Global Warming

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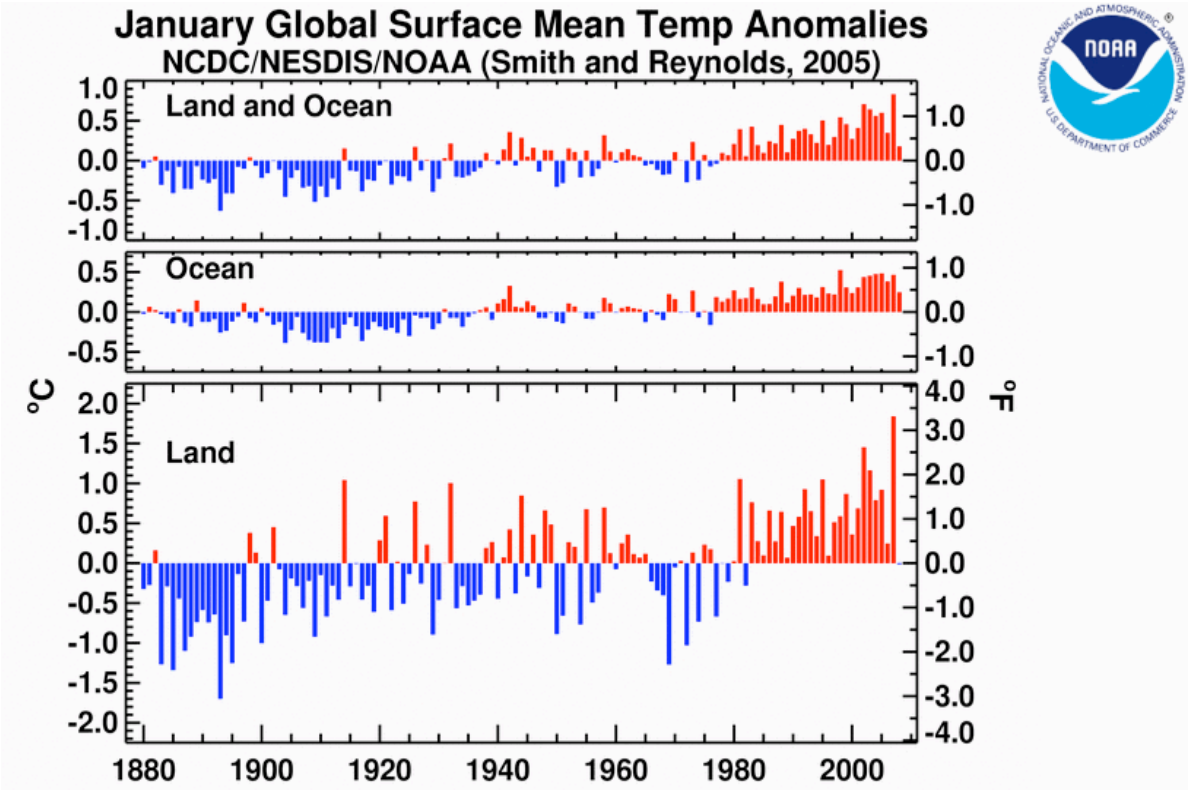
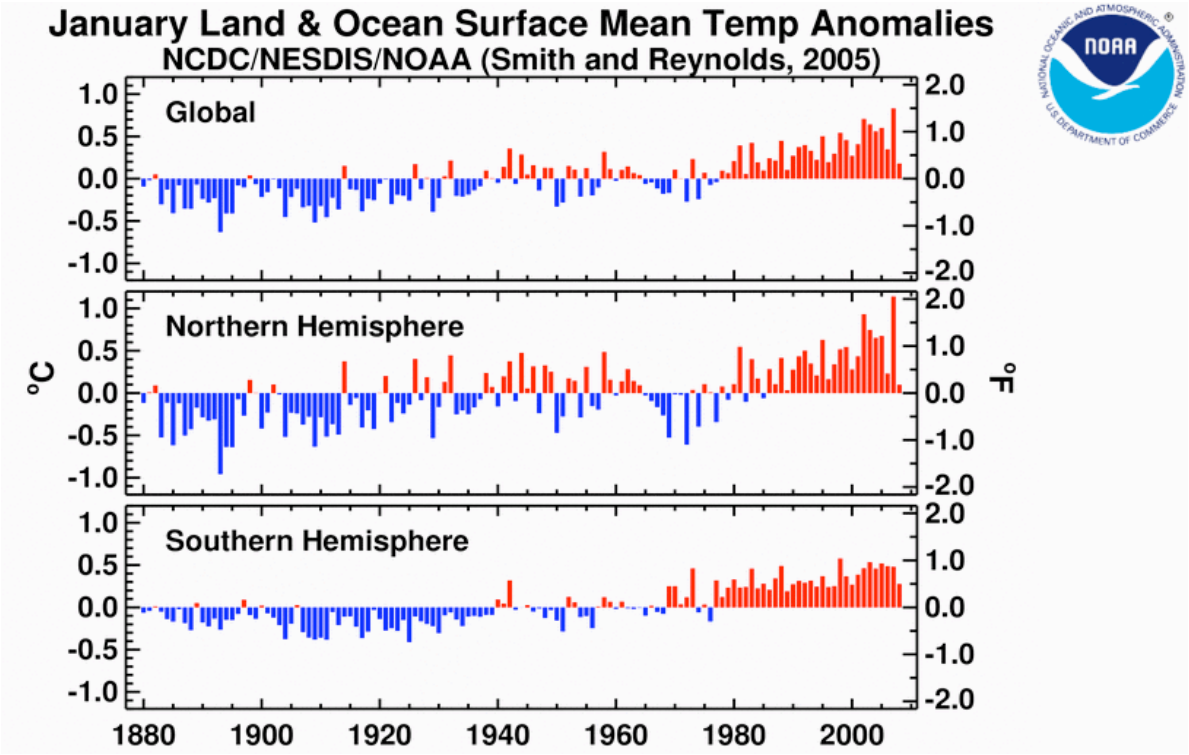
Despite cries that climate change is not occurring, usually supported by parties with serious conflicts of interest (such as pseudo-scientists under the payroll of big oil), evidence for global warming is unequivocal (Intergovernmental Panel on Climate Change website). For example, study the following two graphs of long-term climate change from the National Oceanic and Atmospheric Administration.



