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SULPHUR AEROSOLS IN ANTARCTIC SEA ICE AND THEIR RELEASE DURING SEA ICE MELTING

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This study presents concentrations of dimethylsulphide (DMS) and its precursor compound dimethylsulphonio-propionate (DMSP) in a variety of sea ice habitats in the eastern Antarctic Sea Ice Zone (ASIZ)(64^{o}E to 110^{o}E) during spring and summer. Concentrations of DMS in 81 sections of sea ice ranged from <0.3 to 75 nM, with an average of 12 nM. DMSP in 60 whole sea ice cores ranged from 25 to 796 nM and showed a negative relationship with ice thickness ($y = 125\ x^{-0.8}$). The relationship of DMSP with ice thickness suggests that the release of large amounts of DMSP during sea ice melting may occur in discrete areas defined by ice thickness distribution, and may produce 'hot spots' of elevated seawater DMS concentrations of the order of 100 nM. Satellite-derived seasonal cycles of phytoplankton biomass (CHL) and aerosol optical depth (AOD) time series in the ice-free zone of the Southern Ocean (50-60^{o}S) suggests a close coupling between phytoplankton, DMS dynamics and aerosol load. However, this synchrony is absent over the eastern ASIZ (60-70^{o}S) where the AOD peak in spring often precedes the main summer CHL peak by up to six weeks. We believe this is due to large pulses of DMS emanating from melting sea ice. In eastern Antarctica duplet peaks in AOD in high melt water years, suggest that melting sea ice produces a high aerosol loading close to the Antarctic continent (Gabric et al 2005). Remotely sensed data of summertime coastal aerosols at Neumayer suggest that the direct infra red thermal radiative forcing of this aerosol is + 1.68 W m^{-2} at the surface, comparable to forcing by greenhouse gases (Rathke et al 2002).