“Improving MOBY vicarious calibration products at longer wavelengths”

UNIVERSITY OF MIAMI

Kenneth Voss, Physics Dept., Univ of Miami

Co-Authors: Howard Gordon (UM), Stephanie Flora (MLML), Carol Johnson (NIST), Mark Yarbrough(MLML), Mike Feinholz (MLML), and Terry Houlihan (MLML)

8/16, STAR JPSS 2016 annual meeting, College Park, Md.

1) Brief statement on current status of MOBY Operation and Refresh

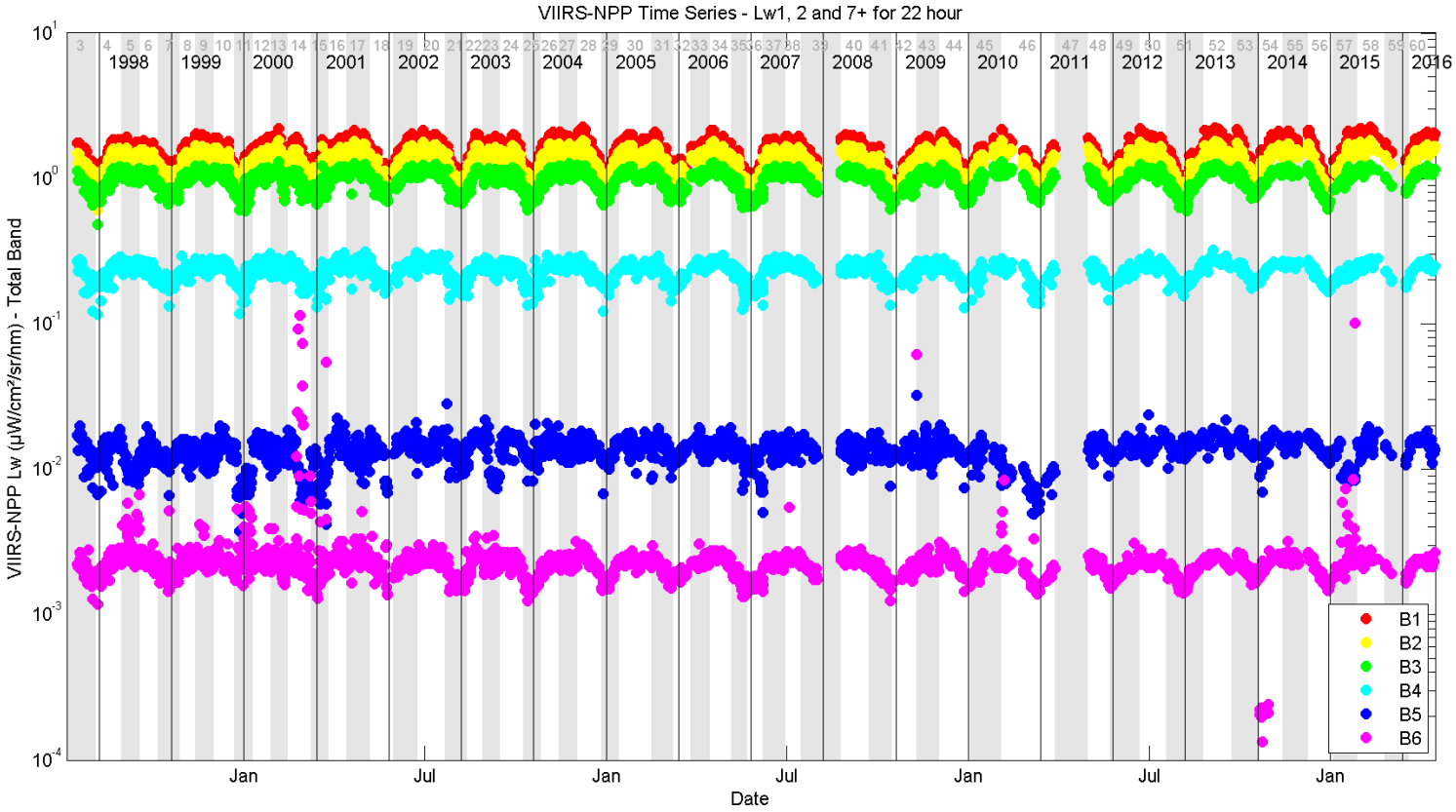
2) Statement of problem for measurement at wavelengths >575nm

3) Description of new data products which add a correction, and wavelength dependent uncertainties.

