The VIIRS SDR Review

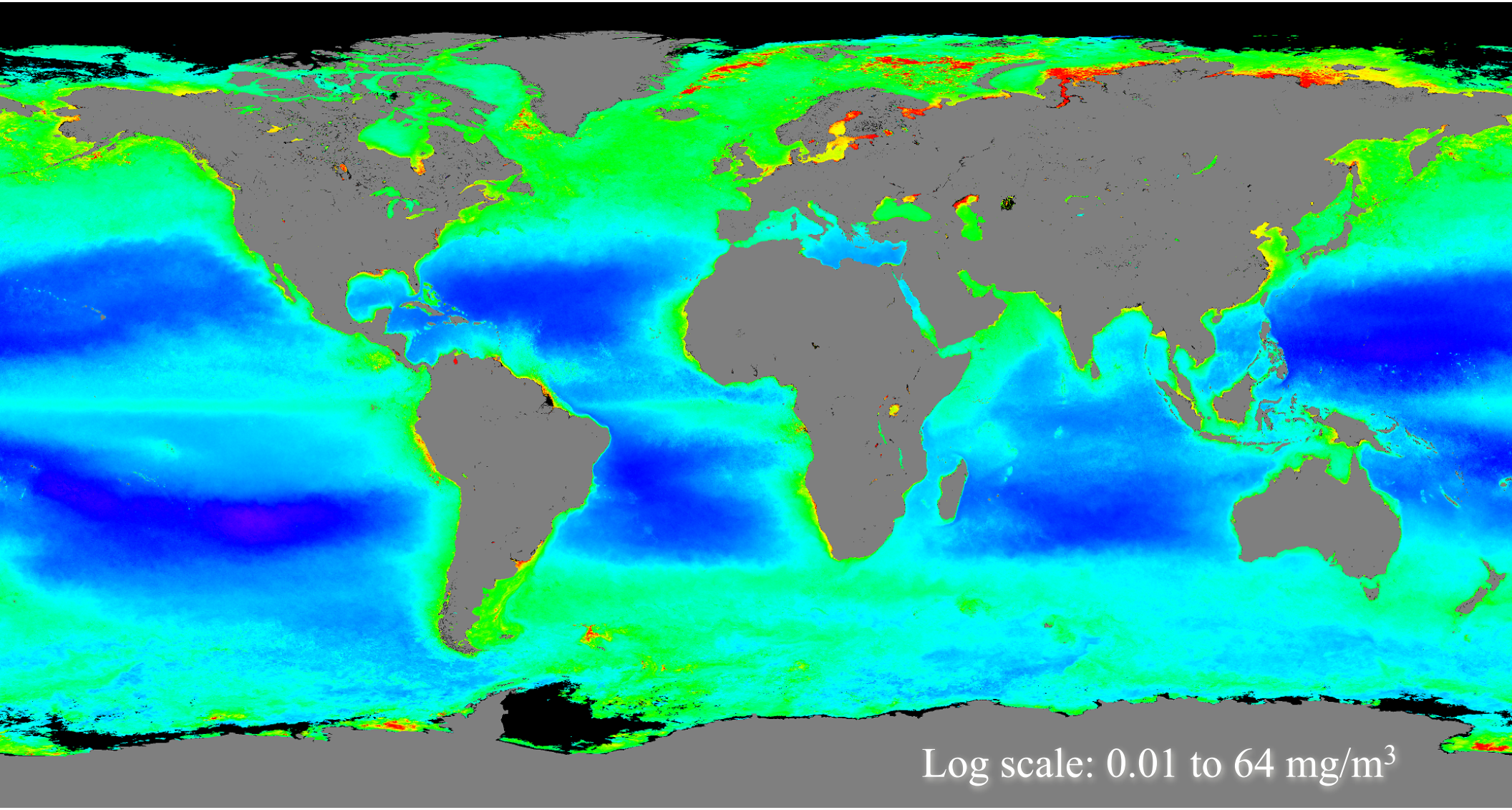
Feedback from Ocean Color EDR Team

Menghua Wang
VIIRS Ocean Color Team

December 19, 2013

VIIRS Climatology Chlorophyll-a Image

(Feb. 2012 to Sep. 2013)

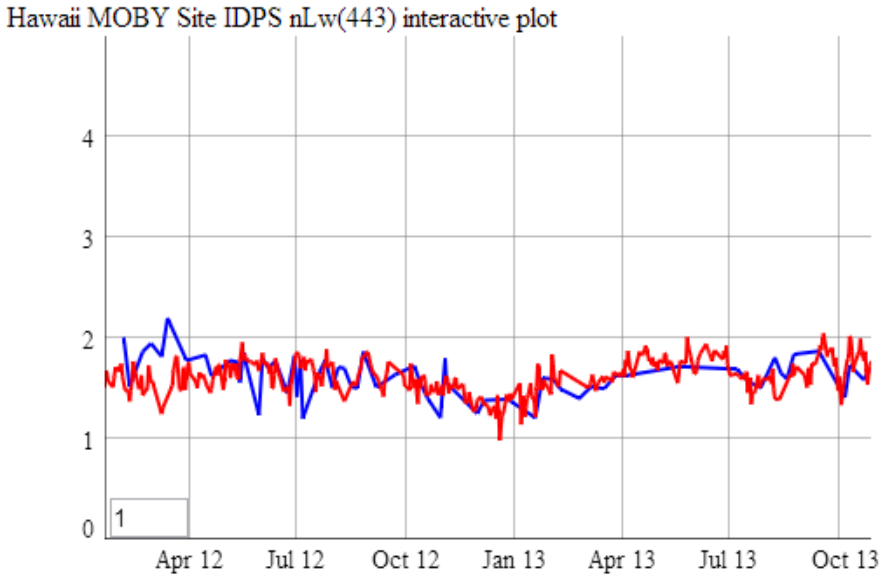


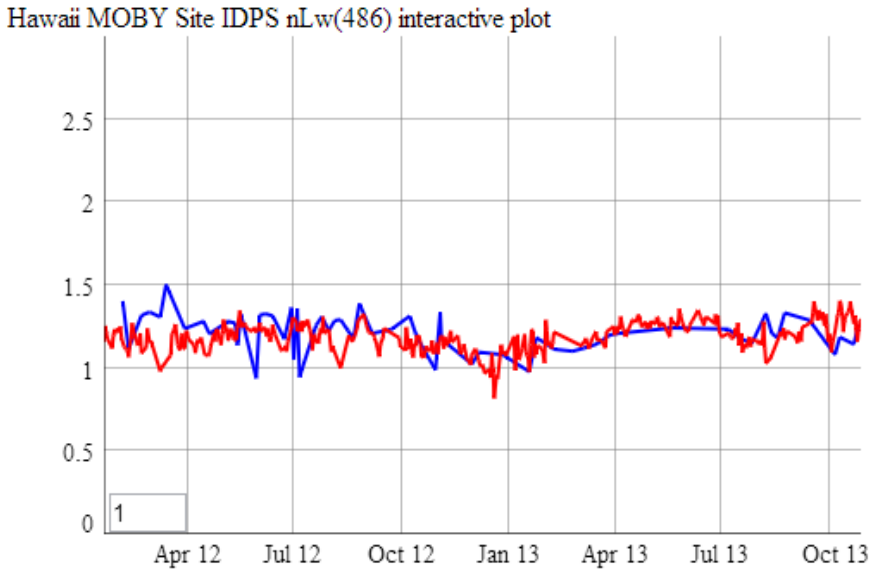
Generated from VIIRS IDPS Ocean Color EDR

