Geophysical Research Abstracts
Vol. 13, EGU2011-11026, 2011
EGU General Assembly 2011

Organics in the troposphere from ACE

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The ACE-FTS instrument is able to retrieve the concentrations of many tropospheric organic molecules such as CH_4, CH_3OH, CH_2O, HCOOH, C_2H_2 and C_2H_6. We will present the near global upper tropospheric distributions of HCOOH, C_2H_2 and C_2H_6 observed from space by solar occultation with the Fourier Transform Spectrometer (FTS) on board the Canadian Atmospheric Chemistry Experiment (ACE) satellite. The high spectral resolution and high signal-to-noise ratio of the ACE-FTS allows us to retrieve these molecules even when their concentrations are at background levels. The data presented are from the new version 3.0 of the ACE retrieval software. An error budget is presented for C_2H_2 and C_2H_6 with the conclusion that the main component in the retrieval error is due to the statistical error and that the systematic errors have a small contribution to the overall error of the retrieved VMRs.
With these data we can produce near global distributions, find seasonal trends and obtain some information about the main sources. ACE's ability to retrieve concentrations of other molecules allows us to calculate tracer-tracer correlations and to make source attributions for specific occultations, and with back trajectories we can associate specific occultations with fires.
Since the ACE-FTS instrument was launched in 2003 a long time series is available, allowing us to observe trends over the period between 2004 and 2010. ACE is still working and producing important data for the community.
Finally the ACE data are compared with the predictions of Chemical Transport Models (CTMs). In particular, we compare the model output from GEOS-Chem with the data available from ACE for C_2H_2, C_2H_6 and CO. The model output is carefully sampled at the locations of the ACE data and then treated with similar statistical methods. An underestimation of the CO concentrations by the model in the Northern Hemisphere, already reported by Kopacz et al. (2010), has been found. The comparison of the model data with the satellite lead us to constrain of the C_2H_6 emission budget as well. The ACE data can be used in the future to validate other CTMs or operational chemical weather forecast models, since the ACE-FTS is the only instrument in orbit able to measure an entire suite of organics at background concentration levels.

References

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