4) Impact on MOBY data

2 thru 4 based on paper to be submitted to JAOT very soon.

Currently have a 19 yr + time series of vicarious calibration data at the MOBY site thanks to NASA, NOAA, Dennis Clark, and the rest of the MOBY team (many of whom have been in the project since the beginning.

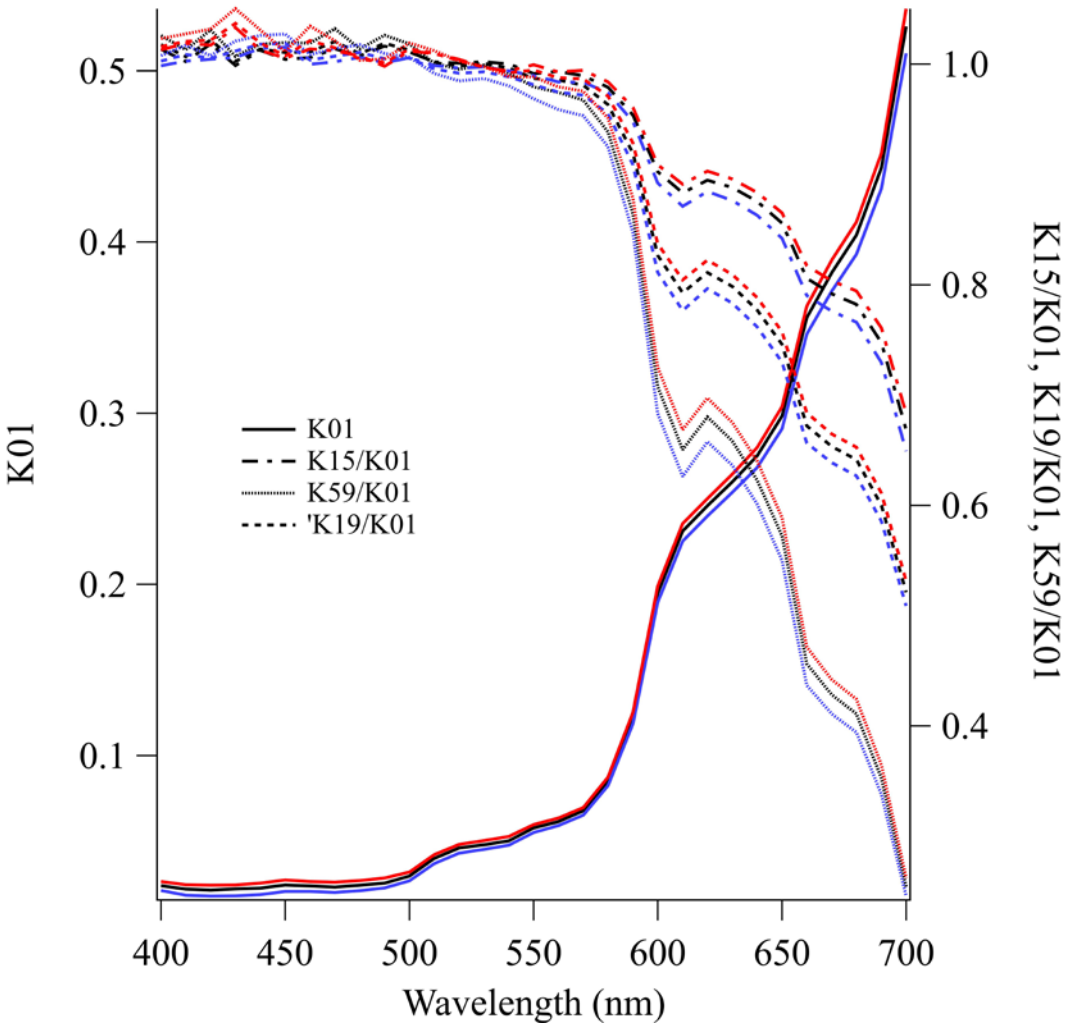


Current status

- Next deployment will be next week.
- Will have first, test, deployment of the blue refresh spectrometer.

As we showed at Ocean Optics 2010, even in well mixed water, the upwelling radiance K (KL) varies in the upper part of the water column at wavelengths greater than 575 nm. This is due to both Raman scattering and Chl fluorescence. Since our best KL is from 1-5m, and we need KL from 0-1m we need to correct for this effect.

This graph shows modeling results from Howard Gordon.



Currently we produce:

Lw1 (and Lwn1) which uses KL(1-5m) and Lu(1m).

