4.159 Long-term variations of HCN in the lower stratosphere measured with ground-based FTIRs over Hokkaido, Japan.

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Abstract:

We report on long-term variations of hydrogen cyanide (HCN) in the lower stratosphere derived from solar-absorption spectra measured with ground-based high-resolution FTIRs over Rikubetsu (43.5°N, 143.8°E, 380 m a.s.l.) and Moshiri (44.4°N, 142.3°E, 200 m a.s.l.) in Hokkaido region, Japan. The stratospheric HCN are mostly transported from the troposphere where biomass burning on the surface is a major source of HCN. A major sink of the stratospheric HCN is transport to the troposphere, and therefore, stratospheric HCN is one of tracers of air-mass transport because there is no significant chemical process of source and sink (e.g. Glatthor et al., ACP, 2015). We have retrieved the vertical distribution of more than 10 trace gases in stratosphere and troposphere from the observed spectra measured in two decades as a part of the NDACC-certified measurements. The HCN climatology in the lower stratosphere over Hokkaido with the FTIRs shows a good agreement with satellite measurements such as ACE-FTS, MIPAS and AURA/MLS. In addition to the seasonal variations, significant enhancements of HCN in the lower stratosphere during 3 years from 1998 to 2001 and during 1 year from 2015 to 2016, respectively, are appeared. For the former event, the trajectory analysis and comparisons with the temporal variations of the other trace gases retrieved simultaneously from the FTIR spectra are carried out, and find that it may not be enough to be affected by transport of polluted air mass as a result of the huge biomass burning event in Indonesia, 1997, although the latter event is mainly caused by the intense springtime biomass burning in Indonesia under the condition of strong El Niño (Sheese et al. GRL, 2017). In the presentation, features of the two enhancement events as well as the climatology and the trend of HCN in the lower stratosphere are discussed.