New, regenerated and carbon production (on-deck) - Sambrotto

Nitrogen and carbon uptake rates were measured with incubation experiments using stable-isotope tracer additions to seawater samples. The rates of new (nitrate) and carbon uptake were measured in the same incubation bottle using a dual-label approach with a combination of $^{15}NO_3$ and $H^{13}CO_3$ (Sambrotto et al., 2008; Sambrotto, 2001). Rates of ammonium and urea uptake were measured separately in parallel incubations. Isotopic tracers were added at less than 10% of the ambient pool (or 0.05 μM when ambient pool levels were undetectable). Incubation times were adjusted to avoid significant depletion or isotopic dilution of the labeled pool. These factors limited ammonium and urea incubations to 4 hr. or less, but nitrate and carbon experiments were often incubated for 24 hr. if nitrate levels were sufficient. All rate measurements are from on-deck incubations. At most stations, samples from throughout the euphotic zone (100, 55, 30, 17, 9, 5 and 1% of maximum submarine light) were collected in 2.4-L PET bottles. The original light levels were simulated with layers of black screen and the bottles were incubated in on-deck incubators cooled with surface seawater pumped from the ship's sea chest.

Particulate material was collected on precombusted Whatman GF/F filters at the end of the incubation. The filters were dried at 40˚C for 24 hr. and stored in a dessicator before being analyzed on-shore with an automated Dumas combustion system coupled to an IRMS operated in continuous flow mode. This analysis yielded both the isotopic enrichment of the particles for the estimation of specific uptake rates, as well as the total amount of particulate nitrogen (PN) and carbon (PC) in the samples. Rates were estimated from the measured enrichment of the particulate material, the amount of tracer and ambient substrate, and incubation time (Legendre and Gosselin, 1997). All transport (uptake) rates reported here are daily rates estimated either directly from 24 hr. incubations or extrapolated from shorter time periods based on measurements of diurnal changes in the uptake rates for the various substrates during the cruise.

References

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