JPSS Proving Ground: NOAA User Based Assessment of Ocean Color Quality

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NOAA CoastWatch

April 1, 2013

User Based Ocean Color Ocean Recommendation

The *Coast**W**atch* Recommendation

Primary recommendation:

The CoastWatch survey, supported with JPSS Proving Ground funding and developed primarily from a series of interviews, indicates:

1. **Use of IDPS-sourced ocean color EDR for global coverage.**
2. **Self consistency requirements between SDR and EDR processing including and the promised vicarious calibration are expected before the end of the CY and subsequently applied to IDPS ocean color production. Results as available via NOAA CoastWatch need to be explicitly available to and accepted by the sampled NOAA users.**
3. This recommendation is provided to the Ocean Color Product Oversight Panel, project sponsors (JPSS), and targeted users. A thorough discussion is required before the recommended approach can be vetted.

Notes - the CoastWatch recommendation must:

4. Be supported by continuous CoastWatch monitoring and review of product quality and availability against climatology and science quality data sources as explicitly requested by users.
5. CoastWatch in collaboration with OSPO will proceed to develop the operationalization, availability and utilization of NOAA Ocean Color Unique Products.

User Based Ocean Color Ocean Recommendation

Users interviewed:

1. **National Ocean Service/National Center for Coastal Ocean Services (NCCOS)/Coastal Ocean Assessment and Status and Trends Branch, Silver Spring, MD.** Rick Stumpf and Shelly Tomlinson.

- Harmful Algal Blooms, U.S. coastal ocean and inland waters and lakes

2. National Marine Fisheries Service / Pacific Islands Fisheries Science Center, **Honolulu, Hawai'i**. Jeff Polovina and Lucas Moxey

- Pacific Basin Ecosystems modeling and cruise support

3. NCEP / Environmental Modeling Center / Marine Modeling and Analysis Branch (MMAB) and Global Climate and Weather Modeling Branch (GCMWB), NCWCP, College Park, M

- Coastal and global ocean modeling

4. NESDIS / OSPO/ Satellite Analysis Branch – Davida Strett (to be scheduled)

5. NOAA CoastWatch East Coast Regional Node – Ronald Vogel (to be scheduled)

User Based Ocean Color Ocean Recommendation

National Ocean Service/National Center for Coastal Ocean Services (NCCOS)/Coastal Ocean Assessment and Status and Trends Branch (February 26, 2013)

Basic requirement: Ocean color imagery for operational HAB Forecast and Warning Bulletin. NOS provided basic quality assessment protocols for assessment.

1. Major issue: IDPS products as available in late February 2013 apparently lacks pixels showing a known and highly publicized Naples, FL red tide. This is probably due to masking out of highly reflective shallow waters.

   Note. Possible solution to this issue beginning on March 9, 2013. Coastal waters and inland lakes now with coverage.
2. NOS strongly stated a requirement for a period of parallel operations (with MODIS) to sort out differences and assess the seasonal impact of sun glint.
3. NOS indicated a need for a comparison of the NOAA product with the NASA/OBPG generated NRT ocean color product for their areas of interest.
4. Don't shut down MODIS operational production until end-of-life.
5. Require regenerated HAB products – regenerated with NASA science quality data.
6. NOS has historically been provided data from multiple spacecraft – a primary data provider and as many as two back-ups.
7. Apparently NOS position favors NOAA L2gen for high values of chl. Otherwise NOS is agnostic wrt VIIRS processing flavors.

   Note: Flagging adjustment could change this position wrt IDPS.

User Based Ocean Color Ocean Recommendation

National Marine Fisheries Service / Pacific Islands Fisheries Science Center - March 21, 2013

Basic requirement: Basin scale resource management on decadal/inter-decadal timescales and fisheries science cruise support (highest resolution possible).

1. Need NRT time chl as well as basin scale long time period data sets.
2. One kilometer data are important for cruise support.
3. Desire data sets from various ocean color missions “stitched” together.
4. Historical reliance has been on the OBPG product but would entertain using the NOAA product if quality can be assessed, quantified, and sustained.

User Based Ocean Color Ocean Recommendation

NCEP / Environmental Modeling Center / Marine Modeling and Analysis Branch (MMAB) and Global Climate and Weather Modeling Branch (GCMWB) – March 21, 2013

Basic requirement: Incorporation of near realtime (vice climatology) chl into regional and global ocean models.

1. Lack of Great Lakes pixels is unacceptable. River outflow important.
   Note: Masking issue will make a difference here.
2. Need significant period of overlap between reprocessed and NRT to ascertain quality.
3. Consistency AND Quality are important . In that order.
4. Differences on the order of 10% between NOAA product and NASA science quality are acceptable.
5. Consistent, quality assured and readily available data from constellations of ocean color satellites is important.

How to unravel the differences for the two flavors of VIIRS Chlorophyll ?

- VIIRS Flavors
  - IDPS (Ingest IDPS EDRs and create CWhdf L3 files; VRSCW)
  - L2gen (Ingest NOAA IDPS SDR to L2gen implementation at NOAA to create EDR and then L3 CWhdf; VRSSCW)

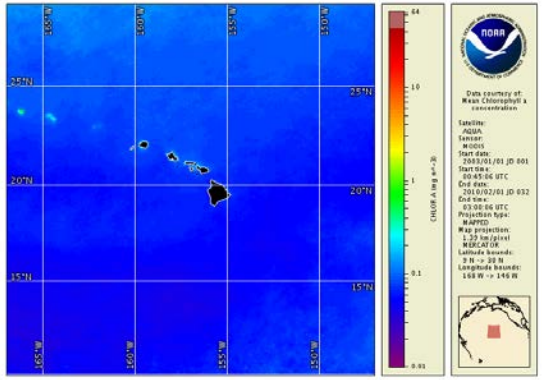
- Baseline product used in the comparison is the multi-year monthly Climatology of MODIS AQUA

  - We compare the daily Chlorophyll pixel by pixel to the Monthly for the corresponding pixel to calculate the Bias and Rel-Diff or Ratio product.

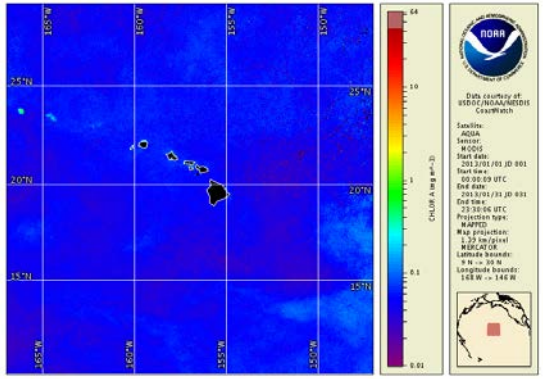
  - So the natural temporal binning period should also be 30 days to make useful comparisons, unless one is looking for day to day changes in the ocean biology.

