NSF Ocean anything currently funded projects (www.nsf.gov):
title words frequency analysis (wordle.net,150 words)

Top 5 words:

Particulate Organic Carbon (POC) vs. inherent optical properties (IOP)

Ocean Optics class
DMC, 2011

POC, small volumes: Menzel and Vaccaro, 1964

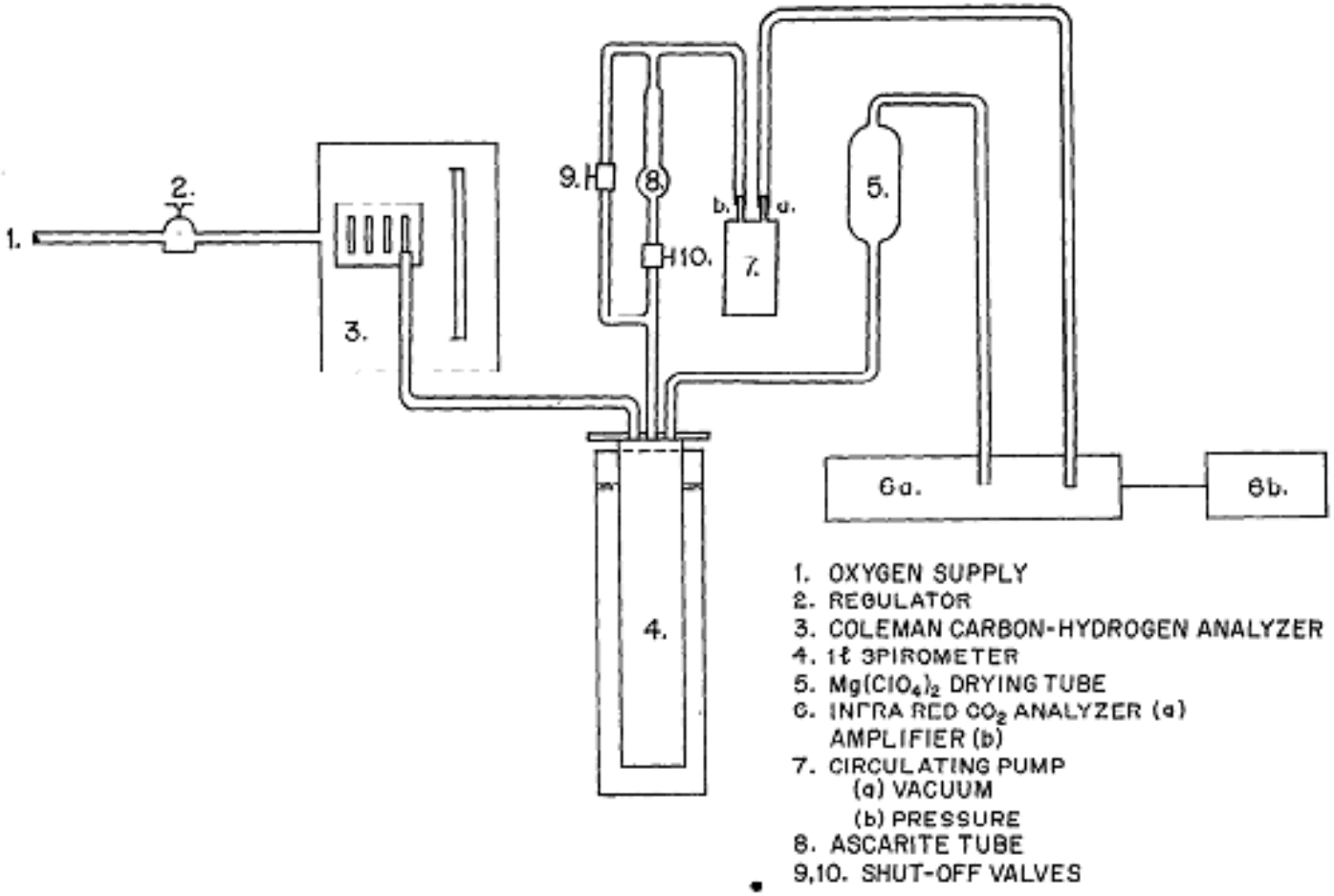


FIG. 3. Schematic diagram of equipment used in the combustion and detection of particulate carbon in seawater.

In situ pumps ~ large volumes~ POC: Bishop and Edmond, 1976

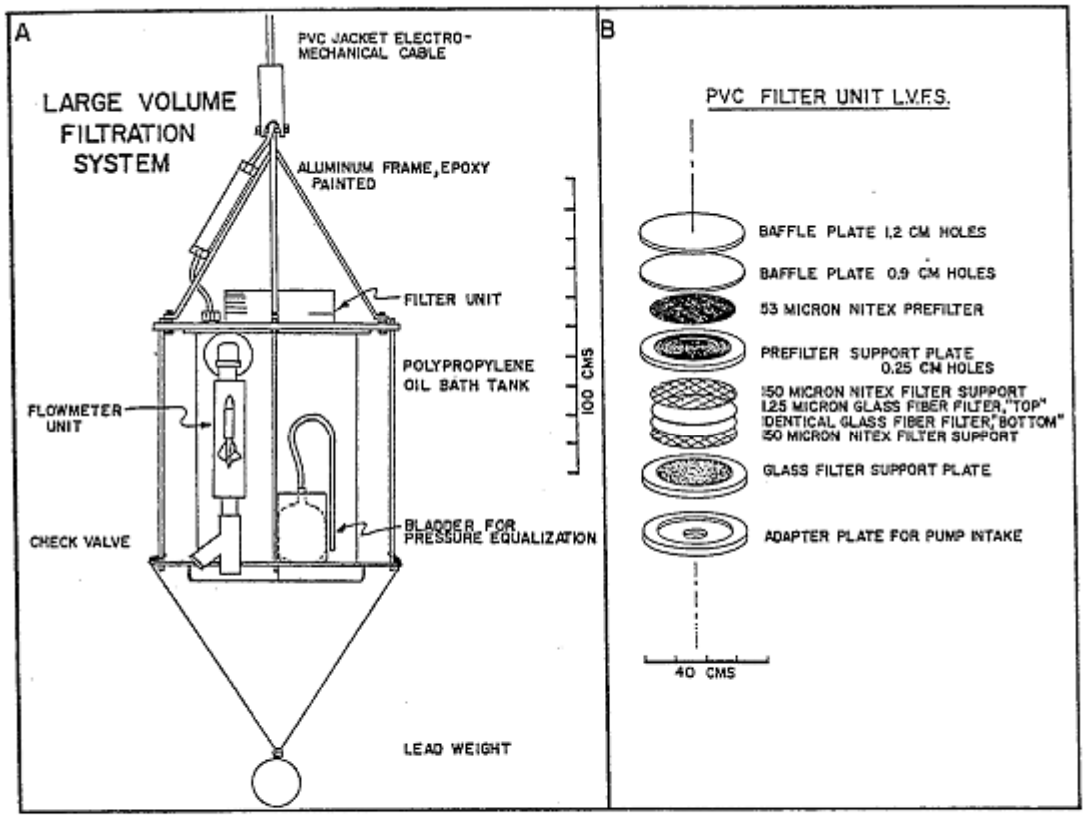
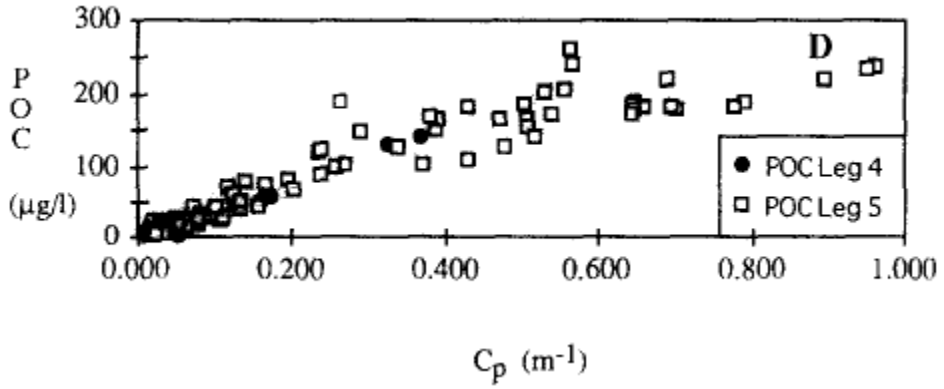