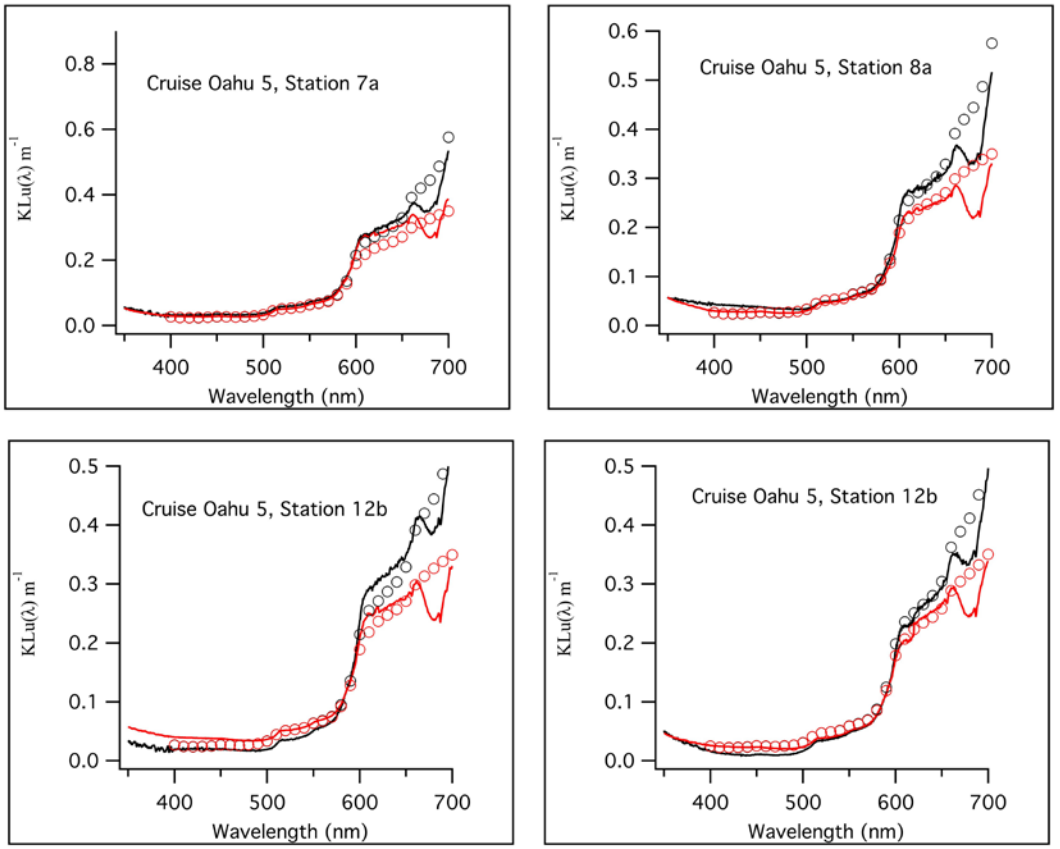
Lw2 (and Lwn2) which uses KL(1-9m) and Lu(1m).

and Lw7 (and Lwn7) which uses KL(5-9m) and Lu(5m)

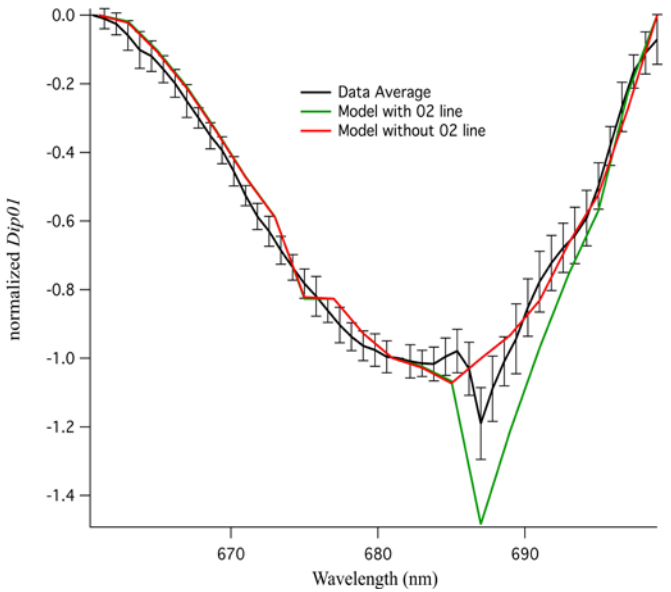
Lw1 is the preferred product.

