



Trend evolution and seasonal variation of tropospheric and stratospheric carbonyl sulfide (OCS) above Jungfraujoch.

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Carbonyl sulfide (OCS) is the most abundant sulfur-containing trace gas in the atmosphere and accounts for a substantial portion of the sulfur in the stratospheric aerosol layer which influences the Earth's radiation budget and stratospheric ozone chemistry. The major identified OCS sources are oceans and anthropogenic emissions, while atmospheric loss and uptake by vegetation and soils constitute the main OCS sinks. The uptake by vegetation strongly influences the distribution and seasonality of OCS throughout most of the Northern Hemisphere, just like for CO₂. Montzka et al. (2007) pointed that atmospheric OCS measurements have the potential to constrain the biomass Gross Primary Production (GPP). Unfortunately, there remain large uncertainties on some components strengths of the atmospheric OCS budget. A recent work by Suntharalingam et al. (2008) showed that uptake by plants has been strongly underestimated in actual balanced budgets, suggesting that additional significant OCS sources have still to be identified.

In order to improve our understanding of the different processes governing seasonal and inter-annual OCS variability, a new approach has been developed and optimized, using the SFIT-2 algorithm, to retrieve atmospheric abundance of OCS from high-resolution ground-based infrared solar spectra. Our observations are recorded on a regular basis with Fourier Transform Infrared spectrometers (FTIRs), under clear-sky conditions, at the NDACC site (Network for the Detection of Atmospheric Composition Change, <http://www.ndacc.org>) of the International Scientific Station of the Jungfraujoch (Swiss Alps, 46.5°N, 8.0°E, 3580m asl). Information content analysis of the retrieved OCS products shows us that we are able to distinguish between tropospheric and stratospheric partial column contributions for this species. Thanks to our unique observational database, we have produced an updated OCS long-term trend from 1995 to 2010, representative for both the troposphere and stratosphere at northern mid-latitudes.

In this contribution, we will present and critically discuss the recent OCS trend evolution, in particular the end of the slow decline of its abundance observed in 2002 and the maximum reached in 2008. In addition to the OCS inter-annual variations, we will analyze the OCS seasonal cycle during the 15 last years. We will also compare our results with simulations of seasonal OCS variations issued from a 3D global atmospheric chemical transport model (CTM), in order to try to quantify the individual contribution of the various processes playing a role in the Jungfraujoch OCS variability and influencing its atmospheric abundance.

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