GREENLAND CLIMATE CHANGES

ISSUE SUMMARY

The TSD uses CCSP statements about accelerated sea level rises and accepts their finding that that will "likely lead to increased sea level projections" without looking at observations in numerous readily available peer review papers that show clearly that sea level rises are decreasing in recent years (see separate comment on sea levels)..
It does so by accepting that recent melting at the edges of the Greenland ice sheet are due to greenhouse gases and global warming and will continue.

TSD ES4
By the end of the century, sea level is projected by IPCC to rise between 0.18 and 0.59 meters relative to around 1990 in the absence of increased dynamic ice sheet loss. *Recent rapid changes at the edges of the Greenland and West Antarctic ice sheets show acceleration of flow and thinning. While understanding of these ice sheet processes is incomplete, their inclusion in models would likely lead to increased sea-level projections for the end of the 21st century.*

COMMENTS:

The described changes in Greenland are not at all unprecedented nor are they as described. Many peer review papers support interaction with the Atlantic multidecadal cycles and other factors not greenhouse warming are the real drivers.

Changes to temperature and ice happen predictably every 60 years or so and is in fact entirely natural, related to multidecadal ocean cycles.

Multidecadal cyclical warming was observed before in the 1800s and middle 1900s long before the industrial revolution. Also there is more recent evidence showing the idea of lubrication by melt water accelerating loss of glacial or icecap ice is not valid.

THE OCEAN MULTIDECADAL CYCLES

The natural multidecadal cycles in the Pacific (called the Pacific Decadal Oscillation or PDO) and Atlantic (called the Atlantic Multidecadal Oscillation or AMO) correlate strongly with temperatures over Greenland and the arctic.

In early May 2008, a paper appeared in Nature (Keenlyside) showing how by including long term ocean cycles in models the recent global cooling or at least lack of warming may continue to 2020. The same week, a story by NASA's Earth Observatory reported on the flip of the Pacific Decadal Oscillation to its cool mode. "This multi-year Pacific Decadal Oscillation 'cool' trend can intensify La Niña or diminish El Niño impacts around the Pacific basin," said Bill Patzert, an oceanographer and climatologist at NASA's Jet Propulsion Laboratory, Pasadena, Calif. "The persistence of this large-scale pattern tells us there is much more than an isolated La Niña occurring in the Pacific Ocean."

GREENLAND

Many recent studies have addressed Greenland ice mass balance. They yield a broad picture of slight inland thickening and strong near-coastal thinning, primarily in the south along fast-moving outlet glaciers. AR4 assessment of the data and techniques suggests overall mass balance of the Greenland Ice Sheet ranging between growth by 25 Gigatonnes per year (Gt/year) and shrinkage by 60 Gt/year for 1961-2003. This range changes to shrinkage by 50 to 100 Gt/year for 1993-2003 and by even higher rates between 2003 and 2005.

Most recently a study by van de Waal in Science showed as the New Scientist reported that “Much noise has been made about how water lubricates the base of Greenland's ice sheet, accelerating its slide into the oceans. In a rare "good news" announcement, climatologists now say the ice may not be in such a hurry to throw itself into the water after all. Mother Nature, it seems, has given it brakes.

Since 1991, the western edge of Greenland's ice sheet has actually slowed its ocean-bound progress by 10%, say the team, who have studied the longest available record of ice and water flow in the region.” They looked at how meltwater has correlated with the speed of ice flow at the western edge of the sheet, just north of the Arctic Circle, since 1991. They found that meltwater pouring down holes in the ice – called "moulins" – did indeed cause ice velocities to skyrocket, from their typical 100m per year to up to 400m per year, within days or weeks.

But the acceleration was short-lived, and ice velocities usually returned to normal within a week after the waters began draining. Over the course of the 17 years, the flow of the ice sheet actually decreased slightly, in some parts by as much as 10%.

"For some time, glaciologists believed that more meltwater equaled higher ice speeds," van de Waal says. "This would be kind of disastrous, but apparently it is not happening."

Van de Waal believes that the channels that carry the meltwater out to sea freeze up during the winter months. In summer, pulses of water rushing down the moulins to the bedrock overwhelm the narrowed channels, and the increased pressure lifts the ice sheet off the rock, enabling it to move faster.