Figure 1. a) Large Volume Filtration System (LVFS) has operated *in situ* 5½ days filtering 600,000 liters to yield 60 particulate matter samples split into >53μm and <53μm size fractions. Water is sucked through filter unit and discharged through flow meter and check valve. Weight in air 430 Kgs. Design depth 5000 m. b) LVFS filter unit and filtration sequence.

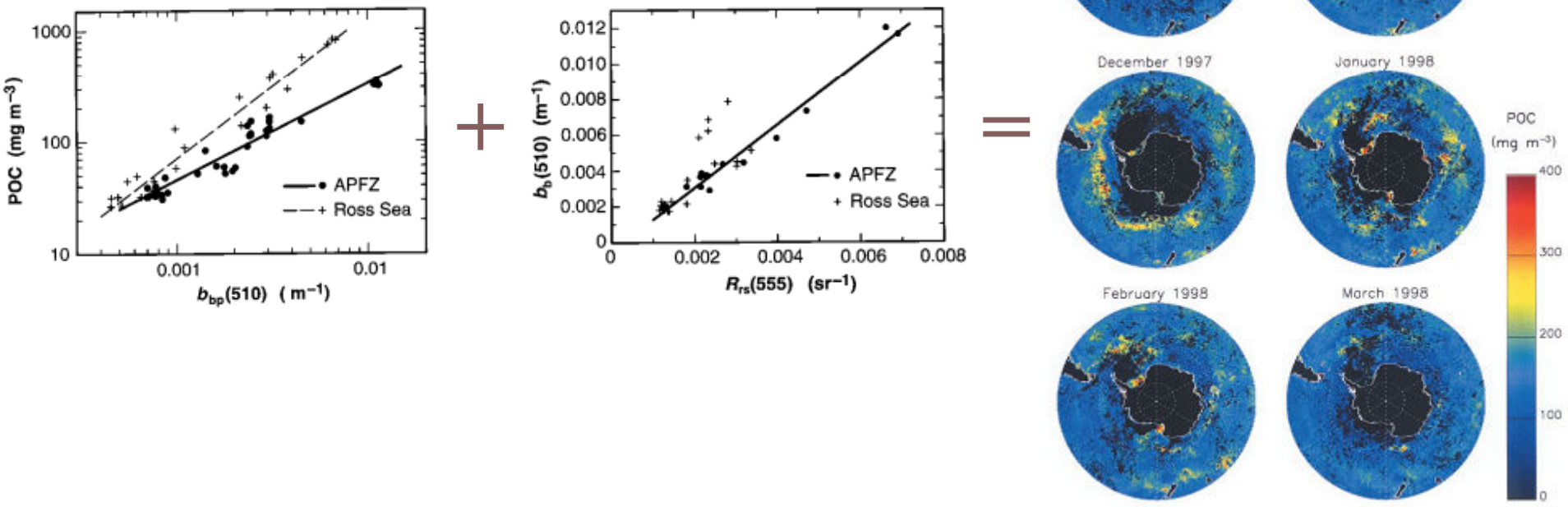
POC vs. IOP

- Morel (1988) suggested there was a linear relationship between particle light scattering and POC (via *b*(550) vs. Chl a and Chl a vs. POC)
- POC to optics via SPM to POC through SPM-beam attenuation (Siegel et al., 1989)
- Gardner et al. (1993) JGOFS North Atlantic



