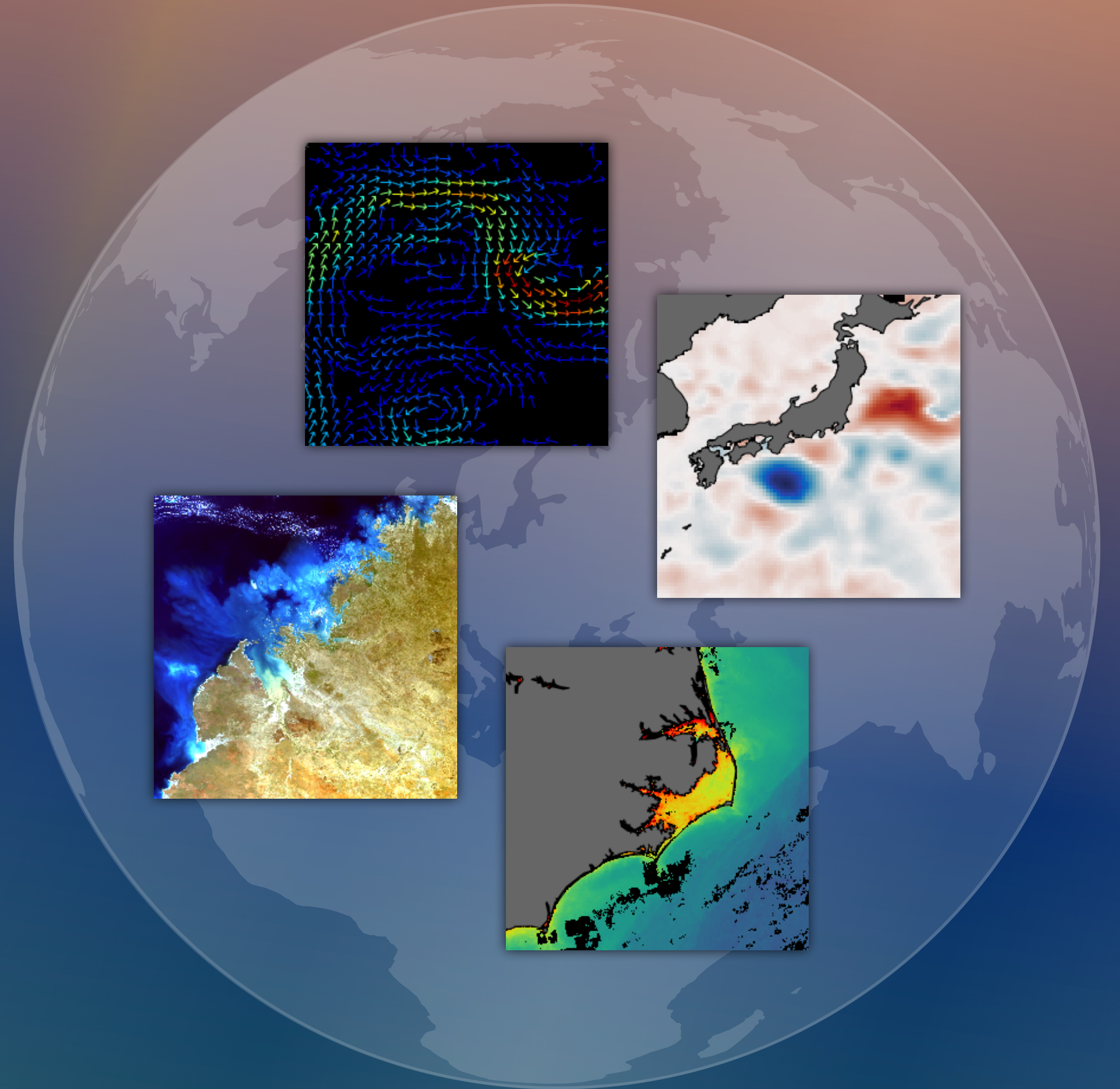


The CoastWatch Utilities 2023 Update

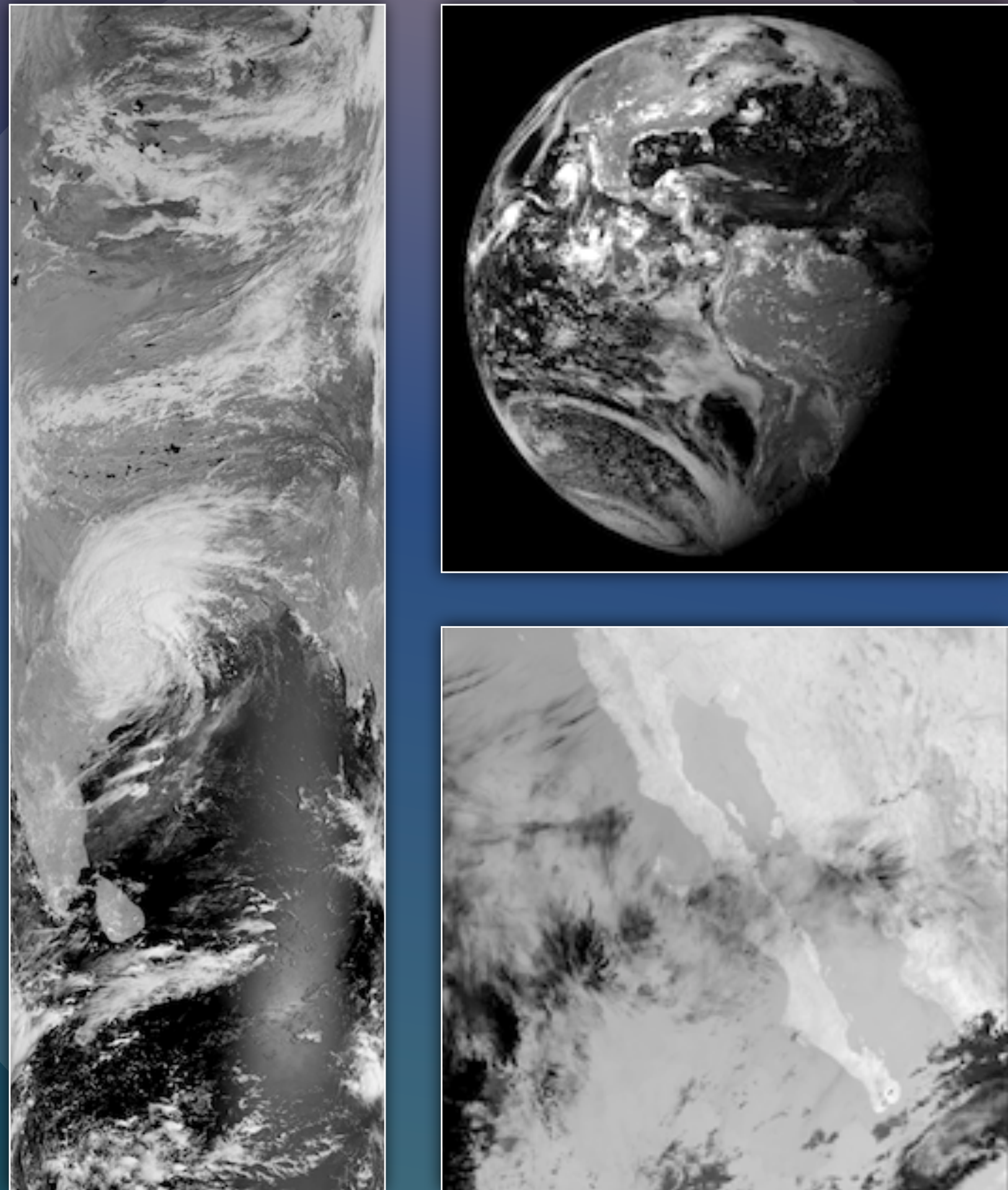
Peter Hollemans

Terrenus Earth Sciences & RIVA Solutions for
NOAA/NESDIS CoastWatch Central Operations

