Supplementary information

Text S1

Simulation of Asian dust

When dust travels over the Asian continent through the atmosphere, it can experience mixing and deposition, as well as undergo chemical reactions (Formenti et al., 2011). The Asian continent suffers from air pollution to varying extents, with dynamically changing emissions of anthropogenic pollutants such as NO_x, SO_2, and NH_3 (Kim et al., 2014). The aging processes, i.e., the reactions of dust aerosols with anthropogenic pollutants, result in the Asian dust carrying a large amount of nutrients and bioavailable trace metals, prior to its deposition in the oceans. In this study, we followed the method of Guieu (2010) to mix the dust and cloud water (100 g L^{-1}) to simulate the aging process. The chemical compositions of the reference eastern Asian rains and cloud water used in this study are summarized in Table S1. As the uptake of organic acidic gases during transport is complicated for Asian dust, we did not add oxalic acid, which was used for simulating the Saharan dust by Guieu et al. (2010), to simplify the reaction of dust surface and emphasize the importance of inorganic acids (H_2SO_4 and HNO_3) (Fan et al., 2006; Formenti et al., 2011; Shi et al., 2012).

References

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Table S1. Primary chemical composition of the rains in the eastern Asian region and the simulated eastern Asian cloud water.

	pH	NO_3^- (M)	SO_4^{2-} (M)
Reference eastern Asian rains*	3.89–7.61	10^{-5}	10^{-5}
Simulated cloud water	1**	10^{-1}	10^{-1}

*Sasakawa and Uematsu, 2002; Watanabe et al. 2001; Zhang et al. 2011; Sakihama et al. 2008; Wang et al. 2002.

** Meskhidze et al., 2003.

Table S2. Recovery yield, accuracy, and detection limit for trace metal analysis

Metal	Detection limit ($\mu g\ L^{-1}$)*	Recovery (%)	RSD (%)**
Zn	0.012	90.6	3.17
Cu	0.226	95.2	2.09
Cd	0.016	88.5	0.87
Pb	0.019	93.2	2.93
Co	0.017	97.9	0.24
Fe	3.738	95.4	3.88
Mn	0.056	90.9	4.48

* Detection limit was calculated as three times the standard deviation of the blank.

** RSD means 'Relative Standard Deviation'.

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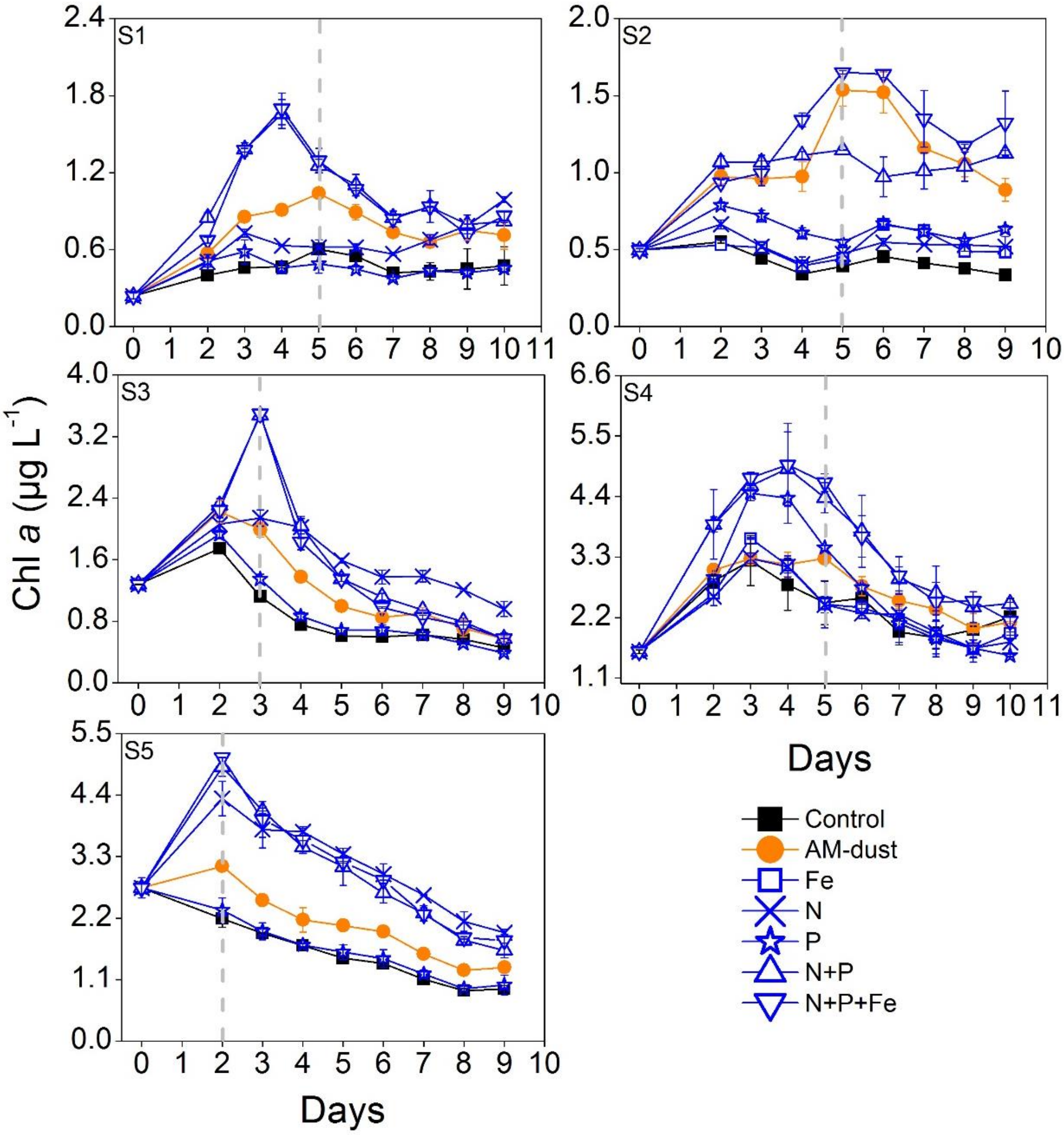