However, after a few days the channels are forced open by the water, and it drains away from the glacier. As a result, the ice grinds back down against the bedrock and the lubricant effect is lost. NO LUBRICATION: Van De Waal says this indicates that, overall, meltwater has a negligible effect on the rate at which the ice sheet moves.”

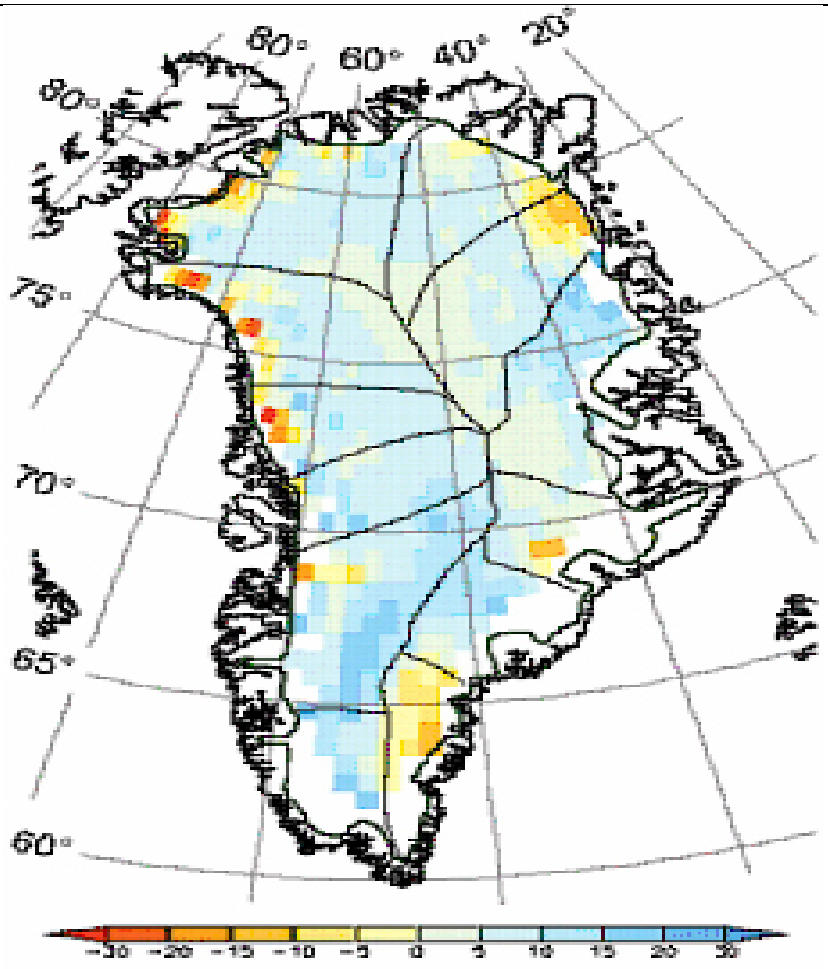

Figure 1: Greenland ice thickness changes as determined from NASA satellites

Other scientists have confirmed that interannual variability is very large, driven mainly by variability in summer melting and sudden glacier accelerations. Consequently, the short time interval covered by instrumental data is of concern in separating fluctuations from trends. But in a paper published in Science in February 2007, Dr. Ian Howat of the University of Washington reports that two of the largest glaciers have suddenly slowed, bringing the rate of melting last year down to near the previous rate. At one glacier, Kangerdlugssuaq, "average thinning over the glacier during the summer of 2006 declined to near zero, with some apparent thickening in areas on the main trunk."

Dr. Howat in a follow-up interview with the New York Times went on to add

"Greenland was about as warm or warmer in the 1930's and 40's, and many of the glaciers were smaller than they are now. This was a period of rapid glacier shrinkage world-wide, followed by at least partial re-expansion during a colder period from the 1950's to the 1980's. Of course, we don't know very much about how the glacier dynamics changed then because we didn't have satellites to observe it. However, it does suggest that large variations in ice sheet dynamics can occur from natural climate variability."

