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Characteristics and error estimation of stratospheric ozone and ozone-related species over Poker Flat (65° N, 147° W), Alaska observed by a ground-based FTIR spectrometer from 2001 to 2003

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Abstract. It is important to obtain the year-to-year trend of stratospheric minor species in the context of global changes. An important example is the trend in global ozone depletion. The purpose of this paper is to report the accuracy and precision of measurements of stratospheric chemical species that are made at our Poker Flat site in Alaska (65° N, 147° W). Since 1999, minor atmospheric molecules have been observed using a Fourier-Transform solar-absorption infrared Spectrometer (FTS) at Poker Flat. Vertical profiles of the abundances of ozone, HNO₃, HCl, and HF for the period from 2001 to 2003 were retrieved from FTS spectra using Rodgers' formulation of the Optimal Estimation Method (OEM). The accuracy and precision of the retrievals were estimated by formal error analysis. Errors for the total column were estimated to be 5.3%, 3.4%, 5.9%, and 5.3% for ozone, HNO₃, HCl, and HF, respectively. The ozone vertical profiles were in good agreement with profiles derived from collocated ozonesonde measurements that were smoothed with averaging kernel functions that had been obtained with the retrieval procedure used in the analysis of spectra from the ground-based FTS (gb-FTS). The O₃, HCl, and HF columns that were retrieved from the FTS measurements were consistent with Earth Probe/Total Ozone Mapping Spectrometer (TOMS) and HALOgen Occultation Experiment (HALOE) data over Alaska within the error limits of all the respective datasets. This is the first report from the Poker Flat FTS observation site on a number of stratospheric gas profiles including a comprehensive error analysis.

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