Figure S1. Changes in Chl *a* during the incubation experiments at each station. The successive increase during the incubation period in this study is identified by the dotted line.

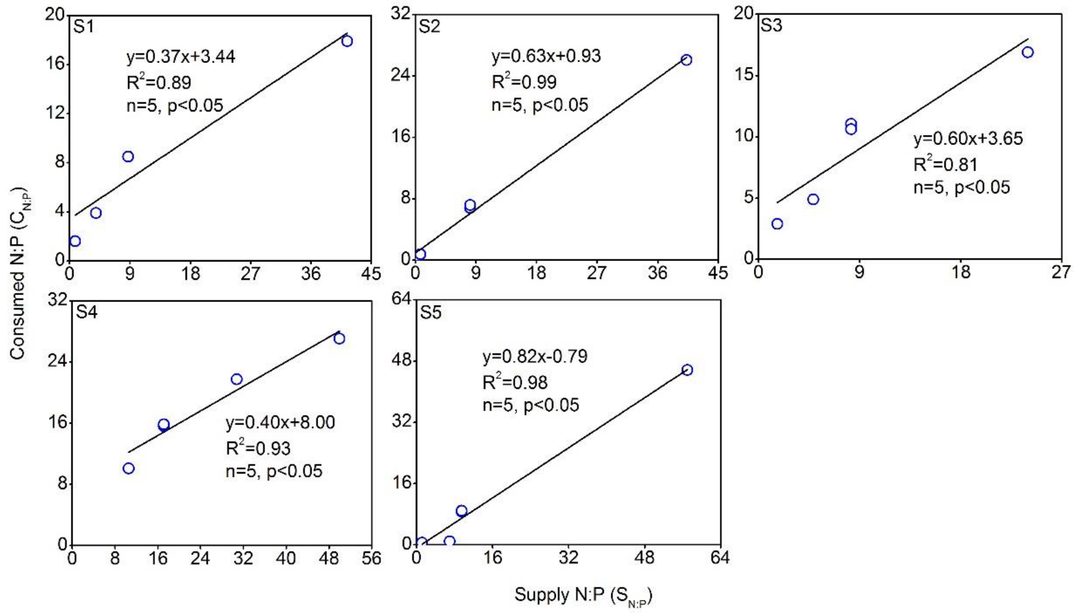

Figure S2. The relationship between the consumed N:P ratio ($C_{N:P}$) and supply N:P ratio ($S_{N:P}$) in the control and the various nutrient treatments during the successive increase in the incubation period at each station