CoastWatch Annual Meeting
Honolulu, Hawaii, May 2023



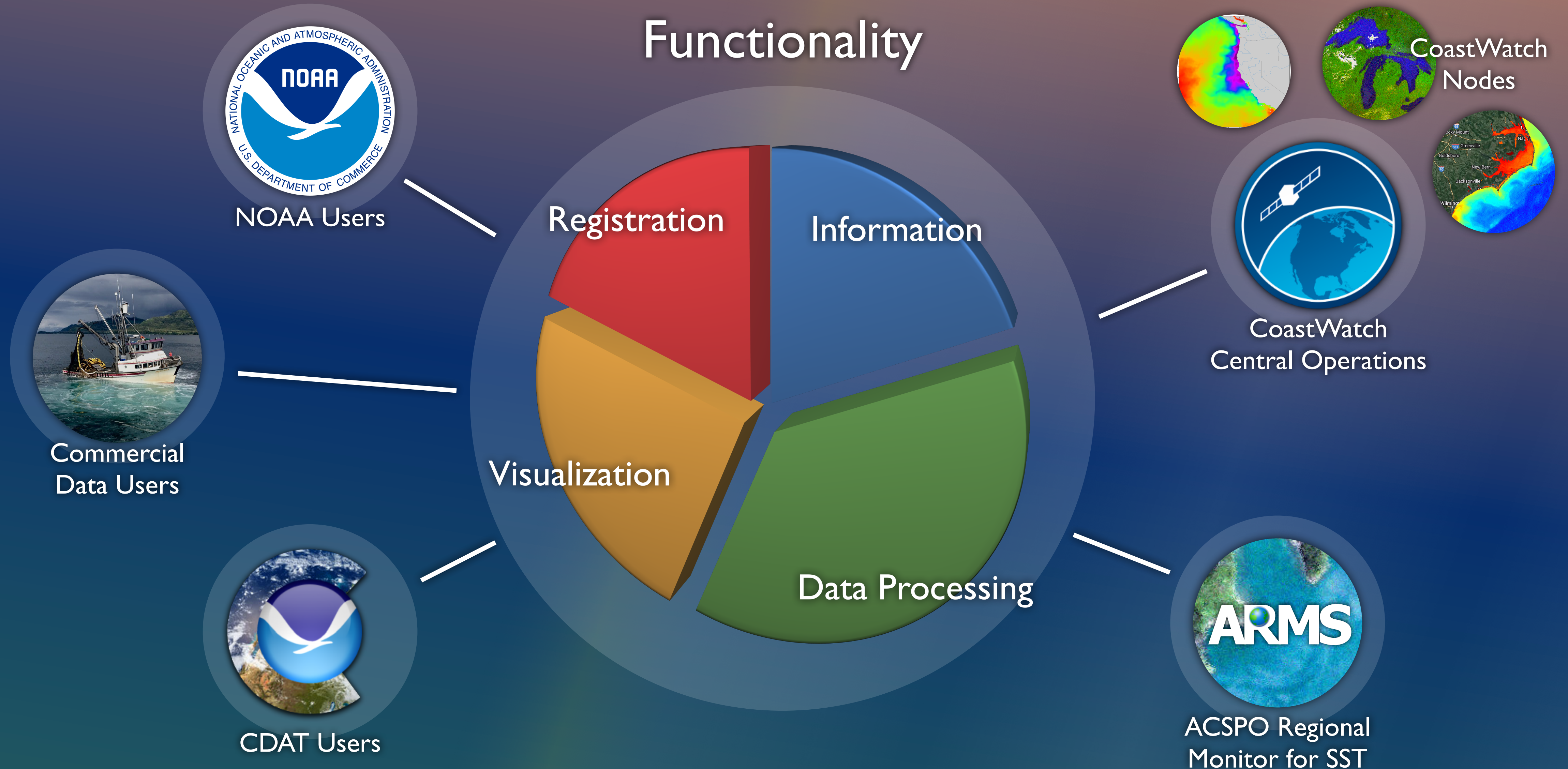
The CoastWatch Utilities are designed to process and transform satellite data in useful ways for data producers and users.