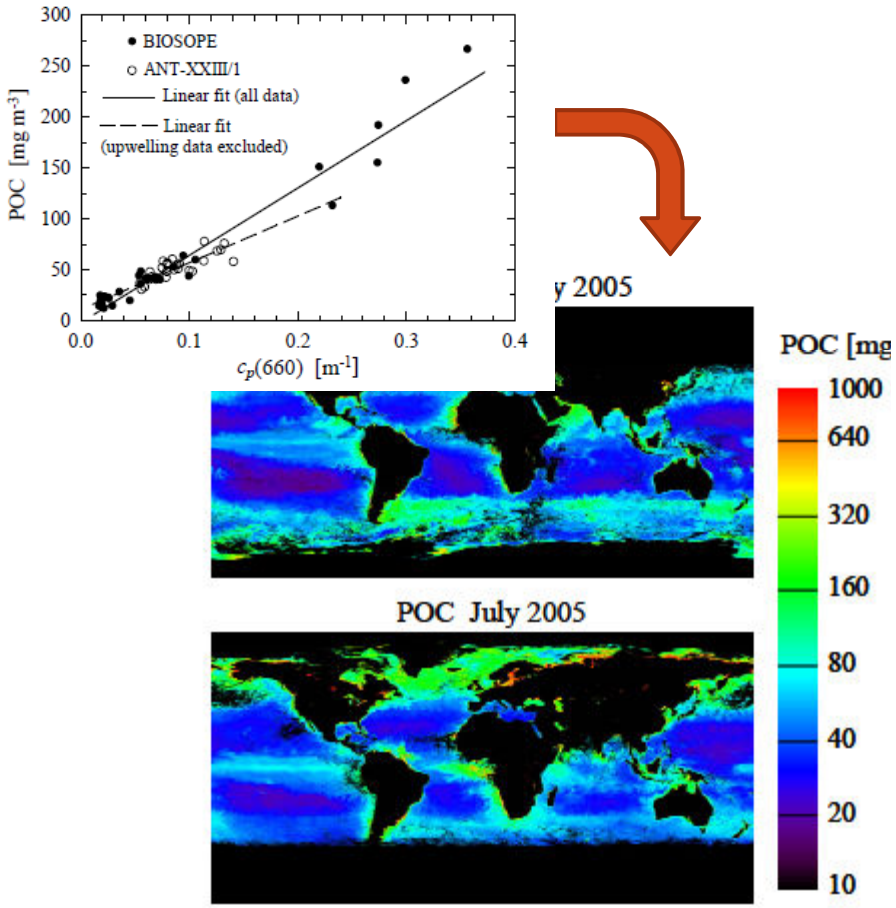
POC vs. IOP

- Stramski et al 1999
- POC vs $b_{bp,}$ b_{bp} vs Rrs

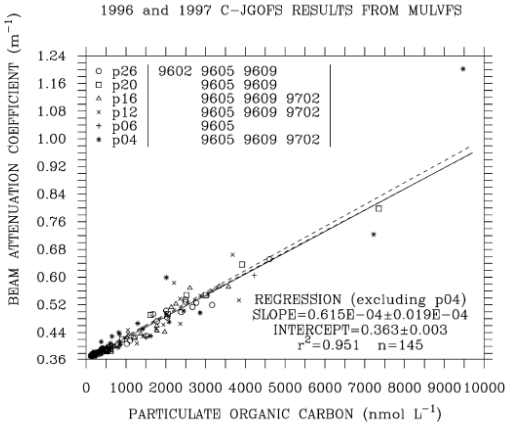


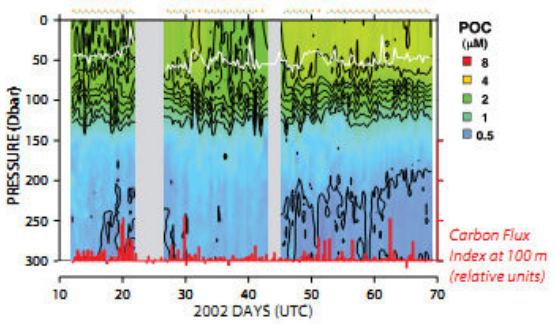
Global application of POC vs. IOP

Global POC algorithm, Stramski 2008

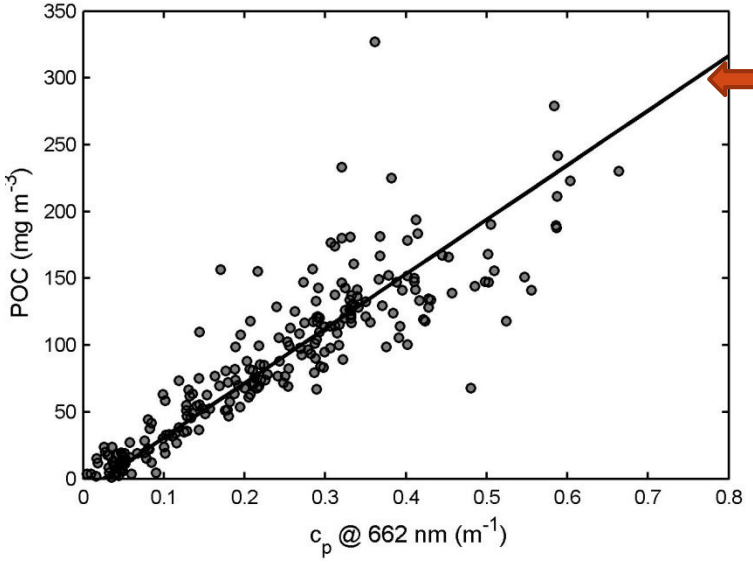


***Carbon explorer*, Bishop 2009, based on Bishop et al, 1999**



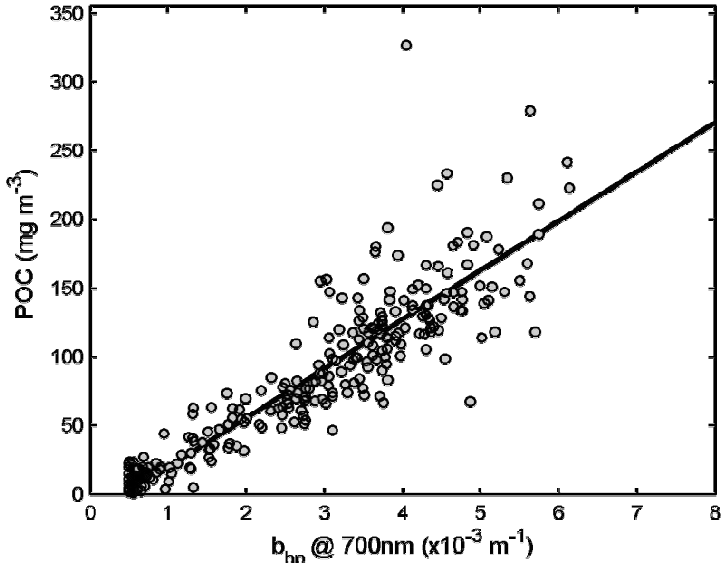


And then you go on the field…

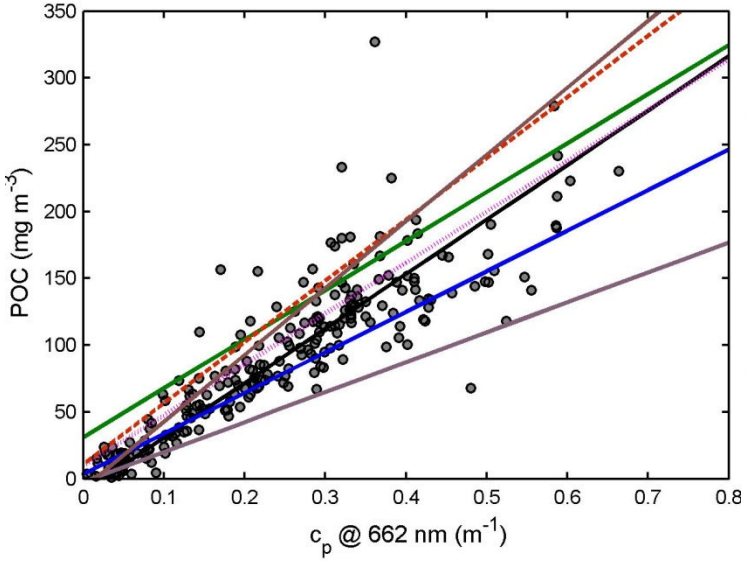


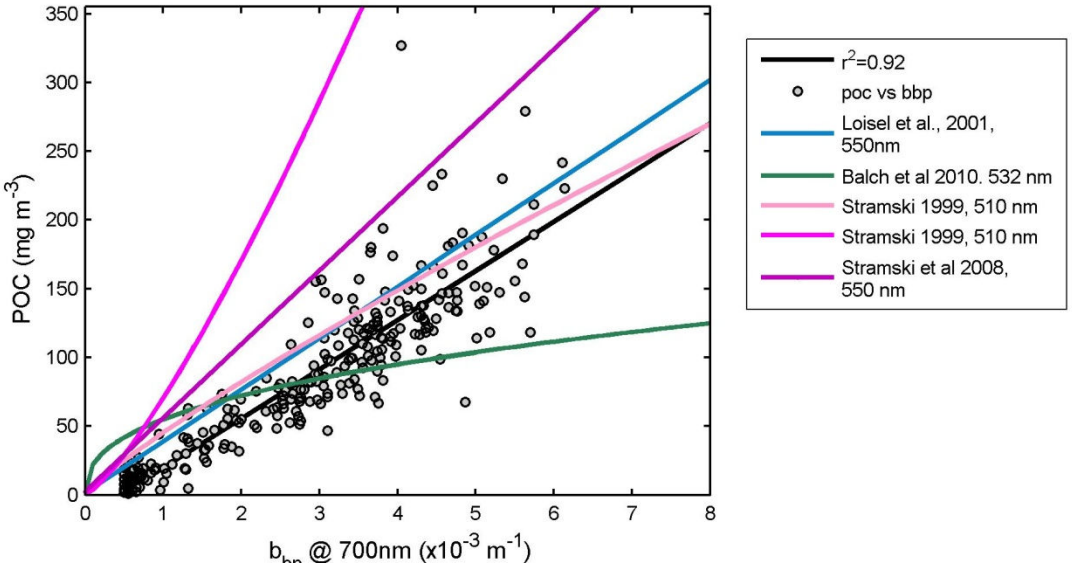
POC (mg m^{-3}) = 391(±19) c_p - 5.8(±5.5)

