

CFCs and global warming:

The latest misrepresentation of climate science

One has to admire the persistence of those who try to disprove the effects on the Earth's atmosphere of more than 560 billion tons of carbon emitted since 1750. The latest "news", spread over the media and blogs, regards the effects of chlorofluorocarbons (CFC) (or halocarbons) on the atmosphere.

A recent article by the Qing-Bin Lu (Department of Physics and Astronomy and Departments of Biology and Chemistry, University of Waterloo, Ontario) titled "Cosmic-ray driven reaction and greenhouse effect of halogenated molecules: culprits for atmospheric ozone depletion and global climate change (<http://arxiv.org/ftp/arxiv/papers/1210/1210.6844.pdf>), is reported in a news release by the University of Waterloo as follows:

"Global warming caused by CFCs, not carbon dioxide, study says"

<http://uwaterloo.ca/news/news/global-warming-caused-cfcs-not-carbon-dioxide-study-says>

The article reads:

"Most conventional theories expect that global temperatures will continue to increase as CO₂ levels continue to rise, as they have done since 1850. What's striking is that since 2002, global temperatures have actually declined – matching a decline in CFCs in the atmosphere," Professor Lu said. "My calculations of CFC greenhouse effect show that there was global warming by about 0.6°C from 1950 to 2002, but the earth has actually cooled since 2002. The cooling trend is set to continue for the next 50-70 years as the amount of CFCs in the atmosphere continues to decline."

The premise is false:

1. The atmospheric energy rise and thereby warming effect of CFCs since 1750 has been ~ 0.34 Watt/m² (IPCC AR4 2007) (**Figure 1**). Compare with the effects of other greenhouse gases: CO₂ - ~1.66 Watt/m², methane ~0.48 Watt/m², N₂O ~0.16 Watt/m². Thus the effects of CFCs has been about **15 percent** of the total effect of greenhouse gases, excepting the local and transient warming effects of water vapor, whose concentration depends on atmospheric temperature. Despite the stabilization

of CFCs since 1990 troposphere temperatures continued to grow, by approximately ~0.3 degrees C (<http://berkeleyearth.org/results-summary/>)

2. It is not true that “The Earth has actually cooled since 2002”. Look at **Figure 2B** showing the ongoing rise in ocean water temperatures at 0 to 700 meter depth since 2002. Ocean water to a depth of 0 to 100 meters depth remained stable or slightly declined (**Figure 2A**). This is a result of increasing sulphur aerosol emissions (mainly from China) since about 2002 (see **Figure 3**) which constitutes an (unintended) geo-engineering effect. 2005 and 2010 constituted the warmest peaks since 1998 (<http://berkeleyearth.org/results-summary/>)
3. Since about 1990 CFC-11 started to decline and since about 1998 CFC-12 leveled, yet temperatures continued to rise (<http://berkeleyearth.org/results-summary/>) as a consequence of accelerated rise of CO₂ (at an unprecedented record rate of 2.98 ppm/year between March 2012 and March 2013) and continuing growth in methane and N₂O (<http://www.esrl.noaa.gov/gmd/aggi/>) (see **Figure 4**).
4. There has been no significant change in the levels of cosmic ray count and sunspots (**Figure 5**).

