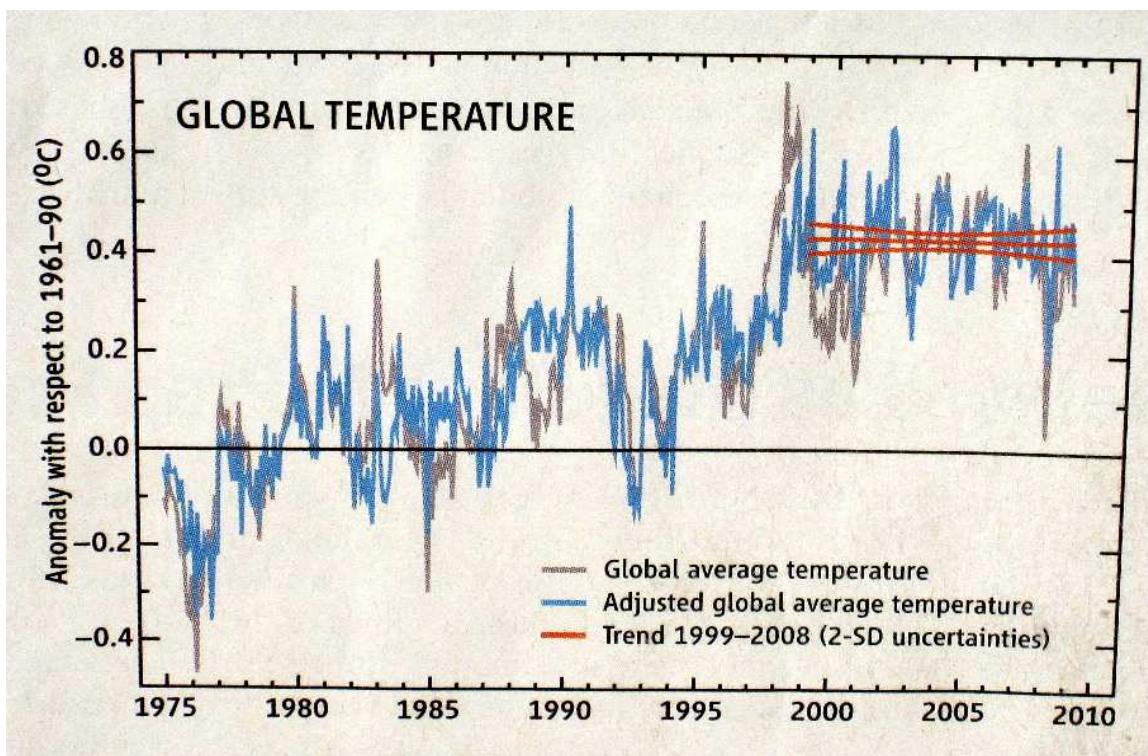


10/28/09 (rev: 1/1/2010)
Dr. A. Cannara
650-400-3071

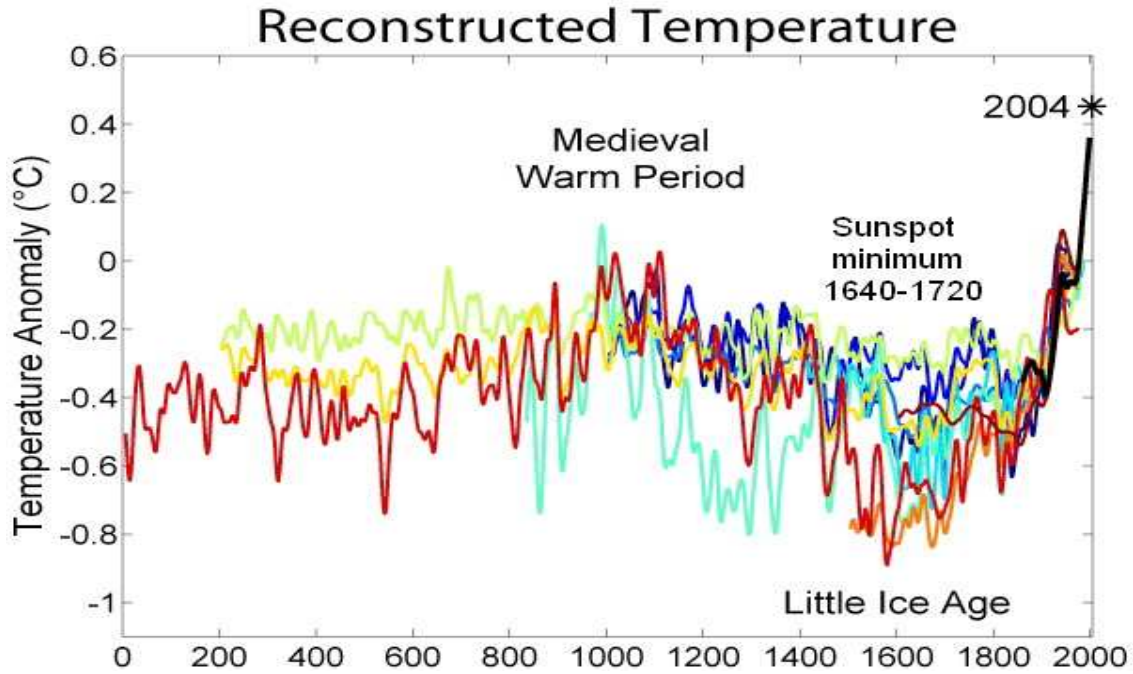
The Warming Pause Myth

You may each have heard rumblings about a **"pause" in global warming**, as represented by recent surface temp measurements. The graph below shows the source of that wishful thinking. It shows