Longitudinal distributions of DMS and pCO_2 in the surface atmosphere and seawater in the northern North Pacific during the summer cruise of MR07-04

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Longitudinal distributions of DMS concentrations and partial pressures of CO_2 (pCO_2) both in surface seawater and the atmosphere were investigated in the subarctic North Pacific along the 47N line between 160E and 120W in the summer of 2007 during the cruise of R/V Mirai MR07-04. Abrupt increases in the DMS concentrations in both surface seawater and the atmosphere were observed between 180 and 160W from 1-5 nM (160E-180) to 30 nM (180-160W) for seawater DMS and from several hundreds pptv (160E-180) to 1-3.5 ppbv (180-160W) for atmospheric DMS. Sea-air DMS flux was estimated to be highest (~100-150 μmol/m^2/day) between 180 and 170W due to the high seawater DMS concentration and high wind speed associated with low-pressure systems. These values were approximately several times higher than the climatological value in this area reported in the literature. While the pCO_2 in the surface air was approximately constant (370 μatm), the pCO_2 in seawater exhibited large variations, ranging from 320 μatm to 400 μatm. At most longitudes (except for 170E and 170W), seawater pCO_2 was lower than pCO_2 in the surface air, indicating that the ocean was a sink of atmospheric CO_2 during this time. At around 180 and 170W, pCO_2 in the surface seawater was about 400 μatm and exceeded that in surface air. As the result, the ocean was a source of CO_2 where high DMS flux to the atmosphere was estimated. The concentration of bio-Ca in the suspended particles of seawater was observed to be high at this longitude, suggesting an increase in coccolithophores which is one of high DMSP producers releases CO_2 into seawater when forming coccolith. From our discussions based on measurement data and literature, it is considered that much DMS and CO_2 were released into the seawater, for example, because of bloom event of coccolithophores.

Keywords: Dimethyl sulfide, Carbon dioxide, Coccolithophores

