Understanding Natural Variability of VSFs and Its Impact on Biogeochemical Retrieval from Ocean Color

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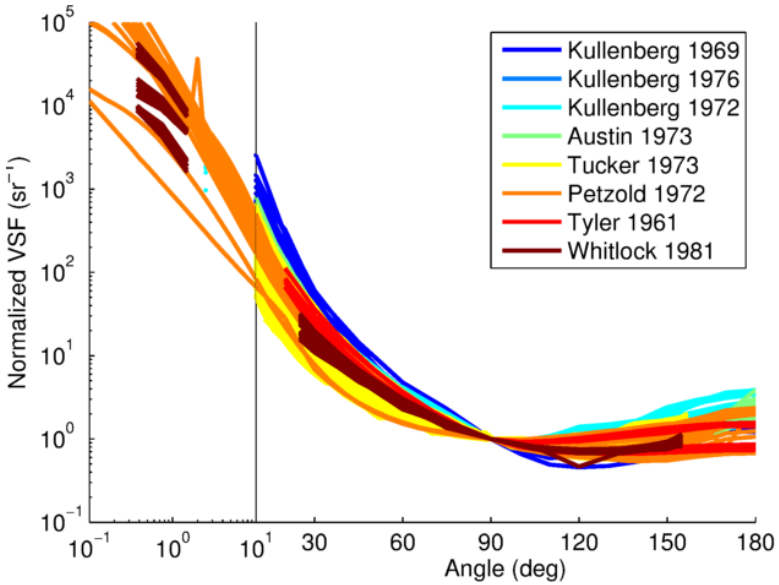
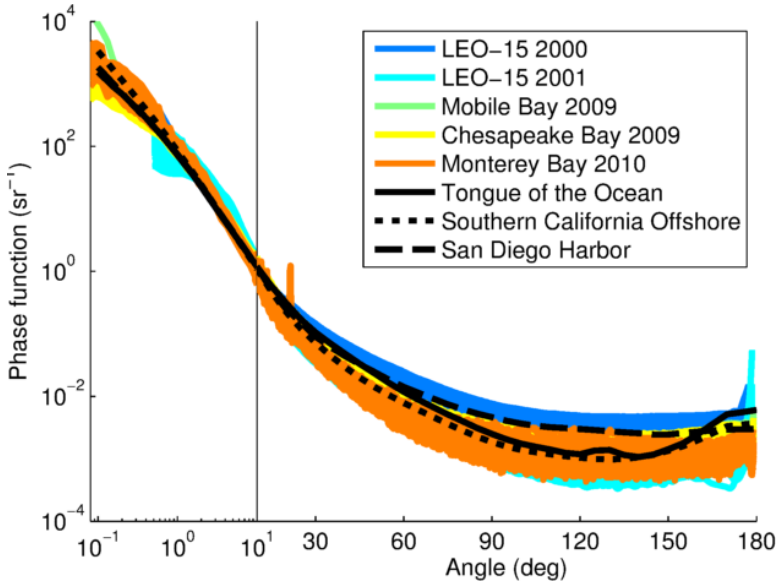
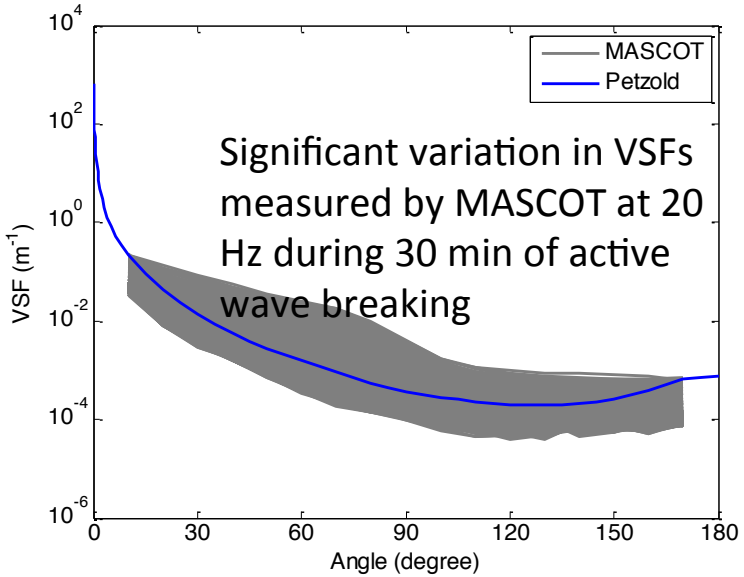
Unprecedented spatial, temporal, and angular resolution of VSFs in the natural environment

