

SPATIAL DISTRIBUTION OF ETS ACTIVITY AND ATP ALONG A TRANSECT FROM ANTARCTICA TO NEW ZEALAND

Maurizio Azzaro *, Filippo Azzaro , Giovanna Maimone and Rosabruna La Ferla
CNR-IAMC of Messina, Spianata S.Raineri 86, 98122 Messina, Italy - maurizio.azzaro@iamc.cnr.it

Abstract

Two proxies of microbial respiration (ETS) and biomass (ATP) were measured at the surface in early autumn 2001 from 51° to 74°S along 175° E across the Antarctic Polar Front (APF). An increasing of ETS activity and a concomitant decreasing of ATP was detected within the APF. This last has revealed itself a site of oxidation of organic matter and consequently a potential oceanic CO₂ source.

Keywords : Biomass, Plankton, Open Sea.

Respiration is controlled by the electron transport system (ETS), which is nearly ubiquitous in living organisms, hence the use of ETS method [1] as a proxy for microbial respiration is a valid way. The transfer of electrons along the ETS chain to oxygen generates adenosine-5'-triphosphate (ATP). Because ATP is rapidly destroyed after the death of organisms, the amount present in seawater can be used as a measure of living biomass [2]. ETS activity and ATP were studied in the superficial waters along a transect from Ross Sea to New Zealand with the aim of studying the influence of the Antarctic Polar Front (APF) on microbial biomass and respiration.

During the XVI Italian Antarctic Research expedition (BIOSESIO II project, BIOsiliceous Sedimentation in the Southern Ocean), surface seawater samples (2.5 m) were collected on board the R/V *Italica* from underway continuous pump at every latitudinal degree (from 74° to 51°) along the Antarctica-New Zealand transect in early autumn of 2001. Microbial respiratory activity (<200 μm) and biomass (Total=0.2-200 μm; Pico=0.2-2 μm; Nano=2-10 μm; Micro 10-200 μm) were determined according to the ETS and ATP methods [3].

ETS activity and ATP values registered in this study are close in the same range reported by other authors in the Southern Ocean [4, 5]. ETS activity ranged from 0.24 to 1.4 μl O₂ h⁻¹ l⁻¹. and showed a positive gradient from 74° to 51°S (Fig.1).

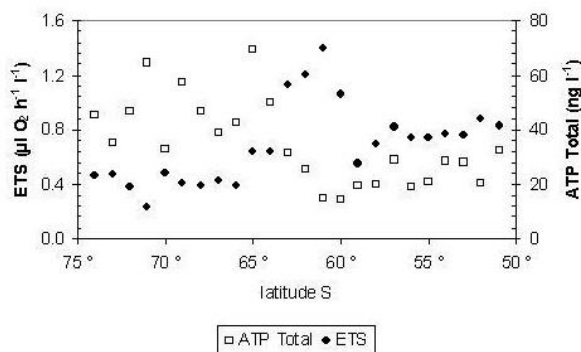


Fig. 1. ETS activity and ATP values along the sampled transect.

The highest and the lowest ETS values were determined in APF (from 63° to 60° S) and in the southern part of the transect, respectively. Intermediate activities were registered from 59° to 51°S.

ATP varied from 14.63 to 69.41 ng l⁻¹ and the highest values were found from 64° to 75°S (Fig.1). Biomass decreased in APF and from 60° increased until 49°S. In general the microplanktonic fraction dominated the transect (>55 %), with the maximum values from 64° to 66°S (>85 %).

ETS activity and ATP values were negatively correlated from 76° to 60°S and positively correlated from 61° to 51°, showing along the transect an uncouple and a couple of biomass and activity, respectively. In conclusion Antarctic polar front has revealed itself a site of oxidation of organic matter and consequently a potential oceanic CO₂ source.

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