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Global CFC-11 (CCl_3F) and CFC-12 (CCl_2F_2) measurements with the Michelson Interferometer for Passive Atmospheric Sounding (MIPAS): retrieval, climatologies and trends

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Vertical profiles of CFC-11 (CCl_3F) and CFC-12 (CCl_2F_2) have been measured with the Michelson Interferometer for Passive Atmospheric Sounding (MIPAS) with global coverage under daytime and nighttime conditions. Time series of altitude/latitude bins were fitted by a parametric approach including constant and linear terms, a quasi-biennial oscillation (QBO) proxy and sine and cosine terms of several periods. In the time series from 2002 to 2011, quasi-biennial and annual oscillations are clearly visible. A decrease of stratospheric CFC mixing ratios in response to the Montreal Protocol is observed for most altitudes and latitudes. However, the trends differ from the trends measured in the troposphere, even after consideration of the time lag accounting for the local age of stratospheric air. At some latitudes and altitudes, trends are even positive, and in some cases they can only be explained by decadal changes in atmospheric age of air spectra or vertical mixing patterns.