IOOS Catalog and Service Requirements to Support Catalog-Driven Workflows

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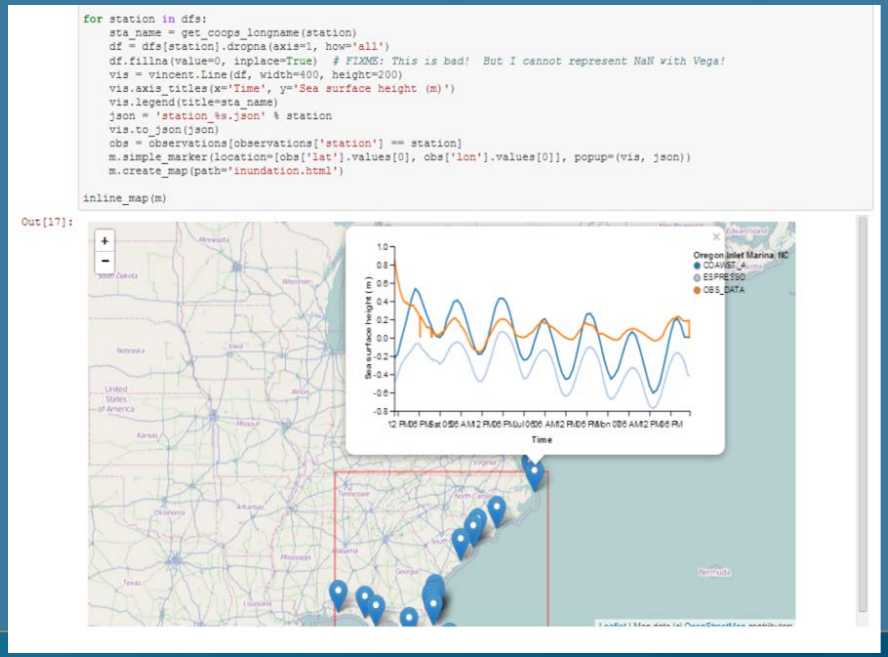
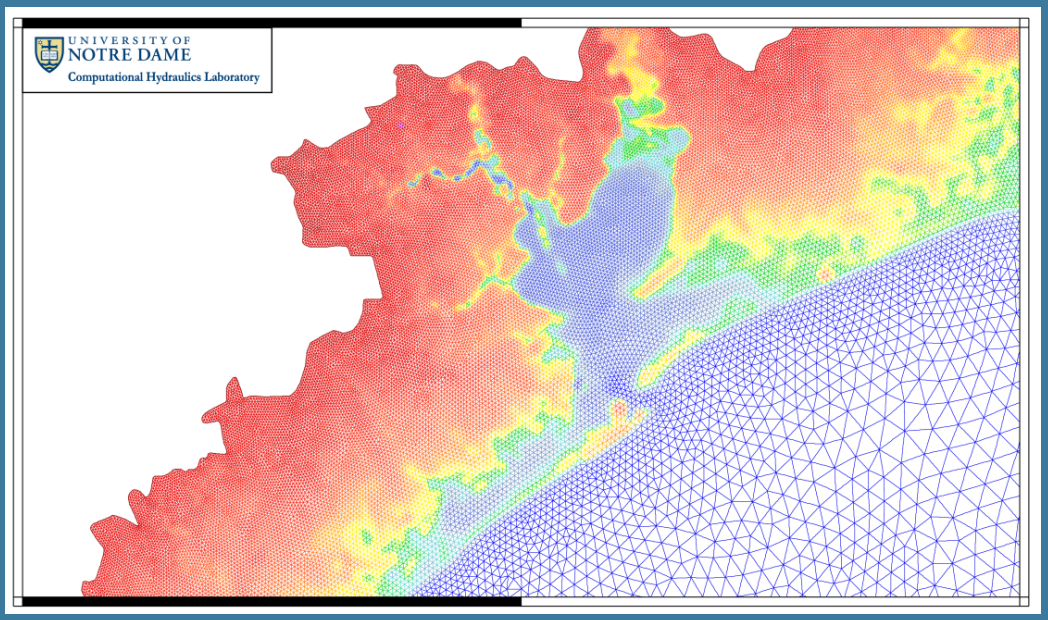


Why not just use ERDDAP?

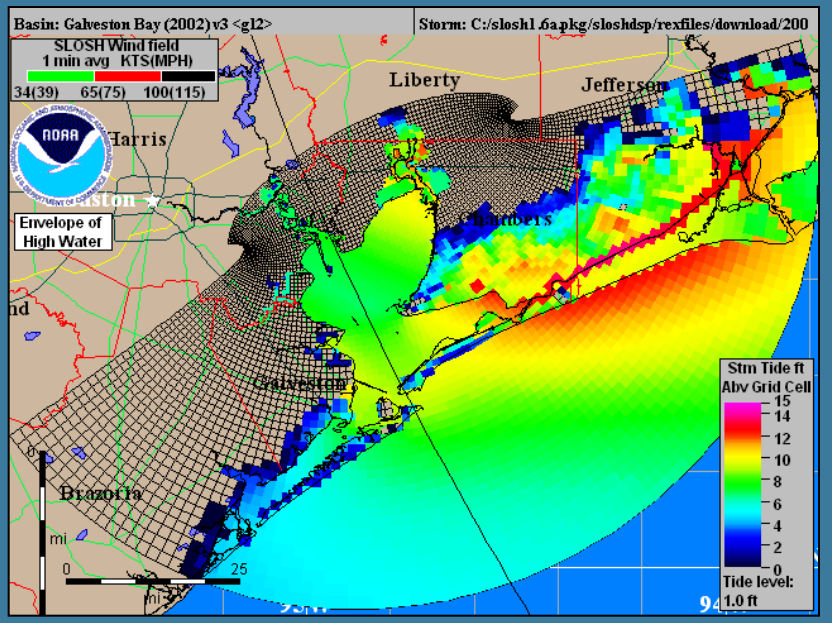
ERDDAP supports uniform grids, but doesn't support:

Unstructured Grids (ADCIRC, FVCOM, SELFE, …)

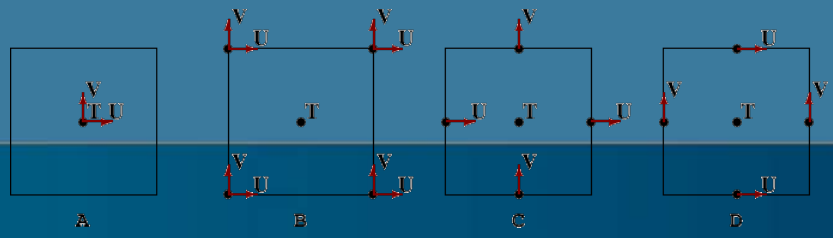


Use OPeNDAP +CF, +UGRID conventions

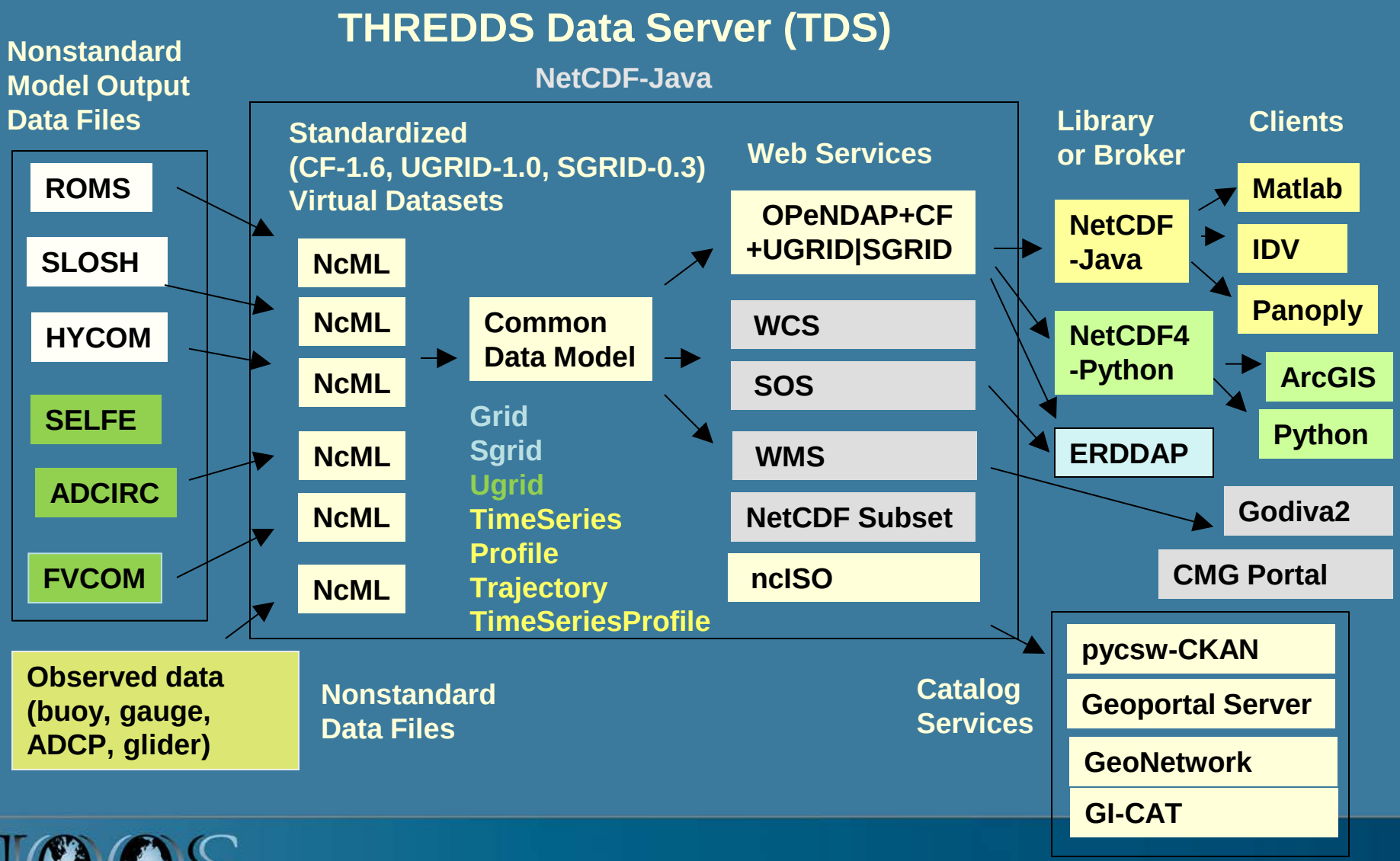
Curvilinear Grids (ROMS, SLOSH, HYCOM…)



Use OPeNDAP +CF (and +SGRID if staggered)



IOOS Model Data Interoperability Design



ncISO (NetCDF to ISO)

