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# ***Interactive comment on “Distinct bacterial production–DOC–primary production relationships and implications for biogenic C-cycling in the South China Sea shelf” by C.-C. Lai et al.***

**C.-C. Lai et al.**

fkshiah@rcec.sinica.edu.tw

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Replies to Referee 1 Major comments 1&2. I don't see the fundamental difference between the EMM and the known MM hypotheses. . . . the nutrient control of BP-DOC pattern is already in the MM. To address this point, the following sentences will be added in the Introduction or Discussion section.”Both of the EMM and MM hypotheses emphasize the effects of nutrient on the ecological interactions among phytoplankton, bacteria and DOC. Using the concept of competition/predation, the MM hypothesis concentrated on the mechanism of DOC accumulation; while the effects of nutrient

C4310

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Interactive Discussion

Discussion Paper



supply on the algal-bacteria-DOC relationships was the major focus of this manuscript”.

3. Another concern is their overlook of DOC input from Peal River (PR) and their bioavailability which actually definitely affect BP-DOC relationship, especially in PR mouth area. True, but difficult to be proved. DOC bioavailability can be measured by the decrease of DOC in long-term (days) incubation, however, it is still difficult (or impossible) to identify the contribution from allo- and auto-chthonous sources quantitatively. DOC bioavailability is a big issue for chemists and microbial ecologists. We don't have any data of DOC availability, and thus certainly don't want to “open another can of worms” in this MS.

4. Lack of data analysis of bacterial abundance, viral abundance, flagellate abundance, etc. which also affect BP-DOC relationship in various ways in microbial loop. True. We do not have the virus and flagellate data, which made this analysis impossible. Our pioneer-type study in the SCS could be implicative for the microbial ecologists interesting in the top-down processes in the future.

5. The author also claimed that internal wave contributes to the observed BP-DOC pattern, but no data back up the point. The influence of internal wave on microbial community is not really understood so far but I think it is not just nutrient supply. Our present conclusion was more or less an indirect one. After this study, we have conducted 9 anchored investigations in different areas of the SCS. The results indicated that the average BP in the elevation internal waves areas were 4~5 times higher than those recorded in the areas with depression internal waves and no internal waves (i.e. the SEATS station). The enrichment experiments indicated that inorganic nutrients (PO<sub>4</sub> and NH<sub>4</sub>) and DOC affected BP differentially over one diel cycle. We are writing a manuscript, and planning to submit it to BG later. We are very willing to share this with you.

6. The point made by Jiao et al (2011, Nature Reviews Microbiology 9, 75 Doi:10.1038/nrmicro2386-c2 ) should be mentioned in the MS. Thanks for providing

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10, C4310–C4314, 2013

Interactive  
Comment

Full Screen / Esc

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Interactive Discussion

Discussion Paper



this information, and we will add their points into our revised MS.

7. The authors should describe clearly the depth ranges of the depth-averaged values, since they were different in different figures and relationships analysis and the trends were even contrary in different depth ranges. For example, Figure 6 showed that concentrations of depth-averaged PO<sub>4</sub> (within euphotic zone) were low in the inner-shelf and then increased seaward. However, Figure 8 showed higher depth-averaged PO<sub>4</sub> concentrations (within mixed layer depth) in the inner- than outershelf, and the legend mentioned “c.f. Fig. 6”. It really makes confusing to understand the context. The authors should state clearly in the methods section where only “within the deepest sampling depth (i.e. euphotic zone)” was currently mentioned. Also, I suggest the authors to add a line indicating mixed layer depths in Figure 5B. We are terribly sorry for the misunderstandings caused by the ambiguous description in the Materials and Methods section. The following sentences will be added to make section 2.1. (i.e. Study site and sampling) more comprehensive. The MLD will be marked in Fig. 5B accordingly. “In these transect and self-mapping studies, water samples were taken from six depths. The deepest sampling depth (i.e. DSD) of each station was bottom-depth (i.e. BD) dependent. For stations with BD > 100 m, the DSD was set at 100m; for stations with BD < 100 m, the DSD was set at the depth 10~15 m above the BD”.

