Information: Summary | License | FGDC | ISO 19115 | Metadata | Background | Data Acce

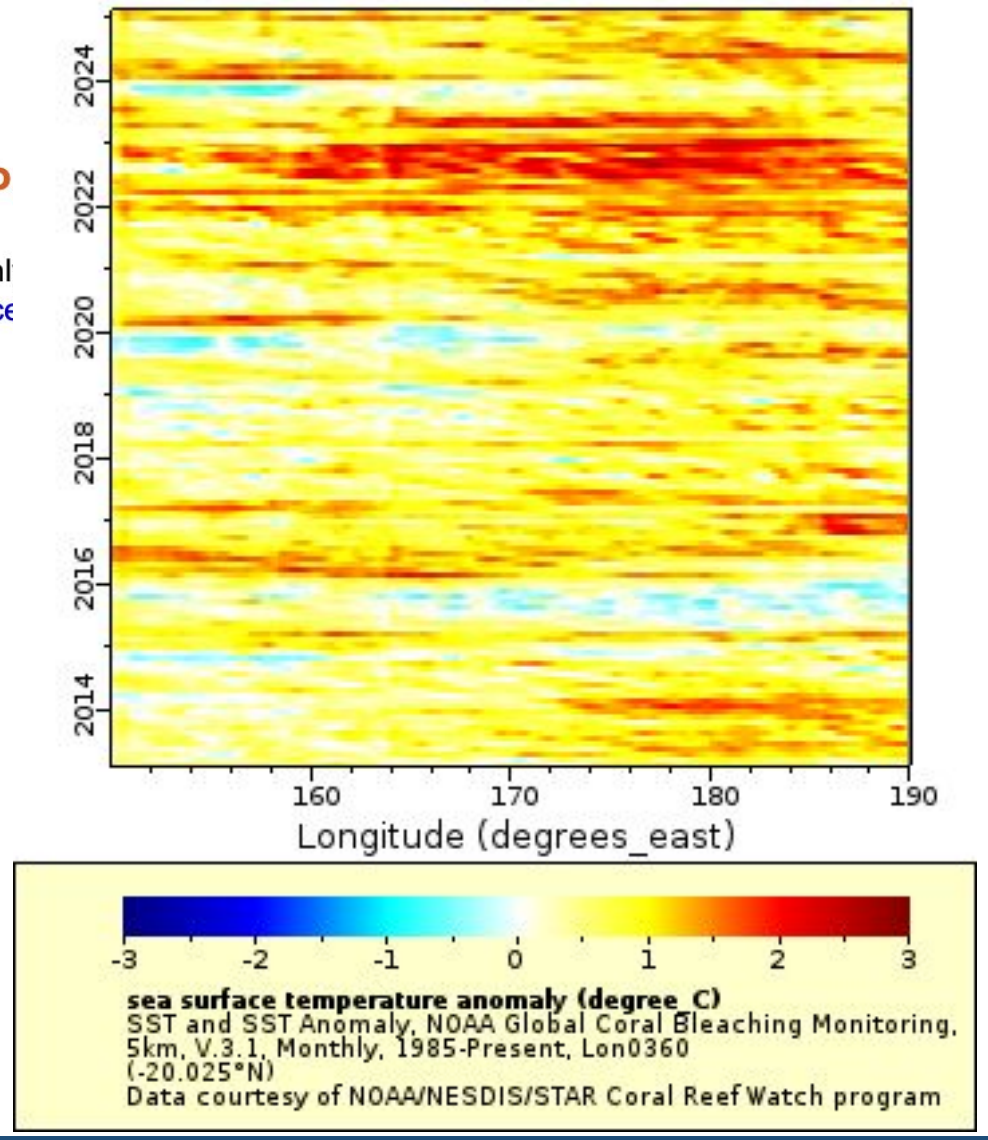
Graph Type: surface

X Axis: longitude

Y Axis: time

Color: sea_surface_temperature_anomaly

Dimensions	Start	Stop
time (UTC)	2013-02-16T00:00:00Z	2025-02-16T00:00:00Z
latitude (degrees_north)	specify just 1 value →	-20.025
longitude (degrees_east)	150.025	190.025



Mapping winds during Typhoon Mawar, May 24, 2023

ERDDAP > griddap > Make A Graph

https://coastwatch.noaa.gov/erddap/griddap/noaacwBlendedWindsDaily.graph?windspeed

Dataset Title: **Sea Surface Wind, NOAA NCEI blended daily averaged 0.25° Version 2.0, Science Quality (1987-recent), Daily** RSS

Institution: NOAA NESDIS NCEI (Dataset ID: noaacwBlendedWindsDaily)

Information: Summary | License | FGDC | ISO 19115 | Metadata | Background | Data Acce

