

Interactive comment on “Factors influencing the dissolved iron input by river water to the open ocean” by R. Krachler et al.

Anonymous Referee #1

Received and published: 20 June 2005

This well written paper highlights uncertainties about riverine iron export to oceans. Understanding riverine iron transport is important because iron availability can limit phytoplankton growth in many parts of the ocean. The paper focuses on removal of riverine iron from the estuarine water due to salinity-induced flocculation of organic colloids that bind iron. The study measures iron transport capacity of freshwater as the fraction of initially dissolved iron that remains in solution after different amounts of artificial sea-water are mixed with the freshwater. The iron transport capacities of water from two unpolluted streams are compared. One stream drained a peat-bog and had 16 times higher concentrations of dissolved organic carbon than did the other stream, which drained a mountainous watershed. Water from the stream draining the peat-bog had much higher iron transport capacity than did water from the other stream. The authors suggest that dissolved organic compounds, probably fulvic acids, in the bog-draining stream form complexes with iron that remain in solution despite increases in

Full Screen / Esc

Print Version

Interactive Discussion

Discussion Paper

Interactive
Comment

salinity. This is a plausible explanation but it is not directly tested. The study did not measure fulvic acid concentrations or analyze organic iron compounds.

This research should be considered preliminary. Given that only two streams were compared, differences in iron transport capacity could be attributed to any factor that differs between the streams. Moreover, the experiment does not seem to have been replicated. Only two water samples were compared, one from each stream. It is stated that error bars for iron transport capacity were estimated to be + 3%, but it is not clear how the error bars were estimated. The error bars may represent the error of analysis of iron concentrations. Apparent inflection points in the curves of transport capacity versus salinity are interpreted by the authors but may just be due to random variation in measurements. This point and the error bars might warrant brief discussion and clarification.

The paper goes on to estimate global riverine iron transport based on the experiments with two water samples and an estimate of global bog area. This is over generalizing from the available data but is still an intriguing exercise. The simple experiment presented in the paper demonstrates the concept that iron solubility and the effects of salinity on iron solubility may differ greatly among waters from different rivers.

Although differences in the quality and quantity of dissolved organic carbon in rivers may significantly affect iron transport, other factors may also be important. As the authors mention in the introduction, photochemical processes may degrade organic compounds that are biologically un-reactive. This could affect the binding of iron to organic matter. In addition, iron oxides may be made more soluble through photo-reduction. Future experiments should test the effects of sunlight on iron transport by stream water. Biotic uptake of iron can also occur anywhere along the flow path from watershed to estuary. The best estimates iron transport through estuaries may eventually come from direct measurements of iron fluxes and burial in estuaries.

Other comments:

[Full Screen / Esc](#)[Print Version](#)[Interactive Discussion](#)[Discussion Paper](#)

Page 539, last line: “accounts” should be “account”

Page 543, the paper mentions that dissolved iron concentrations in the water from the bog-draining stream were higher than the iron-hydroxide solubility level. It would be good to state the iron-hydroxide solubility level in the text or plot it in Figs. 1-2.

Interactive comment on Biogeosciences Discussions, 2, 537, 2005.

BGD

2, S294–S296, 2005

Interactive
Comment

Full Screen / Esc

Print Version

Interactive Discussion

Discussion Paper