NZCLIMATE TRUTH NO 194
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THE CARBON 13 RATIO

Carbon consists mainly of two stable isotopes. About 99% is C12. About 1% is C13. There are two sorts of plant: C3 plants, and C4 plants. C3 plants (trees and crops), are 85% of the total. In their metabolism they discriminate against the C13 isotope, so the carbon in them is depleted in C13.

The carbon dioxide in the atmosphere has a higher proportion of C13 than that derived from plants (including fossil fuels) because it largely results from exchanges with the ocean over many millions of years. It is therefore possible to get a rough estimate of the proportion that has come from C3 plants by comparing the C13/C12 ratio with that found in old geological sediments. It is also possible to tell whether any changes in carbon dioxide have come from C3 plants by measuring changes in the C13/C12 ratio.

As I keep pointing out, current published measurements of carbon dioxide concentrations in the atmosphere are carried out under extremely restrictive conditions over the ocean, with the object of concealing the different figures which can be shown over land surfaces, which have been measured since about 1850, and have recently been documented by Beck, at

Beck, E-G, 2007. 150 Years of Atmospheric Gas Analysis by Chemical Methods, Energy and Environment 18 259-281.

The IPCC have consistently suppressed this material and it is not included in their historical summaries.

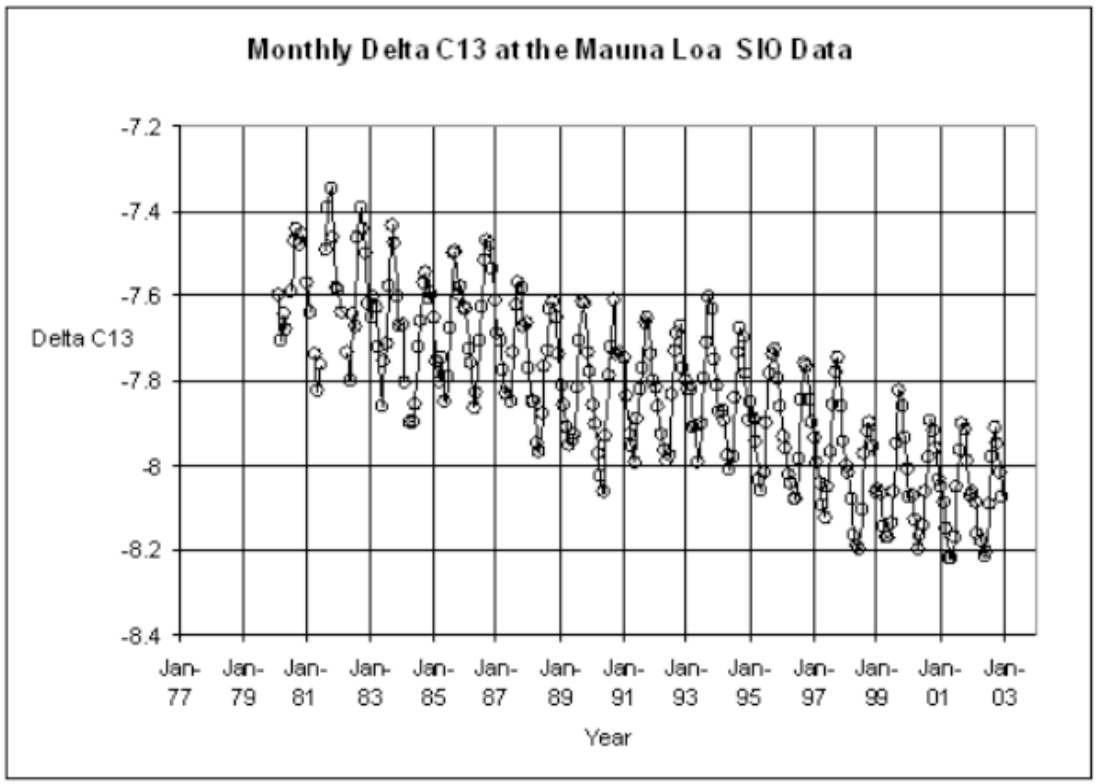
It is claimed that the published measurements represent a "background", and all measurements over land are "noise" (i.e. unwelcome data).

All the same, these measurements have shown an approximately linear increase in atmospheric carbon dioxide since 1978; see
http://tinyurl.com/5cdye2

Although the increase is only about 55% of the increase in carbon dioxide emissions from combustion of fossil fuels it is difficult to understand where else it could possibly come from.

