



Ocean Color EDR Feedback

Impacts of Recent VIIRS F-table Trends on Ocean Color Products

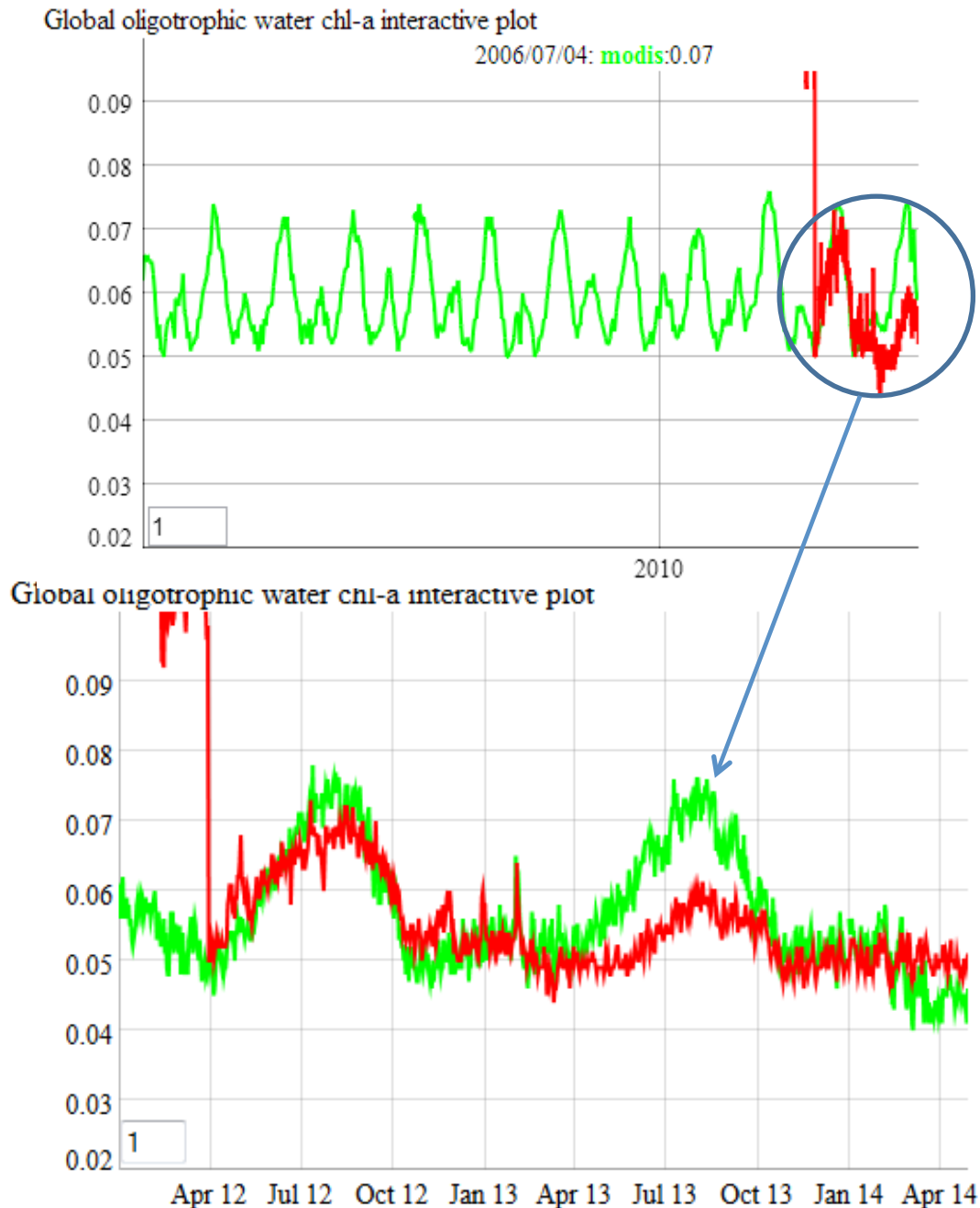
Menghua Wang

VIIRS Ocean Color Team

13 May 2014



The Existing VIIRS Calibration Issue



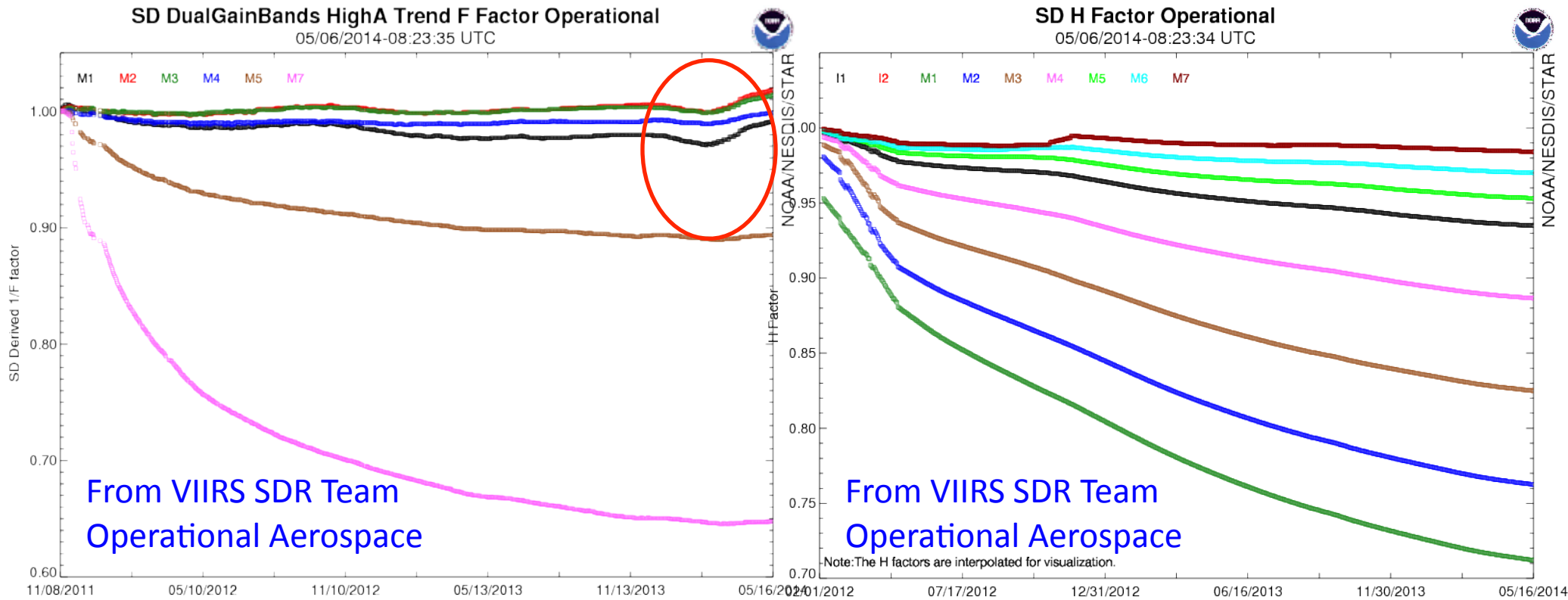
MODIS-Aqua global oligotrophic water Chl-a from 2002 to 2013 (green), overplotted with VIIRS data from 2012 to 2013 (red)

— MODIS-Aqua

— VIIRS (NOAA-MSL12)

- VIIRS and MODIS-Aqua match each other quite well in 2012.
- They have noticeable difference in 2013 (biased low from VIIRS).
- Since MODIS-Aqua has a reasonable Chl-a annual repeatability, It is confirmed that VIIRS SDR has calibration issues, in particular, for the M4 (551 nm) band (**biased low**), at least for 2013.

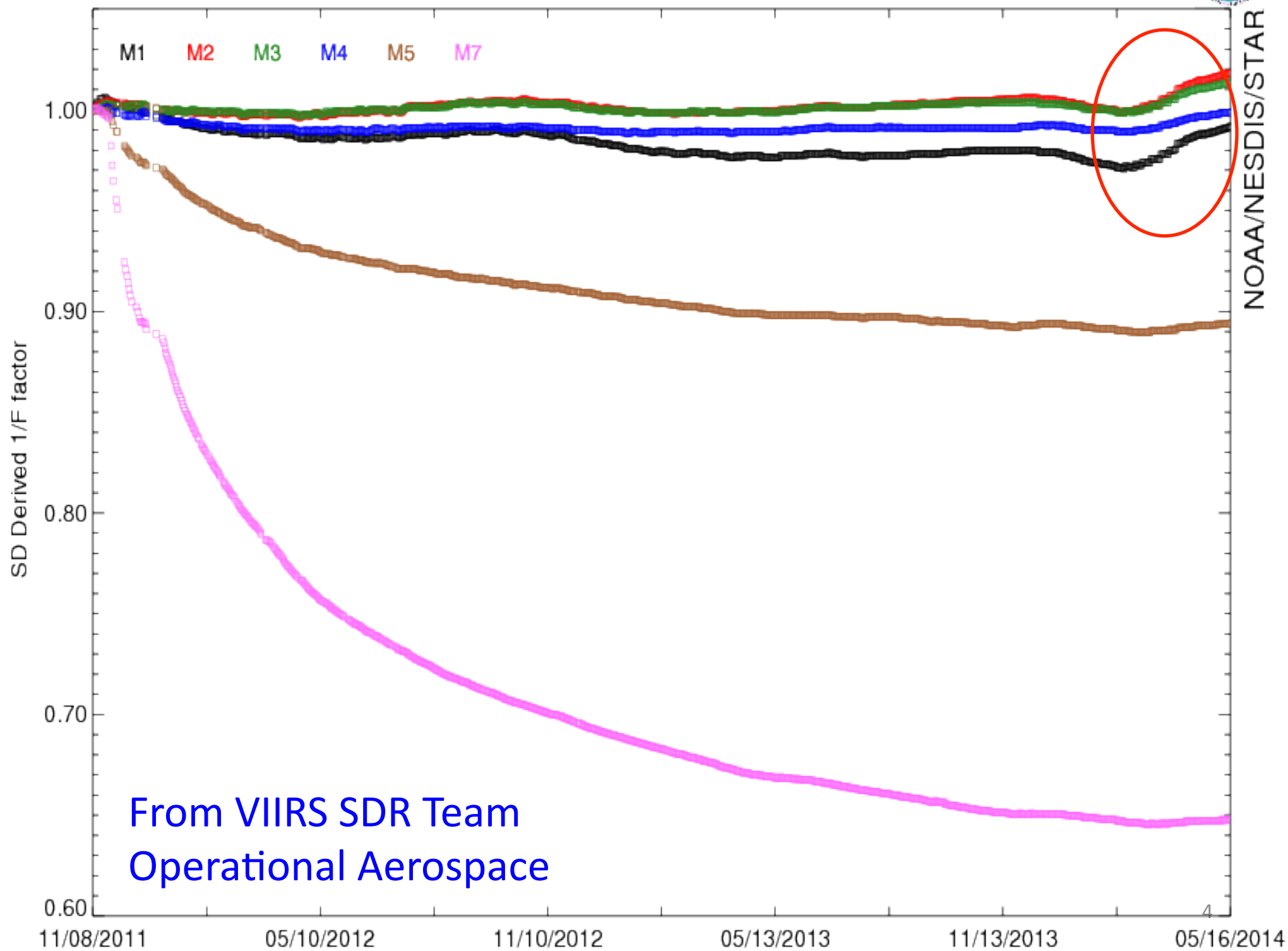
Recent Operational RSB H&F Factors Trends



