Instrumentation class, SMS 598, Fall 2012
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Group II, backscattering lab:

In this lab you will measure scattering in one direction inside a black box designed to minimize scattering of light to the sensor.
Conversion of signal to a scattering coefficient at a specific angle (θ) and wavelength (λ) requires two unknowns:

$$\beta(\lambda,\theta) = slope \cdot (Signal - dark)$$

Flat backscattering sensors are rarely calibrated outside the laboratory, hence we most often use the slope parameter provided by the manufacturer (but see Dall'Olmo et al., 2012). The dark reading, however, can and should be measured by the users as it often changes with the system the sensor is deployed on. The *dark* counts are often measured by putting a black tape on the receiver, immersing the sensor in water and noting the measured counts.

Dark counts=

Don't forget to add uncertainties to this number.
In the class we will do it together and also compare with taking data with DIW.. Are they different?
Next we will sense a sample of filtered and whole seawater through the tank. How different is the reading in CDOM from DIW? How do the different channel compare?

Table:1 Fill the table with data

Sample	$\beta(\lambda_1,\theta=124)$	$\beta(\lambda_2,\theta=124)$	F_{CDOM} (signal-dark)
Dark			
DIW			
0.2mm filtered seawater			
Seawater			

Note that all of our measurements include scattering by water within them. It can be significant (open ocean) in which case that signal is removed. Using data from ac-S compute the particulate backscattering ratio= $1.1(\beta_{seawater}-\beta_{filtered})/b_p$ at the nominal wavelengths. Where are you on the diagram of Twardowski et al., 2001?

References

Dall'Olmo, G., E. Boss, M.J. Behrenfeld, and T.K. Westberry, 2012. Particulate optical scattering coefficients along an Atlantic Meridional Transect, Opt. Express 20, No. 19, 21532-21551.
Twardowski M., E. Boss, J.B. MacDonald, W.S. Pegau, A.H. Barnard, and J.R.V. Zaneveld, 2001. A model for estimating bulk refractive index from the optical backscattering ratio and the implications for understanding particle composition in case I and case II waters. Journal of Geophysical Research, 106, 14, 129-14,142.