Oceanic Distributions and Emissions of Short-lived Halocarbons

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Recent attention has focused on short-lived halogenated gases as potentially significant contributors to stratospheric ozone depletion. Traditionally thought of as weak or non-existent participants in stratospheric ozone chemistry, these gases or their breakdown products could be delivered from the marine boundary layer to the lower stratosphere via rapid, deep convection. Their potential contribution is underscored by a substantial excess (~20-35%) of bromine in the stratosphere that cannot be accounted for by the longer-lived brominated gases

Using intercalibrated data from 7 cruises over a 10 year span, we report marine boundary layer mixing ratios, degrees of surface seawater saturation, and air-sea fluxes of several short-lived halocarbons that are potentially significant in stratospheric chemistry. $CHBr_3$, CH_2Br_2, and CH_3I were all highly supersaturated virtually. Under-saturations were noted at some locations in the Southern Ocean, owing to mixing of surface and subsurface waters, not biological or chemical sinks. Highest saturations of the two polybrominated gases were observed in coastal waters and areas of upwelling such those near the equator and along ocean fronts. CH_3I distributions reflected its different chemistry and cycling in both the water and the atmosphere. The high supersaturations, fluxes, and marine boundary layer mixing ratios in the tropics are consistent with the suggestion that tropical convection could deliver some portion of these gases and their breakdown products to the upper troposphere and lower stratosphere.

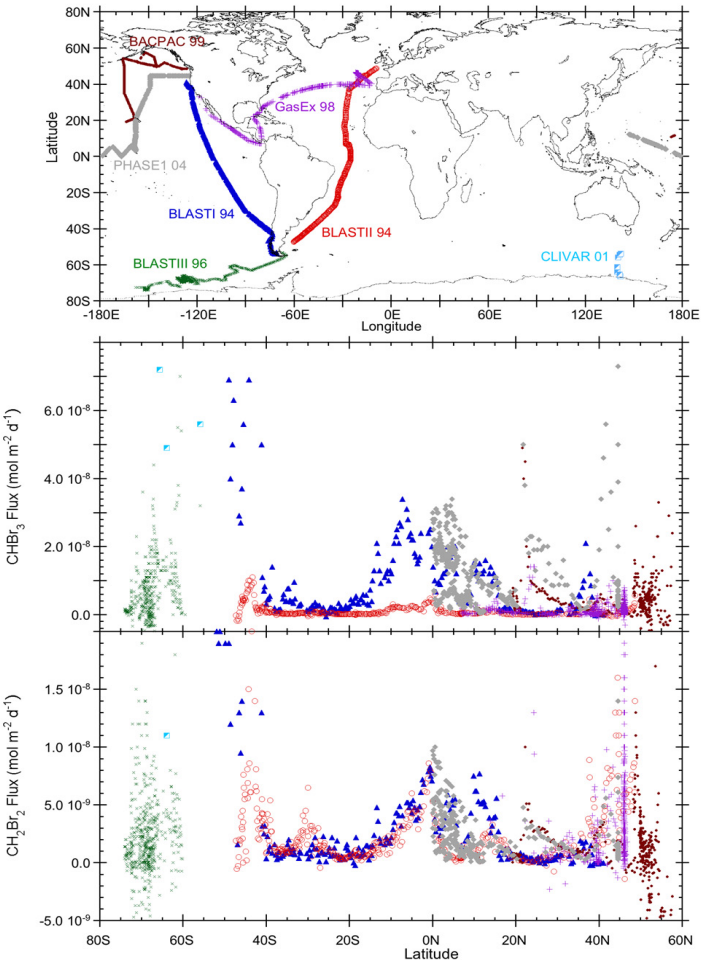

Figure 1. Plots of the oceanic fluxes of $CHBr_3$ and CH_2Br_2 into the marine boundary layer based upon data from 7 research cruises between 1994 and 2004.