A Decline in Ozone-Depleting Organic Bromine

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Our atmospheric measurements indicate that the global tropospheric abundance of ozone-depleting bromine peaked in 1998 and has since decreased by nearly 5% (Figure 1). The decline in total organic bromine stems from a rapid drop in global tropospheric mixing ratios of methyl bromide (CH_3Br). Total bromine from halons continues to increase, but the rate of increase slowed steadily during the 1990s so that by 1999 it was smaller than the rate of decline observed for methyl bromide. The declines we note here for bromine are substantial compared with recent changes in ozone-depleting chlorine, considering that bromine is about 45 times more efficient for depleting stratospheric ozone. In 2000, chlorine was decreasing at about –22 ppt yr^{-1}; decreases in Br since 1998 have averaged –11 ppt yr^{-1} when expressed as equivalent chlorine (where equivalent chlorine = Br*45). The drop we have observed for methyl bromide, a gas with both natural and industrial sources, coincides with decreases in industrial production mandated by the Montreal Protocol, but is somewhat faster than expected. This discrepancy may suggest that the net contribution of natural processes has also declined recently, or that industrial emissions account for a larger fraction of total emissions than recent budget analyses have suggested.

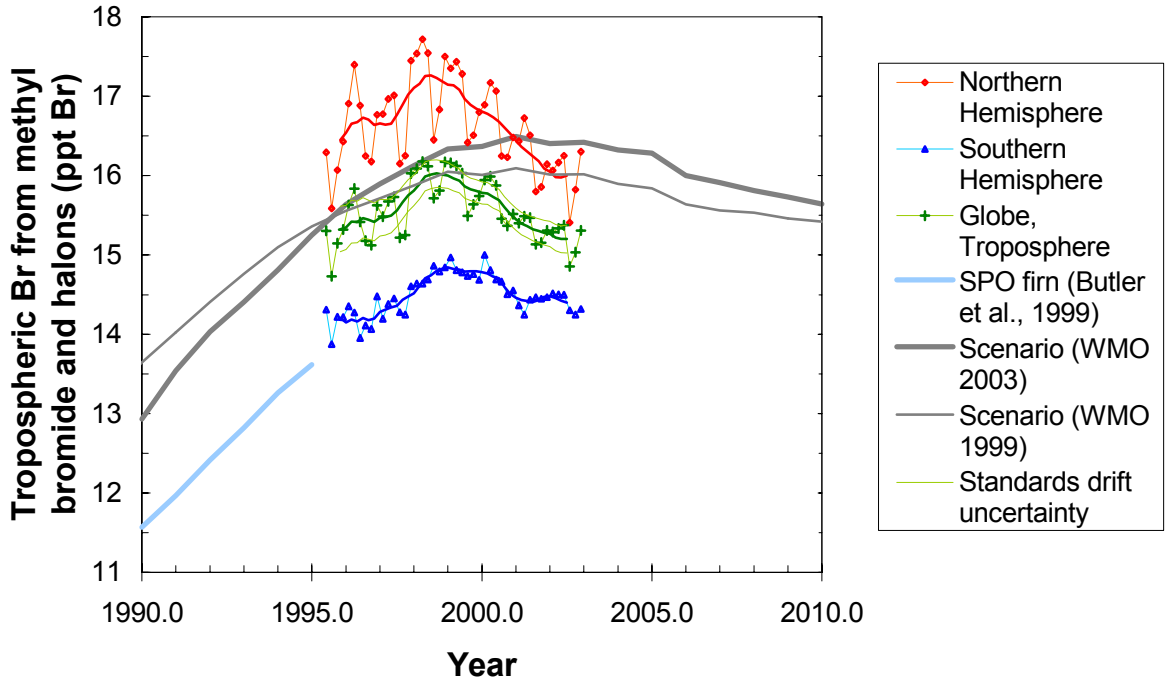

Figure 1. The measured tropospheric burden of organic bromine from halons and methyl bromide over time. Bimonthly hemispheric means (points) are inferred from regular surface measurements by CMDL at multiple sites in each hemisphere. Twelve-month running means (lines) are drawn through the bimonthly hemispheric and global means. For comparison, expectations based upon best-estimate scenarios from recent WMO *Scientific Assessment of Ozone Depletion* reports are shown. Pre-1995 trends for total bromine are shown based upon analyses of firn air collected at south pole.