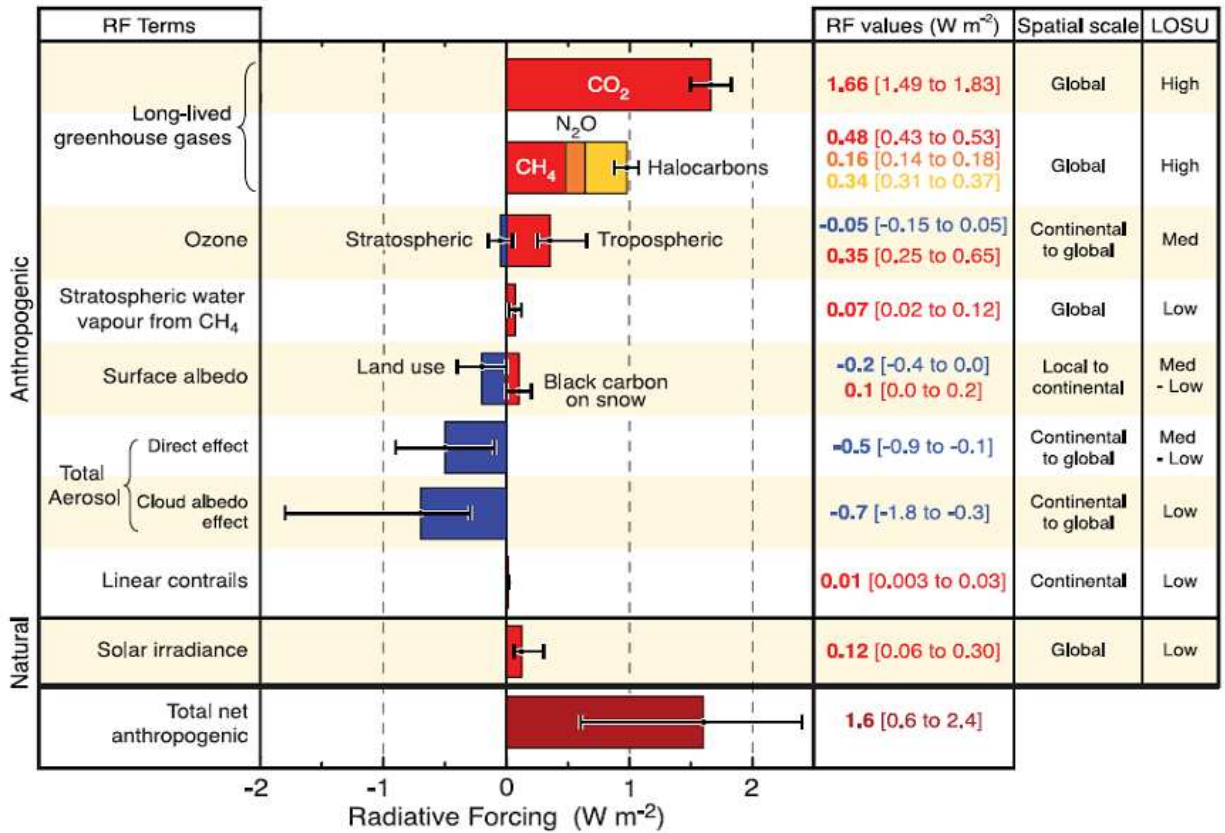
Had global industry relied on production of CFCs on a scale nearly as high as that of carbon-based industry, it is unlikely holding CFC as the culprit for global warming would have received much enthusiastic support.

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5 June, 2013

GLOBAL MEAN RADIATIVE FORCINGS



©IPCC 2007: WG1-AR4

Figure 1.

