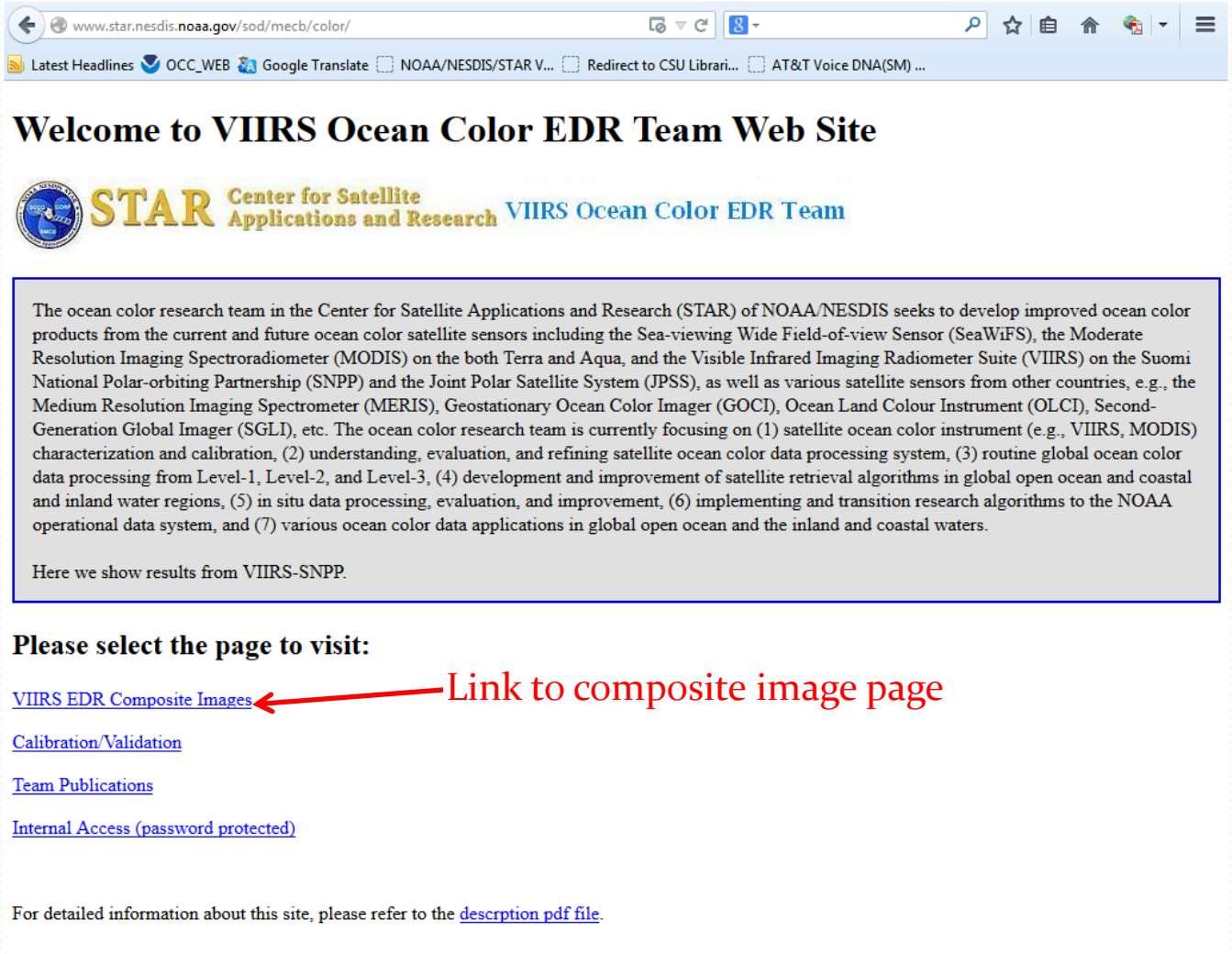
Ocean Color EDR Online Near-real-time Monitoring

Menghua Wang

NOAA STAR Ocean Color Team

Welcome Page

http://www.star.nesdis.noaa.gov/sod/mecb/color/



Link to composite image page

Composite images

http://www.star.nesdis.noaa.gov/sod/mecb/color/composite/

- **Sources:** 1) NOAA-MSL12 (heritage); 2) NOAA-MSL12-SWIR
  3) NOAA-MSL12-BMW; 4) IDPS (official); 5) MODIS-AQUA (official)
- **Types:** 1) Daily composite; 2) 8-daily composite; 3) Monthly composite; 4) Climatology from all available data
- **Products:**
  1) Chlorophyll-a
  2) Normalized water-leaving radiance for all five VIIRS visible M-bands
  3) Diffuse attenuation coefficient at 490nm (NOAA-MSL12 only)
- **Additional Experimental Products for NOAA-MSL12:**
  4) Photosynthetic-Available Radiation (PAR)
  5) Absorption coefficient (total, phytoplankton, detritus/gelbstoff) at 443nm
  6) Backscatter coefficient (total, particle) at 443nm
  7) More products will be added

VIIRS Global Ocean Color Composite Images

STAR Center for Satellite Applications and Research — VIIRS Ocean Color EDR Team

VIIRS: Chlorophyll-a MODIS: Chlorophyll-a Region: Global October 2014 < > Return to EDR Team Home

use viewer

NOAA-MSL12

CLM	MON	8d1	8d2	8d3	8d4	
SUN	MON	TUE	WED	THU	FRI	SAT
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

MSL12-SWIR

CLM	MON	8d1	8d2	8d3	8d4	
SUN	MON	TUE	WED	THU	FRI	SAT
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

MSL12-BMW

CLM	MON	8d1	8d2	8d3	8d4	
SUN	MON	TUE	WED	THU	FRI	SAT
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

IDPS

CLM	MON	8d1	8d2	8d3	8d4	
SUN	MON	TUE	WED	THU	FRI	SAT
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

MODIS-AQUA

CLM	MON	8d1	8d2	8d3	8d4	
SUN	MON	TUE	WED	THU	FRI	SAT
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

Colorbars1

- Chlorophyll-a
- $nL_w(410)$
- $nL_w(443)$
- $nL_w(486)$
- $nL_w(551)$
- $nL_w(671)$
- $K_d(490)$

Colorbars2

- PAR
- a(443)
- $a_{ph}(443)$
- $a_{dg}(443)$
- $b_b(443)$
- $b_{bp}(443)$
- a(551)
- $b_b(551)$

Note:

1. Products before Feb.6, 2012 are not reliable or usable due to VIIRS instrument calibration error.
2. The VIIRS nominal center wavelengths (different from pre-defined product name) are as follows (units in nm):
   M1:410, M2:443, M3:486, M4:551, M5:671, M6:745, M7:862, M8:1238, M10:1610, M11:2250
3. The VIIRS Kd(490) data for NOAA-MSL12 are derived using Wang et al.(2009) algorithm.
4. Experimental EDR: The VIIRS PAR algorithm was provided by Robert Frouin and implemented in NOAA-MSL12 by STAR VIIRS OC Team.
   The VIIRS IOP products for NOAA-MSL12 are derived using the Quasi-Analytical Algorithm (QAA).
5. The MSL12-SWIR processing uses M8 and M10 as the two atmospheric correction bands.
6. The details on MSL12-BMW can be found in Jiang and Wang (2014), Optics Express, doi:10.1364/OE.22.021657

VIIRS Global Ocean Color Composite Images

1. Select product, region, month, year

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Viewer option

VIIRS: Chlorophyll-a | MODIS: Chlorophyll-a | Region: Global | October | 2014 | < | > | Return to EDR Team Home

use v

Chlorophyll-a
nLw(410)
nLw(443)
nLw(486)
nLw(551)
nLw(671)
Kd(490)
Experimental:
PAR
a(443)
aph(443)
adg(443)
bb(443)
bbp(443)
a(551)
bb(551)

MSL12-SWIR

CLM	MON	8d1	8d2	8d3	8d4	
SUN	MON	TUE	WED	THU	FRI	SAT
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

MSL12-BMW

CLM	MON	8d1	8d2	8d3	8d4	
SUN	MON	TUE	WED	THU	FRI	SAT
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

IDPS

CLM	MON	8d1	8d2	8d3	8d4	
SUN	MON	TUE	WED	THU	FRI	SAT
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

MODIS-AQUA

CLM	MON	8d1	8d2	8d3	8d4	
SUN	MON	TUE	WED	THU	FRI	SAT
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

Colorbars1

- Chlorophyll-a
- $nL_w(410)$
- $nL_w(443)$
- $nL_w(486)$
- $nL_w(551)$
- $nL_w(671)$
- $K_d(490)$

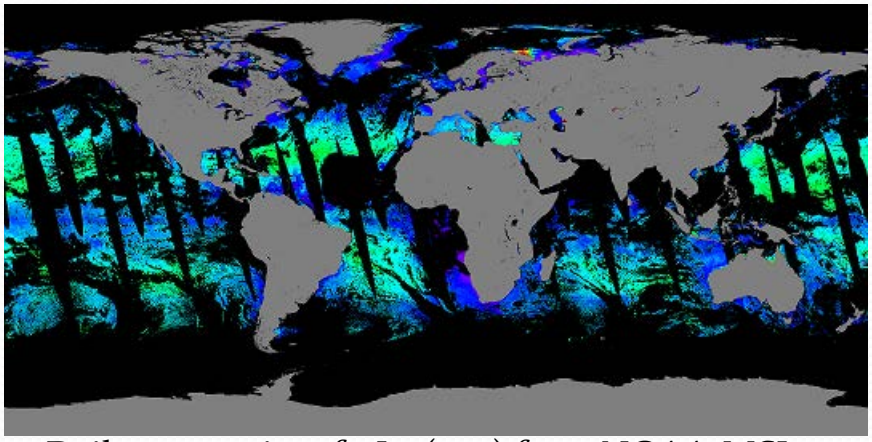
Colorbars2

- PAR
- a(443)
- $a_{ph}(443)$
- $a_{dg}(443)$
- $b_b(443)$
- $b_{bp}(443)$
- a(551)
- $b_b(551)$