Graph Type: surface

X Axis: longitude

Y Axis: latitude

Color: windspeed

Dimensions	Start	Stop
time (UTC)	specify just 1 value →	2023-05-24T18:00:00
zlev (meters)	specify just 1 value →	10.0
latitude (degrees_north)	-5.0	30.0
longitude (degrees_east)	120.0	167.5

Graph Settings

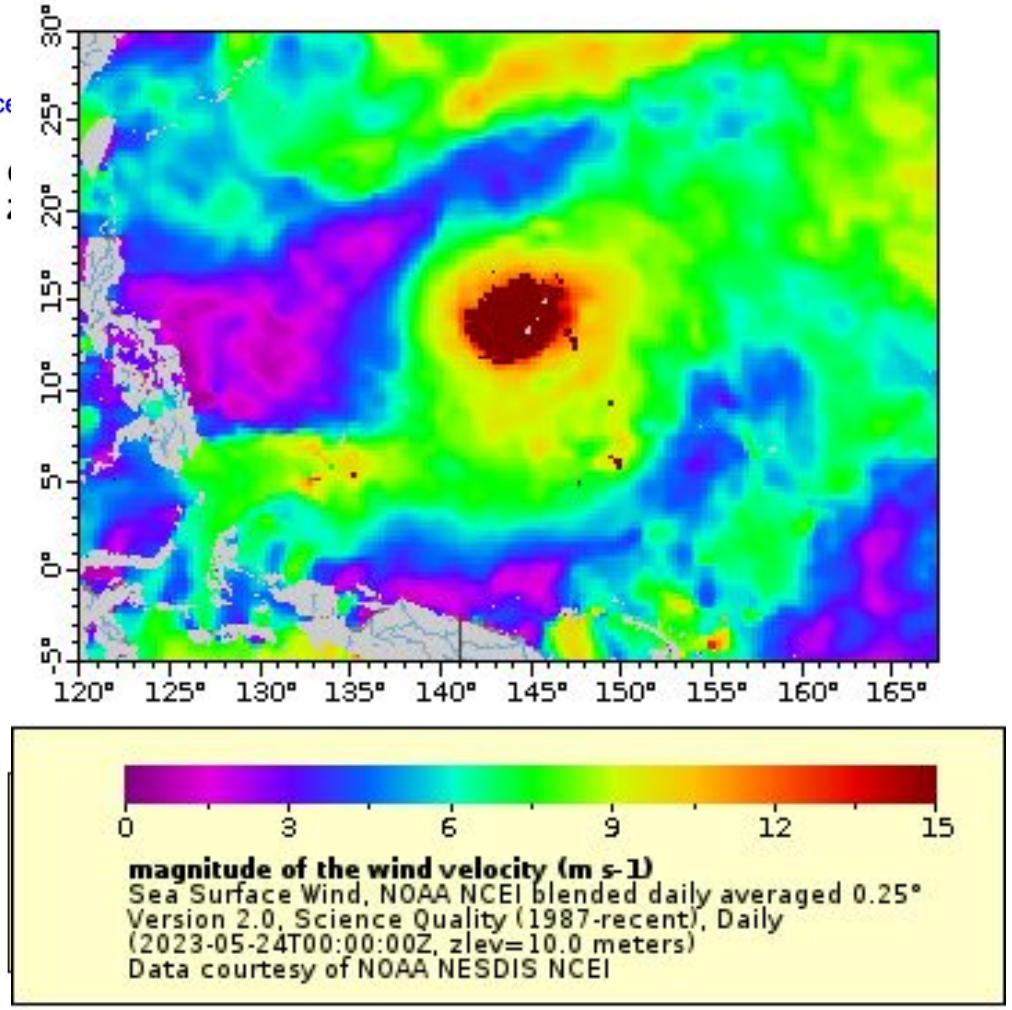
Color Bar: | Continuity: | Scale:

Minimum: | Maximum: | N Sections:

Draw land mask:

Y Axis Minimum: | Maximum: | Ascending

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



Mapping winds during Typhoon Mawar, May 24, 2023

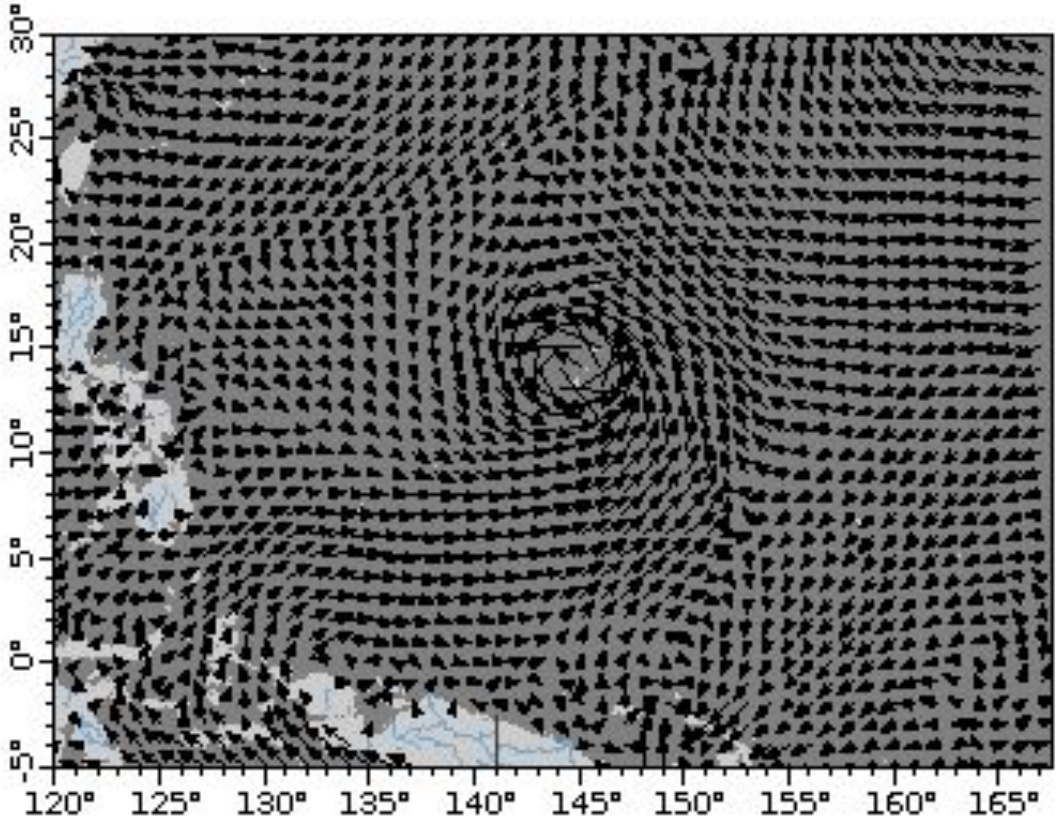
ERDDAP > griddap > Make A Graph

Dataset Title: **Sea Surface Wind, NOAA NCEI blended daily averaged 0.2 Quality (1987-recent), Daily** RSS

Institution: NOAA NESDIS NCEI (Dataset ID: noaacwBlendedWindsDaily)

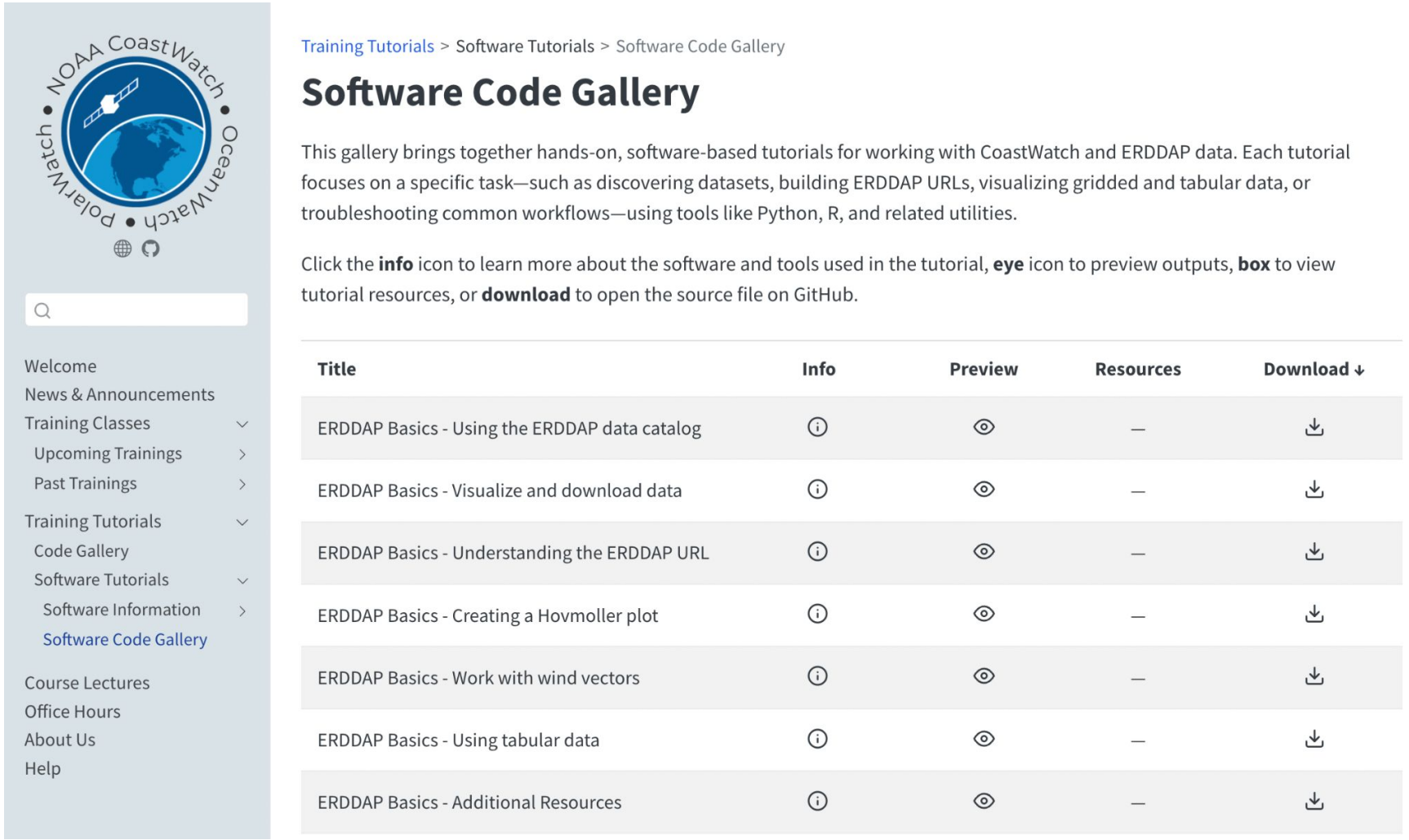
Information: Summary | License | FGDC | ISO 19115 | Metadata | Background | Data Acc