POC (mg m^{-3}) = 35422 (±1754)b_{bp_down} -14.4 (±5.8)



And compare your results with literature (or you are just looking for a good POC vs. IOP relationship to use in your model)



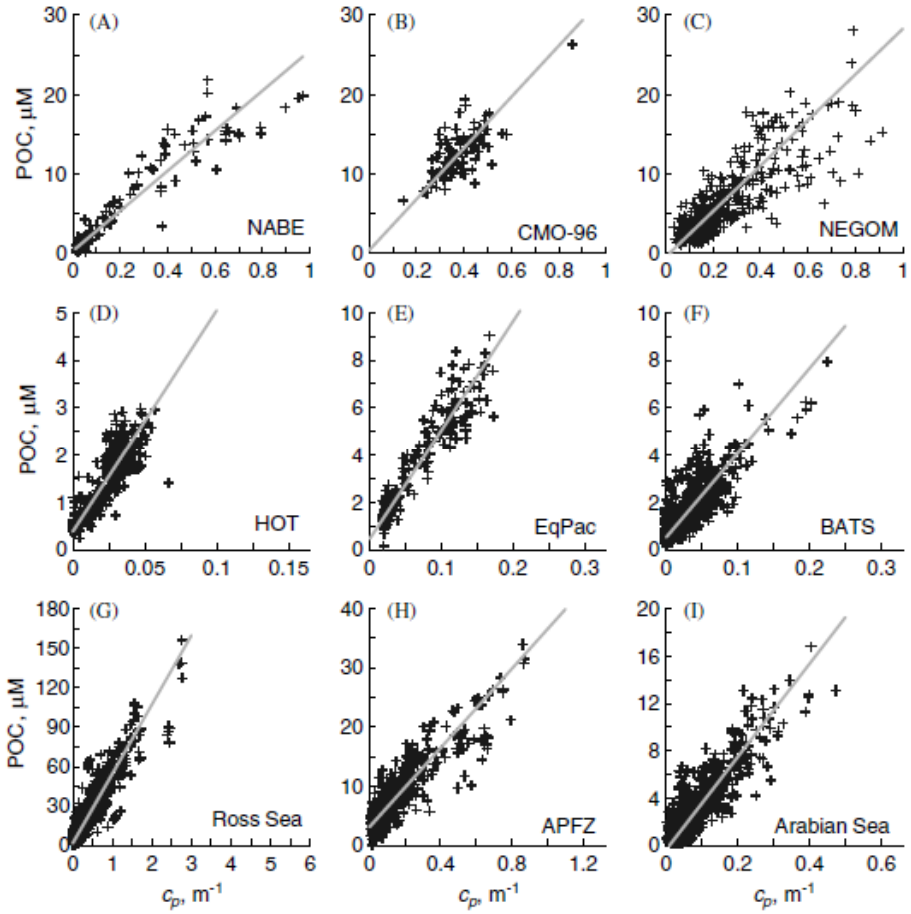


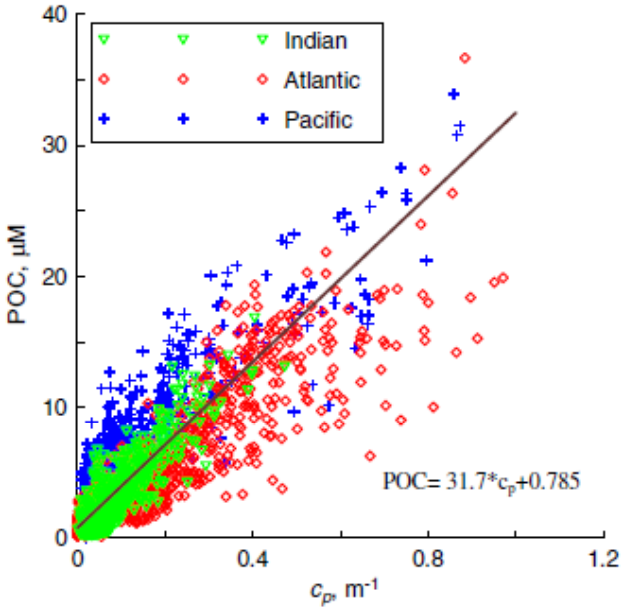
Variability in POC vs. IOP

- Natural variability
  - Particulate composition

- Differences in methods (ouch!)
  - POC side
  - Optical side

Particulate composition: c_p:POC regressions by region (Gardner et al. 2006)



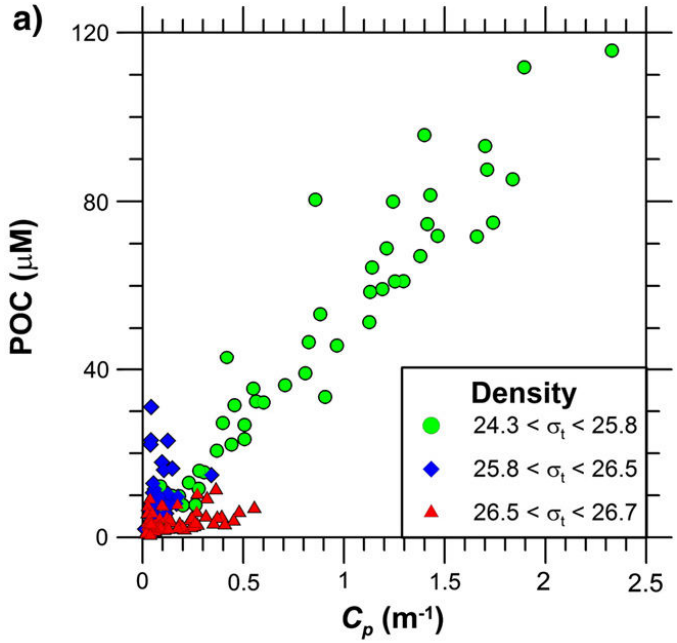


GLOBAL
POC (mg m^{-3})=380.74 c_p+9.43

Range of slopes: 303.88 (NABE) – 631.76 (Ross Sea)

