

Best Practices for Model/Data Preservation at NOAA/NCEI

Patrick Hogan
with Scott Cross, and Rost Parsons
NCEI (Previously NODC and NCDDC)

NGI, NAVO, NCEP & NCEI

Improve Access to Ocean Nowcasts/ Forecasts

NOMADS: Inspiration for OceanNOMADS

NOMADS

National Operational Model Archive & Distribution System

- NCEP, NCEI, and GFDL initiated
- Real-time and retrospective access to NOAA operational atmospheric model output

<http://nomads.ncep.noaa.gov/>

NGI, **FNMOOC**, NCEP & **NCEI**

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OceanNOMADS

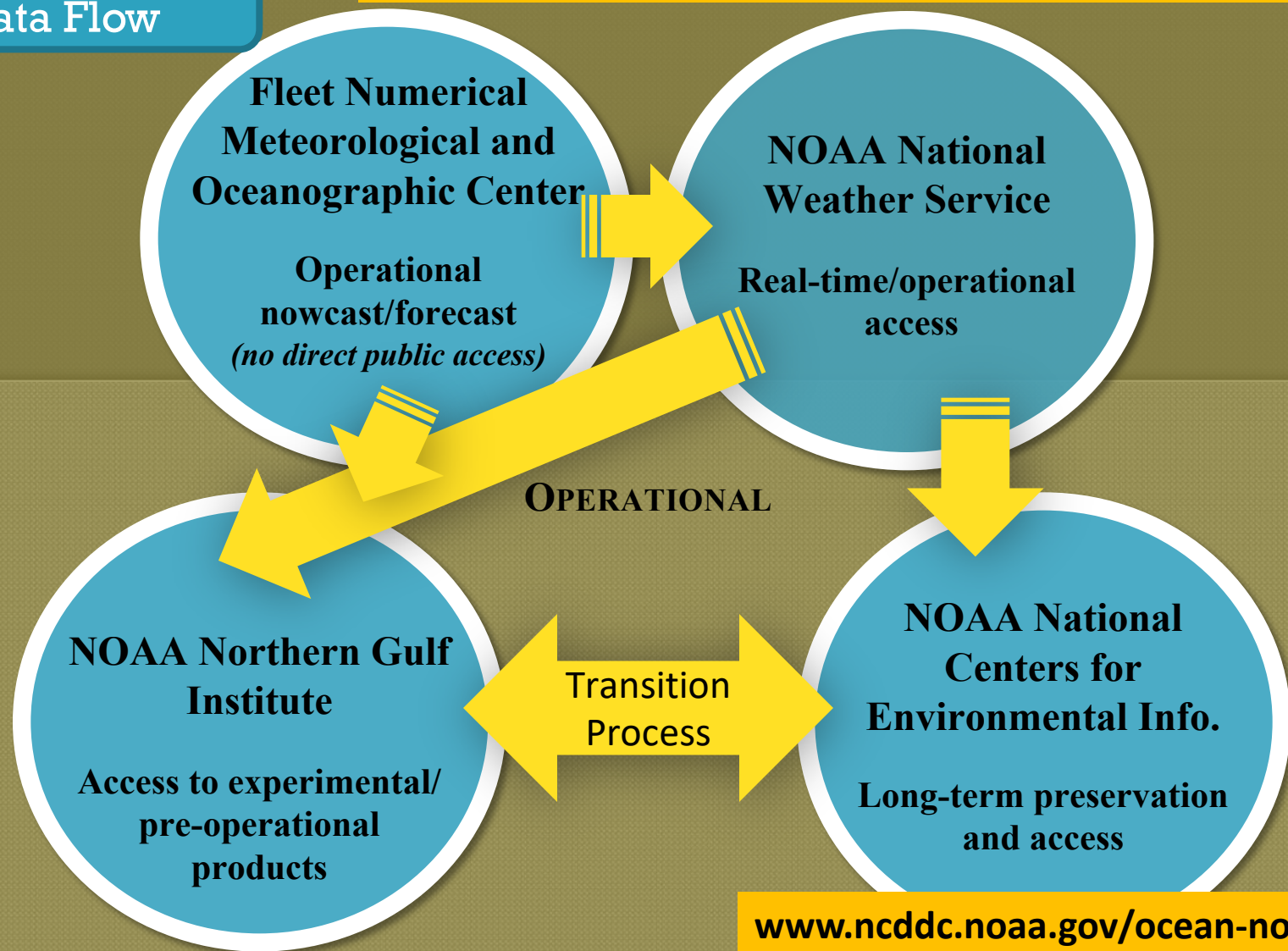
OceanNOMADS

- Navy/NCEP/NGI/NODC (now NCEI) partnership
