Validation of ACE-FTS satellite data using ground-based FTIR measurements of CFC-11, CFC-12, and HCFC-22

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Satellite data can be an effective global monitoring tool for long-lived compounds in the atmosphere. The Atmospheric Chemistry Experiment (ACE) is a mission on-board the Canadian satellite SCISAT. The primary instrument on SCISAT is a high-resolution infrared Fourier Transform Spectrometer (ACE-FTS) which is capable of measuring a wide range of gases including key chlorofluorocarbon (CFC) and hydrochlorofluorocarbon (HCFC) species. These families of species are of interest because of their significant contribution to anthropogenic ozone depletion and to global warming.

To assess the quality of data derived from satellite measurements, validation using other data sources is critical. Ground-based Fourier transform infrared spectrometers (FTIRs) are particularly useful for this purpose. In this study, five FTIRs located at four sites around the world are used to validate the CFC-11, CFC-12, and HCFC-22 data products from ACE-FTS. These species are related; HCFC-22 was the primary replacement for CFC-11 and CFC-12 in refrigerant and propellant applications.

The five FTIR instruments used in this study record solar absorption spectra at Eureka, Canada, Jungfraujoch, Switzerland, Poker Flat, USA, and Toronto, Canada. Details on the instrumentation at each site will be provided. The retrieval of CFC-11, CFC-12, and HCFC-22 are not standard products for many of these FTIRs, and as such, the initial stage of this study is to develop the retrieval of each species. Harmonization of retrieval parameters between the sites is an important step in this process. The development of these retrievals and preliminary results will be presented. Additionally, a new method for the validation of ACE-FTS measurements will be discussed.