Particulate composition: Coastal area

Holser et al, 2011

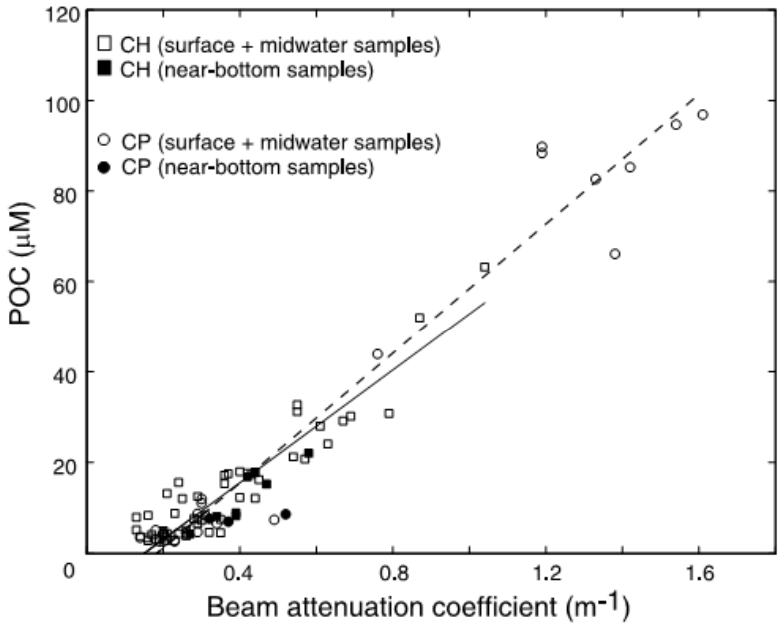


POC (mg m^{-3})=647.4 c_p +1.8

POC (mg m^{-3})=3879.5 c_p -185

POC(mg m^{-3})=548.9 c_p - 43.3

Karp-Boss et al, 2004



POC (mg m^{-3})=745.86 c_p -111.69

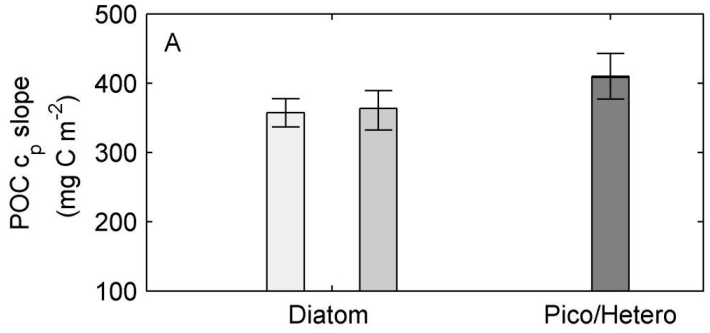
POC (mg m^{-3})=858.76 c_p -157.34

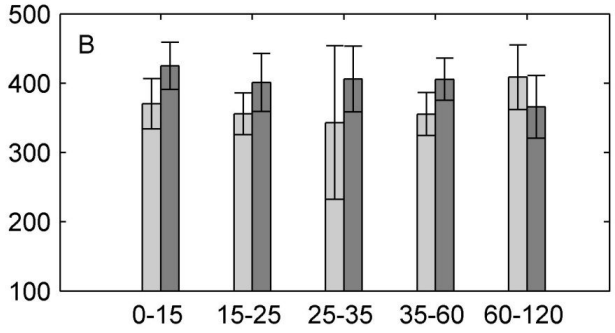
Particulate composition: function of phytoplankton population & depth

