Multicorer Sample Data

Sampling

Undisturbed sediment cores between 10 and 30 cm in length were obtained using the Multicorer (Barnett et. al. 1984). Special core tubes were developed to incorporate two sections and a portion of the lower section was accurately machined to accommodate stirring motors. This enabled effective mixing of the overlying water (100-400 ml) during flux determinations.

On average 20 cores per cruise were collected from each site. The cores were sealed immediately after collection and placed in the controlled temperature room at the in-situ temperature.

Oxygen and nutrient concentration in overlying water

As soon as the cores had been removed from the corer, the overlying water from one tube was siphoned into a Winkler bottle, fixed and analysed for dissolved oxygen. A further sample was immediately analysed on board using standard autoanalyser techniques for nitrate+nitrite, nitrite, phosphate, silicate and ammonia.

Sedimentological determinations

Surface sediment was collected for particle size analysis on the Wentworth scale by sieving and sedimentation for smaller particles. One core from each site was sectioned into 5cm depth slices and 10ml amounts from each stored frozen. The water content was calculated from the weight loss on freeze drying and the organic content calculated from the weight lost during overnight ignition at 450°C.

Oxygen uptake and sulphate reduction determinations

Approximately 100 litres of coring station sea water was collected from as near to the sea bed as possible using the CTD rosette sampler. The water was placed in a PVC tank, aerated, circulated and cooled to the in-situ temperature.

Nine cores with their tops open were carefully placed in the tank to re-equilibrate before the oxygen uptake and sulphate reduction measurements were made.

Six of these cores were used for the oxygen uptake determination. The measurements were made using the method and equipment of Parkes and Buckingham (1986). The tops of the core tubes were sealed with an electronic magnetic stirrer which allowed repeat sampling of the overlying water. Samples were analysed using automated Winkler amphoteric back-titration. The oxygen depletion from the overlying sea water was not allowed to exceed 15% of air saturation during the experiments.

The remaining three cores were used to determine sulphate reduction rates at 5 cm intervals along the core. Each section was subsampled in triplicate under nitrogen and equilibrated in anaerobic jars. Each sample was then injected with $^{35}SO_4$ and incubated at their in-situ temperature under nitrogen for 24 hours before being frozen and stored for laboratory analysis.

The samples were analysed for acid volatile sulphide (AVS) and pyrite plus elemental sulphur (PVS). Sulphate reduction rates were calculated using the method of Jorgensen (1978) as modified by Parkes and Buckingham (1986). Zero time blanks were obtained by freezing samples immediately after inoculation with the radionuclide.

Nutrient flux determinations

Water samples were collected at the start and end of the oxygen uptake experiments and analysed as soon as possible for nutrients on board using standard autoanalyser techniques. Changes in concentration were used to calculate the nutrient fluxes.

Pore water analysis

Two cores from each site were sectioned and subsamples centrifuged under nitrogen. Aliquots of pore water were analysed on board for nutrients using standard autoanalyser techniques.

References

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Jorgensen, B.B. (1978). A comparison of methods for the quantification of bacterial sulphate reduction in coastal marine sediments. 1. Measurements with radiotracer techniques. Geomicrobiology Journal 1, 11-27.

Parkes, R.J. and Buckingham (1986). The flow of organic carbon through aerobic respiration and sulphate reduction in inshore marine sediments. In 'Perspectives in Microbial Ecology': proceedings of the fourth international symposium on microbial ecology. Edited by F. Megusar and M. Gantar. Ljubljana: Slovene Society for Microbiology, 617-624.