- https://github.com/Unidata/threddsIso
- Included in TDS 4.2.4+, but must be enabled
- Handles time, naming authority, properly in version 2.8 (and in TDS 4.6.1+)
- Standalone ncISO (http://www.ngdc.noaa.gov/eds/tds) is still at version 2.3
- Kevin O'Brien, Roland Schweitzer & Unidata team are working on integration of stand-alone ncISO into THREDDS ncISO (adding command line capabilities)

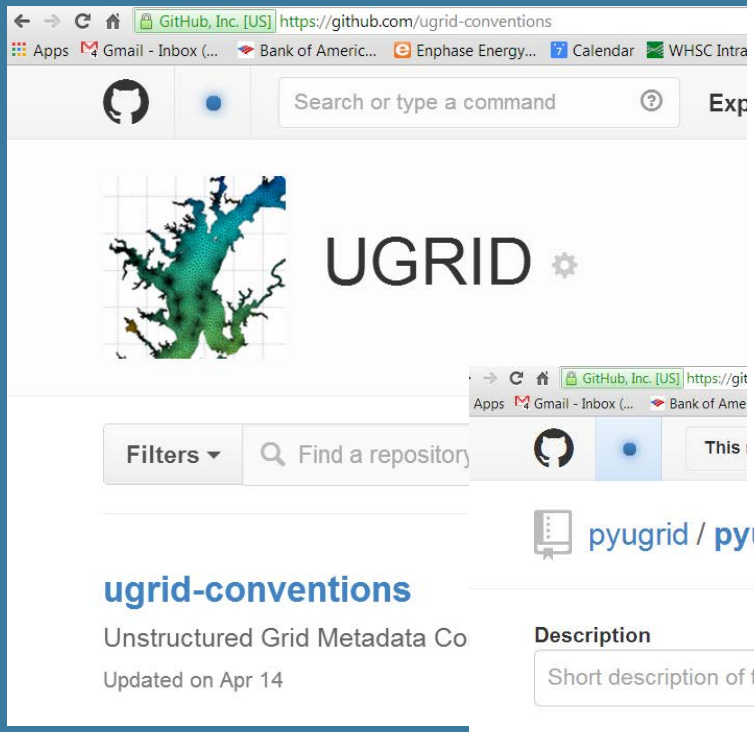
pycsw (Python-based CSW)

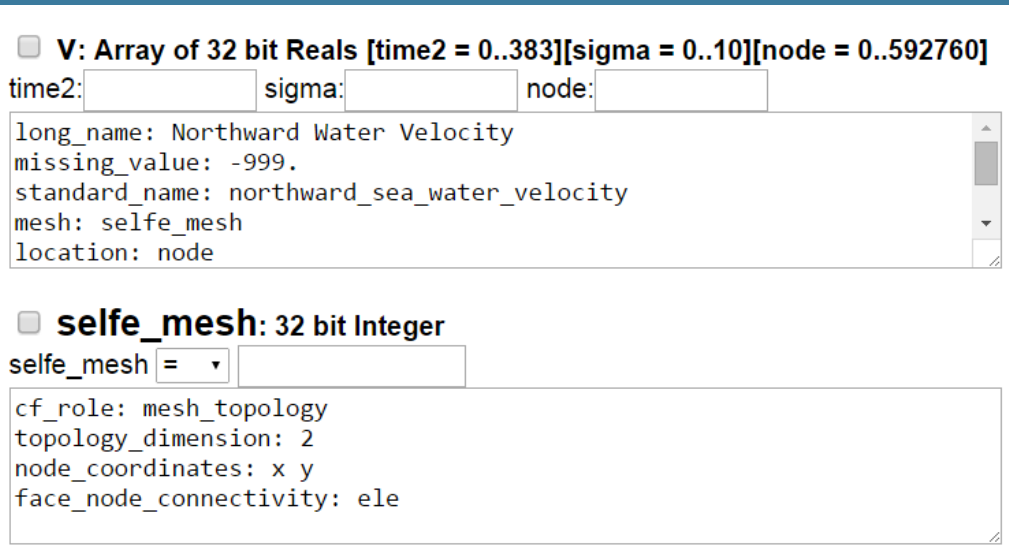
- https://github.com/geopython/pycsw
- Need version 1.10.3 or higher to support query by ServiceType (like OPeNDAP or SOS)