- Real-time and retrospective access to Navy and NOAA selected operational & pre-operational ocean model output
- Web service graphics for quick look at retrospective data
- Currently Serves several models, including:
 - Atmospheric Models
 - Ocean Models (both real-time and climate)
 - Ecosystem Models

<https://www.ncdc.noaa.gov/data-access/model-data/ocean-nomads>

OceanNOMADS
Data Flow

www.opc.ncep.noaa.gov/newNCOM/NCOM_currents.shtml



www.ncddc.noaa.gov/ocean-nomads

R&D

LONG-TERM ACCESS

www.northerngulfinstitute.org/edac/ocean_nomads.php

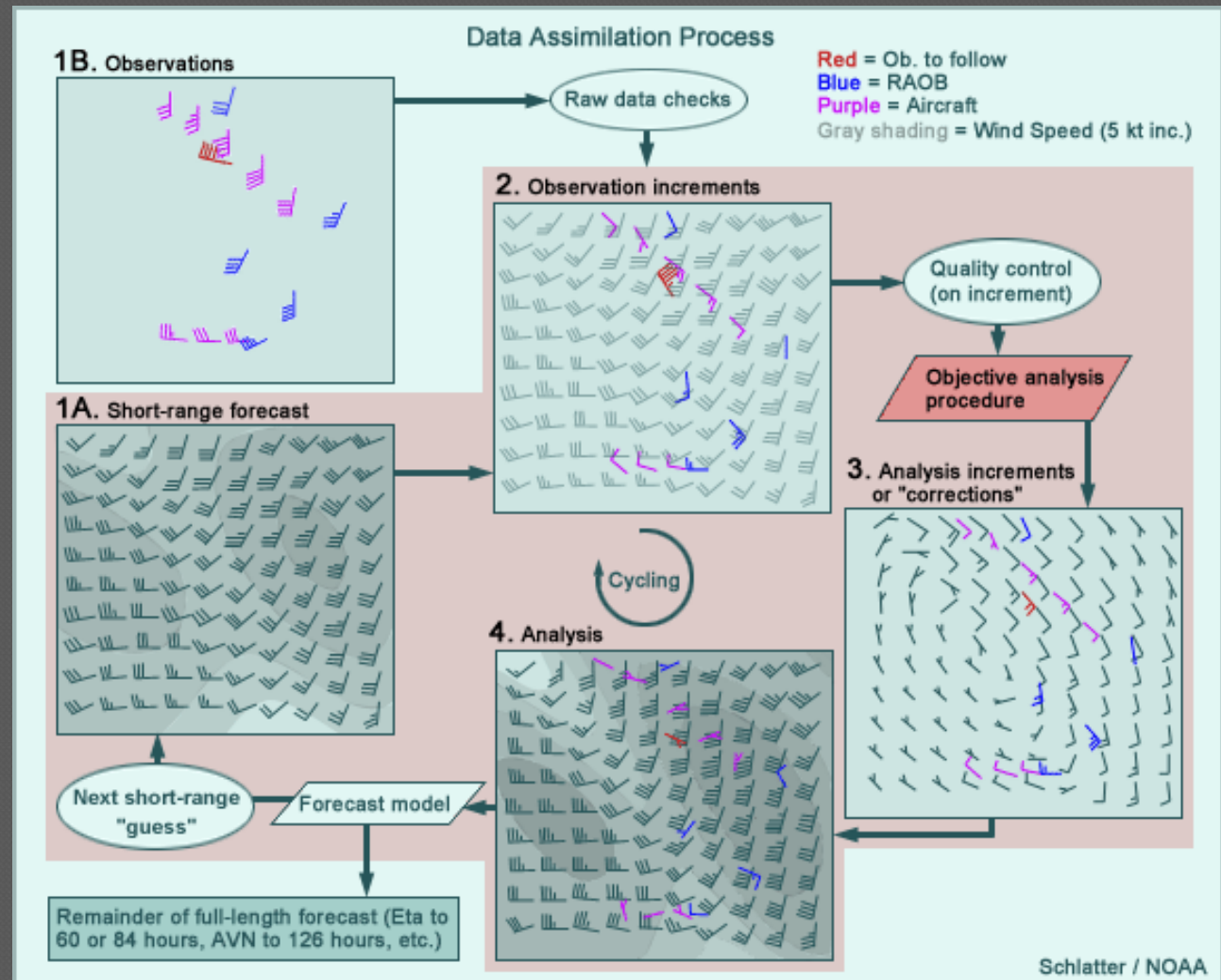
Statistical
combination of
observations
with short-term
model forecast

