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Variability of the microbial biomass and activity in the Ross Sea (Antarctica) and its implication on ecosystem carbon cycle

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The microbial contribution to the ocean biogeochemistry assumes a key role for the equilibrium of the ecosphere. Nevertheless, few knowledges exist on the interrelationships between climate variability and marine microbial biocenoses, although the physical component describes the habitat but the biological one describes the ecosystem evolution. Comparing the model simulations with the observations made during campaigns and research cruises becomes increasingly crucial for evaluating oceanic models' performance.

Such demand results particularly urgent in the Antarctic Ocean that rules the Earth climate, since it acts as "cold sink" and "engine" of the worldwide oceanic currents.

Here, an overview on the variability of microbial biomass and activities, obtained in the Ross Sea in spring-summer periods, is reported. Coastal and pelagic areas, marginal-ice-zones and/or pack-ice-zones as well as spring and summer periods were investigated from 1990 to 2005.

The aims of the study are: 1) to merge the data set on microbial biomass and activities obtained in the frame of several PRNA projects performed over different time and spatial scales; 2) to define whether microbial patterns can be used as index of ecosystemic trends in relations with seasonal and/or annual variability.

Bacterioplankton biomass (epifluorescent microscopy and imaging analysis), total microbial biomass (fractionated ATP), hydrolithic activities (LAP, b-GLU and AP estimates), bacterial production (^{3}H-leucine uptake) and respiratory rates (ETS activity) were studied.

The main results are:

- Marginal ice zones show higher respiratory levels than pack ice zones, reflecting the variability of standing stock and phytoplankton productivity. The metabolic ratios Primary Production to Respiration (PP/R) convey the ice free zones as productive systems (PP/R $>$1) whereas the ice covered zones appear heterotrophic systems. Extending on annual scale the above referred findings, we may assume that microbes act as sink of CO_2 in spring-summer or as source of CO_2 in autumn-winter, respectively.
- The microbial biomass shows an increasing trend over 11 years in coastal areas, whereas scarce variability occurred in pelagic areas. Sporadic peaks seem to be related with peculiar microscale conditions as algal blooms.
- A comparison between microbiological, biochemical and sedimentological data shows that the organic matter is mainly recycled within the Ross Sea continental shelf rather than exchanged with the ocean.