Possible reasons for why we have so much variability in the Chla vs FChla relationship

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• The relation HPLC flou vs Chlorophyll is highly variable and show regional dependency
• The Austral Ocean present the highest anomaly
The [Chla] vs Fchla basic equation

\[ F = E \times a^* \times [\text{Chla}] \times \Phi \]

Fchla  Fluorescence of Chla (mole quanta m\(^{-3}\) s\(^{-1}\))
E      Intensity of light excitation (mole quanta m\(^{-2}\) s\(^{-1}\))
a*     Chlorophyll specific absorption coefficient (m\(^2\) mg Chla\(^{-1}\))
[Chla] Chlorophyll concentration (mg Chla m\(^{-3}\))
\(\Phi\)  Quantum yield of fluorescence (mole quanta emitted
          mole quanta absorbed\(^{-1}\))
In vivo pigment-specific absorption of main pigments

Chelsea Seabird / wetlabs

- Fucoxanthin
- 19'-BF
- 19'-HF
- Zeaxanthin
- Divinyl-Chlb
- Divinyl-Chla
- Chl a

Wavelength (nm)

m² mg pigment⁻¹

eutrophic
mesotrophic
oligotrophic
Variability in photosynthetic absorption associated to trophic status (surface)
Variability in photosynthetic absorption along the vertical

\[ \text{a}(440)/\text{a}(470) \]

\[ \text{mg Dv Chlb m}^{-3} \]

\[ \text{mg Chla m}^{-3} \]

\[ \text{mg zeaxanthin m}^{-3} \]
Summary: Seabird / Wetlabs fluorometer

- Does not excite Chla

- In low latitude environment (e.g. *subtropical gyres*) excites:
  - At surface: *non-photosynthetic* accessory pigments
  - At depth: *photosynthetic* accessory pigments

- In high-latitude environment (*NA / SO*), excites:
  - *photosynthetic* accessory pigments
Chelsea vs Wetlabs FLbb (PIRATA, equatorial Atlantic)
Conclusions & near-future actions

• Excitation at 440 nm target photosynthetic absorption and especially Chla. We expect FChla measured at 440 nm is less variable with respect to [Chla] than Fchla exited at 470 nm
• Multiple sensors (ChelSea + WetLabs /Seabird) on ships are presently deployed together with acquisition of highly resolved HPLC casts
• A 440/470 excitation WetLabs / Seabird fluorometer (same emission) will be soon tested.
• There are global published relationship between pigment composition and [Chla] (varying with depth and along the trophic status)
  • Over long term we might have ways to correct for the slope