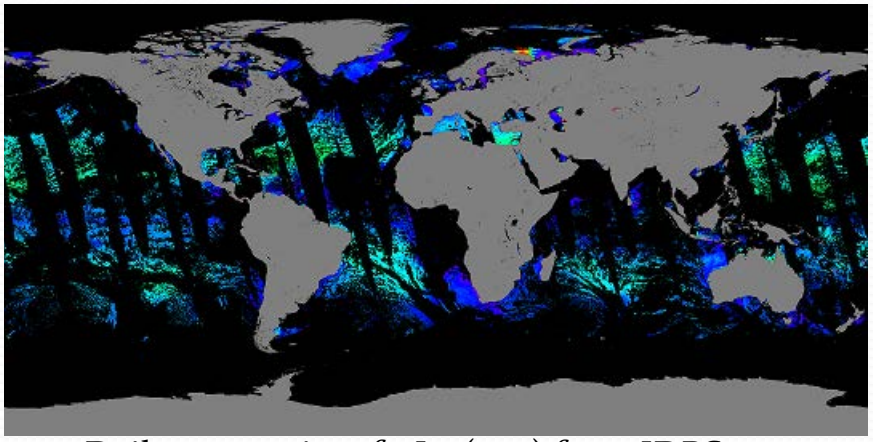
Colorbar for reference

2. Click on the calendars

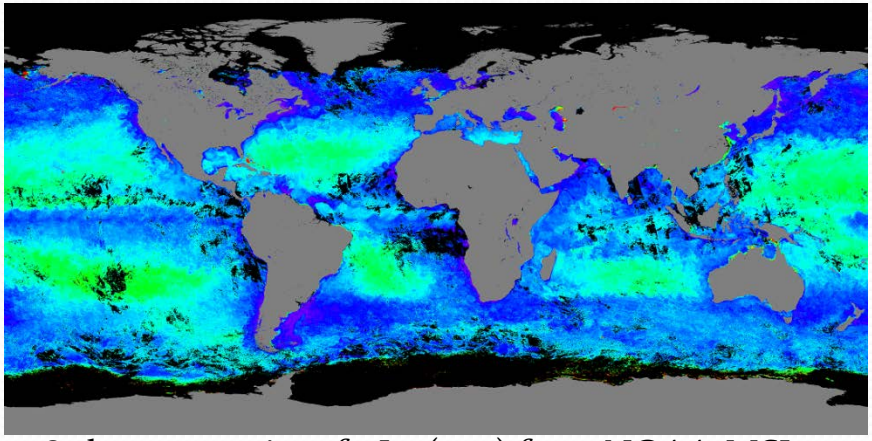
Sample images



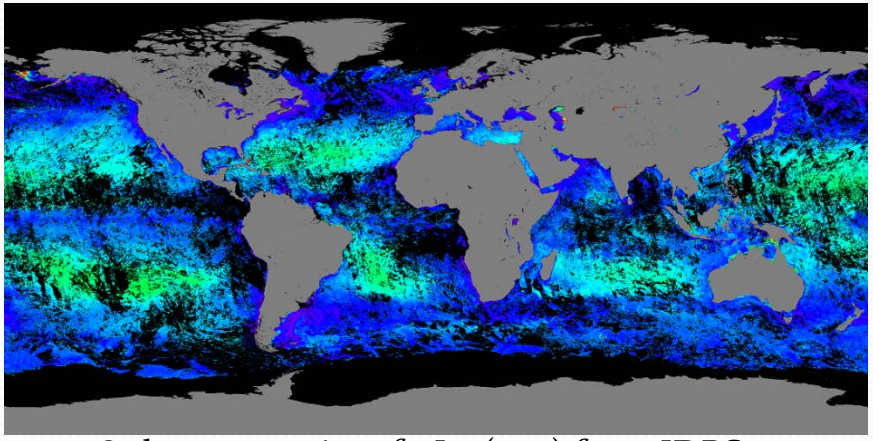
Daily composite of nLw(443) from NOAA-MSL12 on July.31, 2013



Daily composite of nLw(443) from IDPS on July.31, 2013

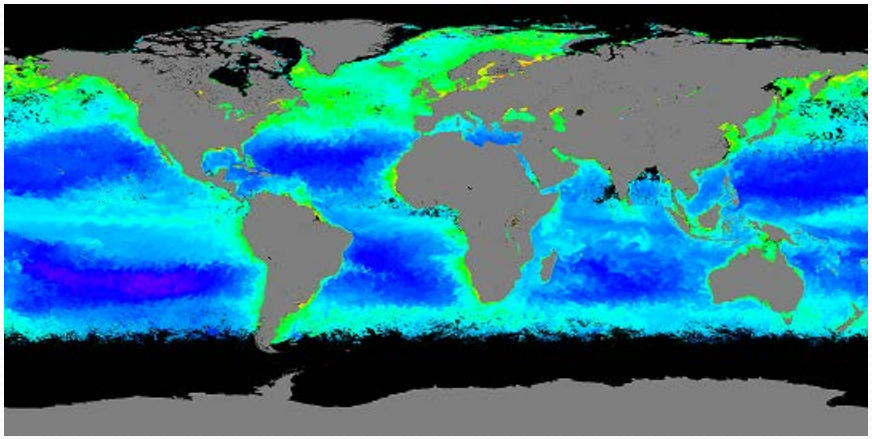


8-day composite of nLw(443) from NOAA-MSL12 during October.8~15, 2014

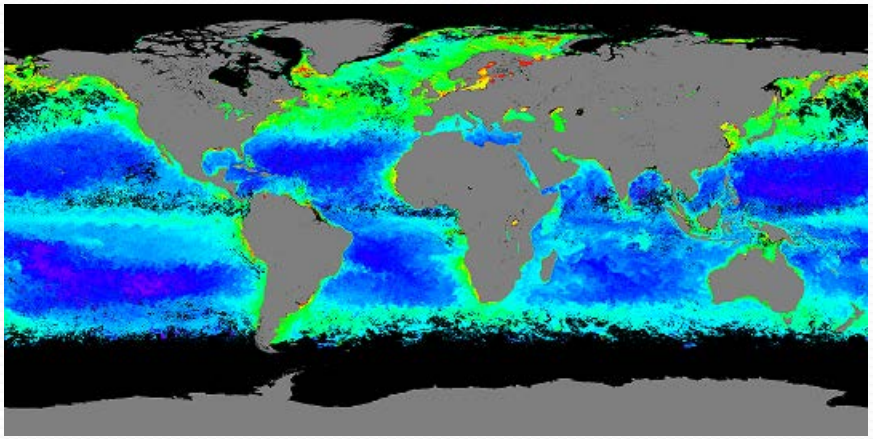


8-day composite of nLw(443) from IDPS during October.8~15, 2014

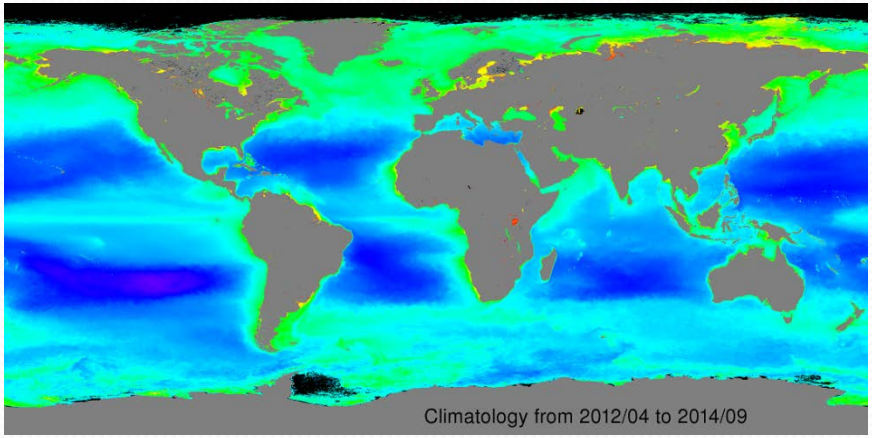
Sample images continued



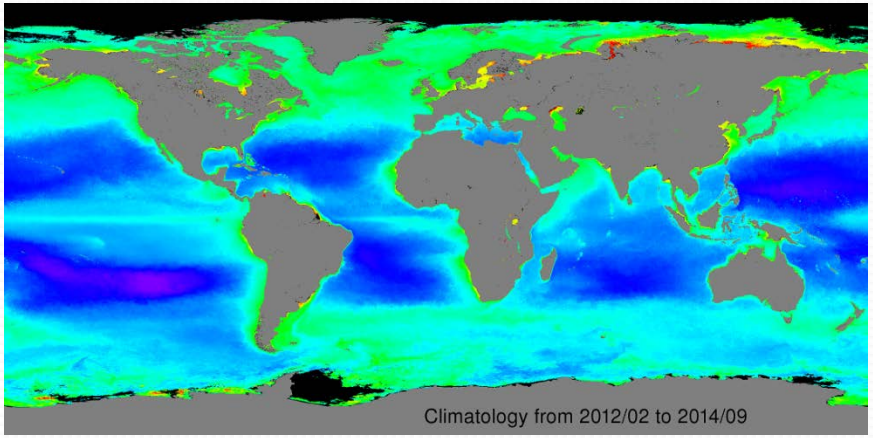
Monthly composite of Chl-a from NOAA-MSL12 of May, 2013



