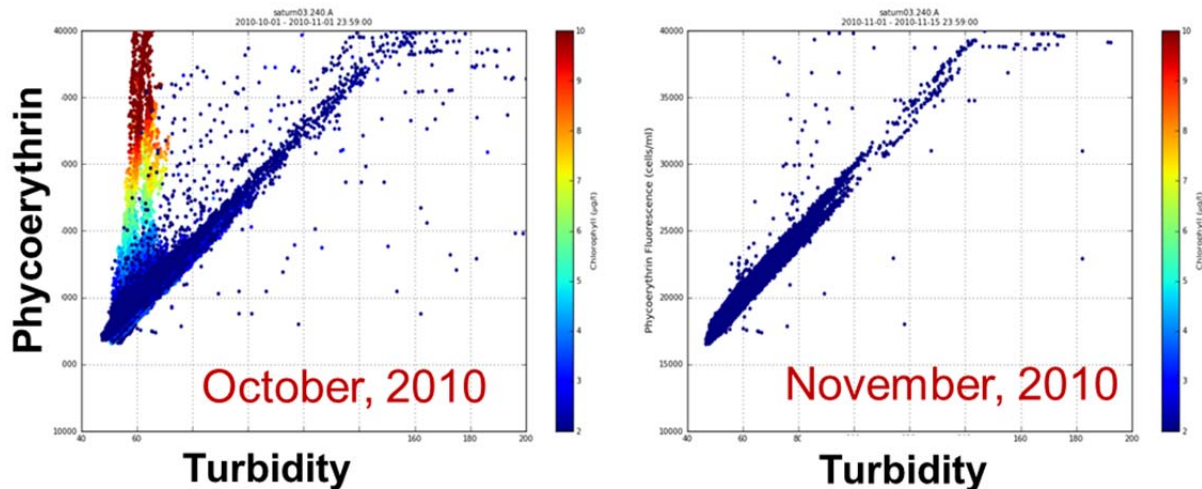


SATURN-03 Phycoerythrin

Turbidity Correction Details for: May 02, 2011 – August 31, 2012

BACKGROUND

The Turner Designs Cyclops Phycoerythrin (PE) sensor has a significant turbidity artifact. This artifact is so extreme that it often exceeds the signal due to PE containing cells. Without correction, the data from this sensor are difficult to interpret. In the two figures below, the PE data are plotted against the turbidity data and are colored by chlorophyll (all scales the same in both figures).



In November there is low chlorophyll and the linear relationship between the PE and represents the turbidity artifact. In October the same relationship is present but a second population associated with chlorophyll & PE containing cells can be seen. This second population is due to the presence of *M. rubrum*. The turbidity corrections aim to reduce/remove the signal due solely to the light scattering in turbid waters.

CORRECTION DETAILS:

The PE sensor that had been deployed at SATURN-03 since July 2010 was removed from the station in early May 2011 for cleaning and evaluation. After re-installation the sensor had an offset, possibly due to a slightly different orientation of the flow cell. In addition, the sensor was not stable and had periods of both baseline “wander” as well as short periods where there were small abrupt shifts in the baseline (see blog entry September 2011). The result of this behavior is that the turbidity corrections were not as precise because the unstable baseline resulted in poor fit of the PE vs. turbidity data compared to this sensor’s previous deployment (see correction details for 7/1/10 – 5/2/11). Monthly turbidity corrections were calculated as an alternative to a single correction and this helped to somewhat improve the corrected data. However, data between 5/3/11 and the end of this sensor’s deployment in late August 2012 should be used with caution and the turbidity corrections should be considered approximate at best.

The data from the co-deployed Turner Designs Cyclops Turbidity sensor and Cyclops Chlorophyll sensor were used to develop a turbidity correction for the PE data from the Turner Designs PE sensor.

Data Selection for each month period:

- **Phycoerythrin:** data that had been visually inspected; outliers or other bad data were excluded from the analysis.
- **Turbidity:** the quality controlled turbidity data was used . Outliers or other periods of bad data were excluded and a period of turbidity sensor offset had been corrected for. Turbidity was interpolated to the phycoerythrin time step and data where the interpolated turbidity was < 25 rfu were included in the fit.
- **Chlorophyll:** PE and turbidity data were excluded from the analysis when the chlorophyll signal exceeded 3 RFUs.

Using the above selection criteria, a linear fit of the PE vs. turbidity data was calculated (data were not binned as in earlier corrections, but a comparison of the approaches showed that the results were similar). The fit represents the artifact to be subtracted from the Raw PE signal:

- Corrected PE = raw PE - turbidity artifact
- Corrected PE = raw PE - (turbidity * slope of fit + intercept of fit)

Another result of this correction is the zeroing of the data so that when there is no PE the signal is close to zero.

RESULTS

Start Date	End Date	Slope	Intercept
05/03/11	07/01/11	3293	37612
07/01/11	08/01/11	3098	31545
08/01/11	09/01/11	3173	34588
09/01/11	11/01/11	3173	34588
11/01/11	12/01/11	4294	42772
12/01/11	01/01/12	5302	36984
01/01/12	02/01/12	5692	35029
02/01/12	03/01/12	4835	43519
03/01/12	04/16/12	5335	45332
04/01/12	05/01/12	5039	44931
05/01/12	06/01/12	4447	46262
06/01/12	07/01/12	4953	36754
07/01/12	07/19/12	4092	46373
07/20/12	09/01/12	3587	20170

The figure below shows the PE data before and after turbidity correction. Because of the sensor stability issues and less precise turbidity corrections, data between 5/3/11 and the end of this sensor’s deployment in late August 2012 should be used with caution

