

1 **Supplement**

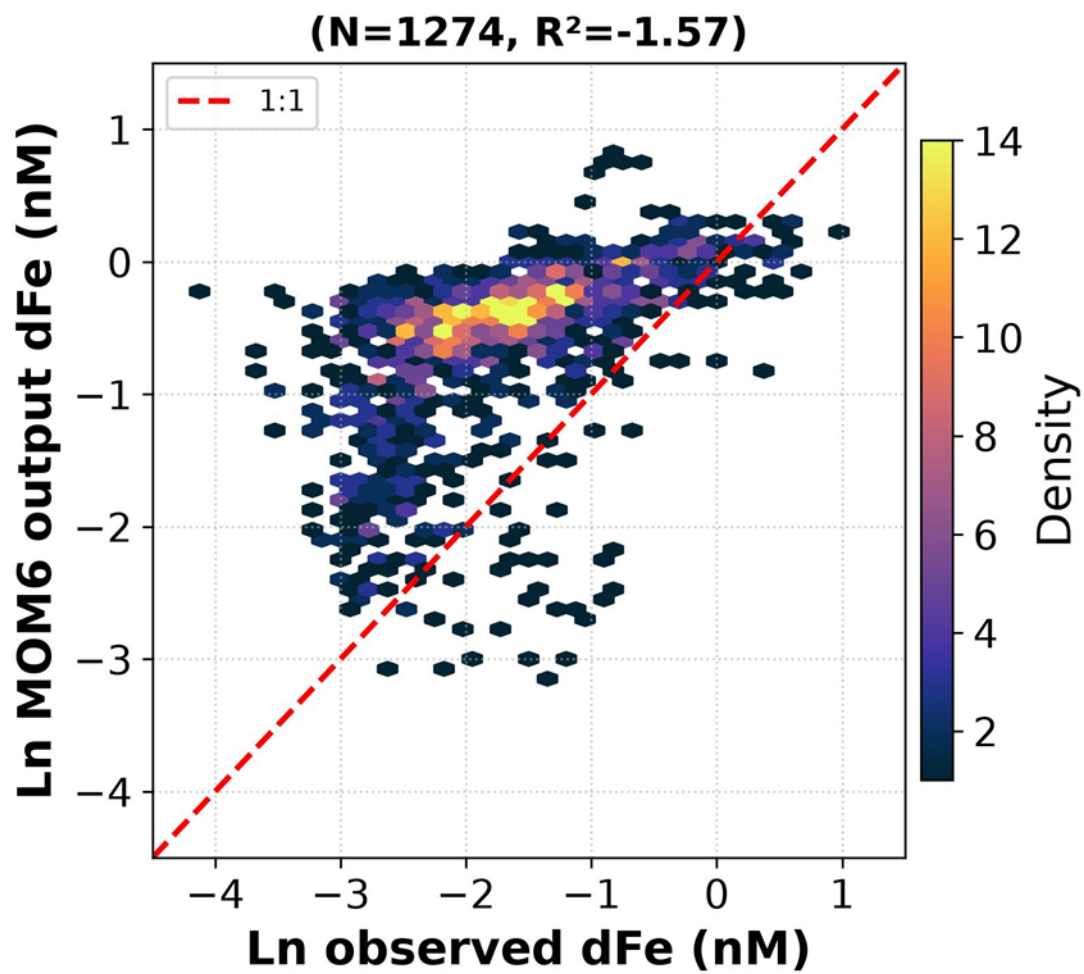
2 **Table S1.** Research cruises contributing dissolved iron observations used for model development.

Cruise	Cruise DOI
NBP0601	DOI: 10.7284/905515
NBP0608	DOI: 10.7284/905528
NBP1201	DOI: 10.7284/903047
NBP1310	DOI: 10.7284/901853
NBP1704	DOI: 10.7284/907629
CN1901	DOI: 10.1016/j.marchem.2024.104436

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Table S2. Candidate environmental predictors considered for dFe model development.

Predictors	Product/Reference	Resolution
Longitude (°)	Sampling information	
Latitude (°)		
Date		
Depth (m)		
Temperature (°C)	Sampling information	
Salinity		
Sigma0 (kg m ⁻³)		
Dissolved oxygen (μmol kg ⁻¹)		
NO ₃ ⁻ (μmol kg ⁻¹)	Sampling information	
PO ₄ ³⁻ (μmol kg ⁻¹)		
SiO ₄ ²⁻ (μmol kg ⁻¹)		
Chlorophyll (mg m ⁻³)		
POC (mg C m ⁻³)	I: Sampling information; II: MODIS-Aqua L3	II: 4 km, Daily
Sea ice concentration (%)	AWI/IUP Bremen ASI product	6.25 km, Daily
Distance to sea ice edge (km)		
Bathymetry (m)	MEaSURES BedMachine Antarctica, V3	500 m
Distance to ice sheet (km)	Calculated from high resolution vector polylines of the Antarctic coastline V7.11	
Distance to groundline (km)		
Wind speed u (m s ⁻¹)	ERA5	0.25°, Daily
Wind speed v (m s ⁻¹)		
Wind speed (m s ⁻¹)		
AOD (m)	MCD19A2.061 (V.6.1)	1 km, Daily



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9 **Fig. S1.** Evaluation of the simulated dFe by MOM6 in the Ross Sea continental shelf. The density
 10 scatterplots compare the ln-transformed observational dFe with the dFe simulated by MOM6 model.

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