Monthly composite of Chl-a from IDPS of May, 2013

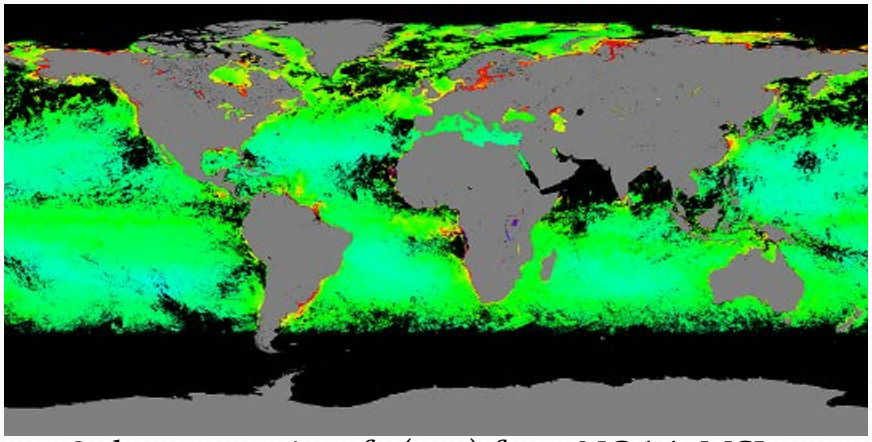


Climatology of Chl-a from NOAA-MSL12 during April 2012 ~September 2014

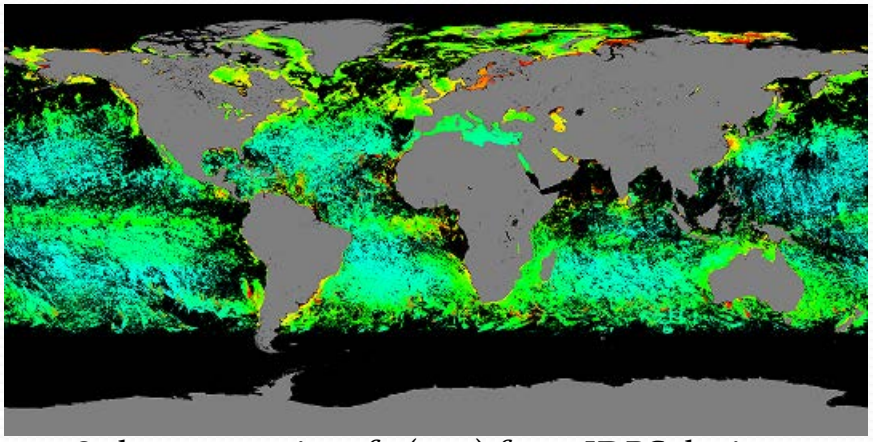


Climatology of Chl-a from IDPS during February 2012 ~ September 2014

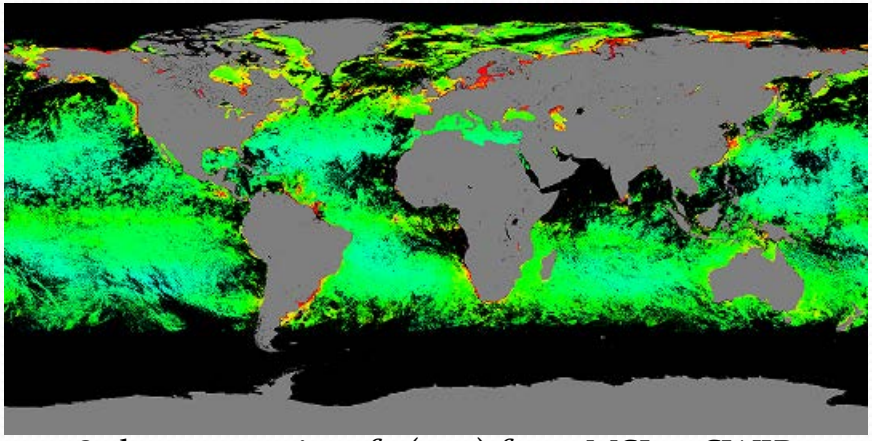
Sample images continued



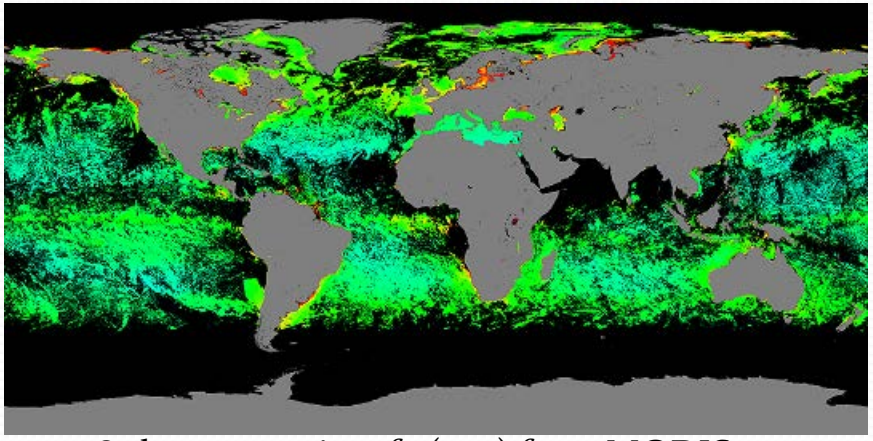
8-day composite of a(443) from NOAA-MSL12 during July.12~19, 2013



8-day composite of a(443) from IDPS during July.12~19, 2013

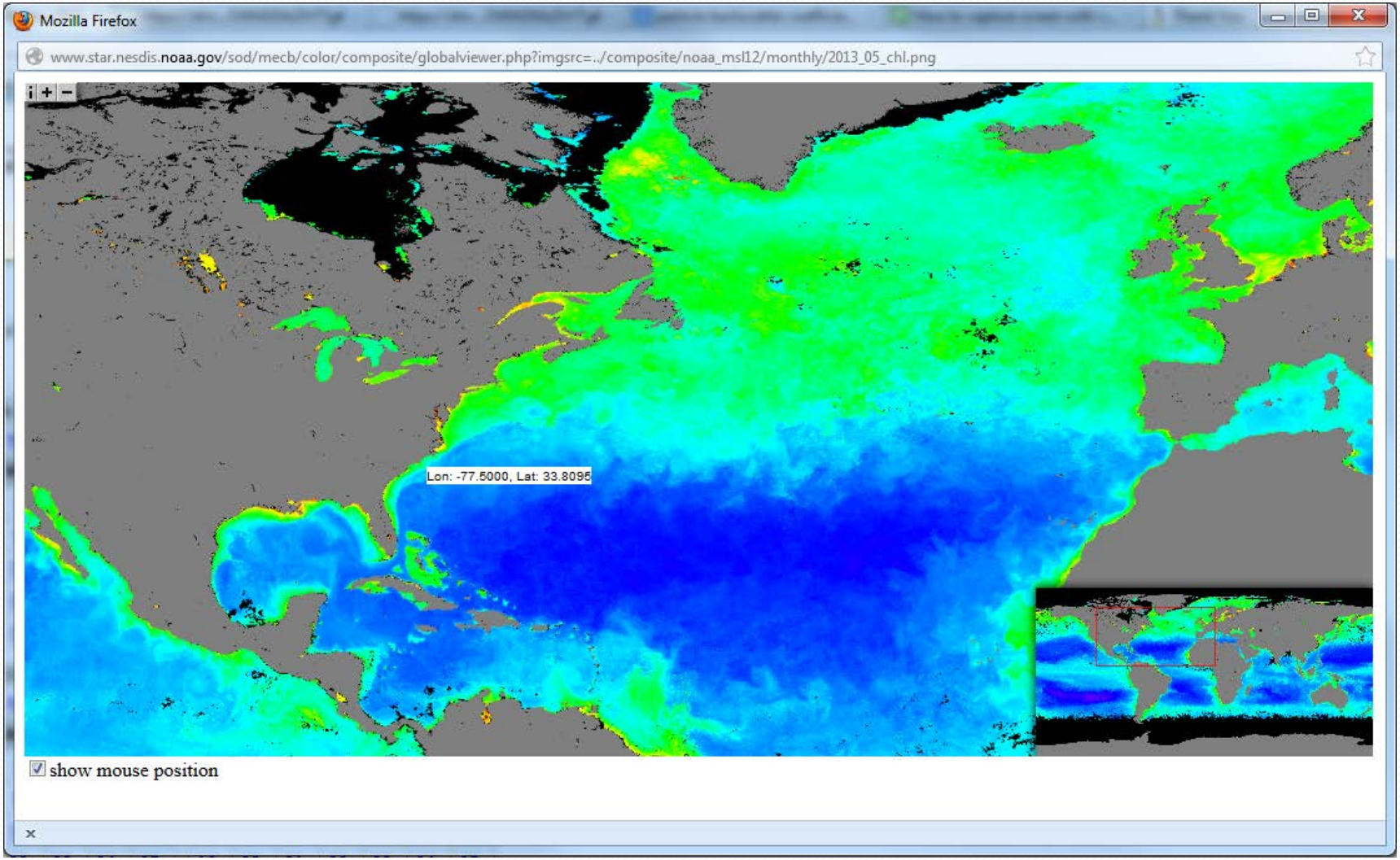


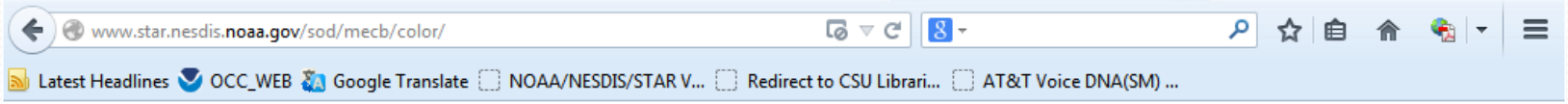
8-day composite of a(443) from MSL12-SWIR during July.12~19, 2013



8-day composite of a(443) from MODIS-AQUA during July.12~19, 2013

Viewer option enabled for global interactive image-viewing





Welcome to VIIRS Ocean Color EDR Team Web Site

STAR Center for Satellite Applications and Research VIIRS Ocean Color EDR Team

The ocean color research team in the Center for Satellite Applications and Research (STAR) of NOAA/NESDIS seeks to develop improved ocean color products from the current and future ocean color satellite sensors including the Sea-viewing Wide Field-of-view Sensor (SeaWiFS), the Moderate Resolution Imaging Spectroradiometer (MODIS) on the both Terra and Aqua, and the Visible Infrared Imaging Radiometer Suite (VIIRS) on the Suomi National Polar-orbiting Partnership (SNPP) and the Joint Polar Satellite System (JPSS), as well as various satellite sensors from other countries, e.g., the Medium Resolution Imaging Spectrometer (MERIS), Geostationary Ocean Color Imager (GOCI), Ocean Land Colour Instrument (OLCI), Second-Generation Global Imager (SGLI), etc. The ocean color research team is currently focusing on (1) satellite ocean color instrument (e.g., VIIRS, MODIS) characterization and calibration, (2) understanding, evaluation, and refining satellite ocean color data processing system, (3) routine global ocean color data processing from Level-1, Level-2, and Level-3, (4) development and improvement of satellite retrieval algorithms in global open ocean and coastal and inland water regions, (5) in situ data processing, evaluation, and improvement, (6) implementing and transition research algorithms to the NOAA operational data system, and (7) various ocean color data applications in global open ocean and the inland and coastal waters.

Here we show results from VIIRS-SNPP.

Please select the page to visit:

VIIRS EDR Composite Images

Calibration/Validation ← Link to calibration/validation page

Team Publications

Internal Access (password protected)

For detailed information about this site, please refer to the descrption pdf file.

