VARIABILITY OF MICROBIAL RESPIRATORY ACTIVITY IN RELATION TO PARTICULATE ORGANIC MATTER OVER SHORT TIME SCALES IN A GLACIAL ARCTIC FJORD (KONGSFJORDEN, SVALBARD)

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**Fig. 1**

Prokaryotic and phytoplankton interaction plays a key role in relevant processes such as carbon fluxes and nutrient regeneration (Zaccone et al., 2004). Sinking biogenic particles drive respiration in the ocean interior, help to maintain the ocean's strong vertical gradient of inorganic carbon and related processes such as carbon fluxes and nutrient regeneration (Zaccone et al., 2004). Sediment trap studies have shown that a low percentage of the surface primary production reaches the bottom. However, organic matter collected by sediment traps does not take into account the entire pool of dissolved organic matter, which includes the dissolved organic matter present in the seawater. The study of microbial respiration rates instead fills this gap, since respiration includes oxidation of both dissolved and particulate organic matter, providing an integrated estimate of the carbon utilization in the sea (Azzaro et al., 2004). In this context, a study on a Prokaryotic and phytoplanktonic biomass and of microbial remineralization rates in relation to particulate organic matter over short time scales in a coastal station (water depth ~100 m), where a mooring (Mooring Dirigibile Italia, MDI: 78° 54 .859’N; 12° 15. 411’ E) is positioned (Fig. 1).

**Fig. 4**

The experiment comprised 5 samplings performed during a 7 day period in MDI station. For each sampling, photosynthetically active radiation (PAR), temperature and conductivity (salinity) were recorded along the water column with a PNF-300 profiler and a SeaBird Electronics SBE-911 plus profiler, respectively. Water samples were taken at five different depths (surface, 5, 25, 50 and 100 m) to determine nutrients, phytoplankton and prokaryotic biomass, particulate organic carbon and community respiration (Material and Methods according to: Langone et al., 2000; Zaccone et al., 2004).

The Kongsfjorden was affected by inflow of Atlantic water as well as glacier melt water runoff (Cottier et al., 2001). Along the water column the intrusion of the salty and warm Atlantic water was visible in the study and the warm core varied in the time (Fig. 2). Such variability, as we shall see later, is also reflected in the chemical and biological properties. Moreover, due to melting of the glaciers in the surface water of the study site there were sediment loads which strongly limited light penetration and at 5 meters below the surface there was low irradiance (~0.07 \( \mu \text{E} m^{-2} s^{-1} \)) (Fig. 3).

Nitrates (NO3) and nitrates (NO2) distribution significantly changed along the vertical and with time and ranged between 2.003 and 4.18 µM, 0.001 and 0.47 µM, respectively (Fig. 4a, b). NO3 concentrations ranged between 0.4 (surface) and 1 µM (100 m) and in general the values increased from surface to bottom (Fig. 4c). NO3 and NO4 were positively correlated.

Prokaryotic abundance and cells volumes ranged between 5.6 and 15.9 x 10^6 cells m^-3 and 0.033 and 0.093 µm, respectively (Fig. 4d, e). These latter parameters, as well as prokaryotic biomass (Prok. Biom.; Fig. 4f), were positively correlated with temperature and showed a peak at 25 m depth in correspondence of inflowing Atlantic water. This evidence has not been determined in chlorophyll a (CHL; range 0.334-1.102 mg m^-2), where the highest values were determined at the surface and 5 m depth (Fig. 4d). However CHL values were also determined below the euphotic zone, probably transported by the water masses (Hegseth and Tverberg, 2013). The percentage of active CHL along the water column would reinforce this hypothesis (Fig. 4g). CHL was negatively correlated with salinity and PO4.

In general, the total carbon (ChlO) and particulate organic carbon (POC) decreased from the surface to the bottom and the values varied over time, as seen for other parameters (Fig. 4f, m). These parameters were negatively correlated with salinity and positively with CHL.

Community respiration (CDR) showed high values of remineralization and variability in time, probably related to the variability thermo-haline rather than to variability of the biological pump (Fig. 4n). In addition, the positive correlation with POC, ChlO and ChL suggested a close relationship between these variables.

**References**


Kongsfjorden, Svalbard: an overview of the physical oceanography (Hegseth and Tverberg, 2013). The percentage of active CHL along the water column would reinforce this hypothesis (Fig. 4g). CHL was negatively correlated with salinity and PO4.

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