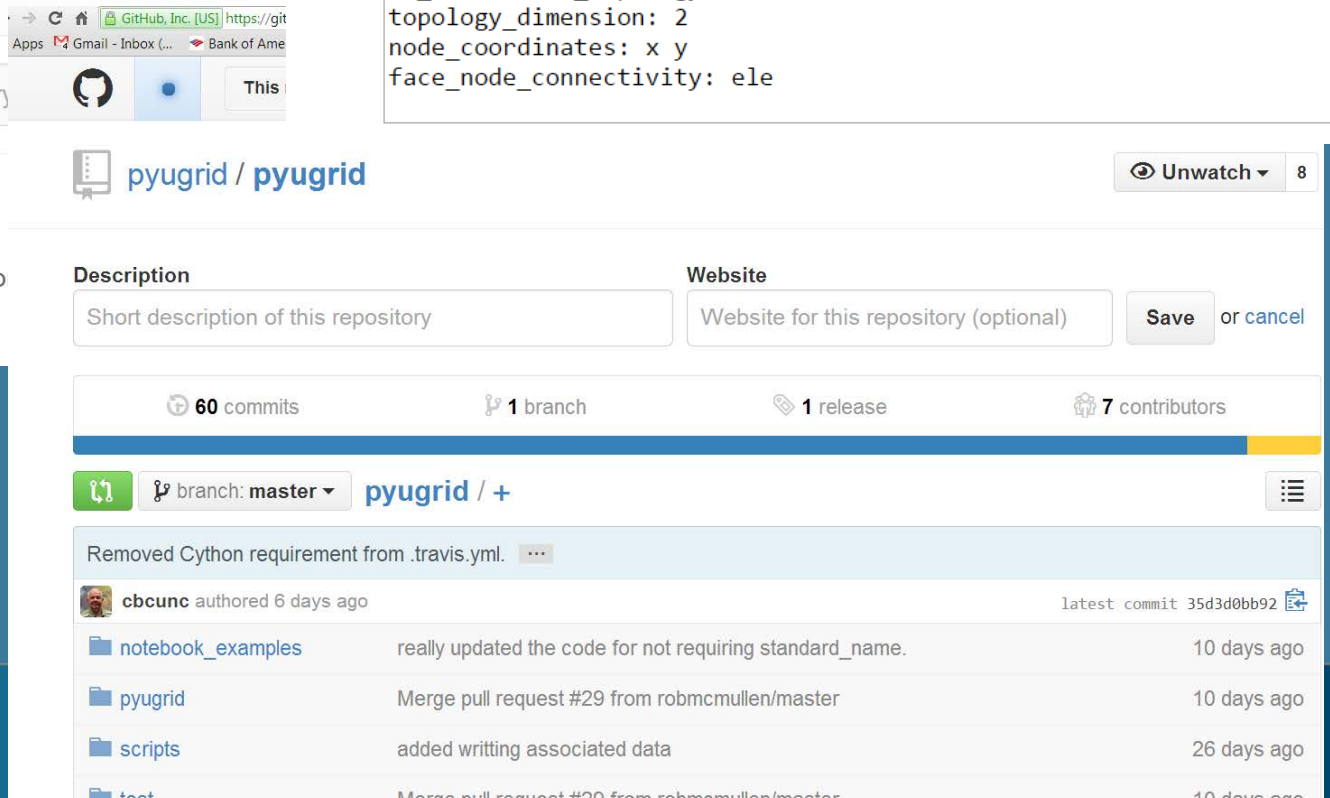
Catalog workflow for TDS data

- At least every day, providers update ISO metadata records in a WAF (web accessible folder):
  - Crawl THREDDS catalogs using Python script, extracting ISO metadata from ncISO TDS services
  - Crawl THREDDS catalogs using standalone ncISO jar file, generating ISO metadata from OPeNDAP services
- At least every day, use script to have pycsw harvest ISO metadata from list of WAFs, eliminating records no longer in WAFs

Standardized access to Unstructured Grid data







SGRID Conventions: github/sgrid

GitHub, Inc. [US] https://github.com/sgrid/pysgrid

This repository Search

sgrid / pysgrid

Python tools for sgrid — Edit

294 commits 1 branch

branch: master pysgrid / +

Merge pull request #53 from ayan-usgs/master ···

ayan-usgs authored 17 hours ago

pysgrid	added notebook example
.gitattributes	added .gitignore and .gitattributes file
.gitignore	Use setuptools for packaging
.travis.yml	Append test requirements onto norma
MANIFEST.in	Use setuptools for packaging
README.md	more readme changes
requirements-test.txt	Append test requirements onto norma

```
        v:grid = "grid" ; // SGRID attribute
        v:location = "edge2" ; // SGRID attribute
    float zeta(ocean_time, eta_rho, xi_rho) ;
        zeta:long_name = "free-surface" ;
        zeta:units = "meter" ;
        zeta:time = "ocean_time" ;
        zeta:coordinates = "lat_rho lon_rho" ;
        zeta:grid = "grid" ; // SGRID attribute
        zeta:location = "face" ; // SGRID attribute
// SGRID variable
    int grid ;
        grid:cf_role = grid_topology
        grid:topology_dimension = 2 ;
        grid:node_dimensions = "xi_psi eta_psi" ;
        grid:face_dimensions = "xi_rho: xi_psi (padding: both) eta_rho: eta_psi (padding:
        grid:edge1_dimensions = "xi_u: xi_psi eta_u: eta_psi (padding: both)" ;
        grid:edge2_dimensions = "xi_v: xi_psi (padding: both) eta_v: eta_psi" ;
        grid:node_coordinates = "lon_psi lat_psi" ;
        grid:face_coordinates = "lon_rho lat_rho" ;
        grid:edge1_coordinates = "lon_u lat_u" ;
        grid:edge2_coordinates = "lon_v lat_v" ;
        grid:vertical_dimensions = "s_rho: s_w (padding: none)" ;

// global attributes:
        :Conventions = "CF-1.0" ;
        :title = "ROMS/TOMS 2.2 - Adria02 Uber Run" ;
}
```

WRF (ARW version)

The WRF-ARW also uses a C-grid. In this ca
models could also result in 3D grid topologies
structured (layered) grid in the vertical, but the

It might be interesting to verify the result for W

```
netcdf wrfout_v2_Lambert {
dimensions:
```

