

Interactive comment on “Dynamics of phytoplankton community structure in the South China Sea in response to the East Asian aerosol input” by C. Guo et al.

Anonymous Referee #3

Received and published: 17 October 2011

General comment

This study aims at elucidating the effects of East Asian dust events on subtropical pelagic ecosystems. Despite their biogeochemical importance, their effects on pelagic ecosystems have not been clarified yet, partly because of great difficulty in obtaining coherent results from aerosol enrichment experiments. The authors succeeded in obtaining some suggestive results from multiple aerosol enrichment experiments in the South China Sea, which can contribute to understanding of atmosphere-ocean interactions and biogeochemical cycling of biogenic materials in the North Pacific. Data quality seems to be sufficiently high, and all the results are shown clearly and con-

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cisely in good English. However, I have found some faults in their experimental design and discussion, which will be described in specific comments.

Specific comments

P6642L19 For how many days and into what seawater the aerosols were settled to dissolve? This information is very important to extrapolate the results into natural environments.

P6643L2 In what way the surface seawater was collected? Were appropriate trace-metal-clean technique were applied?

P6643L2 From which depth the seawater was collected?

P6646L21 Although the authors describe “Concentrations of inorganic N were below 1 $\mu\text{mol l}^{-1}$ ”, Table 1 tells us that at PM7, nitrate and nitrite concentration was over 1 $\mu\text{mol l}^{-1}$. Which is correct?

P6648L7 The authors say “The Chl a concentration in the Low treatment also showed a slight increase”, but figure 3d show that chlorophyll a concentration in the Low treatment dramatically decreased. Do the authors mean “The Chl a concentration in the Low treatment was slightly higher than in the control”?

P6650L9 “... abundances of dinoflagellates species showed a decreasing trend after aerosol addition.” But Fig. 4 demonstrate that peridinin, which is a marker pigment of dinoflagellates, increased after aerosol addition. Does this mean that most dinoflagellates were heterotrophic species, that cell-specific pigment contents increased or both of the two?

P6651L15 What do the authors mean by “most” trace metals? On nutritional terms, trace metal elements include V, Cr, Mn, Fe, Co, Ni, Cu, Zn and Mo (and possibly As, Sr, Cd, Sn, Ba and W), while on biogeochemical terms, they include most metal elements other than Na, Mg, K and Ca. Anyway, the data provided in Fig. 2 do not cover all the elements included in “trace metal”.

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P6651L17 "EA samples ... contain notably higher contents of trace metal elements ... than those in African and European aerosols" Aerosol composition data provided by the authors in Fig. 2 are shown as "trace metal concentration in aerosol leachate", which was affected by solubility of aerosols. Is it possible them with other aerosol composition data?

P6651L26 In this study, aerosols were added after leaching in seawater for some time and following filtration. Is it possible to compare the results with others? P6652L11 Given than N/P ratios were larger than 16, I suspect that the possible limiting element was phosphorus.

P6652L14 In this discussion, the authors must be cautious not only about elemental ratios, but also about absolute amount (availability) of each element. If the ambient (initial) amount of each nutrient was scarce, the impact of aerosols on elemental stoichiometry became relatively great.

P6652L19 Actually the surface Fe concentration of 0.2-0.3 nM is very low, but whether it is at a limiting level is not clear. Check the stoichiometry (Fe/N and Fe/P ratios) of phytoplankton.

P6654L23 As described here, it has been reported that some strains of *Prochlorococcus* and *Synechococcus* lack in proteins essential for utilization of nitrite or nitrate. However, probably all marine phytoplankton including *Prochlorococcus* and *Synechococcus* can uptake and utilize regenerated inorganic nitrogen (ammonium); therefore they may have benefited from aerosol enrichment. Responses in their cell size and chlorophyll fluorescence (Figs. 8 and 9) seem to rather support this explanation. The explanation that activated grazing exceeded the enhancement of pico-sized cyanobacteria by aerosol enrichment sounds more natural than the description here.

P6654L13 The explanation in the section 4.4. sounds more reasonable to me. Rather the discussion in the section 4.3 seems to contradict with the discussion here.

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P6657L12 How did the authors define the terms "ultraoligotrophic" and "oligotrophic"?

P6657L12 In this study, experiments with different designs are conducted at different ocean stations with different chemical fields. Here the authors must take into account confounding of experimental design (mode of aerosol enrichment) and environmental factors (initial nutrient concentration and composition of autochthonous plankton communities). I believe only after the authors discuss this point deeply, their conclusions can be extrapolated into the whole South China Sea and the North Pacific.

Fig. 3 Were these figures obtained by fluorometry or by HPLC?

Fig. 7 Was the precision sufficient for ciliate concentrations? In Methods, the measured volume was 10-30 ml. which means that counts of ciliates were at most 90 or so. This may not be insufficient.

Fig. 11 How was the biomass (or abundance) of Haptophyta and green algae measured or calculated (estimated)? Show the detailed methodology in Methods.

Technical comments

P6647L5 Check significant digits.

P6652L12 Using "limiting" seems more appropriate than "limited".

P6654L8-9 Give an appropriate citation for this description.

Table 2 Check significant digits (particularly for chlorophyll and nitrate concentrations)

Fig. 2 Show the standard deviations or standard errors.

Fig. 7 For the unit of ciliate cell concentration, cells L-1 would be more appropriate.

Interactive comment on Biogeosciences Discuss., 8, 6637, 2011.

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