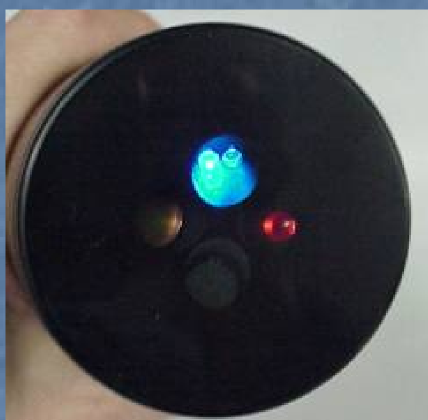
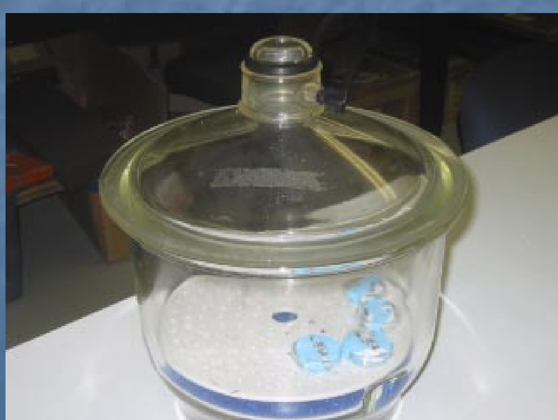
Application of BB2F Corrections and Sources of Error in Total Suspended Material (TSM) Measurement





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Overview of TSM Proxy Presentations

- Sources of Measurement Variation in TSM
- Revisiting the relationship of the EcoBB2f to TSM
- TSM and Calculated K_d values
- Optimal Observatory Sampling Frequency for the BB2f
- Optical Proxies for Measurement of Suspended Particulate Matter
- Tidal and Time Series Relationships of b_b470 and b_b700 with Fluorescence

Relating TSM Technique to Measurement Variation

- Mixing
- Rinsing Technique:
  - Problem: Salt residue due to non-rinsing
  - DI or Ammonium formate ($CHOONH_4$)
- Filter Handling:
  - Consistent loss of actual filter fiber on foil during baking
  - Possible solution: small disposable manufactured foil dishes – avoids filter folding and are coverable

Poor Rinsing Leads to Poor Reproducibility

Rinse **(n=replicates)**	**Sample Vol. (mL)**	**Mean TSM (mg/L)**	**Std. Deviation**
None (n=1)	200	118.5	n/a
3X DI (n=3)	400	13.25	3.70
$CHOONH_4$ (n=3)	400	8.25	1.80

Variation in Measured TSM Results

Date	Sample Vol. (mL)	TSM (mg/L)	St. Dev.
6/30	400	8.89	0.640
7/1	400	11.8	1.87
7/2	400	8.80	2.73
7/6	400	11.6	3.71
7/8	400	8.25	0.250
7/9	400	17.5	3.74
7/12	400	29.8	15.9
7/13	400	3.50	0.661
7/15	400	13.5	3.64

Little Dynamic range offered

BB2F Corrections

- Output: final counts = scale factor (raw counts – dark)
- Attenuation Coupling: determined by ac9 absorption for light scattered along the pathway from light source to sample to detector (Zanefeld)
  - Absorption :Approximately 4% at a=1 m^{-1} for β =117°, can be measured by ac9
- Temperature range: 0-28°C with expected calibration coefficient variation of 10%
  - Can increase in optically clear waters – low particulate value- as signal approaches detection limit error becomes larger (signal to noise ratio); ~ 10%
  - WetLabs does not presently have a correction for instrument temperature variability

Derived Optical Proxies

- VSF: β_p (m^{-1} sr^{-1})= $\beta(117°,\alpha) - \beta_w(117°,\alpha)$;
  - Total volume scattering due to particles – scattering due to molecular water scattering
  - $\beta_w(\theta,\alpha)$ is obtained from an empirical relationship derived by Morel(1974) normalized to λ at 500nm which includes a salinity factor
  - $b_w(\lambda) = 0.0022533\ (\lambda/500nm)^{-4.23}$
- Backscatter
  - b_{bp} (m^{-1})= $2*pi*\beta_p(117°)$
  - $b_b(\lambda)$ (m^{-1})= $b_{bp}(\lambda) + b_{bw}(\lambda)$; where $b_{bw} = b_w/2$

Derived Optical Proxies

- Chlorophyll :

  [XX]sample = (Csample - Cblank) * Scale Factor

  - where [XX]sample = Concentration of a sample of interest (µg/l)
  - Csample = Raw counts output when measuring a sample of interest
  - Cblank = Measured signal in raw counts for a sea water blank
  - Scale factor = multiplier in µg/l-counts.

Observational Applicability

- Robust application for backscatter calculation, which can be used to derive TSM
- Linearly calculates [chl] from one angle (117°) exc. 470nm, emission, 700nm(tail)
- Optical proxy for TSM needed based on time expended and systematic variance
  - Needs a larger range of TSM values to expand its ability to confidently calculate suspended particulate matter
  - Beam transmissiometer, concurrent light attenuation measurements, surface irradiance sensors, ac9 – ratio of particulate bb/b – are particles organic or not based on index of refraction

Acknowledgements

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