The screenshot shows the 'CoastWatch Data Analysis Tool' interface. The main window displays a map of the North Pacific Ocean with a color scale for Sea Surface Temperature (SST) in Celsius, ranging from 6 to 22. The map includes a grid with latitude and longitude markers. A 'Variable: sst' dropdown is visible. On the left, there is an 'Add Overlay' section and an 'Overlay List' with 'Lat/Lon 1', 'Coast 2', and 'Bitmask 1' checked. A 'Select the overlay properties' dialog box is open, showing 'Bitmask Overlay Properties' with 'Mask variable: cloud', 'Drawing color: black', 'Transparency: 0', and 'Integer mask value: 255'. Below the map, a terminal window shows the output of the 'cwstats' command:

```
Exex:Sample Images phollemas$ cwstats --sample 0.01 2016_024_1456_m02_mi.hdf
Variable Count Valid Min Max Mean Stdev Median
swath_struct 14 14 -101 108 -5.857143 69.481439 1.5
swath_bounds 426 426 0 5952.133 2986.628026 1728.605016 2999.5
swath_lat 480 480 -1032.669 2033.858 6.873492 114.423444 -0
swath_lon 480 480 -8050.79 16628.578 28.824881 892.041327 -0
[avhrr_ch1 123000 123000 0.65 84.59 14.489908 11.56327 10.52
avhrr_ch2 123000 123000 0.63 85.88 14.743629 11.234121 11.75
avhrr_ch3 123000 0 NaN NaN NaN NaN NaN
avhrr_ch3a 123000 123000 -0.07 53.46 11.415932 9.88044 8.42
avhrr_ch4 123000 123000 -69.06 31.65 -1.914139 17.144276 0.1
avhrr_ch5 123000 123000 -70.35 28.35 -2.960828 16.684404 -0.39
cloud 123000 114250 1 127 59.764604 44.122509 31
hrpt_header 6180 5999 3 1023 407.514586 372.950589 488
rel_azimuth 123000 123000 15.05 171.36 89.155044 54.499502 66.51
sat_zenith 123000 123000 0.28 68.65 32.384955 19.312518 31.85
sst 123000 123000 -69.7 47.69 1.265105 18.56652 2.2
sun_zenith 123000 123000 33.49 91.5 62.174362 11.896446 61.68
Exex:Sample Images phollemas$
```

The software is actively used by a number of groups and forms an essential part of data processing systems.



New versions are created twice a year and distributed from the CoastWatch central operations website.



