What is a Better Chlorophyll Fluorometer?

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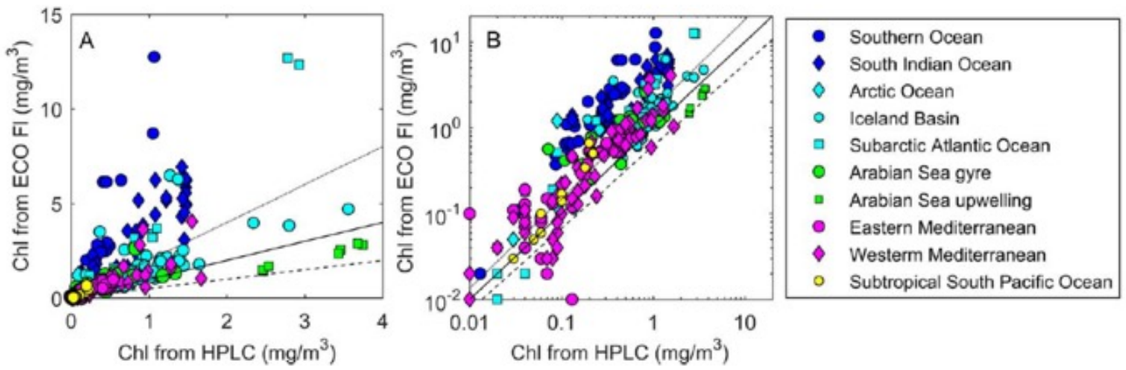
Variability in the FChl vs. Tchla Relationship

The relationship between Chlorophyll fluorescence F_{chl} and HPLC Total Chl *a* pigment concentration [Tchla] is highly variable and shows regional dependency. The Southern Ocean presents the highest anomaly.



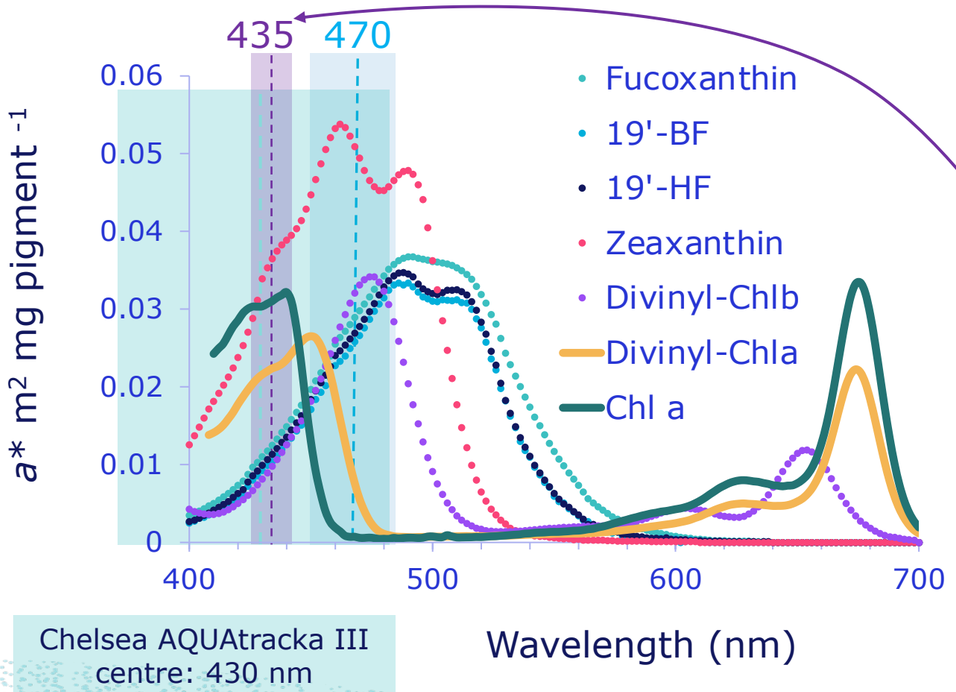
Factory-calibrated in-vivo fluorescence from Sea-Bird Scientific ECO fluorometers paired with HPLC Total Chl*a. Slope factors of 0.5 (dash), 1.0 (solid), 2.0 (dotted)* (Roesler et al. 2017, LO Methods, 2017.)