Long-term averages over the last century from 1880 to the present are plotted with below average deviations shown in blue, above average ones in red. Notice that land masses began to warm decades before the oceans and that land temperatures have increased more than those of the oceans. Water has a high specific heat, which means that more heat energy is required to raise its temperature -- indeed the oceans have acted as a heat sink which has kept land temperatures from rising as much as they would have without the large bodies of water. Average global temperatures of both land and

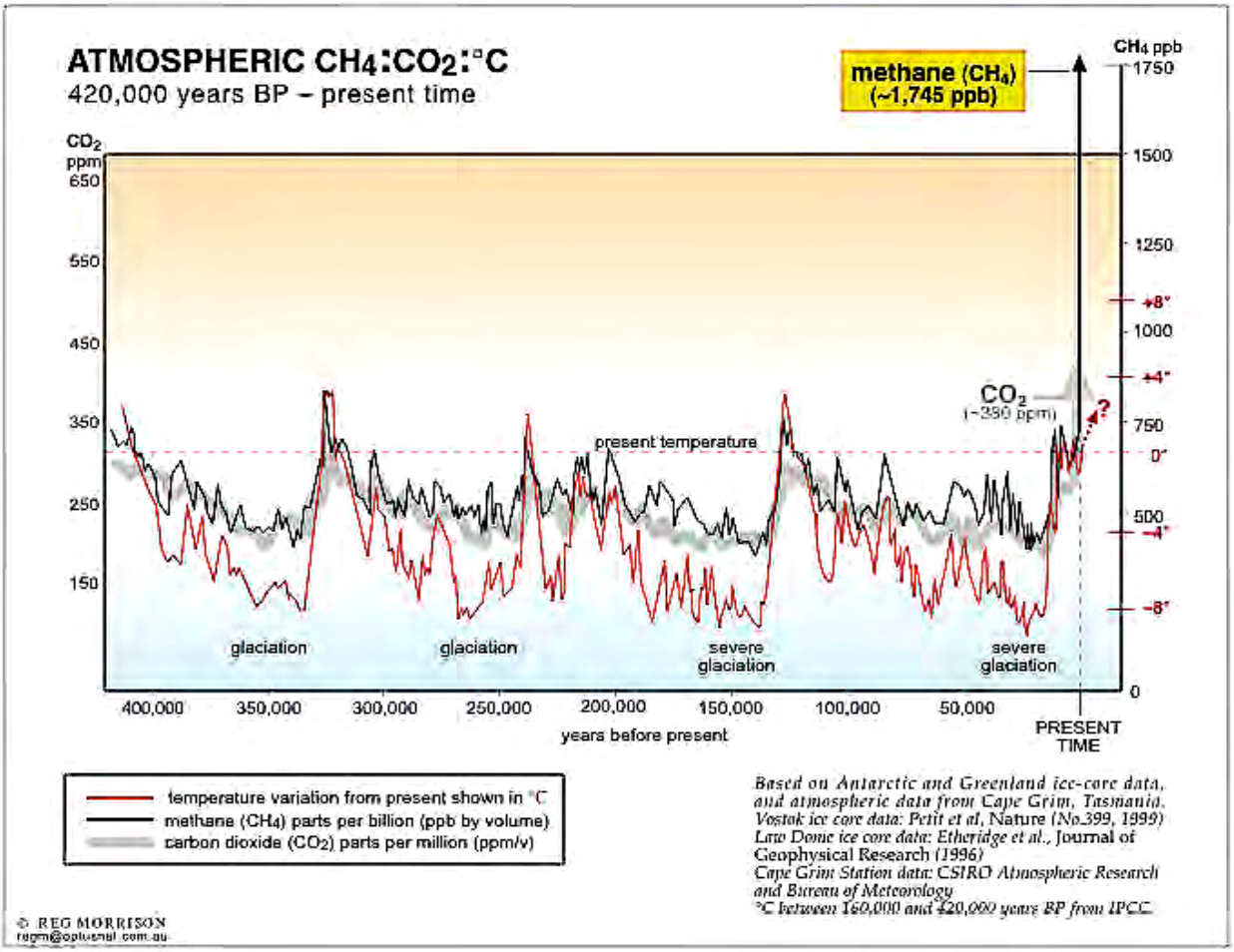
oceans have been above average every year for the past 25 years.



