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ACTIVITIES OF THE BIOMASS/SIBEX CRUISE OF THE UMITAKA MARU III

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The UMITAKA MARU III belonging to the Tokyo University of Fisheries participated in the BIOMASS/SIBEX Project during the period from November 22, 1983 to March 14, 1984. Scientists on board the vessel were 15 in total from 7 universities and 2 other organizations and consist of 8 biologists, 5 chemists and 2 physicists. Research activities in the Southern Ocean were carried out in the third and fourth legs. In the third leg oceanographic, biological and acoustic surveys were conducted on the meridional line of 116°E and in the area between 61°S to 65°S and 116°E to 122°E. In the fourth leg the surveys were mainly carried out on the 150°E line. A sediment trap, which had been moored by the R/V HAKUHO MARU, was recovered after a lapse of 42 days successfully. Visual observations were made on seabirds and marine mammals during the two legs. Throughout the voyage from Tokyo to Tokyo pollutants such as chlorinated hydrocarbons were measured for the surfcae sea water and air. (p. 1–7).

OCEANOGRAPHIC CONDITIONS OF THE SOUTHERN OCEAN SOUTH OF AUSTRALIA DURING THE SUMMER OF 1984

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The oceanographic observations were carried out by the T/V UMITAKA MARU in the Australasian sector of the Southern Ocean during January to February 1984. In this paper, we described about three major fronts in the Southern Ocean and the Antarctic Divergence from the XBT and CTD observations.

Four meridional sections were analyzed for positions of the Subtropical Convergence, the Subantarctic Front and the Antarctic Front on the basis of the thermal structure and of changes of the surface salinity. The Subtropical Convergence was at 40°S along 116°E and at 47°S along 150°E. The Subantarctic Front was at 49°S–50°S along 116°E and at 55°S along 150°E. The Antarctic Front was at 55°S–56°S along 116°E and at 56°S–58°S along 150°E.

In a grid survey area between 61°S and 65°S, between 116°E and 122°E, we found a high-salinity zone in the surface between 63°S and 64°S. Horizontal salinity distribution at the depths of 100 m and 200 m also showed the existence of the high-salinity water in this zone. Moreover, it was confirmed by the dynamic topography that this zone was coincident with the Antarctic Divergence Zone. (p. 9–22).

SURFACE DISTRIBUTION OF NUTRIENTS IN THE SOUTHERN OCEAN SOUTH OF AUSTRALIA

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Phosphate, silicate, nitrate and nitrite concentrations in surface waters were determined in the Australasian Southern Ocean. They were also measured continuously across the Antarctic Polar Front along 150°E with an autoanalyzer.

The values of nutrients showed stepwise distribution patterns along the north-south sections. Going to south their concentrations increased sharply around the fronts, namely the Subtropical Convergence, the Subantarctic Front and/or the Antarctic Polar Front. In the areas between the fronts the minimal changes in the concentrations were observed. Silicate concentration increased abruptly from less than 2 μM to more than 30 μM at the APF. Linear trends between phosphate and nitrate concentrations were found whose slopes were different depending on the regions divided by the SAF.

The continuous records of the nutrient distribution across the APF were obtained for the first time. The nutrients showed obvious changes in their concentrations at the front. Silicate value, in particular, jumped from 1 μM to 30 μM within a distance of 10 km.

Around 61°S in the Antarctic Polar Frontal Zone silicate concentration decreased significantly, while water temperature and salinity changed little. The decrease in silicate concentration might be attributed to biological uptake of the nutrient after ice melting. (p. 23–42).

DISTRIBUTION AND CHEMICAL COMPOSITION OF PARTICULATE ORGANIC MATTER IN THE PACIFIC SECTOR OF THE ANTARCTIC OCEAN

Eiichiro TONOUE

Particulate matter was collected from the surface through deep water layers at nine hydrographic stations along 116°E and 150°E in the Pacific sector of the Antarctic Ocean. The particulate matter was analyzed for organic carbon, total nitrogen, amino acid, carbohydrate and lipid contents.

Average particulate organic carbon concentrations ranged from 59.7 to 118 μgC/l in the surface layers with values tending to decrease with depth to a range of 16.1–54.1 μgC/l in the deep layers along both longitudes. The values obtained in the present study are lower than those reported in the most productive oceanic areas, but several times higher than those reported in low latitude areas. The values are comparable to those reported in middle latitude areas of the Pacific and Atlantic Oceans.

The percentages of amino acid-, carbohydrate- and lipid-carbon in the particulate organic carbon were determined. Sums of these three components in the surface layer were 63.8–88.3%, and the values decreased to 48.8–69.4% in the intermediate layer and 36.1–59.9% in the deep layer. The percentages of amino acid- and lipid-carbon in the particulate organic carbon increased as one moved farther south to areas where dichothermal waters were clearly observed. Significantly high percentages of amino acid-carbon in the particulate organic carbon were found for the particulate matter suspended in the water layers above the cold water layers, while high values more than 35% were obtained for the particulate lipid in the cold water layer and just below the cold water masses. It can be concluded that protein rich particulate matter is distributed above the cold water masses, while lipid rich particulate matter is localized in the cold water masses. Mechanisms by which these characteristic distributions of the chemical compositions were produced are discussed. (p. 43–57).