RECENT CHANGES IN TRACE GAS LEVELS AT CAPE POINT, SOUTH AFRICA

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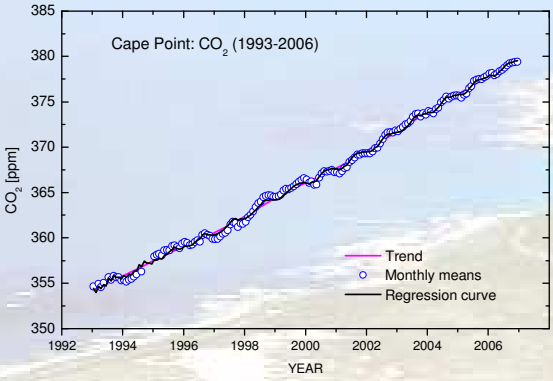
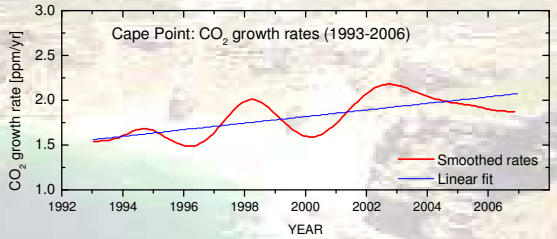
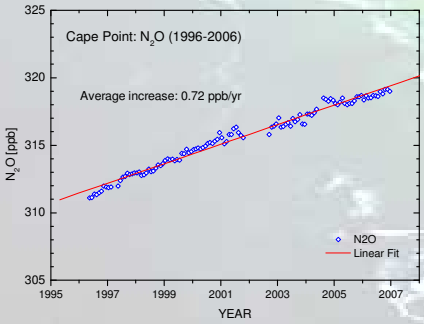
Measurements of CO_2, CH_4, N_2O, CO and O_3 have been made at Cape Point (CPT, 34 °S, 18 °E) spanning differing time periods, ranging from 14 complete years for CO_2 to 28 years in the case of CO. With respect to N_2O, the first seven years (1989 – 1995) have been excluded from current analyses because of lower data quality.

The poster presents the latest trend and growth rate estimates, based on data filtered with respect to background concentrations. Note that the temporal variability of trend curves and growth rates is dependent on the degree of smoothing chosen for the calculations.

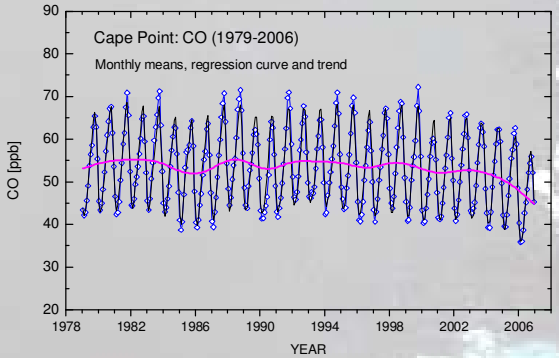




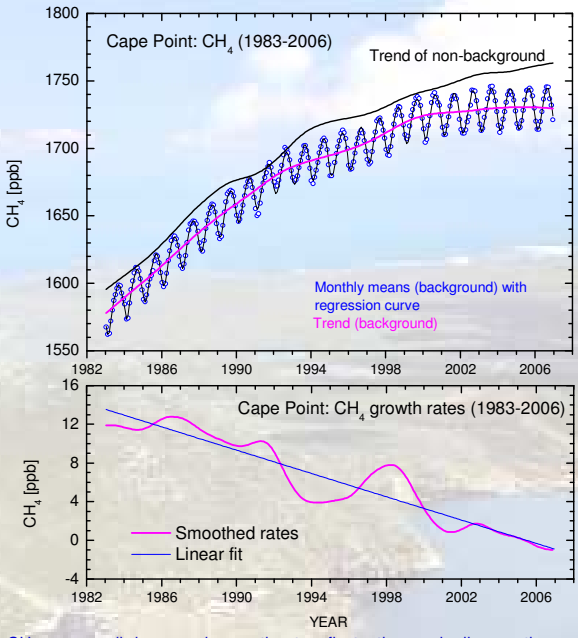
The CO_2 growth rates, calculated as derivatives of the trend curve, have fluctuated between 1.5 and 2.2 ppm yr^{-1} (as obtained with 5-year smoothing). Linear regression performed on the growth rates indicates an increase of the fit from 1.6 ppm yr^{-1} in early 1993 to 2.1 ppm yr^{-1} at the end of 2006.



For N_2O a nearly linear growth of 0.7 ppb yr^{-1} has been determined from the observations between 1996 and 2006.



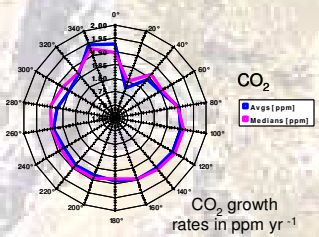
The CO time series does not display a significant long-term trend, whereas inter-annual variability is evident. However, since 2003 an overall decline of the CO mole fractions has been observed. This culminated in an abnormally low annual minimum during February 2006 and a lower than usual annual maximum in October 2006.

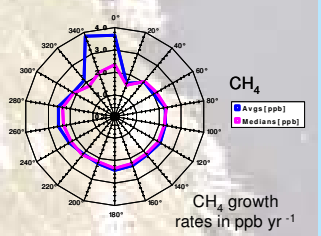


For CH_4, an overall decrease in growth-rates, fluctuating markedly over the years, has been observed since 1983. Methane levels have stabilized since 2003, and during 2006 the CH_4 growth rate even dropped to about -1 ppb yr^{-1}. A linear fit of the growth rates yields values of 13 ppb yr^{-1} for the beginning of 1983 and zero growth for mid-2005.

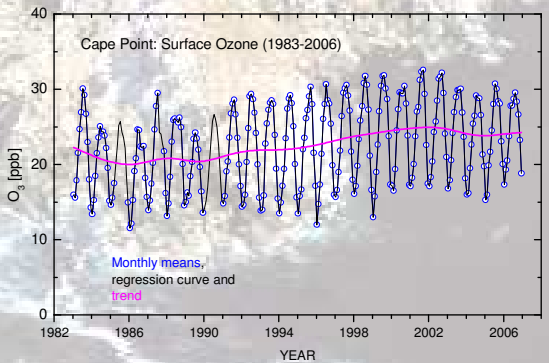
From 1982 till the mid-1990s the non-background CH_4 trend has closely matched that of the background data. However, thereafter non-background levels have continued their upward trend till present. This is probably related to growing local sources to the north of the station. See plots below.

Location of the station at the southern tip of the Cape Point nature reserve. Trends of CO_2 and CH_4 have been determined as a function of wind direction for the period 1999 – 2005.





Wind sector-dependent growth rates reveal an enhanced long-term increase of CO_2 and CH_4 for the northerly sector. For CO_2, the ppm-per-year increase was 3.2 % higher than for background conditions (1.94 vs. 1.88 ppm yr^{-1}). Similar calculations for CH_4 yielded a 55 % higher rate relative to background (3.74 vs. 2.41 ppb y^{-1}). Due to the underlying CH_4 concentration distribution, the medians yielded a smaller difference between the rates. The increased trends reflect the recent expansion of the greater Cape Town area.



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.

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