- Recent F-factors ($1/F$) show significant trend change which suggests that degradation has stopped or even reversed.
- F-lookup tables for M1-M4 show significant increase of $\sim 1\text{-}2\%$ since early February. F factors for M1 and M2 increased $\sim 2\%$ in 3 months.
- Thus, calibration gains are decreased by $\sim 2\%$ for M1 and M2.

SD DualGainBands HighA Trend F Factor Operational

05/06/2014-08:23:35 UTC

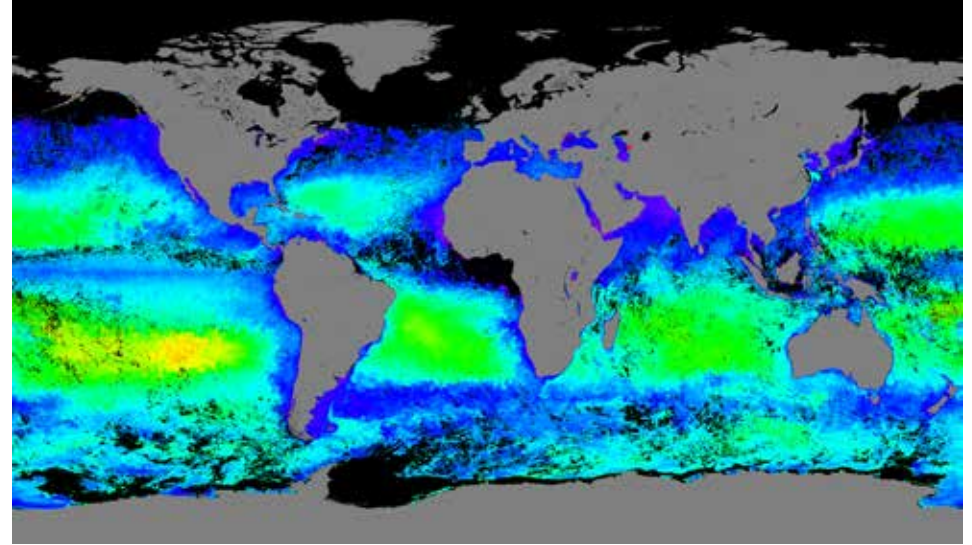
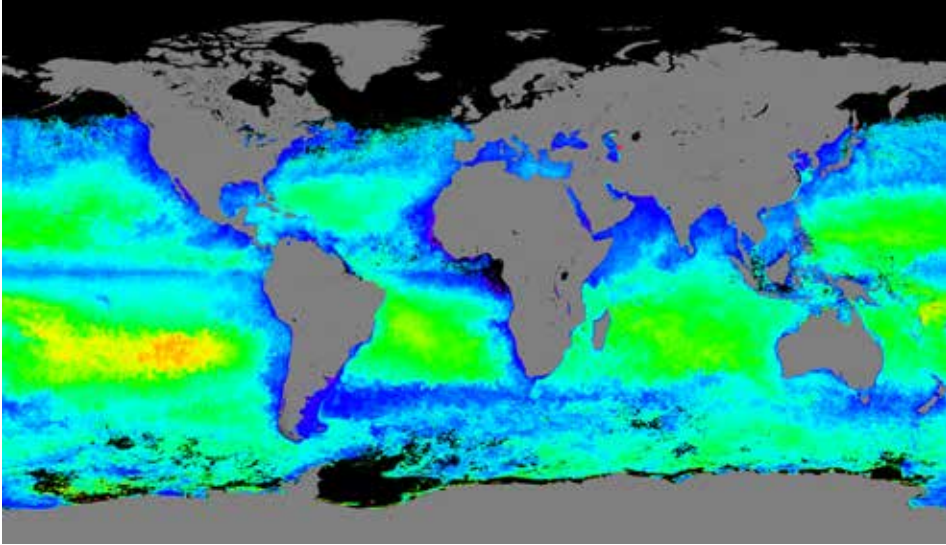


Global OC nLw since February 2014

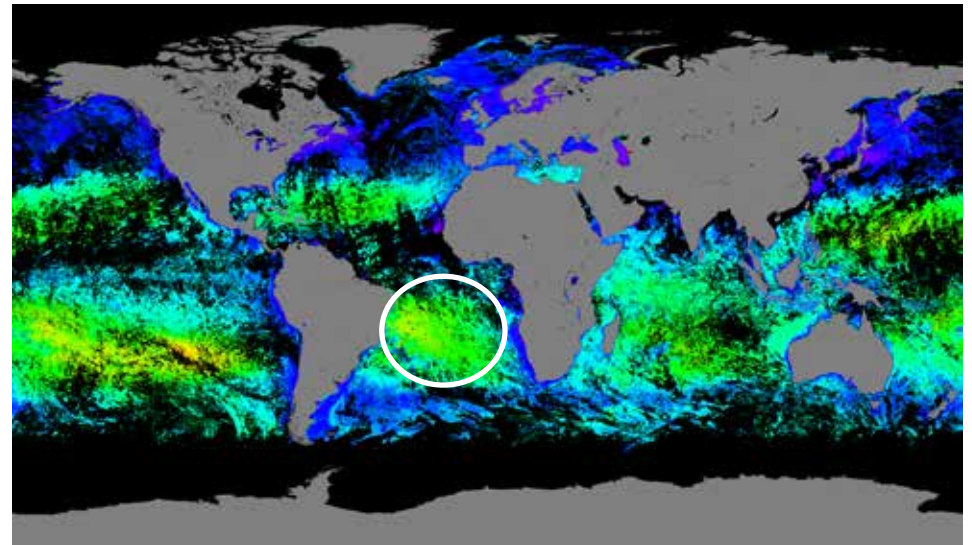
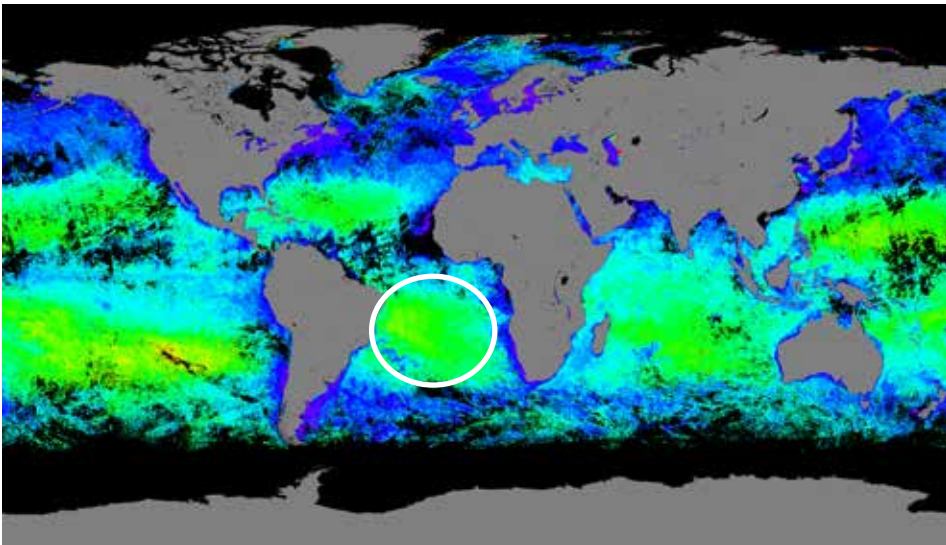
VIIRS nLw(410)

MODIS nLw(412)

