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Improved ACE-FTS observations of carbon tetrachloride (CCl_4)

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The Atmospheric Chemistry Experiment Fourier transform spectrometer (ACE-FTS), on board the SCISAT satellite, has been recording solar occultation spectra through the Earth's atmosphere since 2004 and continues to take measurements with only minor loss in performance. ACE-FTS time series are available for a range of chlorine 'source' gases, including CCl_3F (CFC-11), CCl_2F_2 (CFC-12), CHF_2Cl (HCFC-22), CH_3Cl and CCl_4.

Recently there has been much community interest in carbon tetrachloride (CCl_4), a substance regulated by the Montreal Protocol because it leads to the catalytic destruction of stratospheric ozone. Estimated sources and sinks of CCl_4 remain inconsistent with observations of its abundance. Satellite observations of CCl_4 in the stratosphere are particularly useful in validating stratospheric loss (photolysis) rates; in fact the atmospheric loss of CCl_4 is essentially all due to photolysis in the stratosphere. However, the latest ACE-FTS v3.5 CCl_4 retrieval is biased high by $\sim$ 20–30%.

A new ACE-FTS retrieval scheme utilising new laboratory spectroscopic measurements of CCl_4 and improved microwindow selection has recently been developed. This improves upon the v3.5 retrieval and resolves the issue of the high bias; this new scheme will form the basis for the upcoming v4 processing version of ACE-FTS data. This presentation will outline the improvements made in the retrieval, and a subset of data will be compared with modelled CCl_4 distributions from SLIMCAT, a state-of-the-art three-dimensional chemical transport model. The use of ACE-FTS data to evaluate the modelled stratospheric loss rate of CCl_4 will also be discussed. The evaluated model, which also includes a treatment of surface soil and ocean sinks, will then be used to quantify current uncertainties in the global budget of CCl_4.