

Tracking the temporal and spatial variability of dissolved organic matter, its diagenetic state and bioavailability during various bloom states in the North Atlantic – C. Carlson

During occupation of various bloom state these indicators of DOM production, persistence, and export potential will be monitored:

Distribution and amount: Direct measurements of bulk of DOC and DON distribution will be made over the surface 1500 m along four meridional transects occupying distinct phases North Atlantic phytoplankton bloom.

Chemical characteristics affecting lability: Variability in DOM quality will be assessed by: 1) measuring change in the elemental stoichiometry of the seasonally accumulated DOM; 2) the contribution of the dissolved combined neutral sugars (DCNS) relative to total DOC (DCNS yield) and 3) measuring change in the molar fractions of specific neutral sugars (Skoog and Benner, 1997; Goldberg et al., 2011). These measurements will provide indices of shifting DOM diagenetic state in the context of bloom physiological state and phytoplankton phenology.

Lability and persistence: Microbial remineralization bioassay experiments conducted over the four phytoplankton bloom phases will be used to quantify the bioavailable portion of DOM. They will also provide estimates of the persistent and potentially exportable portion of seasonally-produced DOM . Fig 1

Contribution to export: Estimates of the annual DOM export out of the surface 100 m and into the mesopelagic zone will be constrained by assessing changes in mesopelagic DOC inventories before and after deep convective mixing. Fig 2

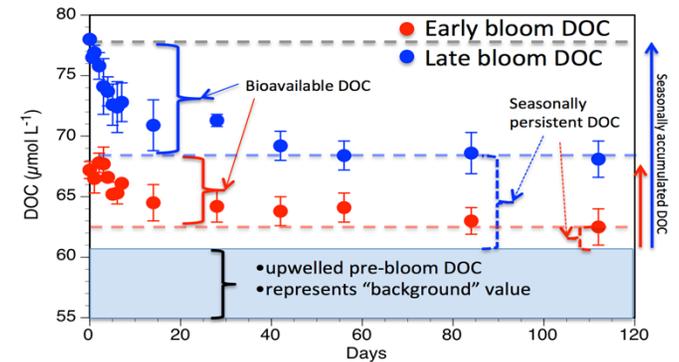


Fig. 1. Example of data from a microbial remineralization experiment used to evaluate bioavailable (blue and persistent DOC from a coastal phytoplankton bloom in the Santa Barbara Channel. The length of the solid arrows on the right y axis indicate the quantity of seasonally accumulated DOC for early bloom (red) and late bloom (blue) conditions. (Wear and Carlson unpublished data)

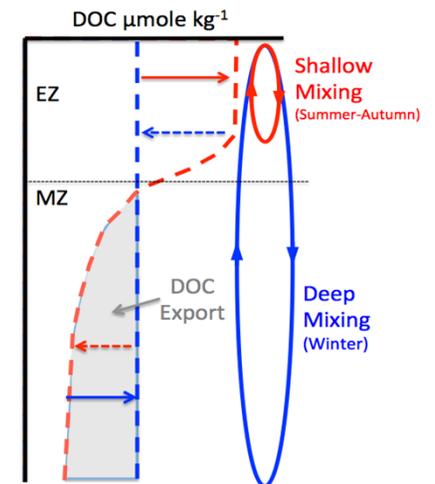


Fig 2. Idealized conceptual model of DOC export via deep convective mixing. EZ= epipelagic; MZ= mesopelagic. DOC profile in dashed blue is during winter mixing, DOC profile in red dashed line is during stratified period prior to mixing. Gray is the difference between profiles and represents export (Carlson et al, 1994, Hansell and Carlson 2001). Solid red is seasonal DOC accumulation, dashed red arrow in MZ is remineralization. Solid blue arrow represent net MZ DOC increase via mixing, blue dashed arrow is surface dilution. After Carlson et al. 1994