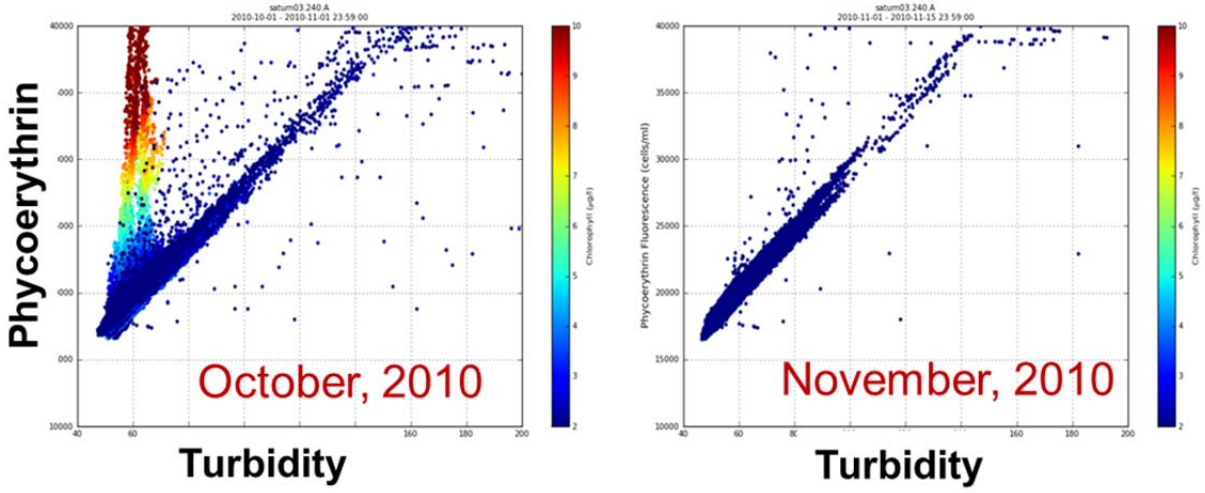
SATURN-03 Phycoerythrin

Turbidity Correction Details for: July 01, 2010 – November 15,2010 & November 15, 2010 – May 02, 2011

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 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:

- Phycoerythrin: data between July 1 & November 15th that had been visually inspected. The data had been corrected for sensor drift (see QA/QC note s3-pe01) and identified 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 then interpolated to the phycoerythrin time step.

- Chlorophyll: PE and turbidity data were excluded from the analysis when the chlorophyll signal exceeded 3 RFUs.

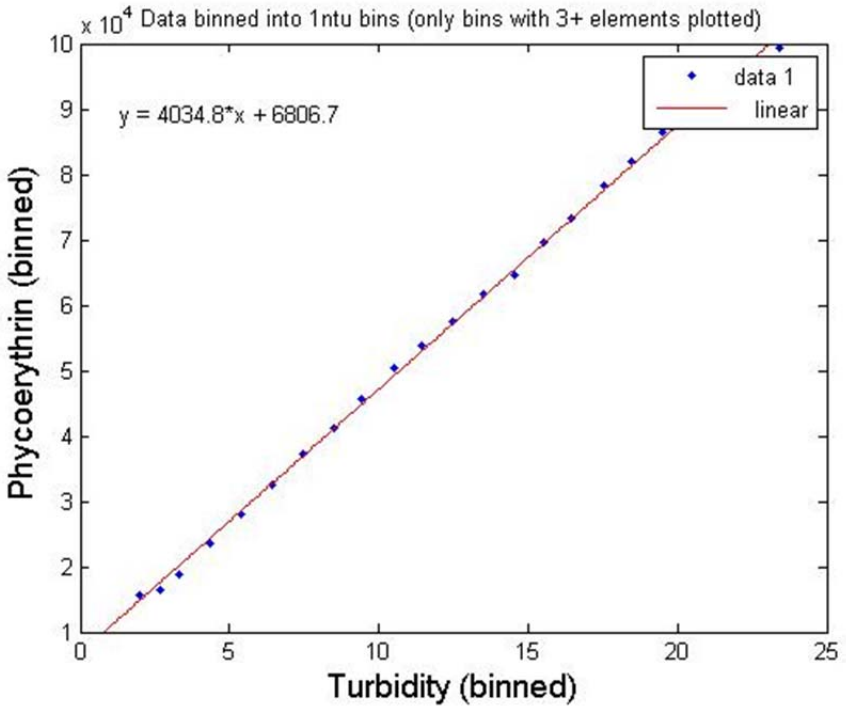
Using the above selection criteria, the data were then binned into 1 RFU turbidity bins. Within these bins, the mean turbidity and PE values were calculated and then plotted (note: if a bin had less than three data points, the data from that bin were not included). The linear fit of these points represents 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)

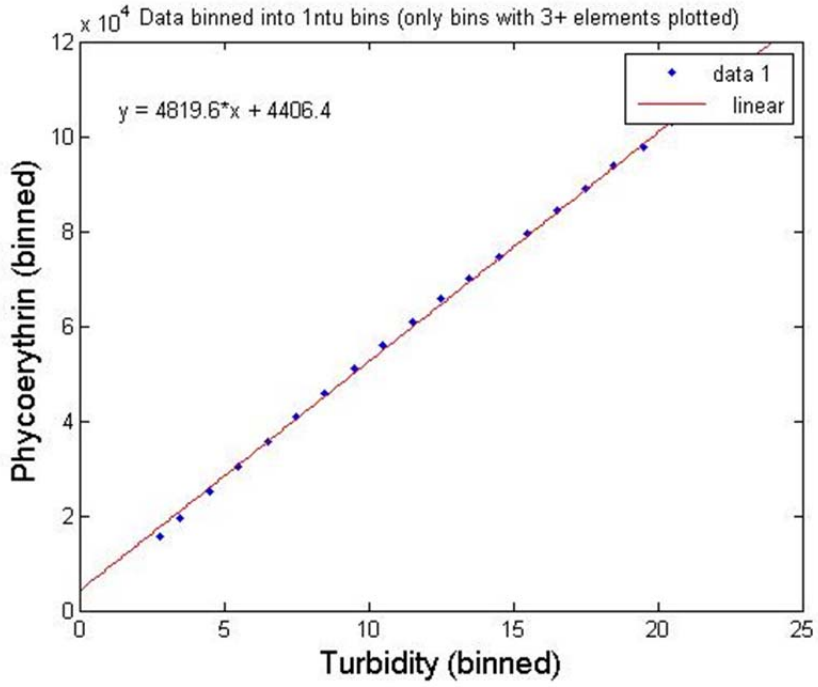
Another result of this correction is the zeroing of the data so that when there is no PE the signal is close to zero. Two corrections were calculated because of a shift in the relationship between PE and turbidity. It is possible that the changing relationship is partly a function of temperature or other seasonal parameters.

RESULTS

July 1, 2010 – Nov 15, 2010: Turbidity Artifact = 4035*turbdity + 6807



<u>Nov 15, 2010 – May 2, 2011</u>: Turbidity Artifact = 4820*turbidity + 4406



The figure below shows the PE data before and after turbidity correction. The Fall 2010 months show a distinct positive PE signal which was associated with the *M.rubrum* bloom that year. The winter months of 2010/2011 and spring 2011 had periods with a high degree of noise in the data which have not been filtered out.