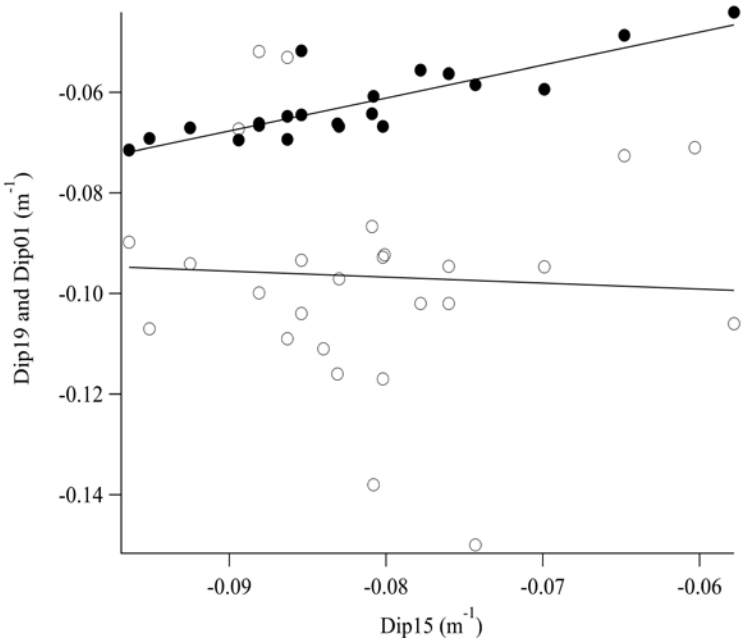
We have modeled KL(0-1m), KL(1-5m), KL(1-9m), and KL(5-9m) for Chl's 0, 0.05, 0.10, and 0.15 mg/m3 (basically the range at MOBY), and solar zenith angles of 10, 20, 30, 40, 50, 60 degrees.

To check our model, we had a data set of special MOS/ROV data from a cruise off of Oahu with measurements at 0.1,1, 5, and 9 m. The data are the solid lines, the model the circles. This has no Chl correction in the model (660-700 nm “dip”). As can be seen the model and data agree very well.



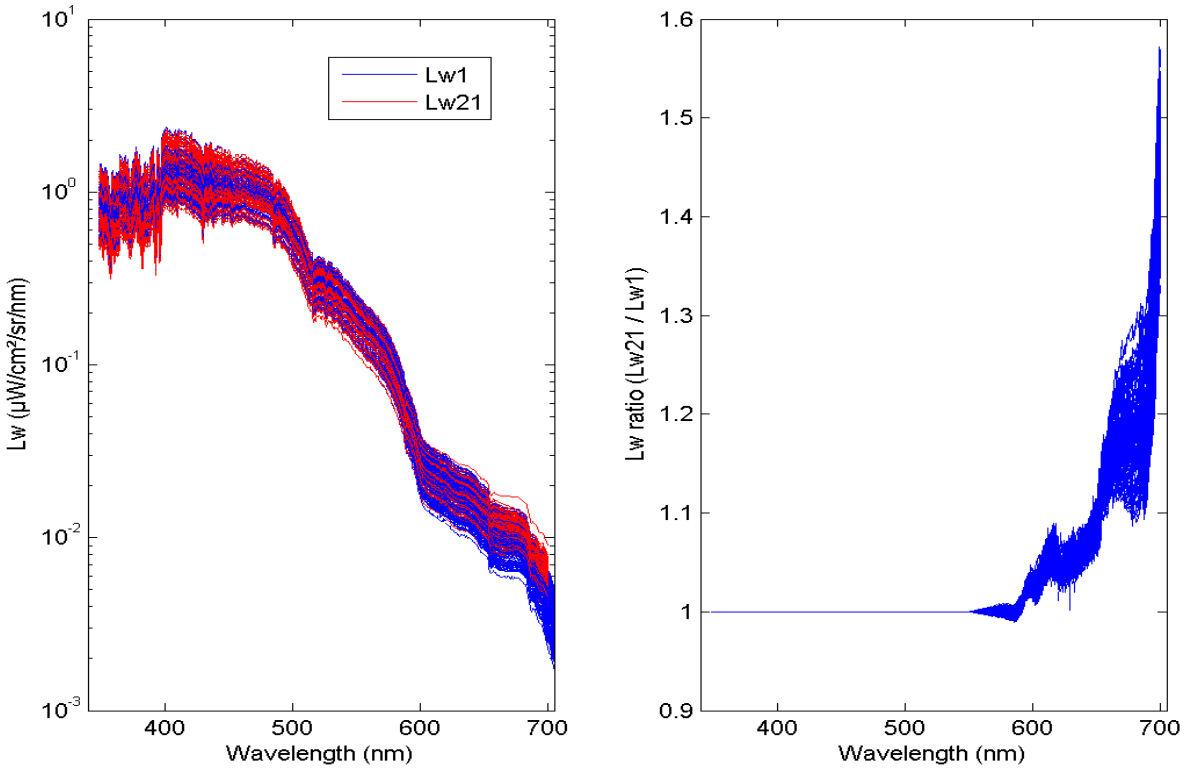
Yarbrough, M.A., M.E. Feinholz, S. Flora, T. Houlihan, B.C. Johnson, Y.S. Kim, M.Y. Murphy, M. Ondrusek, and D.K. Clark, 2007a: Results in coastal waters with high-resolution *in-situ* spectral radiometry: The Marine Optical System ROV. *Proc. SPIE 6680, Coastal Ocean Remote Sensing*. 66800I, doi:10.1117/12.735064.



