Overview of 2002 Activities and Future Plans of the Halocarbons and other Atmospheric Trace Species (HATS) Group of CMDL

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Flask and In Situ Substantial Measurements: Weekly collections of flasks and in situ measurements at CMDL stations and cooperative sites have continued during 2002. Mixing ratios of CFC-12 (CCl_2F_2) appear to have peaked in 2002 and the concentration of CFC-12 in the global atmosphere appears to have peaked. The growth rate of nitrous oxide (N_2O) appears to have decreased to 0.4 parts per billion (ppb) per year from a high of about 1 ppb per year in 1999-2000. The mean global mixing ratio of methyl bromide (CH_3Br) is decreasing in the atmosphere as a result of provisions enacted in the Montreal Protocol and its subsequent amendments. Even though the major halons are still increasing in the atmosphere, total organic bromine has peaked in the atmosphere and is currently decreasing because of the decline of atmospheric CH_3Br. Methyl chloroform (CH_3CCl_3), carbon tetrachloride (CCl_4), and CFC-11 (CCl_3F) are still decreasing in the atmosphere, so total equivalent chlorine (Cl + 45*Br) is still decreasing. Atmospheric carbonyl sulfide (COS) has a very strong seasonal cycle in the northern hemisphere and appears to have decreased in global mixing ratios since its peak in the 1970s; however, its current mixing ratio is between 100 and 200 parts per trillion higher now than at the beginning of the Industrial Revolution in the early 1700s.

Standards Research: New calibration standards continued to be prepared and analyzed against older standards during 2002 for the HATS and CMDL Carbon Cycle Greenhouse Gases (CCGG) groups. The calibration scales of methyl bromide and methyl chloride (CH_3Cl) were finalized over the past year. Small drifts in the calibration scales of these methyl halides were quantified. The drift of the methyl bromide scale is smaller than the observed downward trend observed in the atmosphere. A calibration scale for COS also was finalized. New calibration standards of bromoform ($CHBr_3$), chloroform ($CHCl_3$), dichloromethane (CH_2Cl_2), trichloroethene (C_2HCl_3), and perchloroethene (C_2Cl_4) were prepared and are currently being analyzed.

Airborne Programs: A new airborne gas chromatograph was tested and operated during two NASA airborne missions in 2002 and 2003. The new instrument used in these missions, PAN (peroxyacetyl nitrate) and Trace Hydrohalocarbon Experiment (PANTHER), includes four electron capture detectors and one mass selective detector. For the first time, HATS scientists measured CH_3Br, CH_3Cl, and numerous HCFCs in the stratosphere. In addition to these missions, HATS ER-2 airborne and balloonborne gas chromatographs were flown in 2002 to continue to monitor total equivalent chlorine in the stratosphere. Our ER-2 airborne chromatograph will fly in early summer over the rain forests of Brazil.

Ocean Research: Three papers on HATS ocean research were published over the past year. These include the ocean's contribution to the atmospheric lifetime of a number of key atmospheric trace gases, the production and degradation of CH_3Br in the ocean, and estimates of the saturation anomaly of CH_3Br from satellite maps of global sea surface temperatures.

New Gas Chromatographs Program: HATS scientists are adding a new mass-selective detector to our existing gas chromatographic systems to include shorter-lived atmospheric trace gases for the flask and in situ programs.