Monthly Chlorophyll

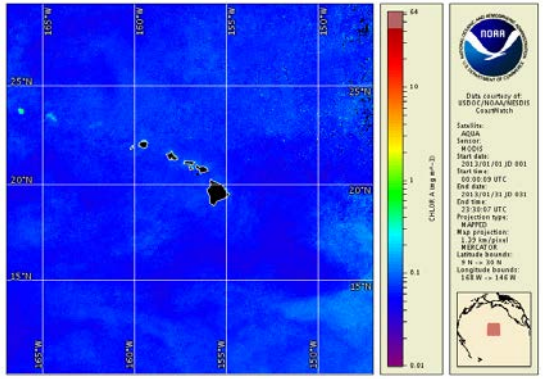
MODIS Climatology for January



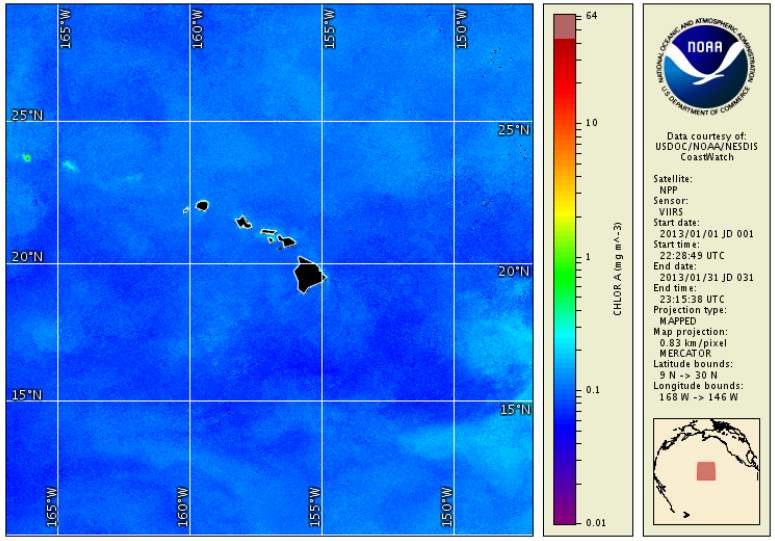
MODIS (L2gen) NRT for January



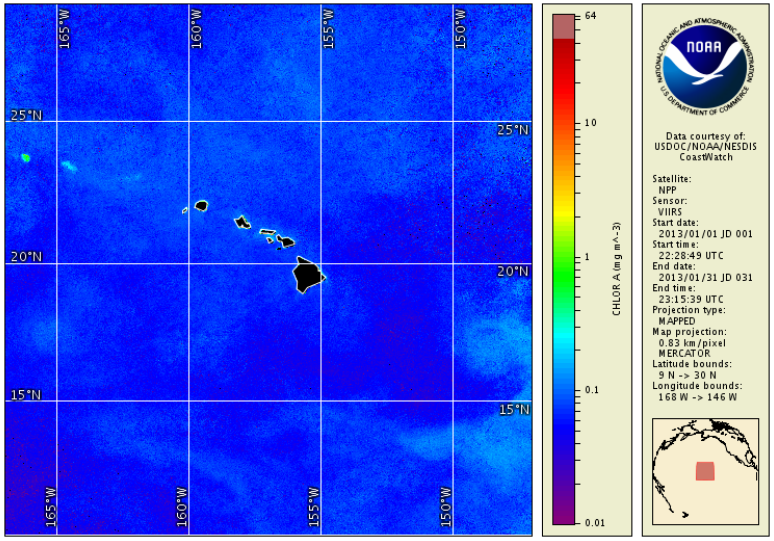
MODIS (SWIR) NRT for January



VIIRS(L2gen) for January

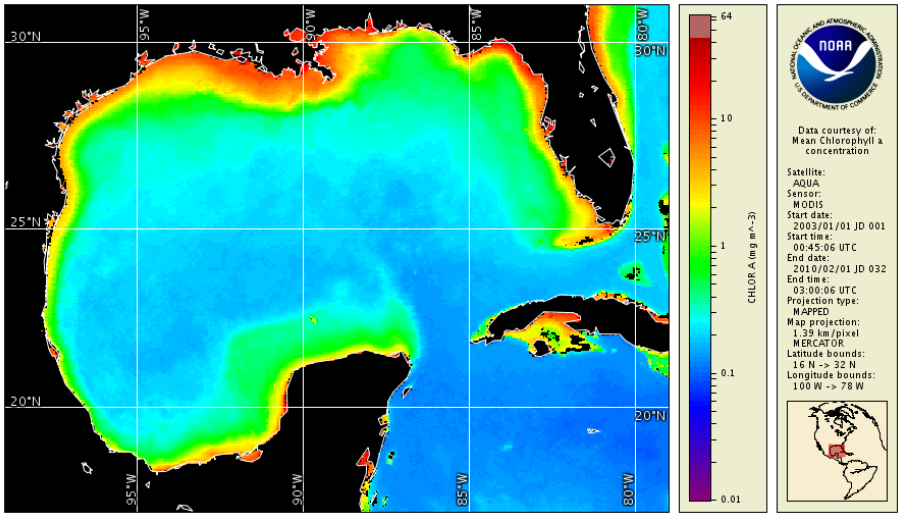


VIIRS(IDPS) for January

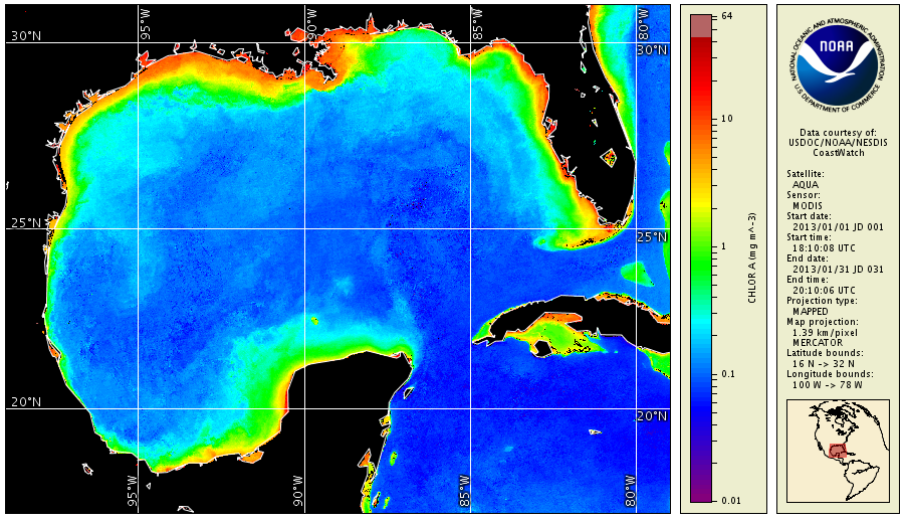


Chlorophyll Images from various algorithms