the last 35 years and the statistical pause at its right is being used, by those oddly denying warming, to say we're actually cooling.

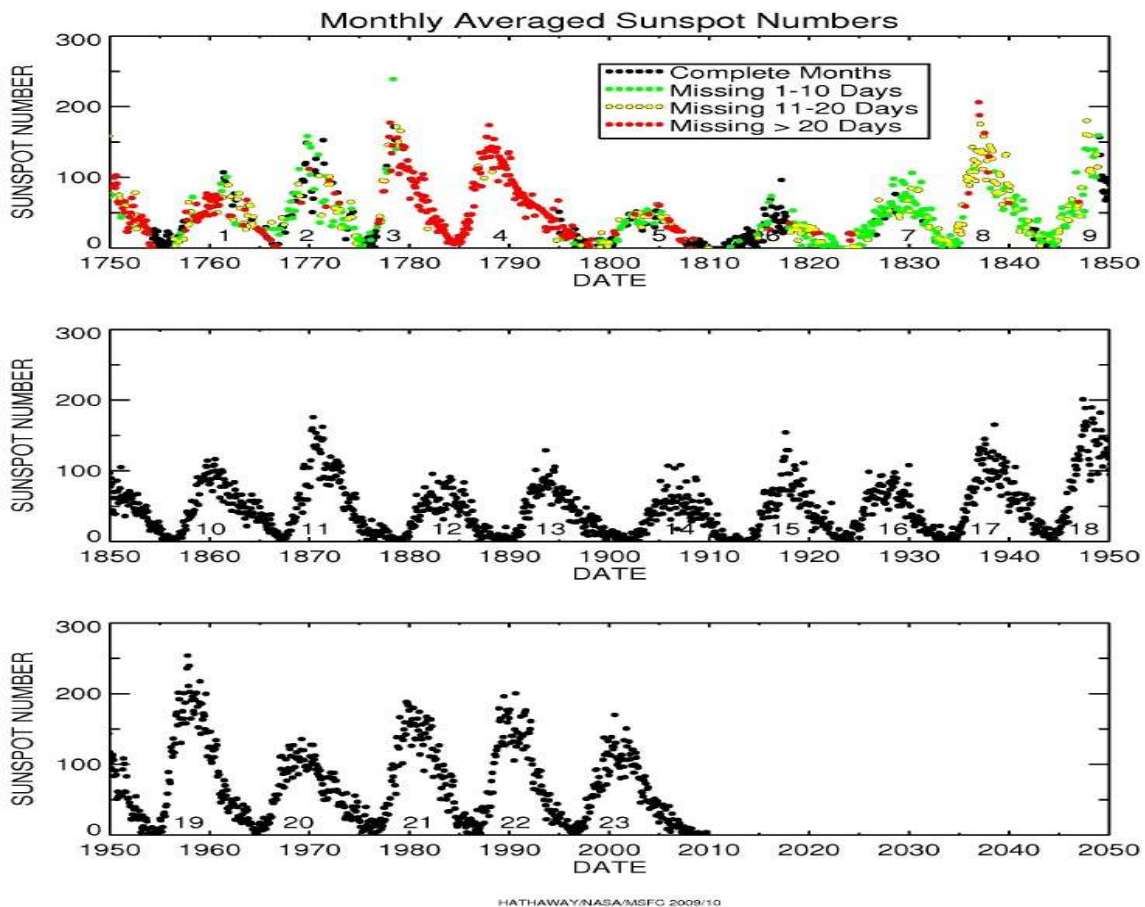


As you know, there's always more (often less) to a story than what Fox News reports, or the Chamber of Commerce avoids. So **what could be a real reason for the 'pause'?**

