Fitzsimmons Lab
Arctic GEOTRACES GN01

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OCEANOGRAPHY
TEXAS A&M UNIVERSITY

Dissolved and colloidal Fe, Mn, Zn Ni, Cu, Cd, & Pb

Outline

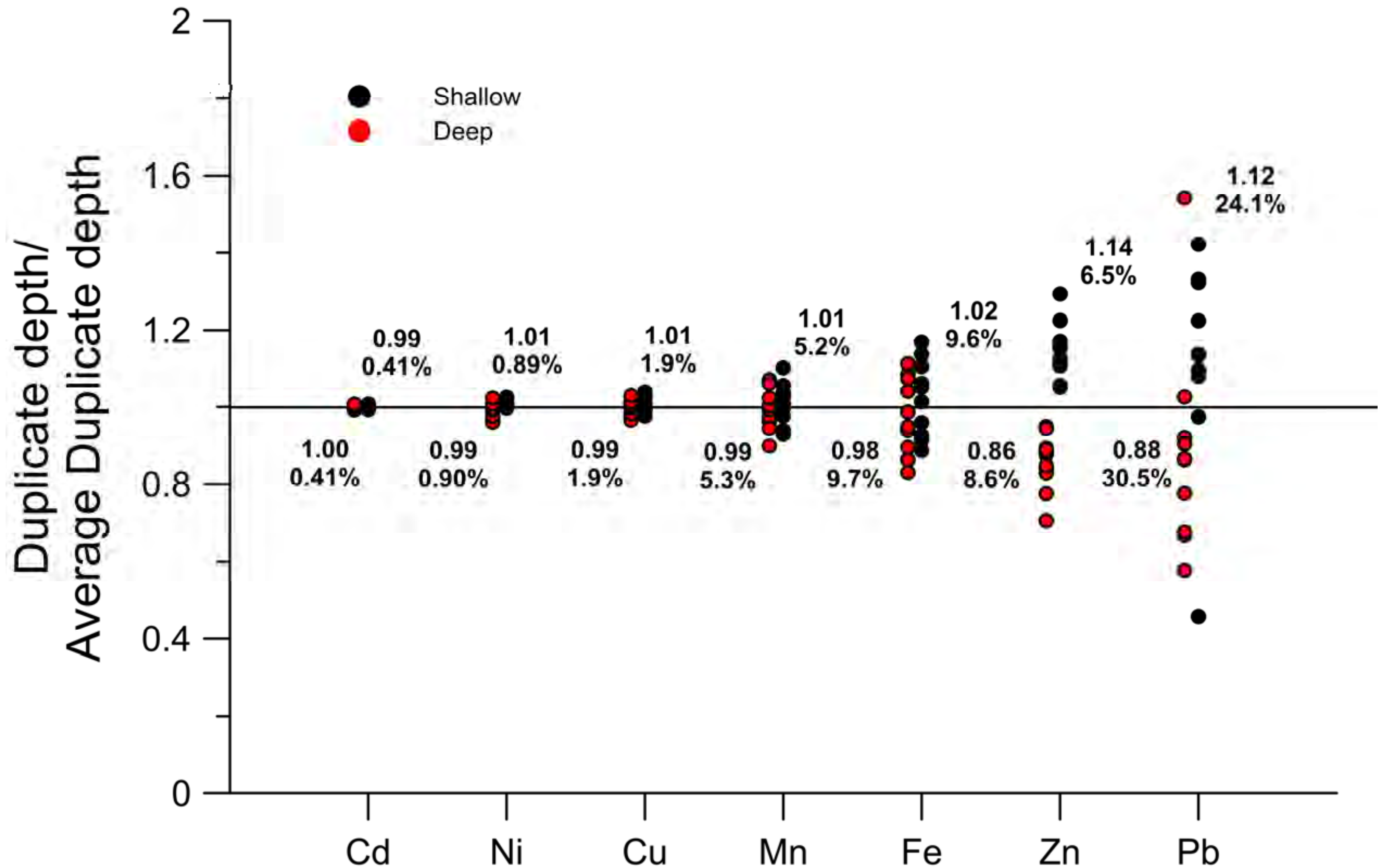
1. Dissolved metal data quality and (inter)national intercalibration