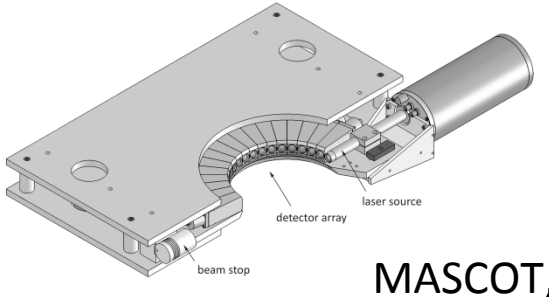






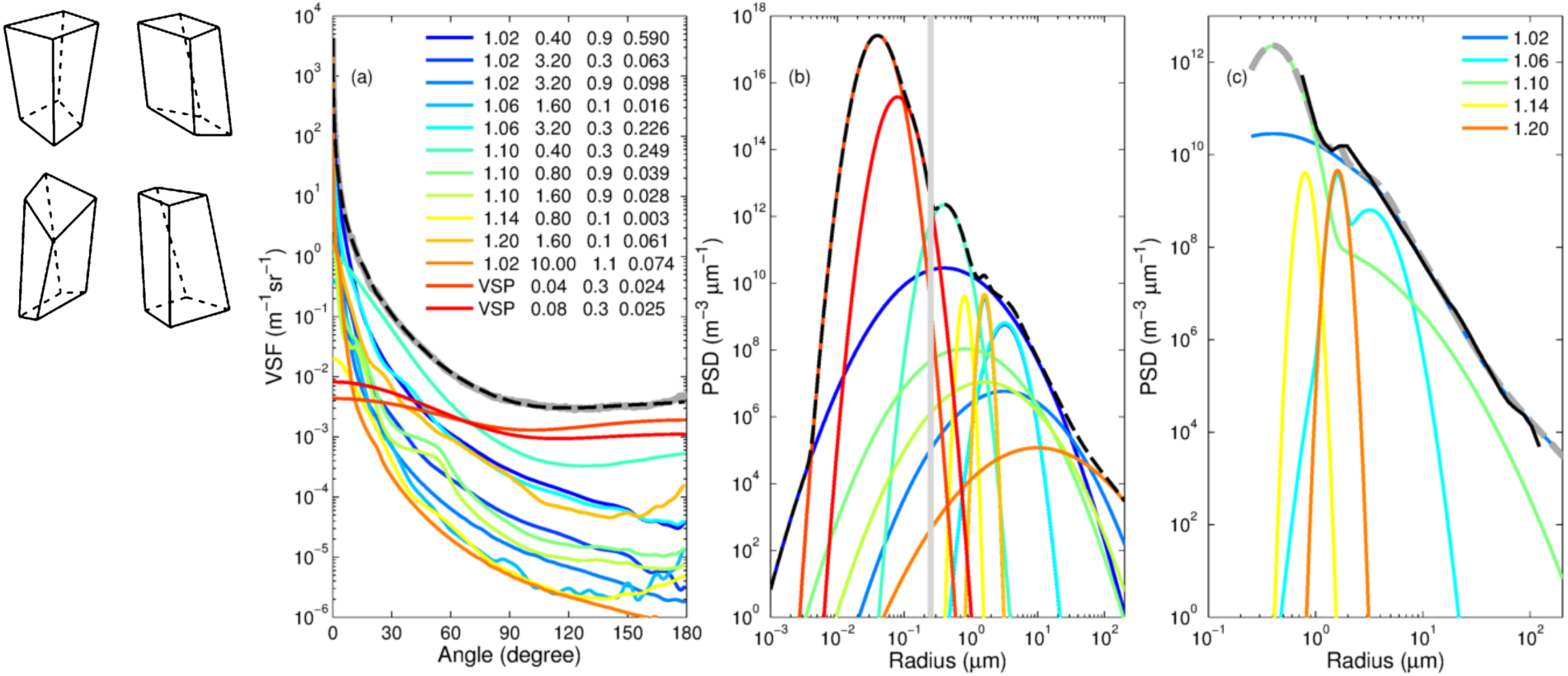
LISST-VSF, Sequoia:
S11: 0.1 – 150°
S12 and S22: 15 - 150°