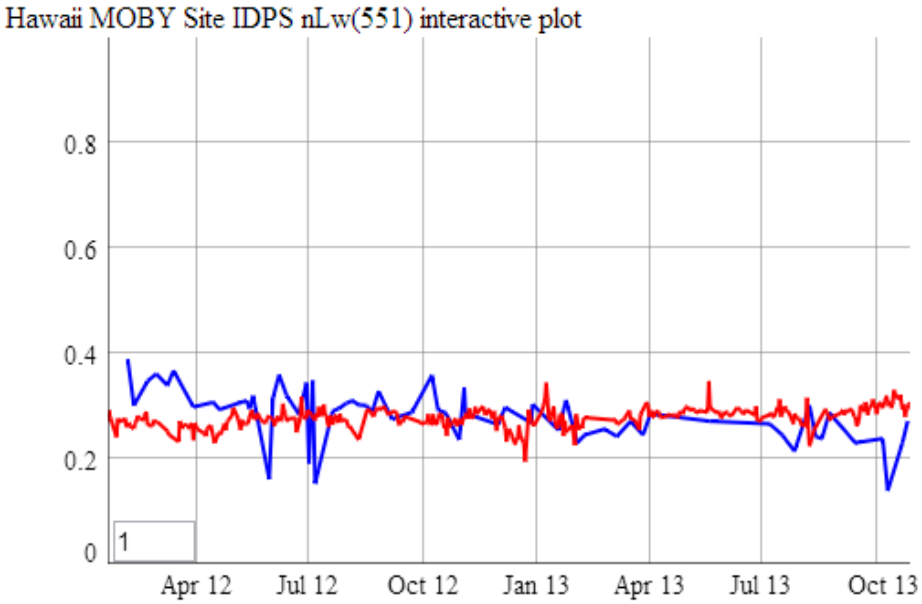
Outline

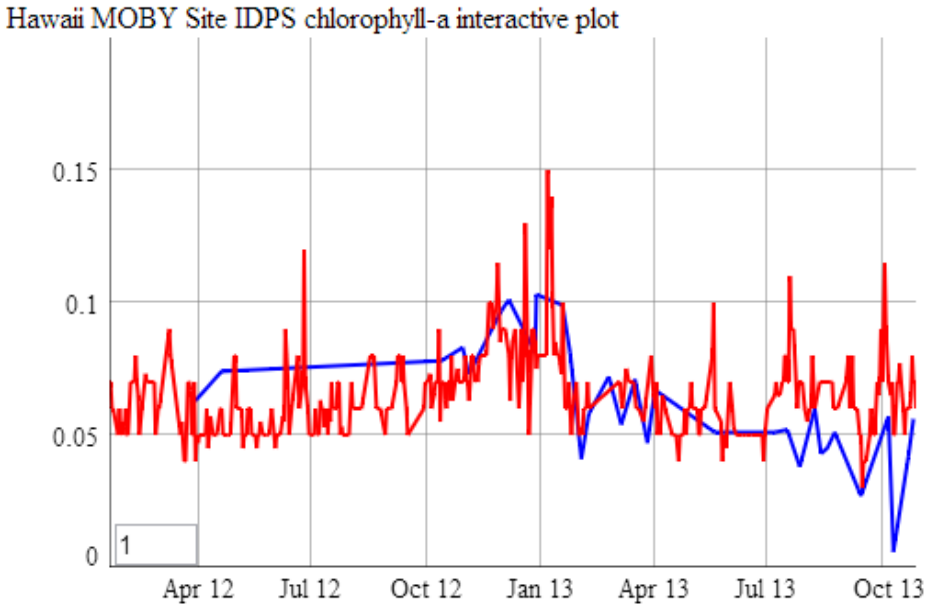
- VIIRS and MOBY matchup comparison
- Impact of the shutdown
- Calibration issues
- Summary

MOBY Matchup Comparison (IDPS)





