

Bromoform and dibromomethane measurements in the seacoast region of New Hampshire, 2002–2004

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Abstract

Atmospheric measurements of bromoform (CHBr_3) and dibromomethane (CH_2Br_2) were conducted at two sites, Thompson Farm (TF) in Durham, New Hampshire (summer 2002–2004), and Appledore Island (AI), Maine (summer 2004). Elevated mixing ratios of CHBr_3 were frequently observed at both sites, with maxima of 37.9 parts per trillion by volume (pptv) and 47.4 pptv for TF and AI, respectively. Average mixing ratios of CHBr_3 and CH_2Br_2 at TF for all three summers ranged from 5.3–6.3 and 1.3–2.3 pptv, respectively. The average mixing ratios of both gases were higher at AI during 2004, consistent with AI's proximity to sources of these bromocarbons. Strong negative vertical gradients in the atmosphere corroborated local sources of these gases at the surface. At AI, CHBr_3 and CH_2Br_2 mixing ratios increased with wind speed via sea-to-air transfer from supersaturated coastal waters. Large enhancements of CHBr_3 and CH_2Br_2 were observed at both sites from 10 to 14 August 2004, coinciding with the passage of Tropical Storm Bonnie. During this period, fluxes of CHBr_3 and CH_2Br_2 were 52.4 ± 21.0 and 9.1 ± 3.1 $\text{nmol m}^{-2} \text{h}^{-1}$, respectively. The average fluxes of CHBr_3 and CH_2Br_2 during nonevent periods were 18.9 ± 12.3 and 2.6 ± 1.9 $\text{nmol m}^{-2} \text{h}^{-1}$, respectively. Additionally, CHBr_3 and CH_2Br_2 were used as marine tracers in case studies to (1) evaluate the impact of tropical storms on emissions and distributions of marine-derived gases in the coastal region and (2) characterize the transport of air masses during pollution episodes in the northeastern United States.