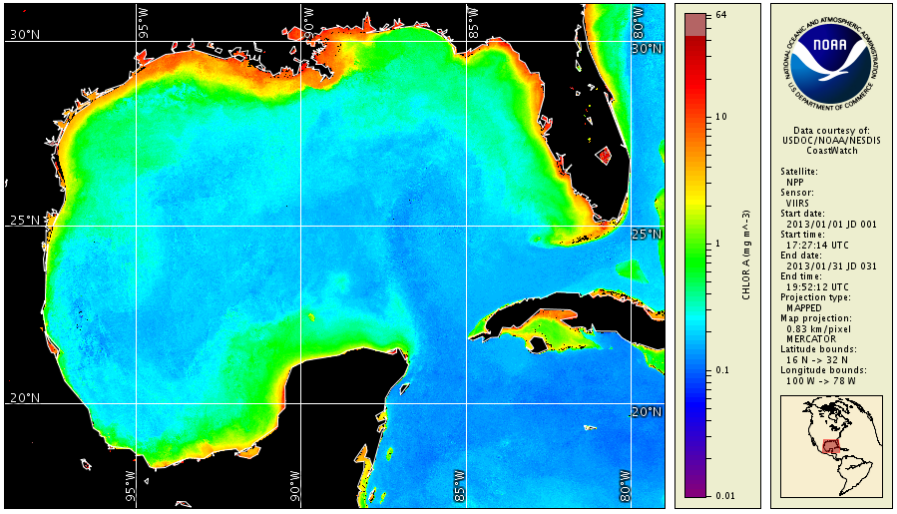
MODIS Climatology For January



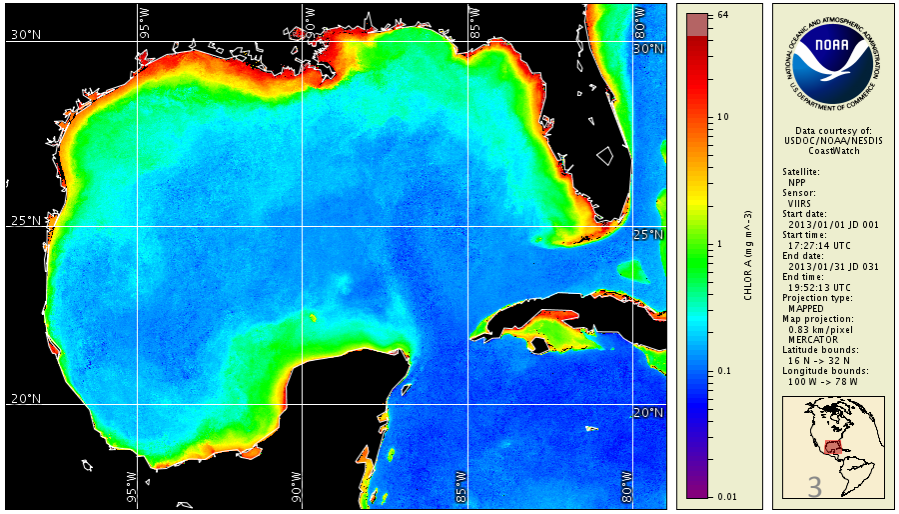
MODIS (L2gen) Monthly for Jan 2013



VIIRS (L2gen) monthly for Jan 2013

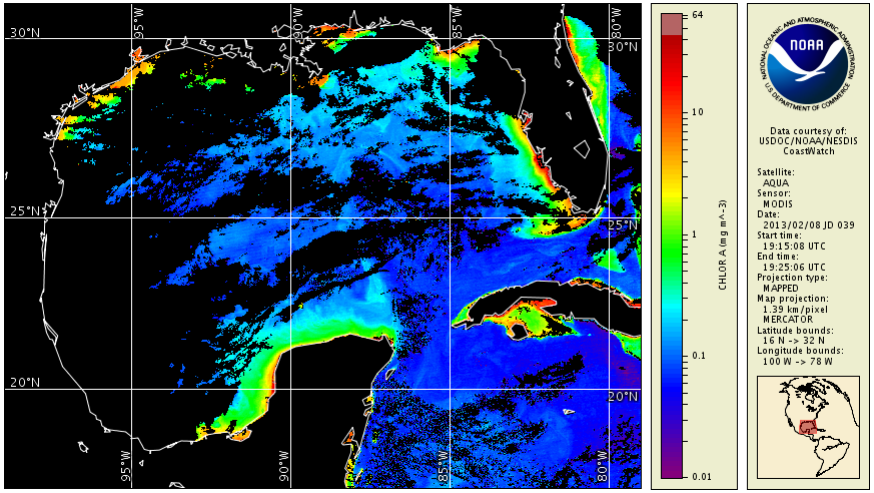


VIIRS (IDPS) monthly for Jan 2013

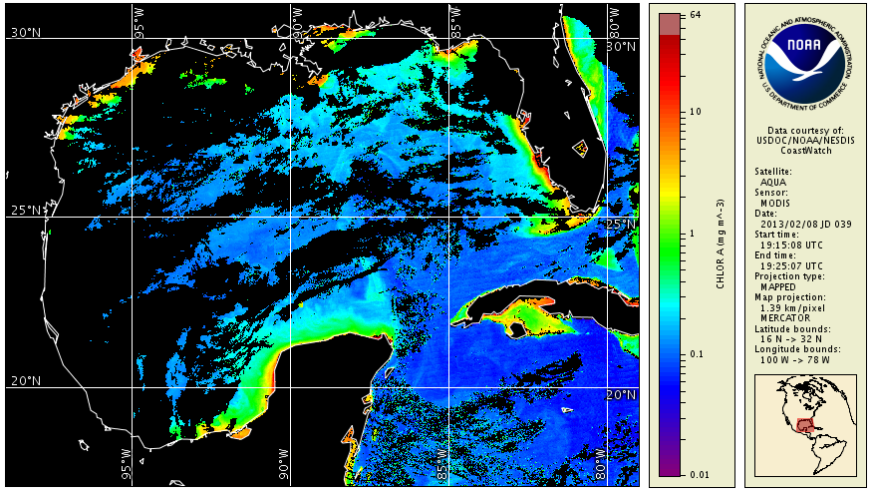


Daily Chlorophyll

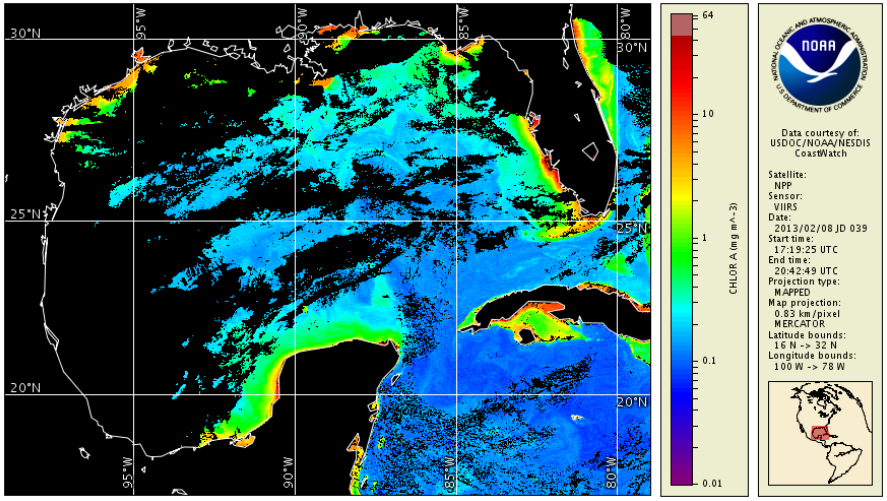
MODSCW_P (L2gen)



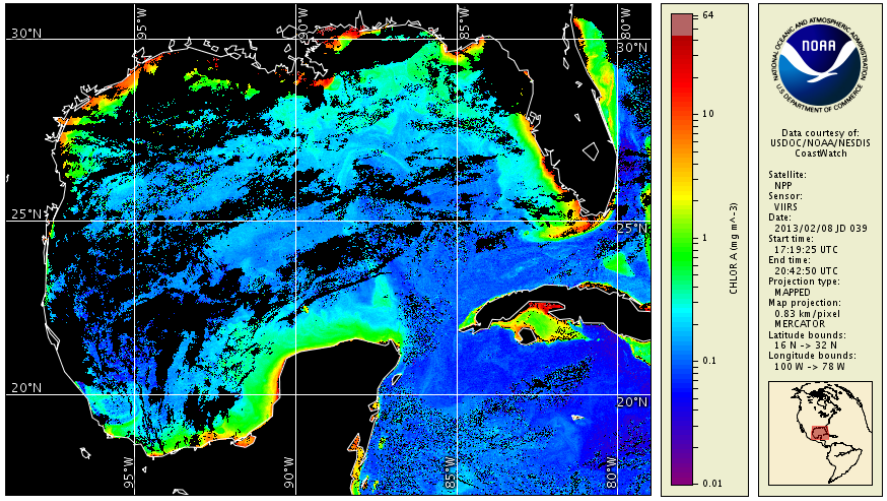
MODWCW_P (SWIR)