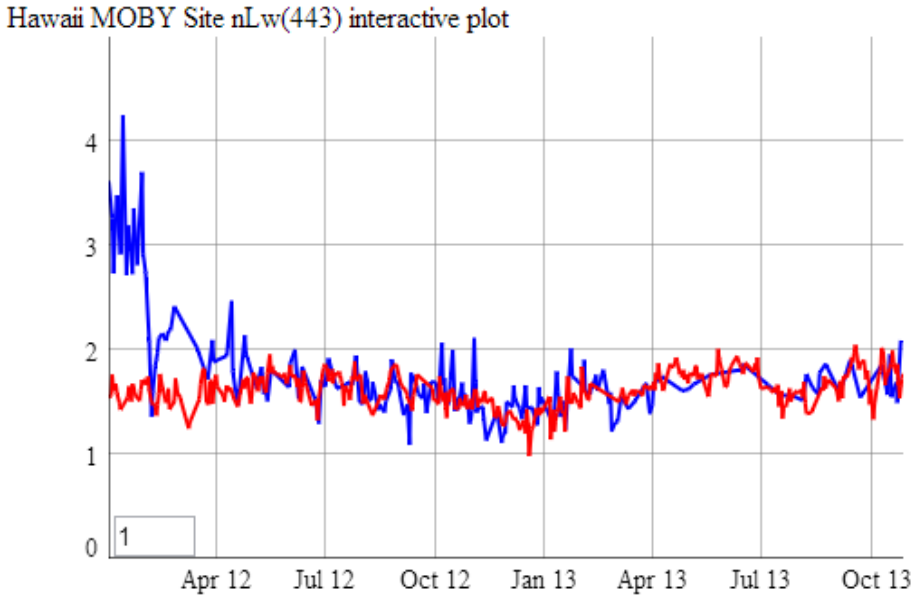


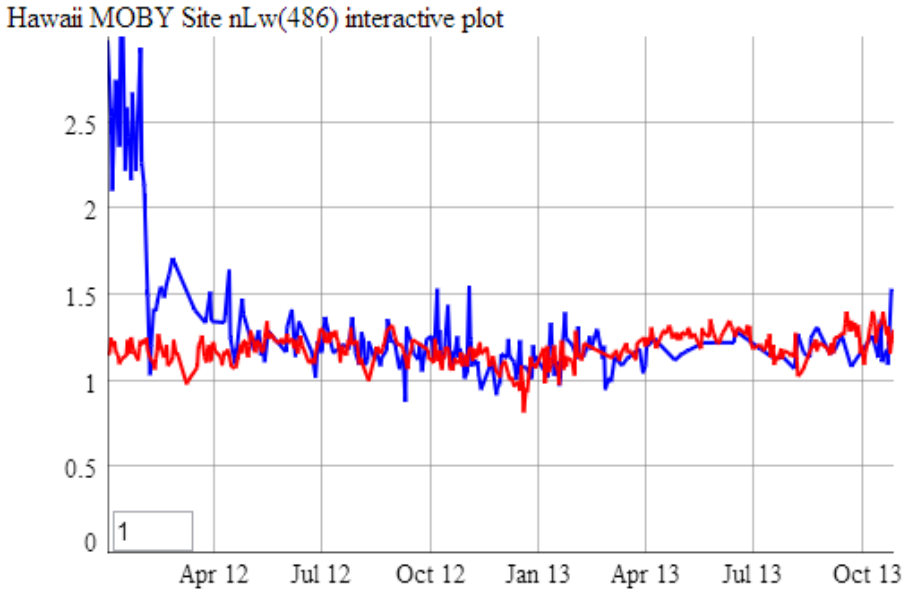


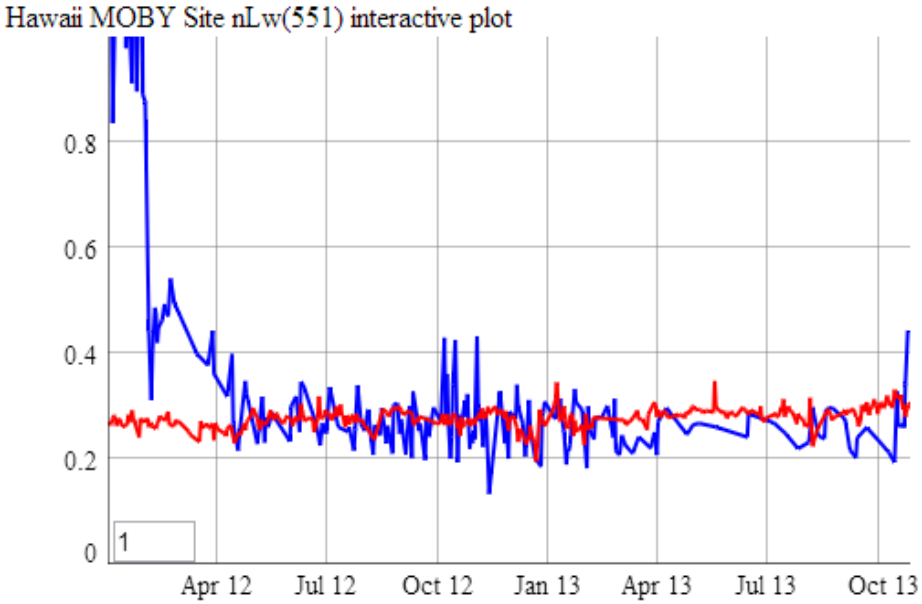
satellite

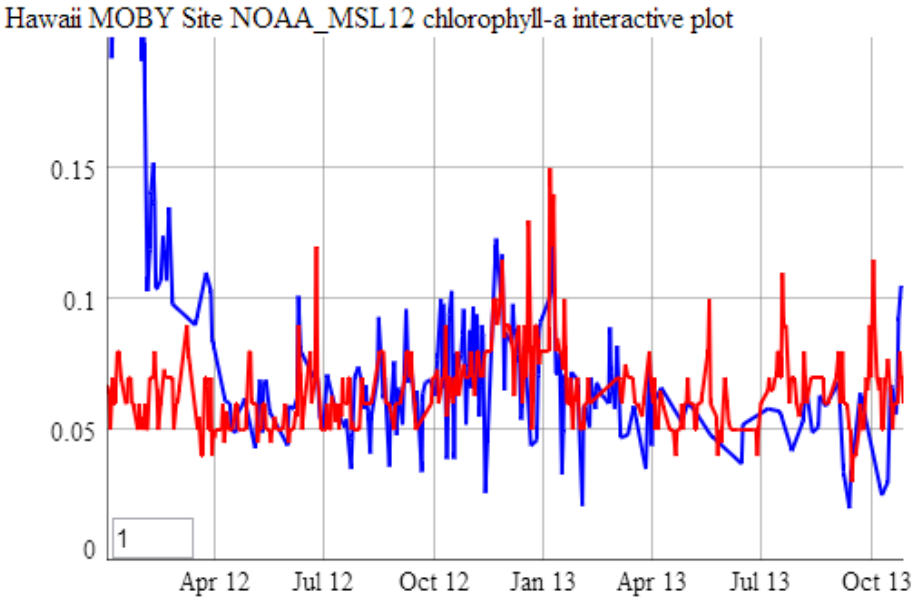
In situ

MOBY Matchup comparison (NOAA-MSL12)