3DVar
4DVar
LETKF
EnKF
Hybrids

Yesterday's
forecast is the
background for
tomorrow's
analysis

It's all in the
covariances...

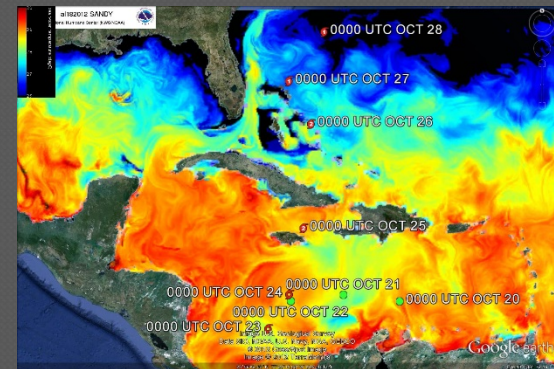
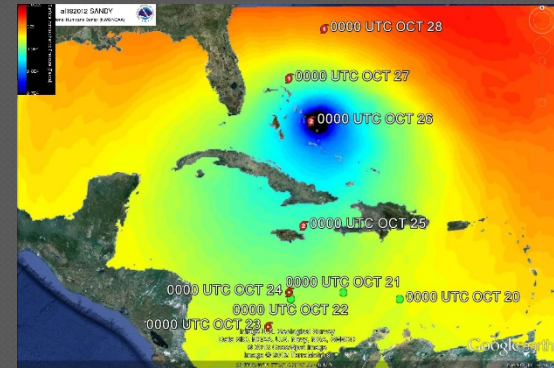
data assimilation





Applications:

- Ecosystem models:
 - Whole-ecosystem trophic models
 - (Mass, salt, temp fluxes)
 - Biogeochemical submodels
 - Larval transport
 - (Currents)
 - Habitat suitability
 - (T, S, currents)
- Regional or local ocean models
 - Boundary conditions
 - Comparison, ensemble production
- Emergency response*
 - NOAA OR&R Hazmat
 - USCG SAR



OceanNOMADS: AMSEAS
Sandy Example:

Sfc. Pressure & SST Evolution

26 October 2012

Global Ocean Forecast System (GOFS 3.1) based on HYCOM 1/12° horizontal resolution, 41 vertical layers. GOFS 3.5 1/25°



NOAA NATIONAL CENTERS FOR ENVIRONMENTAL INFORMATION
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Formerly the National Climatic Data Center (NCDC)... [more about NCEI](#) »



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CFS

CM2.X

CMIP5

GDAS

GEFS

GFS

HYCOM

The Fleet Numerical Meteorology and Oceanography Center (FNMOC) Global Hybrid Coordinate Ocean Model (HYCOM)

The Fleet Numerical Meteorology and Oceanography Center (FNMOC) global-scale operational ocean prediction system is based on the Hybrid Coordinate Ocean Model (HYCOM). This system provides 4-day forecasts at 3-hour time steps, updated at 00Z daily. Navy Global HYCOM has a resolution of 1/12 degree in the horizontal and uses hybrid (isopycnal/sigma/z-level) coordinates in the vertical. The output is interpolated onto a regular 1/12-degree grid horizontally and 40



HYCOM regions. Regions that we serve have their names on a dark background.

HYCOM: hybrid (ALE) time varying vertical coordinate. Isopycnals in the deep stratified ocean, z-coordinates in unstratified ocean (including mixed layer) and sigma coordinates in shallow water.

