Review Report

Spatial distributions of iron and manganese in surface waters in the Arctic’s Laptev and East Siberian seas

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Summary of the Study

A descriptive study examining the mechanisms regulating the distribution of iron (Fe) and manganese (Mn) trace metals in the Arctic's Laptev and East Siberian Seas based on in-situ measurements. Overall, they find that river discharge and shelf sediment-water exchange processes are essential sources of Fe and Mn in this region. Contrasting the East Siberian Sea (ESS) and Chukchi Abyssal Plain (CAP) with the Makarov Basin (MB) and Amundsen Basin (AB), they find significant differences driven by source waters and biological activity. Surface waters in the ESS and CAP are generally enriched in Mn but depleted in Fe compared to those in the AB and MB. The ESS receives nutrients and trace metals from Pacific waters, in contrast to the Atlantic waters found in the MB and AB. Biological control of Fe through ligand complexation is a key mechanism, resulting in Fe predominantly existing in a particulate phase while Mn remains in the dissolved phase on the shelf.

Major comments

The in-depth characterization of the Arctic's Laptev and East Siberian Seas provided here is an essential contribution to understanding the biogeochemical and physical processes controlling trace metals budgets, especially given the recent accelerating changes in the region. The authors present a compelling mechanistic synthesis, but the manuscript requires refinement in its presentation. Overall, the manuscript is generally grammatically clean. However, it needs improvements in structure and readability. First, the manuscript reads more like a report or book chapter, overly descriptive and lacking a clear hypothesis, or answering specific questions. Though a valuable contribution, it is unclear why readers should read it. For instance, focusing on contrasting the physical and biogeochemical controls of iron (Fe) and manganese (Mn) in the Arctic's Laptev and East Siberian Seas could provide a better framework for the study. Second, the labeling of the figures is inadequate; nearly all figures lack titles, necessitating readers to refer to figure descriptions for context. Moreover, the figure descriptions do not adequately explain the terms used, and there is a notable presence of technical jargon throughout the study. Third, the manuscript overuses acronyms, which can hinder readability. Finally, some sentences contain incomplete reasoning, which detracts from the overall coherence of the manuscript. Below, I highlight few examples.

Minor comments

Line 165: Too many acronyms already, you don’t need S and T for temperature and salinity.
Line 165: “The T of water above 25 m exceeded 0°C at 125−145 °E (Figs. S1 and S2), owing to the atmospheric radiative forcing” It is not clear what you mean in this sentence. What does radiative

forcing have to do with surface ocean temperature? These two concepts are obviously related, but it is unclear how you are using them

Line 190: Define the terms in your figures.
Line 215: “In contrast, a negative value of f_{sim} along the continental slope suggests that sea ice formation is dominant in the region,” which region?

Figure 4: Same issue with Figure 3, but you sometimes use full names. Be consistent..

Line 255: {The dMn concentration in the surface waters gradually increased with decreasing salinity, whereas the dFe concentration did not show a similar increasing trend (Fig. 5)} This statement is not a complete interpretation of figure 5, can you explain the exceptions