Biotic Structure and Biogeochemical Cycles

Nutrient and trace metal cycling break-out

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What are the key unknowns in this area?

Nutrients:

- F ratio and constraint by nitrification rates
- Competition by phytoplankton and bacteria for substrates
- Denitrification and shifts in DOM vs C:N
- Factors that **control** nitrification rates, nitrogen fixation
- How does the increase in anthropogenic nitrogen deposition effect production?
- Why do we not see as much phosphorus limitation
- What is DON production in situ vs allocthonous sources.
- How does the utilization of DON change from coast to open ocean.

Oxygen

- What is limiting the extent of hypoxia?
- How does hypoxia effect remineralization rates.
- What limits denitrification?

Mechanisms

- Transport of particle fluxes at depth and how much material makes it out of the euphotic zone.
- Measurements of re-mineralization rates and changes in the Redfield ratios (links to hypoxia)
- N/P ratio how important is it in defining sources and sinks (N2 fix vs. dentrification).
- Atmospheric deposition and submarine groundwater discharge delivery o f nutrients and trace metals.
- What is the solubility of the aerosols…are they solubilized?
- Coastal transport of particulate and dissolved into the ocean interiors.
- Connecting chemical speciation and bioavailability of trace metals.

Mechanisms

- Connecting coastal zone to open ocean global models
- More physical chemistry and chemical kinetics.
- New approaches to characterize LMW DOM
- Issues of new technology and how this is needed to address these questions. Global scale measurements.
- Importance of transient vs globally averaged phenomena.
- Permanent bottom resuspension layers and what role they play in remineralization.

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I. What mechanisms control rates of primary plankton production, carbon export and nutrient depletion?

II. What mechanisms control carbon transport and remineralization in the mesopelagic?

Studies should consider:

Integrate models at all stages in the program

Link the study with a time-series for greater temporal context

Incorporate diverse technologies:

(Gliders, profiling mooring, molecular techniques, continuous observations on volunteer ships, remote sensing, new geochemical tools)

Fruitful areas for study:

HNLC regions

Wind driven coastal upwelling

Sites of natural perturbation
(i.e. natural iron enrichments,
eutrophication)