Global radiative forcing since 1750

http://www.ipcc.ch/publications_and_data/ar4/wg1/en/tssts-2-5.html

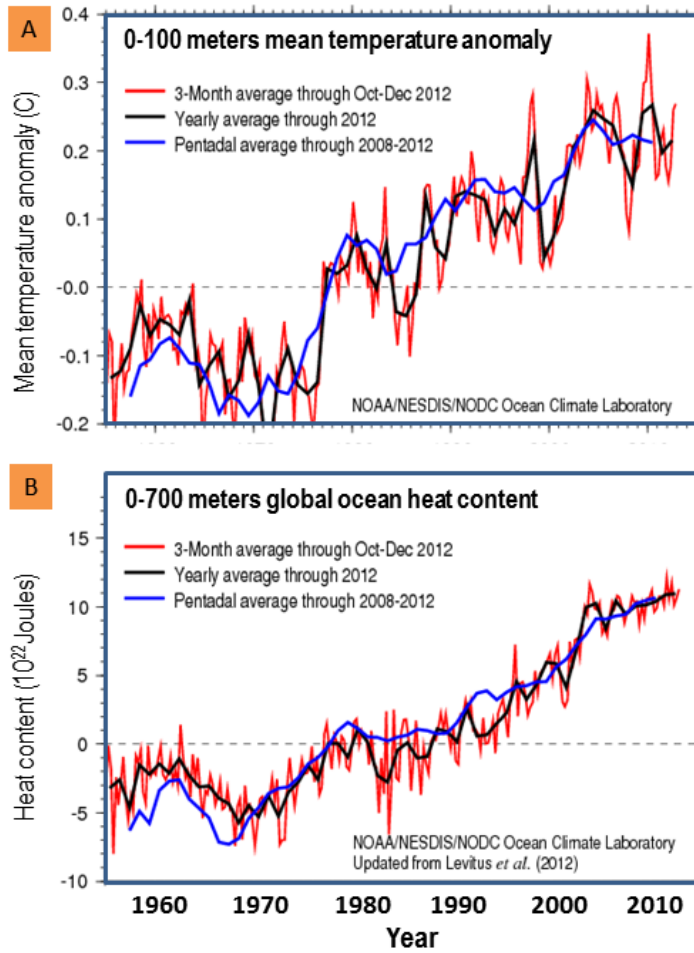


Figure 2

Ocean heat contents: (A) 0 – 100 meters depth mean temperature anomaly; (B) 0 – 700 meters depth global ocean heat content.

