Variation of new production with time and concentration of the substrate in the Bay of Bengal

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During the course of Bay of Bengal Process study (BOBPS) a number of stations were occupied in the central and coastal Bay of Bengal and nitrogen uptake rates determined using 99 atom% enriched 15N tracers such as nitrate, ammonia and urea. The simulates-in situ incubations were carried out on board ORV Sagar Kanya during 15 Sep.-15 Oct. 2002. Tracers were added at 10% of the ambient concentrations and incubations conducted for 4 hours symmetrical to the local noon, following the JGOFS protocol. Additional experiments were conducted to determine whether the nitrogen uptake rate changes with (a) time, during the 4 hours by sampling ever hour after the beginning of the experiements and (b) concentration of the substrate added, by changing the same(0.1, 0.2, 0.3 and 0.4 uM];(c) in addition, a 12 hour incubation was conducted both in situ at 4 depths (0,20,40 and 60 m) and simulated in situ (deck).

The results show that there are significant changes in the uptake rates during the 4 hour incubations.While ammonia uptake rate remained constant at .005/h, urea uptake rate reduced from .025/h to .02/h during the 4 hour period. Nitrate uptake increased to .01/h to 0.015/h during the 4^{th} hour. New production increased from 30% (first 3 hours) to 40% (last hour). Similarly in experiment (b), all 4 hour incubations, ammonia and urea uptake rates increased from 0.001/h to 0.004/h and 0.002/h to 0.006/h respectively, while that for nitrate decreased from 0.003 to 0.001/h, all with increasing substrate concentrations. The f-ratio decreased from 50% to 10%. In experiment (c) the total prodcutivity (using a C/N ratio of 6.6) was 521 $mgC/m^2/d$ for the in situ experiment, while it was 162 $mgC/m^2/d$ for the deck incubations. Independent in situ productivity measurements based on ^{14}C are in agreement with the results of the deck incubations.

These results have significant implications to the determination of new prodcution in the surface ocean using the ^{15}N technique, which will be discussed.

Variation in fatty acid molecular and ^{13}C composition of both benthic invertebrates and settling particles during a spring bloom

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Organic matter generated during spring phytoplankton blooms defines the particular lipid class and fatty acid structure in cold ocean coastal environments such as Conception Bay in Newfoundland. Samples of phytoplankton were gathered from net tow and sediment traps while the fatty acid molecular assemblage and isotopic compostion of several benthic species was determined. Several fatty acids have been found to be useful "molecular markers" for cold ocean marine food webs [1-3]. As the bloom progressed, the diatom markers were initially higher and the dinoflagellate markers increased as the bloom waned. The proportions for the saturated fatty acids in the mudstar *Ctenodiscus* seem to be different from *Sagitta* and *Yoldia*, while for PUFAs, *Sagitta* seems to have a unique signature. Both *Yoldia* and *Ctenodiscus* are "bottom-dwellers" and the diet of both the bottom-dwellers might reflect phytoplanktonic sources, unlike *Sagitta*, since the arrow worm feeds on many other organisms that inhabit pelagic waters, including broods of their own size.

There was a shift towards lower $\delta^{13}C$ values as the bloom progressed reflecting conditions of decreased DIC and very high phytoplankton growth rates. The isotopic compostion of *Yoldia* migh support the issue of zooplankton keeping energy stores for future use as well as isotopic discrimination with increasing trophic levels because of the heavier isotopic compostion of the bivalve compared to the phytoplankton tow samples taken at almost the same time as the zooplankton was collected. The PUFA 18:4n-3 has a consistently depleted isotopic composition in all samples such that the very low isotopic compostion might be inherited from settling particulate matter, compared to previous studies on mussels from Conception Bay which was attributed to bacterial sources [4]

References:

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