Phytoplankton community composition

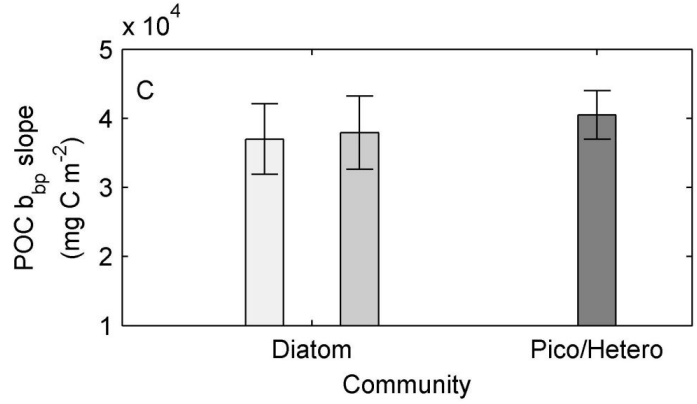
Depth distribution

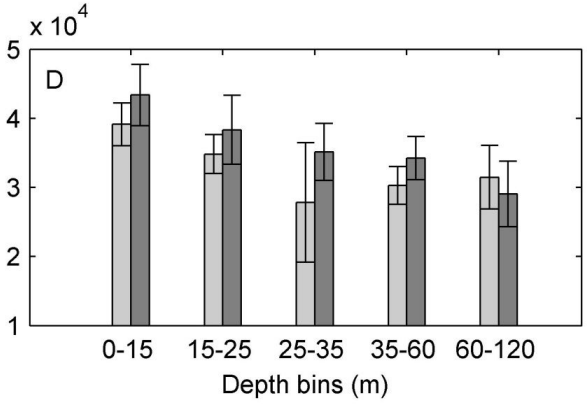
c_p





b_{bp}

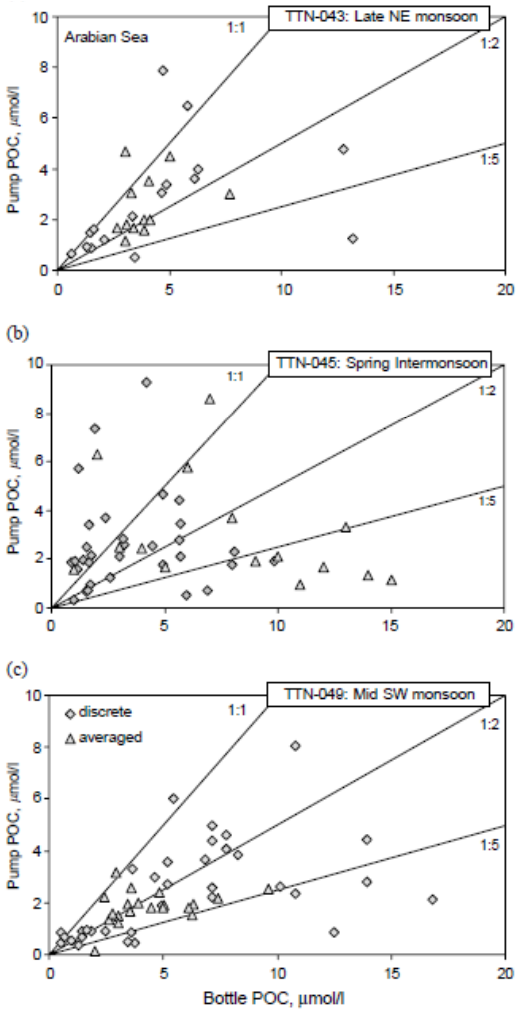




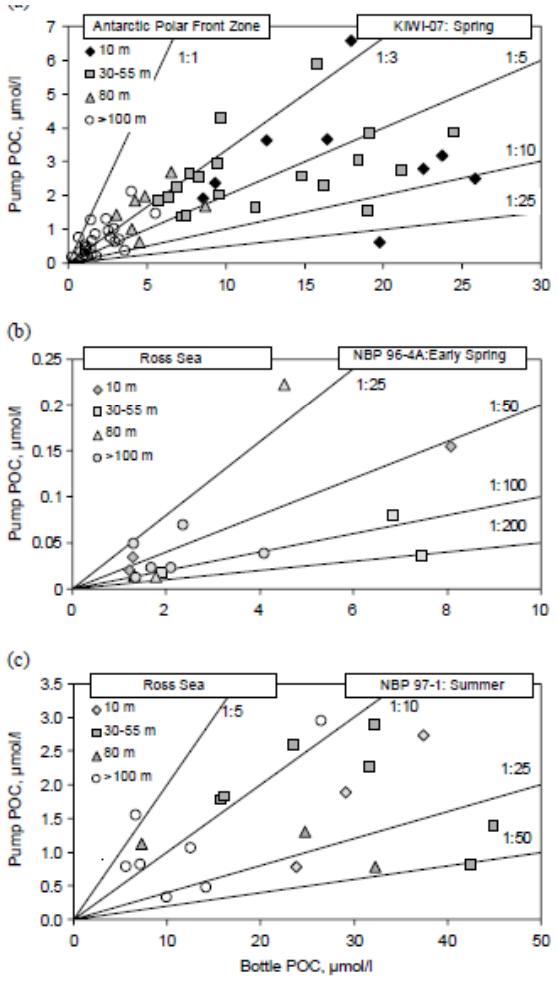
Cetinić et al, in prep

Differences in methods, POC side
In situ pumps vs. small volume sampling

Arabian Sea – up to 5X difference

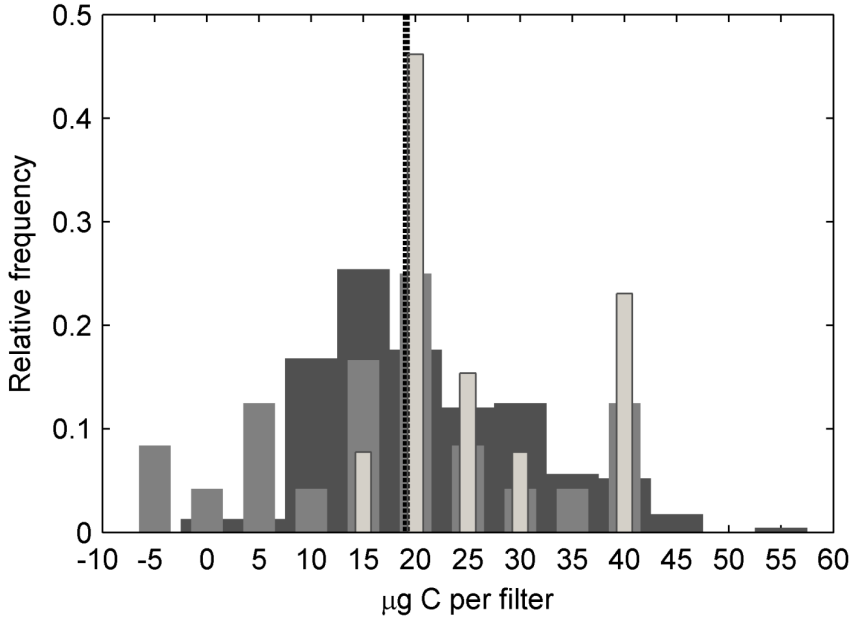


Ross Sea – up to 200X difference



Gardner et al, 2003

- Proper blanking (DOC adsorption on filter)



- Oligotrophic ocean POC <<100 mg m^3
- DOC adsorption is ~constant per unit of filter area
- Filtering volume….

Differences in methods, POC side

double filter blanks

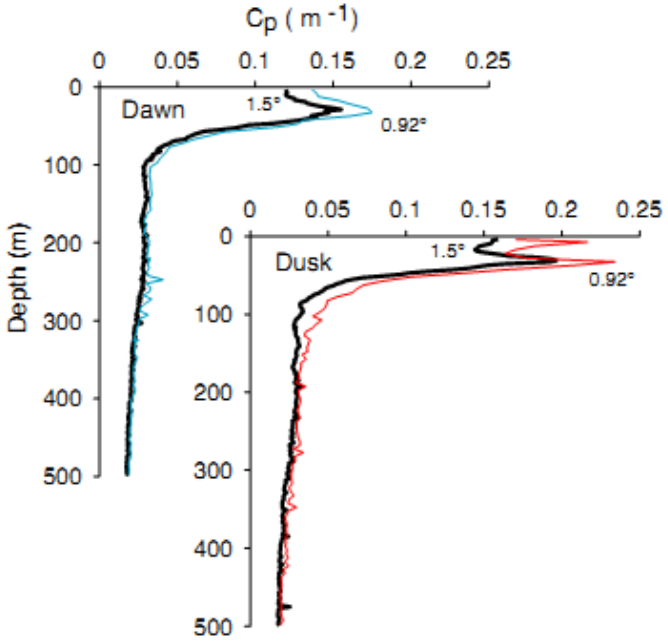
triple volume intercept blanks

samples collected ~600 m depth.

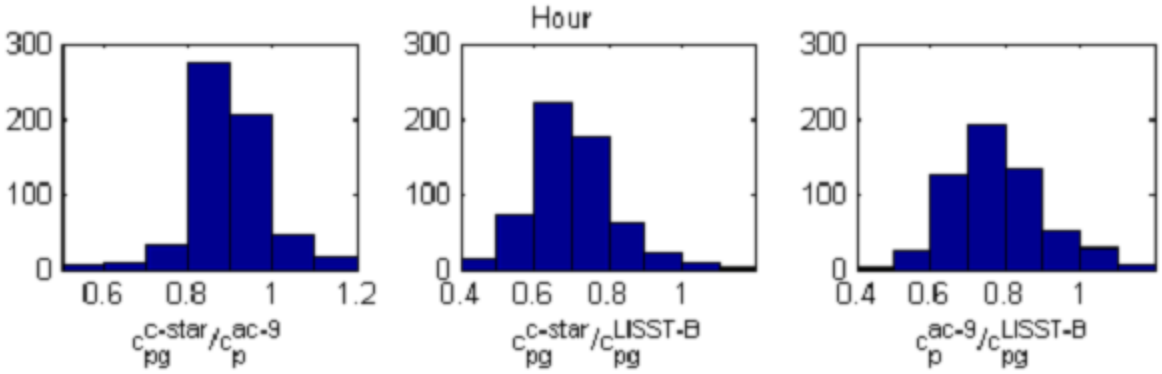
final blank = filter + adsorbed DOC

Cetinić et al, in prep

- Acceptance angle of beam transmissometers



- Bishop & Wood, 2008



Differences in methods, IOP side

SCATTERING LECTURES FROM FIRST WEEK !!!!!