2. Fitzsimmons lab publications: current & planned

3. Additional topics for potential discussion

Dissolved metal sample quality

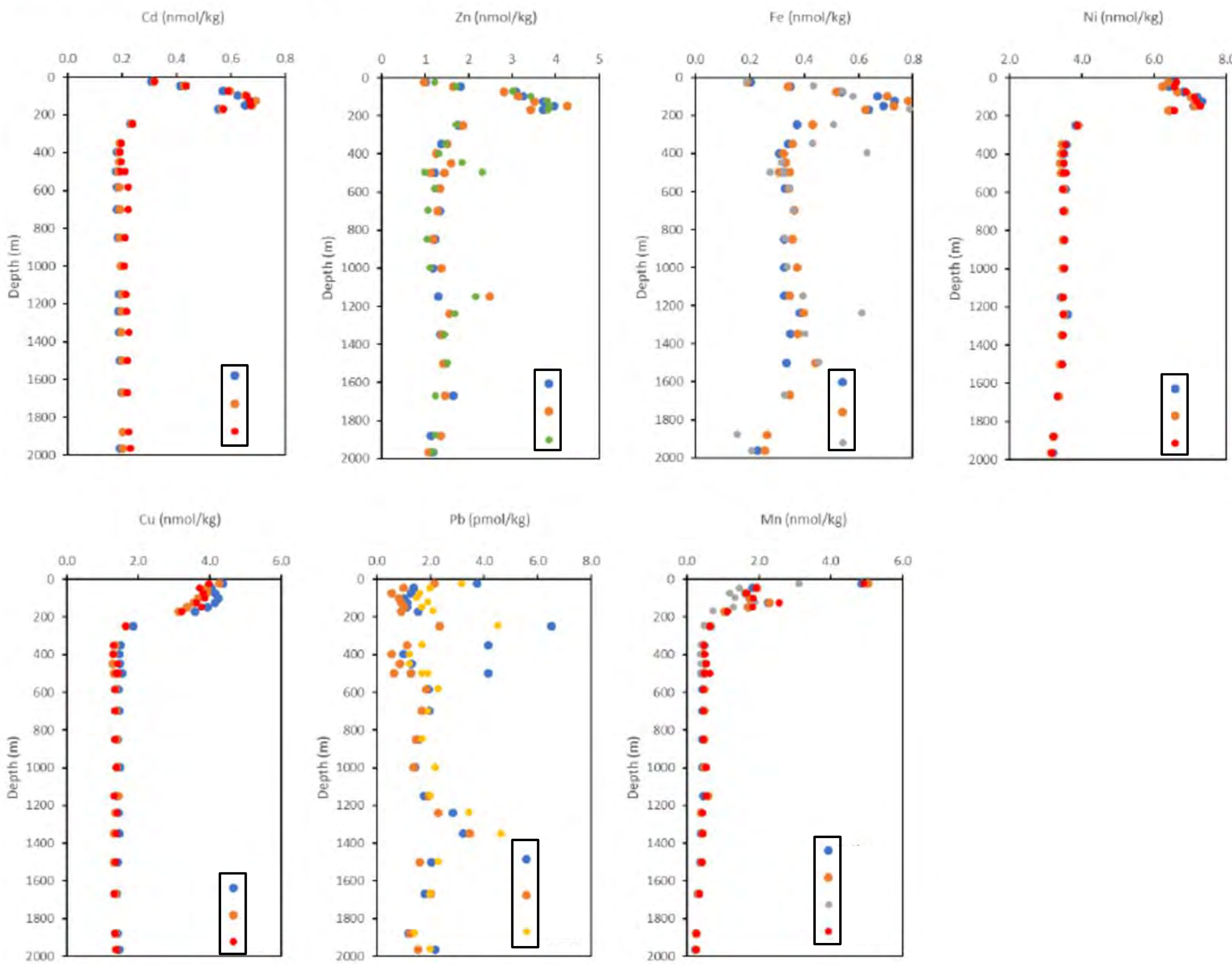
Internal intercalibration at "overlap" depths showed high sample quality, potentially with some Zn and Pb troubles