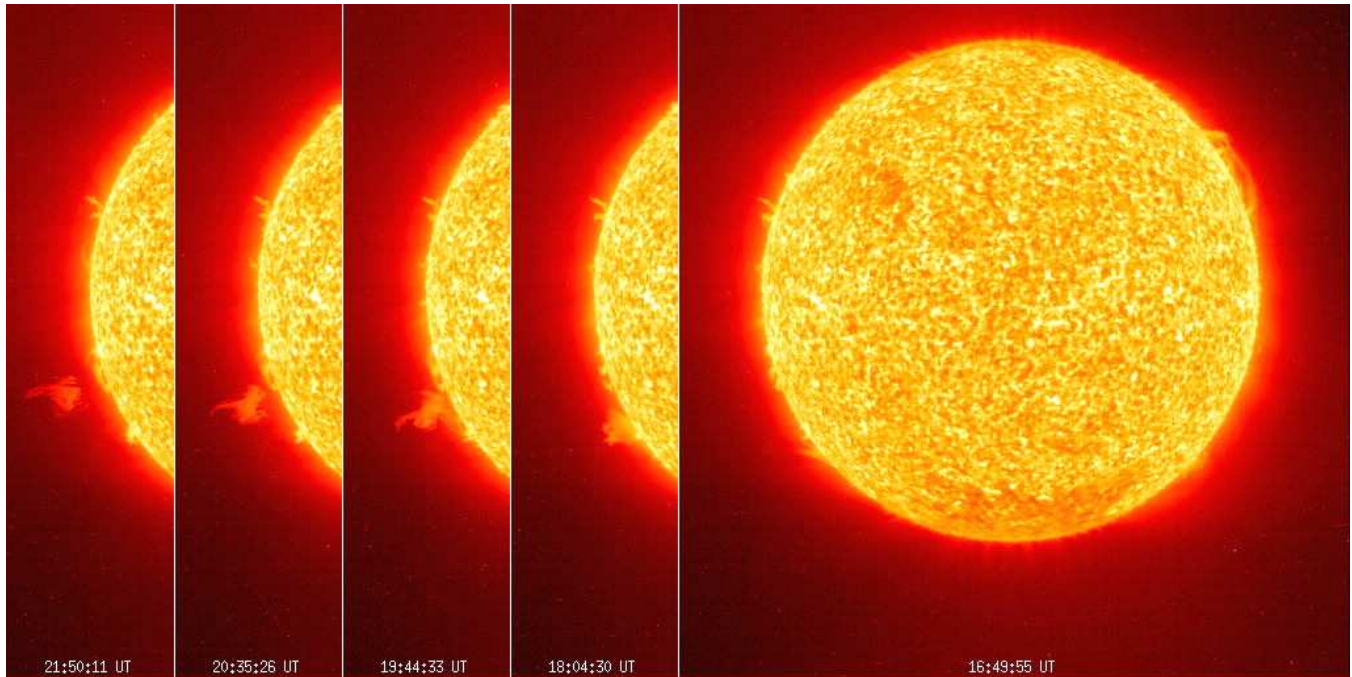
One is how **earth's orbit & tilt** vary year to year and another is **sunspot activity**, which is a powerful weather changer and was partly responsible for the Little Ice Age in the 1600s and the medieval warming in the 1100s -- next graph...



Notice we're now at the bottom of the current 11-year sunspot cycle...



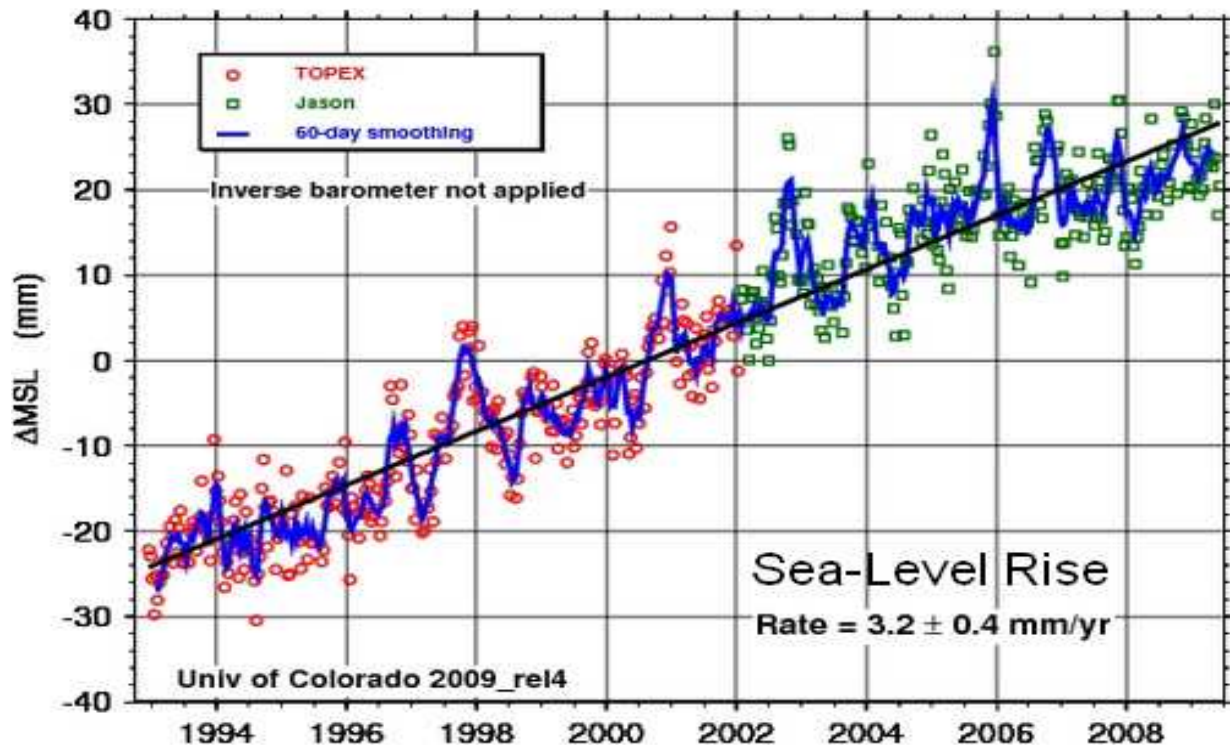
So **our atmosphere isn't receiving quite as much radiant energy these years**, nor are we getting pummelled by the typical blasts of million mph protons (mass ejections) associated with violent sunspot activity – this space-probe sequence shows what a blast of gigatons of protons looks like when shooting (leftward) from the sun, perhaps along one of the frequent magnetic tunnels directed at us (we're 20 feet to the left of the page)...



