Geophysical Research Abstracts,
Vol. 11, EGU2009-10575-1, 2009
EGU General Assembly 2009

The effect of bubbles on sea-to-air transfer of organohalogen gases

J. Woeltjen, M. Martino, and P. S. Liss

School of Environmental Science, University of East Anglia, Norwich, UK (j.woeltjen@uea.ac.uk, M.Martino@uea.ac.uk, P.Liss@uea.ac.uk)

The flux of a gas from the ocean to the atmosphere is controlled by many different factors, including wind-induced turbulence, bubble entrainment by waves, surfactants, and rain. The direct measurement of gas fluxes from the ocean to the atmosphere is only possible for very few gases. Therefore, fluxes of organohalogens are calculated using saturation anomalies and conventional flux parameterizations. These parameterizations are based on studies of gases with different physical characteristics from organohalogens and they mostly depend solely on wind speed. Their applicability to organohalogens hasn't been investigated so far.

Here we present results from experiments on the influence of bubbles on the air-sea gas transfer of volatile organoiodine and organobromine compounds. Organohalogens were added to a laboratory tank filled with artificial seawater, which was bubbled with air using a glass frit on the bottom of the tank. Concentrations of halocarbons were measured versus time for different bubble concentrations and different bubble spectra and also with an added model surfactant. Organohalogen transfer rates were calculated from the variation of concentration with time.

We see a strong increase in the flux of CH3I, CH3CHICH3, CH2ICH2CH3 and C2H5I with increasing bubble flow, whereas bubbles have only a small effect on the fluxes of CH2BrCl, CH2Br2, CH2BrI, CHBr3, CH2ClI and CH2I2,. Bubble-mediated transfer velocities of the organohalogens increase linearly with increasing bubble flow and show a strong dependency on the solubility of the gas. The addition of surfactants and a change in bubble spectrum show no significant effect.

The results are used to calculate bubble-mediated transfer velocities of organohalogens at different wind speeds, and are compared with current parameterizations for bubble-induced gas fluxes. The implications for oceanic organohalogens fluxes will be discussed.