~6-12 month release
as needed

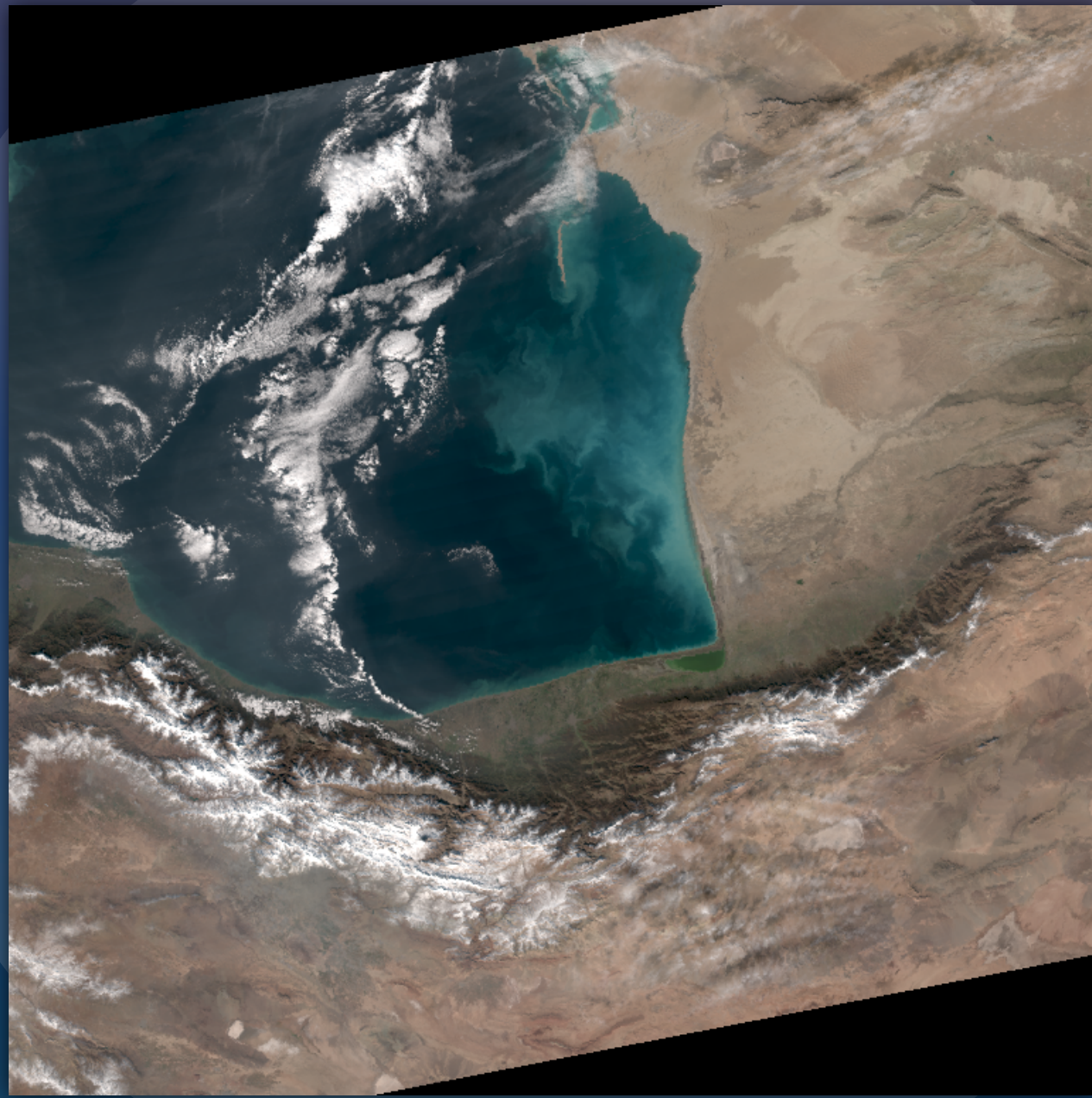


Installable packages: coastwatch.noaa.gov (look in Data Tools)

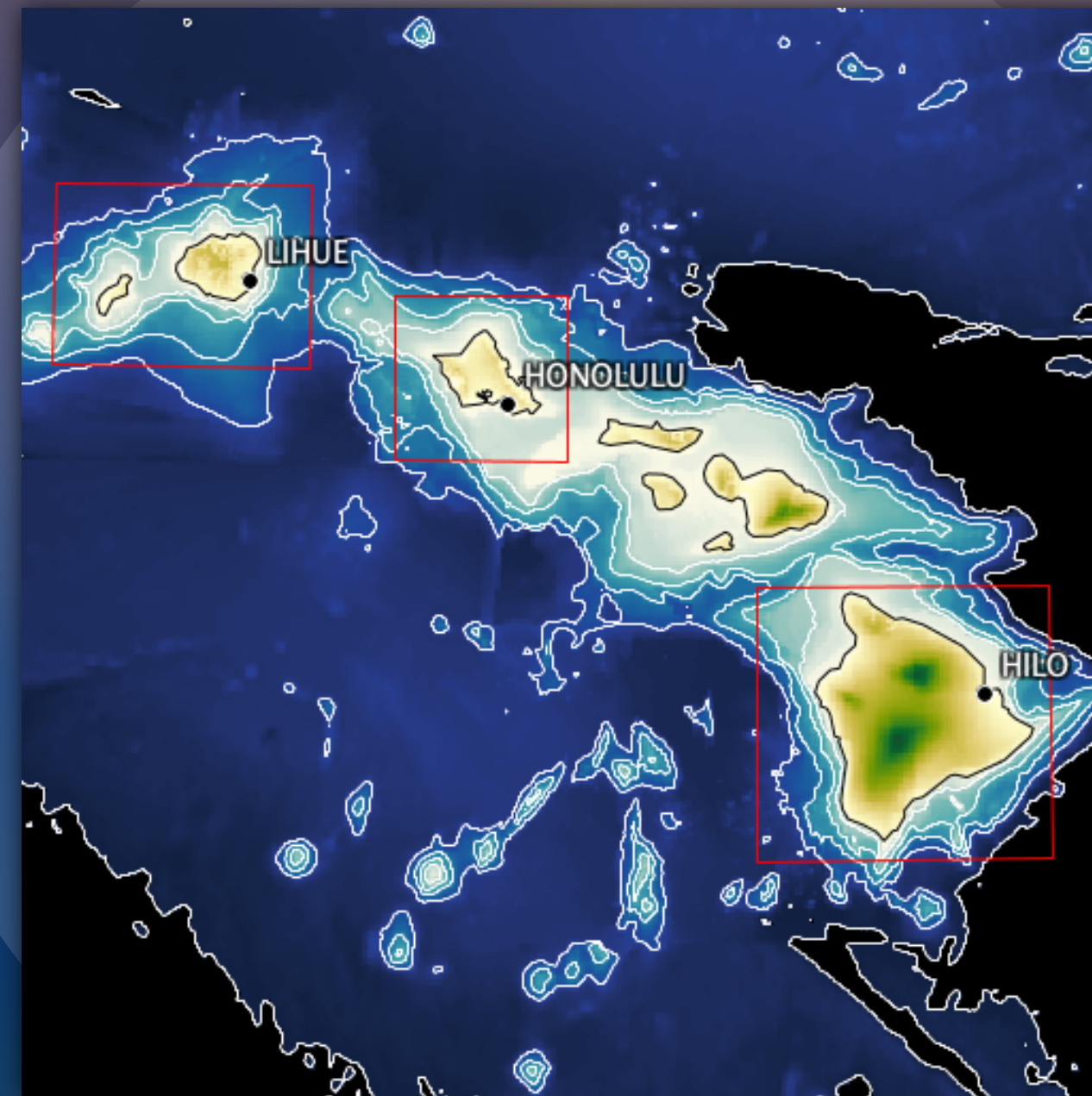
Open source: github.com/phollemans/cwutils

The latest release includes a number of useful improvements.