Sources of Variability - 1

The excitation energy of SBS ECO Chl-470 (454-480 nm) and Chelsea AQUAtracka III (378-483 nm) overlaps the absorption spectra of important photosynthetic (Fuco, 19'-BF/HF) and photoprotective (Zea) accessory pigments. ECO Chl-470 does not match up with Chla or Divinyl-Chla.

Sea-Bird ECO Chl-435
centre: 433.5 ± 2.8 nm
FWHM: 18 ± 2 nm

Sea-Bird ECO Chl-470
centre: 467 ± 4 nm
FWHM: 23 ± 2.5 nm

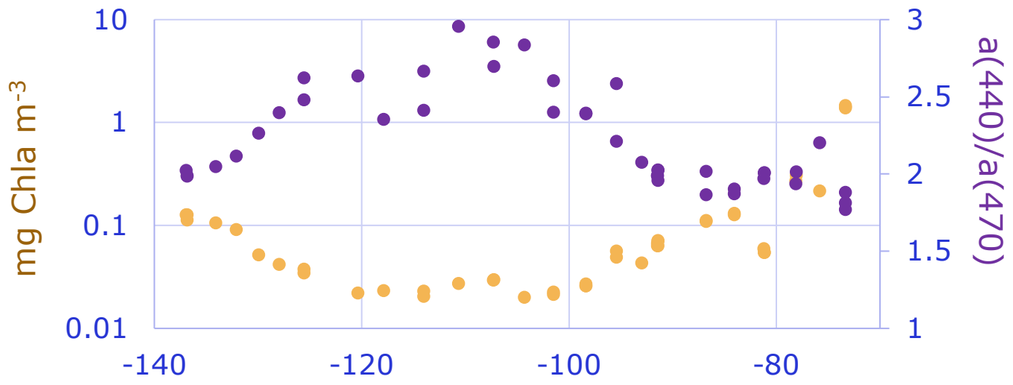


Chelsea AQUAtracka III
centre: 430 nm
"bandwidth": 105 nm

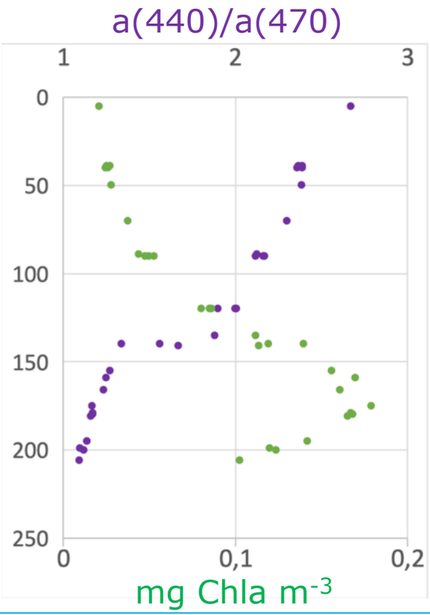
Sources of Variability - 2

Accessory pigments vary with region (e.g., surface trophic status) and depth (e.g., photoacclimation). Since chl-specific absorption a^* varies, so does fluorescence F_{chl}.

F_{chl} = Irradiance x a^* x [TChla] x Fluor_Quantum_Yield



Claustre et al., 2018, ADMT, 2019



A Better Chlorophyll Fluorometer

Excitation at 435 nm targets photosynthetic absorption and especially Chla. We expect F_{chl} measured at 435 nm to be *less variable* with respect to [TChla] than F_{chl} excited at 470 nm. Initial profiles of ECO Chl-435 with ECO Chl-470 show good agreement.