Dissolved metal intercalibration

U.S. intercalibration at five stations for seven metals: Fe, Mn, Cu, Cd, Zn, Ni, Pb

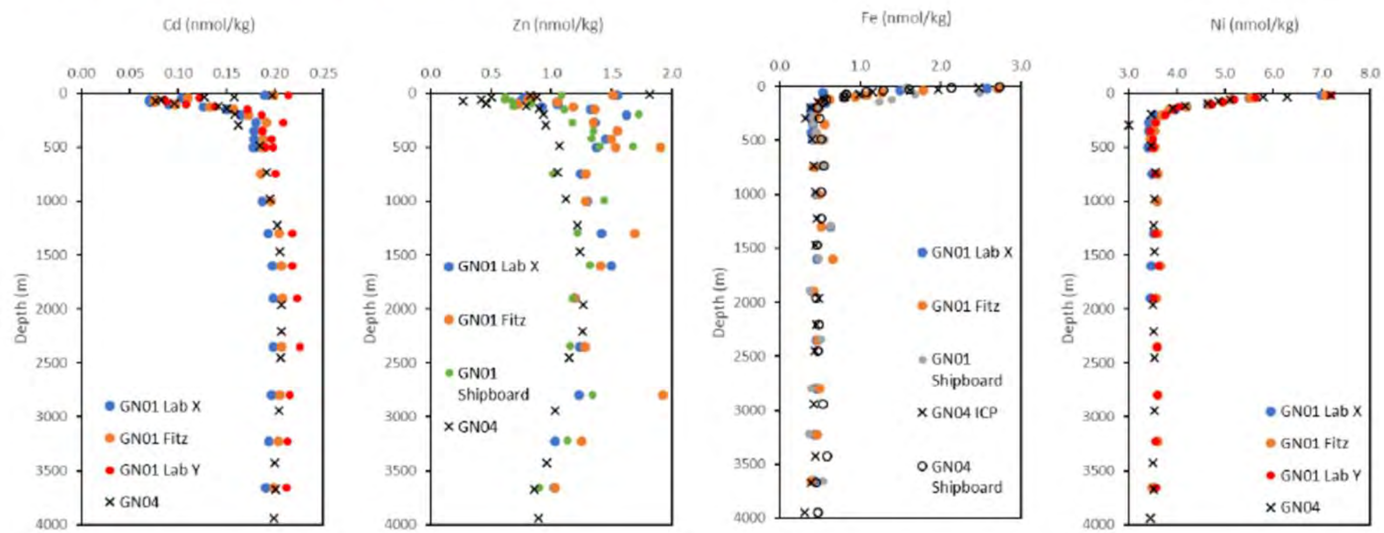
GN01 Station 19 – U.S. analytical intercalibration

