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Biogeosciences Discussions

Interactive comment on "From the shape of the vertical profile of in vivo fluorescence to Chlorophyll-a concentration" *by* A. Mignot et al.

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Comments on Mignot et al. 2011

'From the shape of the vertical profile...'

Initial thoughts are that this is a very useful meta-analysis, which will be of wide use to the oceanographic community. The authors correctly (in my view) foresee a rapid increase in the number of vertical F profiles available, primarily from long-term glider and profiling mooring deployments. As none of these remote deployments will be accompanied by calibration data (except for co-location of surface measurements with ocean colour), there is a real need to understand the variability in the fluorescence-to-chlorophyll ratio. As a side note, a similar analysis is urgently needed for understanding

the F-chl ratio from continuous measurements of surface fluorescence on ships-of-opportunity (FerryBox systems), as the number of routes for these is also expanding rapidly. The paper and its rationale are clearly laid out and, the equations can be easily used and tested on other data tests, which I'm sure many colleagues will do. My only general point is that the authors do not thoroughly explore the variability between their derived chlorophyll and measured chlorophyll. I would like to see more detailed analysis of the results in Figure 11, particularly with respect to depth.

Additional comments

Introduction p.3699 ". . .most measured biological property (together with O2).. " Alongside oxygen, underwater light is also relevant here as a proxy for biological status of the water. I would argue that, as with fluorescence, irradiance profiles are also underutilised at present.

p.3699 l.18 Fluorescence equation. I think the spectral dependence of E and a* should be noted here. See my comments later on the choice of excitation wavelength for the fluorometer. There should also be a term (+Fb) for the background fluorescence response of the instrument in the absence of algal fluorescence, this is not negligible and typically increases with depth due to bleaching of the "cDOM or fDOM" pool at the surface.

p.3699 l. 19 Units of E normally expressed per s-1 rather than d-1. Three lines later, f has units of mol photon m-3 s-2

Materials and Methods

Please change "Chl-a" to use a subscript or superscript rather than '-', it is confusing in the equations later on.

P3704 l. 11 Please state the types of fluorometers used on the CTDs on these cruises. Were only blue-excitation light sources used, or a range of lamp or LED types?

p.3705-06 Sorting the Data. A world map showing the distribution of the three profile

types would be useful.

Results and Discussion p.3709 l. 4 Replace “[chl ze] increases” with “decreases”

p.3711. l.1-5. The are other reasons for the change in F/chl with depth in addition to quenching. A slope > 0.3 with depth can also be seen in nighttime CTD profiles. I think this is due to spectral acclimation at depth, where the excitation cross-section of photosystem-II in the blue-green is enhanced at the DFM relative to the surface. This leads to more effective capture of the blue excitation light used by most fluorometers, per unit chlorophyll.

p.3714-3715 Method Validation This section could be expanded in a number of ways, most obviously by looking at different regions. However, in order not to expand the paper too much, what I would most like to see is a grouping of the validation results according to optical depth bins. A ’day’ versus ’night’ comparison of predictions would be also be useful.

Conclusions p. 3716. Some mention should also be made of the ’blank’ problem and how best to remove non-algal signal from the profiles, as this can be a serious contamination in some low-biomass waters.

Interactive comment on Biogeosciences Discuss., 8, 3697, 2011.