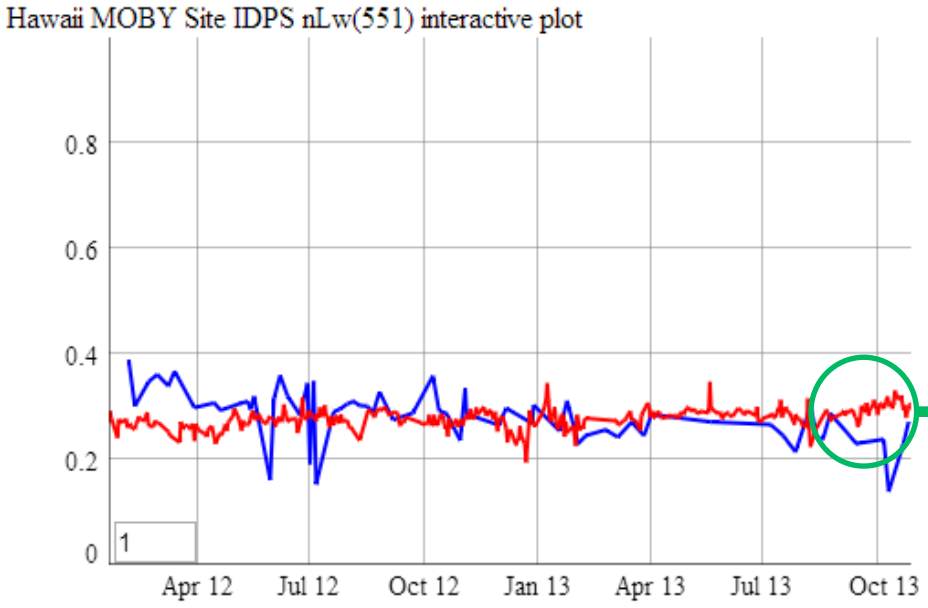
satellite

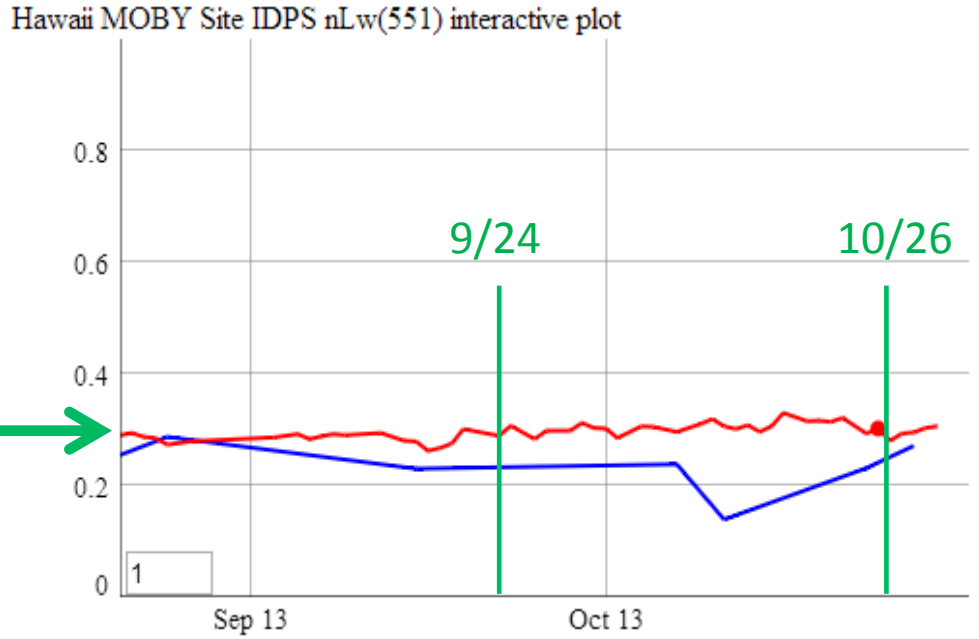
In situ

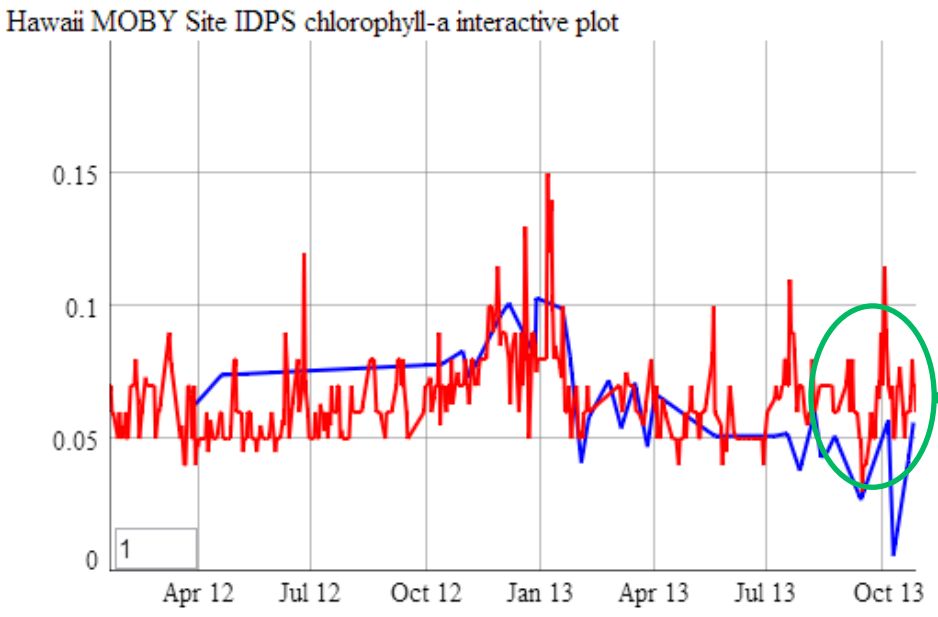
Possible Impact of the Shutdown

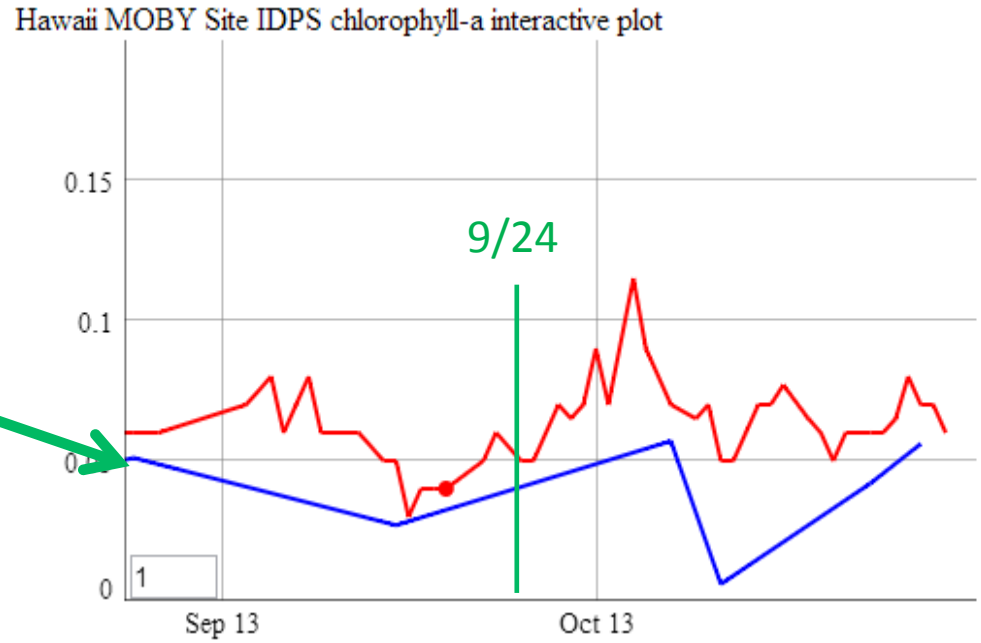
- During the shutdown, there were no LUTs updates for VIIRS SDR between 9/24 to 10/24.
- As requested from Janna Feeley, we have quickly looked possible impact of this to VIIRS Ocean Color data quality.
- VIIRS ocean color data from IDPS and NOAA-MSL12 were compared with the MOBY in situ data for the shutdown period (also for other periods).
- We found that during the shutdown, $nL_w(551)$ data are significantly biased low, leading to significantly biased low chlorophyll-a data.
- This issue may possibly be related to the lack of the SDR update during the shutdown??

