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Interactive comment on "Phytoplankton growth responses to Asian dust additions in the Northwest Pacific Ocean versus the Yellow Sea" *by* Chao Zhang et al.

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Review of "Phytoplankton growth responses to Asian dust additions in the Northwest Pacific Ocean versus the Yellow Sea" by Chao Zhang et al.

General comments: This paper present a set of microcosm experiments performed on-board using sea water collected from two distinct oceanic regime: 1) Oligotrophic waters (Northwest Pacific Ocean) and 2) nutrient rich waters (Yellow Sea), to understand the impact of atmospheric dust (or processed dust) and other nutrients (N, P, Fe e.t.c) on the phytoplankton productivity in terms of increase in chlorophyll a (Chl a) and abundance of phytoplankton in various size fractions (e.g. micro, nano, pico e.t.c). The artificially modified atmospheric dust (AM-dust) is prepared using surface soil collected

from Gobi Desert. The set of experiments lasted for 9-10 days and clearly indicate an overall increase in Chl a concentrations due to addition of various combination of nutrients including AM-dust. Authors have proposed a "new" net conversion efficiency index (NCEI) to better understand the impact of specific nutrients (N, P, Fe, and AM-dust) on primary productivity at the sampled locations. The presented case study makes an important contribution towards improving our understanding on impact of aeolian deposition (external source of nutrients) on productivity and ocean biogeochemistry. The results obtained from set of experiments are discussed well, manuscript is easy to read (except few sections, see in specific comments) and should be of great interest to the Biogeoscience community. So, I recommend this paper for publication in Biogeosciences, but after addressing some of the concerns detailed in specific comments.

Specific comments: 1) Section 2.1: What is the size distribution of soil samples used for preparing AM-dust? This information is important because if, majority of collected soil particle are in coarse fraction (e.g. more than 30 microns), most of them gets deposited at the source region and hardly get transported to the Pacific. So, the soil used for AM-dust preparation is not at all a representative undergoing long-range transport and depositing on surface waters. The fine fraction (less than 5 microns) or typically clay fraction of the soil is a more representative dust which can be artificially processed to mimic the processed aeolian dust.

2) Section 2.2: Line 110-112: Why Day 1 was not sampled?

3) Section 2.4: The ultrasonic bath treatment may overestimate the nutrient concentration. What was the time duration used for ultra-sonication? More than 30 minute of treatment will increase the temperature and may enhance the leaching of nutrients and thus overestimate. Usually, the treatment is done for aerosol samples collected on filter substrate to loosen the particles from matrix.

4) Section 4.1: Line 328-329: This is a speculative statement and of course, it need further investigation. Except here, the role of trace metals (as nutrient or toxicant)

is nowhere discussed. The concentration of suite of trace metals (in AM-dust) are very low except Fe and Mn. This once again indicate that, AM-dust is not the best representative for processed dust.

5) Section 4.2: It is very difficult to follow the proposed conversion efficiency index (NCEI). It may be a good tool to specifically understand the role of nutrients on nitrogen consumption or productivity, but need to be elaborated more. It is not clear, why summation of differences of treatment and control for consecutive days are used?

6) Section 4.3: Line 408-419: This paragraph is mostly speculative and difficult to follow, although authors have concluded the importance of DOP determination in seawater.

Minor comments:

Line 181: should be Table 1.

The legends used in Fig. 2, 3 and 4 for nutrients (other than AM-dust) are in same colors and very hard to make out. Most of them are superimposed. It will be useful for reader if different coloured legends with connecting lines can be used.

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