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Working Group 1 – Characterization of sinking particles over the upper 500 m

Organizers/Attendees: White, Karl, Van Mooy, Repeta, Ingalls, Dyhrman, Zehr

General themes for WG1

1. Depth-dependent attenuation of energy content, elemental (C, N, P, H, O, Fe, etc.), and macromolecular/metabolite composition of suspended and sinking particles and DOM
2. Vertical changes in particle size structure (suspended and sinking) and the role of predation/viruses as modifiers of particle size
3. Source-tracking of export (e.g., where vertically in the water column does the material originate)
4. Quantify absolute and relative contributions of living (e.g., *Prochlorococcus*, diazotrophs), dead, and dormant microbes to particle concentrations and export

Shipboard activities to be pursued by the group include

- Regular collection of suspended POM and filtrate via CTD collections. For reference, suspended PC at ALOHA is **~0.5-3 μmol L^{-1}**
- Regular deployments of net traps to acquire sinking POM. Net trap deployments should result in **~10-50 mg** of organic carbon in a single 24-hour, 200m deployment
- Regular deployments of PIT traps for collection of sinking material in the upper 500m of the water column. Typical ~N mass collected in a 24 hr deployment **is 5-15 μg PN per replicate trap at 150 m**. Crosses can be deployed at multiple depths and on multiple arrays. For reference, the range for C **flux at 150m is ~10-50 mg m^{-2} d^{-1}**
- Regular deployment of McLanes pumps on the hydrowire. These pumps have 2 filter heads that each holds a 142 mm filter and 8L/min pump heads. It is possible to use 0.2 μm Supor filters (will collect 50-100L before clogging). With either a 0.7 or 0.3 μm GFF you can filter more water but will free living small cells.
- Prolonged (~7d) and repeat deployments of an Indented Rotating Sphere Carousel Trap (IRSC) Trap to determine sinking velocity and relationship of sinking velocity to particle size distribution. Tests of this trap are being done on HOT 322 to assess the magnitude of flux collections relative to PIT traps.
- A marine snow catcher is being tested on upcoming HOT cruises and may be used in combination with net traps or IRSC traps to separate sinking/rising particles.
- Tangential flow filtration may be used ?
- Regular deployment of free-floating arrays for in situ incubations in the upper 200m using stable and radioactive tracers; may be paired with in situ remineralization/respiration experiments

Multi-investigator, collaborative projects and smaller individual projects within the working group that were discussed included but were not limited to

- Collection of sinking POM and collaboration in remineralization/degradation experiments.

- Collection of suspended and particulate material and assessment of microbial diversity and activity (enzyme activities) on particles
- Understanding the diversity of diazotrophs and size-distributions on suspended and sinking particles using high through-put NanoSIMS
- Measurement of enzyme activities on particles; measurement of macromolecular metabolite composition on particles
- Multi-dimensional NMR of net-trap collections, paired with coordinated measurements of molecules/metabolites/calorimetry/elemental ratios/ Ion chromatography
- Surface net tows for collection of diazotrophic organisms for measurement of activity, diversity, and abundance
- In situ imaging of particles and the PSD from a variety of optical and imaging platforms
- On deck incubations designed to generate particles or degrade particles

Several of the above proposed projects require preliminary measurements or testing prior to the SCOPE 2021 cruise (e.g., on a forthcoming HOT cruise).

- IRSC testing on HOT 322-323
- UVP testing on HOT 321-324
- Scripps Plankton Camera tests in 2020-early 2021 as feasible
- Net traps build/testing in 2020
- Mclane testing – will need to be on CTD line
- Total hydrolysable and NMR on suspended particles
- Suspended Particles in TFF – testing will proceed at WHOI