The pictured ejection (lower left) is many times as large as earth and extremely dangerous for astronauts as well as GPS & other satellites (when spots peak again in a few years, we expect to lose a \$100M GPS satellite or two).

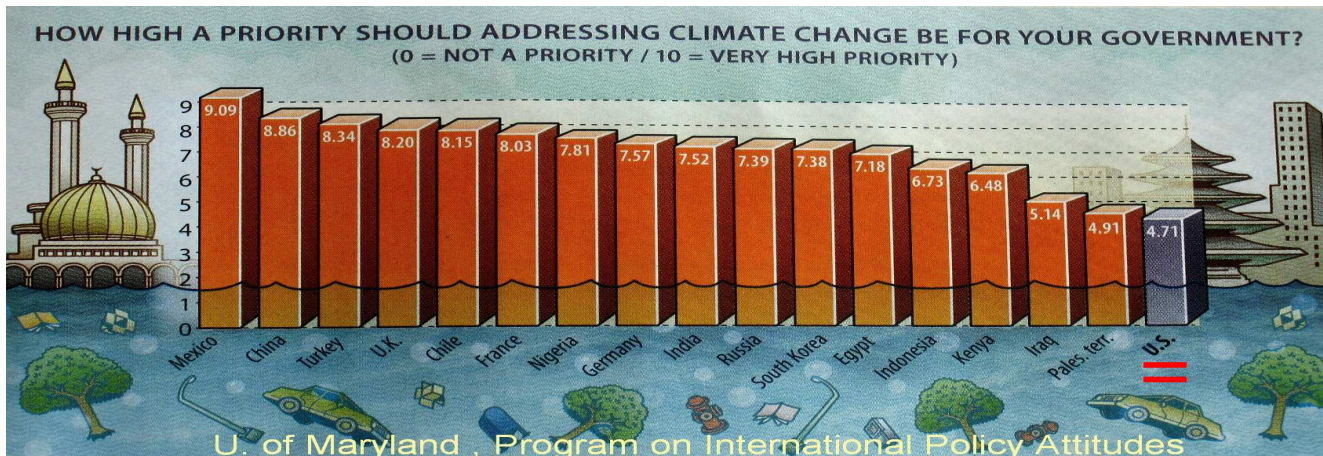
Increased sunlight and mass ejections during sunspots also compress & heat the upper atmosphere and the light simply adds heating down here, as we'd expect. So, the **current flat temps aren't at all surprising**, as we're at the low ebb of the current sunspot cycle.

In fact, **looking at more sturdy things like sea level**, the next picture shows how water just keeps on rising -- keeping average air temps stable for a few years doesn't have much effect on huge masses of previously-heated water gradually warming & expanding cooler volumes, plus huge masses of ice that have already stored up lots of unusual heat & need only a little more to melt...