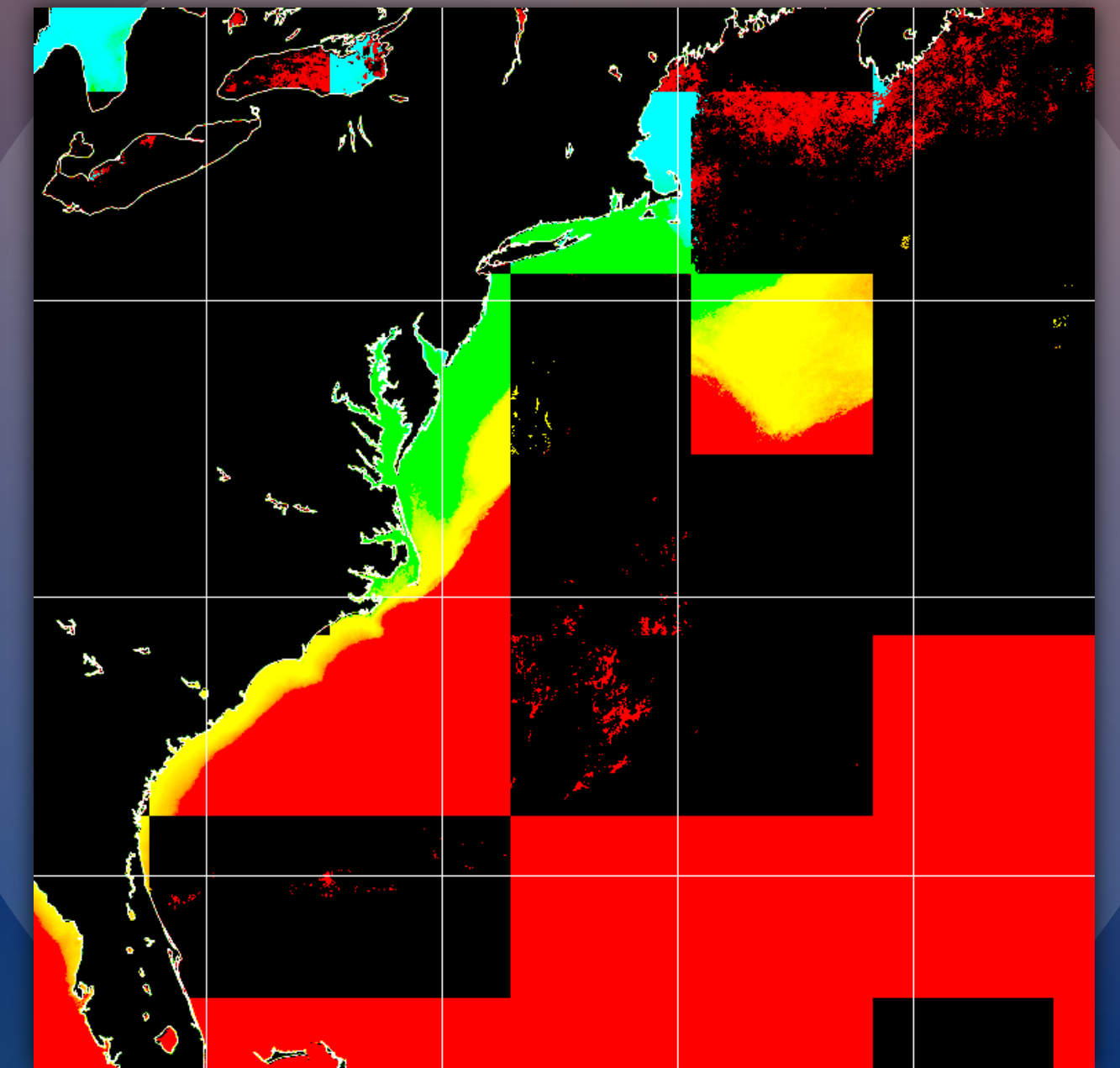
Release 3.8.0 — May 2023



True color
correction tool



Easier rendering of
polygons and labels







Bug fixes for math,
composite, general I/O

Also: New tool options, documentation updates

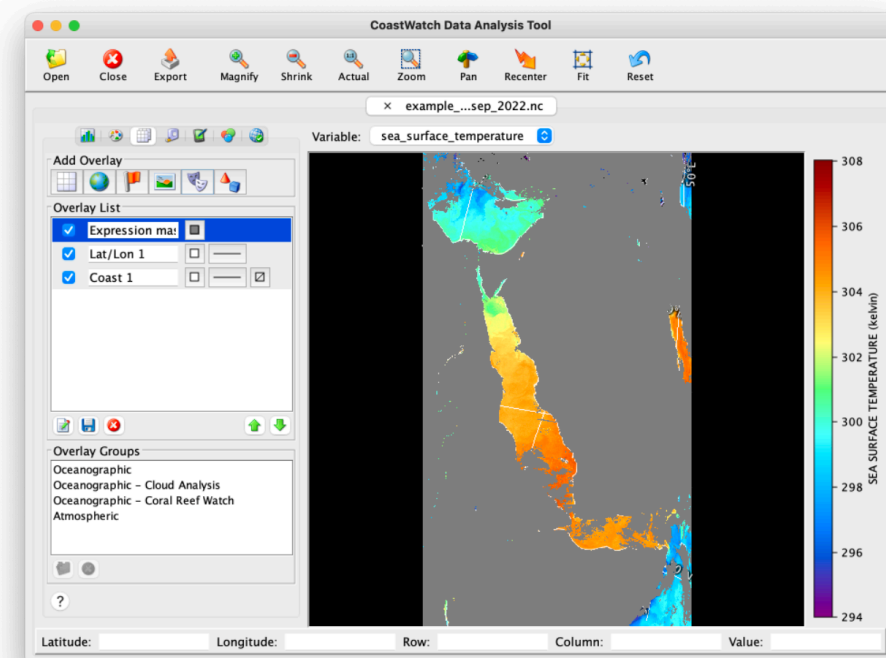
The CoastWatch Utilities now has its own online training course.

Data Overlays

CDAT shows graphics in the data view using overlays, which are layered on top of the data image. To show a latitude/longitude grid, coastlines, and to mask low quality SST data, click the  **Overlay Layers** control tab, then:

1. Click the  **Coast** button to add a coastline.
2. Click the  **Grid** button, and then **Lat/Lon** for a latitude/longitude grid.
3. Click the  **Mask** button, and then **Expression mask**. An overlay properties window will appear — type `quality_level < 5` in the mask expression text field, then click **OK**.

Your CDAT window will look similar to the following:

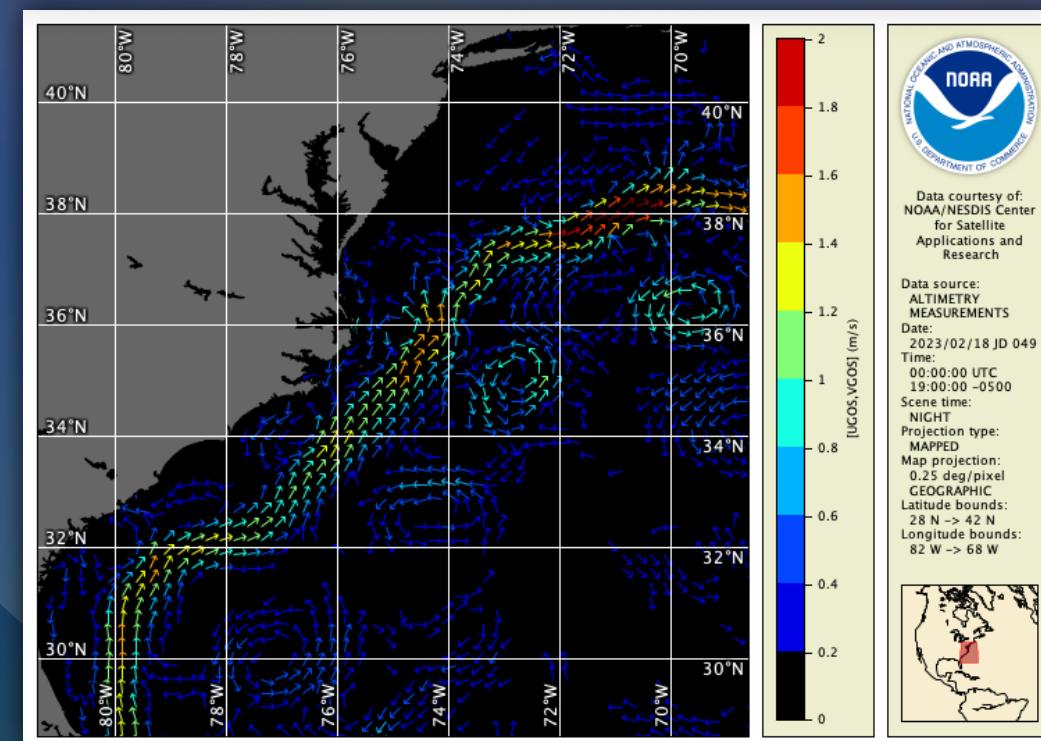


Step by step use of CDAT with screen captures

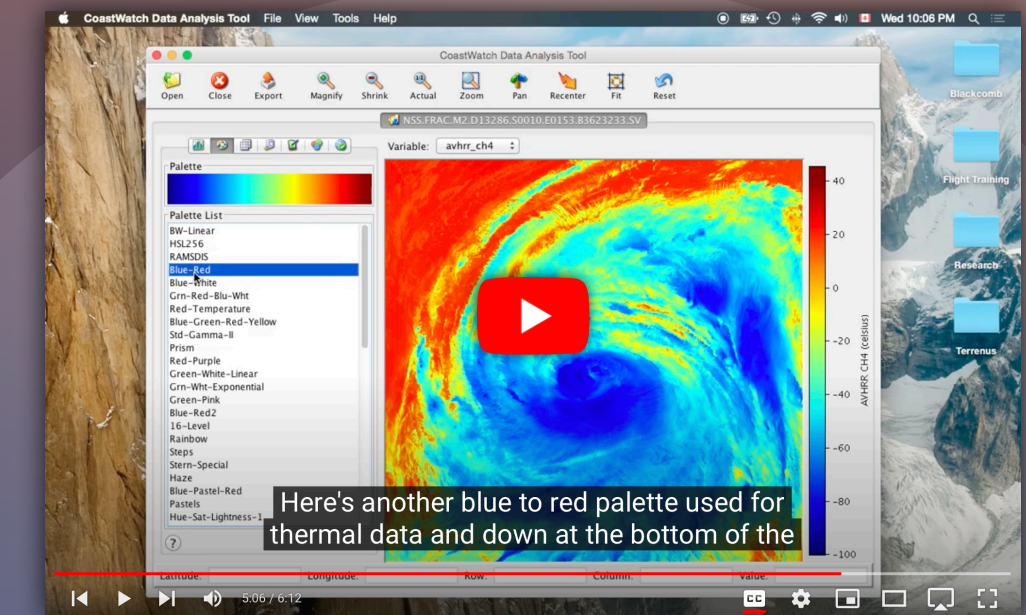
```
phollemas$ cwinfo example_altim_surface_curr_feb_2023.nc
Contents of example_altim_surface_curr_feb_2023.nc

Global information:
Data source:  Altimetry measurements
Date:         2023/02/18 JD 049
Time:        00:00:00 UTC
Scene time:  day/night
Projection type: mapped
Transform ident: noaa.coastwatch.util.trans.GeographicProjection
Map projection: Geographic
Map affine:    0 0.25 0.25 0 -179.88 -89.88
Spheroid:     WGS 84
Origin:       NOAA/NESDIS Center for Satellite Applications and Research
Format:       Java-NetCDF interface (NetCDF-4 user.nc2.dataset.conv.CF1Convention)