C-star/1.2º

ac9/ 0.93º

SeaTech /1.03º

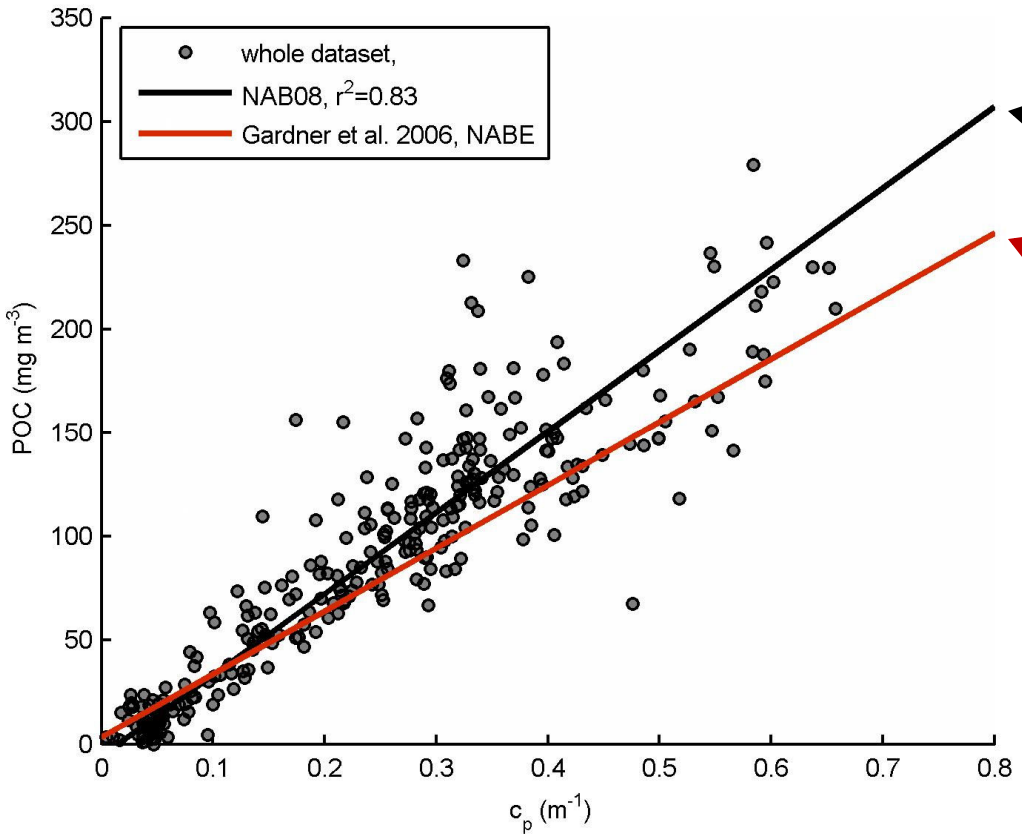
LISST 100-B & 100X-B/0.0269º

LISST-100X-Floc/0.006º

This difference is due to variations in scattered light collected with different acceptance angles and is neither constant nor easy to parameterize.

Boss et al (2009)

- Acceptance angle of beam transmissometers



NAB08 slope 391

NABE slope 303.88

Differences in methods, IOP side

SCATTERING LECTURES FROM FIRST WEEK !!!!!

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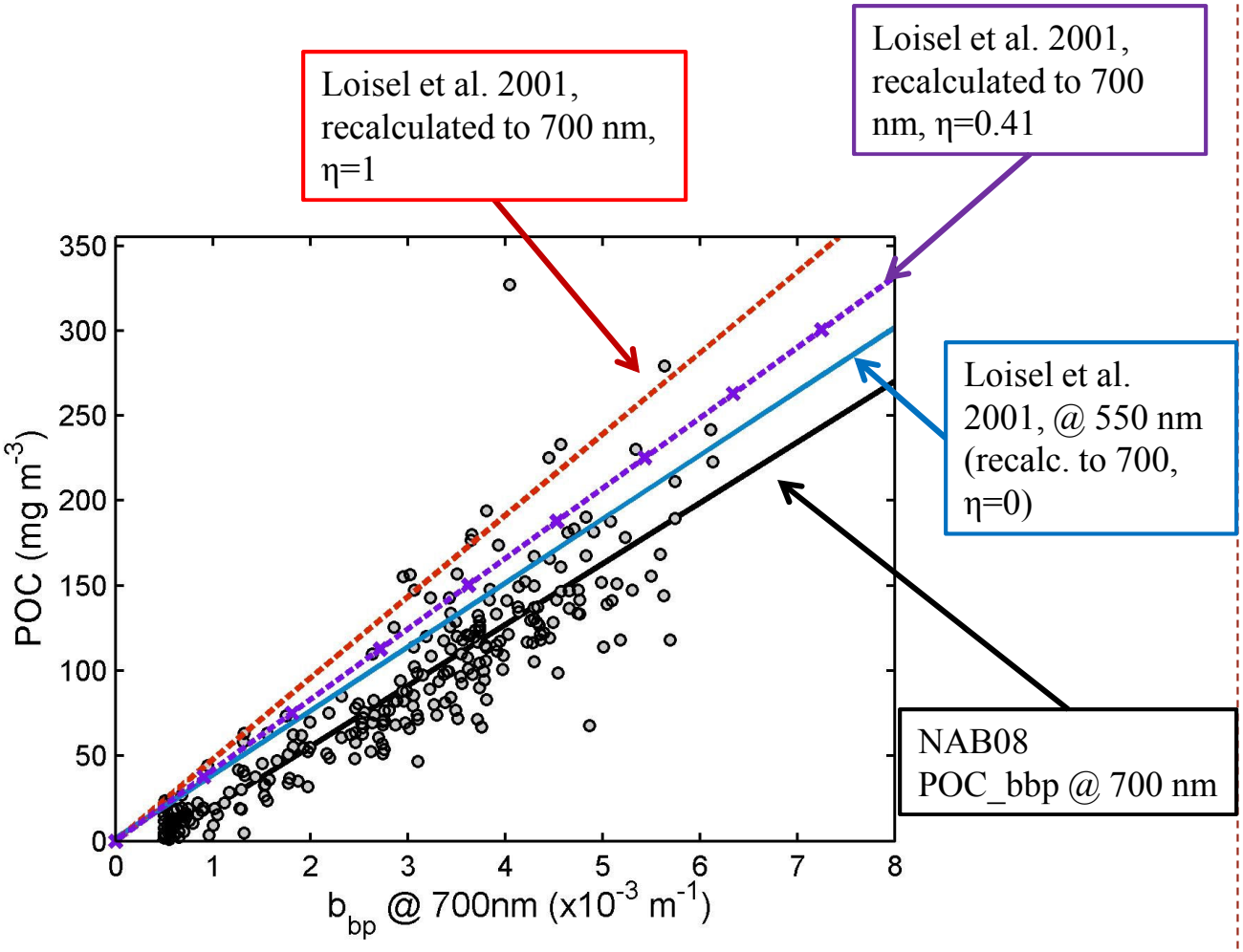
This difference is due to variations in scattered light collected with different acceptance angles and is neither constant nor easy to parameterize.

Boss et al (2009)

- Backscattering wavelength



Differences in methods, IOP side

SCATTERING LECTURES FROM FIRST WEEK !!!!!