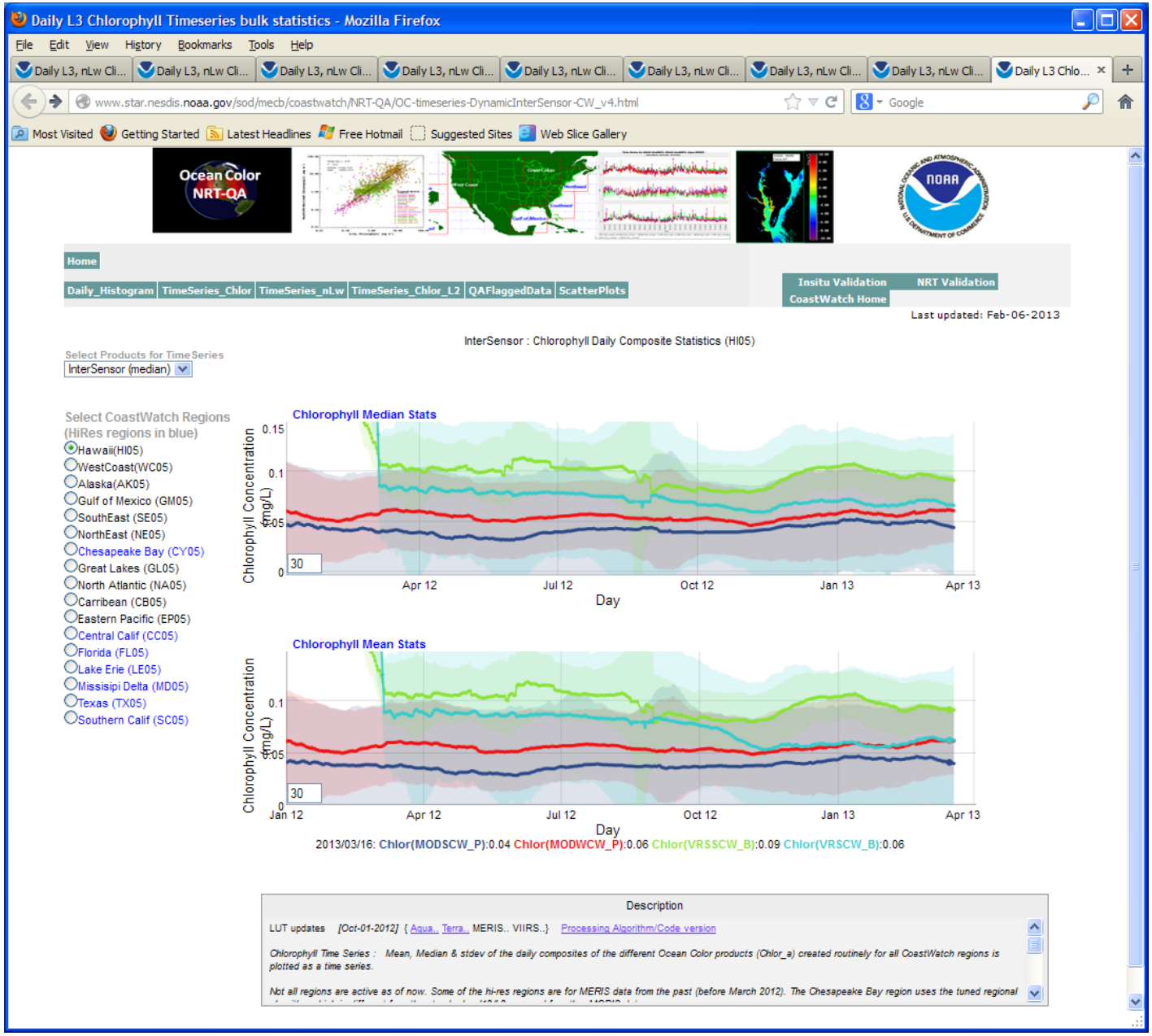
VRSSCW_B (L2gen) - no vicarious gains



VRSCW_B (IDPS) – no gains applied



More pixels are retrieved now with IDPS stream though aggressive masking for coastal pixels remain with IDPS


Daily L3 Chlorophyll Timeseries bulk statistics - Mozilla Firefox
File Edit View History Bookmarks Tools Help
www.star.nesdis.noaa.gov/sod/mecb/coastwatch/NRT-QA/OC-timeseries-DynamicInterSensor-CW_v4.html
Most Visited Getting Started Latest Headlines Free Hotmail Suggested Sites Web Slice Gallery
Ocean Color NRT-QA
NOAA
Home
Daily_Histogram TimeSeries_Chlor TimeSeries_nLw TimeSeries_Chlor_L2 QAFlaggedData ScatterPlots
Insitu Validation NRT Validation
CoastWatch Home
Last updated: Feb-06-2013
InterSensor : Chlorophyll Daily Composite Statistics (HI05)
Select Products for TimeSeries
InterSensor (median)
Select CoastWatch Regions
(HiRes regions in blue)
Hawaii(HI05)
WestCoast(WC05)
Alaska(AK05)
Gulf of Mexico (GM05)
SouthEast (SE05)
NorthEast (NE05)
Chesapeake Bay (CY05)
Great Lakes (GL05)
North Atlantic (NA05)
Carribean (CB05)
Eastern Pacific (EP05)
Central Calif (CC05)
Florida (FL05)
Lake Erie (LE05)
Missisipi Delta (MD05)
Texas (TX05)
Southern Calif (SC05)
Chlorophyll Median Stats
Chlorophyll Concentration (mg/L)
0.15
0.1
0.05
0
30
Apr 12
Jul 12
Oct 12
Jan 13
Apr 13
Day
Chlorophyll Mean Stats
Chlorophyll Concentration (mg/L)
0.1
0.05
0
30
Jan 12
Apr 12
Jul 12
Oct 12
Jan 13
Apr 13
Day
2013/03/16: Chlor(MODSCW_P):0.04 Chlor(MODWCW_P):0.06 Chlor(VRSSCW_B):0.09 Chlor(VRSCW_B):0.06
Description
LUT updates [Oct-01-2012] { Aqua.. Terra.. MERIS.. VIIRS..} Processing Algorithm/Code version
Chlorophyll Time Series : Mean, Median & stdev of the daily composites of the different Ocean Color products (Chlor_a) created routinely for all CoastWatch regions is plotted as a time series.
Not all regions are active as of now. Some of the hi-res regions are for MERIS data from the past (before March 2012). The Chesapeake Bay region uses the tuned regional

Daily L3 Chlorophyll Timeseries bulk statistics - Mozilla Firefox

File Edit View History Bookmarks Tools Help

www.star.nesdis.noaa.gov/sod/mecb/coastwatch/NRT-QA/OC-timeseries-DynamicInterSensor-CW_v4.html

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Home

Daily_Histogram | TimeSeries_Chlor | TimeSeries_nLw | TimeSeries_Chlor_L2 | QAFlaggedData | ScatterPlots

Insitu Validation | NRT Validation | CoastWatch Home

Last updated: Feb-06-2013

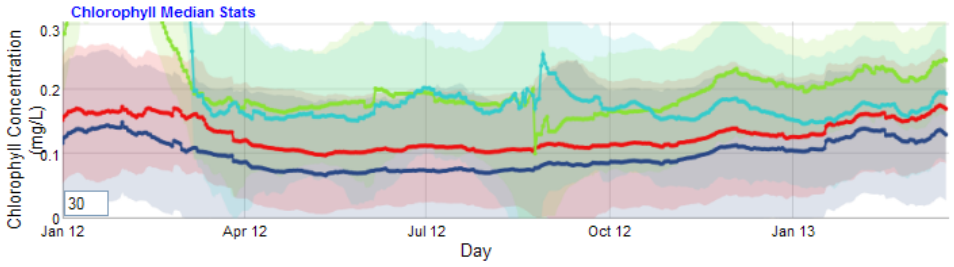
InterSensor : Chlorophyll Daily Composite Statistics (GM05)

