Geophysical Research Abstracts, Vol. 8, 01423, 2006
SRef-ID: 1607-7962/gra/EGU06-A-01423

Atmospheric CO2 Growth-Rate Anomalies in 2002-03

C. Jones (1), P. Cox (2)

(1) Hadley Centre, Met Office, Exeter, UK (chris.d.jones@metoffice.gov.uk) (2) Centre for Ecology and Hydrology, Dorset, UK.

It has been hypothesised that the 2003 drought and heatwave in Europe perturbed the terrestrial biosphere sufficiently for it to become a significant carbon source during that period. Here, we examine the growth-rate of atmospheric CO2 in 2002 and 2003 which show consecutive increases of greater than 2 ppmv/yr for the first time on the Mauna Loa record to determine the extent to which the recent rises are anomalous.

Increasing anthropogenic emissions explain the long-term upwards trend in CO2 growth rate, but they cannot explain these recent growth-rate anomalies. Interannual variability in growth rate is thought to be dominated by the response to natural climate variability. In particular there is a strong correlation with ENSO, punctuated by ocassional dips in growth rate due to atmospheric cooling following large volcanic eruptions. 2002 and 2003 did not show the strong El Nino signals normally associated with anomalously large rates of CO2 increase. Hence the recent rises are anomalous in terms of their mechanisms rather than magnitude.

It is likely that suppressed land-carbon uptake due to the hot, dry European summer in 2003 contirbuted to the global CO2 growth-rate anomaly. In-situ measurements of CO2 and the principal gases linked to biomass burning (such as carbon monoxide and methane) at the Mace Head Observatory, Ireland, reveal a strong correlation in 2002-03. Thus, it seems likely that increased forest fires in the northern hemisphere may also have contributed significantly to the 2003 CO2 rise.

Although impossible to attribute a single event such as this to climate change, a long-term increase in the airborne fraction of emissions is expected as the strength of the terrestrial carbon sink weakens in response to warming. Given claims that the probability of occurrence of the 2003 heatwave was increased by human influence on climate, we may be seeing the first signs of a positive climate-carbon cycle feedback.