http://www.nodc.noaa.gov/OC5/3M_HEAT_CONTENT/

http://www.nodc.noaa.gov/OC5/3M_HEAT_CONTENT/index3.html

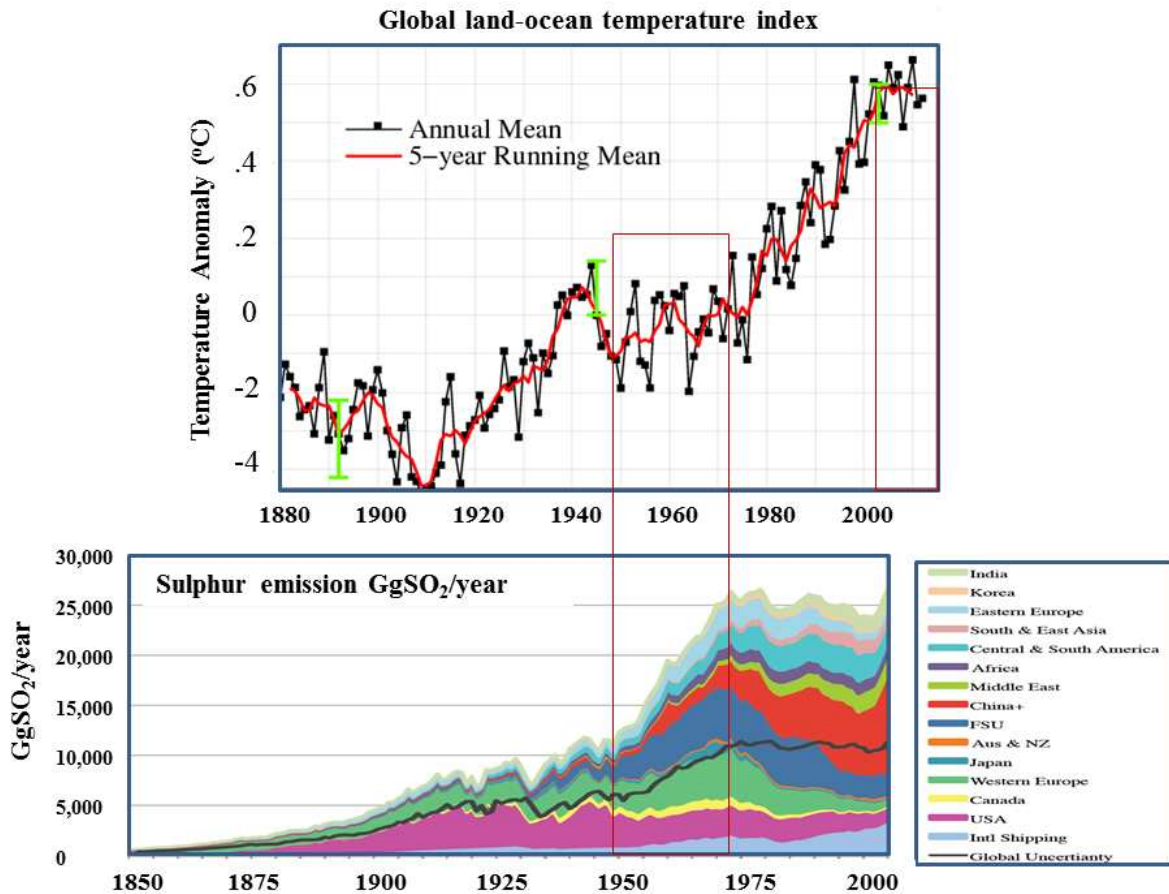


Figure 3

Effects of sulphur emissions on global temperatures. (A) Annual mean and 5-years running mean temperatures 1800 – 2010 (NASA GISS/Temperature. http://data.giss.nasa.gov/gistemp/graphs_v3/ ; (B) Global SO₂ emissions 1850 – 2005 (Smith et al., 2010, figure 4, Atmos. Chem. Phys., 11:1101–1116). Note the overlap between increased emission of SO₂ and the slow-down in warming during ~1950 – 1975 and from about ~2001.

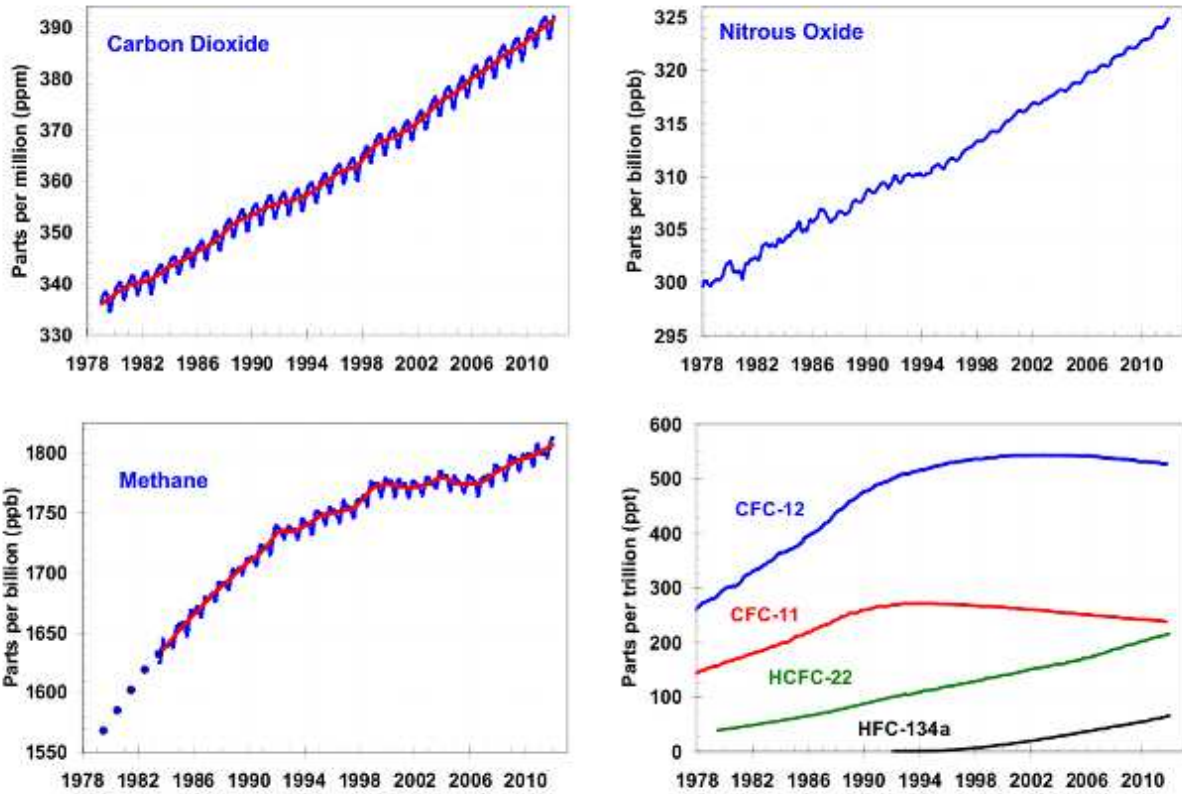


Figure 4.

