Size-fractionated planktonic nitrogen regenration in the Iberain Upwelling Region

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Summary:

During this first year of the project efforts have been directed to three main tasks. First, the development of proper analytical techniques to experimentally measure the excretion of DON by plankton, in collaboration with partners measuring excretion of DOC and zooplankton excretion of DIN. Second, the review of available information of DON concentrations in the study area, particularly in relation to the upwelling over the shelf. And finally, the planning and preparation of cruises for the second year, in which the excretion of DON will be measured in the OMEX study area. These activities correspond to project Tasks II.9.2 and II.10.2 of the Technical Annex. Also, preparation of intercalibration exercises during the planned cruises will be part of IEO contribution to Tasks IV.2 and IV.3.

Descriptive:

1.- Analytical techniques:

After an extensive survey of the available literature, a decision was taken to use the method of Slawyk & Raimbault (1995) for DON recovery in experiments with the tracer ^{15}N. This method, has the advantage of allowing the simultaneous recovering of DIN and DON from the same experimental bottle with a minimum effort, compared to other separation procedures (eg. Axler & Reuter, 1986; Bronk & Glibert, 1991). An experimental protocol to be used during the cruises was prepared.

2.- Review of DON data:

An extensive survey of nitrogen forms and phytoplankton on the N and NW Spanish shelf was made in March 1992. Dissolved inorganic nitrogen (DIN) included nitrate, nitrite and ammonium, were determined by colorimetric analysis. Dissolved organic nitrogen (DON) was determined by persulfate oxidation of filtered seawater. In addition, particulate nitrogen and carbon, chlorophyll-a, sestonic proteins and primary production measurements were carried out at selected stations. Samples were representative of main conditions within the euphotic zone (0 to 80 m). Surface waters in the western region (Galicia) were characterised by the presence of Eastern North Atlantic Water of subtropical origin. This water mass moved into the S Bay of Biscay (Mar Cantábrico) and originated frontal zones where phytoplankton accumulated. DIN (mainly nitrate) was nearly depleted in the surface of coastal areas with high chlorophyll concentrations (> 5 mg Chla m^{-3}). DON reached concentrations of up to 10 µM in these phytoplankton rich areas, particularly in the eastern part of the S Bay of Biscay where primary production was also high. Particulate nitrogen and carbon were significantly correlated with sestonic proteins and showed maximum concentrations in the high chlorophyll zones. Positive correlations were found between DON and particulate nitrogen and carbon, chlorophyll and primary production, while a negative correlation was found between DON and DIN. Using regression functions computed between these variables the average enrichment of DON in surface shelf waters off NW Spain can be estimated. These results will be useful for the interpretation of DON excretion measurements taken during the project.

3.- Cruise preparation:

The cruise OMEX-0898 was scheduled for 1st. to 11 August 1998, planned and directed by scientists of the IEO. At first the R/V Cornide de Saavedra of the IEO was booked, but by the beginning of 1998 it was clear that this ship will not be available at the scheduled dates. The IEO decided to rent a russian oceanographic ship with equivalent equipment and facilities to those on board the Cornide de Saavedra. At present, the name of the russian ship is not known but contacts with the Russian Academy of Sciences are currently being made to find a suitable ship. The cruise OMEX-0898, as part of the OMEX WPII, is aimed to obtain basic data (CTD, nutrients, plankton biomass) along with experimental measurements of plankton productivity and excretion of DOM during the season of active upwelling. In addition, concentrations of DOC and DON will be measured on board. Sampling will be made along three of the OMEX reference sections in the Galician coast. In addition, extended CTD measurements will be taken at several stations determined jointly with the participants in the CD114 cruise, on board the R/V Charles Darwin, that will be sampling the same area for OMEX WPI at the same time. Intercalibration exercises (CTD, primary production, DON) and sample collection (nutrients, zooplankton) were arranged between participants in these cruises. The number of participants in this cruise will be 21, including scientists and technicians from partners no. 4a (Plymouth Marine Laboratory), 14a (Universidade do Algarve), 19 (Universidad de Oviedo), 20 (IEO) and 21 (Universidad de Vigo). During this cruise partner no. 9 (National Environmental Research Council, UK, Remote Sensing Data Analysis Service) will provide remote sensing information.

Plans for the 2nd. year:

During the second year of the project the first measuements at sea will be collected during cruise OMEX-0898 in August 1998. The processing and analysis of these samples will take most of the time in the following months. A joint experiment with partners 19 and 21 will be performed during October-November 1998 to determine the role of mesozooplankton in DOM excretion. The second cruise organized by the IEO will be scheduled for the spring of 1999, with the participation of other OMEX partners.

References:

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