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Response of surface phytoplankton to water mass thermal distribution in the Southern Ocean during the austral summer 2004-2005

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During the 2004-2005 Italian Antarctic Expedition, the upper ocean thermal structure was investigated through XBT (expandable bathythermograph) measurement along the section between New Zealand and the Ross Sea (Antarctica). Measures were performed every 15' latitude. The section crosses the Subantarctic Front (SAF), the Polar Front (PF) and the southern Antarctic Circumpolar Current front (sACCf). The SAF consists of two parts which have distinct thermohaline signatures: the northern part (NSAF) is associated with the temperature gradient of 4-7 °C, whilst the southern part (SSAF) is associated with the temperature gradient of 3-4 °C. The PF shows temperature lower than 2 °C and the sACCf temperature lower than 0 °C. Seawater samples were collected at the surface from the ship underway system every 15' to 30' latitude to assess nutrient distribution and phytoplankton standing stocks. Additionally, one CTD station was performed at 62°26'S, close to the PF: samples were collected at standard oceanographic depths to assess the vertical distribution of water mass properties, including nutrients and phytoplankton. The spatial evolution of surface water physical structure is coupled with the variations of nutrient concentrations. In fact the different water masses can be identified by both temperature and nutrient trends. We present here data on the main fossilizable phytoplankton groups, i.e. coccolithophorids, diatoms and silicoflagellates, whose distribution in surface water (and along one depth profile) appears to be particularly sensitive to the position of water mass fronts and nutrient distribution. Nutrients were analysed, after filtered through GF/F Whatman filters (0.7 micron), using an Autoanalyzer TRAACS 800, while coccolithoforids samples were filtered on board through cellulose acetate filters (0.45 mi-

cron) and then analysed under polarised light microscope for coccolithophorid species determination. Diatoms and silicoflagellates were finally analysed using a portion of sample resuspended from the filter and settled on glass slides. Coccolithophorids, which possess a fossilizable calcite skeleton, are an important phytoplankton group in the world ocean, in particular dominating in oligotrophic tropical to temperate regions. Athough their abundance and diversity generally decreases towards higher latitudes, one species (E. huxleyi) shows a strong positive response to the increasing nutrient availability from the Transitional to the Subantarctic Zone. South of the PF, their concentrations drop immediately, and only poorly calcified species are recorded in the assemblage. Diatoms, all over present, reveal strong variations in both total abundance and assemblage composition. Low specific diversity and temperate species dominate the sector North of the NSAF. Total diatom abundance increases southward, reaching maximum concentration and highest specific diversity between the SSPF and the PF. South of the PF their total abundance lightly decreses and strong modifications in assemblage composition are observed: most of the transitional species disappear along with a simultaneous drop in specific diversity. Similarly silicoflagellates, which also possess an opal skeleton, increase southwards along the section, although they reach lower abundances with respect to diatoms. In conclusion, the main phytoplankton groups analysed in surface waters from this sector of the Southern Ocean show a strong correlation with the distribution of water masses: sudden horizontal variations in both dominance and diversity, at group and species level, are strictly related to the position of the main oceanographic fronts.