January 2014



3rd Week of April 2014



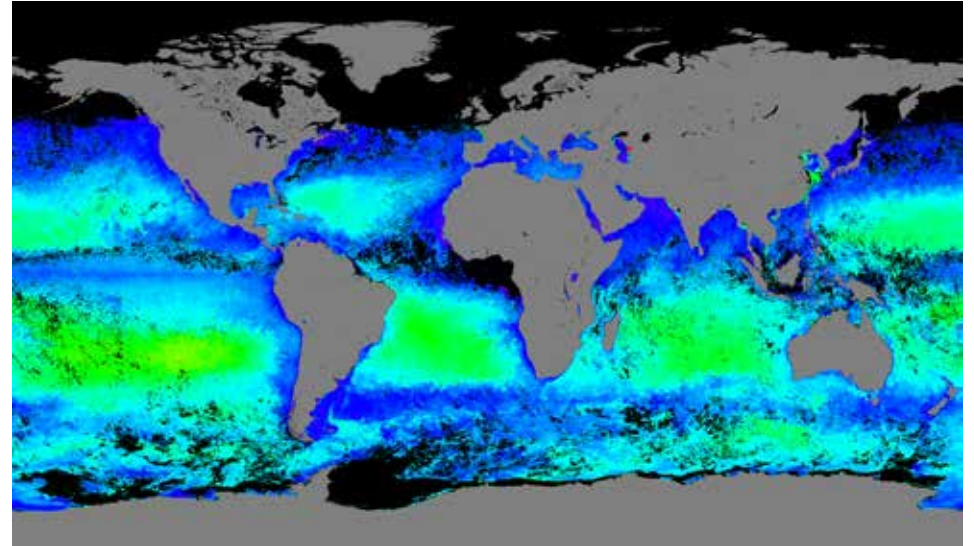
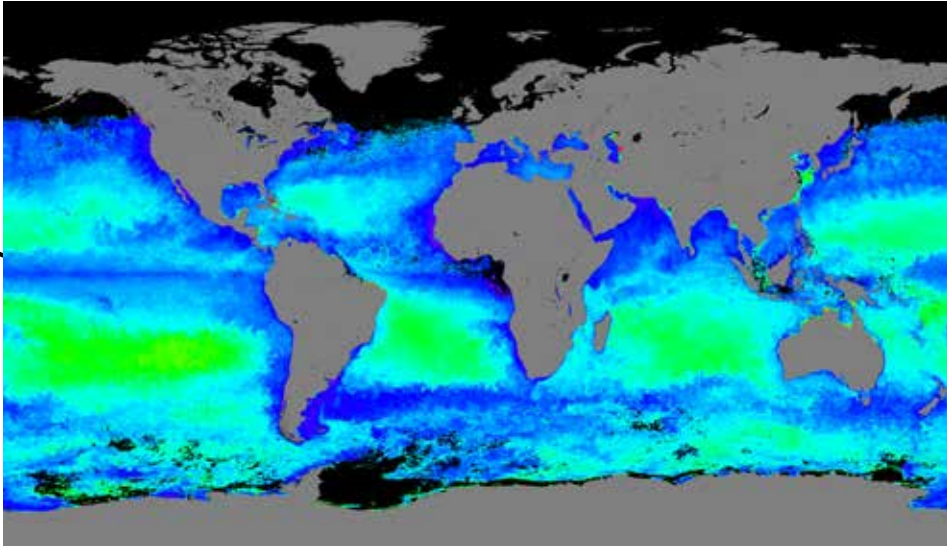
VIIRS data were generated using **NOAA-MSL12**

Global OC nLw since February 2014

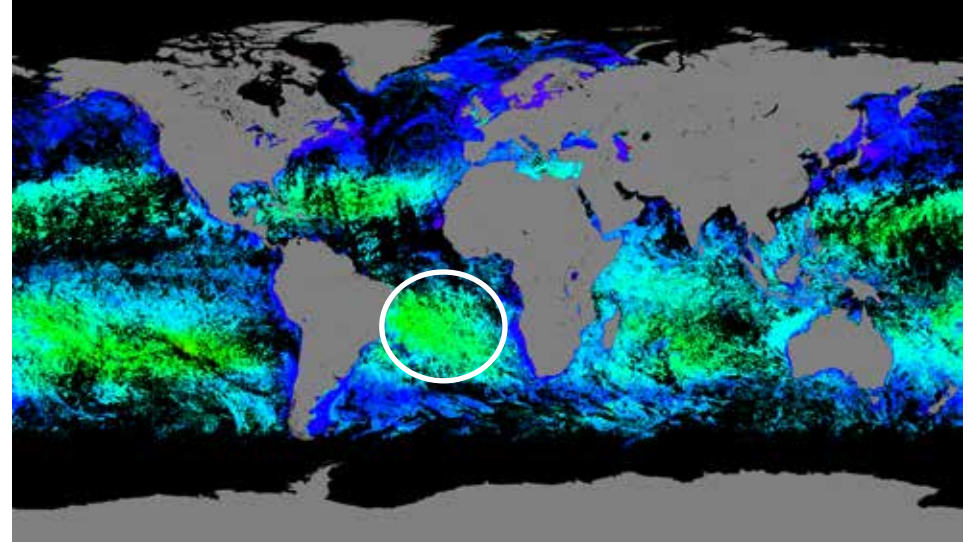
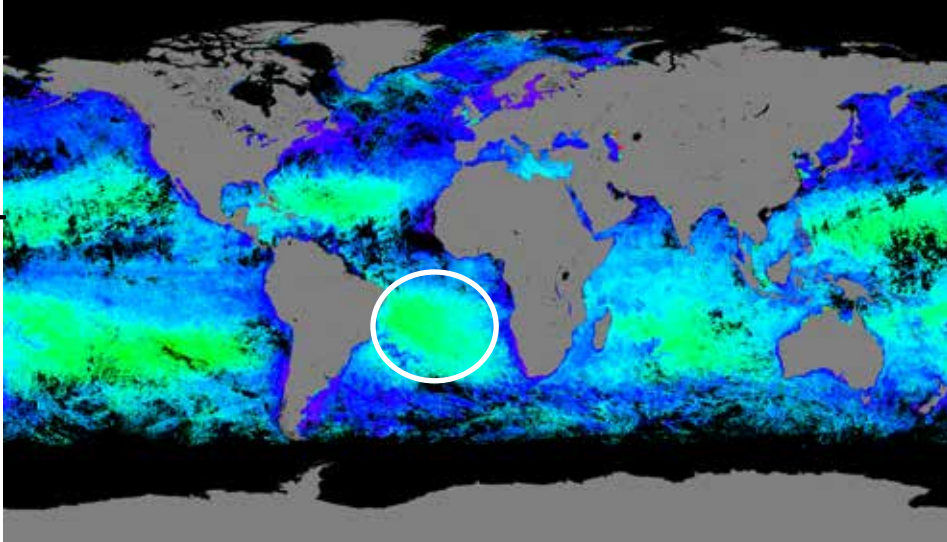
VIIRS nLw(443)

MODIS nLw(443)

January 2014



3rd Week of April 2014



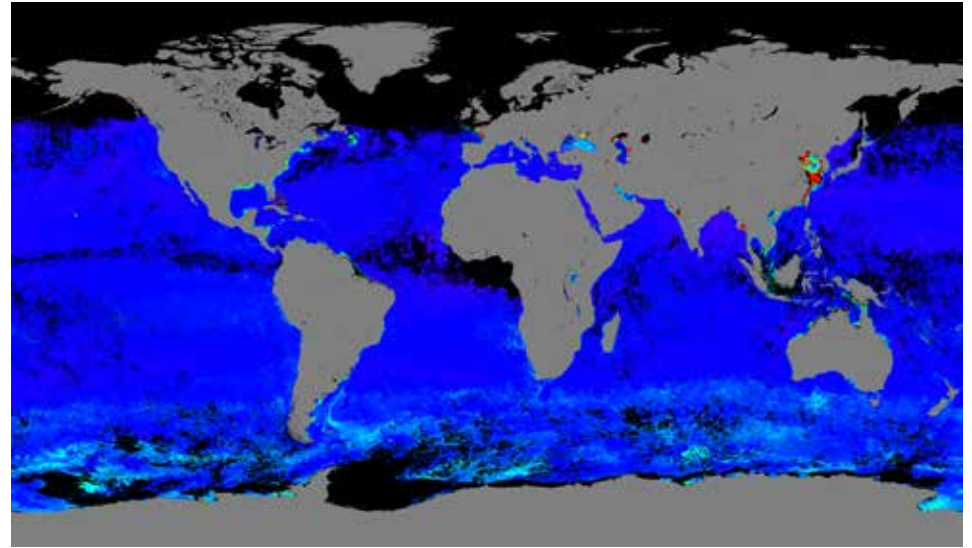
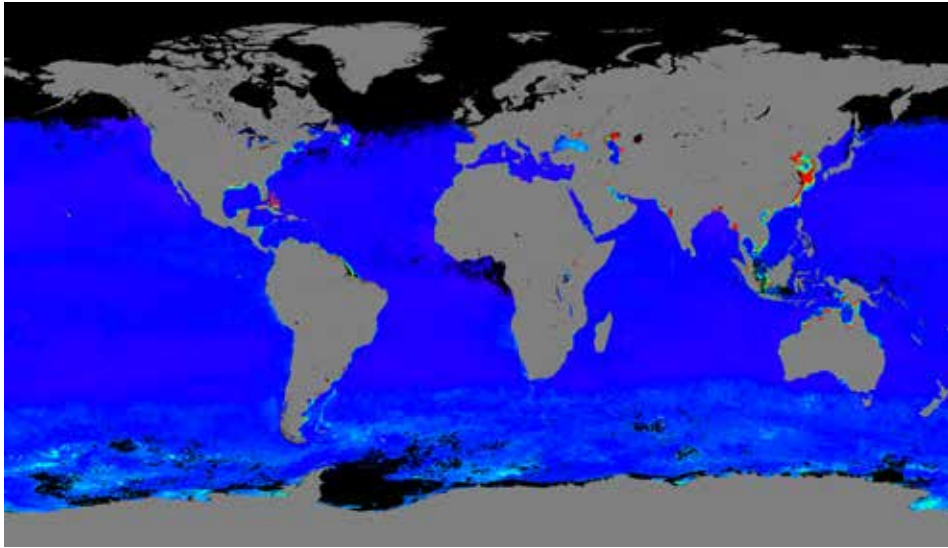
VIIRS data were generated using **NOAA-MSL12**