Near-real-time Cal/Val

http://www.star.nesdis.noaa.gov/sod/mecb/color/validation/

- In situ and satellite data comparison
  - MOBY
  - AERONET CSI
  - AERONET LISCO
  - AERONET USC
  - Others (e.g. BOUSSOLE, Chesapeake Bay, etc, will be added)
- Regional ocean color EDR monitoring
  - Hawaii
  - South Pacific Gyre
  - U.S. East Coast
  - Upper, Middle and Lower Chesapeake Bay
  - Other regions (will be added)
- Global deep water monitoring

www.star.nesdis.noaa.gov/sod/mecb/color/validation/

Latest Headlines | OCC_WEB | Google Translate | Redirect to CSU Librari... | AT&T Voice DNA(SM) ...

VIIRS Ocean Color Product Calibration/Validation

Return to EDR Team Home

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Show cal/val sites location map

Select a NOAA-MSL12 analysis: MOBY matchup (daily F-LUT) **or an IDPS analysis:** none View Site Locations On Map

Select data source, site, etc for static plots

NOAA-MSL12

MOBY Site Ocean Color (With Daily F-LUT) Data Matchup

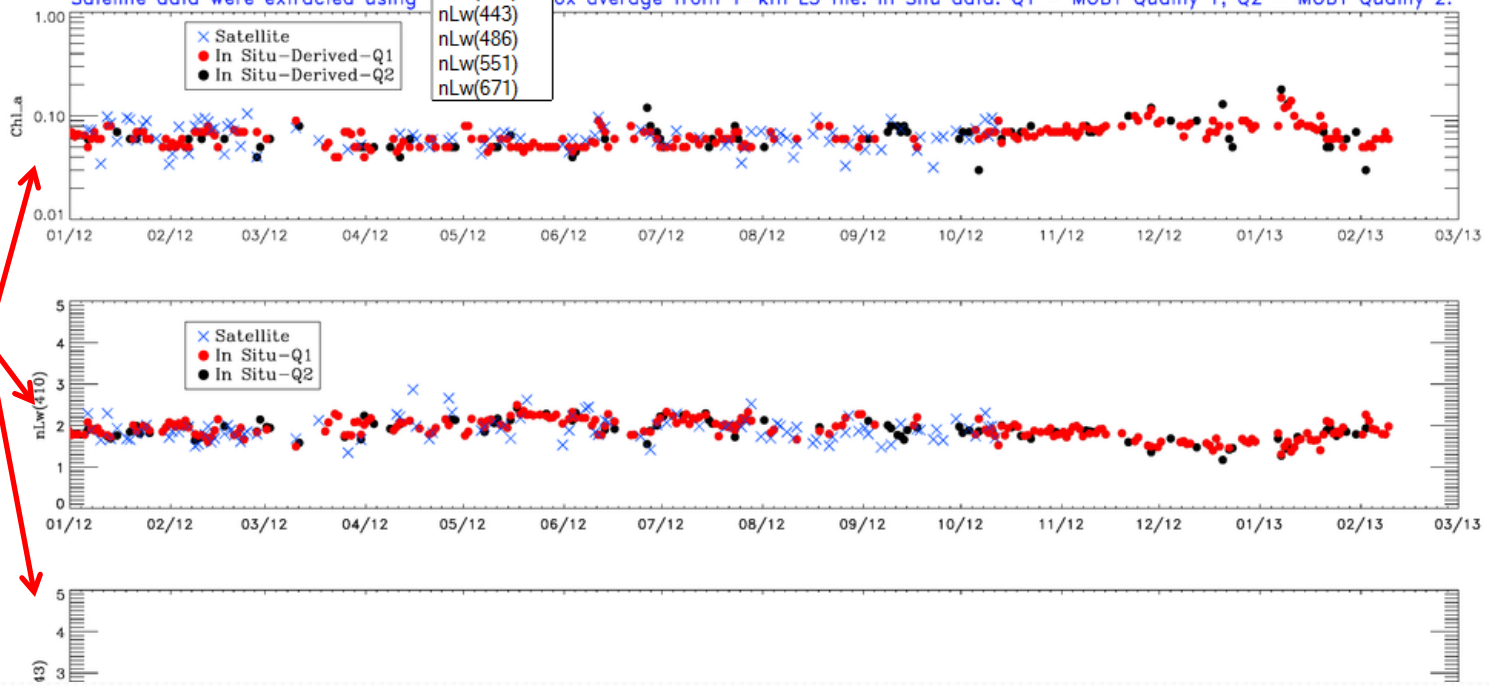
Select a parameter for interactive plot: none (Supported web browsers: FireFox, Chrome and Safari) View Scatter Plot

Select product for interactive plots

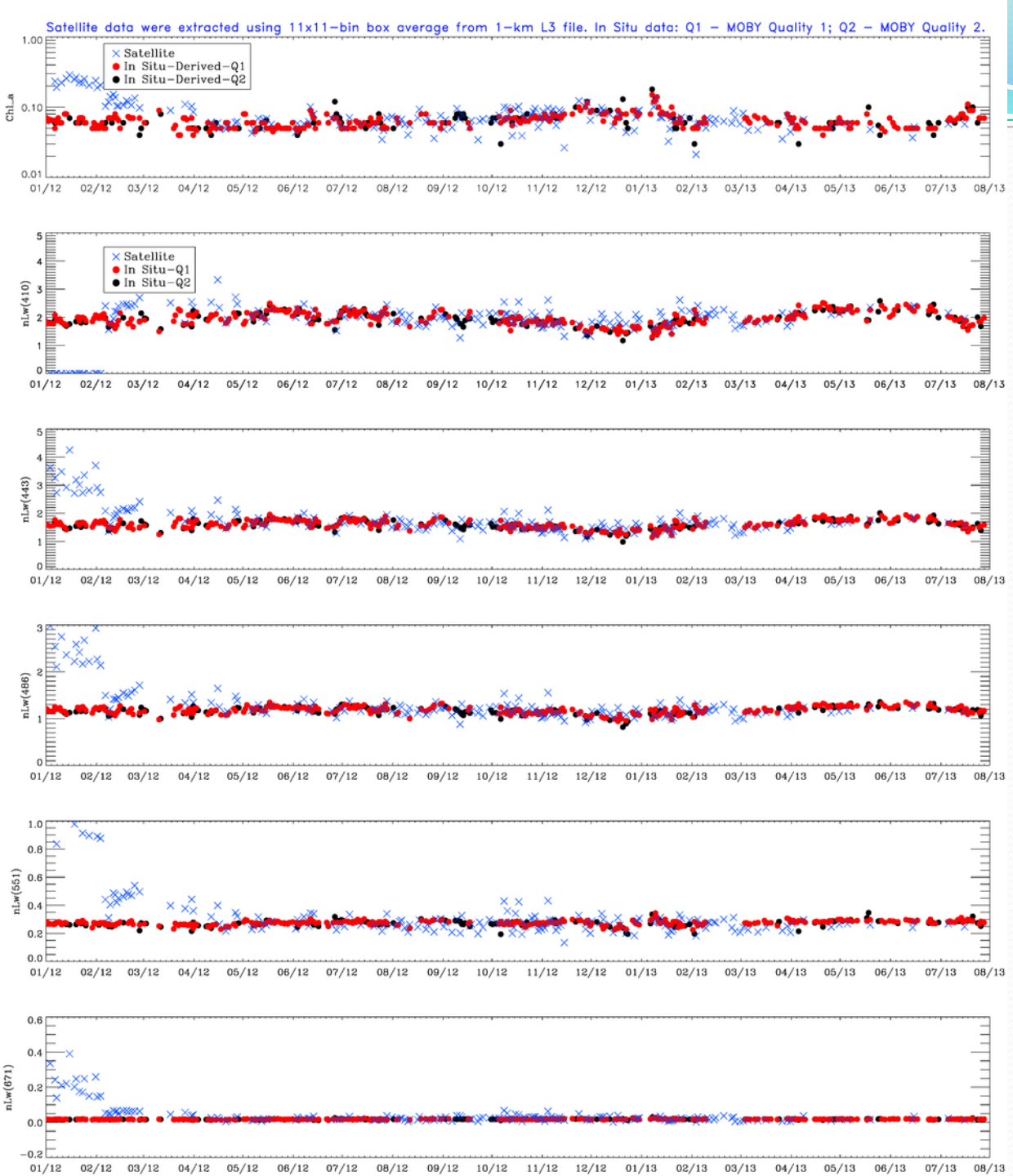
Show scatter plots

none
chl-a
nLw(410)
nLw(443)
nLw(486)
nLw(551)
nLw(671)

Satellite data were extracted using ox average from 1-km L3 file. In Situ data: Q1 – MOBY Quality 1; Q2 – MOBY Quality 2.

