Insight into contributions of different iron sources to the ocean from a model of the stable isotopes of iron

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Quantification of external DFe sources: high uncertainties!

Iron source	Flux (Tg DFe year^{-1})
lithogenic aerosols	0.17–0.42(3.2)
pyrogenic aerosols	0.1–0.2
rivers	0.15–1.3
sediments	0.13–4.97(6.08)
hydrothermal	0.005–0.5
glaciers and icebergs	0.22–1.7

Estimates of some DFe sources collected from literature.

Model	Dust	Sediment	Hydrothermal	Rivers	Total
BEC	21.9	84.6	17.7	0.34	124.5
BFM	1.4	0	0	0.06	1.4
BLING	3.3	9.1	0	0	12.4
COBALT	32.5	155	0	0	182.5
GENIE	1.8	0	0	0	1.8
MEDUSA1	2.7	0	0	0	2.7
MEDUSA2	3.4	2.9	0	0	6.8
MITecco	3.5	104	0	0	107.5
MITigsm	1.4	194	0	0	195.4
PISCES1	32.7	26.6	11.3	2.5	71.0
PISCES2	32.7	26.6	11.3	2.5	71.0
REcoM	3.7	0.6	0	0	4.3
TOPAZ	13.8	74.8	0	0	88.6

Results from FEMIP I by Tagliabue et al. 2015 (Gmol year^{-1})

$\rightarrow$ Models try to match measured DFe concentrations by altering processes and parameters in the iron cycle. The poor constraints on iron sources strongly hamper our understanding of the marine iron cycling.

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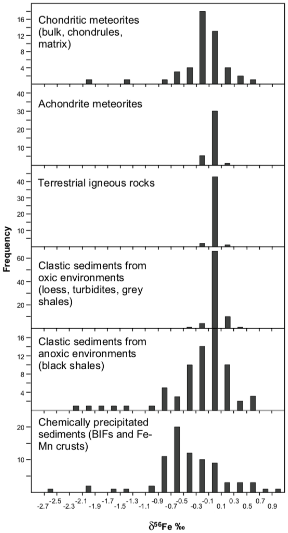
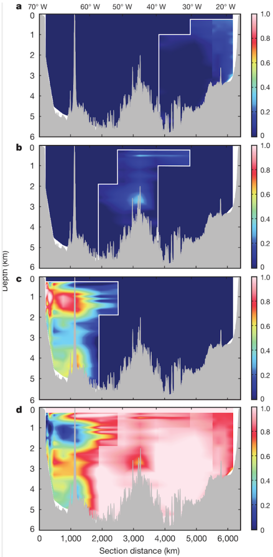
Different sources have fingerprints in their isotopic composition



- isotopic signals determined for main external sources for marine DFe
- physical transport and mixing change source signals
- chemical and biological processes fractionate between isotopes
- more and more observations of the isotopic composition of DFe and PFe

←Beard and Johnson 2014

Use the fingerprints to trace the sources...



- assumption of two sources in defined regions and starting isotopic compositions
- physical mixing taken into account
- fractionating chemical and biological processes ignored

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→ biogeochemical cycling of Fe isotopes can and need to be taken into account in models
→ poster presentation at 17:30 on Wednesday 21st August as part of session 10k

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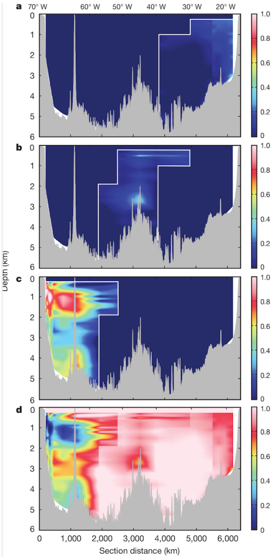

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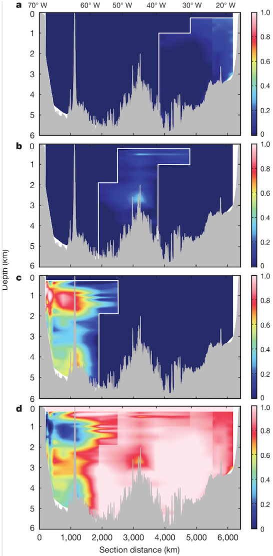

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