

### 1) Benthic S.O. Sources

- Are S.O. systems different from other coastal or warmer HNLC systems?
  - Do benthic sources need to come from reducing sediments?
  - Have S.O. organisms/ecosystems adapted differently than temperate systems?
  - Annual cycling/seasonality is v. different in S.O. vs. other HNLC regions
  - Bacteria may be more active in high latitudes than previously thought
  - Methods for getting benthic Fe to the surface

### 2)

Forms of Fe in the Water Column - pFe in these systems typically dominates over dFe

- 1) Biogenic (bound to organic matter, e.g. in cells or sinking O.M.)
- 2) Scavenged (surface-bound phases)
- 3) Colloidal (inorganic, sub-micron)
- 4) Lithogenic (clays, silicates, basalts; via dust or benthic routes]

Functional/Operational Definitions in the Particulate world

Size classes also exist within all these forms, confounding interpretations

-Multiple size fractions? How many? (>0.4/0.8, >5, >20, >50?) What do they capture or mean?

-GT uses two classes: suspended <51um and sinking >51um

-FeCycle found >20um fraction dominates the lithogenic component, but <20um fraction dominates the Fe turnover

Chemical leaches/Sequential Leaching

-25% Acetic acid (+heating step/reductant [Bruland], to lyse cells)

-"Total dissolvable" (acidified whole water leach, pH 2 for 6 months)

-Which phases are they accessing, and do they represent "bioavailable" iron? (and on what timescales?)

Operationally defined chemical leaches access different phases than the conceptual phases  
If only 1% pFe lability is needed to close a budget, are these differences b/w leaches/styles even relevant?

### 3)

Bioavailability - Processes that make pFe bioavail.

-Microzooplankton/direct consumption/feeding

-Bacterial microecosystems within particle environments leading to Fe release to the larger community

-Recycling processes in the microbial loop leading to retention of Fe in the upper water column

Recommendations:

GEOTRACES Part. cookbook contains recommendations for particulate collection (they should be collected!)

-Storage at room temp vs. Freeze (to prevent Fe oxide phase changes)

Total Dissolvable Fe -collect now, analyze later

Experiment: Siderophore leaches to investigate availability of pFe types/sizes(?)

-2nM (?) siderophore (DFB) leach, followed by total particulate digestion

Methods for identifying particulate sources (Mn, Nd isotopes)

-Size fractionate? Probably not...too complicated

-How to leach, if any?

Questions:

Is surface-bound iron/colloidal Fe an artifact of filtration?

Can the biogenic fraction be truly separated from the scavenged and other phases?

(oxalate rinsing? Ben says Fe "coatings" aren't actually seen, and may be filtration artifacts)