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Interactive comment on "Influence of river discharge on phytoplankton absorption properties: a case study in the East China Sea and Tsushima Strait" *by* S. Wang et al.

Anonymous Referee #2

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General comments to editor

This paper aims to prove and show the Package effect on phytoplankton light absorption in the ocean waters, especially in the low salinity waters, influenced by river fresh water discharge. The package effect explain the light absorption efficiency (a* or Qa*) of biological (phytoplankton) particle. The theoretical Package effect was well known and proved by Morel & Bricaud (1981), with total chlorophyll concentration, cell size and intercellular pigment concentration based on the Van de Hulst & MIE theory. Morel & Bricaud, they called the Package effect, in other world, "Effect on discreteness". They are same meaning but it's a difference of point of view between "Large particle(Package)" ↔ "small particles(Discreteness)". Generally, light absorption efficiency

is decreased with increase of cell size" & total CHL concentration (TCHL) value in the Lab. measurement.

Until now there are many papers on package effect research with TCHL values in the field, but it is rare with cell-size effect because of the difficulties of size measurement in the ocean waters. In this paper, the authors introduced & demonstrated newly "package effect" and "cell-size relationship" by using cell-size classification techniques developed by Hirata et al.(2008).

Again, the authors focused with low salinity waters and package effect. How the diluted water influence on the package effect? It's curious question in scientifically. This paper shows us certainly advanced scientific results, in the low saline waters (East China Sea), the phytoplankton physiological changes in compare with normal water (Tsushima Strait).

The scientific aims & results are good and reasonable.

The only fault is the field absorption measurement techniques (QFT) adopted here. But the technique is the only available in the field measurement. This is a reason why the researches on package effect for the seawater are rare. Anyway even if we admit the uncertainty of QFT technique, the phytoplankton absorption coefficients in the field measurement are KEY data in this research.

I think the authors have made serious error in the absorption measurement with bad assumption. It can't be accepted if the author can't explain my "question-1".

Conclusions This research work is enough to publish in the Bio-geosciences This paper is acceptable only after minor (?) revision. But It can't be accepted if the author can't explain my "question-1" or not the author should reprocess & correct the absorption data with considering mineral light absorption curve.

General comments to Authors

In this paper, 1st, the authors concluded the high CHL values in the seawater bring the

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low efficiency of light absorption caused by the package effect.

But the authors should understand the difference & similar of “package effect” and “Self-shading effect”. It seems that the “Total chlorophyll concentration” (Tchl-a) values influence on the Package effect. But “Self-shading effect” is more close to explain low efficiency of light absorption. (section 4.1).

Maybe this is a reason why you have low relationship between a*ph and T chl-a.

2nd , the conception of package effect is not only exist in the light absorption but also in the light scattering. So you should express at least in first time you mention the “package effect on light absorption” After that you can say just “package effect”

3rd , The package effect is explained, in other word, “effect on discreteness”(Morel & Bricaud, 1981). And please explain who the first user is for the term of “package effect”.

The filter technique (Kiefer & Kishino) has lot of problem to measure the real phytoplankton absorption coefficient (aph). i.e, optical path amplification (β) and self-shading effects. Of course, you corrected the aph by using Cleveland &Weidemann(1993) equation. It’s the only easy way to measure the separated aph from atotal.

In your final results, you say that a*ph was poorly correlated with Tchl-a in coastal region. But you don’t have any proof caused by influence of “river discharge”. This conclusion is too much a jump in the logic (see also question-1). The reason can possible from the low saline water but also turbid water (bad absorption measurement), nutrients from bottom or other hydrological reasons. So I recommend you change of title ; ïČř Phytoplankton light absorption properties: a case study in the East China Sea and Tsushima Strait

Key Question:

1) Page 14480, section 2.2; You subtracted the absorption values at 750nm, assuming no absorption in this wavelength. It is true if the seawater is CASE-I water where the phytoplankton absorption dominate total absorption. But in the ECS where you

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sampled water are not CASE-I water. It exist obviously the mineral particles. In case, your assumption can make a mistake, because the mineral absorption curve is not flat with wavelength. It can make seriously error absorption coefficient in the blue bands. Please explain clearly & logically the assumption is valid.

2) Page 14481, section 2.2 It is very confusing process for the absorption coefficients calculation. You subtracted the 750nm values in all wavelengths. It means that already you removed ad(λ) values, but in Eq.(3) you subtract again the ad(λ) by using the Kishino technique. In case you will have negative values at 750nm and naturally the blue band absorption coefficient will be distorted.

<Suggestion> The values 750nm by QFT comes from by 2 reason ;

1. Optical base line shift in the dual-beam spectro-radiometer during the absorption measurement. => It's ghost value. 2. Detritus particles absorption (including mineral & biological particles). =>It's real absorption values.

In case-1. Your assumption is OK In case-2. Your assumption is bad.

<Suggested technique>

1. Neglect your assumption; ap(750) = 0. 2. Use directly Kishino technique. 3. If you have still ad(750)nm $\geq$ 0 Consider this as real values 4. Calculate aph(λ) using Eq.3 5. Make new base line with assumption aph(750) =0.

Please also note the supplement to this comment:
http://www.biogeosciences-discuss.net/10/C6534/2013/bgd-10-C6534-2013-supplement.pdf

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Interactive comment on Biogeosciences Discuss., 10, 14475, 2013.