Controls on atmospheric chloroiodomethane (CH2ClI) in marine environments

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Abstract

Mixing ratios of chloroiodomethane (CH_2ClI) in ambient air were quantified in the coastal North Atlantic region (Thompson Farm, Durham, New Hampshire, and Appledore Island, Maine) and two remote Pacific areas (Christmas Island, Kiribati, and Oahu, Hawaii). Average mixing ratios were 0.15 ± 0.18 and 0.68 ± 0.66 parts per trillion by volume (pptv) at Thompson Farm and Appledore Island, respectively, compared to 0.10 ± 0.05 pptv at Christmas Island and 0.04 ± 0.02 pptv in Hawaii. Photolysis constrained the daytime mixing ratios of CH_2ClI at all locations with the minimum occurring at 1600 local time. Daily average fluxes to the atmosphere were estimated from mixing ratios and loss due to photolysis at Appledore Island, Christmas Island and Hawaii, and were 58 ± 9, 19 ± 3, and 5.8 ± 1.0 nmol CH_2ClI m^{-2} d^{-1}, respectively. The measured sea-to-air flux from seawater equilibrator samples obtained near Appledore Island was 6.4 ± 2.9 nmol CH_2ClI m^{-2} d^{-1}. Mixing ratios of CH_2ClI at Appledore Island increased with increasing wind speed. The maximum mixing ratios observed at Thompson Farm (1.6 pptv) and Appledore Island (3.4 pptv) are the highest reported values to date, and coincided with high winds associated with the passage of Tropical Storm Bonnie. We estimate that high winds during the 2004 hurricane season increased the flux of CH_2ClI from the North Atlantic Ocean by 8 ± 2%.

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