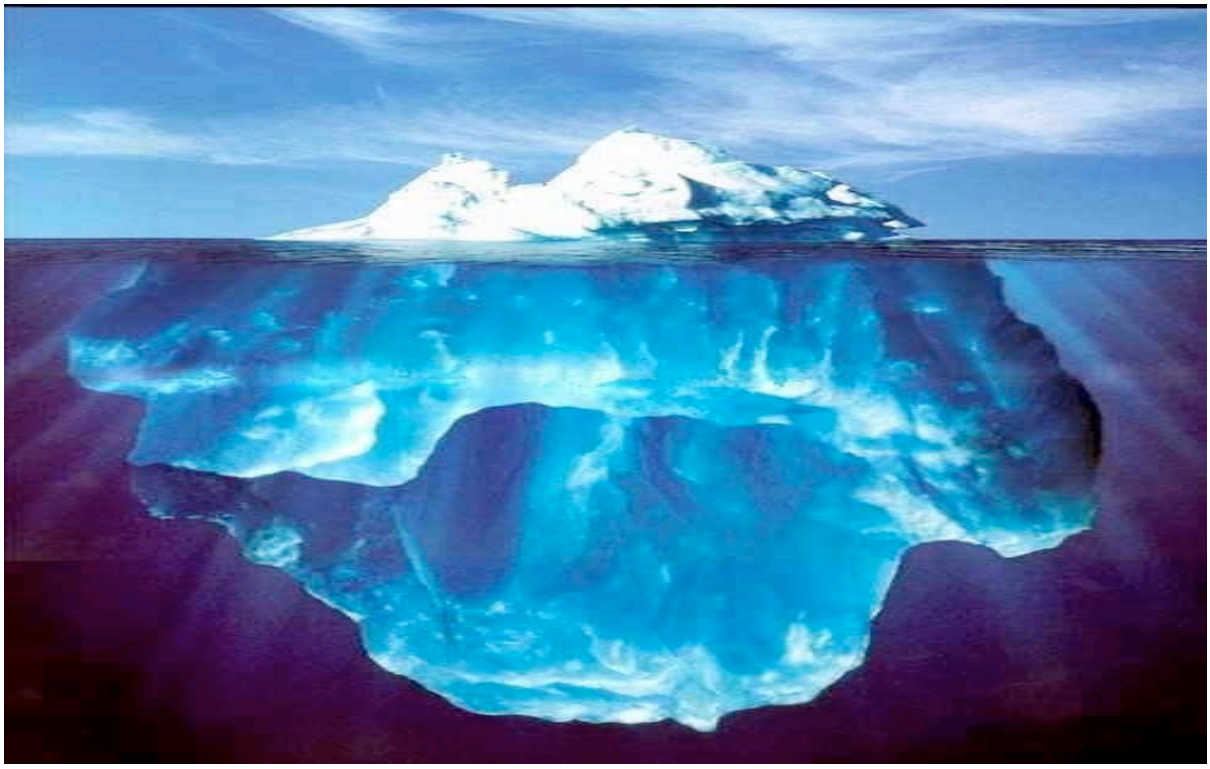
This plot separates thermal global averages for the northern and southern hemispheres. Note that temperatures in the northern hemisphere, where most of the people are located, started to rise earlier and has become warmer than the southern hemisphere.

Everyone is familiar with the increasing carbon dioxide levels in the atmosphere due to human activities, especially burning of fossil fuels. People are less familiar with the recent surge in methane levels (see graph below). Like CO_2, methane is a greenhouse gas which holds in heat. One molecule of methane is equivalent to about 20 molecules of carbon dioxide in terms of its effects on global warming. Long frozen fossil methane is being released from thawing permafrost and from the deep oceans at an ever accelerating rate. As temperatures rise, more methane bubbles up to the surface, further raising temperatures in an ever increasing positive feedback loop. Is there a critical "tipping point" at which the state of Earth's surface will change drastically, and if, so, what is it and when will it be reached? Some experts think this tipping point has

already been crossed.



This plot is based on air samples of known age dating back almost half a million years taken from Antarctic and Greenland ice cores. Temperature changes are plotted in red, CO_2 in fuzzy gray, and methane levels in black. Four prolonged ice ages are clearly evident. Earth is presently in a warm interglacial phase and CO_2 levels are well above any that have been experienced during the last 400,000 years. But look at the methane spike! Some experts think that eventually all Earth's glaciers will melt and sea levels will be substantially higher, innudating all major coastal cities. One very large Antarctic glacier, currently on land, is sliding towards the sea at an accelerating rate. Remember 'the tip of the iceberg' (90% is underwater). When that huge glacier finally plunges into the ocean, sea levels will rise almost instantly all around the world. Talk about a tipping point!



Another very dangerous man-made molecule, trifluoromethyl sulfur pentafluoride SF_5CF_3, has recently begun to appear in the atmosphere. Each molecule of this greenhouse gas has 18,000 times the effect of one molecule of carbon dioxide on heat retention. Although SF_5CF_3 is present in very small amounts, it is exceedingly stable (half life = 1000 years) and is increasing at a rate of about 6% per year [Sturges et al (2000) Science 289:611-613].

- National Oceanic and Atmospheric Administration
- Intergovernmental Panel on Climate Change
- Interview with meteorologist Dr. Chris Rapley
- Enyclopedia of Earth global warming website