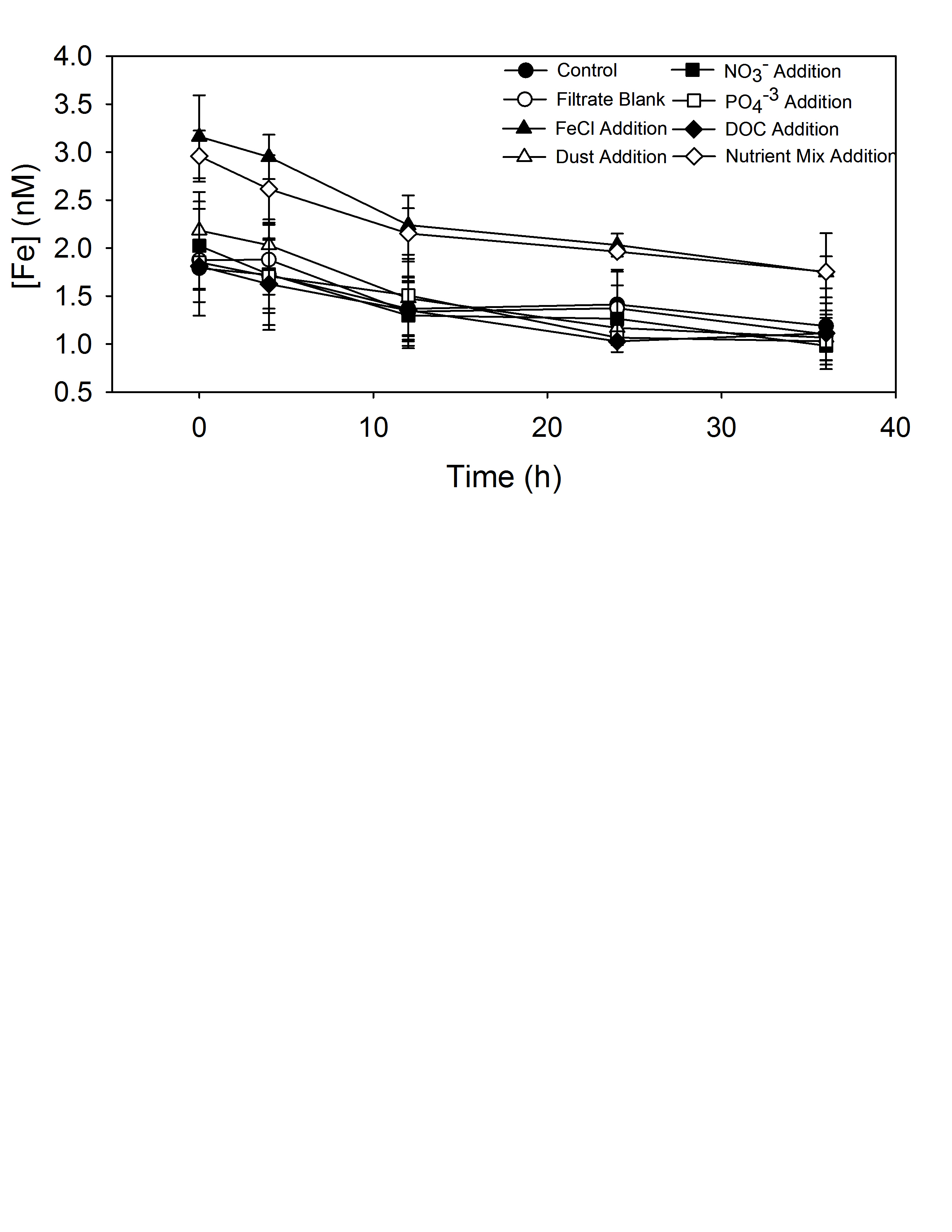
**The Microbial Response to Atmospheric Dust**

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**Introduction**

Natural and anthropogenic aerosols are a significant source of bioactive trace elements to ocean surface waters, often influencing the growth of marine microbial communities[1,2]. Opportunistic, heterotrophic bacteria have been shown to experience an initial, rapid growth during atmospheric dust deposition events[3,4,5] that may influence trace element availability for other microorganisms[6]. There is, however, limited knowledge on the components of dust that stimulate this bacterial response. The principle objectives of this study are to determine which dust constituents stimulate the heterotrophic bacteria and how the activity of such bacteria affects the availability of dust-derived trace elements to marine autotrophs.

**Experimental**

 Dissolved trace element concentrations were monitored during five incubation experiments of natural marine waters. Eight different treatments were conducted: control, filtrate blank (acts as control for dust addition), iron salt (FeCl3) addition, atmospheric dust addition, nitrogen (NO3-) addition, phosphorus (PO4-3) addition, carbon (DOC) addition, and a nutrient mixture (NO3-, PO4-3, DOC, and FeCl3). Seawater was sampled from the incubation containers at times 0, 4, 12, 24, and 36 hours. The samples were analyzed for dissolved trace elements (Al, Mn, Fe, Co, Ni, Cu, Zn, Cd, and Pb) by pre-concentration onto a cation exchange column prior to analysis by high-resolution inductively-coupled plasma mass spectroscopy (HR-ICP-MS). A detailed description of the method can be found in Milne et al. (2010)[7]. The samples were analyzed using the Thermo Scientific Element 2 (E2) HR-ICP-MS at the Geochemistry Program of the NHMFL.

**Results and Discussion**

Iron, as an essential micronutrient, was the initial focus of our experiment. The average dissolved iron concentrations for the addition experiments over time are shown in Fig. 1. Linear regression was performed on each treatment over time to determine the rate of loss of iron. The treatments had similar rates of iron loss (Table 1). Only the FeCl3 treatment showed a higher loss rate compared to the control.

**Table I** Loss of iron over time from the different incubation treatments. The p-value indicates a significant difference between the FeCl3 treatment (A) and the control, filtrate blank, NO3-, PO4-3, and DOC treatments (B). The dust and nutrient mix treatments showed no significant difference between the other treatments (AB).

**Fig.1** The average dissolved Fe concentrations in the eight different incubation experiments over time. Error bars indicate standard deviation (n = 5).

**Acknowledgements**

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| --- | --- | --- |
| Treatment | Iron Loss Rate (pmol L-1 h-1) | p-value  (<0.05) |
| Control | 16 ± 4 | B |
| Filtrate Blank | 22 ± 6 | B |
| FeCl3 Addition | 39 ± 7 | A |
| Dust Addition | 32 ± 6 | AB |
| NO3- Addition | 26 ± 6 | B |
| PO4-3 Addition | 24 ± 4 | B |
| DOC Addition | 20 ± 5 | B |
| Nutrient Mix | 31 ± 6 | AB |

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