IDPS Ocean Color Product





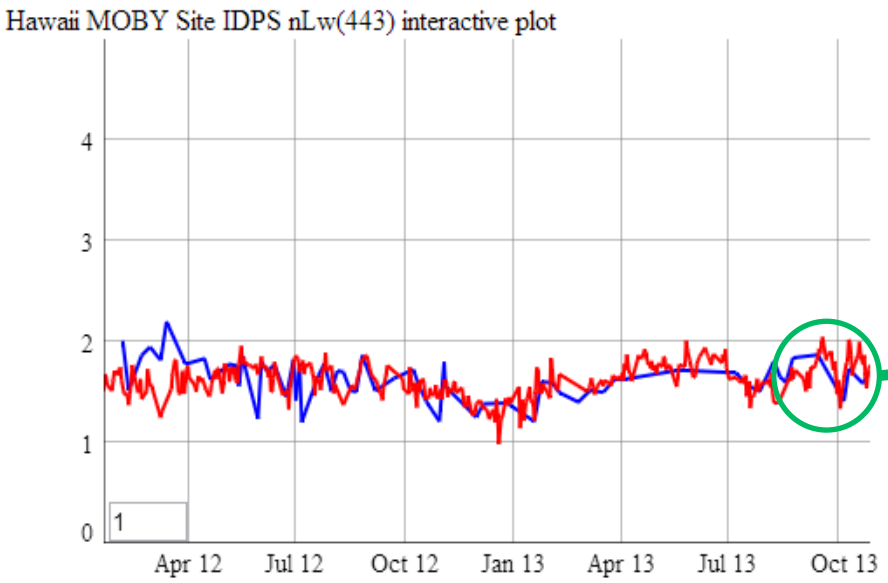


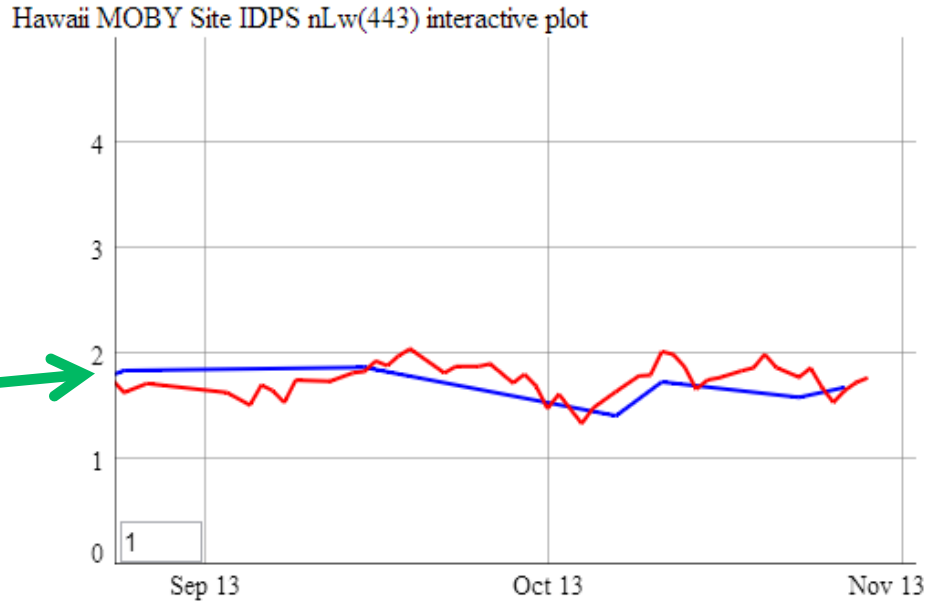


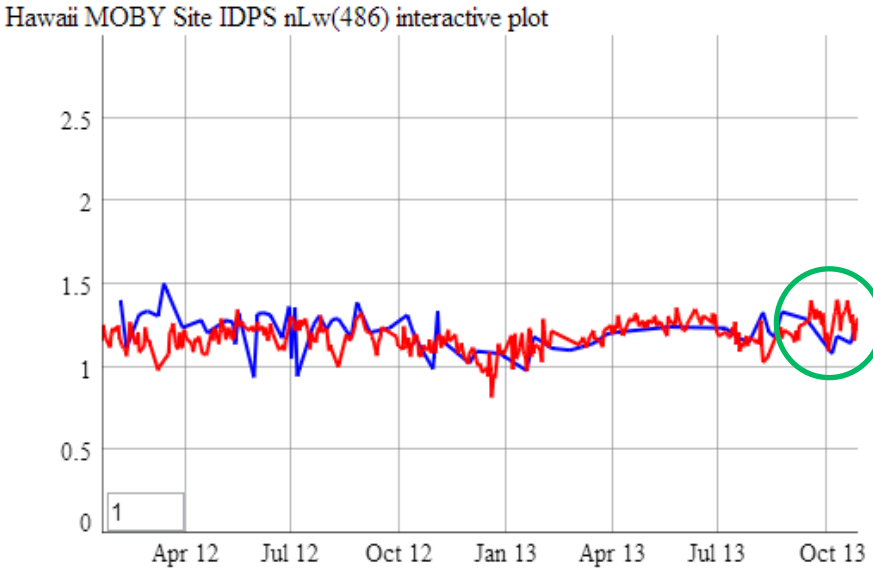
satellite

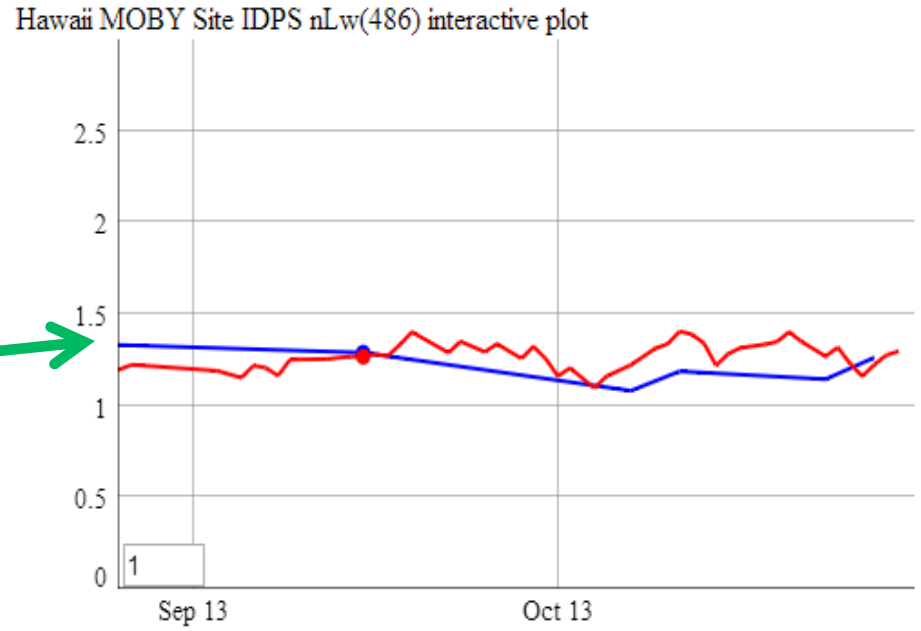
In situ

IDPS Ocean Color Product





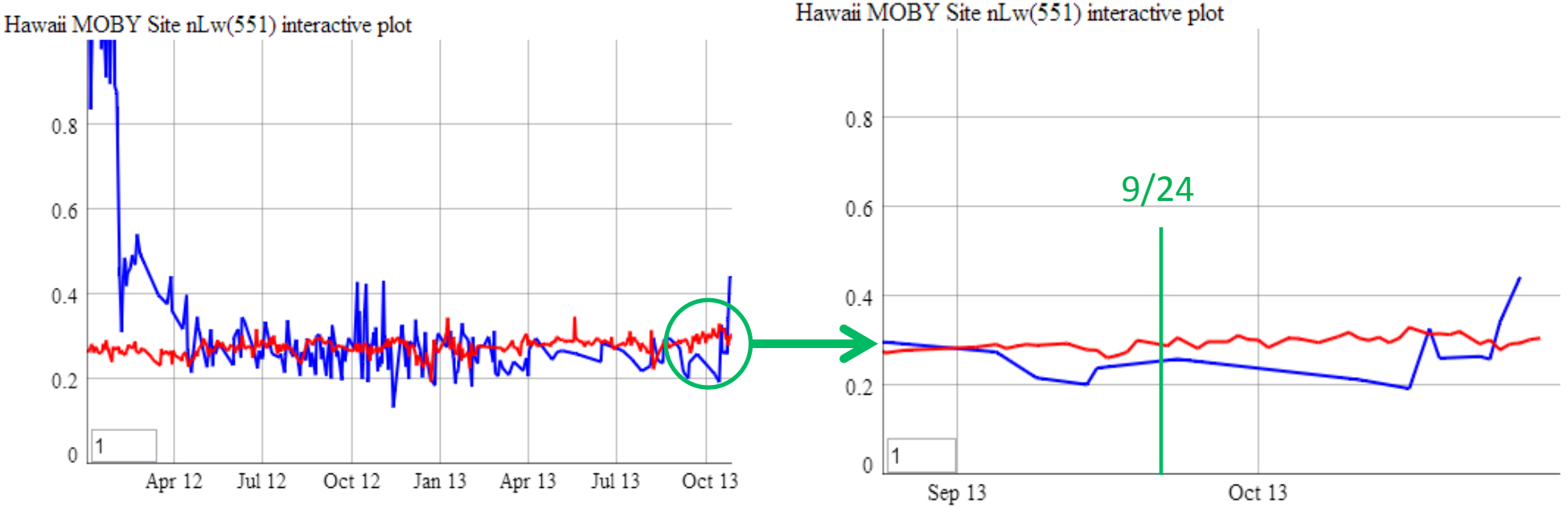


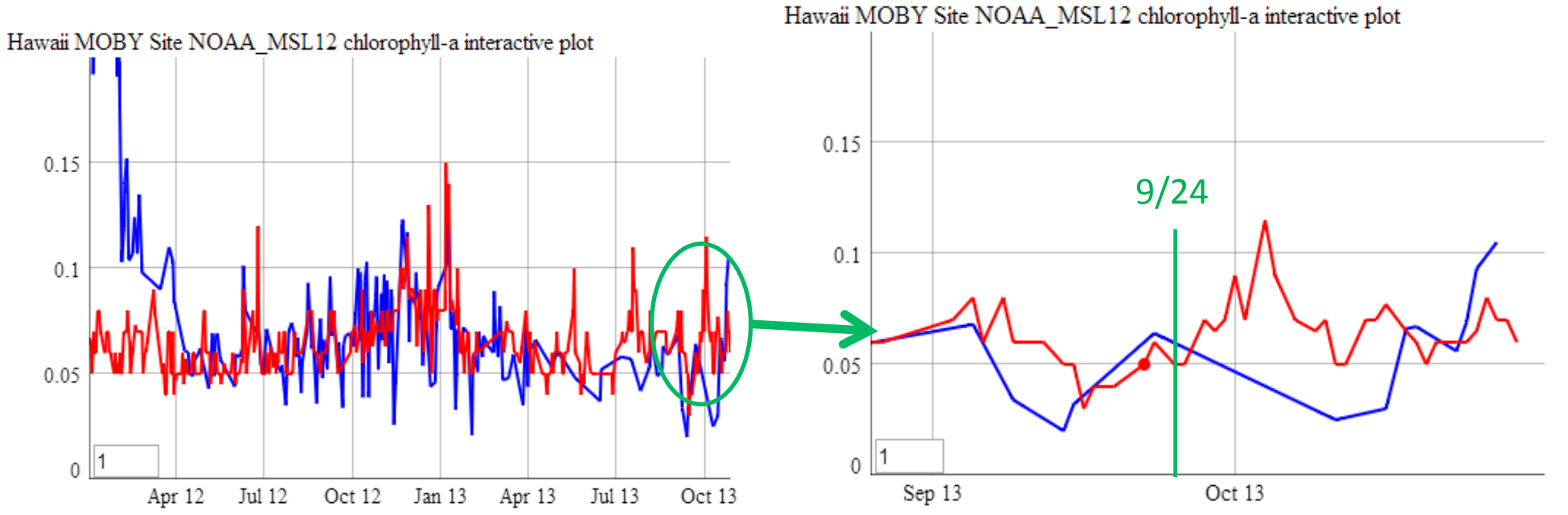