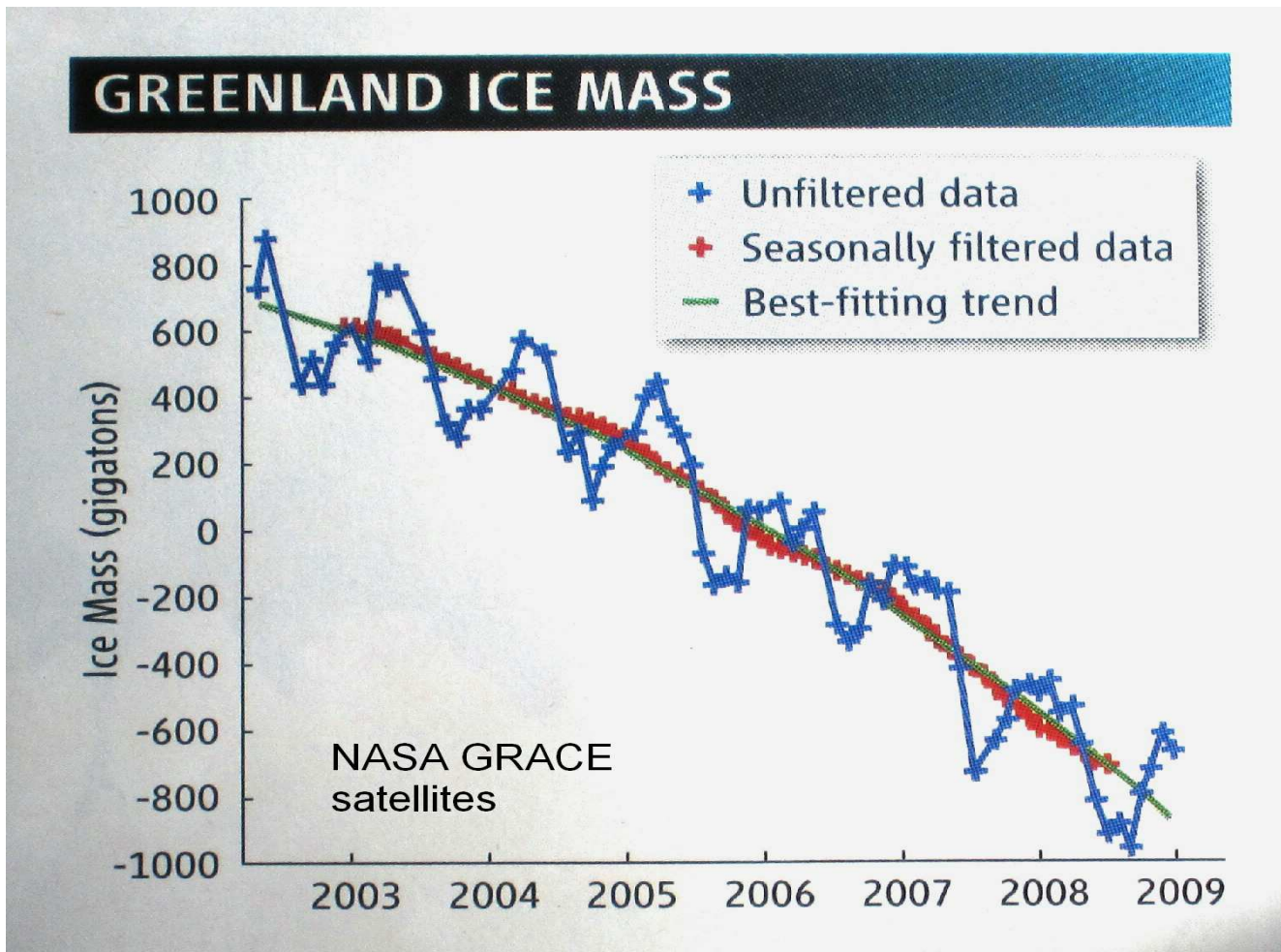


So when someone tries to say there's no warming and we're cooling now, remind him/her of the more complex reality, that in a few years, sunspots will return & will bring back warming with a vengeance, given the CO₂ etc. we've added during the sunspot ebb time. In fact, you can point out that this low-sunspot period should, in fact, have reduced temps, as in the Little Ice Age (~1650 in 2nd graph) & many other periods. **So the fact that surface temps have flatlined, rather than dropped, should be a wakeup & warning** of what's to come in a few years.

Unfortunately, naïve or disingenuous arguments that fib or mislead have led us to the unique problem of being more 'heads-in-sand' than even the Palestinians...



The most recent satellite data on **ice-mass loss at both poles** is truly alarming. Just Greenland, which lost 51 cubic miles of ice last year and appears to now double its loss each 7 or 8 years, is getting gone quicker & quicker...



The same is happening in Antarctica. This is a disastrous trend. **Greenland alone represents over 20 feet of sea-level rise...**