Global OC nL_w since February 2014

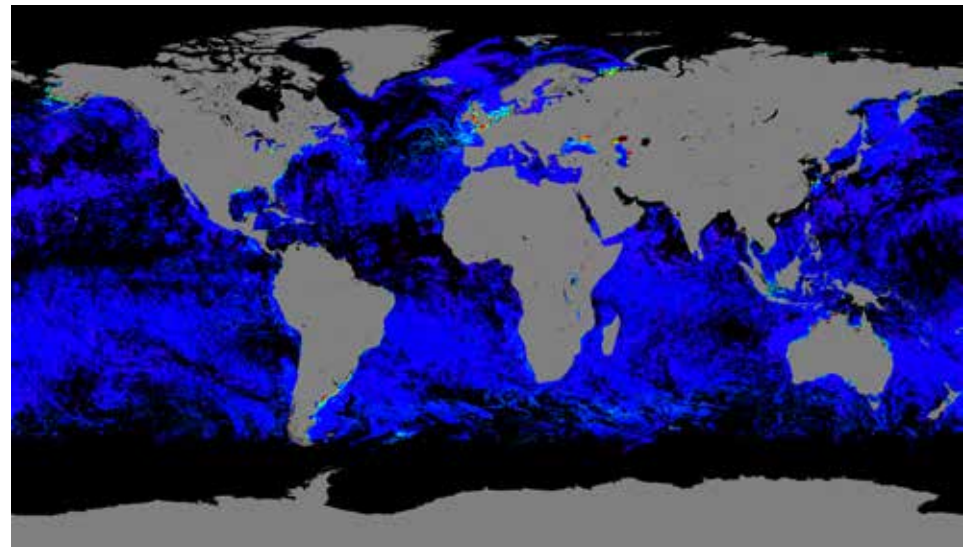
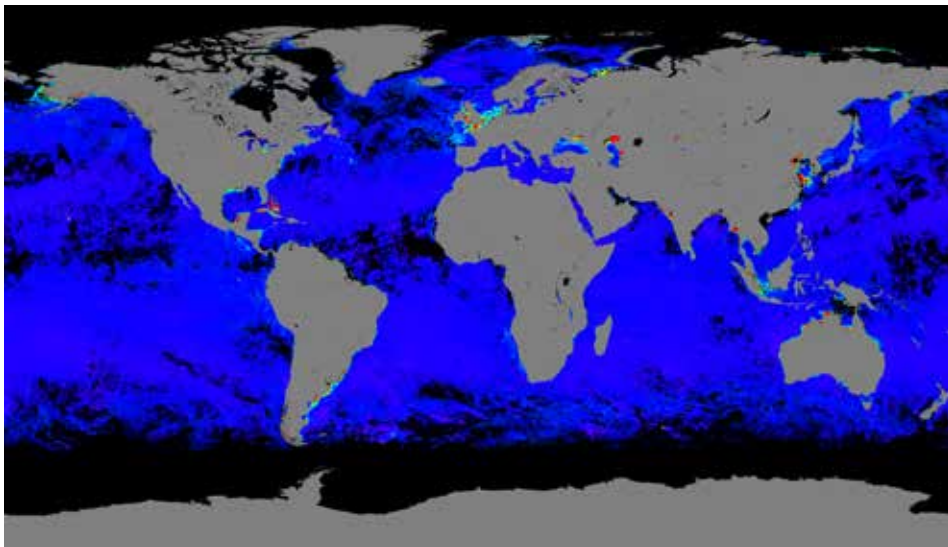
VIIRS $nL_w(551)$

MODIS $nL_w(551)$

January 2014

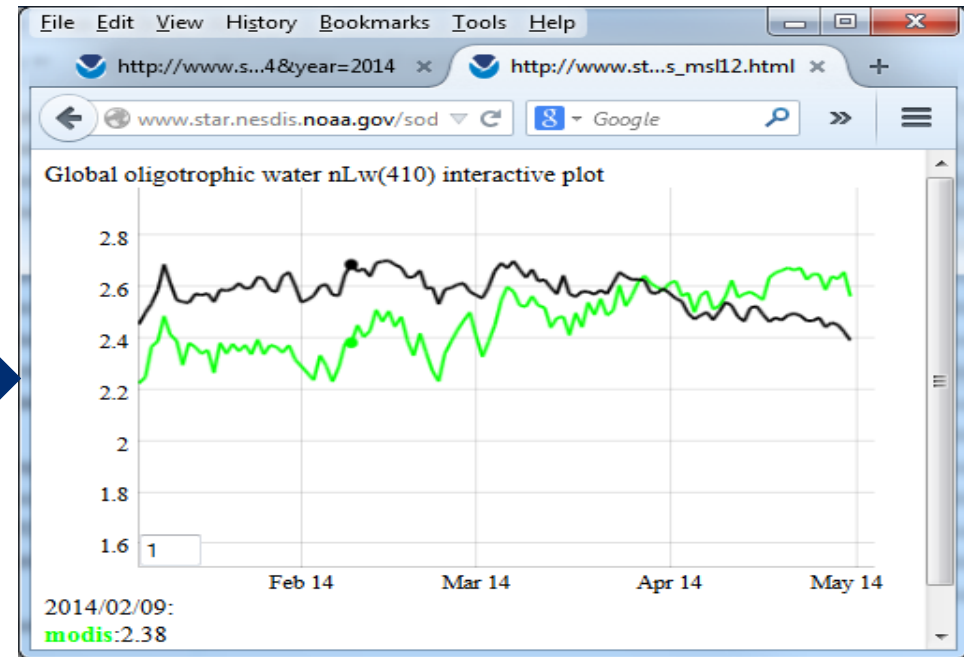
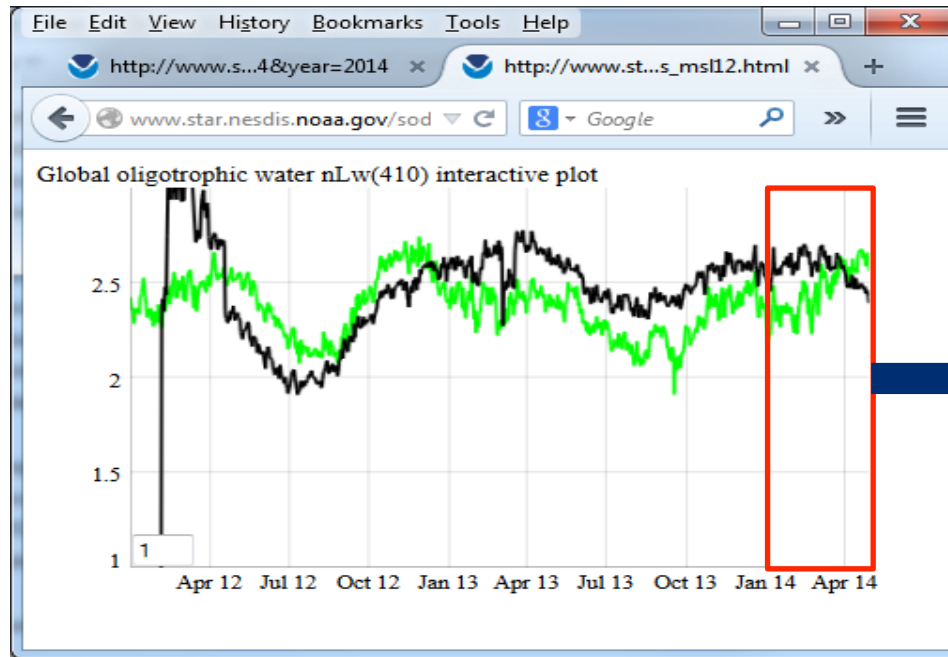


3rd Week of April 2014

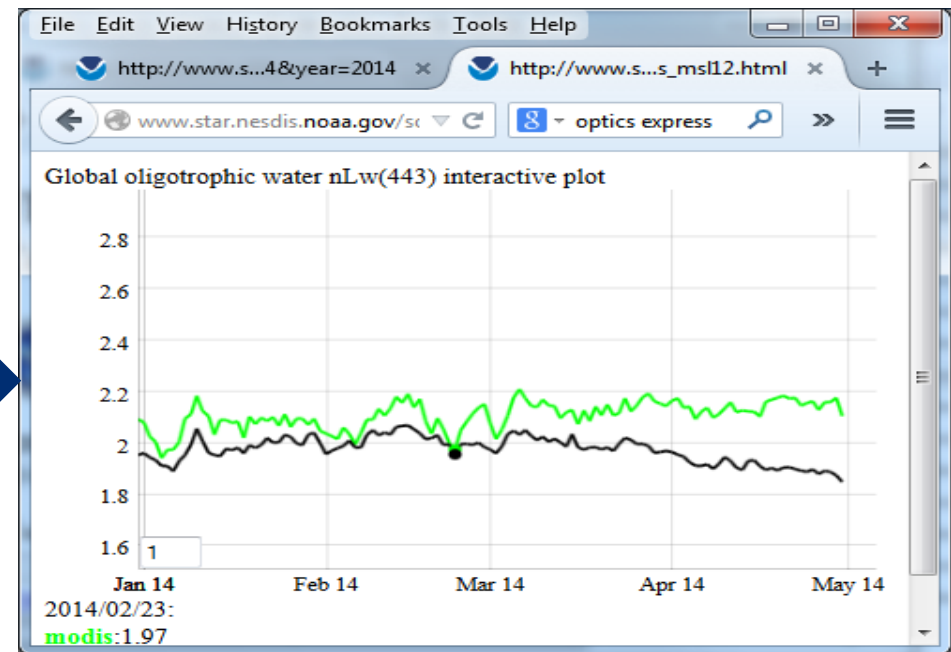
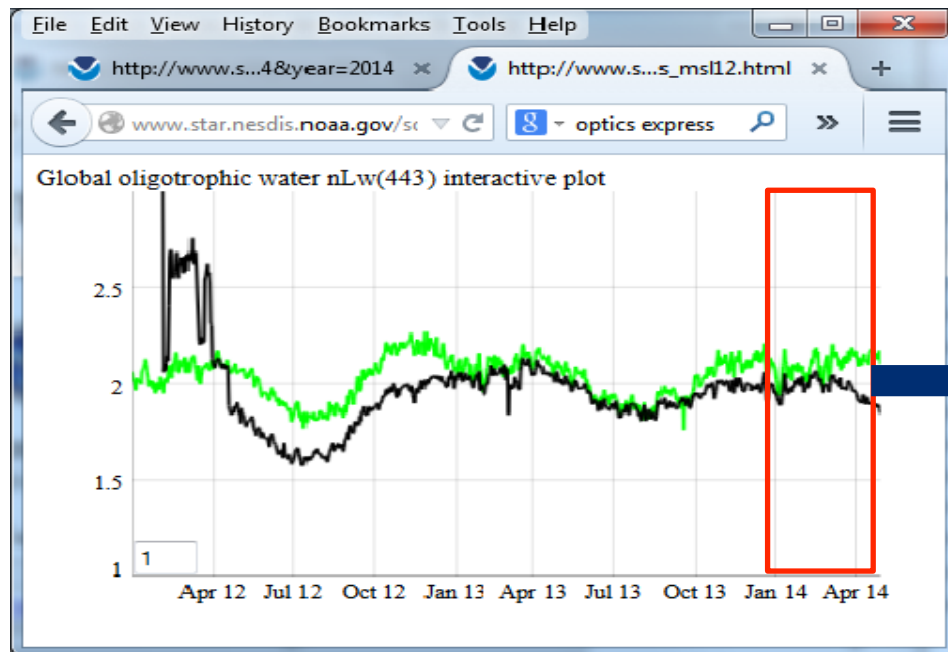