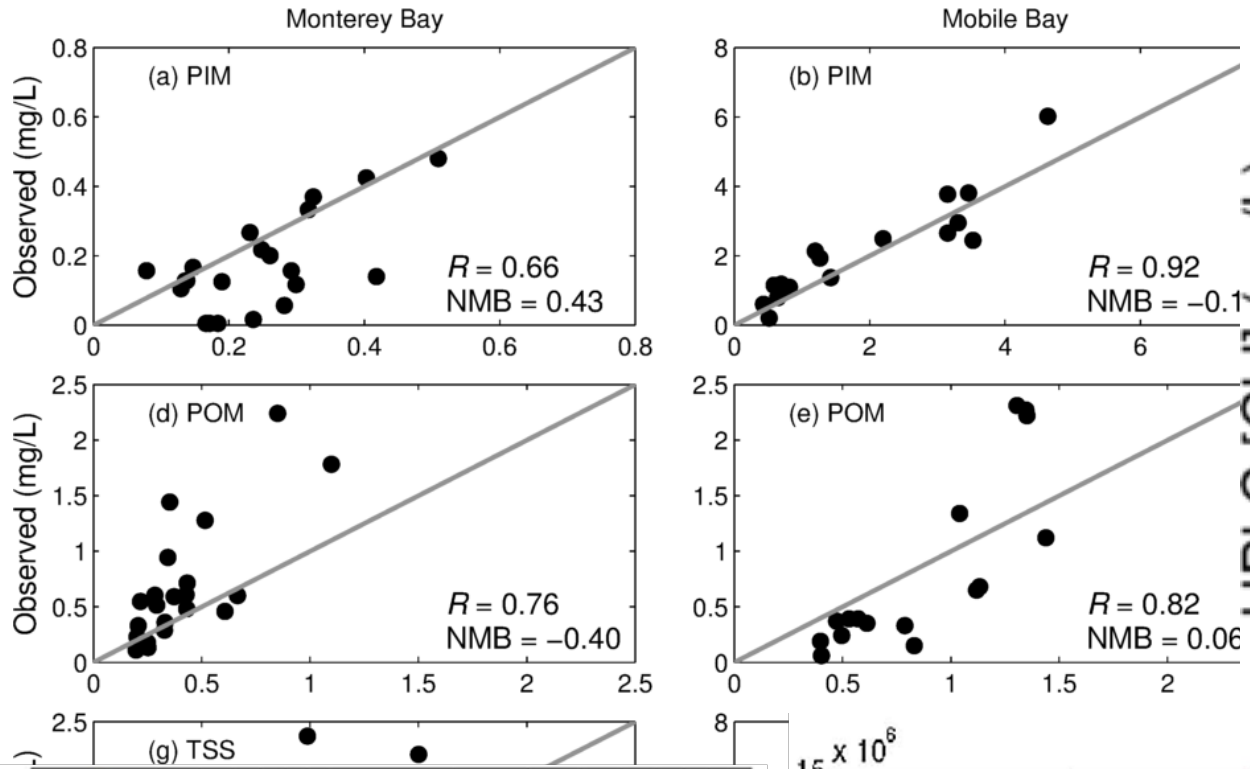
VSM + LISST, Gray and Weidemann:
8 wavelengths @ 0.25°, >600 angles

