Theme 1: Biological uptake and trace element bioavailability

1. How does stoichiometric plasticity connect to trace metal distribution and inventories?
2. How much do we know about the different TE acquisition systems of microorganisms?
3. What 'modes' of metal (M) uptake dominate in different natural systems?
4. How important are co-limitations?
5. What are the interactions within an organism for multiple metals?
6. How can molecular tools help us to improve our knowledge?

7. How do we improve our understanding of TE bioavailability?
8. What is the role of TE speciation (redox, organic, and physical) for their uptake and bioavailability (link with Theme 2)?
9. Can we connect entire food-web structure on TE uptake and inventories?
10. Can we capture and understand temporal variations (early stage vs. decline of the bloom) and spatial variations?
11. How available are TE when regenerated (link with Theme 3)?
12. How do we connect large GEOTRACES datasets to their influence on biological pump?

Theme 1: Biological uptake and trace element bioavailability

1- Bacterial demand? Very poorly modelled… Although very important.
2- Issue of phagotrophy?... Major issue for uptake.
3- What is bioavailability? Do we have new data that can help resolving the question?

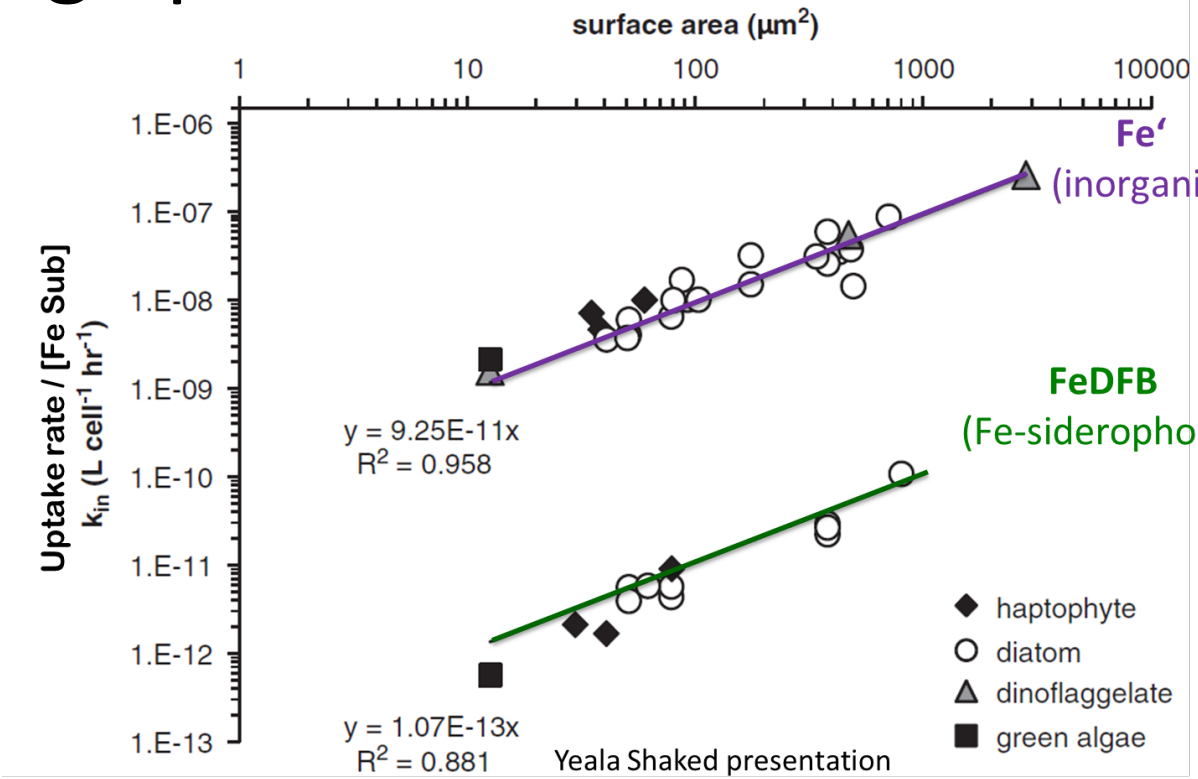
2 sub-groups:

- **Stoichiometry/co-limitation**
- **Uptake/bioavalability**

Stoichiometry Working Group

1. Deep chlorophyll maximum iron limitation phenomenon T, I
2. Cd or other metals (Co) as proxy for sinking POC compare to Th flux(constrained Cd:P) T, I
3. What does the slope of metal:phosphate mean (d and p)? Spatial variability? T, I
4. Are biological quotas set by availability or vice versa? Esoteric
5. Phytoplankton functional groups (PFT): ?
    1. Can we constrain the realized quota, what is the maximum?
    2. Can pigment abundance be converted to estimated metal quotas?
6. Can quota be estimated from biochemical first principles (Raven-like)? T, I
    1. Present: From model organism specific activities
    2. Future: From metalloproteomics
7. Do metal-metal interactions influence the dissolved and particulate distribution?
    1. How much stoichiometric distribution is accidental (e.g. Cd and Zn)?
8. By restoring the model to observations can the gross fluxes from the surface be calculated?

Uptake/bioavailability Working Group modeling uptake as a function of metal species



We can infer this relationship using field data (HPLC, Chla (size-fractionated), nutrient, Community composition, Fe profile, estimated growth rate, primary productivity).
Determine correlation with the different Fe species and particulate Fe species
=> North Pacific, because of high biogenic particles.
=> Can be done for other metals

Recommendations

- Light (PAR)
- Flow cytometry-bacteria-largest C pool in ocean
- Primary productivity
- Size-fractionated Chla
- Growth rate
- Sequence data can tell us what kinds of bacteria are there, other eukaryotic functional groups that are currently unknown
- role of zooplankton and heterotrophic protists

Until which depth?
At the bottom of the DCM and below the euphotic zone (we want bacteria).