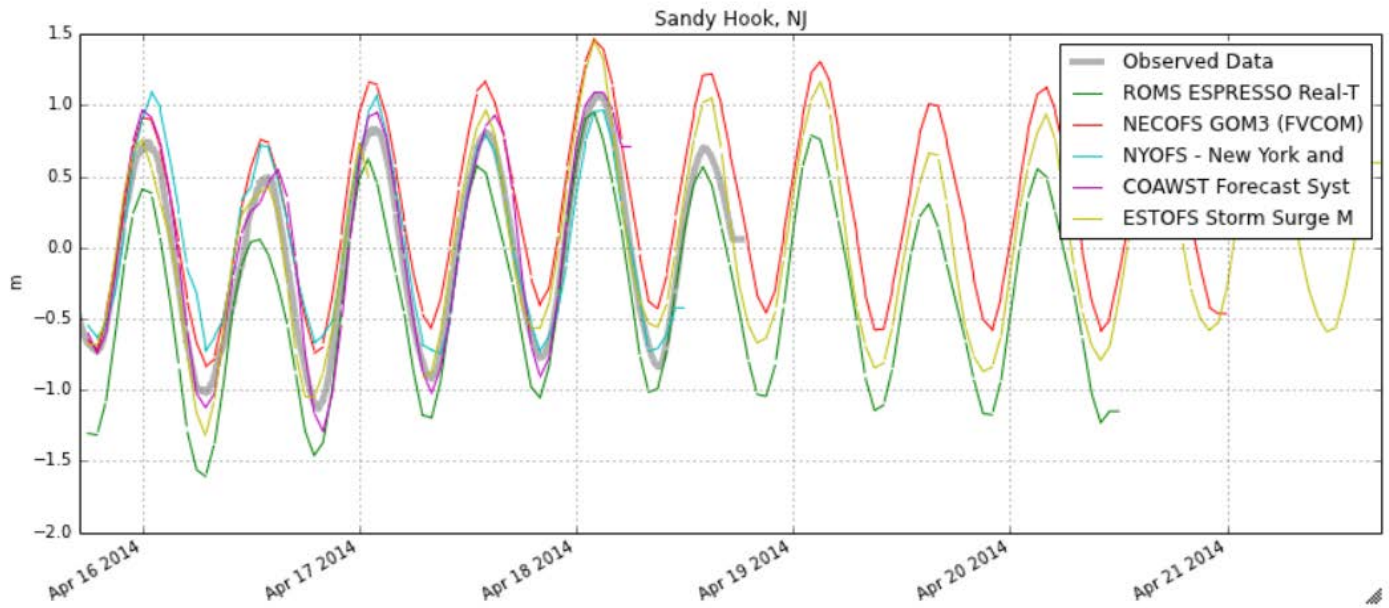
Automated model comparison

IP[y]: Notebook IOOS_inundation Last Checkpoint: Mar 15 16:08 (autosaved)

