

« [Quing-Bin LU: Global warming since 1970 is caused by CFC's](#)
[The SALBY Hamburg conference: is CO2 the integral of temperature?](#) »

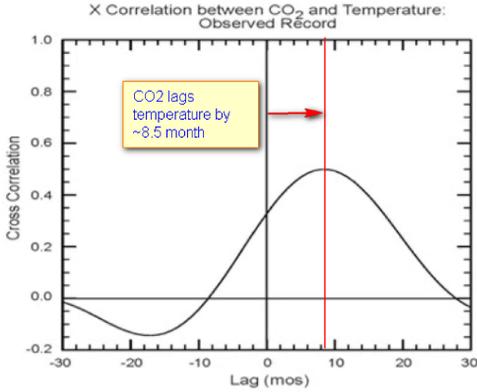
The SALBY Hamburg conference: phase lag between CO2 and temperature

Prof. Murray SALBY presented his conference "Relationship between Greenhouse Gases and Global Temperature" the 18 April 2013 at the University of Hamburg (see Youtube version [here](#) and MP4 version [here](#)). His presentation was similar, but not identical to that I discussed in a [previous post](#). It was quite technical in several parts (the video shows a very silent public, but this could simply show that German academics are well-mannered), but not overwhelming for someone who is familiar with the usual tools used in signal or time series processing. Nevertheless, it is good idea to go several times through this great presentation (the Quicktime player is hard to make precise stops at a certain slide), and to make some notes on several aspects.

1. The lag between observed CO2 and temperature changes.

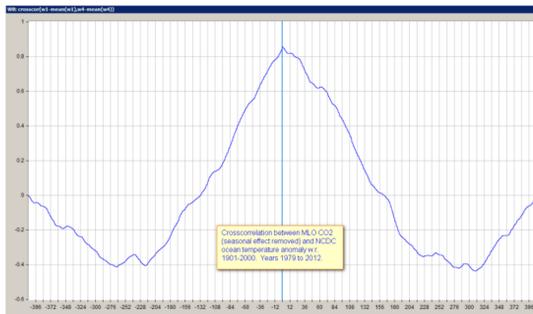
In this first comment, I will compare some findings concerning the time lag between the observed measurements between CO2 and some of the global temperatures. I made several calculations myself, using the exceptional [DADISP](#) software (which remains my favorite tool since many, many years).

Here is what Prof. Salby shows concerning the cross-correlation between CO2 and global temperature (colored elements added by me): CO2 levels lag temperature by about 8.5 months (temperature rises first, CO2 follows).

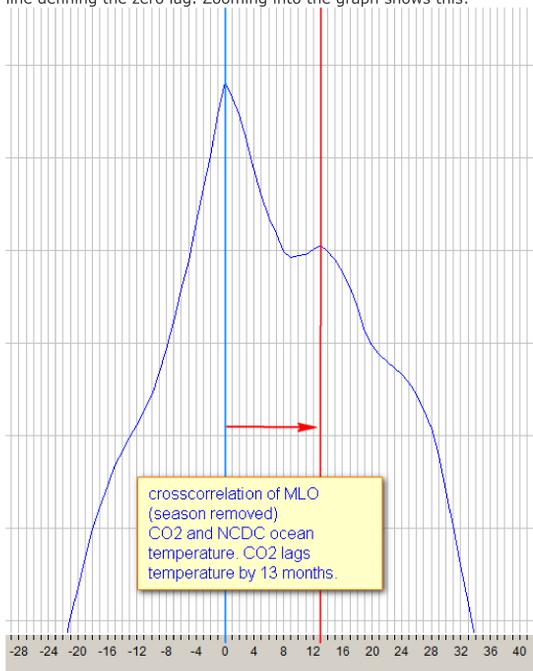


I made the same calculations using various monthly CO2 and temperature data for the 1979 to 2012 period: the seasonal detrended [Mauna Loa CO2 data](#), the NCDC series of various monthly global temperature anomalies ([ocean](#), [land and ocean](#), [land](#)) and the [RSS satellite data](#) of lower troposphere temperature anomalies.