satellite

In situ

NOAA-MSL12 Ocean Color Product





satellite

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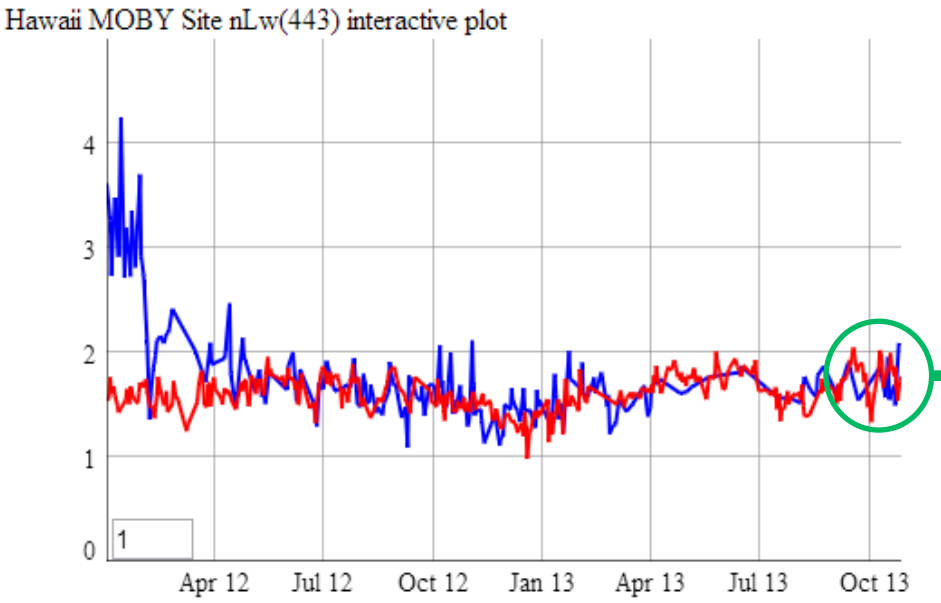
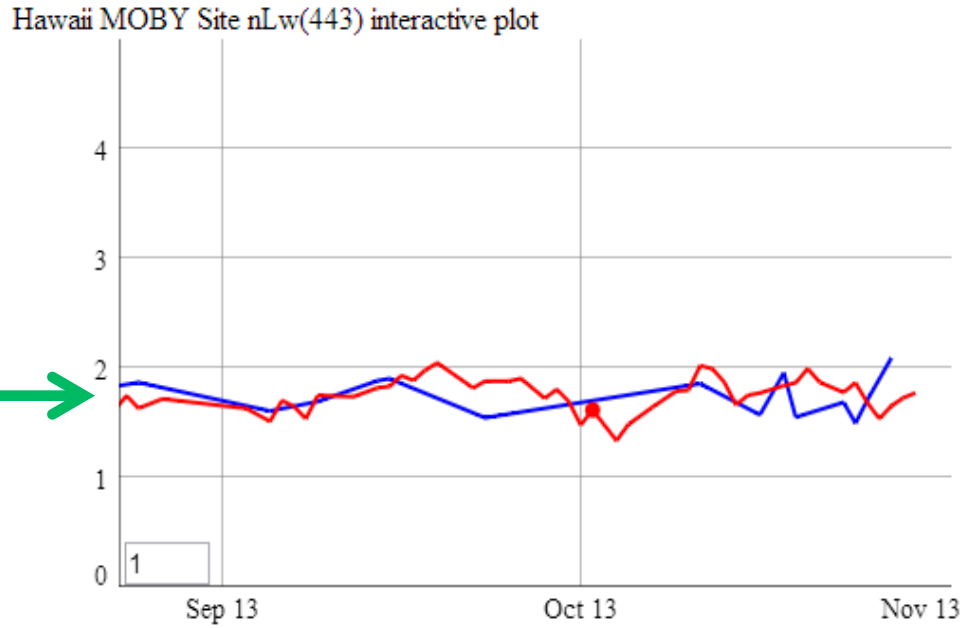
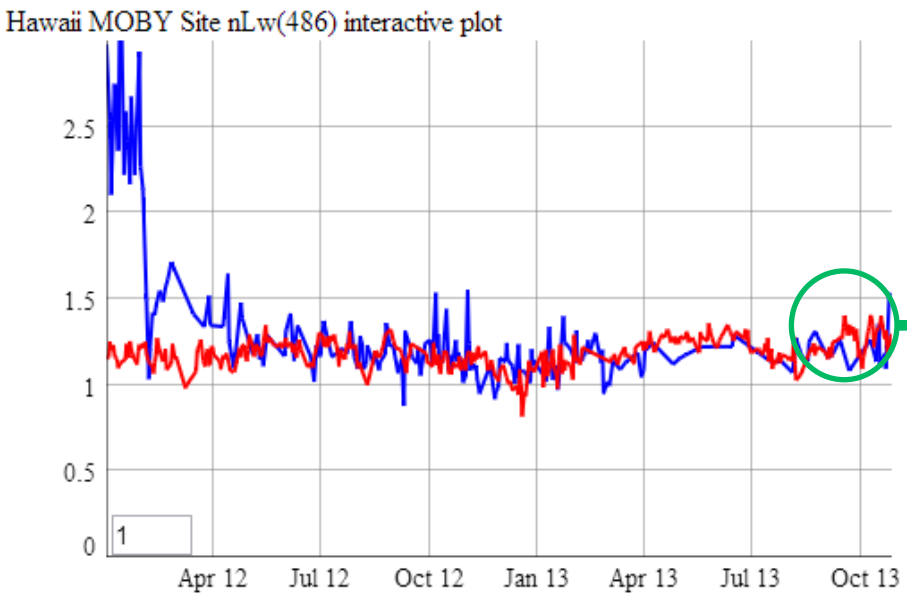
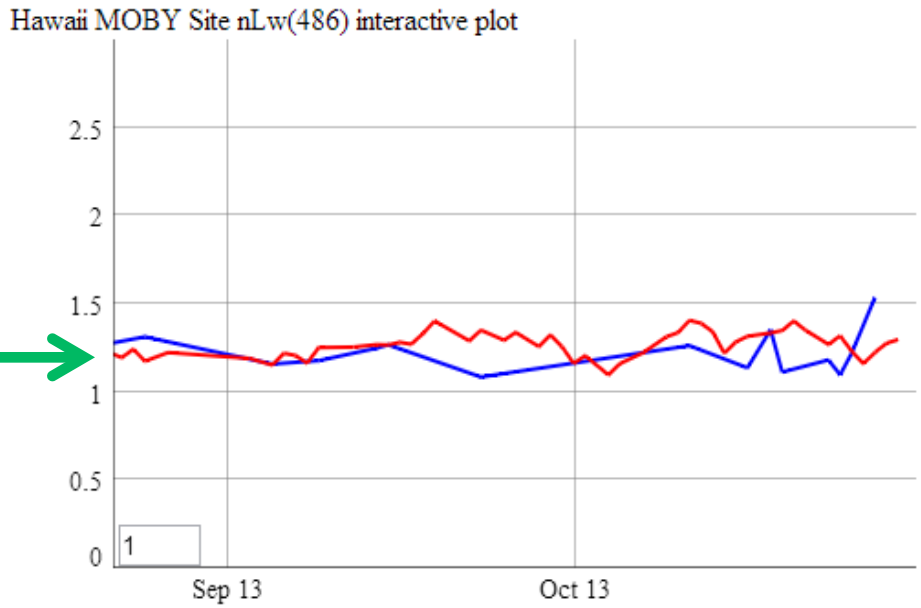
NOAA-MSL12 Ocean Color Product