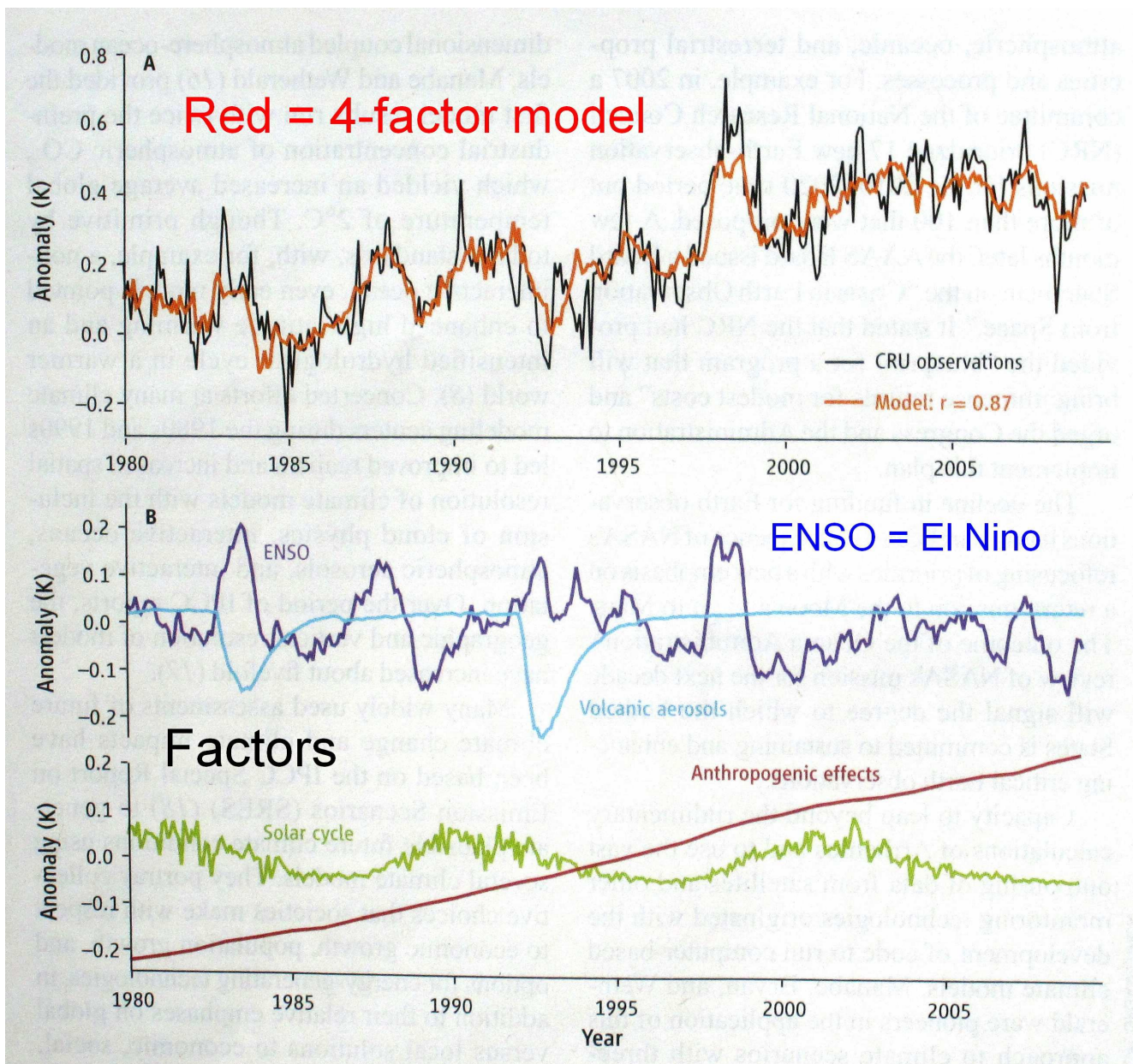
http://www.agu.org/sci_soc/prl/2009-17.html

<http://www.glaciology.net/Home/Miscellaneous-Debris/How-would-the-world-look-if-greenland-melts>

The total of non-floating ice around the world, if melted, raises seas 300 feet, as documented along coasts like Oregon's cliffs. **SF Bay is especially vulnerable...**

http://www.bcdc.ca.gov/planning/climate_change/index_map.shtml

Using 4 updated data sets, the latest temperature model agrees very well with all the last 28 years...



...from the 2009 AAAS Annual Presidential Address by J. McCarthy (reprinted in Science, 18 Dec. 2009, pp1646-1655).

Adding the lack of an El Nino this century to lowered sun activity makes recent temperature behavior even more reasonable, despite emissions increases. When El Nino & sunspots return...

Such a bind we're in, just because we ignored Arrhenius 100 years ago...

<http://www.globalwarmingart.com/images/1/18/Arrhenius.pdf>

and we became more addicted to fossil fuels than he & others ever imagined.

Take just last year's 51 cu mi of Greenland ice loss. A cubic mile holds over 9 trillion pounds of water/ice at 32F. Each pound of ice requires 200 Watt-hours of heat to melt. That means 51 cubic miles of melted Greenland ice absorbed about 92 trillion kilowatt-hours of energy, from summer sun, air or sea, just to melt and not get warmer (this is water's "heat of fusion"). Humans on the whole planet now consume 15 trillion watts of power, or 0.36 trillion kilowatt hrs per day. So that 51 cubic miles of just Greenland ice needed about $92/.36 = 255$ days of all humanity's energy generation to melt into the sea. Scaled up, this gives us an idea of how astronomically much energy we must prevent from entering all the pole ices, from any sources, whether from waste heat, GHG absorption, oceanic warming, etc.