Quantitative Evaluation for Global Oligotrophic Waters

VIIRS vs. MODIS nLw(412)

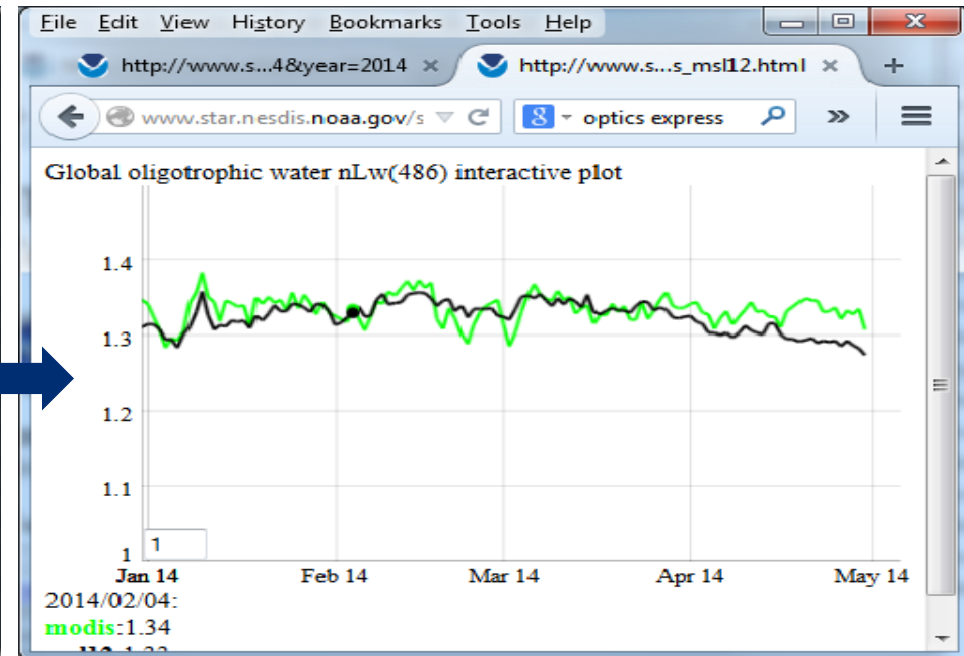
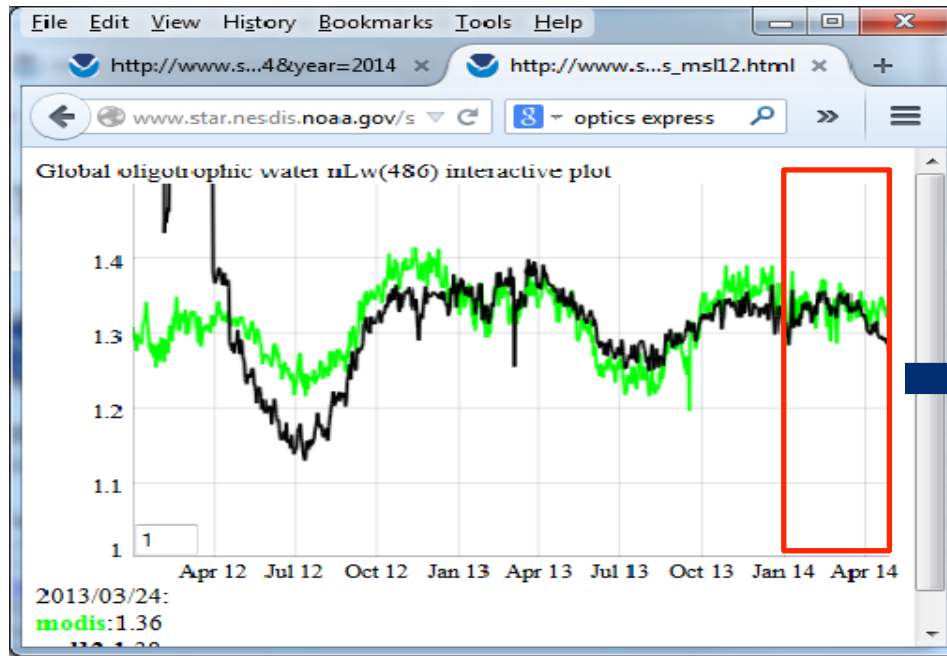


VIIRS vs. MODIS nLw(443)

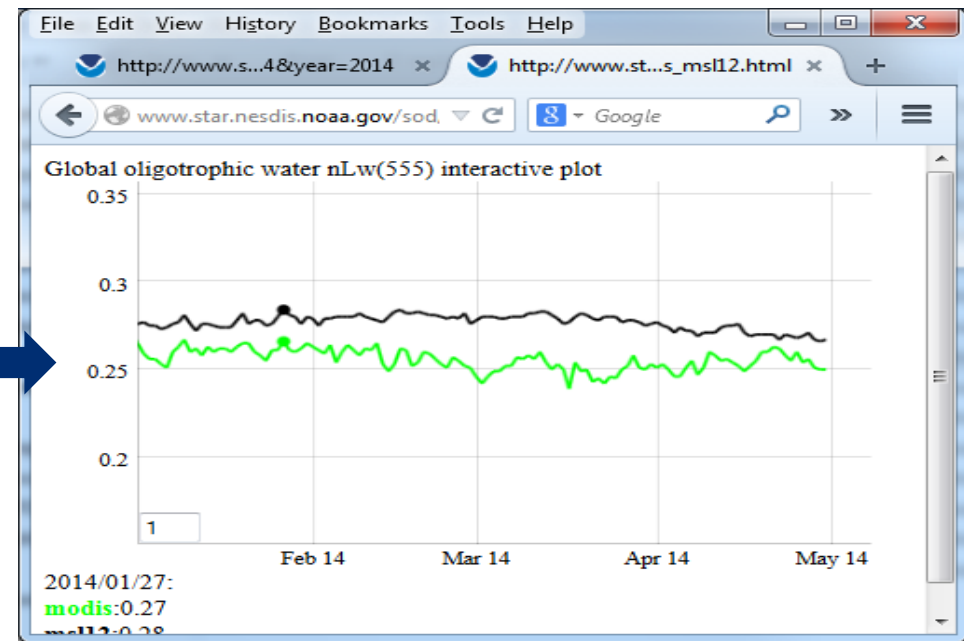
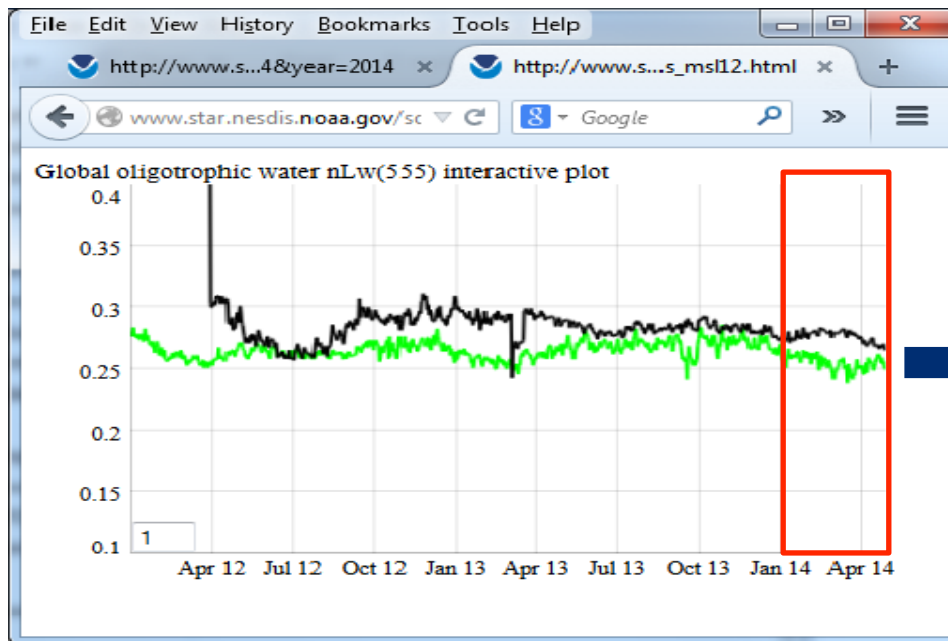


Quantitative Evaluation for Global Oligotrophic Waters

VIIRS vs. MODIS nLw(488)