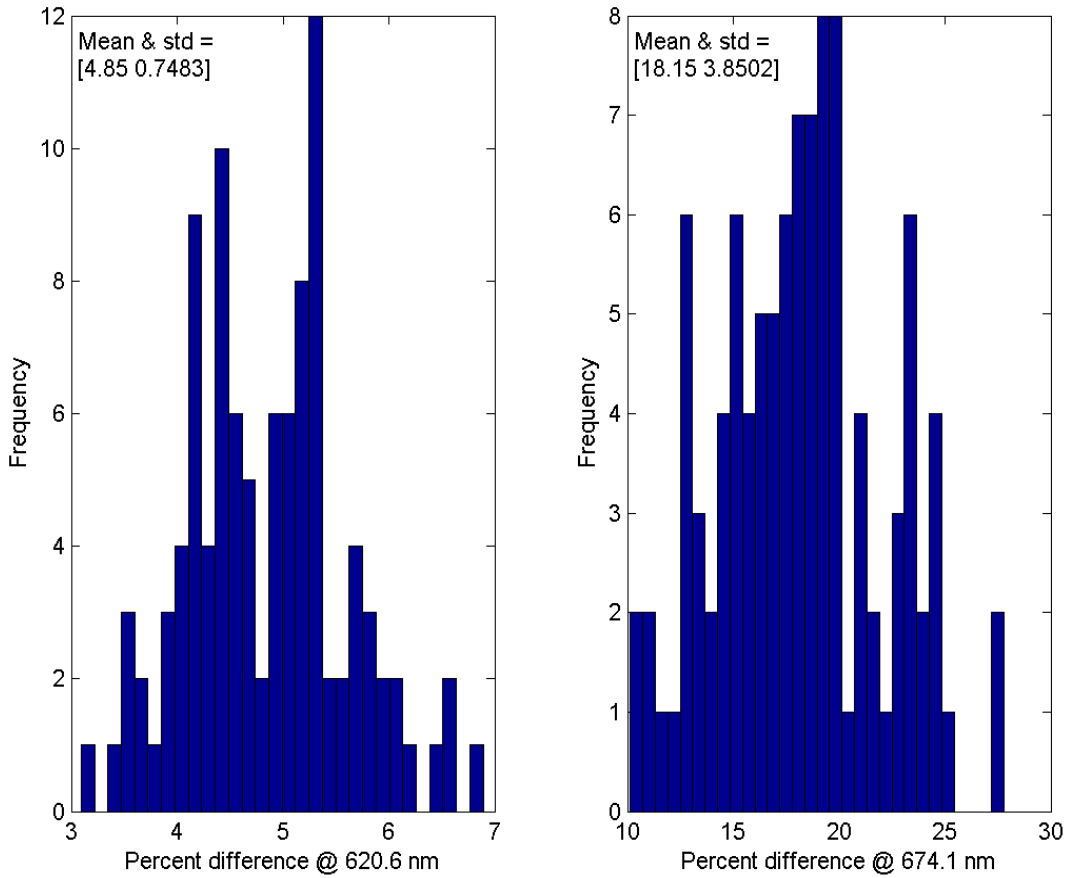


For Chl dip, a baseline from 660-700nm is determined and the deviation from this baseline was obtained for each measurement in our validation data set…resulted in a very good average shape. We use this average in our correction.