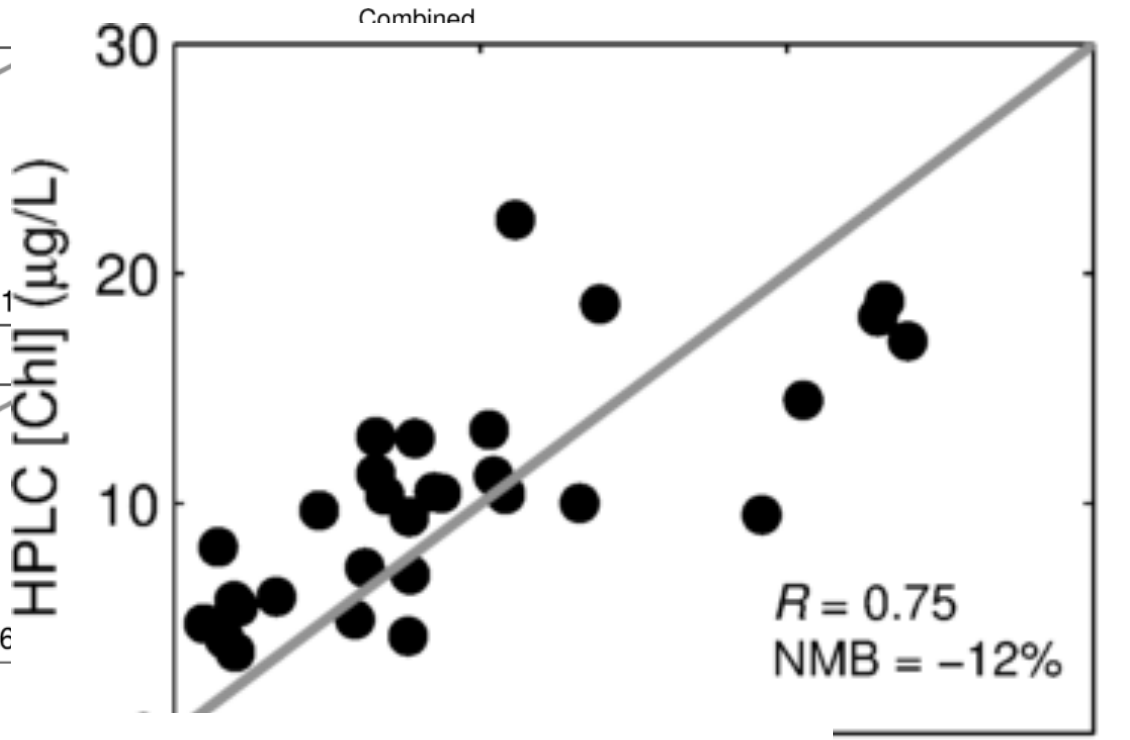


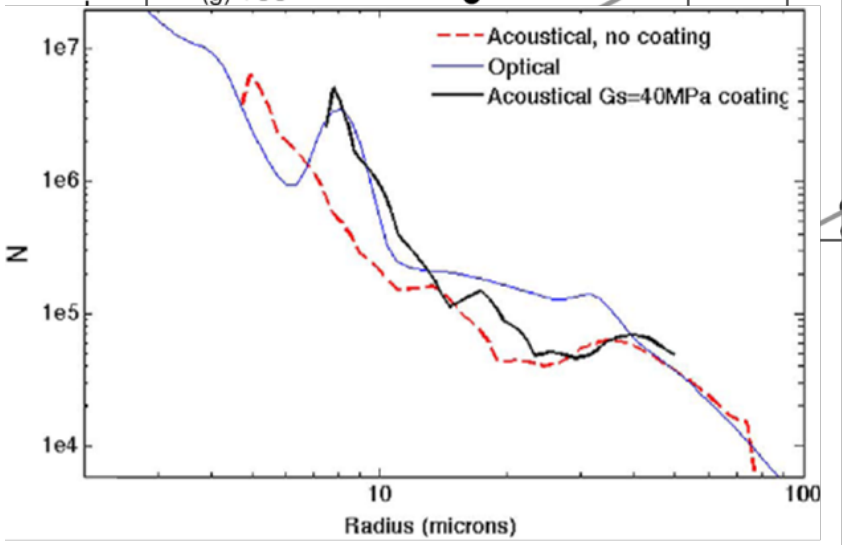
MASCOT, WETLabs,
20 Hz, 10°, 17 angles

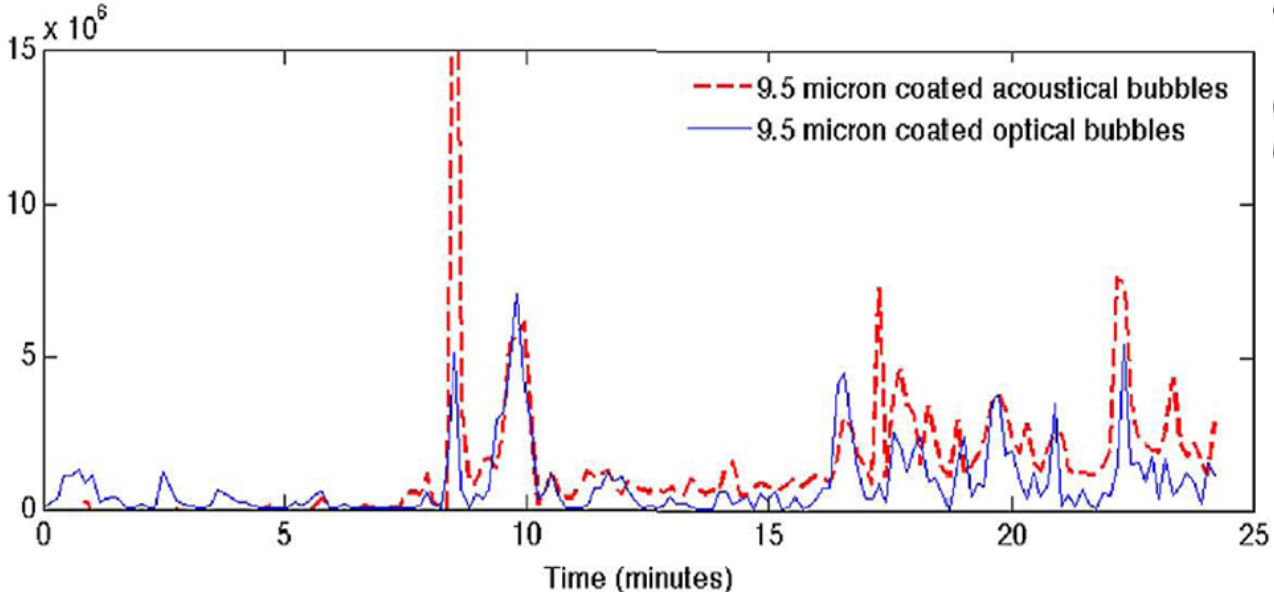
A new way to understand VSFs: an inversion approach (Zhang et al. 2011; 2012; 2013; 2014. Czerski et al. 2011. Twardowski et al. 2012)




Monterey Bay
Mobile Bay
(a) PIM
(b) PIM
(d) POM
(e) POM
(g) TSS
Observed (mg/L)
R = 0.66
NMB = 0.43
R = 0.92
NMB = −0.1
R = 0.76
NMB = −0.40
R = 0.82
NMB = 0.06