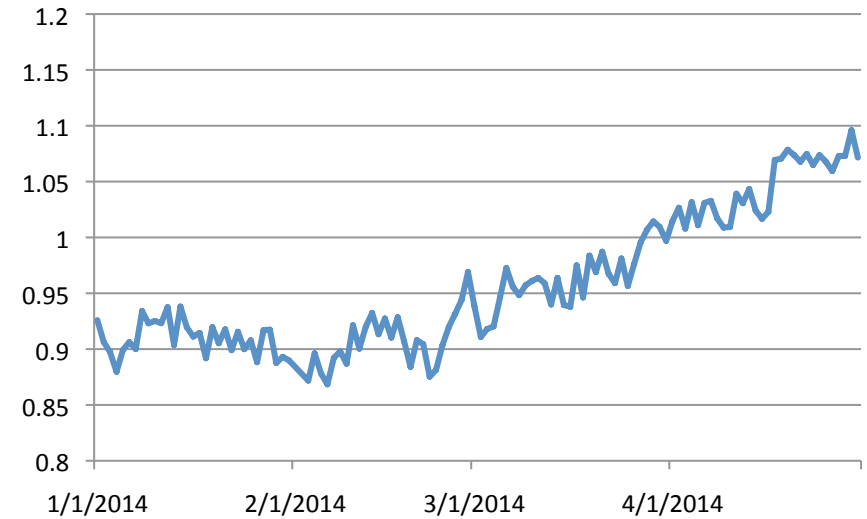
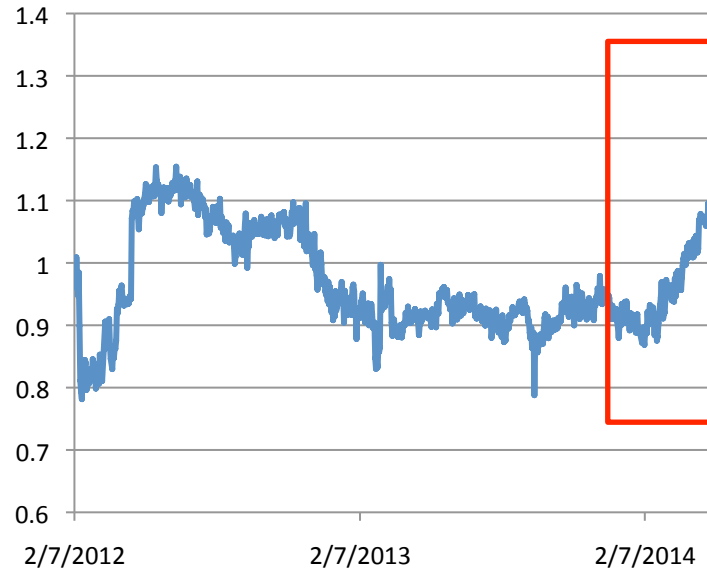


VIIRS vs. MODIS nLw(551)

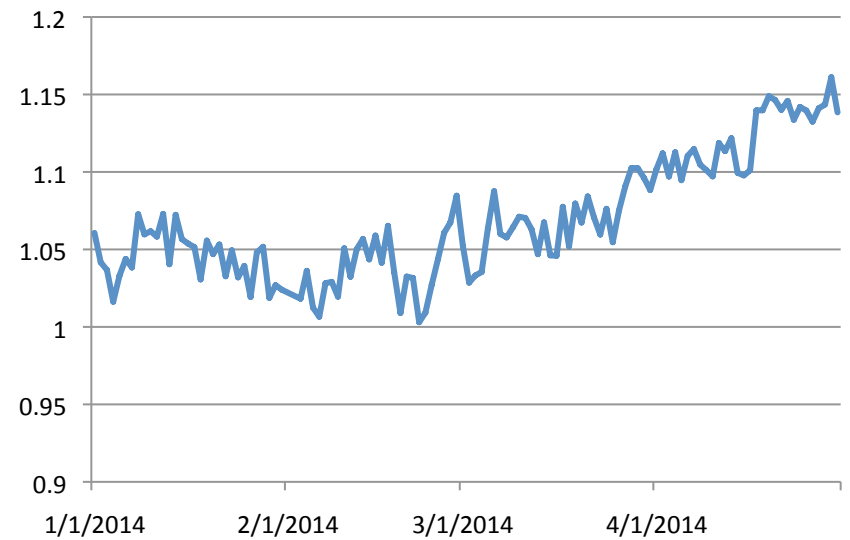
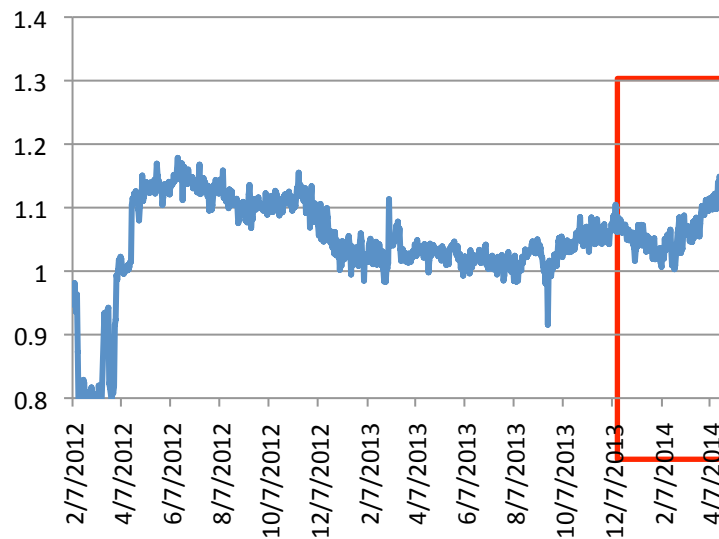


nLw Ratio (MODIS/VIIRS) for Global Oligotrophic Waters

MODIS/VIIRS nLw(412)

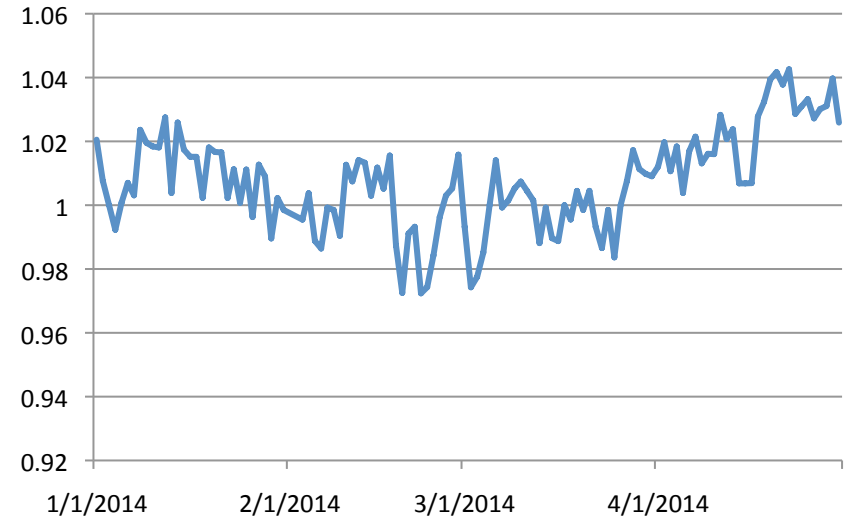
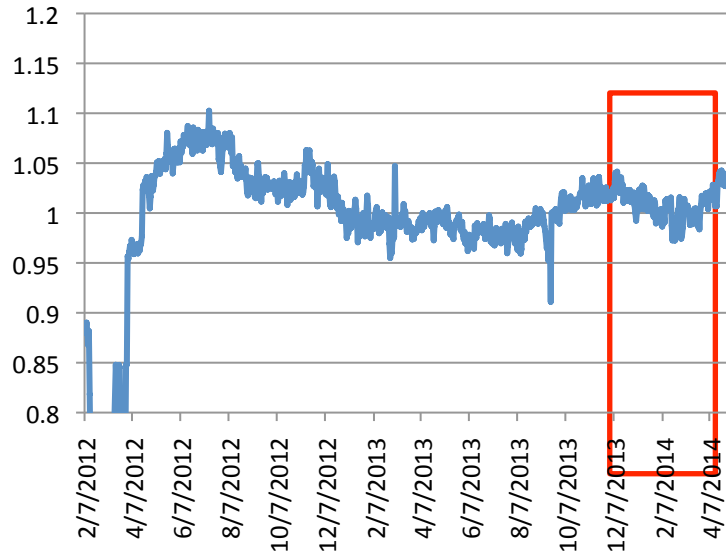


MODIS/VIIRS nLw(443)

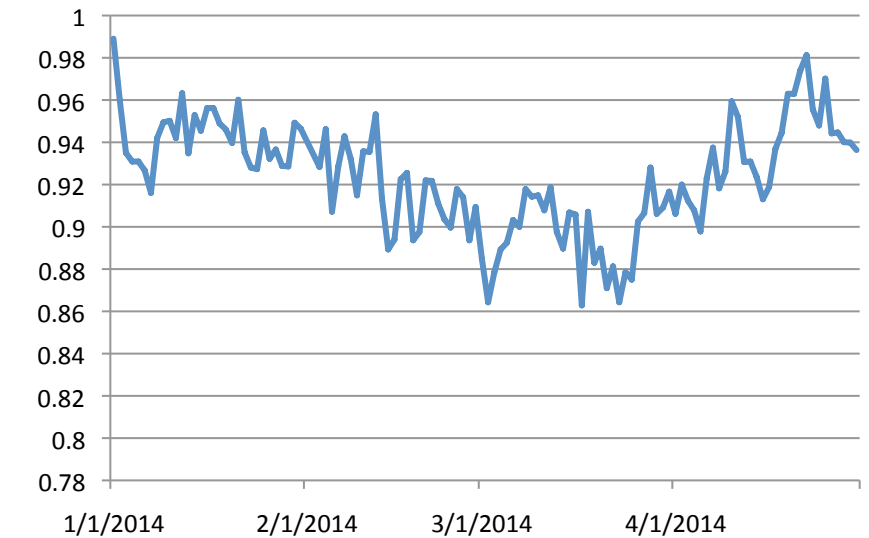
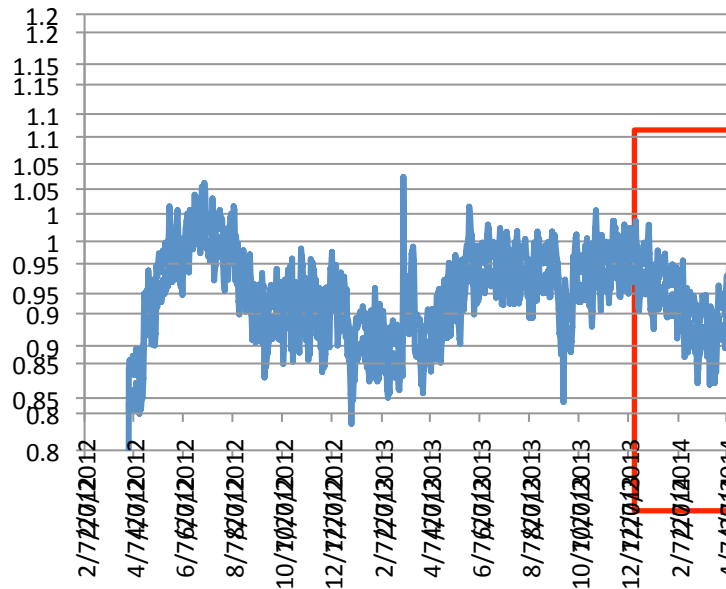


nLw Ratio (MODIS/VIIRS) for Global Oligotrophic Waters

MODIS/VIIRS nLw(488)