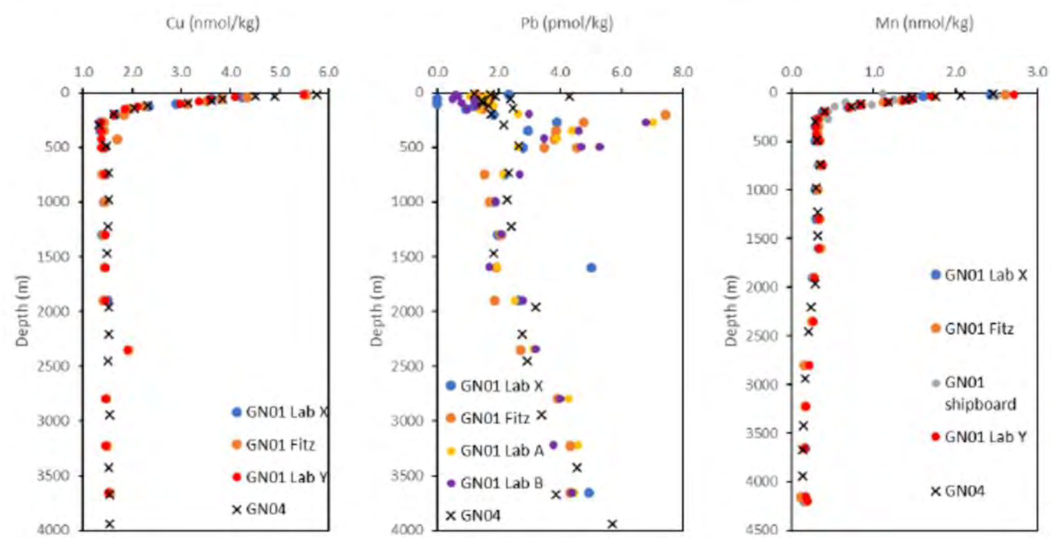


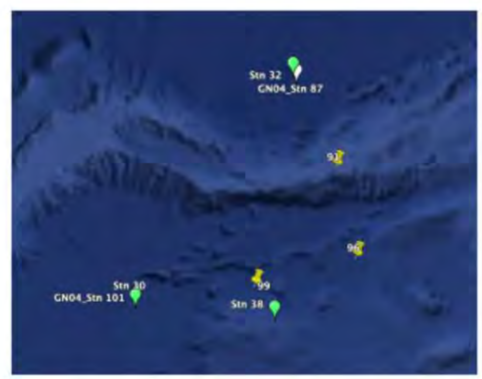
Dissolved metal intercalibration

GN01-GN04 intercalibration at 2 stations for 7 metals: Fe, Mn, Cu, Cd, Zn, Ni, Pb