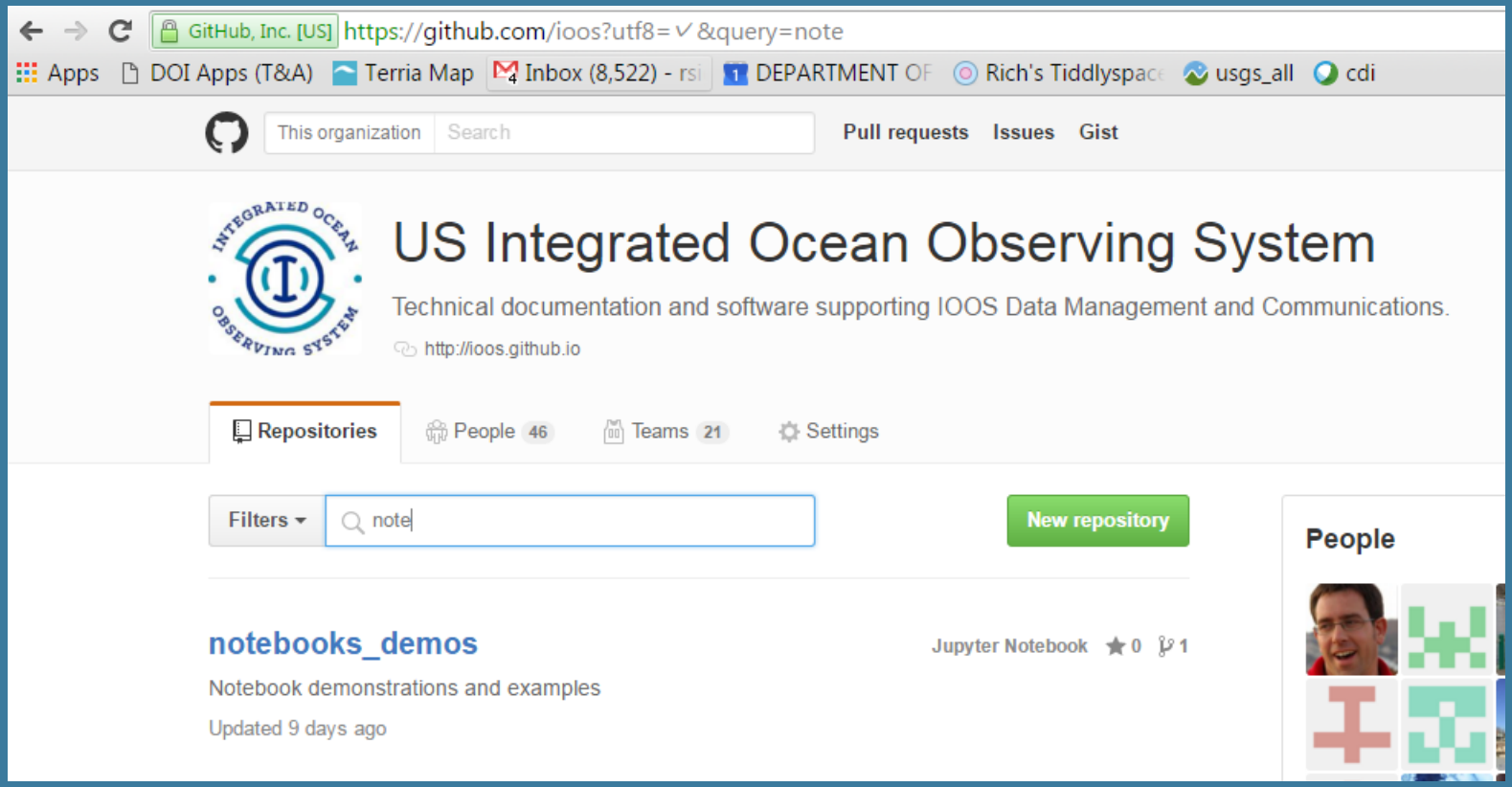
File Edit View Insert Cell Kernel Help

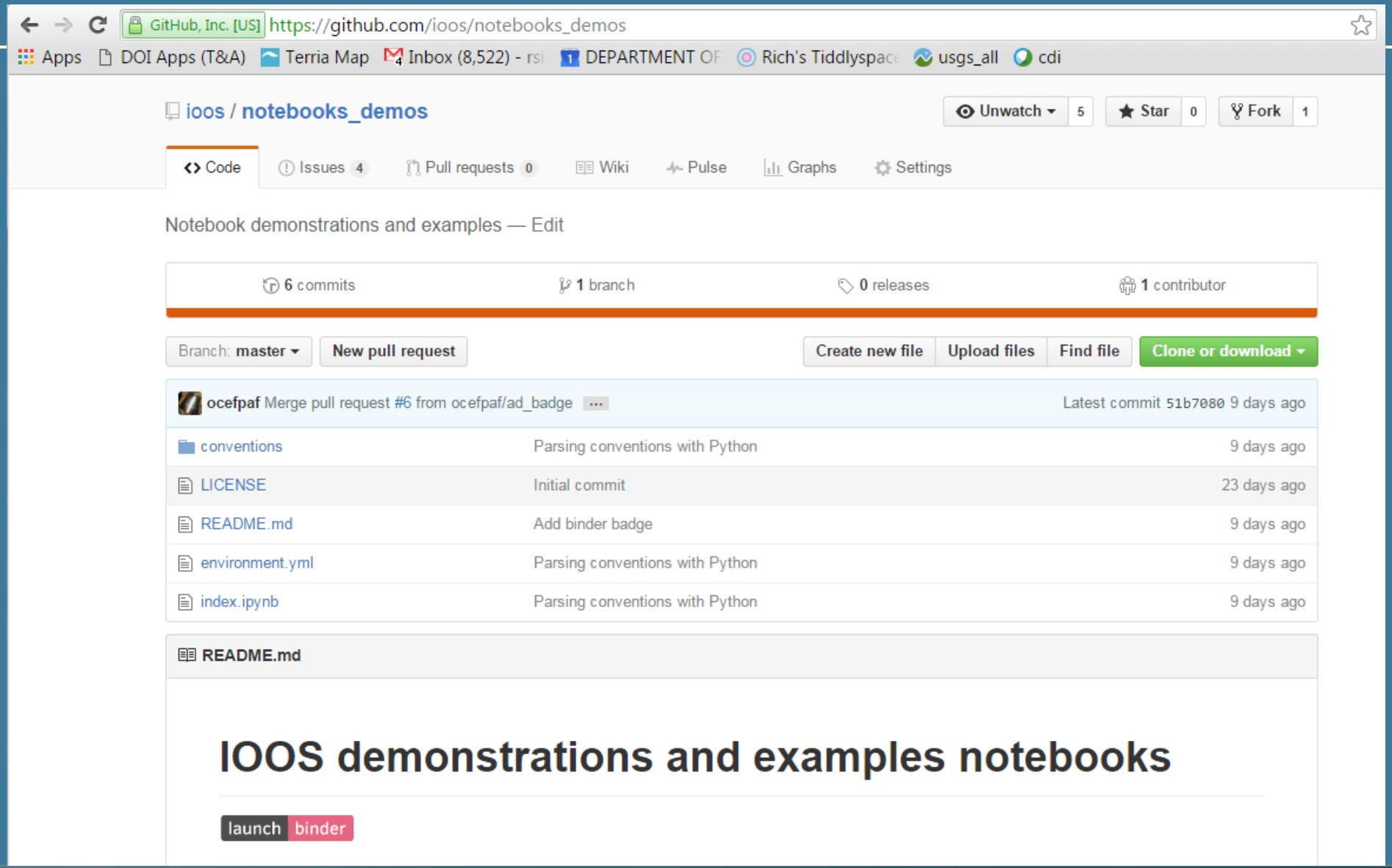
Code Cell Toolbar: None

```
In [45]: for df in obs_df:
             df.plot(figsize=(14,6),title=df.name)
             ylabel('m')
```



Notebook Demos




GitHub, Inc. [US] https://github.com/ioos/notebooks_demos
Apps DOI Apps (T&A) Terria Map Inbox (8,522) - rsi DEPARTMENT OF Rich's Tiddlyspace usgs_all cdi
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Notebook demonstrations and examples — Edit
6 commits 1 branch 0 releases 1 contributor
Branch: master New pull request
Create new file Upload files Find file Clone or download
ocefpaf Merge pull request #6 from ocefpaf/ad_badge ...
Latest commit 51b7080 9 days ago
conventions Parsing conventions with Python 9 days ago
LICENSE Initial commit 23 days ago
README.md Add binder badge 9 days ago
environment.yml Parsing conventions with Python 9 days ago
index.ipynb Parsing conventions with Python 9 days ago
README.md
IOOS demonstrations and examples notebooks
launch binder