The next figure shows the cross-correlation between CO2 and the NCDC ocean temperature (SST anomaly):



One clearly sees a small uptick on the right side of the vertical blue line defining the zero lag. Zooming into the graph shows this:



The lag between SST and CO2 is 13 months: temperature first rises, and 13 month after its (statistical) maximum, CO2 reaches its next peak value.

Prof. Ole Humlum (from the [climate4you](#) blog) and co-authors published in "Global and Planetary Change 100 (2013) 51–69" a paper "The phase relation between atmospheric carbon dioxide and global temperature" (pay-walled, see abstract [here](#)). Using a different calculation method, they too find CO2 levels lagging temperature.

The following table summarizes the different findings:

author	temperature series	period	lag of CO2 w.r. to temperature (months)
Salby	unknown	~1959 to 2011	8.5
Humlum	SST	1980 to 2011	11 to 12
	ocean and land	1980 to 2011	9.5 to 10
	RSS lower troposphere	1980 to 2011	9.5 to 10
Massen	NCDC SST	1979 to 2012	13
	NCDC land	1979 to 2012	12
	NCDC ocean and land	1979 to 2012	12
	RSS lower troposphere	1979 to 2012	12 (15)

The RSS cross-correlation in the last row has a first miniscule peak at 12 months lag, and a next one at 15 months.

Normalizing the correlations (using the XCORR function of DADISP) gives the following cross-correlation maxima for the NDC and RSS series: NCDC land: 0.64, **NCDC ocean: 0.77**, NCDC land + ocean: 0.77, RSS lower troposphere: 0.59

These numbers (to be compared to the Salby 0.5 maximum) show that one should use either SST alone, or the global land plus ocean series. The satellite derived lower troposphere anomalies seem to be less influential in documenting the CO2 changes.

All these lags are of the same sign, i.e. all point to an observed temperature rise preceding the CO2 rise. This would invalidate the essential IPCC "consensus" that atmospheric CO2 levels are the primary drivers of global temperature change. The lags found above are a hint that temperature change is the (or at least one of others) cause, and CO2 change the effect, and not the other way around.

2. First conclusion

The Salby, Humlum and my own calculations all show that global temperature change is not driven by atmospheric CO2 mixing ratio, but that statistically speaking, it is the inverse: if temperature rises, CO2 follows. This lag has been found for instance in the Vostok ice core series, albeit with much longer delays (about 800 years). Our short term observations simply document the well known physical effect that a warmer ocean will absorb less CO2 than a colder one. Hardly surprising!

What can not be deduced from these correlations is that the CO2 increase in the atmosphere has a predominant natural origin. More on this in a next comment.

PS: The Humlum paper has not been well received by different researchers. M. Richardson has a comment in print (pay-walled, see abstract [here](#)) that seems to show that Humlum's method violates conservation of mass. A second critique is that it can not be shown that the natural contribution to atmospheric CO2 levels is distinguishable from zero. More on this in a next comment.

Share this:



Loading...

Related

- [The SALBY Hamburg conference: is CO2 the integral of temperature?](#)
June 25, 2013
 - [The part of natural CO2 emissions: dynamite](#)
April 29, 2012
 - [Climate trends at Diekirch, Luxembourg: part 2c \(atmospheric CO...\)](#)
March 9, 2016
- Liked by 1 person

This entry was posted on June 16, 2013 at 12:59 and is filed under Uncategorized. You can follow any responses to this entry through the [RSS 2.0](#) feed. You can [leave a response](#), or [trackback](#) from your own site.

2 Responses to "The SALBY Hamburg conference: phase lag between CO2 and temperature"

Dixie Howe Says:
 August 5, 2017 at 20:07 | [Reply](#)

Good info. I just discovered your website and had to let you know that I have actually enjoyed looking through the blog. I have become a subscriber to your blog feed and I hope you will post again soon. I am curious if I should really subscribe to comments RSS feed as well. Any helpful discussions taking place in posts comments?

4TimesAYear Says:
 April 30, 2018 at 03:50 | [Reply](#)

Reblogged this on [4TimesAYear's Blog](#).

Leave a comment