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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Accelerated dissolution of iron oxides in ice" *by* D. Jeong et al.

Anonymous Referee #1

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Jeong et al. investigated the dark dissolution of several iron oxide particles trapped in ice samples frozen in the presence of organic complexing agents at variable temperature. The main finding of this work is that mainly soluble Fe3+(aq) is produced and the non-reductive reaction was enhanced at pH < 4 compared to that in water. Particles with larger surface areas, strong binding ligands, and higher freezing temperatures (T→263 K) accelerate the process as explained in combination with a freeze concentration effect. This article is an important contribution to understand the role that mineral dust trap in environmental ices can play as a source of bioavailable iron to the surface of the oceans. However, some minor corrections and clarifications are needed prior to final acceptance to ACP. The authors should discuss if the reciprocal ice-enhanced dissolution dependence with freezing temperature is simply due to "ice concentration effects" or if the rate of freezing could have affected their observations.

In several statements and figure captions the use of "FA/HA" or "[fulvic/humic]" should be corrected to "FA and HA" or "[fulvic acid] or [humic acid]" (e.g., p. 20113 l. 14, Table 1, Fig 1.). To avoid conflicts with the many typos related to negative Celsius temperatures in the text, all temperatures need to be reported in Kelvin. Although the work is excellent because two different analytical methods were used to quantify dissolved iron (p. 20117 l. 16), instead of indicating "little difference" the instrumental/method error (as a percentage difference) between AAS and UV-visible measurement should be indicated. Similarly, (p. 20118 l. 6-4) instead of "the iron dissolution rates were much slower" quantitative information is needed. Indicate the % yield after "15 uM of total dissolved iron" (p. 20118 l. 11). Why did hematite (with the smallest surface area) show negligible iron dissolution? Elaborate (p. 20119 l. 2-3).

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 20113, 2012.