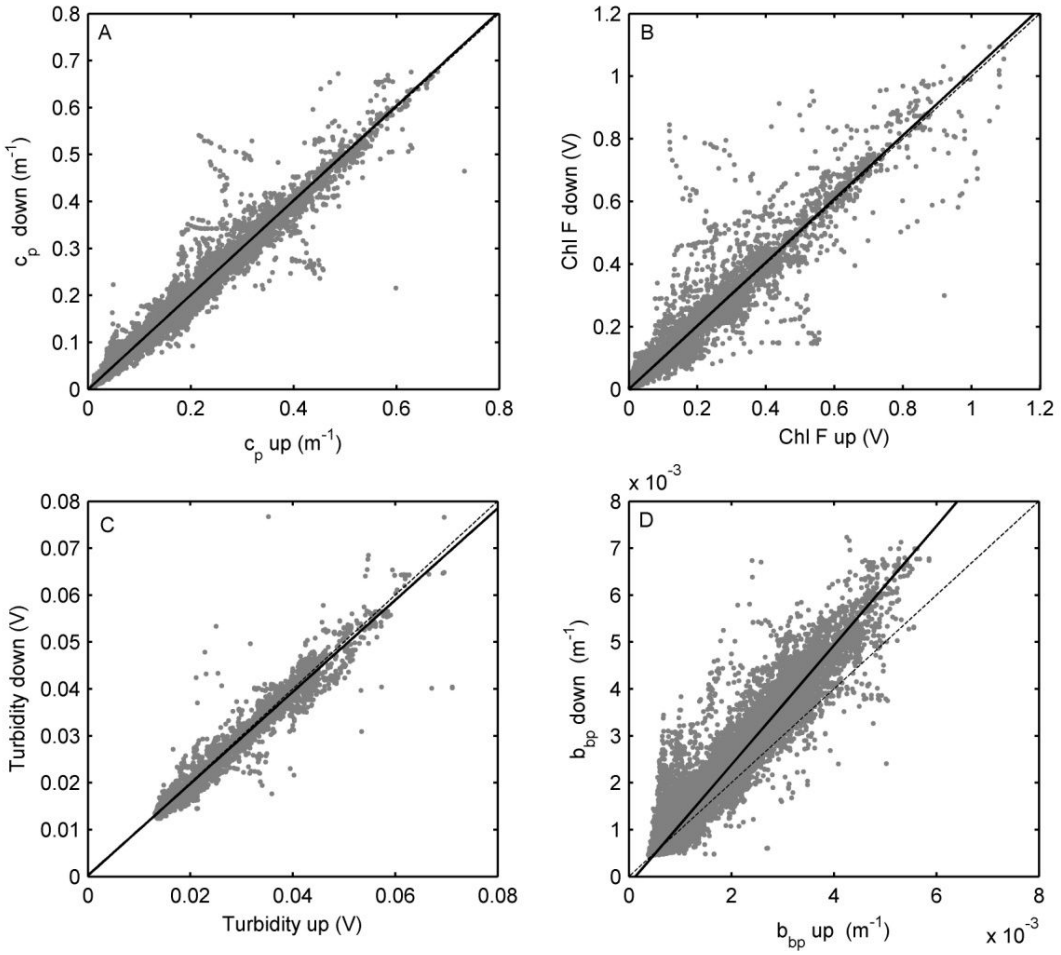
Backscattering spectral shape

$$b_{bp}(\lambda) = b_{bp}(\lambda_o)\left(\frac{\lambda}{\lambda_o}\right)^{-\eta}$$

Errors in calculation from λ_0 to λ due to the incorrect slope

- Upcast vs. down cast discrepancy in optical measurements

DOWNCAST



UPCAST

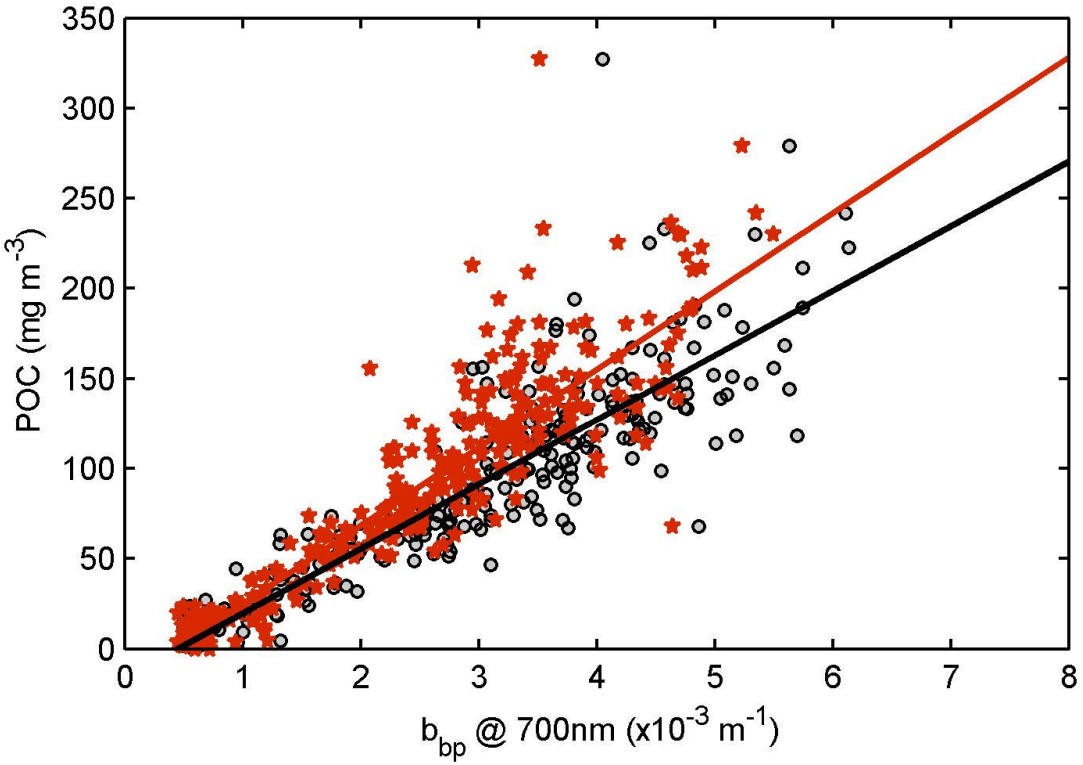
Differences in methods, IOP side

- real change in particulate optical properties?
- instrumental artifact?

Should you pair your POC measurements with upcast or downcast optical profiles?

Cetinić et al, in prep

- Upcast vs. down cast discrepancy in optical measurements



DOWN: POC (mg m^{-3}) = 35422 (±1754) b_{bp_down} -14.4 (±5.8)

UP: POC (mg m^{-3}) = 43317 (±2092) b_{bp_up} -18.4 (±5.8)

Differences in methods, IOP side

- specific instrumental response to change in particulate size/type?
- instrumental artifact?

Should you pair your POC measurements with upcast or downcast optical profiles?

Cetinić et al, in prep

We have a BIIIIG responsibility

- For difference than you, ocean optics class graduates, some scientists don't stop and look at the minor (or major) details ~sampling and processing… they just grab the data/relationship/product and run

  - e.g. Question from Ocean Color forum (NASA)

  *"**Is it possible to convert CDOM Index (no unit) in units of POC product (mg/m3) to have a possibility to compare absolute values?**"*

  polite answer from Ocean Color forum admin

  "*CDOM* is a dissolved component, not a particulate component. So, no…"