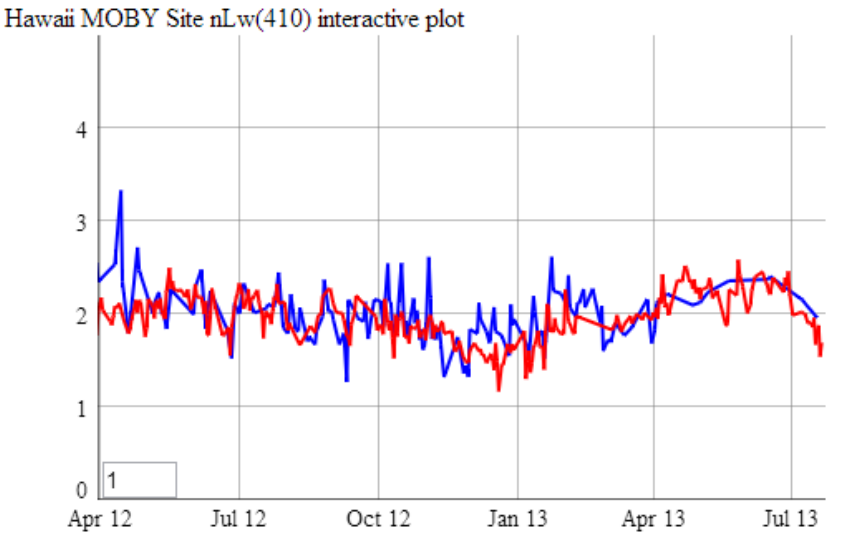


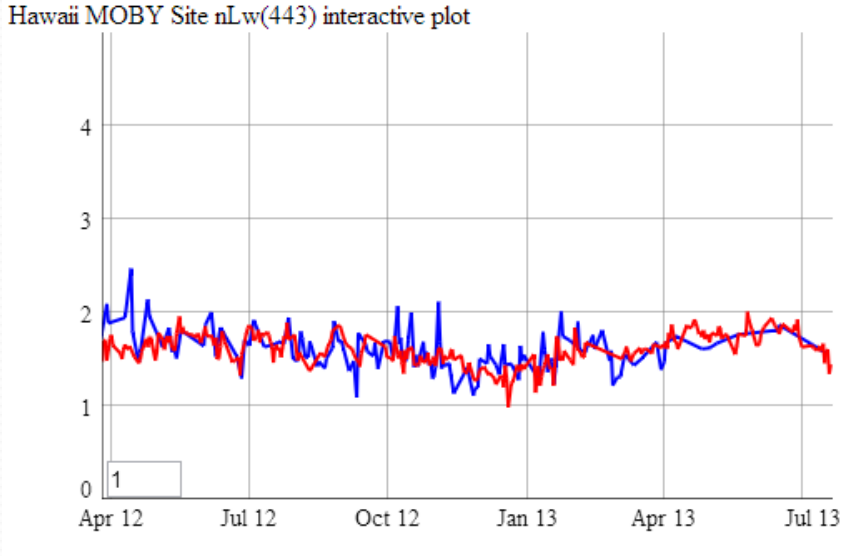
Static plots

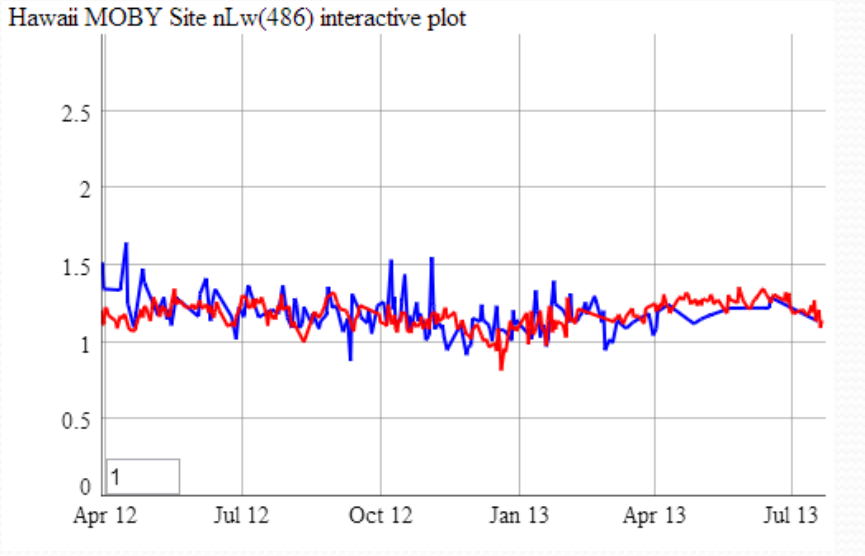


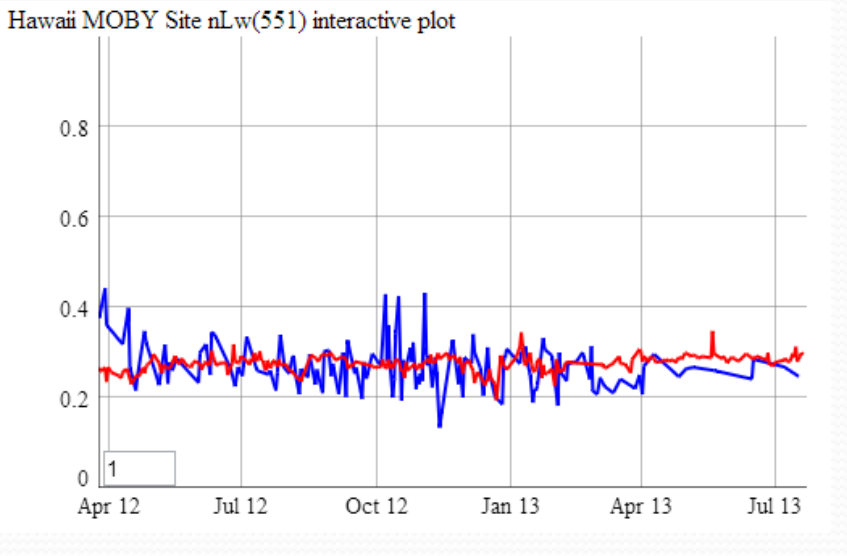
MOBY in situ and satellite data daily time-series comparison: chl-a, nLw410, nLw443, nLw486, nLw551, and nLw671

