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Analyses and comparisons of the ACE-FTS and MIPAS CFC-11, CFC-12 and HCFC-22 data

The most recent ACE-FTS version 5.3 data for CFC-11, CFC-12 and HCFC-22 are compared with the Michelson Interferometer for Passive Atmospheric Sounding (MIPAS) version 8 data for these species, processed by the IMK/IAA (Institut für Meteorologie und Klimaforschung/Instituto de Astrofísica de Andalucía) for 2005 - 2012 . Comparisons of these two datasets are carried out for the time series of zonally averaged monthly means in nine latitude bands of 20° width from 90°S to 90°N. Four types of time series are used: two from the coincident subsampled datasets of both instruments and two from the entire datasets.

Dynamical components are extracted from these time series. The mean annual cycles are derived by averaging over the data period, while the mean distributions, linear trends and quasi-biennial oscillations (QBOs) are derived from the de-seasonalized time series using multiple linear regression (MLR).

A companion analysis is applied to the MIPAS tracer-derived residual velocity data. These velocity components largely explain the mean distribution of the atmospheric species, the annual variations linked to the Brewer-Dobson Circulation, the interhemispheric asymmetry in linear trends between the Southern and Northern Hemispheric stratosphere, and the QBOs in the equatorial region.

In addition, the time series analyses of both the ACE-FTS and MIPAS data are enhanced using derived meteorological product (DMP) data, allowing comparisons between latitude/altitude and equivalent latitude/potential temperature space. Finally, 21 years of ACE-FTS data are used to derive time varying linear trends in the latitude/altitude bins, reflecting events related to compliance/non-compliance with the Montreal Protocol and its subsequent amendments.

Topic

Atmospheric composition (Earth and planets), chemistry and transport

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