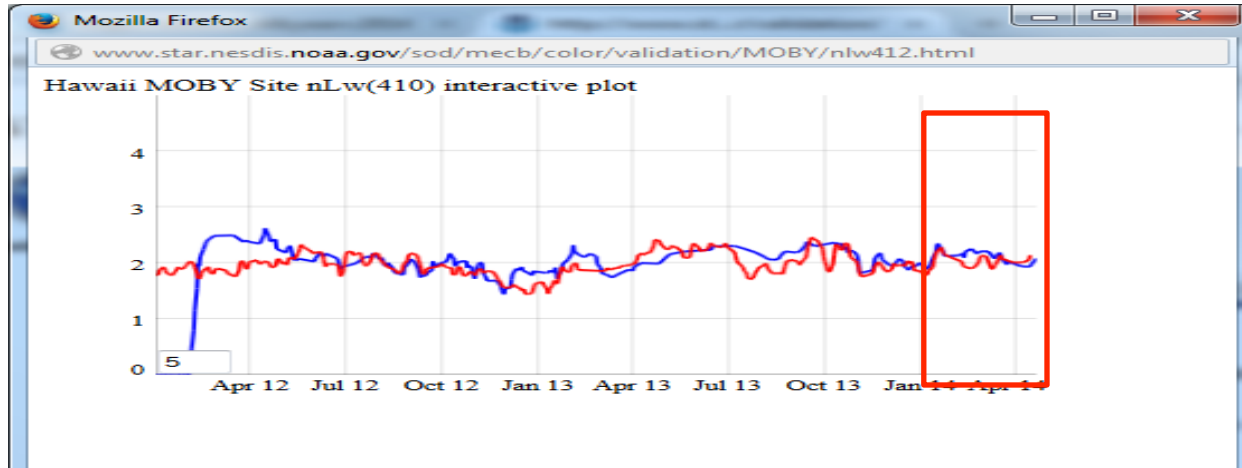


MODIS/VIIRS nLw(551)

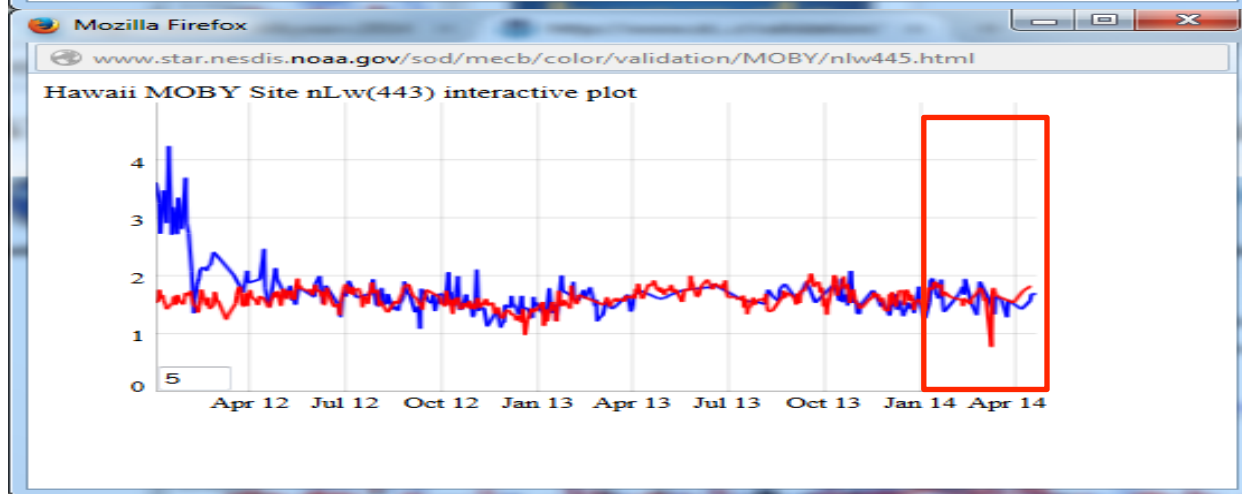


Compare with MOBY In Situ Data

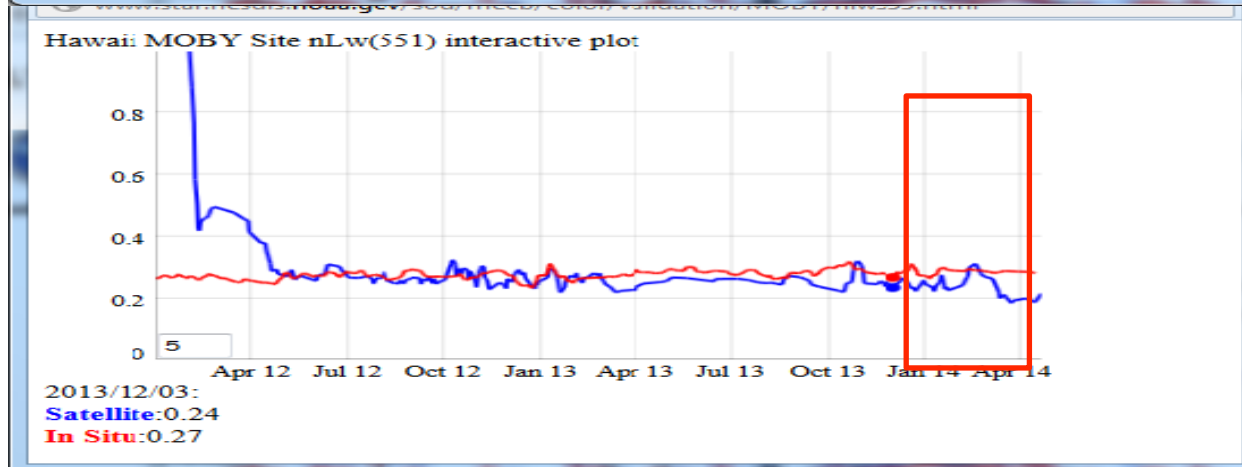
VIIRS nLw(410)



VIIRS nLw(443)

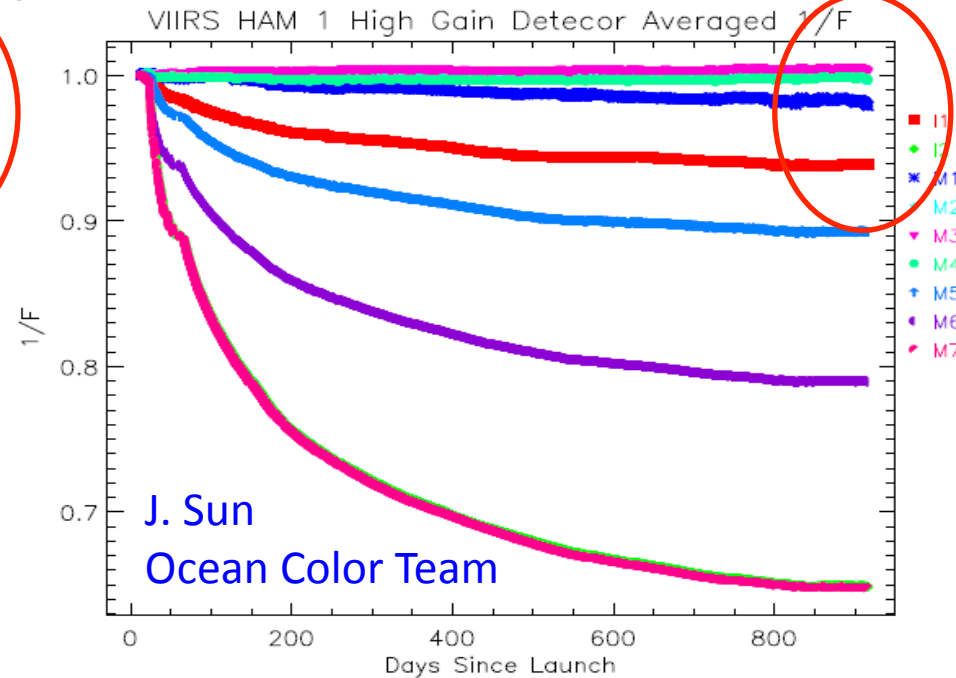
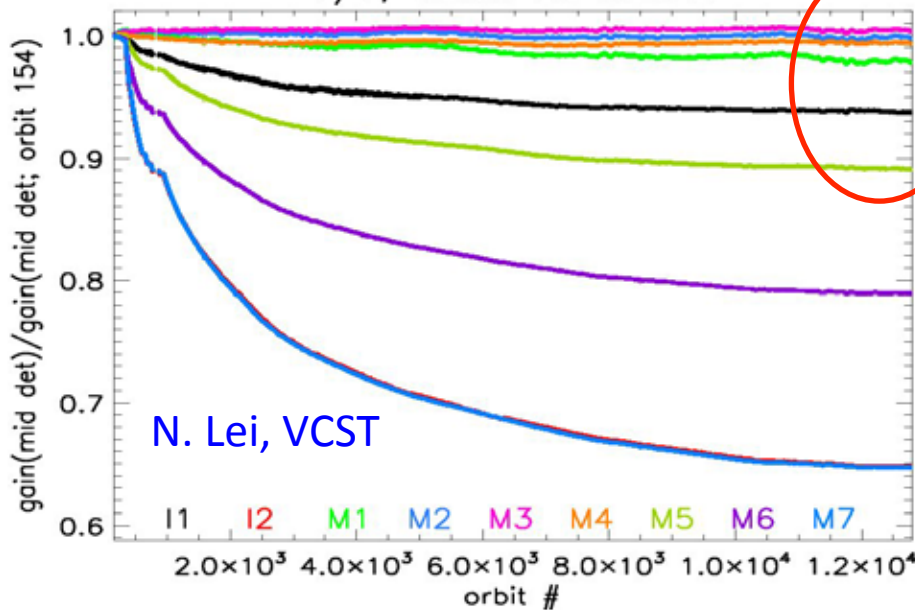
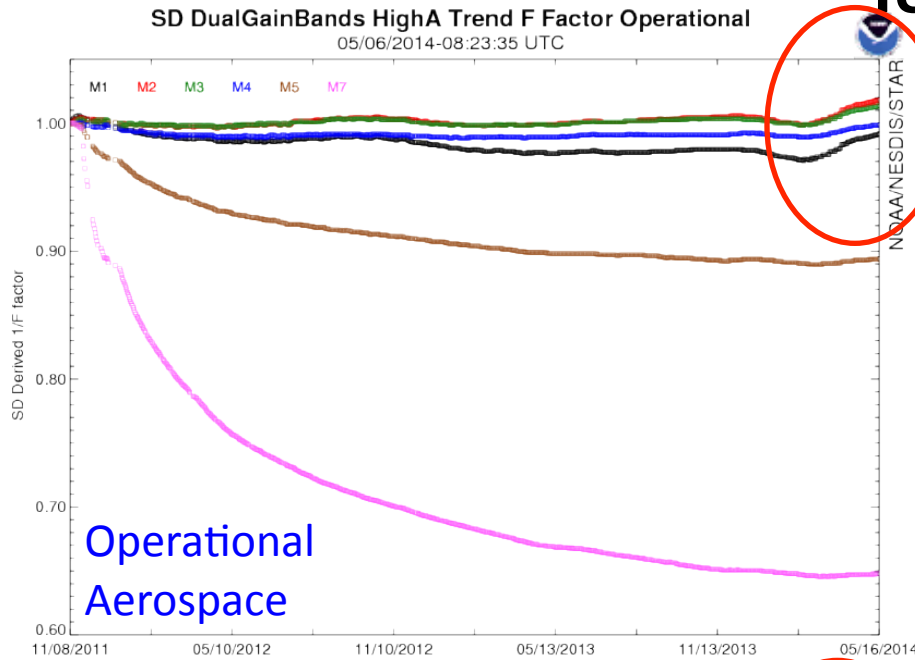


