Geophysical Research Abstracts,
Vol. 10, EGU2008-A-00000, 2008
EGU General Assembly 2008

Retrievals of C_2H_2 from high-resolution FTIR solar spectra recorded at the Jungfraujoch station (46.5ºN) and comparison with ACE-FTS observations

E. Mahieu (1), P. Duchatelet (1), P.F. Bernath (2), C.D. Boone (3), M. De Mazière (4), P. Demoulin (1), C.P. Rinsland (5), C. Servais (1) and K.A. Walker (3, 6)

(1) Institute of Astrophysics and Geophysics of the University of Liège, Liège, Belgium, (2) Department of Chemistry, University of York, Heslington, UK, (3) Department of Chemistry, University of Waterloo, Waterloo, Canada, (4) Belgian Institute for Space Aeronomy (BIRA-IASB), Brussels, Belgium, (5) NASA-Langley Research Center, Hampton, VA, USA, (6) Department of Physics, University of Toronto, Toronto, Canada (emmanuel.mahieu@ulg.ac.be)

Acetylene (C_2H_2) is among the nonmethane hydrocarbons (NMHCs) accessible to infrared remote sensing technique. As a product of combustion and biomass burning, it is emitted at the Earth's surface and further transported and mixed into the troposphere. Destruction by OH is the main removal process. The average tropospheric lifetime of C_2H_2 is estimated at about 1 month on the global scale; at mid-latitudes, it varies between 20 days in summer to 160 days in winter. This compound is appropriate to study tropospheric pollution and transport, and is often used in conjunction with other tracers of fires.

C_2H_2 presents exploitable infrared absorption features near 3 and 15 μm, where weak isolated lines of the ν_5 and the $\nu_2 + \nu_4 + \nu_5$ bands are found, respectively. Several of these lines can be used to retrieve abundances of C_2H_2 from high-resolution ground-based infrared solar spectra. Typical observations recorded at the Jungfraujoch station (46.5ºN, 8.0ºE, 3580m asl, Swiss Alps) by the NDACC (Network for the Detection of Atmospheric Composition Change)-affiliated Bruker instrument have been fitted with the OEM-SFIT-2 (v3.91) algorithm. Various approaches and combination of lines have been tested, seeking for the optimum inversion strategy. The HITRAN-2004 spectroscopic line parameters including the August 2006 updates for water vapor have been

adopted in the retrievals.

These approaches will be presented and critically compared, with the help of error budget and information content analyses, taking into account the impact of major interferences such as water vapor.

The time series of C_2H_2 tropospheric column abundances above Jungfraujoch will also be presented, including determination of its long-term trend and strong seasonal cycle. The ground-based results will further be compared with zonal mean observations performed by the ACE-FTS space-based instrument since early 2004.