Online interactive plot of MOBY in situ and satellite data daily time-series

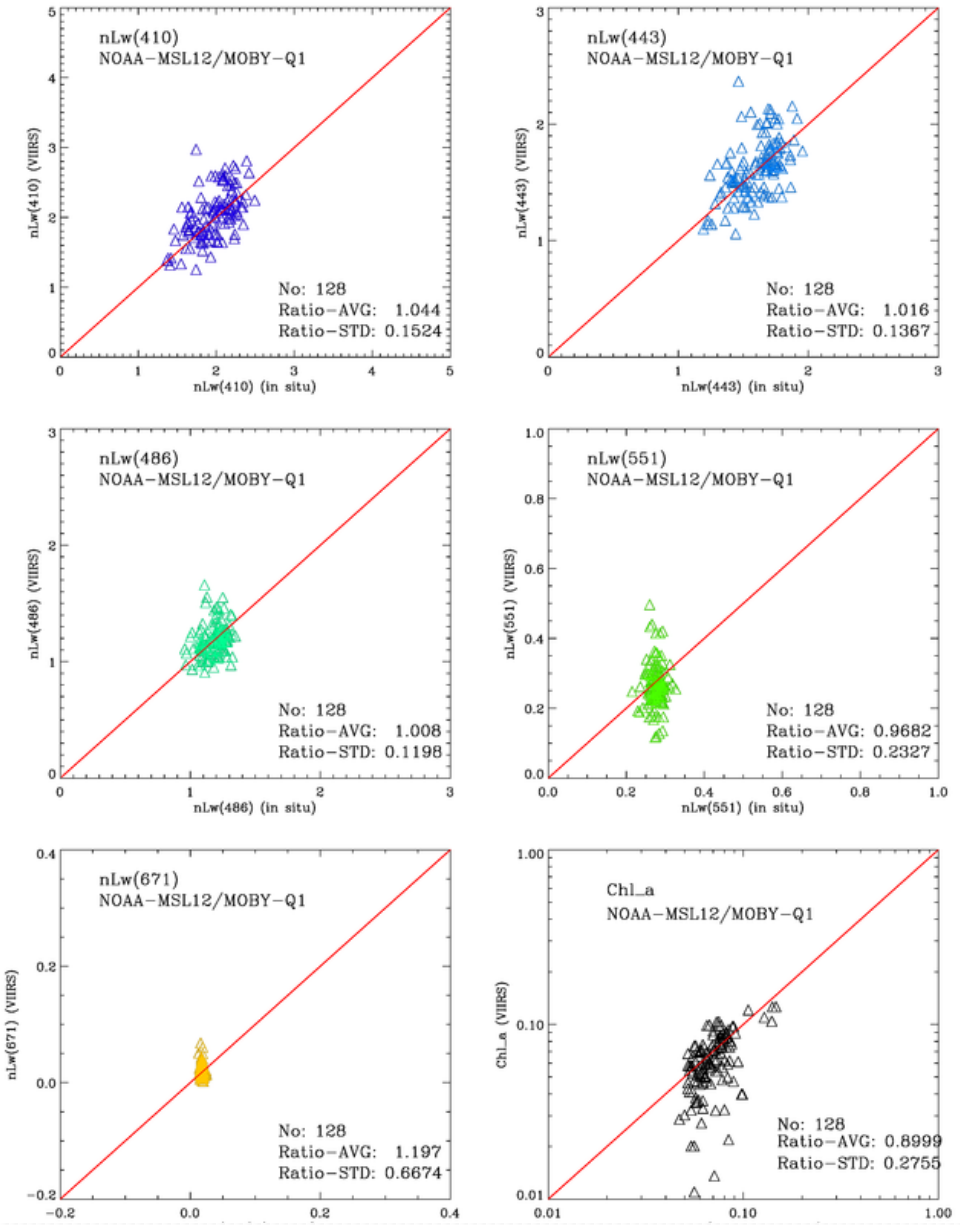




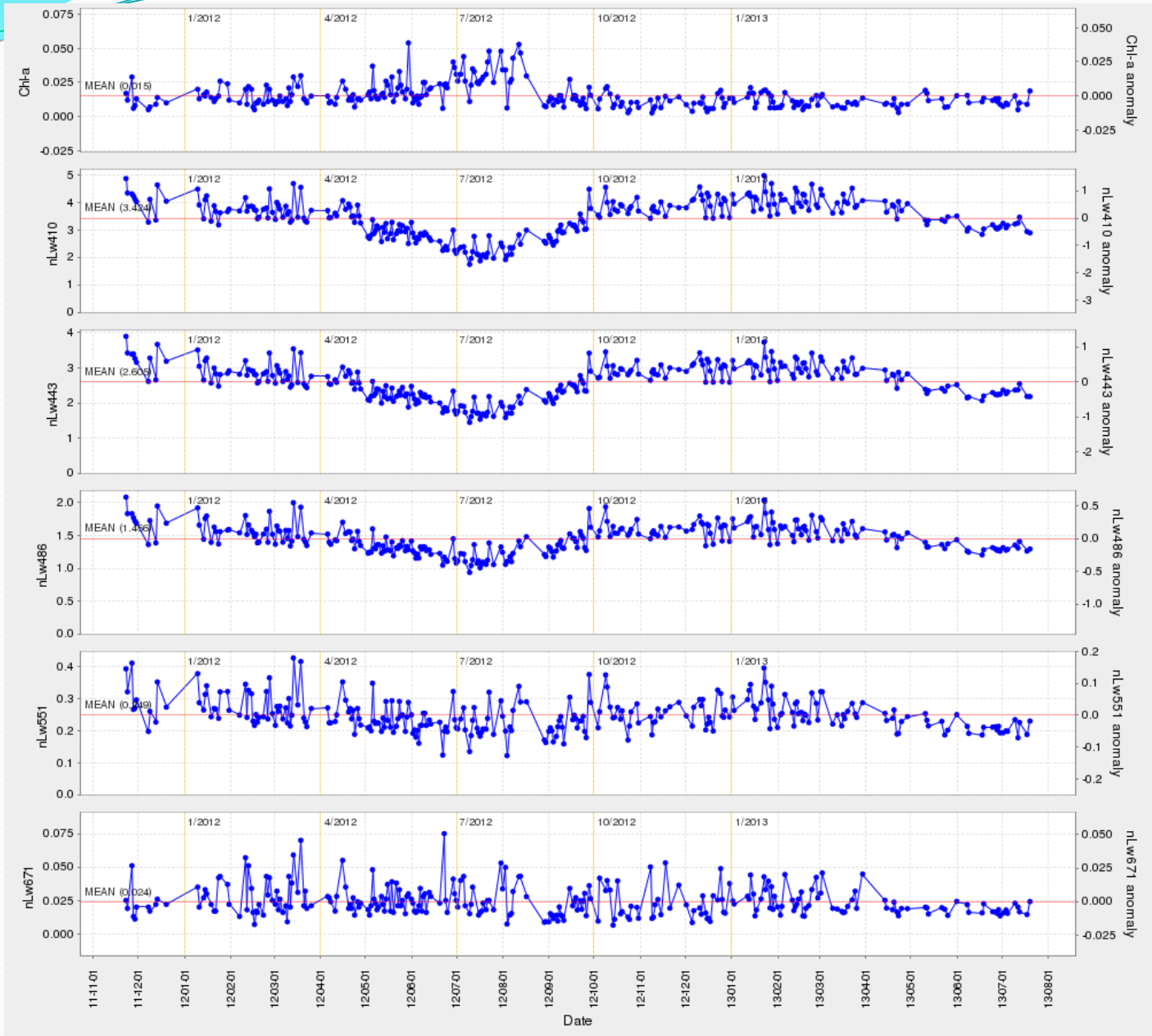




On the web-browser, user can mouse over to display and highlight individual values, and click and drag to zoom to a time period.

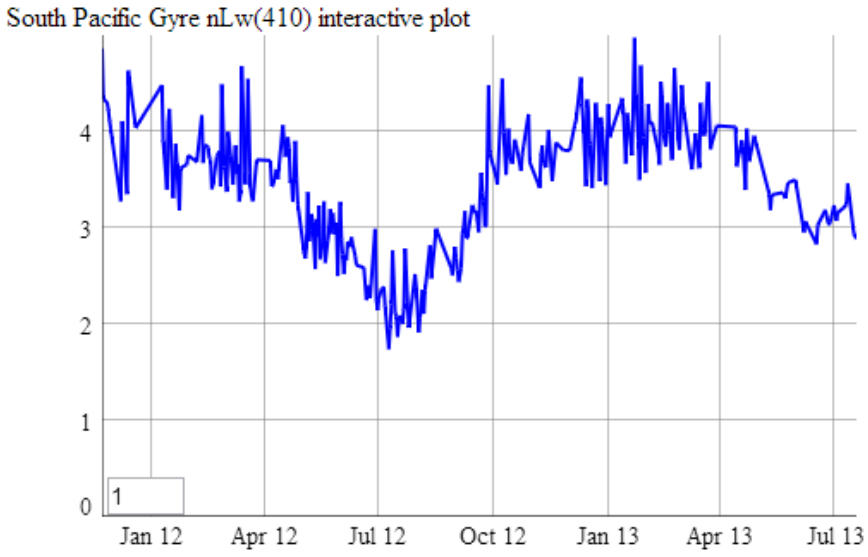


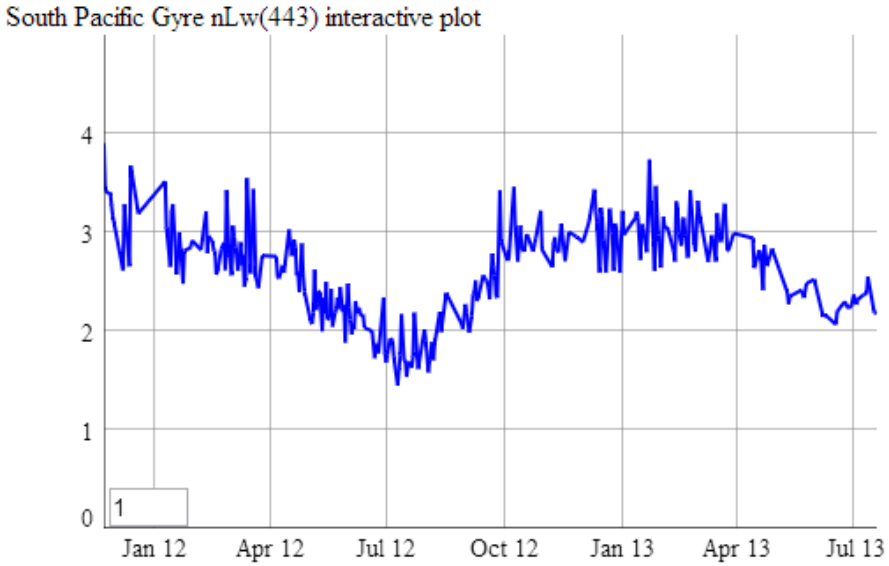
Satellite-In Situ data match-up scatter plots at MOBY site: chl-a, nLw410, nLw443, nLw486, nLw551 and nLw671.

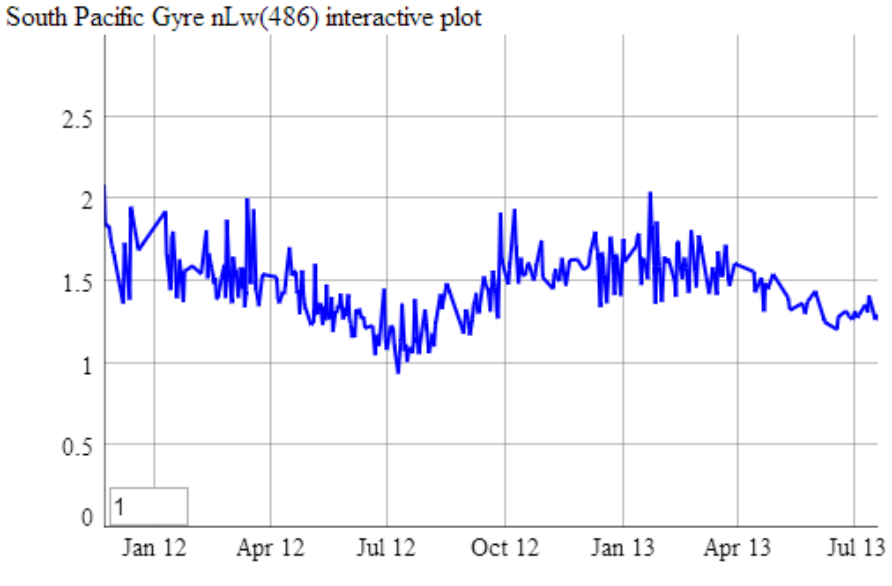


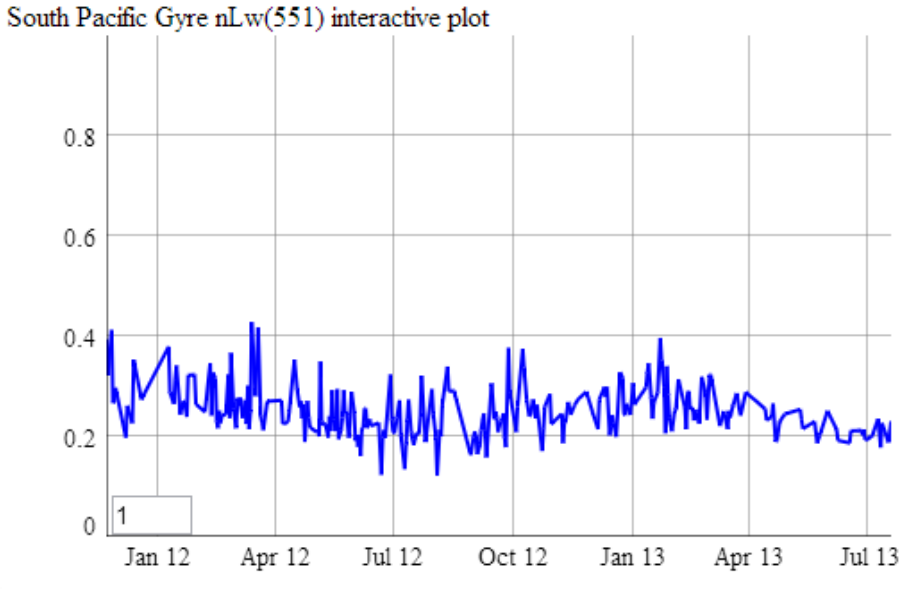
VIIRS ocean color EDR regional time-series monitoring at South Pacific Gyre (SPG)

