3.079 Sea-to-air flux of dimethylsulfide in the South and North Pacific Ocean as measured by Proton Transfer Reaction-Mass Spectrometry coupled with the Gradient Flux technique.

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Abstract:

Exchange of dimethylsulfide (DMS) between the surface ocean and the lower atmosphere was examined by using Proton Transfer Reaction-Mass Spectrometry coupled with the Gradient Flux (PTR-MS/GF) system. We deployed the PTR-MS/GF system and observed vertical gradients of atmospheric DMS just above the sea surface in the subtropical and transitional South Pacific Ocean and the subarctic North Pacific Ocean. The DMS flux determined was in the range from 1.9 to 31 μmol m^{-2} d^{-1} and increased with wind speed and biological activity, in reasonable accordance with previous observations in the open ocean. The gas transfer velocity of DMS derived from the PTR-MS/GF measurements was similar to either that of DMS determined by the eddy covariance technique or that of insoluble gases derived from the dual tracer experiments, depending on the observation sites located in different geographic regions. When atmospheric conditions were strongly stable during the daytime in the subtropical ocean, the PTR-MS/GF observations captured a daytime vs. nighttime difference in DMS mixing ratios in the surface air overlying the ocean surface. The difference was mainly due to the sea-to-air DMS emissions and stable atmospheric conditions, thus affecting the gradient of DMS. This indicates that the DMS

gradient is strongly controlled by diurnal variations in the vertical structure of the lower atmosphere above the ocean surface.