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Constraints from atmospheric measurements on the global budget and seasonal cycle of carbonyl sulfide

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Recent investigations into uptake of carbonyl sulfide (COS) by terrestrial vegetation [Sandoval-Soto et al. 2005; Montzka et al. 2007] indicate that the magnitude of this flux is 3-6 times larger than that estimated in the previous, globally balanced, atmospheric budget estimates of Watts [2000] and Kettle et al. [2002]. An important implication is that the global COS budget now displays a significant imbalance, characterized by an excess of sinks over sources.

Here we analyze global COS simulations from an atmospheric chemical transport model together with measurements from the NOAA-GMD flask network of Montzka et al. [2007] with a focus on reducing uncertainty in individual components of the atmospheric COS budget. Model simulations are developed using the GEOS-Chem global atmospheric chemical transport model in combination with recent best estimates of surface fluxes (updated fluxes of Kettle et al. [2002]). We investigate the discrepancies between simulated and observed concentrations of annual mean values, spatial gradients and seasonal cycles to determine the extent to which the atmospheric measurements provide constraints on reducing uncertainties in individual COS fluxes, and on closing the global budget.

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