Reader ident: noaa.coastwatch.io.CommonDataModelNCReader

Variable information:
Variable  Type  Dimensions  Units  Scale  Offset
sla       short 720x1440    m      0.0001 -0
ugos      int   720x1440    m/s    0.0001 -0
vgos      int   720x1440    m/s    0.0001 -0
time      double 1           days since 1950-01-01 00:00:00
latitude  float  720        degrees_north
longitude float  1440       degrees_east
phollemas$
```



Example command line calls and output



Question 3 1 pts

The `cwmaster` tool can read and write map projection master templates for:

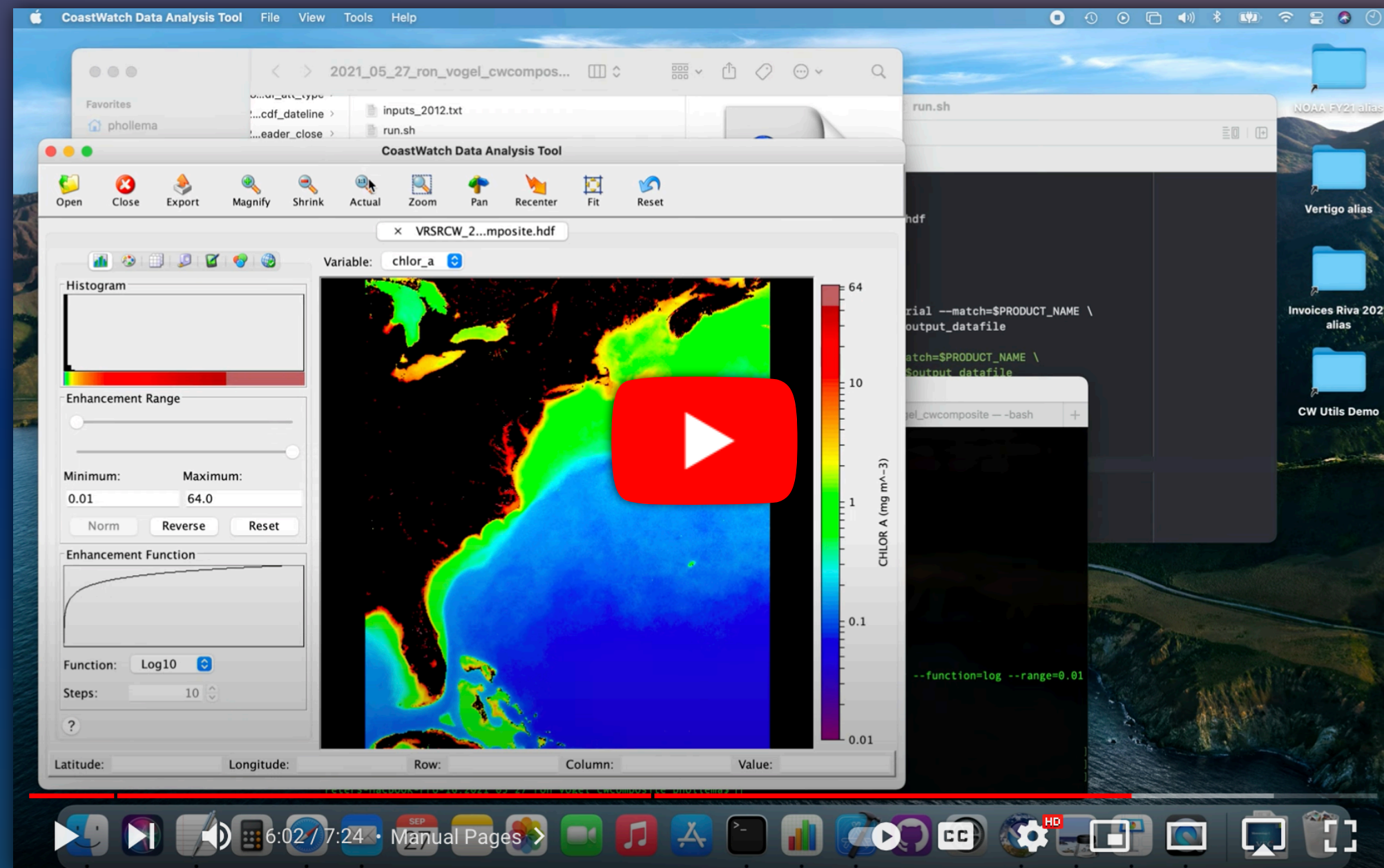
- Polar Stereographic
- Albers Equal Area
- Mercator
- Icosahedral