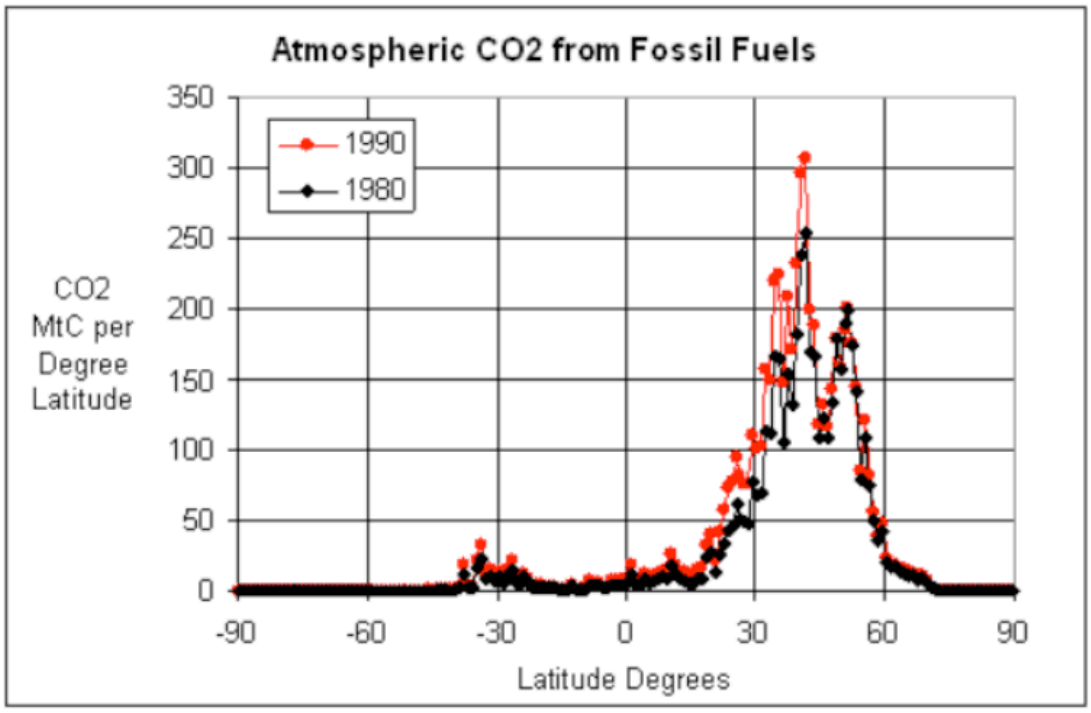
There is additional evidence that fossil fuel emissions are involved as a result of measuring the C13/C12 ratio. It is found that this ratio has fallen. This indicates that the atmosphere must be receiving additional amounts of carbon dioxide derived from plant material, for which the emissions must be the favoured source.

A typical record of measurements of the C13/C12 ratio from the measurement site at Mauna Loa, Hawaii is attached. It does indeed show a fall in C13 ratio over the period when atmospheric carbon dioxide has increased.



It has been pointed out to me recently by Tom Quirk that the fall is not steady. It actually falls in jumps, followed by periods when the ratio is constant.

Quirk gave an explanation for why this happens. He showed that the fossil fuel emissions take place predominantly over only a small region of the earth , between 30 and 60 degrees of latitude (see attachment). It can also be noted that the sudden jump downwards takes place at the same time as an El Niño event, when mixing of the atmosphere is enhanced. In the diagram this was in 1983, 1987, 1994 1nd 1998. These years were also ones where the rate of increase of the measured carbon dioxide also increased.



What is happening is this: Carbon dioxide concentrations are higher above the emitting region, but it takes time for the recent emissions to reach the ocean. At first, they displace what has already been assimilated over the land surfaces, so what gets to the ocean has an unchanged C13 ratio. It is only when there is more efficient mixing from an El Niño event that the new emissions suddenly get to the ocean and cause a sudden drop in C13 ratio. At the same time, the rate of change in CO2 goes up because of the better mixing.

The conclusions of this finding are as follows.

* They confirm that the measured increases in carbon dioxide concentration are the result of emissions from fossil fuel combustion.

* That the concentrations over land surfaces, and particularly close to the emitting regions, are higher than those recorded over the ocean. This confirms the sort of figures that were documented by Beck.

* Carbon dioxide in the atmosphere is NOT "well-mixed" as the IPCC assume, and the possible effects of increases in carbon dioxide might be very different over land surfaces than those currently calculated over the sea. This means that the calculations from their models do not apply over land surfaces, where all the efforts to reduce emissions are made.

Of course, all this does not alter the fact that, so far, there is no evidence that the climate is being harmed by increases in carbon dioxide, however you calculate it.