Global Atmospheric Distributions of Some Short-lived Halocarbons

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A number of short lived halocarbons (CH_3I, CH_2Br_2, $CHBr_3$) are emitted to the atmosphere in large quantities, predominantly from natural processes. Because these chemicals have short lifetimes (weeks to months) they supply reactive halogen to the troposphere and influence the tropospheric chemistry of ozone and mercury, for example. In the case of CH_2Br_2 and $CHBr_3$, their lifetimes are long enough so that these chemicals can deliver to the stratosphere significant amounts of Br that influences stratospheric ozone chemistry. The magnitudes of these contributions and the mechanisms by which most Br reaches the stratosphere from these chemicals are not well understood. Some of this uncertainty stems from the difficulties associated with interpreting observations of short-lived compounds at any point in space and time in terms of broader-scale mixing ratios and atmospheric impacts. We have measured these chemicals at a global network of surface and aircraft profiling sites for multiple years (up to 14). The results provide a unique picture of global distributions, inter-annual and seasonal variability, and vertical mixing ratio gradients at continental, marine and coastal locations. When contrasted with results from the recent HIPPO campaign over the mid-Pacific Ocean basin, consistent patterns emerge over land and sea that suggest we may be able to quantify mean mixing ratios and their variability over large spatial scales for some of these chemicals, particularly in the free troposphere. Such information will provide useful constraints on the influence these chemicals have on atmospheric chemistry in both the troposphere and stratosphere.

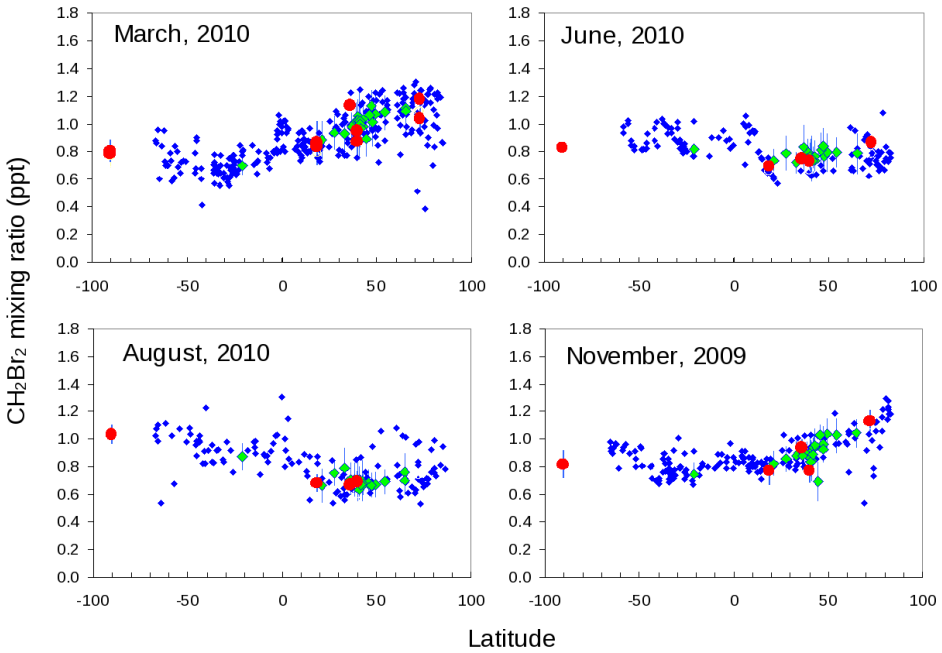

Figure 1. Monthly mean mixing ratios of CH_2Br_2 from flasks collected 1.5-8 km above sea level from surface stations across the globe (red circles) and aircraft profiles (green diamonds, predominantly over North America) during the indicated month, and from concurrent HIPPO transects (filled blue diamonds; mid-Pacific Ocean basin).