

ABSTRACT

The ecohydrodynamical approach of the Southern Ocean during INDIGO III cruise demonstrates that the diversity of the areas and time scale is so rich that all possibilities of ecobiochemical mechanisms may occur.

Phytoplanktonic pigments distribution, studied by HPLC, shows that the spatial structure of maximum chlorophyll a concentrations is bound up with the main frontal systems which have the characteristics of a convergence and, in the Antarctic Surface Water, with the areas of increased stability. However, biomasses are fairly low ($< 1.2 \text{ mg chl a/m}^3$).

Biochemical contents of the subsurface plankton allow us to understand the mesoscale structure and functioning of the Antarctic subsurface ecosystem. It seems that in summer, the stabilization of the upper layers of the water column due to the retreat of the constantly melting ice-edge induces a series of phytoplanktonic and zooplanktonic blooms, from the north to the south. Patchy distributions of the different trophic levels and their biochemical characteristics are observed, with, to the north, old zooplanktonic populations and to the south, young phytoplankton. The spatial scale depends on the speed of the pack-ice retreat.

An new and original study of the planktonic ecosystem, using fatty acids distribution and their physiological meaning, shows that maximum values of planktonic food chain efficiency are not found close to the Antarctic continent (where phytoplanktonic biomasses are important but turnover is low) but between the Antarctic Polar Front and the Subtropical Convergence (where each trophic level is quickly consumed by the following one with a high turnover rate).