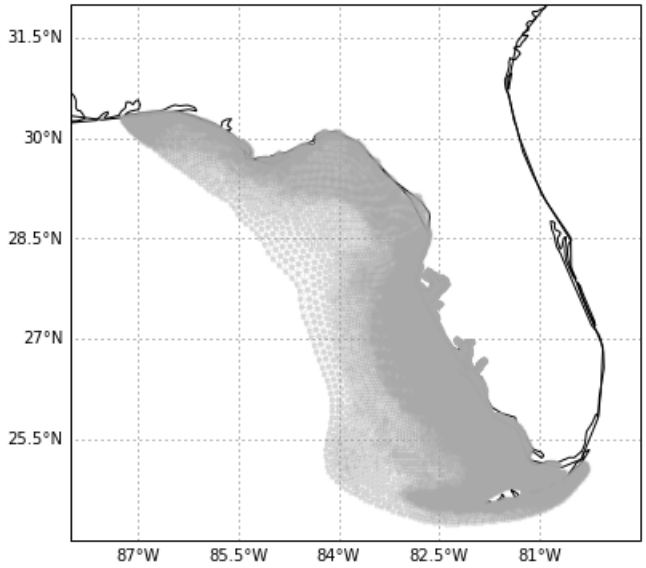
https://app.mybinder.org:80/1820744146/notebooks/conventions/CF-UGRID-SGRID-conventions.ipynb

jupyter CF-UGRID-SGRID-conventions (unsaved changes)

File Edit View Insert Cell Kernel Help

Markdown CellToolbar

```
ax.coastlines()
ax.set_extent([-88, -79.5, 24, 32])
```



There is some effort to integrate `pyugrid` into `iris` to augment the cube object to be both CF and UGRID aware by adding convenience plottin methods with pyugrid. You can see the full pyugrid example here.

SGRID-0.3 (pysgrid)

http://sgrid.github.io/sgrid/

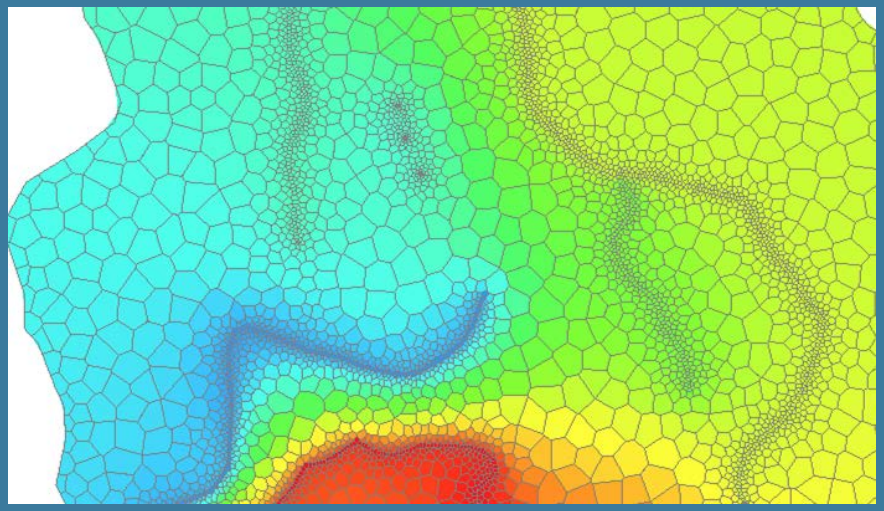
In [12]:
```
import pysgrid

url = ('http://geoport.whoi.edu/thredds/dodsC/clay/usgs/users/'
```

Improving Reliability

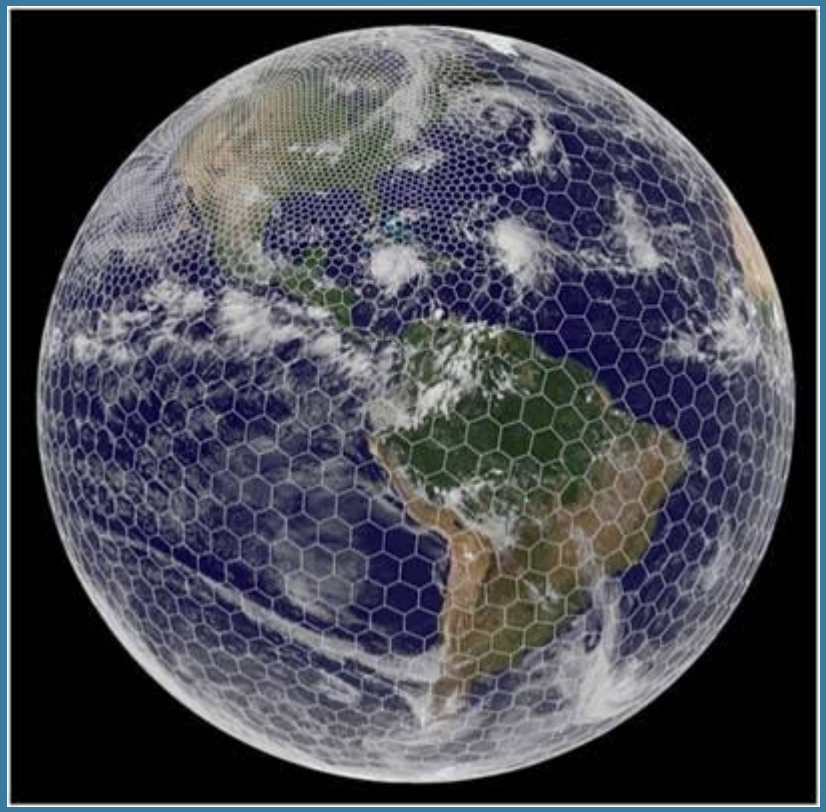
- Monitor services
- Using conda and conda-forge for supporting the IOOS python environment
- Use Docker for deploying services: THREDDS Data Server, ERDDAP, pycsw, sci-wms

