Atmospheric composition observation in an urban area using a high-resolution FTIR instrument in Nagoya, Japan

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We are currently preparing for the observation of tropospheric and stratospheric trace gases, including air pollutants in urban areas, by installing a high-resolution FTIR instrument at the Higashiyama Campus of Nagoya University. In and around urban areas with high population concentrations, air quality degradation due to increased air pollutants is a serious social problem that causes health effects on residents. The long-term variability of tropospheric ozone, nitrogen oxides, formaldehyde, and other air pollutants there must be clarified, and the preservation of air quality by controlling these pollutants is one of today's challenges as part of efforts for "sustainable development" that effectively preserves the living environment for residents while also improving their quality of life.
The solar absorption spectrum observation using a high-resolution FTIR instrument has the feature that the vertical distribution of various atmospheric minor constituents can be analyzed simultaneously and is suitable for observation for air quality conservation because it can observe stratospheric ozone, trace gases related to ion-molecule reactions, and other molecules involved in solar activity, as well as air pollutants. We plan to conduct long-term observations similar to the atmospheric composition observations we have been operating in Rikubetsu, Hokkaido. The obtained observation data will be available to researchers for studying the long-term changes in the substances responsible for these global environmental changes, together with land-based data. They are also used to validate satellite observation data from TROPOMI, GEMS, GOSAT series, etc.
Up to now, the assembly of the high-resolution FTIR instrument (Bruker IFS120HR) used at the Moshiri observatory has been completed, the operation of the instrument has been confirmed, and an instrumental line shape function has been measured. In addition, a solar tracker and meteorological instruments necessary for FTIR observation are being installed. Observations will be made at a wavenumber resolution of 0.0035 cm^{-1} in the wavelength range from 3 to 15 μm. We plan to analyze the vertical distribution and column amount of more than 20 molecules, including O_3, HCl, HF, HNO_3, $ClONO_2$, CH_4, C_2H_6, CO, N_2O, HCN, H_2O, OCS, CCl_4, HCHO, CH_3OH, C_2H_2, CFC-11, CFC-12, HCFC-22, C_5H_8, and NH_3, from the observed solar absorption spectra.
The presentation will report on the instrument's current status and future plans.

Keywords: Atmospheric minor constituents, Troposphere, Stratosphere, Air pollutants, Infrared spectroscopy