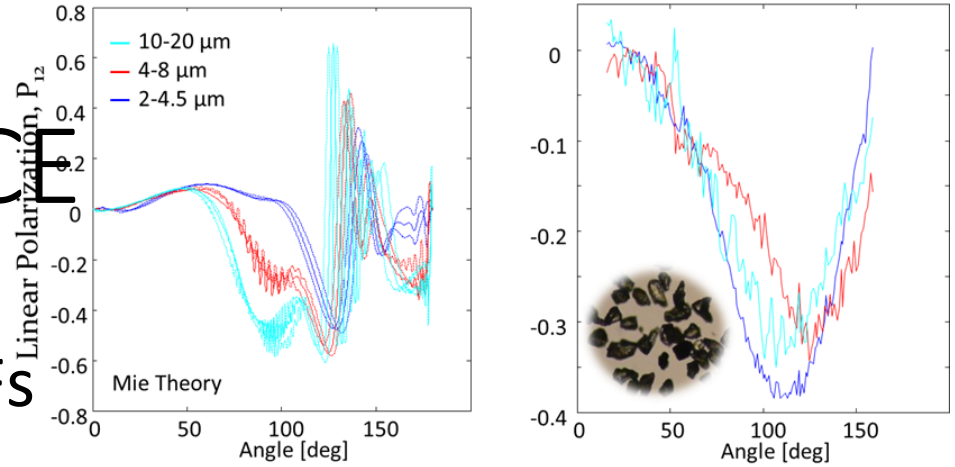

Combined
HPLC [Chl] (µg/L)
R = 0.75
NMB = −12%

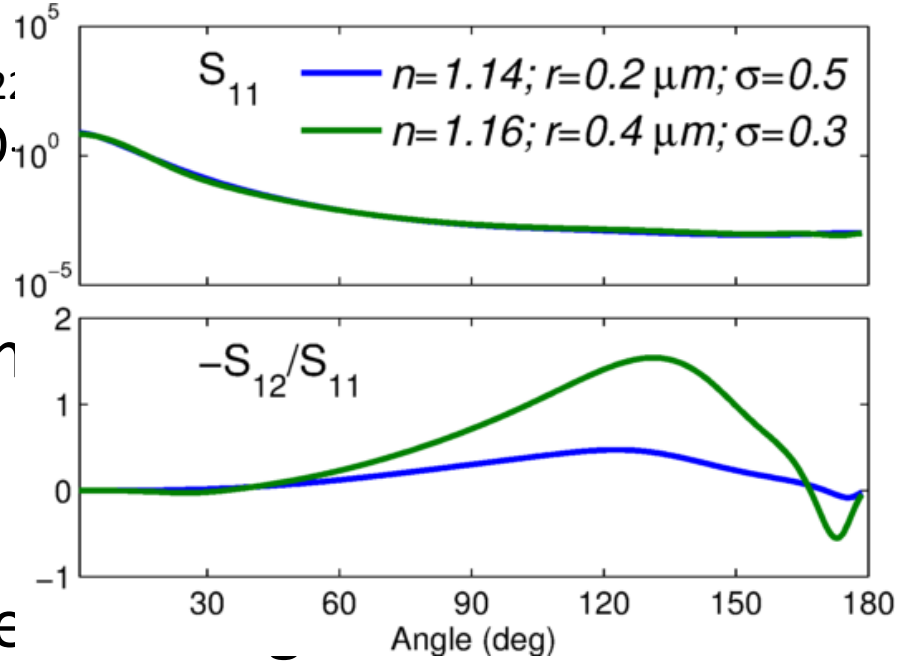

Acoustical, no coating
Optical
Acoustical Gs=40MPa coating
N
Radius (microns)


x 10^6
9.5 micron coated acoustical bubbles
9.5 micron coated optical bubbles
Time (minutes)

Proposed work under PACE

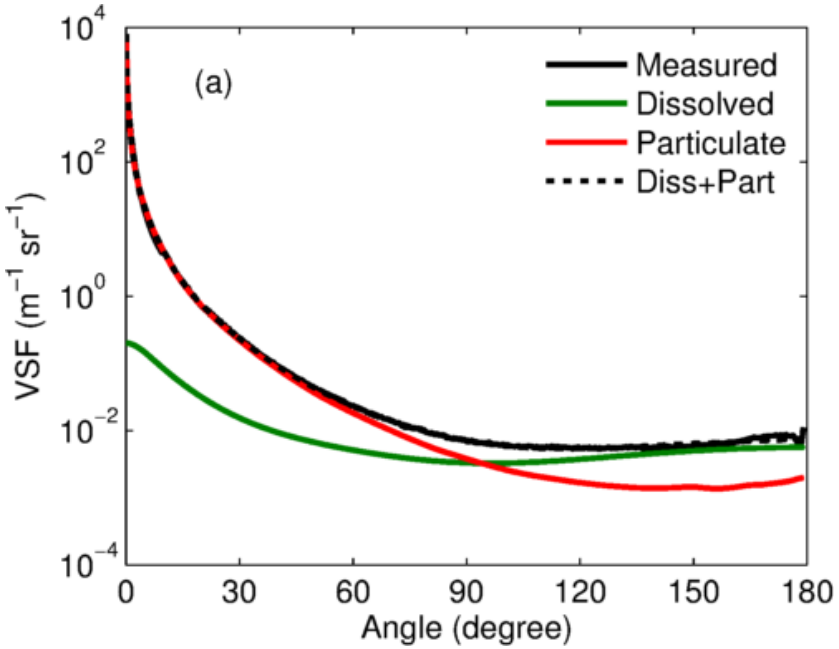
- Spatial and temporal variability of VSFs
  - Additional LISST-VSM data
  - New LISST-VSF data, particularly S_{12} and S_{2}
  - Concurrent measurements: ac-meter, ECO
- BRDF
- Inversion of VSFs to identify biogeochem significantly to the observed VSFs
  - Include polarization
- Forward modeling to evaluate how diffe contribute to spectral b_b