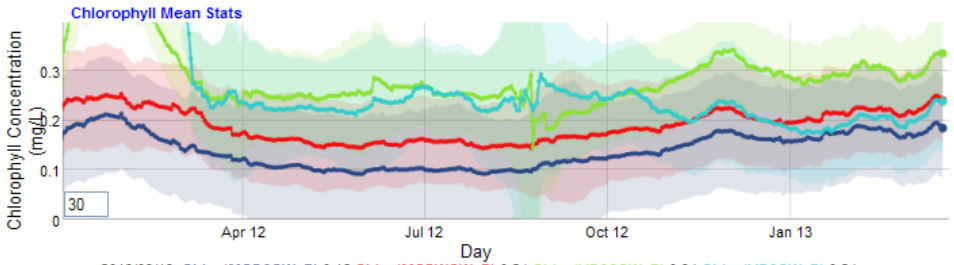
Select Products for TimeSeries

InterSensor (median)

Select CoastWatch Regions
(HiRes regions in blue)

- Hawaii(HI05)
- WestCoast(WC05)
- Alaska(AK05)
- Gulf of Mexico (GM05)
- SouthEast (SE05)
- NorthEast (NE05)
- Chesapeake Bay (CY05)
- Great Lakes (GL05)
- North Atlantic (NA05)
- Carribean (CB05)
- Eastern Pacific (EP05)
- Central Calif (CC05)
- Florida (FL05)
- Lake Erie (LE05)
- Missisipi Delta (MD05)
- Texas (TX05)
- Southern Calif (SC05)





2013/03/19: Chlor(MODSCW_P):0.18 Chlor(MODWCW_P):0.24 Chlor(VRSSCW_B):0.34 Chlor(VRSCW_B):0.24

Description

LUT updates *[Oct-01-2012]* { Aqua.. Terra.. MERIS.. VIIRS..} Processing Algorithm/Code version

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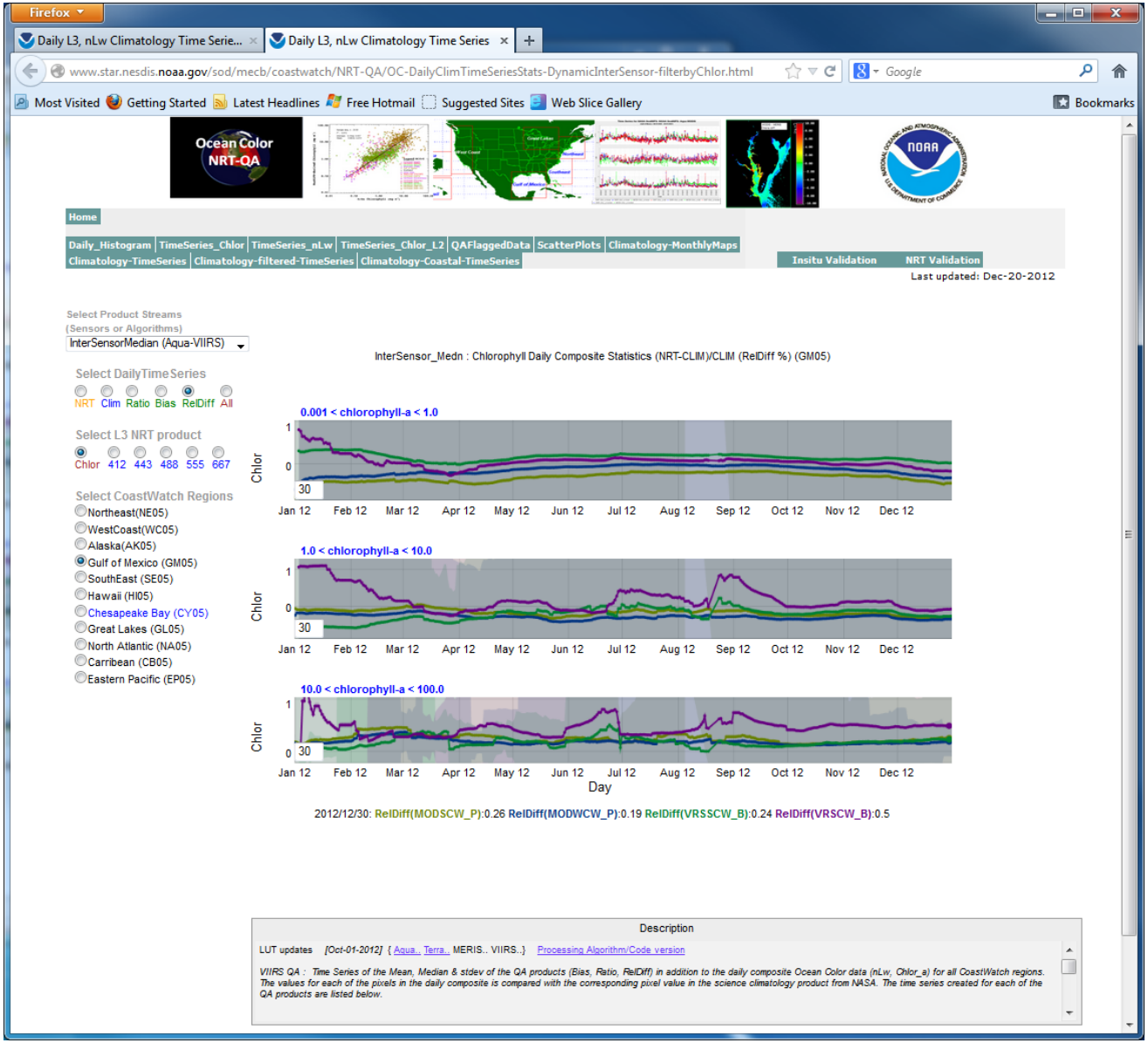
https://web.sp-systems.com:9898/MyeFAACT/login.aspx

Part - II

- QA by stratification of data in comparison to multi-year Climatology from MODIS
  - By Chlorophyll values (3 big bins)
  - By distance from coastlines (100km)
  - By Bathymetry data (3-4 bins)