Bonus exercises:

- Customize the SST processing script to produce a different output file format with your own preferred set of geographic overlays. The `cwrenderer` manual page will be useful.
- Use `cwmaster` to create your own master projection template and use that in the script instead of the one provided.
- Use your own ESRI shapefile data for the aquaculture enclosure polygons. You could create a custom shapefile visually using the [UCLA click2shp](#) web tool.
- Watch a [YouTube video](#) showing the use of a script that composites and renders a year of chlorophyll data.

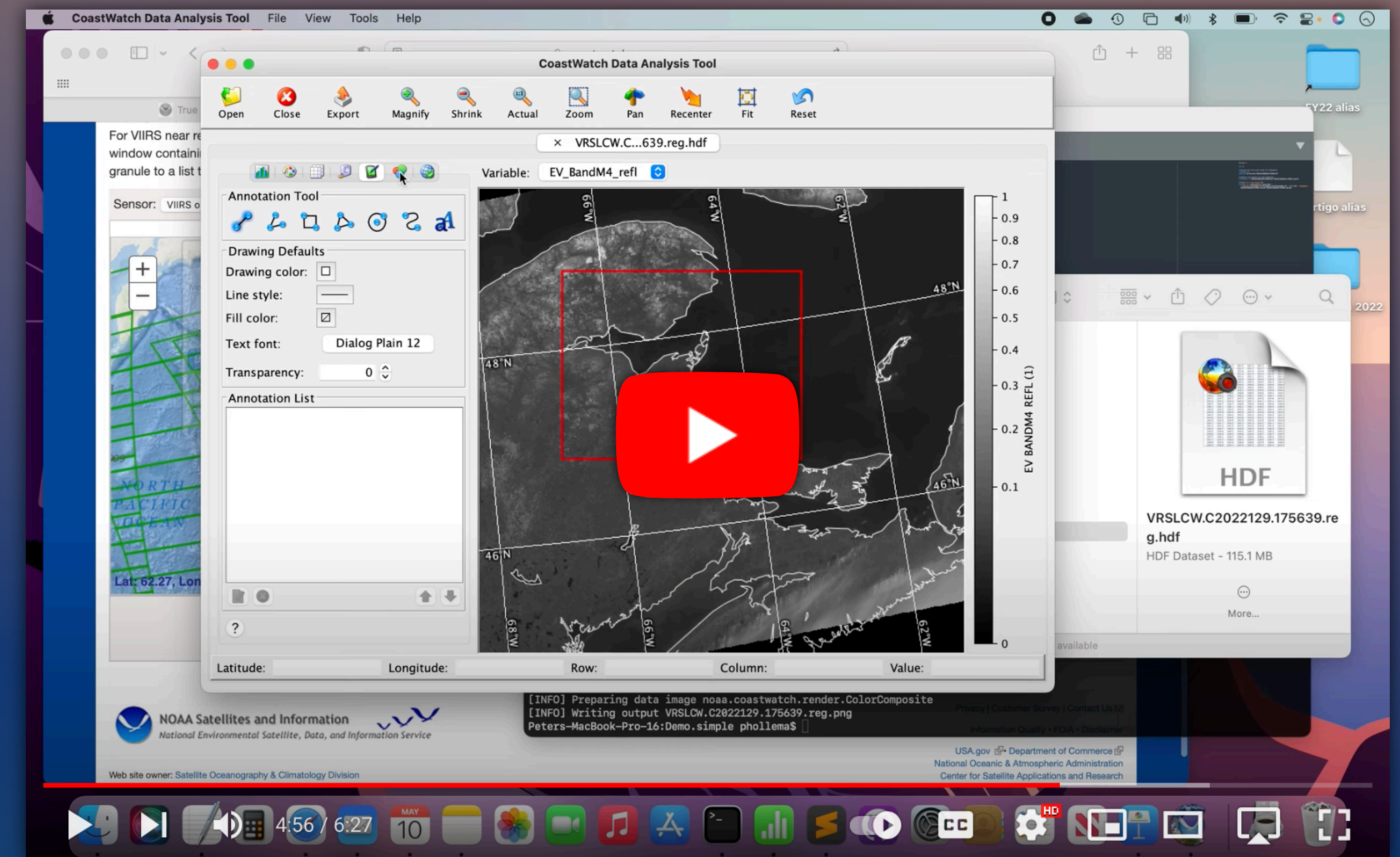
Assignments, quizzes, bonus exercises, and videos

Several recent demos are available online.



2021 demo:

<https://youtu.be/wAjttnTBRBA>



2022 demo:

<https://youtu.be/ZISvOvd7LPU>