Regional Ocean Models based in Navy Coastal Ocean Model (NCOM)

Product	Scale	POR	Model Cycle	Output Time Step	Access
AmSeas, Recent	1/30°	2013-04-05-Present	1 day	3 hours	TDS agg, TDS files, ERDDAP 2D, ERDDAP 3D
AmSeas, Prior	1/36°	2010-05-08-2013-04-04	1 day	3 hours	TDS agg, TDS files, ERDDAP 2D, ERDDAP 3D
U.S. East, Recent	1/30°	2013-04-05-Present	1 day	3 hours	TDS agg, TDS files, ERDDAP 2D, ERDDAP 3D
U.S. East, Prior	1/36°	2009-11-19-2013-04-04	1 day	3 hours	TDS agg, TDS files, ERDDAP 2D, ERDDAP 3D
U.S. East, Earliest	1/36°	2009-02-08-2009-11-18	1 day	3 hours	TDS agg, TDS files, ERDDAP 2D, ERDDAP 3D
Alaska	1/30°	2015-04-13-Present	1 day	3 hours	TDS agg, TDS files, ERDDAP 2D, ERDDAP 3D

NCOM: static sigma-z vertical coordinate system
 Resolution ranges from 100's m to 3 km (typically)

ERDDAP Server (Environmental Research's Div. Data Access Program)

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. 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.

- **ERDDAP acts as a middleman between you and various remote data servers.**

When you request data from ERDDAP, ERDDAP reformats the request into the format required by the remote server, sends the request to the remote server, gets the data, reformats the data into the format that you requested, and sends the data to you. You no longer have to go to different data servers to get data from different datasets.

- **ERDDAP offers an easy-to-use, consistent way to request data: via the OPeNDAP standard.**

Many datasets can also be accessed via the Web Map Service (WMS).

- **ERDDAP returns data in the common file format of your choice.**

ERDDAP offers all data as .html table, ESRI .asc and .csv, Google Earth .kml, OPeNDAP binary .mat, .nc, ODV .txt, .csv, .tsv, .json, and .xhtml. So you no longer have to waste time and effort reformatting data.

- **ERDDAP can also return a .png or .pdf image with a customized graph or map.**

- **ERDDAP standardizes the dates+times in the results.**

Data from other data servers is hard to compare because the dates+times often

Start Using ERDDAP:

Search for Interesting Datasets

- [View a List of All 173 Datasets](#)

- **Do a Full Text Search for 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](#)**

- **Search for Datasets by Protocol**

Protocols are the standards which specify how to request data. Different protocols are appropriate for different types of data and for different client applications.


Protocol	Description
griddap datasets	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). griddap documentation
tabledap datasets	Tabledap lets you use the OPeNDAP constraint/selection protocol to request data subsets, graphs, and maps from tabular datasets (for example, buoy data). tabledap documentation
"files" datasets	ERDDAP's "files" system lets you browse a virtual file system and download source data files. WARNING! The dataset's metadata and variable names in these source files may be different than elsewhere in ERDDAP!

Also:


- THREDDS
- FTP
- HTTPS
- AIRS



ERDDAP Server (Environmental Research's Div. Data Access Program)


← → ↻ 🏠 [ncei.noaa.gov/erddap/griddap/NCOM_us_east_latest2d.graph?surf_el\[\(2020-05-07T00:00:00Z\)\]\[\(20.0\):\(42.0977897644043\)\]\[\(278.0\):\(296.09820556640625\)\]](https://ncei.noaa.gov/erddap/griddap/NCOM_us_east_latest2d.graph?surf_el[(2020-05-07T00:00:00Z)][(20.0):(42.0977897644043)][(278.0):(296.09820556640625)])


 **ERDDAP**
Easier access to scientific data


ERDDAP > [griddap](#) > Make A Graph


Dataset Title: **US East 2D (April 05, 2013 to Present)** 




Institution: Naval Oceanographic Office via NOAA NCEI (Dataset ID: NCOM_us_east_latest2d)
Information: [Summary](#)  | [License](#)  | [Metadata](#) | [Background](#) | [Data Access Form](#)



Graph Type: 




X Axis: 




Y Axis: 

Color: 

Dimensions  **Start**  **Stop** 

time (UTC)  specify just 1 value → 

latitude (degrees_north)   

longitude (degrees_east)   

Graph Settings


Color Bar: Continuity: Scale:


Min: Max: N Sections:

Draw the land mask:


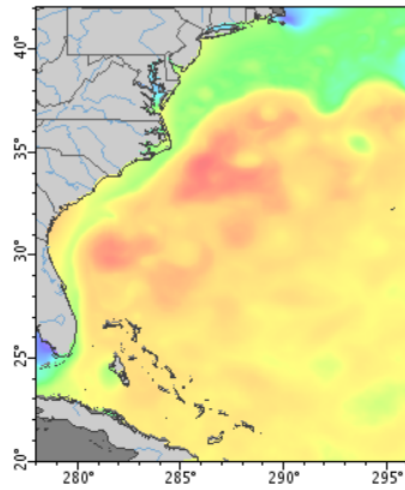
Y Axis Minimum: Maximum:

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

Optional:
Then set the File Type: and
or view the URL: [https://www.ncei.noaa.gov/erddap/griddap/NCOM_us_east_latest2d.htmlTable?surf_el\[\(2020-05-07T00:00:00Z\)\]\[\(20.0\):\(42.0977897644043\)\]\[\(278.0\):\(296.09820556640625\)\]](https://www.ncei.noaa.gov/erddap/griddap/NCOM_us_east_latest2d.htmlTable?surf_el[(2020-05-07T00:00:00Z)][(20.0):(42.0977897644043)][(278.0):(296.09820556640625)])
([Documentation / Bypass this form](#) ) ([File Type information](#))

Click on the map to specify a new center point. 

Zoom:

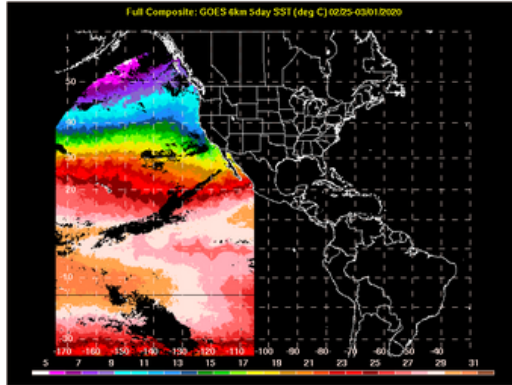


Water Surface Elevation (meter)
US East 2D (April 05, 2013 to Present)
(2020-05-07T00:00:00Z)
Data courtesy of Naval Oceanographic Office via NOAA NCEI

Allows gridding, subdomains, graphics, etc.

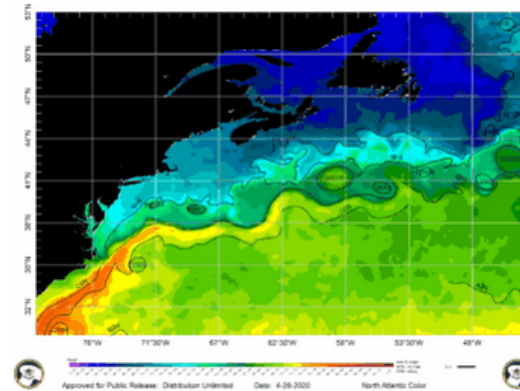
Ocean Analyses and Forecast Products

Ocean Analysis



Sea Surface Temperature

Updated: Wed, 08-Apr-2020 20:40:21 UTC



U.S. Navy Gulf Stream

Updated: Tue, 28-Apr-2020 13:45:14 UTC

What we save: Whatever the modeling groups send us, although we only save analyses (continuous time series) but not forecasts.

Temperature, Salinity, u,v, velocity components, geopotential, etc.
Frequency can range from 3-hourly to daily snapshots to daily means.

<https://ocean.weather.gov/OceanProd.php>

Archival process:

- For larger (TB scale) or repeating datastreams:
 - Advanced Tracking and Resource tool for Archive Collections (ATRAC)
 - <https://www.ncdc.noaa.gov/atrac/index.html>
 - Prepare and submit a Request to Archive form
 - Appraisal process will consider costs, if any
- For smaller/one-off datasets:
 - Send2NCEI web application
 - <https://www.nodc.noaa.gov/s2n/>
- Archive retention schedule:
 - ≥ 5 yrs for atmospheric models
 - ≥ 75 yrs for ocean models

<https://www.ncei.noaa.gov/archive#submitting>

Questions?

Please check out:

[https://www.ncdc.noaa.gov/
data-access/model-data/ocean-nomads](https://www.ncdc.noaa.gov/data-access/model-data/ocean-nomads)