In Situ Ground and Aircraft Observations of Carbonyl Sulfide (COS): Evidence for Uptake

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Carbonyl sulfide (COS) is an important trace gas in the atmosphere, because it is a strong infrared absorbing gas and contributes to 25-50% of the total source stratospheric sulfate aerosol layer, which also catalyzes stratospheric ozone depletion. Atmospheric levels of COS have increased about 150-200 ppt in the atmosphere since the industrial revolution of the 1750s . The increase may be related to enhanced emissions of sulfur from fossil fuels and other industrial activities. While the trace gas COS has the strongest direct positive climate forcing of all of the minor greenhouse gases (SF_6, HFCs, HCFCs, solvents, halons), it has a negative indirect climate forcing because it is a source of stratospheric sulfate aerosols that can cool the atmosphere. COS has a strong seasonal cycle because there is strong uptake by plants similar to the CO_2 uptake during photosynthesis. Our understanding of gross terrestrial primary production may be improved through the study of atmospheric COS. This talk will focus on recent ground based *in situ* observations from NOAA ESRL baseline observations and *in situ* airborne observations from the tropics and polar regions that show a pattern of uptake at the surface. For example in the Pt. Barrow, Alaska high frequency observations shown below, this pattern is seen during the period of high seasonal emissions of chloroform (green) where snow has melted and surface vegatation is exposed, which permits photosynthetic uptake and depletion of CO_2 (black) and COS (red) in air masses originating over the arctic tundra.

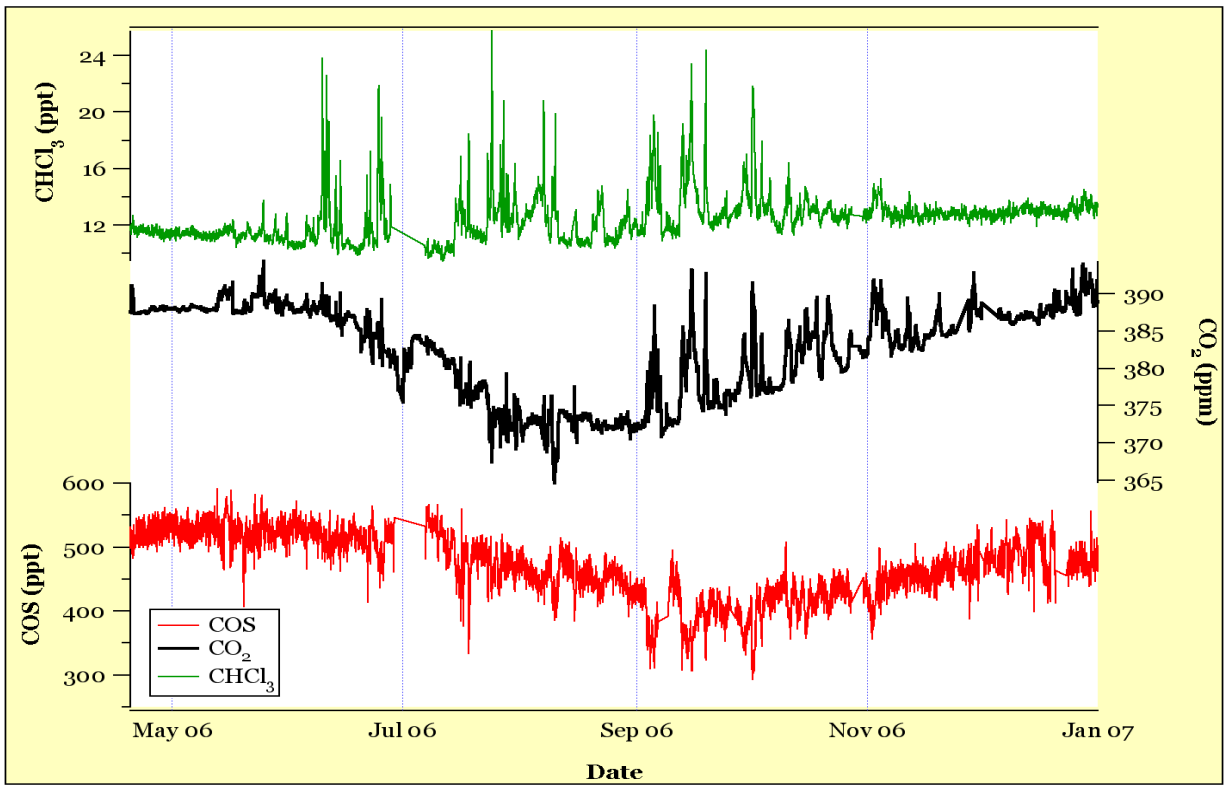

Figure 1. Concentrations of $CHCl_3$ (green), CO_2 (black), and COS (red) at Pt. Barrow, Alaska in 2006.