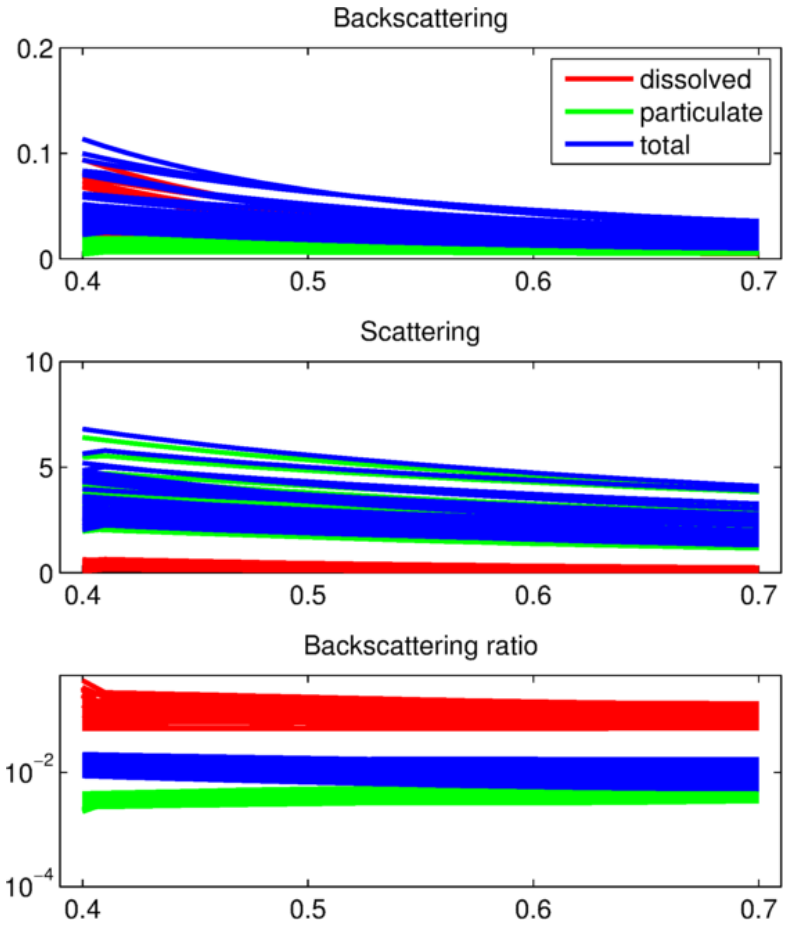


An example to illustrate the proposed work

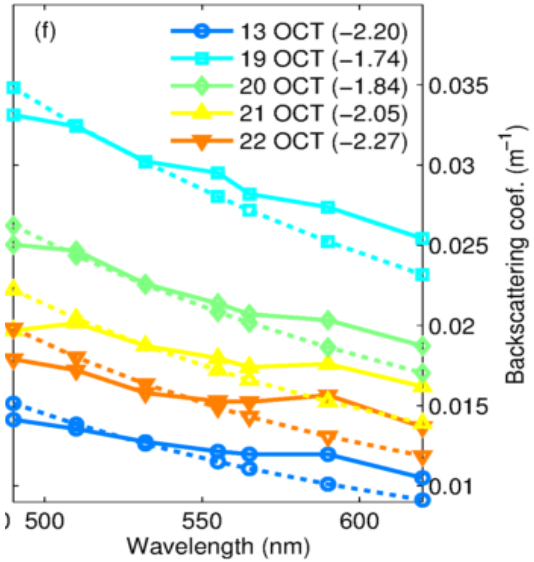
Inversion



Forward modeling



Validation



Connections with other groups

- VSFs dataset – IOPs data
- Inversion technique – IOP inversion
  - Polarization
  - The general technique can also be applied to absorption inversion
- BRDF – Atmospheric group
- Ultimate scientific question to be addressed
  - Biogeochemical origin in spectral b_b