Coccolithophore and diatom distribution across the main pelagic zonal systems of the Southern Ocean

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Time series sediment traps were deployed along a transect between Tasmania and Antarctica in order to quantify and characterize the seasonal and inter-annual variability of particle fluxes in the main oceanographic regions of the Southern Ocean: the Subantarctic Zone (SAZ), Polar Frontal Zone (PFZ), and Antarctic Zone (AZ). Additionally, the composition and temporal variability of coccolithophore and diatom sinking assemblages were studied at the three sites. Total mass fluxes were highest in the AZ, followed by the PFZ, and then the SAZ. Bulk chemical composition of the particle fluxes mirrored the composition of the distinct plankton communities in the surface layer. The latitudinal variation of the total coccolith and diatom fluxes was found to be in line with the carbonate and biogenic silica export, respectively. While the carbonate fraction was the main component of the particle fluxes in the SAZ, where coccolithophores are most abundant, the biogenic silica fraction dominated the particle export in the PFZ and AZ, where phytoplankton assemblages are dominated by diatoms. Despite the fact that total mass fluxes were significantly higher in the AZ and PFZ as compared to those of the AZ, particulate organic carbon (POC) export was similar for the annual average at the three sites (~1g m^{-2} yr^{-1}). Our results suggest that the latitudinal variations in the composition and abundance of phytoplankton communities largely influence the efficiency of the biological pump across the zonal systems of the Southern Ocean.