The 780,000 square miles of Greenland is 90% ice covered, to an average depth of about 2 miles. That means the total ice recently there is about 1.5 million cubic miles. If ice loss stuck at 51 cu mi/yr, we'd have about 30,000 years until it's all gone. But loss doubling every 7 or 8 years aggressively cuts that time to a few hundred years, if no additional warming, say due to bared land & sea occurred. This clearly changes the whole 10,000-year ice-age cycling humans have experienced in all our sensible existence.

If we somehow could build refrigeration machinery large enough to reverse just Greenland's melting, we'd have to devote all our worldwide generating capacity to that for 255 days, except that we'd have to accept the basic thermodynamic inefficiency of at best 40%, even if we ran our cooling system with a space radiator, to gain maximum efficiency without further heating the planet. So, we'd actually have to use no energy at all ourselves and devote 100% of all our generation to just refreezing that latest 51 cu mi of water, requiring $255/0.4 = 639$ days, or 1.75 years of everyone doing without all forms of energy.

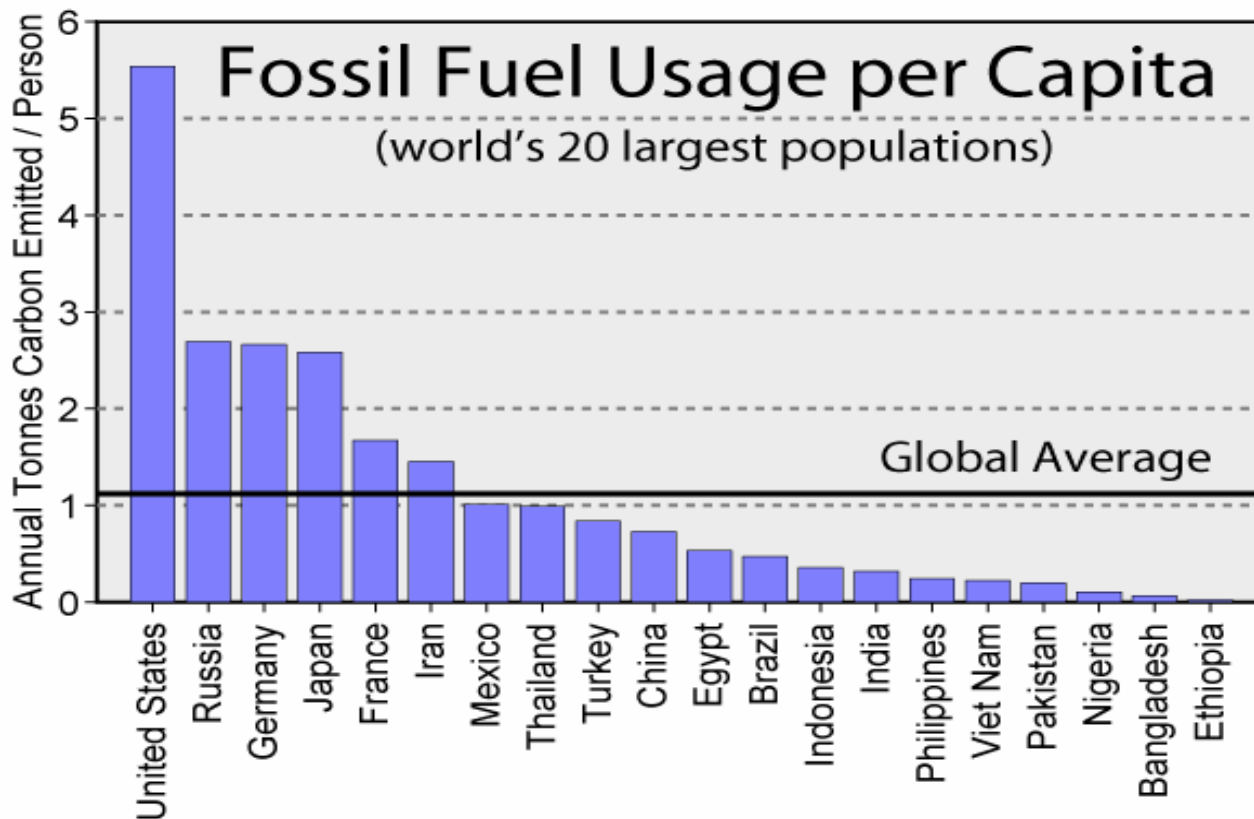
And, of course, we'd still be behind, because of all the heat already stored in oceans & ice around the world that will keep Greenland & the rest melting unnaturally. This should bring the problem we now face home.