U.S. GN01 Station 32 – Dutch GN04 Station 87







Dissolved metal intercalibration

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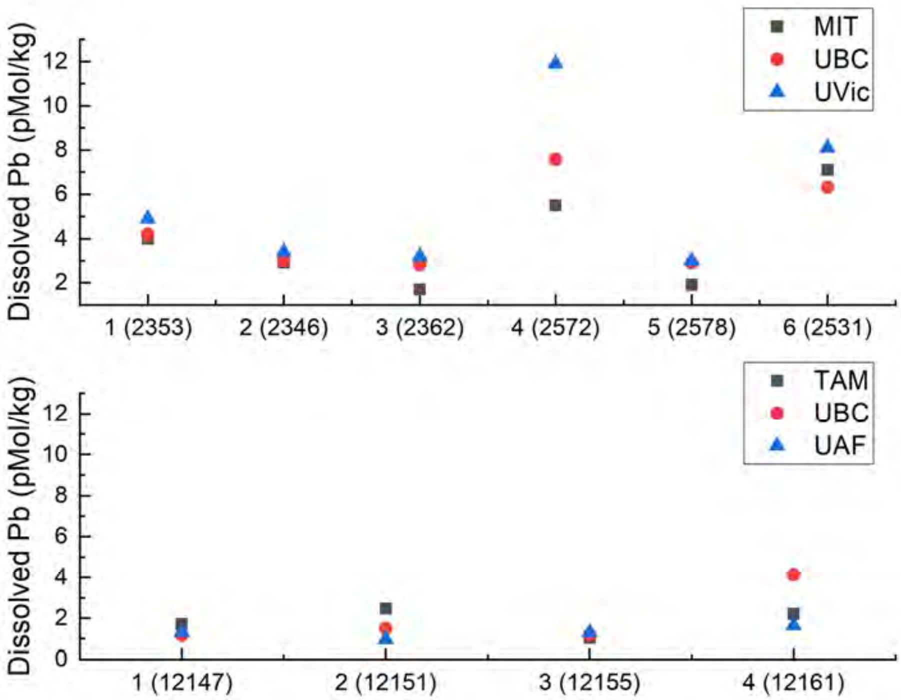
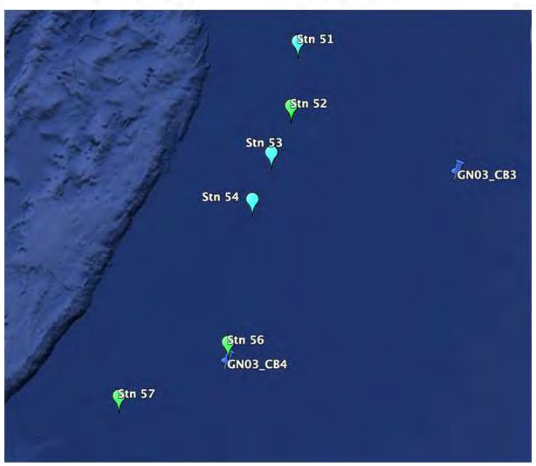
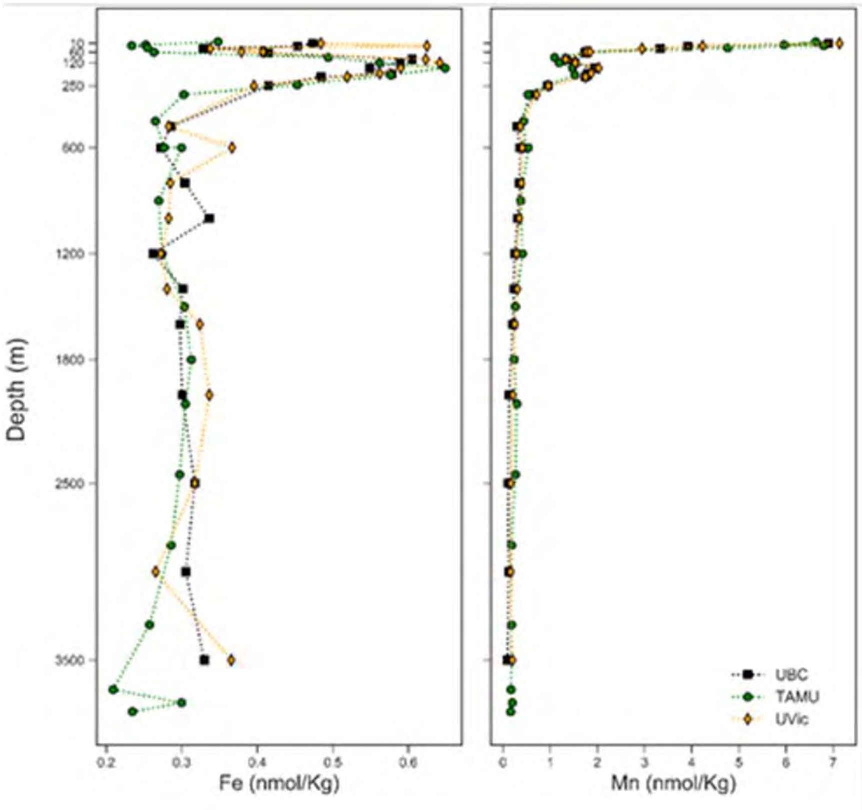
GN01-GN03 intercalibration: no direct overlap stations







GN03 CB3 vs. GN01 Stn 52

Fitzsimmons: GN01 Publications

Papers already published:

1. Jensen et al. (2020) – Bottle sorption tests done on Arctic GEOTRACES, etc.
2. Jensen et al. (2019) – Dissolved Zn
3. Zhang et al. (2019) – Dissolved Cd and Cd isotopes
4. Kadko et al. (2018) – Metal residence times
5. Marsay et al. (2018) – Trace elements and isotopes in meltponds
6. Hein et al. (2017) – Ferromanganese crusts (Dissolved Sc)

Papers we plan to submit in next year (chapters of Jensen dissertation):

1. Jensen et al. (full manuscript drafted) – Dissolved Fe and Mn
2. Jensen et al. (in prep) – Cryospheric trace metal colloids
3. Jensen et al. (in prep) – Dissolved Cu and Ni

Jensen et al. 2019 – Dissolved Zn

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AGU100 ADVANCING EARTH AND SPACE SCIENCE