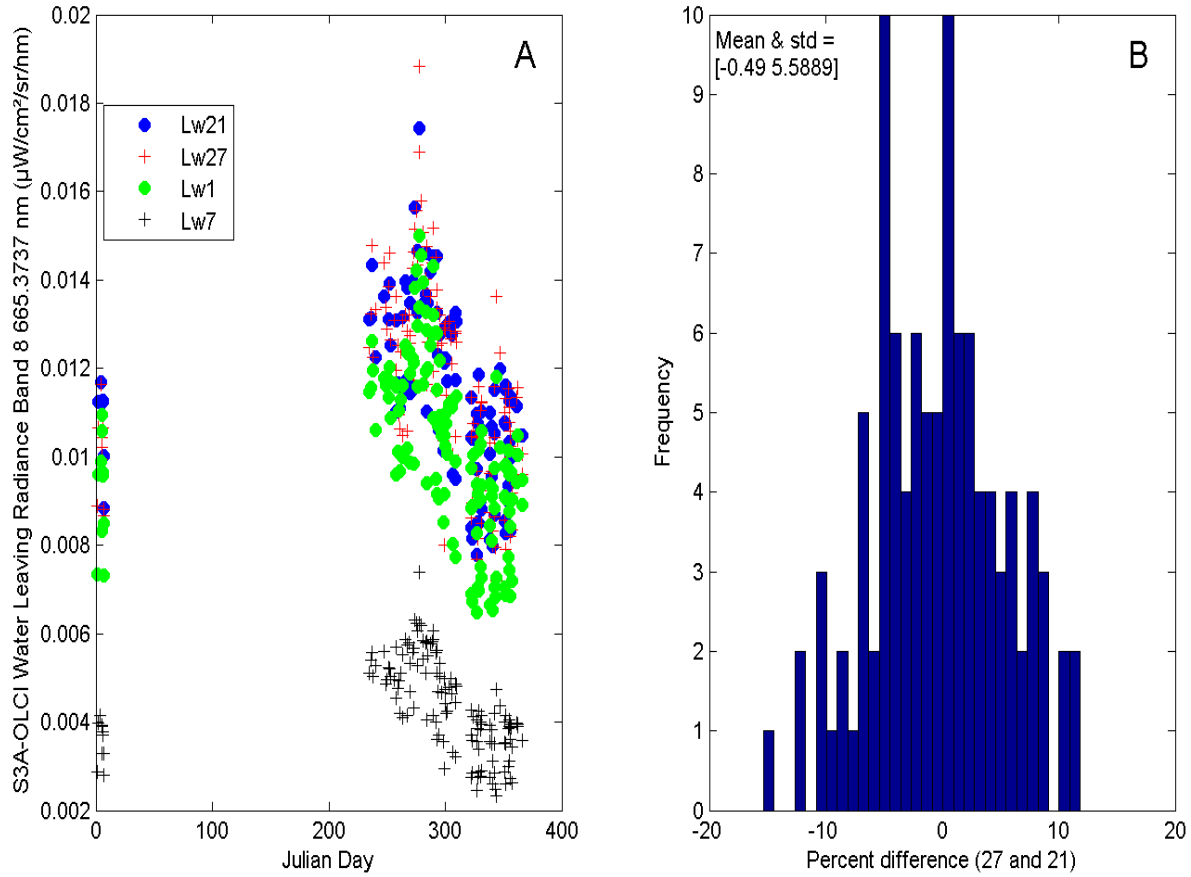
Interestingly, while the dip in 1-5m data was correlated with the dip in the 1-9m data, it was not correlated at all with the 0-1m data. Thus we use an average magnitude of 0.10m^{-1} to do the correction.



Left panel without correction (Lw1) and with correction (Lw21), right panel, ratio. First, very little light at these wavelengths at MOBY site. However, correction is a large value there. This is for one full deployment.



For the blue wavelengths, not much difference, in the red, however, a large difference, here I show two red bands in the OLCI instrument (which has many red bands)



We can do a similar correction for Lw7 (and Lw2), the hardest is Lw7, but as shown here, the data after our correction (Lw21 and Lw27) agree very well.

We will continue to make the normal products…Lw1, Lw2, and Lw7.

However we are going to also produce Lw21, Lw22, and Lw27.

Along with this product we will be introducing and developing a spectrally dependent uncertainty product for each data set and Lw product.

We are going to be continuing development of this uncertainty product going forward. This uncertainty product will include measurement specific uncertainties due to instrument tilt (and variation during measurement period), compass, etc.

Expect this product to roll out in early fall...messages will be coming out about this when we are ready to put it online.