Graph Type:	vectors		
X Axis:	longitude		
Y Axis:	latitude		
Vector X:	u_wind		
Vector Y:	v_wind		
Dimensions		**Start**	**Stop**
time (UTC)		specify just 1 value →	2023-05-24T18:00:00
zlev (meters)		specify just 1 value →	10.0
latitude (degrees_north)		-5.0	30.0
longitude (degrees_east)		120.0	167.5



zonal wind component, meridional wind component (20.0 m s-1)
Sea Surface Wind, NOAA NCEI blended daily averaged 0.25°
Version 2.0, Science Quality (1987-recent), Daily
(2023-05-24T00:00:00Z, zlev=10.0 meters)
Data courtesy of NOAA NESDIS NCEI

CoastWatch ERDDAP Tutorials and Code Gallery



- Work with tabular data on ERDDAP
- Deconstructing an ERDDAP data request URL
- Using ERDDAP in R

https://coastwatch-training.github.io/tutorials/software.html

List of NOAA CoastWatch ERDDAP sites

CoastWatch Central Pacific Node
https://oceanwatch.pifsc.noaa.gov/erddap/

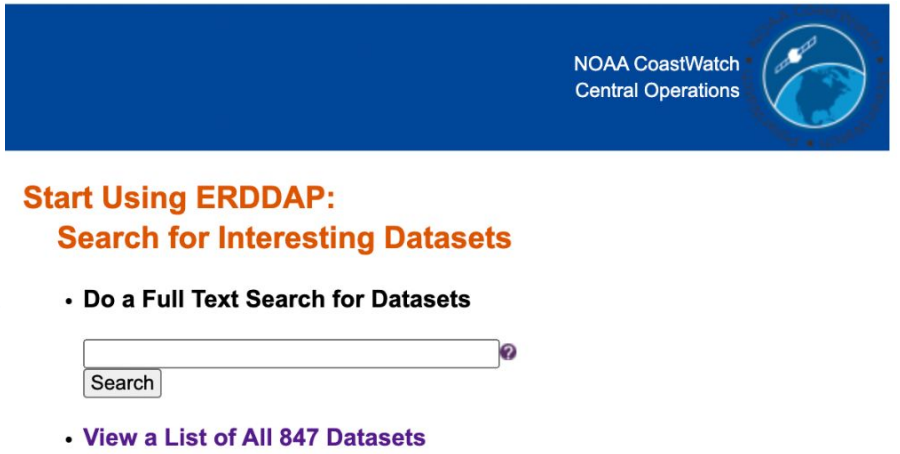
CoastWatch Central https://coastwatch.noaa.gov/erddap/

CoastWatch West Coast Node https://coastwatch.pfeg.noaa.gov/erddap/

CoastWatch PolarWatch Node https://polarwatch.noaa.gov/erddap/

CoastWatch Gulf of Mexico Node https://cwcgom.aoml.noaa.gov/erddap/

CoastWatch Great Lakes Node https://coastwatch.glerl.noaa.gov/erddap/



Which ERDDAP should I use?

If you are unsure of which ERDDAP hosts the dataset you are interested in, you can use these two unofficial ways to search multiple ERDDAPs for datasets:
http://erddap.com/ (not working);
https://erddap.github.io/SearchMultipleERDDAPs.html