Global Biogeochemical Cycles

RESEARCH ARTICLE
10.1029/2018GB005975

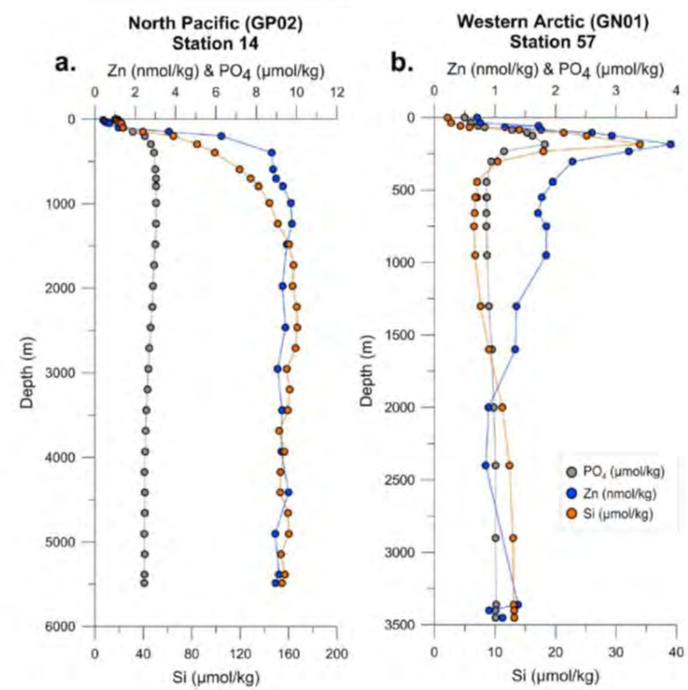
Biogeochemical Cycling of Dissolved Zinc in the Western Arctic (Arctic GEOTRACES GN01)

L. T. Jensen[1], N. J. Wyatt[2,3], B. S. Twining[4], S. Rauschenberg[4], W. M. Landing[2], R. M. Sherrell[5,6], and J. N. Fitzsimmons[1]

[1]Department of Oceanography, Texas A&M University, College Station, TX, USA, [2]Department of Earth, Ocean and Atmospheric Science, Florida State University, Tallahassee, FL, USA, [3]Ocean and Earth Sciences, University of Southampton, Waterfront Campus, National Oceanography Centre, Southampton, UK, [4]Bigelow Laboratory for Ocean Sciences, Boothbay, ME, USA, [5]Department of Marine and Coastal Sciences, Rutgers University, New Brunswick, NJ, USA, [6]Department of Earth and Planetary Sciences, Rutgers University, Piscataway, NJ, USA

Key Points:
- Dissolved Zn profiles in the Western Arctic do not have the typical "nutrient-type" profile shape found in the Atlantic and Pacific Oceans
- Arctic Zn is controlled by shelf fluxes from porewater remineralization of Zn-rich phytoplankton and water mass mixing of preformed Zn
- Arctic Zn:Si slope is higher than the global mean and weakly correlated

- Dissolved Zn profiles in Arctic don't have have the typical "nutrient-type" profile shape
- Arctic Zn is controlled by:
  - Shelf fluxes from porewater remineralization of Zn-rich phytoplankton
  - Water mass mixing of preformed Zn

