

## Long-term variations of CFCs and HCFCs observed with ground-based FTIR spectrometers at Rikubetsu, Syowa Station, and Tsukuba since 1995

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We have been observing atmospheric minor constituents with ground-based Fourier-Transform InfraRed spectrometer (FTIR) at Rikubetsu (43.5N, 143.8E) since 1995, at Syowa Station, Antarctica (69.0S, 39.6E) in 2007, 2011, and 2016 with Bruker IFS-120M, and at Tsukuba (36.1N, 140.1E) since 2018 with Bruker IFS-125HR. We have analyzed vertical profiles and total columns of CFC-11, CFC-12, and HCFC-22 with SFIT4 retrieval algorithm. Production and consumption of CFCs and HCFCs have been regulated under the Montreal Protocol since 1987. Substitution to HCFCs and HFCs which do not destroy ozone layer is underway. However, illegal production of CFC-11 somewhere in Asia was recently reported (Montzka et al., Nature, 2018). Monitoring of these gases are possible not only by ground-based gas-chromatogram/mass-spectroscopy technique, but also by infrared spectroscopic measurements. Ground-based FTIR measurement has a capability to monitor multiple gas species simultaneously with vertical profile information for some gases. We retrieved vertical profiles and column amounts of CFC-11, CFC-12, and HCFC-22 since 1995 from FTIR spectra. Figure 1 shows total column amounts of HCFC-22 since 1995, while Figure 2 shows partial column amounts of HCFC-22 between 0 and 8 km. Seasonal variation which are seen in Figure 1 might be due to the change of tropopause height. However, it is removed in partial column amount in Figure 2. Trajectory calculation results of CFC-11 and other gases will be presented at the meeting.

Keywords: CFC, HCFC, FTIR

Figure 1

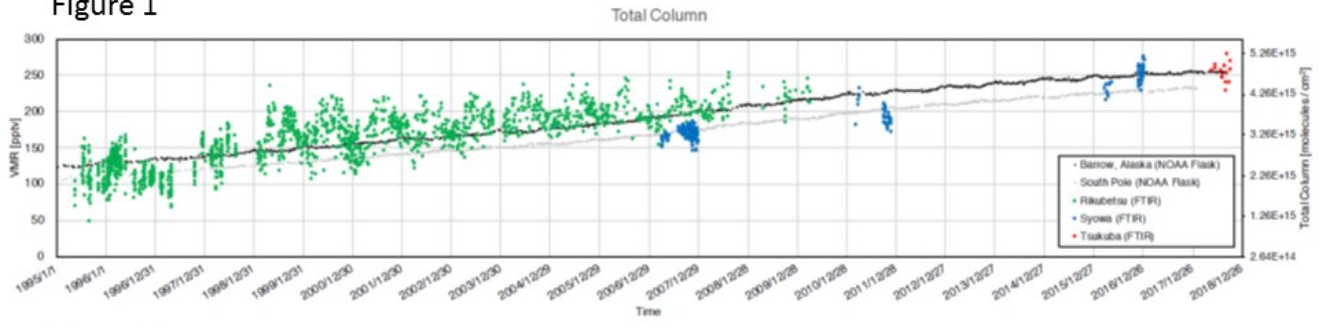


Figure 2