Online interactive plot of SPG time-series

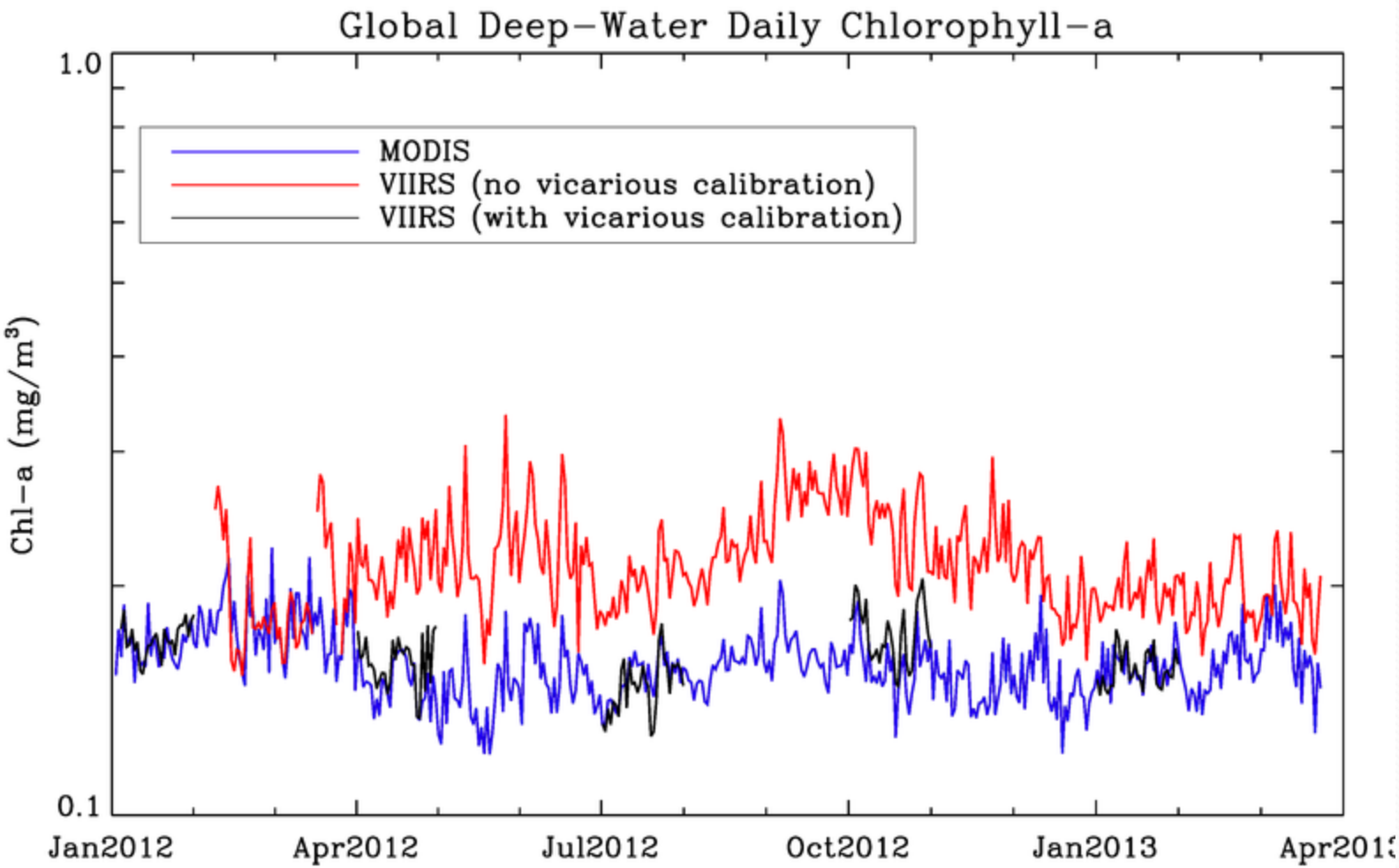




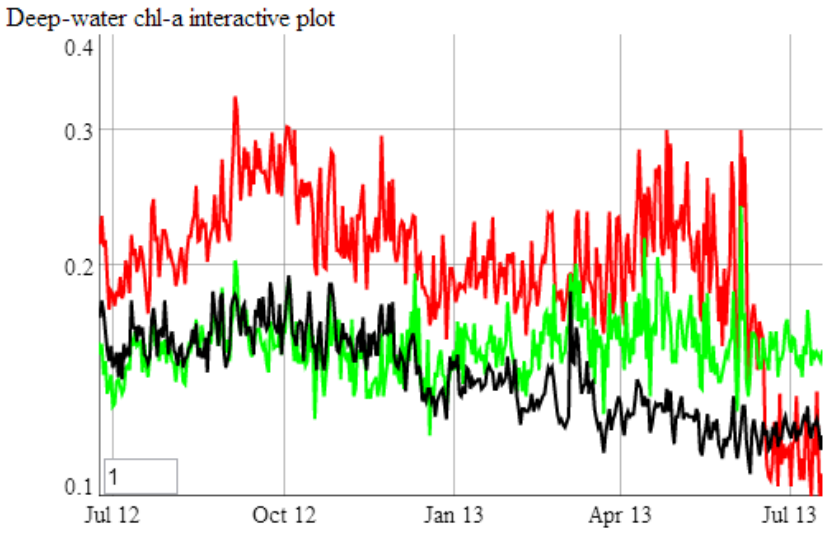


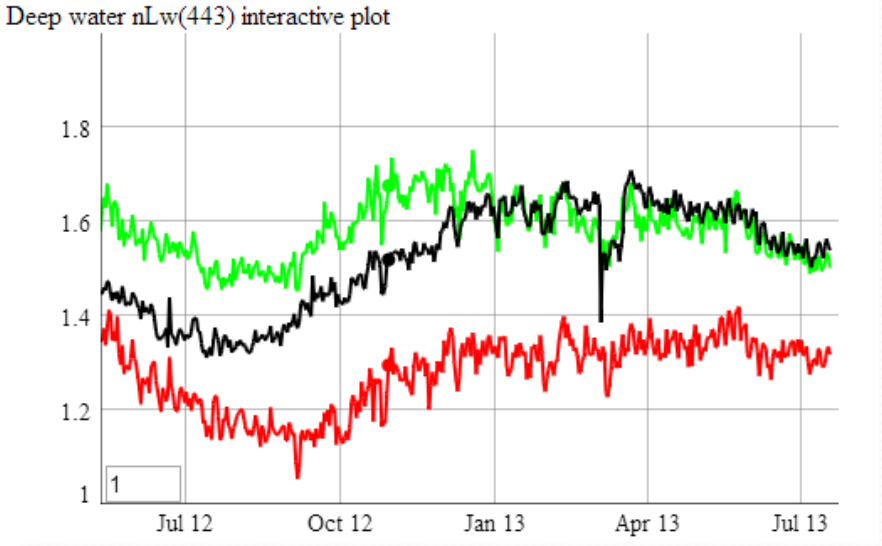


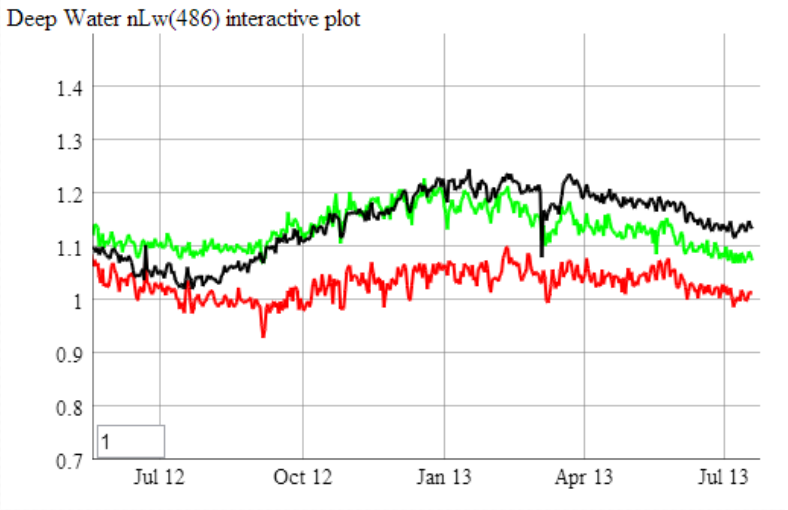
Global deep-water (>1000 m) ocean color EDR monitoring:
chl-a, nLw410, nLw443, nLw486, nLw551 and nLw671

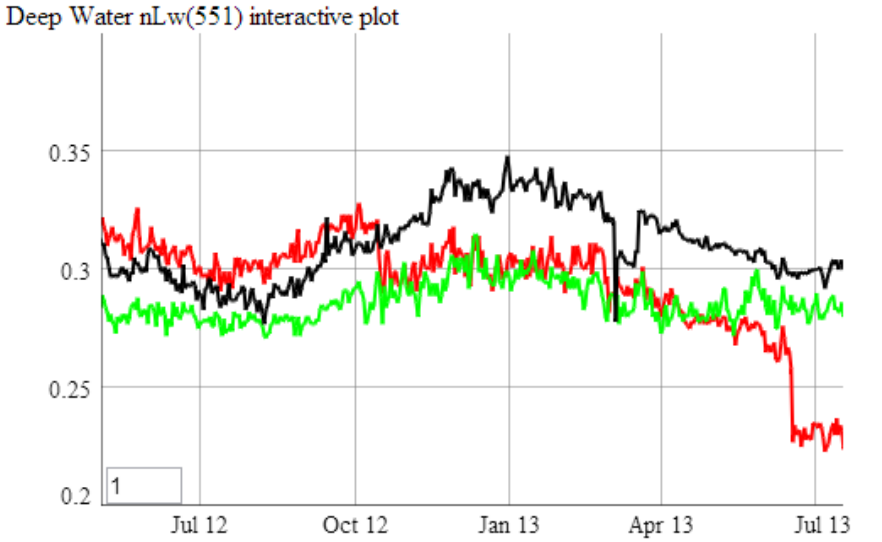


Online interactive plot of global deep-water daily time-series

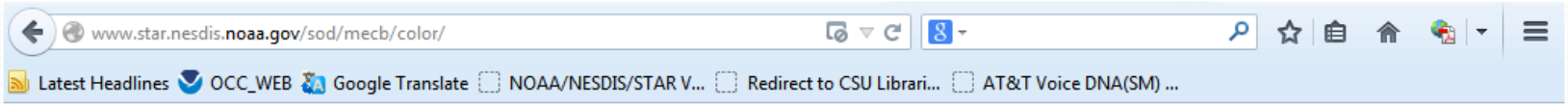








IDPS NOAA-MSL12 MODIS



Welcome to VIIRS Ocean Color EDR Team Web Site

STAR Center for Satellite Applications and Research VIIRS Ocean Color EDR Team

The ocean color research team in the Center for Satellite Applications and Research (STAR) of NOAA/NESDIS seeks to develop improved ocean color products from the current and future ocean color satellite sensors including the Sea-viewing Wide Field-of-view Sensor (SeaWiFS), the Moderate Resolution Imaging Spectroradiometer (MODIS) on the both Terra and Aqua, and the Visible Infrared Imaging Radiometer Suite (VIIRS) on the Suomi National Polar-orbiting Partnership (SNPP) and the Joint Polar Satellite System (JPSS), as well as various satellite sensors from other countries, e.g., the Medium Resolution Imaging Spectrometer (MERIS), Geostationary Ocean Color Imager (GOCI), Ocean Land Colour Instrument (OLCI), Second-Generation Global Imager (SGLI), etc. The ocean color research team is currently focusing on (1) satellite ocean color instrument (e.g., VIIRS, MODIS) characterization and calibration, (2) understanding, evaluation, and refining satellite ocean color data processing system, (3) routine global ocean color data processing from Level-1, Level-2, and Level-3, (4) development and improvement of satellite retrieval algorithms in global open ocean and coastal and inland water regions, (5) in situ data processing, evaluation, and improvement, (6) implementing and transition research algorithms to the NOAA operational data system, and (7) various ocean color data applications in global open ocean and the inland and coastal waters.