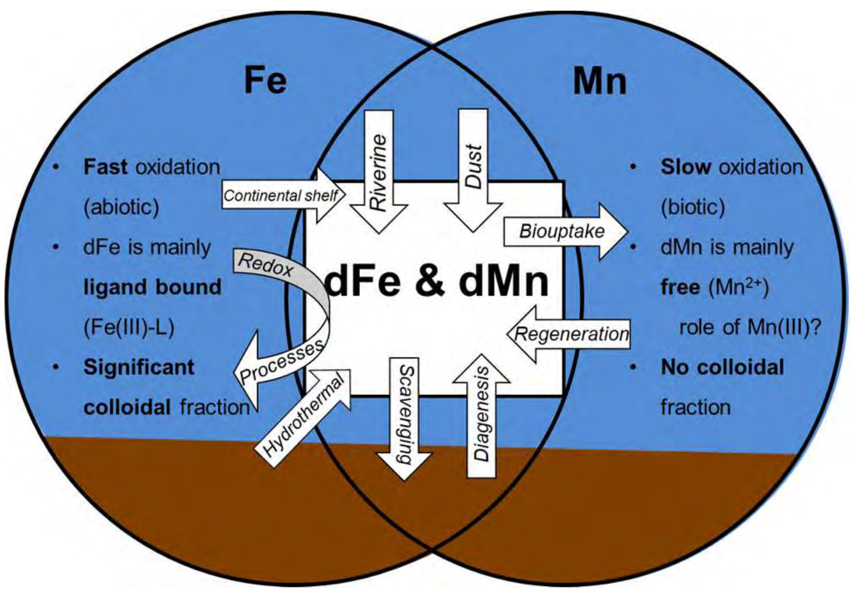


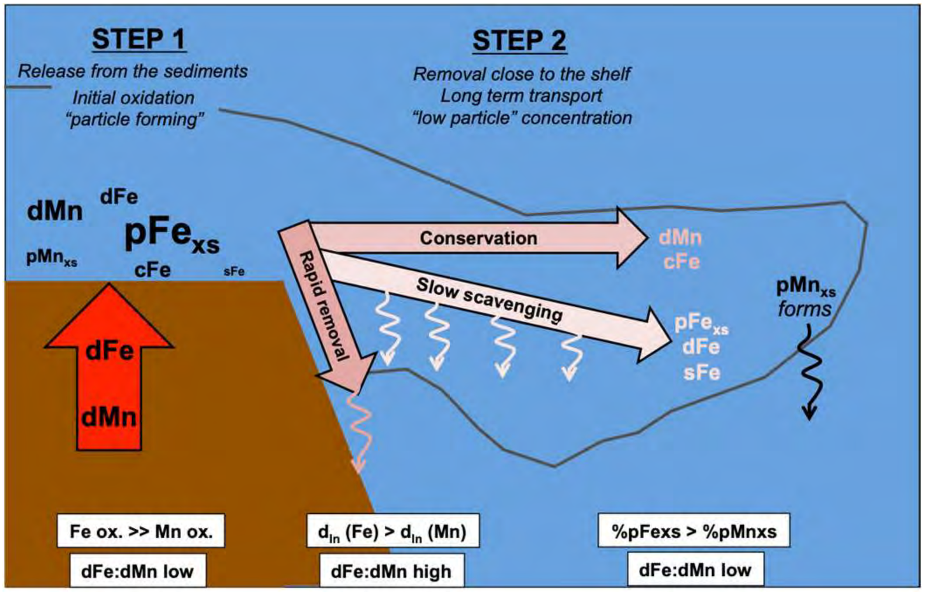
Jensen et al. *drafted* – Dissolved Fe & Mn

A comparison of Fe and Mn cycling using the U.S. GEOTRACES GN01 Western Arctic as a case study

Large U.S. GN01 collaboration; manuscript draft to coauthors next week!

- Decoupling of Fe and Mn in the Arctic Ocean (both dissolved & particulate)
- Shelf Fe/Mn reflects oxidation timescales, halocline Fe/Mn reflects stabilization
- Both dFe and dMn are rapidly removed close to the shelf, but dFe is slowly removed in halocline while dMn is conserved in halocline





Jensen et al. *in prep* – Cryospheric colloids

Biogeochemical transformations of trace metal colloids in the Arctic cryosphere

Can speciation changes between snow, sea ice, melt ponds, and seawater tell us anything about how the cryosphere influences metal fluxes to seawater?

- Higher %colloids controlling dissolved phase in cryospheric freshwaters compared to underlying seawater
- Clear station-to-station variability due to mixing, particle concentration, dust
- Cryospheric incubation timescales (e.g. melt ponds etc.) are an important pathway for loss of colloidal Fe specifically

See: Laramie's talk on Wednesday!

Date/Time: **Wednesday 2/19/20, 15:30**
Room: SDCC 5B, UL
Session: CT33A- Controls on Trace Metal Biogeochemistry and Physicochemical Speciation in Seawater II

Jensen et al. *in prep* – Dissolved Cu & Ni

- Surprisingly, Cu (hybrid-type) and Ni (nutrient-type) share remarkable correlation in the Arctic: WHY?
- Both have high surface concentrations and enrichment in halocline (atypical oceanographic profiles)
- Deviations from overall correlation most significant along shelf, halocline, and ice hole stations