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Long-term measurements of CO2, CH4, CO and O3 at Cape Point, South Africa

E.-G. Brunke (1), C. Labuschagne (1), and H.-E. Scheel (2)

(1) South African Weather Service, Stellenbosch 7599, South Africa, (2) Forschungszentrum Karlsruhe, IMK-IFU, 82467 Garmisch-Partenkirchen, Germany (hans-eckhart.scheel@imk.fzk.de)

Measurements of environmentally important trace gases, notably CO2, CH4, CO and O3, have been made at the coastal station Cape Point (CPT, 34 °S, 18 °E) spanning differing time periods. Observations range from 16 complete years for CO2 to 30 years in the case of CO. The latest trend and growth rate estimates for these four gases, based on data filtered with respect to background concentrations, are presented. It should be noted that the temporal variability of trend curves and growth rates is dependent on the degree of smoothing chosen for the calculations.

CO2 levels have steadily increased from 355.6 ppm at the start of the measurements in 1993 to approximately 383 ppm in 2008. Growth rates were calculated as derivatives of the trend curve obtained via 5-year smoothing. These fluctuated between 1.5 and 2.2 ppm yr-1. Linear regression performed on the growth rates indicates an increase of the fit from 1.6 ppm yr-1 in early 1993 to 2.0 ppm yr-1 at the end of 2007.

In the case of CH4, an overall decrease in growth-rates, fluctuating markedly over the years, has been noted since 1983. Methane levels have stabilized since 2003, and during 2006 the growth rate even dropped to about -1 ppb yr-1. A linear fit of the growth rates has yielded values of 13 ppb yr-1 for the beginning of 1983 and zero growth for mid-2005. However, since about October 2007 the methane levels have resumed their growth.

Over most of its 30-year measuring period, the CO time series has not displayed any signifi-cant long-term trend, whereas some interannual variability is evident. However, since 2003 an overall decline has been observed in the CO mole fractions with an abnormally low annual minimum during February 2006 as well as a lower than normal annual maximum in October 2006. Thereafter CO returned to previously observed levels again, but decreased to an unprecedented low annual maximum in 2008.

For surface ozone, a positive trend was recorded between 1990 and 2002, accompanied by an increase in seasonal peak-to-peak amplitudes. Since 2003 the increase has levelled off again.

In addition, trends of non-background CO2 and CH4 have been examined for the past 14 years. Wind sector-dependent growth rates for the two gases (based on all data) reveal increasing anthropogenic sources to the north of the station, where densely populated areas are located.