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

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First of all, the authors want to thank Prof. Gnanadesikan for his stimulating comments.

Specific comments:

"I'd wonder whether mixing with more basic river water, for example water which contains higher levels of calcium carbonate, would have the same or different effect than mixing with seawater." We performed a series of mixing experiments, shaking acidic coloured peat-bog waters of different origin with the 10fold volume of river water from a limestone area, and found in all cases enhanced iron transport capacities of the river water. Iron-fulvic complexes exist as small colloid particles. Their surfaces contain ionisable functional groups like -OH and -COOH. The charge of these particles is strongly dependent on the degree of ionisation (proton transfer) and consequently on the pH of the medium. The electrical charge carried by a colloidal particle is of fundamental importance, since without it colloidal systems would be very unstable. Electrical double layers of the same sign surrounding all the particles result in their mutual repulsion, so they do not approach sufficiently closely to coalesce. An increase in pH results in an increase of the negative electrical charge and thus the colloids become more stable. Consequently, we do not expect that mixing of acidic peat bog water with buffered, basic river water will be accompanied by flocculation and sedimentation of complexed iron. The large increase in pH offsets the influence of the moderate increase in ionic strength. Electrical conductivities of river waters are typically in the range of 0.1 -1.0 mS cm-1, maximum 2 mS cm-1. The electrical conductivity of seawater is around 42 mS cm-1. The main effect of these 20-40fold higher concentrations of electrolytes is to compact the double layer so that the separation distances between the suspended particles shrink, van der Waals attraction outweighs repulsion, and the colloids agglomerate. During mixing of peat-bog water with seawater, a large fraction of the chelated iron will therefore be removed by flocculation.

"There may be particle-scavenging of ligand-bound iron, I wonder what would happen if the iron-rich waters were mixed with more turbid river waters." The rate of scavenging of dissolved ligand-bound iron by particulate matter is dependent on the abundance of particles. In rivers, the suspended matter concentrations vary widely, in connection with their lively hydrographic characteristic. In the River Danube near Vienna, the suspended matter concentrations are found to be $<$1 mg L-1 in low water situations and approximately 13000 mg L-1 during extreme flood situations. Significant loss of ligand-bound iron due to adsorption onto suspended particulate matter (metal oxides, clay minerals, and carbonates) is expected only during the relatively short periods of floods, 2-6 weeks per year.

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