Thomas, et al. (2000) showed great variance in mass balance of the Greenland ice sheet with highly variable thickening and thinning depending on location. This February (2008) during a bitter cold winter, Denmark's Meteorological Institute stated that the ice between Canada and southwest Greenland reached its greatest extent in 15 years.

Temperatures were warmer in the 1930s and 1940s in Greenland. They cooled back to the levels of the 1880s by the 1980s and 1990s. In a GRL paper in 2003, Hanna and Cappelen showed a significant cooling trend for eight stations in coastal southern Greenland from 1958 to 2001 (-1.29ºC for the 44 years). The temperature trend represented a strong negative correlation with increasing CO2 levels.

Shown below in figure 2, see the temperature plot for Godthab Nuuk in southwest Greenland. Note how closely the temperatures track with the AMO (which is a measure of the Atlantic temperatures 0 to 70N). It shows that cooling from the late 1950s to the late 1990s even as greenhouse gases rose steadily, a negative correlation over almost 5 decades. The rise after the middle 1990s was due to the flip of the AMO into its warm phase. They have not yet reached the level of the 1930s and 1940s.

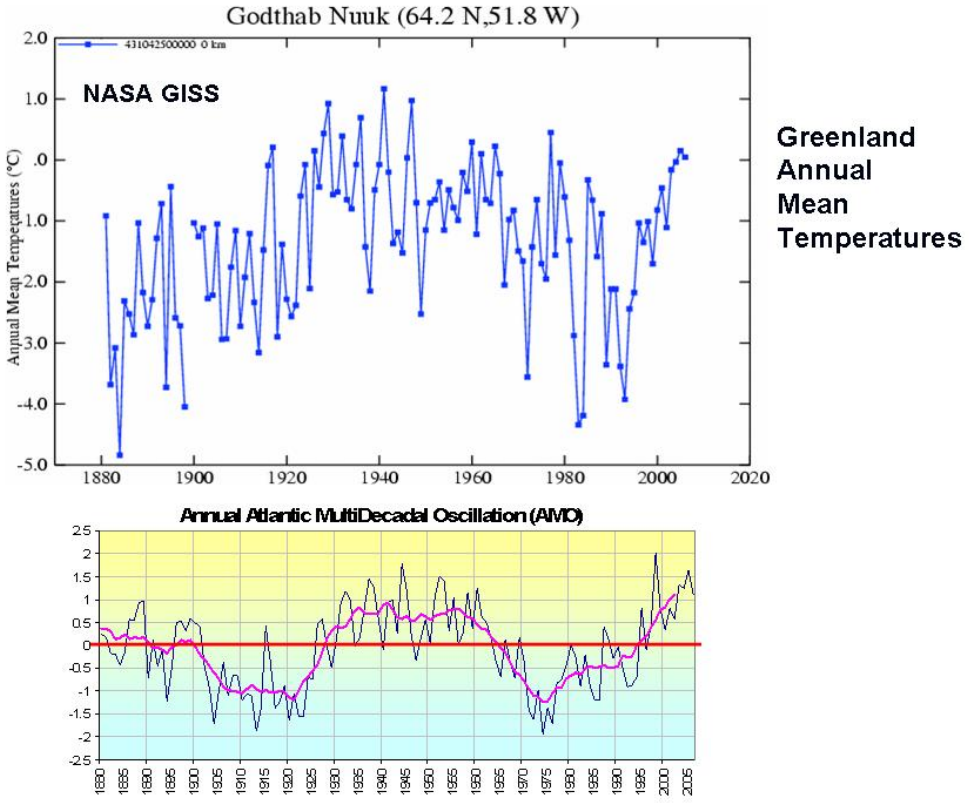

Figure 2: Godthab Nuuk, Greenland annual mean temperatures (NASA GISS) top and the AMO bottom (annual dark blue and 5 year running mean purple) source CDC Climate Indices

SUMMARY

Warming in Greenland has not yet reached the levels of the 1930s and 1940s. Temperatures in Greenland were much warmer in prior periods like the Medieval Warm Period. The idea that rapid melting and lubrication has been proven to be in error by the most recent research.

Greenhouse gases are not the causes of these natural cyclical changes. Given the current cooling of the atmosphere and ocean, accelerated melting of the glaciers and icecaps and the resultant threat of catastrophic sea level is highly unlikely.

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