Here we show results from VIIRS-SNPP.

Please select the page to visit:

VIIRS EDR Composite Images

Calibration/Validation

Team Publications

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Link to the publication list of the ocean color team

For detailed information about this site, please refer to the descrption pdf file.

Team publications

http://www.star.nesdis.noaa.gov/sod/mecb/color/publication/

Ocean Color Team Publications

Return to EDR Team Home

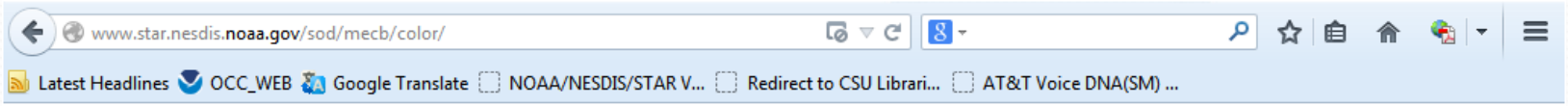
2014

- **Sun, J.**, **M. Wang**, **L. Tan**, and **L. Jiang**, "An efficient approach for VIIRS RDR to SDR data processing", *IEEE Geosci. Remote Sens. Lett.*, **11**, 2037-2041 (2014). doi:10.1109/LGRS.2014.2317553
- **Shi, W.** and **M. Wang**, "Satellite-observed biological variability in the equatorial Pacific during the 2009-2011 ENSO cycle", *Adv. Space Res.*, **54**, 1913-1923 (2014). doi:10.1016/j.asr.2014.07.003
- **Sun, J.**, X. Xiong, Y. Li, S. Madhavan, A. Wu, and B. N. Wenny, "Evaluation of radiometric improvements with electronic crosstalk correction for Terra MODIS band 27", *IEEE Trans. Geosci. Remote Sensing*, **52**, 6497-6507 (2014). doi:10.1109/TGRS.2013.2296747
- Hlaing, S., A. Gilerson, R. Foster, **M. Wang**, R. Arnone, and S. Ahmed, "Radiometric calibration of ocean color satellite sensors using AERONET-OC data", *Opt. Express*, **22**, 23385-23401 (2014). doi:10.1364/OE.22.023385
- **Jiang, L.** and **M. Wang**, "Improved near-infrared ocean reflectance correction algorithm for satellite ocean color data processing", *Opt. Express*, **22**, 21657-21678 (2014). doi:10.1364/OE.22.021657
- **Shi, W.**, **M. Wang**, and W. Guo, "Long-term hydrological changes of the Aral Sea observed by satellites", *J. Geophys. Res. Oceans*, **119**, 3313-3326 (2014). doi:10.1002/2014JC009988
- **Sun, J.**, X. Xiong, A. Angal, H. Chen, A. Wu, and X. Geng, "Time-Dependent Response Versus Scan Angle for MODIS Reflective Solar Bands", *IEEE Trans. Geosci. Remote Sensing*, **52**, 3159-6507 (2014). doi:10.1109/TGRS.2013.2296747
- Doxaran, D., N. Lamquin, Y. J. Park, C. Mazeran, J. H. Ryu, **M. Wang**, and A. Poteau, "Retrieval of the seawater reflectance for suspended solids monitoring in the East China Sea using MODIS, MERIS and GOCI satellite data", *Remote Sens. Environ.*, **146**, 36-48 (2014). doi:10.1016/j.rse.2013.06.020
- **Son, S.**, **M. Wang**, and L. W. Harding Jr., "Satellite-measured net primary production in the Chesapeake Bay", *Remote Sens. Environ.*, **144**, 109-119 (2014). doi:10.1016/j.rse.2014.01.01
- **Shi, W.** and **M. Wang**, "Ocean reflectance spectra at the red, near-infrared, and shortwave infrared from highly turbid waters: A study in the Bohai Sea, Yellow Sea, and East China Sea", *Limnol. Oceanogr.*, **59**, 427-444 (2014). doi:10.4319/lo.2014.59.2.0427
- **Sun, J.**, X. Xiong, S. Madhavan, and B. N. Wenny, "Terra MODIS band 27 electronic crosstalk effect and its removal", *IEEE Trans. Geosci. Remote Sensing*, **52**, 1551-1561 (2014). doi:10.1109/TGRS.2013.2252180

- **Wang, M.**, **S. Son**, **L. Jiang**, and **W. Shi**, "Observation of ocean diurnal variations from the Korean Geostationary Ocean Color Imager (GOCI)", *Proc. SPIE 9111, Ocean Sensing and Monitoring VI*, 911102 (23 May, 2014). doi:10.1117/12.2053476
- **Naik, P.** and **M. Wang**, "Evaluation of in-situ radiometric data processing for calibration and validation of satellite ocean color remote sensing", *Proc. SPIE 9111, Ocean Sensing and Monitoring VI*, 911108 (23 May, 2014). doi:10.1117/12.2053457
- Tong, D., H. Lei, L. Pan, T. Chai, H. Kim, P. Lee, R. Saylor, **M. Wang**, and S. Kondragunta, "Assimilation of satellite oceanic and atmospheric products to improve emission forecasting", *Springer Proceedings in Complexity, Air Pollution Modeling and its Application XXIII*, D. Steyn and R. Mathur (Eds.), pp.563-569, 28 March, 2014, Springer International Publishing Switzerland. doi:10.1007/978-3-319-04379-1_93

2013

- Hlaing, S., T. Harmel, A. Gilerson, R. Foster, A. Weidemann, R. Arnone, **M. Wang**, and S. Ahmed, "Evaluation of the VIIRS ocean color monitoring performance in coastal regions", *Remote Sens. Environ.*, **139**, 398-414 (2013). doi:10.1016/j.rse.2013.08.013



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Internal composite images

- Includes additional images not available on the public page for internal use
- **Additional sources:**

  MSL12-TEST: NOAA-MSL12 with various modifications in evaluation
- **Additional evaluation products for NOAA-MSL12:**

  1) Aerosol Optical Thickness (AOT) at 862nm (IDPS: no; MODISA: yes)

  2) Angstrom exponent at 551nm (443nm for MODISA) relative to 862nm (IDPS: no; MODISA yes)

  3) More products to be added
- **Regional images:**

  1) Alaska; 2) Amazon River; 3) Great Lakes; 4) GOM & Carribean;

  5) La Plata River; 6) Mediterranean Sea; 7) North Sea; 8) U.S. East Coast

  9) U.S West Coast; 10) Western Pacific; 11) American Samoa; 12) Hawaii;

  13) Great Barrier Reef; 14) Puerto Rico; 15) More regions to be added
- **True color regional images**

VIIRS Level-3 Ocean Color Images

STAR Center for Satellite Applications and Research — VIIRS Ocean Color EDR Team

VIIRS: True Color | MODIS: Chlorophyll-a | Region: Puerto Rico | October | 2014 | < | > | Return to EDR Team Home

use viewer

NOAA-MSL12

CLM	MON	8d1	8d2	8d3	8d4	
SUN	MON	TUE	WED	THU	FRI	SAT
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

MSL12-SWIR

CLM	MON	8d1	8d2	8d3	8d4
SUN	MON	TUE	WED	THU	FRI
			1	2	3
5	6	7	8	9	10
12	13	14	15	16	17
19	20	21	22	23	24
26	27	28	29	30	31

IDPS

CLM	MON	8d1	8d2	8d3	8d4	
SUN	MON	TUE	WED	THU	FRI	SAT
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

MODIS-AQUA

CLM	MON	8d1	8d2	8d3	8d4
SUN	MON	TUE	WED	THU	FRI
			1	2	3
5	6	7	8	9	10
12	13	14	15	16	17
19	20	21	22	23	24
26	27	28	29	30	31

Note:
1. Products before Feb.6, 2012 are not reliable or usable due to VIIRS instrument calibra
2. The VIIRS nominal center wavelengths (different from pre-defined product name) are M1:410, M2:443, M3:486, M4:551, M5:671, M6:745, M7:862, M8:1238, M10:1610,
3. The MSL12-SWIR processing uses M8 and M10 as the two atmospheric correction ba

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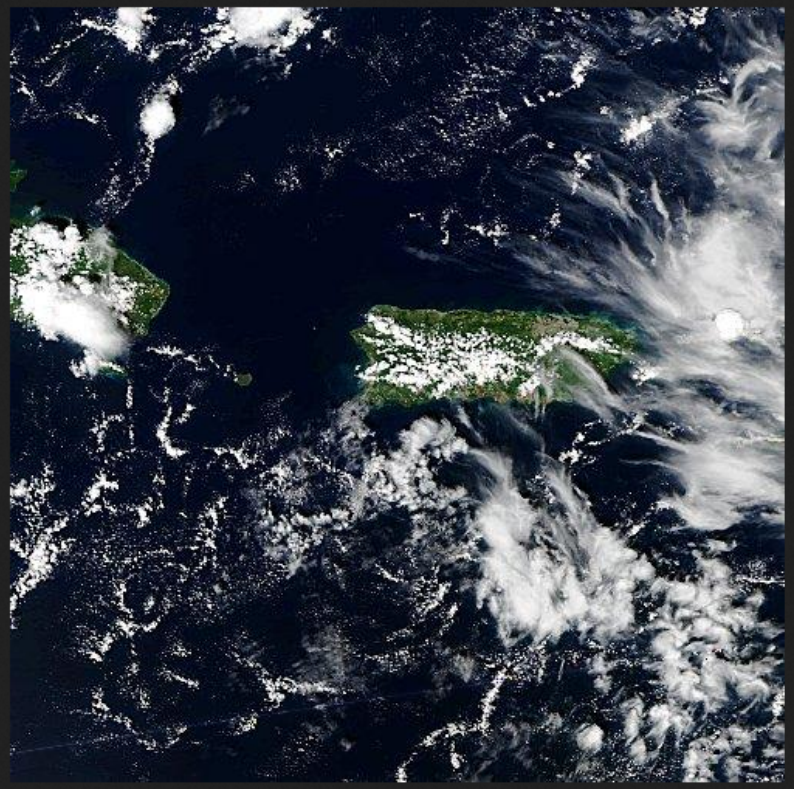
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