8. In-depth discussion should be included, for example, in term of the possible competition mechanisms for limiting nutrients between heterotrophic bacteria and phytoplankton. Finally, missing of N measurements made the conclusions weak. More discussions on the subject of algal-bacteria mineral competition will be added in the revised version. The good correlation shown in Fig. 2 indicated that the PO<sub>4</sub> data could be representative for nutrient distribution. See also our reply to the first comment of referee #2.

Specific comments: 1) Page 9072, line 19-26: The two sentences are repeated. One of them will be deleted as suggested. 2) Page 9073, line 9: The location of St. 2 is not consistent between Fig. 1 and 5. St. 2 should be in north-east (not north-west) off

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Interactive Discussion

Discussion Paper



the Dong-Sha atoll? St. 2 is at the north-west off the Dong-Sha atoll. We will redraw a new Fig. 1 to mark the actual position of St. 2. Note the shaded area appeared at the lower left hand side in Fig. 5 represented the coast of China. The referee probably misunderstood it as the Atoll. 3) Page 9074, line 6; Page 9075, line 6 and 10: Abbreviation was repeated several times through the manuscript. It will be revised as suggested. 4) Page 9074, line 17: Not all depth-averaged values were obtained by dividing the depth integrated value by the deepest sampling depth of the station. Please refer to the above suggestion “1”. See also our response for the question 7 of the Major Comments. 5) Page 9075, line 5: Should be “Fig. 3A” (capital, not lowercase). Check through the MS. Originally we used capital letter in figures and text. The BG had turned them into lowercase in the text, and we did not notice that when reading the Discussion proof. We will correct it as suggested. 6) Page 9076, line 6: Should be “PO<sub>4</sub> concentrations were. . .”. The word “concentrations” will be added as suggested. 7) Page 9076, line 27: It is the S-E (not N-E) and S-W corners according to Fig. 6A. Terribly sorry for this stupid mistake, and will be corrected as suggested. 8) Page 9077, line 9: Should be “Fig. 7A and D” (not b). Will be corrected as suggested. 9) Page 9078, line 8: Liu et al., 1998 is not included in References section. The reference of Liu et al (Liu, A. K., Chang, Y. S., Hsu, M. K., and Liang, N. K.: Evolution of nonlinear internal waves in the East and South China Seas, J. Geophys. Res., 103, 7995~8008. 1998) will be added in the revised edition. 10) Page 9078, line 14: “The shallow area was probably not nutrient-limited” should be supported by citations, since many studies have been done in the South China Sea shelf. Or the data, such as N: P, obtained from this study should be mentioned to support “not nutrient-limited”. We did provide the evidence (Figs. 3D~3D) and arguments in the paragraph below. See page 9078, lines 20~24 of the original version. 11) Page 9078, line 16: Should be “relationships” (not responses). Will be corrected as suggested. 12) Page 9079, line 22 and 23: Should be “Fig. 7B and E” and “Fig. 7A and D” (not Fig. 6). You are corrected. These will be revised as suggested. 13) Page 9079, line 25: Delete “rate”. Will be deleted as suggested. 14) Page 9084, Fig. 2: Should be “June 2010” according

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to the text. You are corrected. This will be revised as suggested. 15) Page 9088, Fig. 6: Inner-shelf are indicted by symbols of red dots (not squares). You are corrected. This will be revised as suggested. 16) Page 9090, Fig. 8: Add “depth-averaged” before “bacterial production.”; Delete “c.f. Fig. 6a”, probably “c.f. Fig. 5B”? Please point out the sources of these data in the legend and the text, i.e. stations (all data, the PRD data or the shelf-mapping data?) and cruises (both cruises, 2009 or 2010?) The word “depth-averaged” will be added. The word “c.f. Fig. 6a” will be changed to “c.f. Fig. 5B”. The data source (the shelf-mapping study in June, 2010) will be added.

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10, C4310–C4314, 2013

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Interactive Discussion

Discussion Paper

C4314