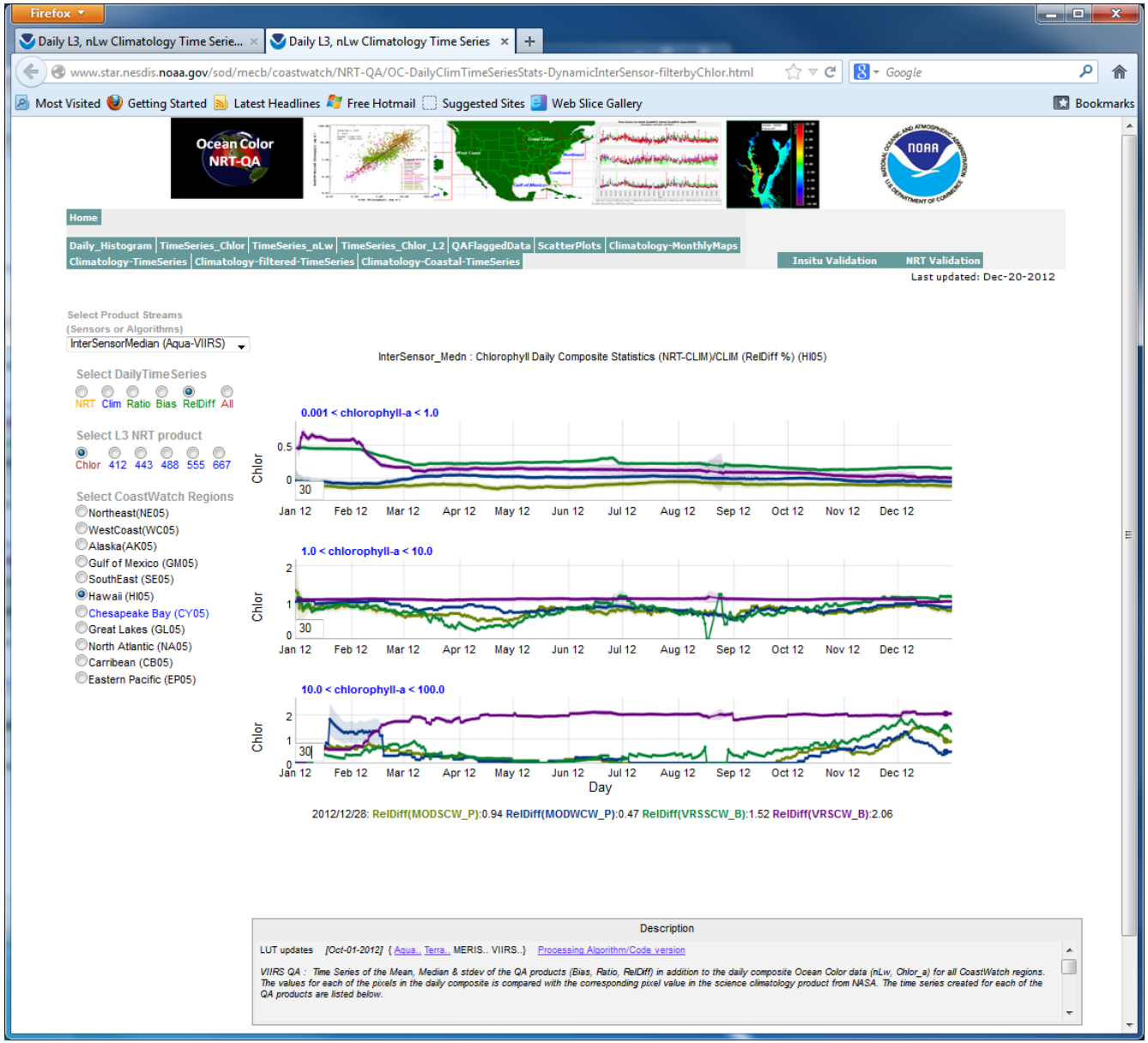
COMPARISON
BY CHLOROPHYLL VALUES

Relative Difference GM05



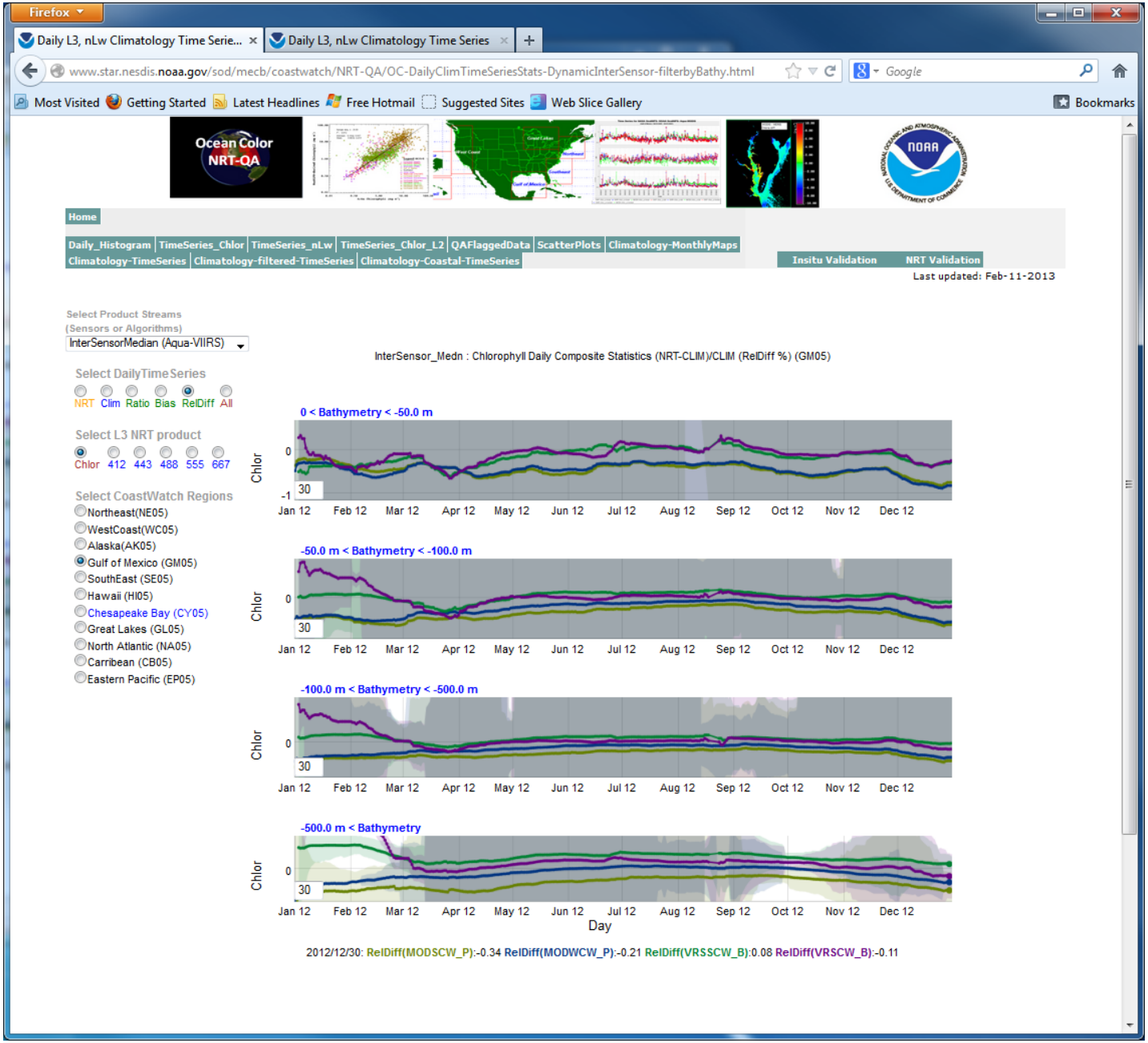
Note: L2gen(NOAA) returns high values for Chlorophyll in open ocean and IDPS does the same for high (coastal) values

