

Analysis of photosynthetic pigments and CHEMTAX determination of phytoplankton community composition in the Southern Ocean.

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Previous studies done in the Southern Ocean (SO) have determined that high phytoplankton productivity are associated with increased fluxes of atmospheric carbon into the deep ocean (1,2). In the Marginal Ice Zone (MIZ) phytoplankton profit from higher light intensities than usual due to the seasonal ice melt that provides a stable water column and continued supply of nutrients. Thus these conditions would allow increased algal growth and primary production and also cause increased drawdown of CO₂ from the atmosphere (3). However most of the SO is characterised by High Nutrient Low Chlorophyll regions and in these regions light and mostly iron limits the phytoplankton growth. It is important to know that the CO₂ drawdown into the deep ocean not only depends on the uptake rates but also on the fate of these micro algae. Different groups have different export characteristics and thus the biogeochemical cycles for each group vary (4). Therefore, in depth knowledge is required of the phytoplankton group composition in the SO and their role in the biological pump.

The aim of this study is to investigate and understand the distribution of phytoplankton groups in the Atlantic Sector of the Southern Ocean and their methods of analysis. The objective is to validate and setup a method that is best suited for the analysis of phytoplankton pigments. This includes using UHPLC to analyse phytoplankton pigment extracts and then use CHEMTAX software analysis on the UHPLC results to provide useful data for the reconstruction of phytoplankton group composition and community structure. The initial pigment ratios used in the CHEMTAX factorisation for phytoplankton groups are from a study done in the Indian sector of the SO by Wright et al. (5). A set of HPLC pigment data from the Indian SO will be analysed as well as our own samples (6,7). The samples used are from the SANA E 54 research cruise on board the Agulhas II. The second objective is then to determine, how the results of phytoplankton group compositions in the Indian and Atlantic sector of the SO relate to incubation studies done on the SANA E 54 cruise, and the bigger carbon cycle. The SO can play an important role in the CO₂ drawdown if the dominant phytoplankton group has a large fraction of its organic matter being incorporated in the long term sediments.

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