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# Exploring the relationship between atmospheric COS and CO2 in the Northern Hemisphere

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Uptake by vegetation represents the main loss mechanism for atmospheric carbonyl sulfide (COS). COS undergoes rapid hydrolysis by carbonic anhydrase and rubisco, the same enzymes involved in the initial stages of carbon assimilation by vegetation. The influence of this uptake is readily observed in the spatial and temporal distribution of atmospheric COS in the Northern Hemisphere. COS is unique, however, because it is not emitted in large quantities from vegetation as is CO2 during respiration. This critical fact suggests that large-scale features observed for COS may be responding primarily to spatial and temporal variations in terrestrial photosynthesis. Although this hypothesis is consistent with much of the data obtained to date, the influence of non-vegetative COS fluxes remains poorly constrained. Here we investigate the observations we have made of COS and CO2 as a function of time and space to assess the consistency of these results with this hypothesis and the extent to which non-vegetative processes influence the relationship between these two trace gases in air sampled over North America. Concurrent measurements of additional trace gases may aid in gauging the magnitude of such influences. Results for HFC-134a and hydrogen, for example, may provide useful indicators of anthropogenic influence and soil activity in air samples collected over the North American continent.