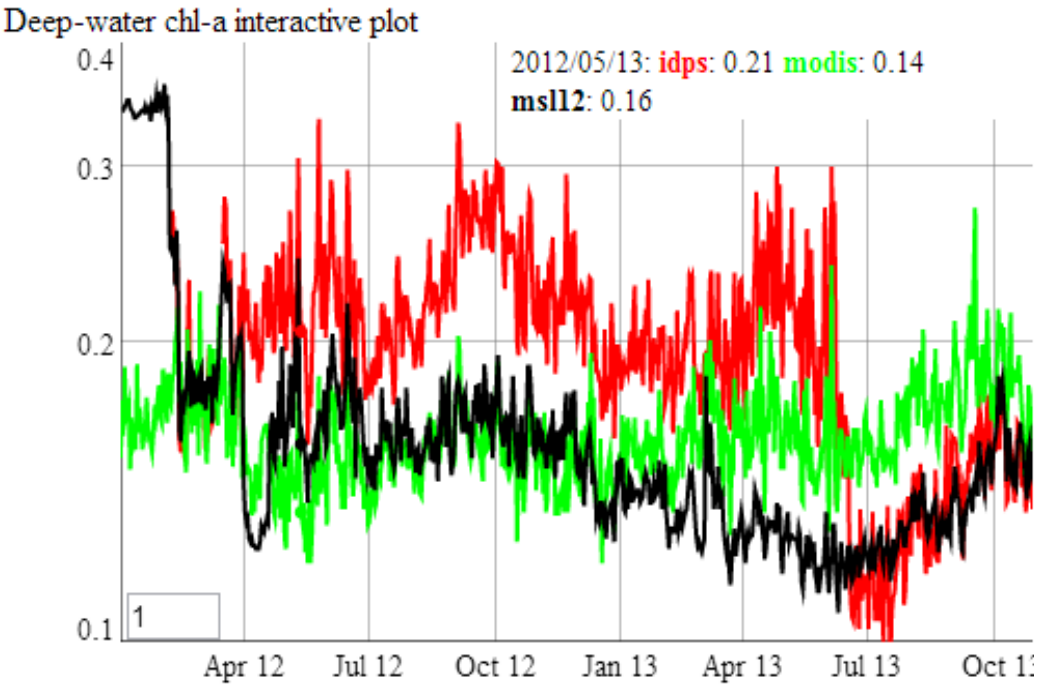
satellite

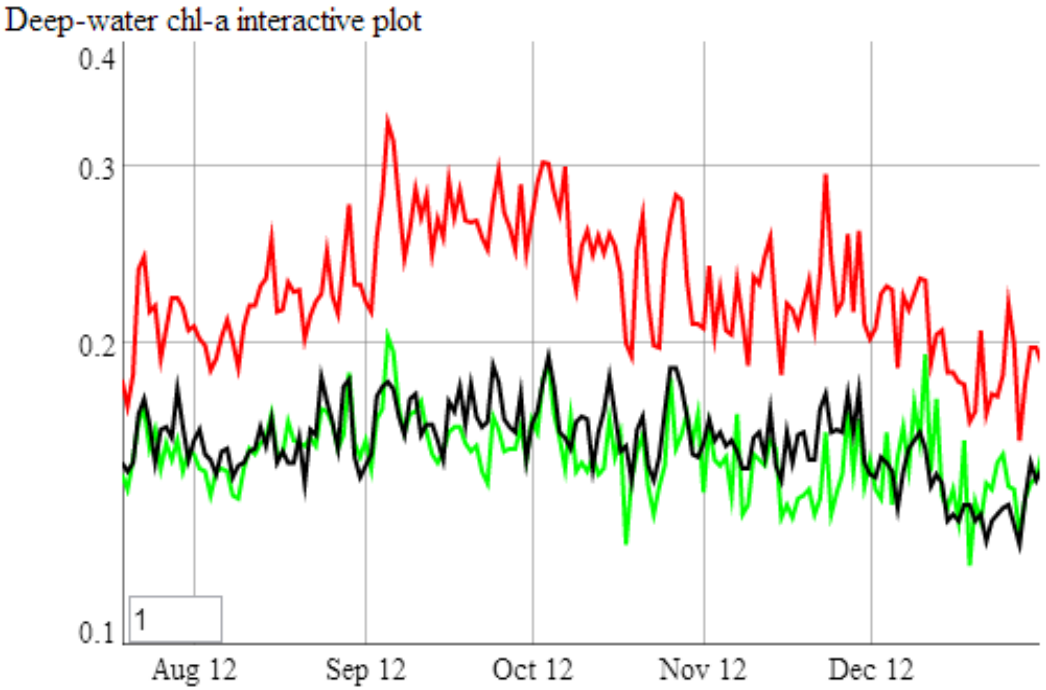
In situ

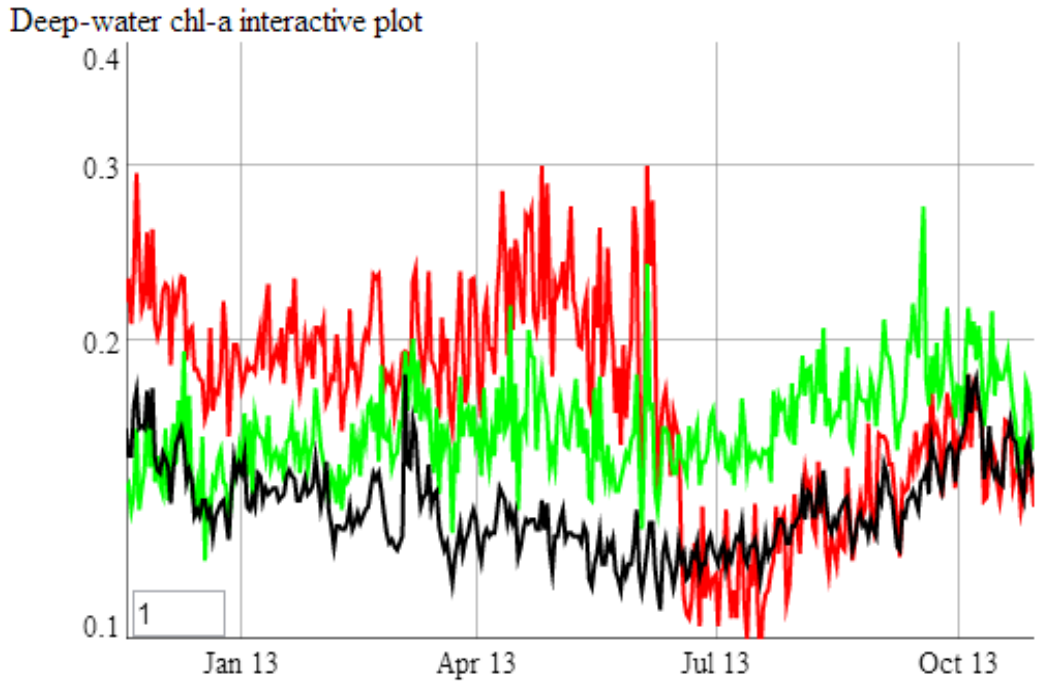
Recommendation/Suggestions

- It would be useful that the VIIRS SDR team generates updated F-LUTs for VIIRS all M-bands (visible, NIR, and SWIR) and I-bands for the shutdown period, and compare with those from the current (not updated) F-LUTs, in particular, for the VIIRS **M4** band.
- Although results show significant changes in $nL_w(551)$ (M4 band) during the shutdown period, it may result also from the NIR bands (M6 and M7) for atmospheric correction. Other VIIRS M-bands may also be impacted.
- Frequent VIIRS SDR LUTs update is required.

Possible Calibration Issue (1)





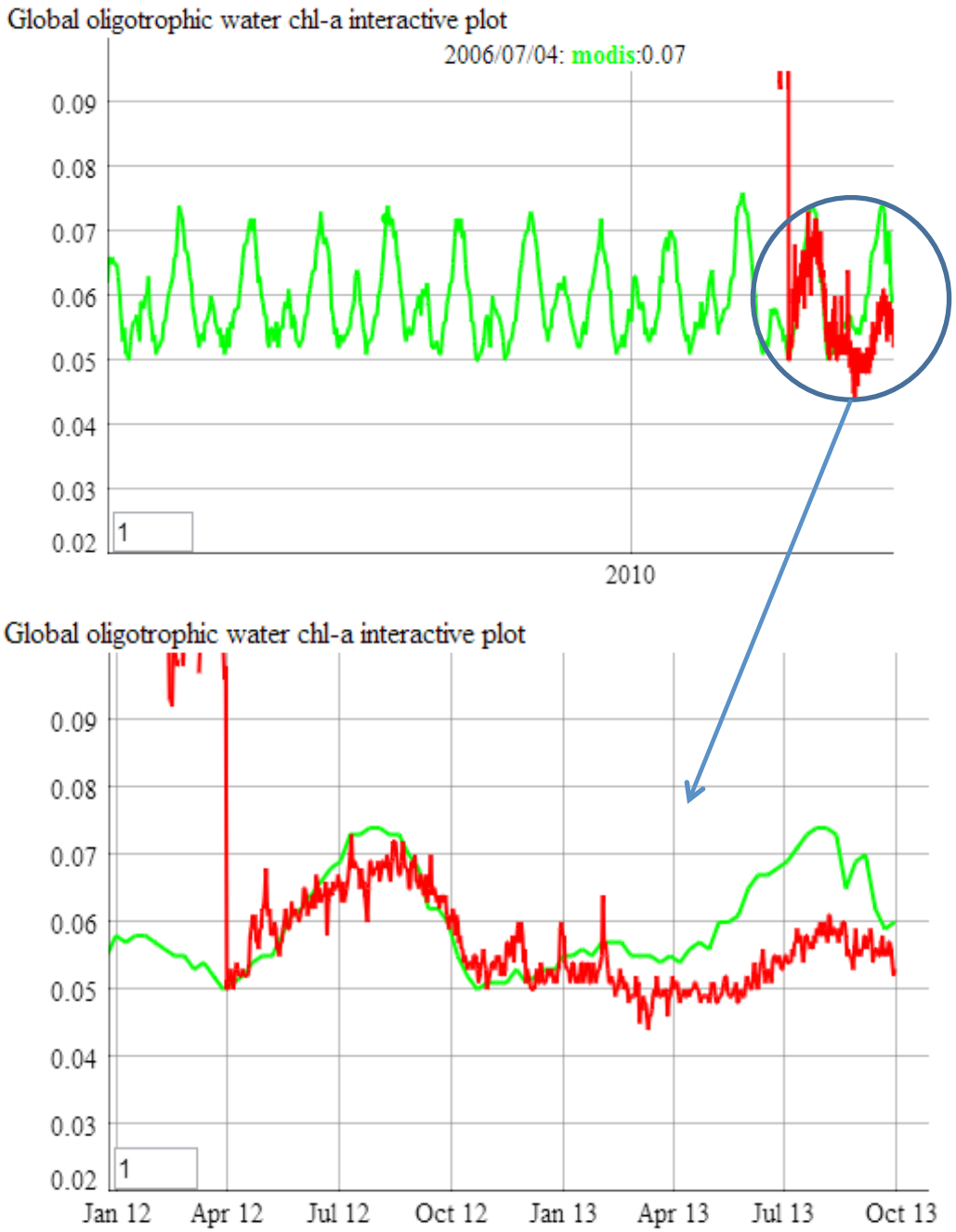


NOAA-MSL12

MODIS-Aqua

IDPS

Possible Calibration Issue (2)



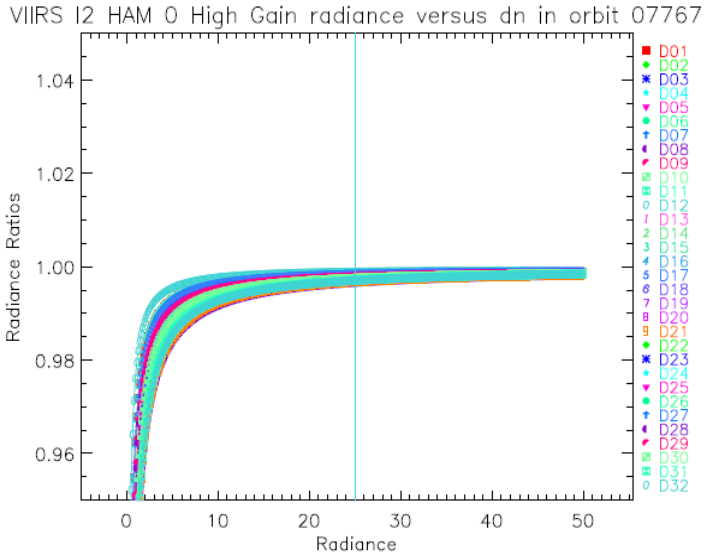
MODIS-Aqua global oligotrophic water Chl-a from 2002 to 2013 (green), overplotted with VIIRS data from 2012 to 2013 (red)

