Geophysical Research Abstracts,
Vol. 11, EGU2009-10310, 2009
EGU General Assembly 2009

Interannual variabilities of O3 (since 1994) and CO (since 2002) in the UTLS as seen by the MOZAIC program.

V. Thouret (1,2), J.P. Cammas (1,2), R. Zbinden (1,2), P. Nédélec (1,2), G. Athier (1,2), D. Boulanger (1,2)

(1) Université de Toulouse, UPS, LA (Laboratoire d'Aérologie), 14 avenue Edouard Belin, 31400 Toulouse, France (thov@aero.obs-mip.fr), (2) CNRS, LA (Laboratoire d'Aérologie), 31400 Toulouse, France

The MOZAIC program (http://mozaic.aero.obs-mip.fr/web/) is performing regular measurements of ozone (O3), water vapor and temperature on 3 to 5 commercial aircraft since August 1994. Aditionnal data of nitrogen oxides and carbon monoxide (CO) are recorded since October and December 2001 respectively. Equipped commercial aircraft are flying between 9 and 12 km altitude mainly between Europe and North America and between Europe and China-Japan. Thus, 90% of the data are recorded in the upper troposphere lower stratosphere (UTLS). All the data are scaled to the tropopause altitude to present homogeneous data sets corresponding to the upper troposphere (UT) and the lower stratosphere (LS) independently. The tropopause has been defined as a 30 hPa thick layer centered on the surface PV=2 pvu. The UT is then attributed to the atmospheric layer, 60 hPa thick, lying below the tropopause and the LS the 60 hpa thick layer above the tropopause as detailed in Thouret et al., [2006]. This previous study analyzed only the O3 interannual variabilities over only 3 regions between the US and Europe (the most documented area) for the period August 1994 – December 2003. 4 more years are now available to further analyze the MOZAIC data base this way. Thus, this present analysis aims to show the long-term time series of O3 (1994-2007) and CO (2001-2007) in the UTLS for different regions (USA, North Atlantic, Europe, Siberia and Northern Eastern China-Japan) of the northern mid-latitudes.
As previously described in Thouret et al., [2006], we observe a general increase of O3 (around 1%/year) in the UTLS all over the northern mid-latitudes. The longer ozone time series presented here remain characterized by the so-called 1998 anomaly but noticeable regional differences will be highlighted. On the other hand, the CO time series (2001/12 – 2007/03) present a general decrease (around 2%/year). This may reflect the effect of the emissions reductions policies. For example, this decrease over the Mediterranean region is estimated to be around 1.7%/year. Surprisingly, this decrease is also observed on the eastern part of the northern hemisphere where Asian emissions are known to have increased dramatically. For example, the time series of CO over Siberia exhibit very high concentrations in summer 2003 (monthly mean of 180 ppb in June and July) due to intense boreal fires [Nedelec et al., 2006] but the entire MOZAIC time series shows a decrease of about 2%/year in the UT.

References:

Nédélec P., V. Thouret, J. Brioude, B. Sauvage, J.-P. Cammas, and A. Stohl, Extreme CO concentrations in the upper troposphere over North-East Asia in June 2003 from the in-situ MOZAIC aircraft data.Geophys. Res. Lett., Vol. 32, No. 14, L14807 10.1029/2005GL023141, 2005.

Thouret V., J-P. Cammas, B. Sauvage, G. Athier, R. Zbinden, P. Nédélec, P. Simon and F. Karcher, Tropopause referenced ozone climatology and inter-annual variability (1994-2003) from the MOZAIC programme, Atmos. Chem. Phys., 1033-1051, 2006.