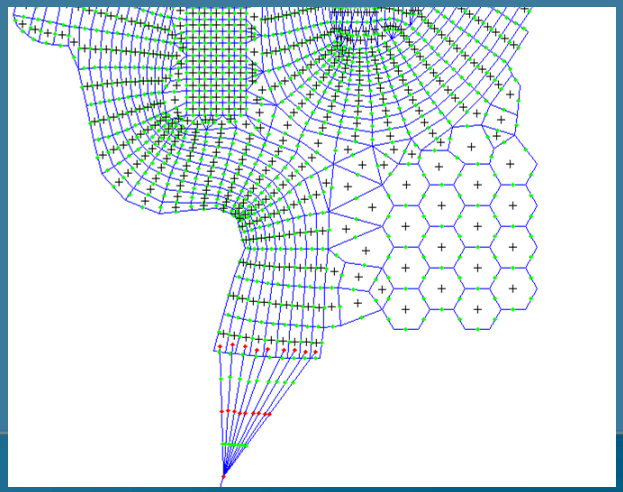
Next-Generation Models

MODFLOW-USG Groundwater Model, USGS, USA



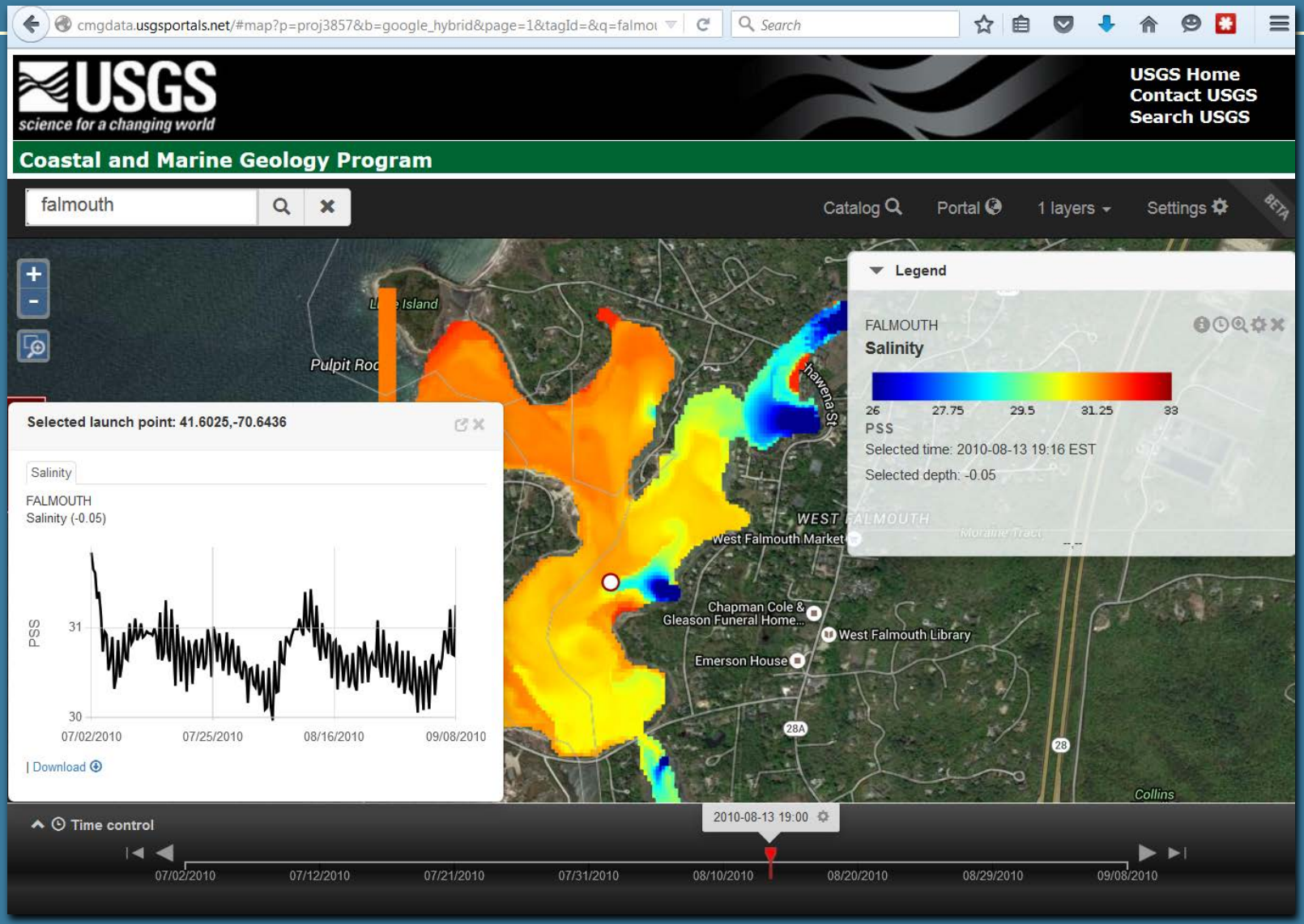
MPAS Global Forecast Model, NCAR/LANL, USA





Delft-Unstructured Ocean/Estuary/River Model (Deltares, Netherlands)

USGS Model and Time Series Portal



Instructions on IOOS GitHub