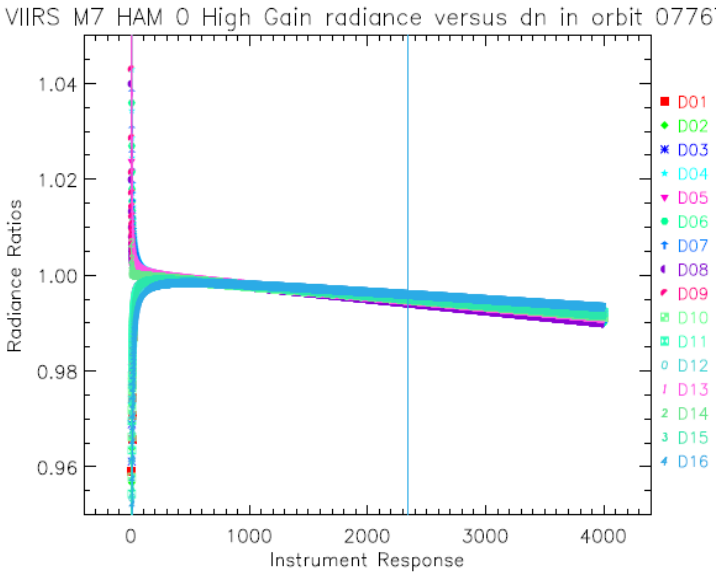
MODIS-Aqua

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 possible that VIIRS SDR has some calibration issues.
- However, at this moment, we cannot completely rule out MODIS-Aqua Cal problem.

Impact of the non-zero C_0 and C_2



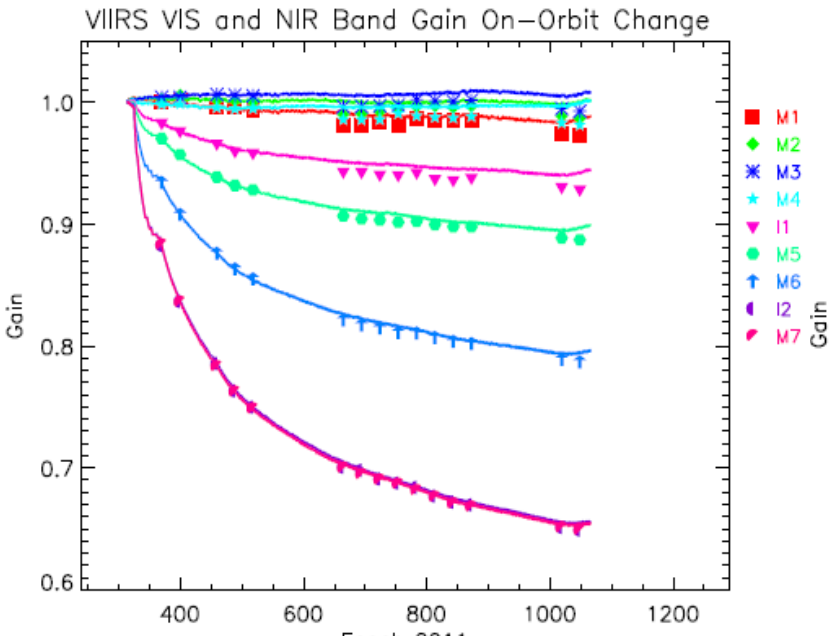


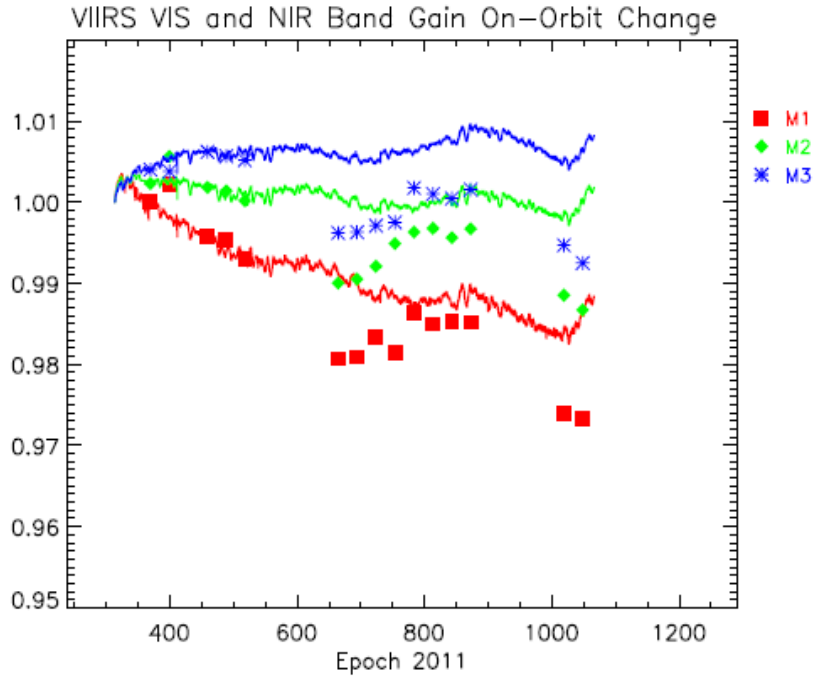
- F factors are calculated with prelaunch C_0 and C_2 and without them (force them to be zero), respectively.
- Radiance are calculated with non-zero and zero C_0 and C_2 using the corresponding F factors, respectively.
- The curves and symbols are the ratios of the two sets of radiance.

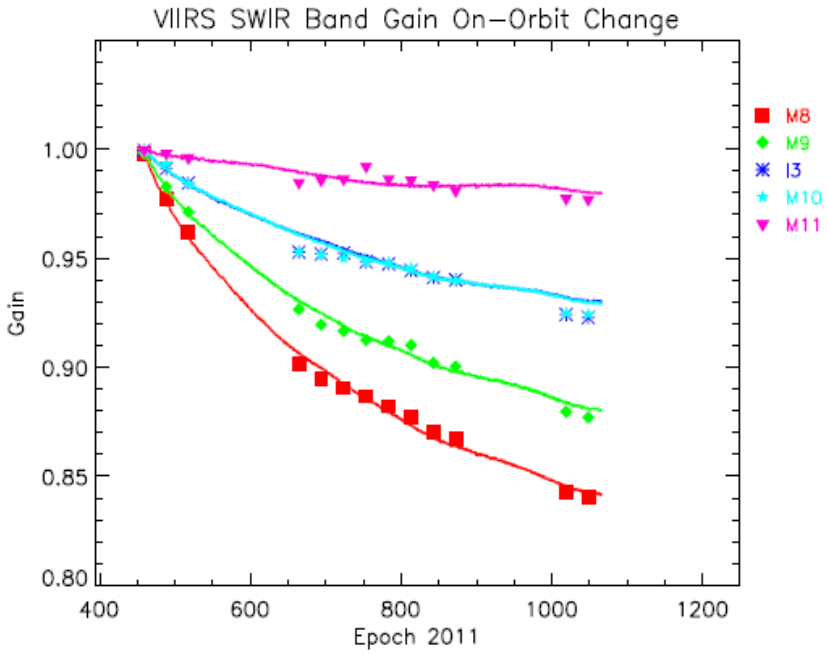
- Prelaunch C_0 has large impact on I2 at low radiance. It may induce striping in the ocean surface images and large radiometric uncertainty, especially for dark ocean.
- Prelaunch C_0 has much less impact on M7 at low radiance, while C_2 may have noticeable impact around typical radiance.

C_0 has been set to zero for I2 and M7, how about other M bands?

SD and Lunar F Factors Comparison







- Symbols are lunar F Factors
- Curves are SD F factors
- Disagreement between SD and lunar calibration in autumn-winter time period every year for short-wavelength bands

Summary

- Except for some cases (e.g., the shutdown), VIIRS SDR data are generally reasonable for deriving reasonable VIIRS normalized water-leaving radiance spectra data. VIIRS chlorophyll-a data are consistent with those from MODIS-Aqua in 2012, but show some significant differences in 2013.
- However, for VIIRS ocean color EDR, there are still some VIIRS SDR calibration issues:
  - Significant difference in chlorophyll-a between VIIRS and MODIS-Aqua from early 2013 likely due to SDR Cal issue.
  - Linear and non-linear fitting in Cal (non-zeros in C_0 and C_2).
  - Solar and lunar calibration differences.
- Frequent VIIRS SDR LUTs update is required.
- More efforts are needed to further improve the VIIRS SDR data quality.