VIIRS nLw(551)



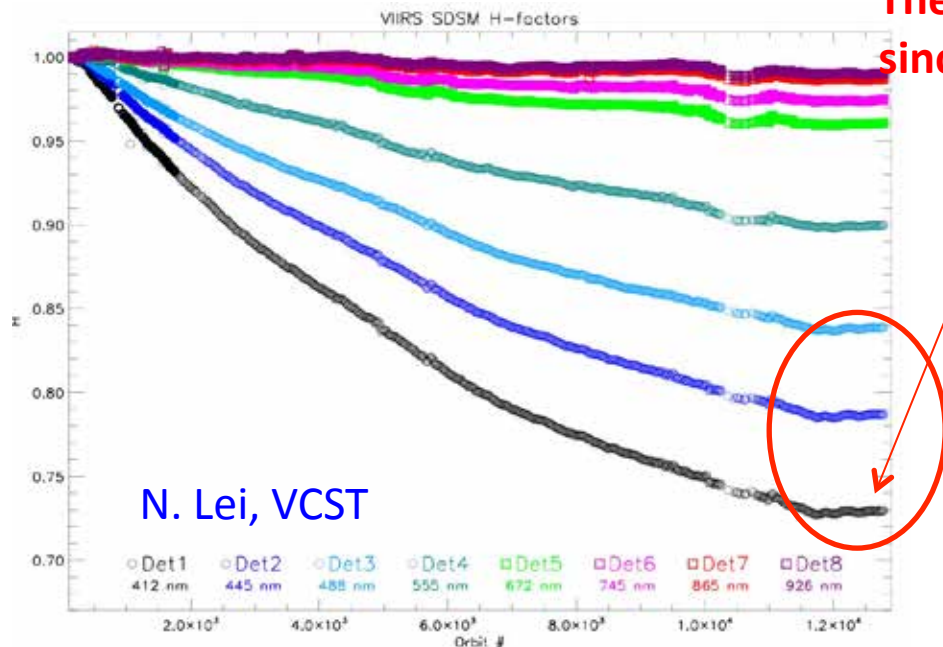
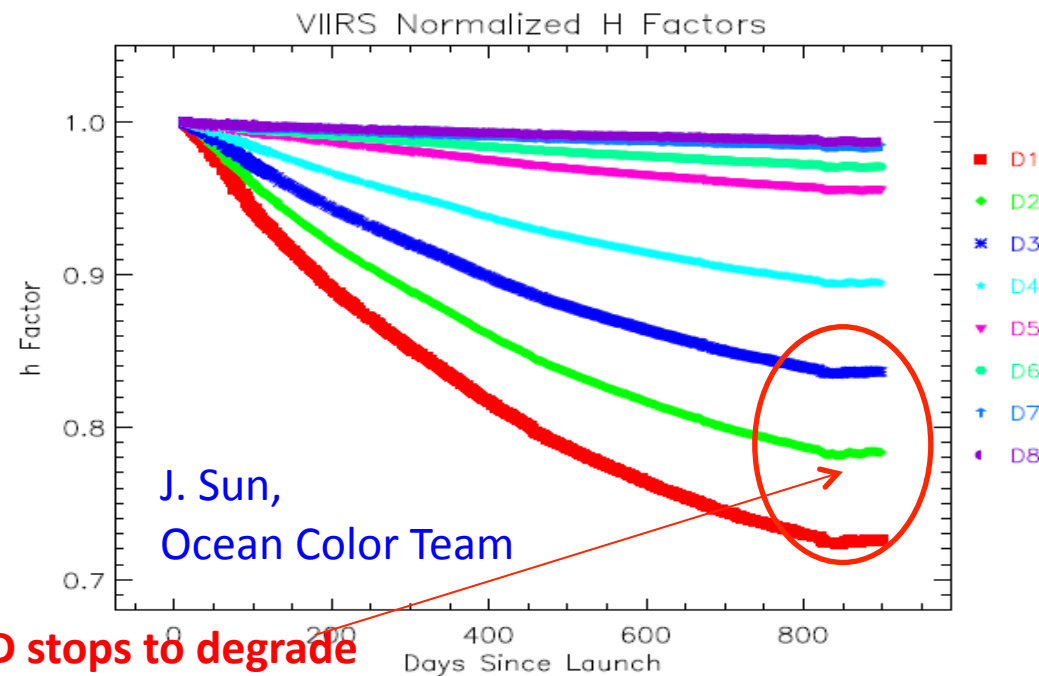
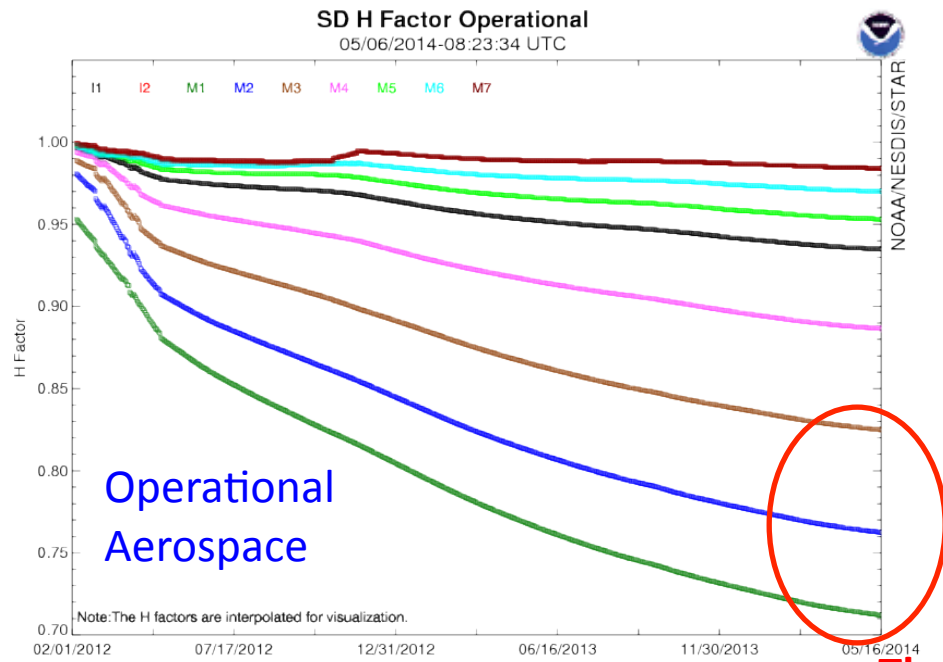
F factors from Operational, VCST, and Ocean Color EDR

Team



- The recently F-factors ($1/F$) increase (Cal. gains decrease) in short wavelength bands observed in operational F-LUTs is not seen in F factors derived by Ocean Color Team and VCST.
- The artificial F-factors increase lead to the EV radiance/reflectance decrease and significantly impacted VIIRS ocean ocean products, leading to biased low nLw values and missing values due to $nLw < 0$.

H factors from Operational, VCST, and Ocean Color EDR Team



The SD stops to degrade
since Feb. 2014

- The operational H-LUTs do not reflect the recent SD degradation rate change.
- The artifacts in SD degradation in the operational H-LUTs induced the artifacts in gain decrease or increase of the F-factors in the operational F-LUTs.
- The artifact of increase in the F-factors then induces the EV radiance/reflectance decrease.

Summary

- Following the reverse trends of VIIRS SDR F-LUTs, global VIIRS nLw data show decreasing trends from February to May. Using MODIS-Aqua as reference, nLw(410) (M1) and nLw(443) (M2) drifted lower ~**15-20%** as of early May 2014, and nLw(488) (M3) decreased ~**8-10%** for global oligotrophic waters. There also may be some effect to nLw(551) (M4).
- We do not see above nLw trends at MOBY site between February and May, this can be attributed to the lack of the MOBY in-situ data in this period.
- The recently operational F factors increase trends (Cal gains decrease) in short wavelength bands is not seen in F factors derived by VCST and VIIRS Ocean Color Team.
- Operational H-LUTs do not reflect the recent SD degradation rate change. Artificial SD degradation in the operational H-LUTs induced the artificial gain decrease (or increase of the F-factors) in the operational F-LUTs, and consequently leads to biased-low ocean color nLw retrievals since February 2014. The impact to OC products is quite significant. **The correct F-LUTs should be used now.**