

## ***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.***

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We thank the reviewer for her/his constructive suggestions for our paper. Please see our detailed response to reviewer's comments below.

- It seems only one PM<sub>2.5</sub> sample in 8 by 10-inch Quartz filter was used for the whole incubation experiments, which was collected in one sunny day of the December 2010 as the northeast monsoon prevailed. There is little information about the chemical composition of the aerosol sample used as well as the typical winter aerosols over the South China Sea. I wonder if the filter sample is selected particularly out of a series of filters sampled continuously in HKUST, and how representative it is in terms of the

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aerosols in certain period over the South China Sea? It is important to know at least the percentage of PM<sub>2.5</sub> in total suspended particles (TSP) over this region since only PM<sub>2.5</sub> was used in the microcosm experiments which may significantly bias the results as the coarse particles (>2.5 micrometer) is a major contributor to the dry deposition fluxes of chemical components to the ocean surface.

Enrichment of trace metal element and macro-nutrient (nM) from the addition of East Asia aerosol leachate showed in Fig. 2 can indicate the soluble part of aerosol-contained nutrient, which we think is more important in assessing their biological effect in the sea. The filter sample we used was chosen from 5 filters sampled on different days during Nov to Dec in HKUST after a rough measurement of inorganic nutrient. We think it is somewhat representative. First, the PM<sub>2.5</sub> concentration was 42  $\mu\text{g}/\text{m}^3$  on that day, which is in the range of the normal concentration in winter and accounted for more than 50% in PM<sub>10</sub> (data were obtained from Environmental Central Facility, Atmospheric & Environmental Database of HKUST). Second, the relative chemical composition of the soluble nutrient and trace metal element in our study was consistent with the chemical composition of the aerosols over South China Sea and other East Asian aerosols showed by previous studies: the aerosols was characterized by relatively higher concentrations of nitrate and ammonium than phosphate, and relatively higher concentrations of Al, Fe, Pb, Cu, Mn, Zn than other trace metals (Cohen et al. 2004; Zhang et al. 2007).

Fine particle (PM<sub>2.5</sub>) was inferred to be more important in East Asia, due to its anthropogenic origin and high nutrient and trace metal content (Cohen et al. 2004, Hsu et al. 2010). Also, the long distance transportation from landmass to the South China Sea favors small size particles over larger particles (Duce et al. 1991). It has been reported that the fine particle (PM<sub>2.5</sub>) dominate (>50%) the coarse particle (PM<sub>10</sub>) over the Northern South China Sea (Zhang et al. 2007). Therefore, we choose the PM<sub>2.5</sub> fraction.

- The aerosol filter was dissolved in prefiltered seawater followed by 0.2 micrometer

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filtration to make the aerosol leachate before the cruise. How was the leachate stored during the cruise, and for how many hours before it was used in the microcosm experiments? I would suggest to use sub-sampled aerosol filters directly in the incubation instead of aerosol leachate, because biological uptake of nutrients or trace elements from aerosol particles could be a rapid and dynamic process and the existence of microorganisms in seawater may enhance the dissolution of some refractory trace elements (e.g. Fe) from the aerosol. Concentrations of nutrients and trace elements should be determined at time zero and then along with each sampling time point.

The leachate was stored in dark under 4 °C. It was made on 30/12/2009 and used on 8/1/2010, 12/1/2010, 17/1/2010 and 21/1/2010 in the microcosm experiments. We have thought to use a sub-samples of the aerosol filter directly in incubation bottle, but we worried that the quartz filter would become fibers suspended in the seawater, affecting the physical and chemical environment in the microcosm. Thanks for the reviewer's suggestion. We will consider those suggestions when we conduct future study. We did not sampling for the trace metal because our initial purpose was to look at the effect of atmospheric N. We have measured inorganic nutrients at time zero and some sampling points during the incubation. However, a lot of data points, especially the N concentration, fall below the detection limit of the instrument. So we did not use the data.

- Page 6652 line 12, “: : supporting the point that N was relatively limited in this ecosystem.” I think that N/P ratios larger than 16 should indicate a P limitation in this oceanic region.

The N/P ratios were less than 16 at most stations especially in the oceanic stations. Sorry for the careless typo.

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