On longer scales, every 100,000 years, the earth's orbit becomes very circular, so no unusually strong sunlight to the seasonal summers at either pole. Ice can stay solid,

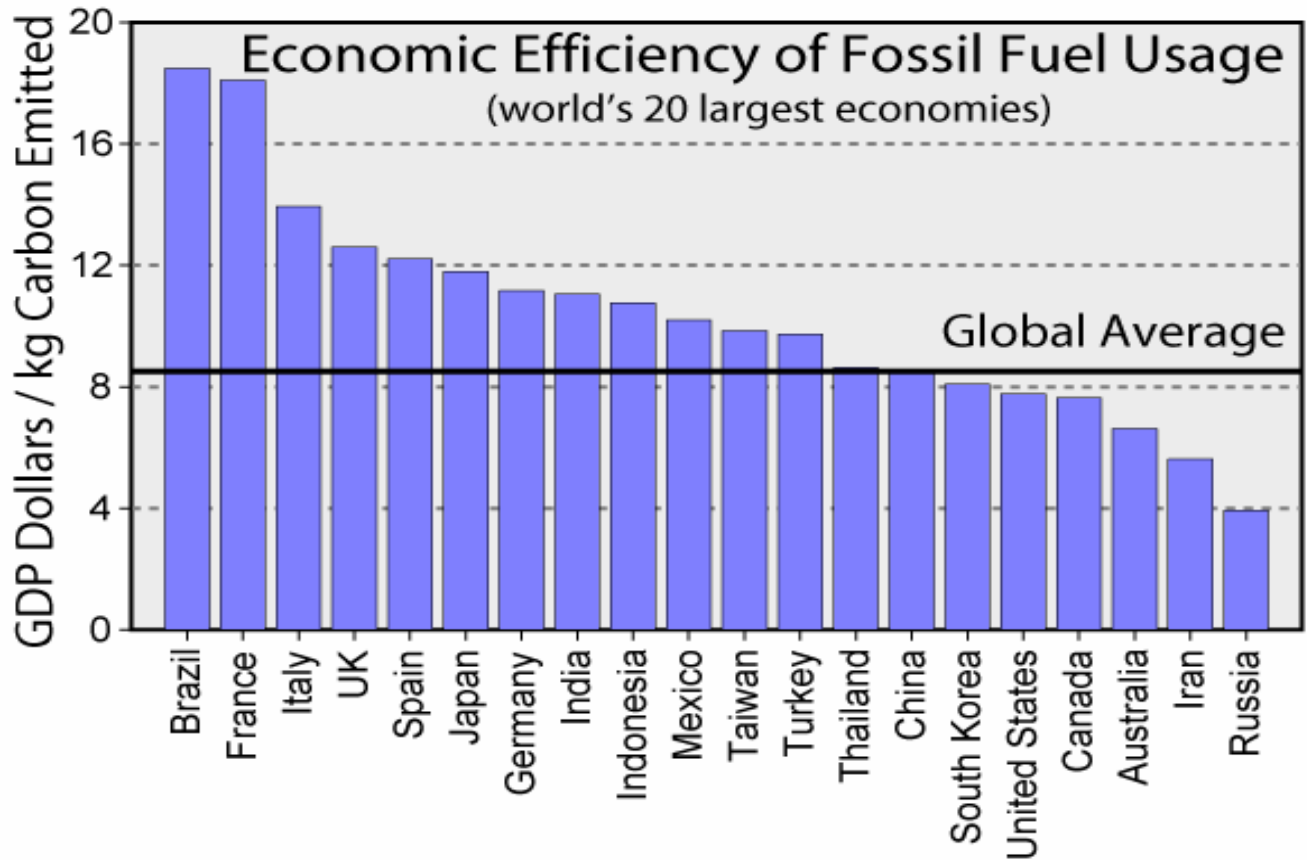
barring increased GHGs. But, when that changes and the orbit and sunspot effects drive ice to start melting, that initiates the speedy end of any major ice age. The melting North American ice flows eastward into the Atlantic. Since it's cold but not salty, it rides atop the warmer, but denser salt water cycling up from the south in the Gulf Stream & related currents. This cold, light water then blocks the warm current from reaching as far northward as it did, causing Europe to freeze while the poles thaw. Related events on the other side of the earth change monsoons, causing droughts that in human times will be disastrous too. The complex system is just now beginning to be understood -- none too soon, because fully melting Greenland will accomplish about the same!

We're now in a situation **where all humanity is faced with the most expensive & difficult problem it has ever experienced** in our millions of years of development. Time to get cracking. No more dawdling & playing with 'green'. As the wise old farm saying goes: "Spit in one hand & wish in the other, and see which gets full first".

For reference, see our **2005 energy status**, which explains why India & China have been reluctant to make up for our energy promiscuity -- why slow their economic development just to make up for our historical CO₂ burden & us wasting 58% of all our energy generation...



We're even below average in turning energy into wealth...



To see how even our famous 'green' building efforts fall short...

http://www.stanford.edu/group/CIFE/online_publications/TR183.pdf

http://energy.senate.gov/public/_files/MajumdarTestimony022609.pdf

The latter being Congressional testimony by the new 'Green' Czar.