Global trends of the mixing ratios of the well-mixed greenhouse gases versus time from NOAA observations. <http://www.esrl.noaa.gov/gmd/aggi/>

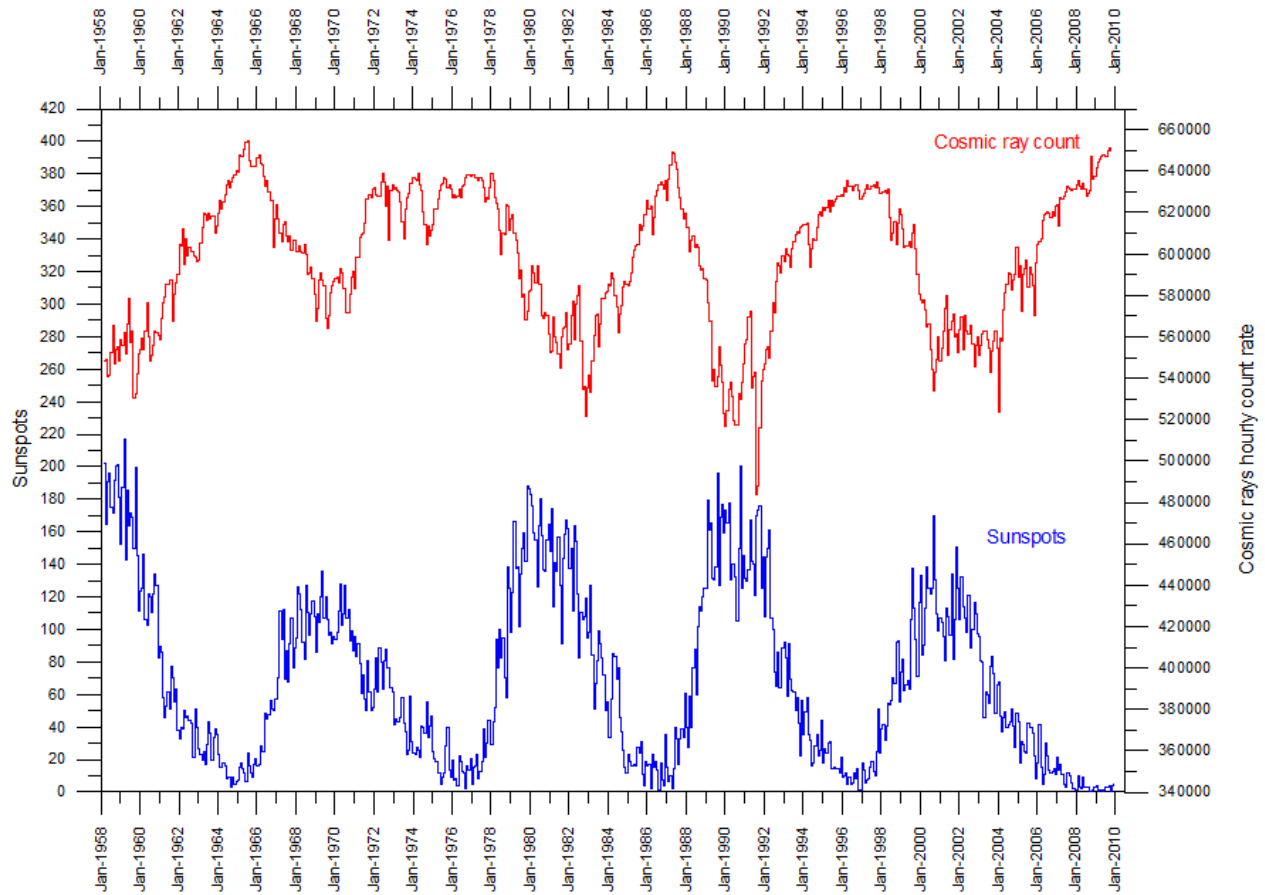


Figure 5

Variation of cosmic ray intensity and monthly sunspot activity since 1958 according to the Germany Cosmic Ray Monitor in Kiel (GCRM) and NOAA's National Geophysical Data Center (NGDC), respectively. High sunspot activity correlates with low cosmic ray intensity, and vice versa. Last month incorporated: August 2009 (GCRM) and October 2009 (NGDC). Last diagram update: 6 November 2009.