

This manuscript presents an important and timely contribution to our understanding of atmospheric iron deposition and its potential role in regulating marine productivity during the Pleistocene–Holocene transition. By generating the first continuous records of FeICP and operationally defined dissolved iron (DFe) from the EGRIP ice core, the authors provide a high-resolution perspective on how iron speciation, rather than total iron flux alone, varied across a major climatic transition. The study is carefully executed, clearly written, and well situated within the long-standing debate surrounding the “iron hypothesis” and its regional expression in HNLC systems. In particular, the finding that dissolved iron increased only modestly during the Younger Dryas, despite a large enhancement in total iron, represents a valuable constraint on the effectiveness of aeolian iron fertilization in the North Pacific region.

Overall, this study represents a significant methodological and conceptual advance. By shifting the focus from total iron flux to iron solubility and chemical form, the authors provide a more nuanced framework for evaluating the climatic impact of atmospheric iron deposition. With minor clarifications regarding bioavailability and broader oceanographic implications, this manuscript will be of high interest to the paleoclimate, biogeochemistry, and Earth system science communities.

1. Age model and chronological constraints

- How sensitive are the observed millennial- to centennial-scale variations in FeICP and DFe to uncertainties in the EGRIP age model?
- Could short-term depositional variability or age-model smoothing influence the alignment between iron speciation, acidity, and climatic transitions (e.g., the Younger Dryas)?

2. Analytical methods and proxy interpretation

- How robust is the operational definition of CFA-derived DFe as a “labile” iron fraction across different aerosol sources and depositional conditions?
- Are there potential analytical or post-depositional processes in snow and firn that could alter iron solubility or speciation prior to measurement?

- Can the authors further clarify how volcanic versus dust-derived iron is distinguished analytically, and whether their dissolution behavior differs under the CFA protocol?

3. Bioavailable iron and global implications

- How do the authors evaluate the extent to which CFA-DFe represents iron that is truly bioavailable to marine phytoplankton, rather than merely chemically soluble?
- What additional constraints—such as iron speciation analyses, ligand-binding considerations, or experimental dissolution and incubation studies—would be required to directly link ice-core DFe to biological uptake in the ocean?
- Given that the ice-core record integrates long-range atmospheric transport, how representative are the inferred iron solubility patterns for North Pacific?
- Can the authors elaborate on the pathways by which similar iron species are deposited in both marine sediments and ice cores, and how post-depositional processes in snow, firn, and seawater may differentially modify iron speciation?

4. Lastly, one minor comment: although the study period extends slightly beyond the Holocene, it represents only a very limited interval of the late Pleistocene. As such, the term “Pleistocene–Holocene” in the title may be somewhat misleading with respect to the actual temporal scope of the study. I suggest revising the title to refer more specifically to the “last deglaciation” or to explicitly highlight the focus on the Younger Dryas interval.