Relative Difference HI05

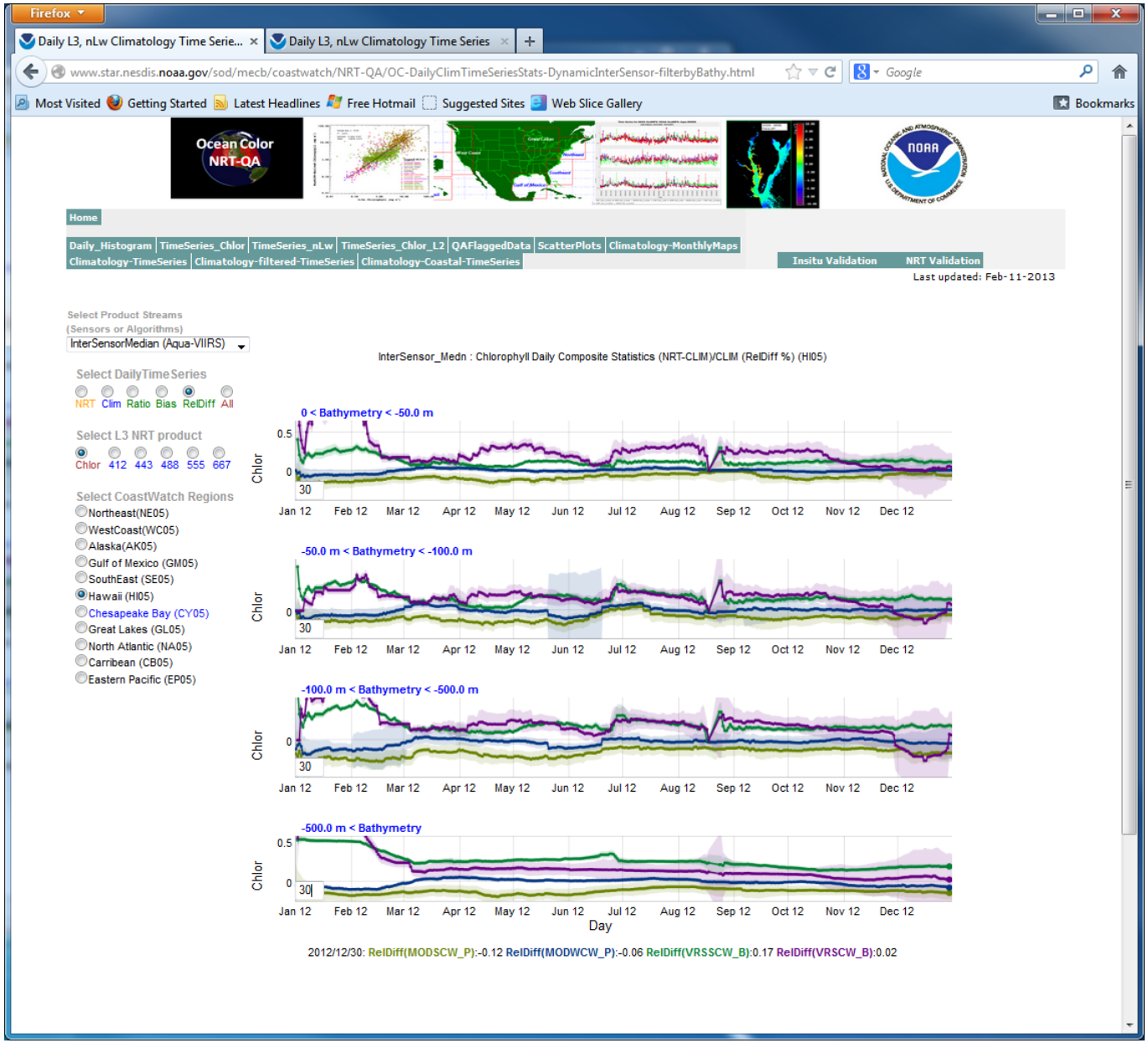


CHLOROPHYLL & NLW COMPARISONS BY BATHYMETRY

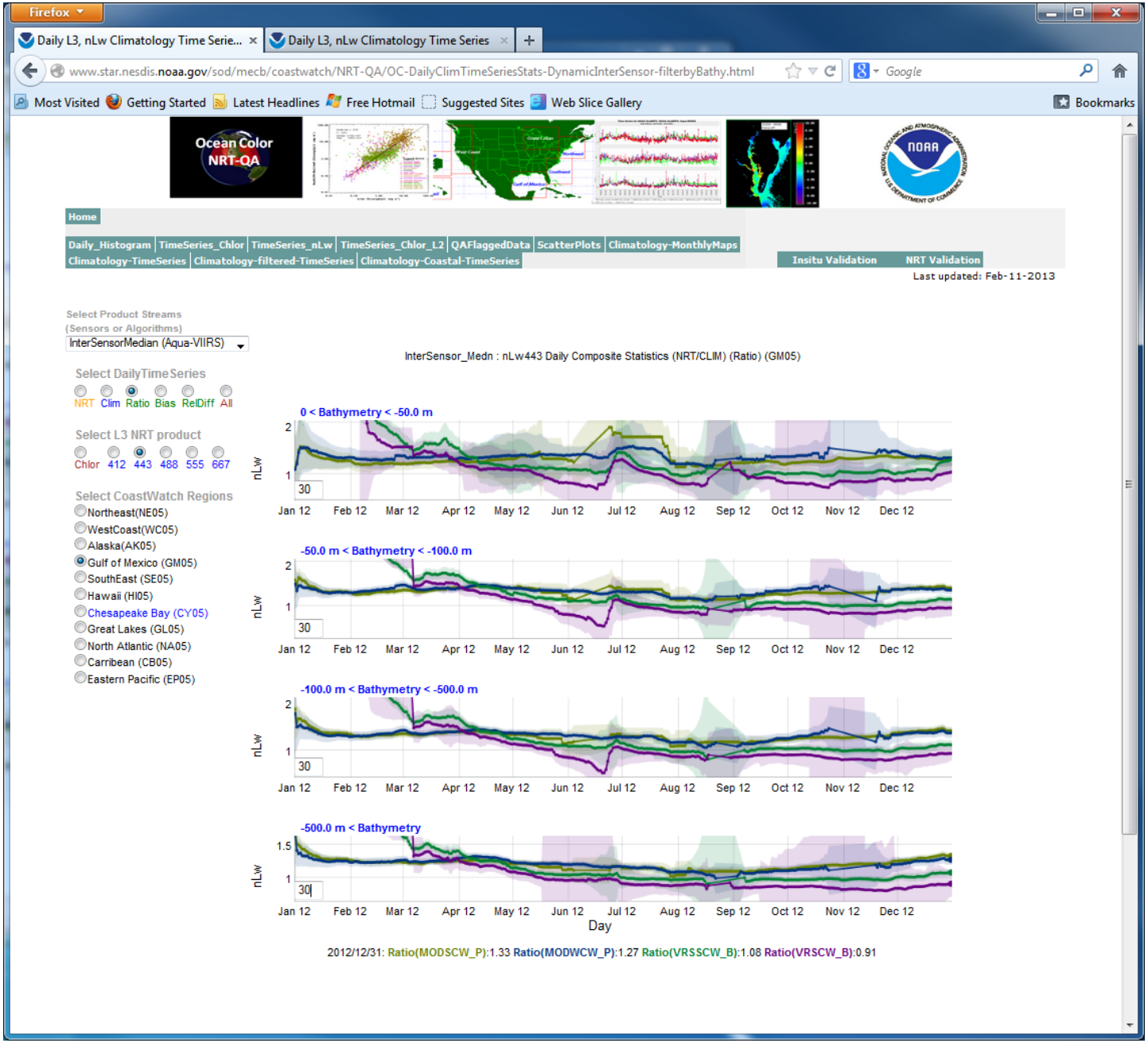
Chlorophyll Relative Difference GM05



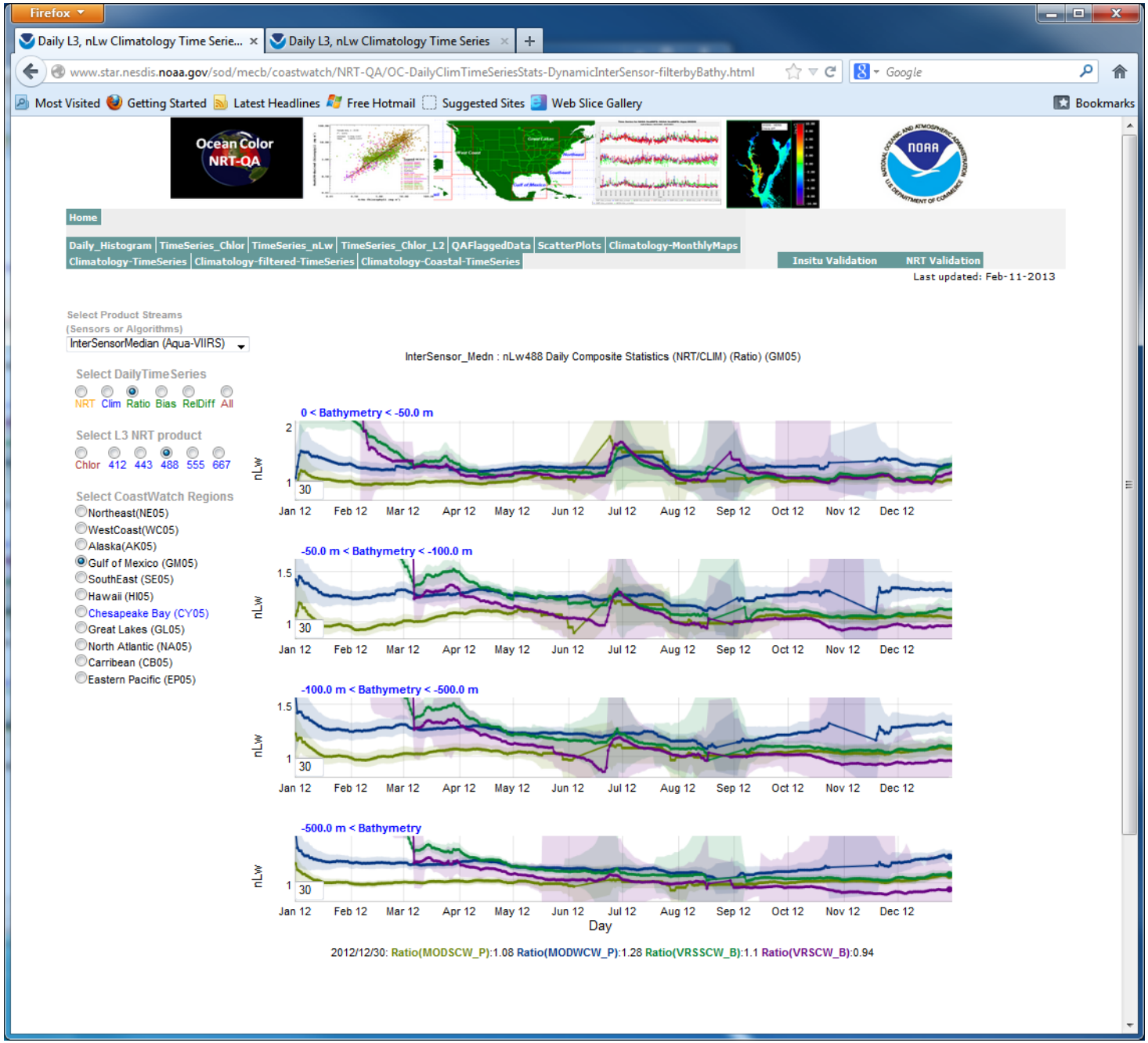
Chlorophyll Relative Difference HI05



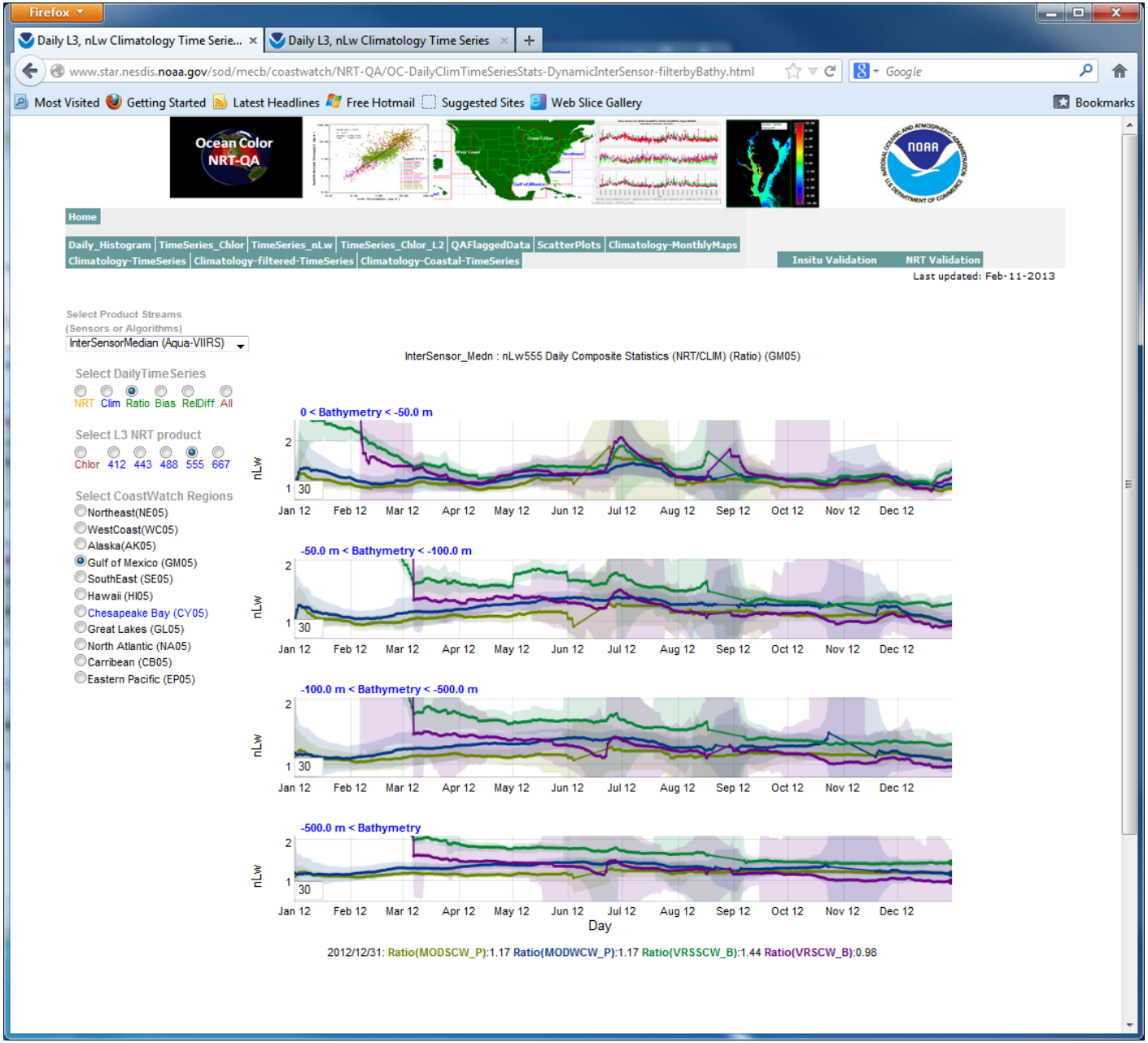
nlw443 Ratio GM05



nlw488 Ratio GM05



nlw555 Ratio GM05



CHLOROPHYLL & NLW COMPARISONS

BY DISTANCE FROM COASTLINE

Relative Difference Chlorophyll HI05

Results

- Chlorophyll
  - IDPS looks good in comparison with heritage and Climatology for open ocean waters.
  - L2gen is as good as IDPS or better than IDPS for high chlorophyll coastal waters.

- nLw
  - 443 & 488 bands are closer to corresponding Climatology values for L2gen (< 5%), it is more like 10-15% for IDPS
  - However 551 band is sitting with a large bias (50%) for L2gen when compared to IDPS product (<5%) at this time.

NRT-QA links

Inter-sensor plots :

http://www.star.nesdis.noaa.gov/sod/mecb/coastwatch/NRT-QA/OC-timeseries-DynamicInterSensor-CW_v4.html

Comparison with MODIS Climatology

Filter by Chlorophyll value:

http://www.star.nesdis.noaa.gov/sod/mecb/coastwatch/NRT-QA/OC-DailyClimTimeSeriesStats-DynamicInterSensor-filterbyChlor.html

Filter by distance from Coast:

http://www.star.nesdis.noaa.gov/sod/mecb/coastwatch/NRT-QA/OC-DailyClimTimeSeriesStats-DynamicInterSensor-filterbyCoastal.html

Filter by Bathymetry:

http://www.star.nesdis.noaa.gov/sod/mecb/coastwatch/NRT-QA/OC-DailyClimTimeSeriesStats-DynamicInterSensor-filterbyBathy.html