



Beyond the Point of No Return

Supercomputer Climate Models, Plain English, the Warmest Stable Climate State and Various Assorted Climate Catastrophes Happening Now

I recently responded to a question from one of the folks in an advocacy group I belong to about the unknown workings of a “black box”, used by local traffic engineers and city and regional planners, for estimating future traffic volumes for transportation planning. The question was about the unknown workings of the magic black box that created these future traffic projections and why the engineers and planners kept the workings of the “black box” secret, often referring to them as *proprietary information*, and when they did talk about, they would explain things in “plain English”.

My advocacy group friend had stumbled upon the conundrum of scientific outreach. The secret information in the planning and traffic models is just a bunch of engineering calculations. Most traffic models use very simple calculations, although with complicated timing factors required for transportation systems with advanced traffic signalization. Population growth models may use a little more individual judgment in coming to a figure for growth in an area, but in general these types of models are nothing but advanced math equations. The excuse about proprietary information is a cover for either not knowing the equations that the model uses to determine an outcome, or simply not caring to discuss something with a citizen that the engineer or planner have little skill in doing – explaining their work in terms that can easily be understood by persons who are not skilled in that field.

Climate models, *and climate modelers* are little different. Well, at least in theory, climate models are nothing but a bunch of formulas lined up and run together to determine an outcome. Except in climate models the number of times the calculations are performed is astronomical. Compared to a traffic model for a city for example. If a City’s traffic model was one “cell”, place 500,000 of those cells on the Earth’s surface and tell them to talk to each other. That is, tell each cell to pay attention to the numbers generated from the equations in the cell to the north, northeast, east, southeast, south, southwest, west and northwest. Then add about 30 layers all around the world, up into the atmosphere to say 60,000 feet high and tell all of those cells to pay attention to what the other twenty six cells adjacent to each individual cell are coming up with in their individual calculations. And then add the ability of certain massive groups of cells in multiple different regions of the world to tell other groups of cells in far away regions of the world what they are doing. This is called a teleconnection and it is important in weather and climate because sometimes the weather in the equatorial Pacific (El Nino) can have an effect on Indian Monsoon, or the Midwest US drought, or the Siberian winter temperature.

Got it? The climate models get their extraordinary complexity from the sheer volume of information used which is maybe 15 million times more information used than a traffic model. Same relatively simple equations (to the engineer or scientists) but a jillion time larger.

And that description to the public in plain English? This is exactly why our climate is out of control. Yes, I know - from what we see about climate change, it is if we are on a very slow train heading towards the horizon in the flat endless desert. We have heard that the train has no brakes, but we are going slow enough so we don't worry. We have also heard that the tracks may run off over a cliff out there on the horizon somewhere. We don't know how high the cliff is but we know that we are on a very slow train that is heading that way. And the doors will lock us in sometime before get to the cliff. And the tracks start going downhill more rapidly the closer we get to the cliff, but we can't see that from here.

I lifted the following sentence from a typical piece of writing that a scientist has tailored for general consumption. This is an excellent example of why the media has lost interest in climate change, and subsequently, why the public's perception of the importance of climate change has dwindled to beneath that of immigration, lobbyists and trade policy at number 20 on the latest Pew Center poll.

The ingenious numerical models executed by powerful supercomputers generate excellent simulations of atmospheric changes capturing the nonlinear motions of thermodynamic characteristics of chaotic multivariate systems.

Now this is what the European Union's Environmental Commissioner said about climate last week. **"World's last chance to stop climate change before it passes the point of no return."**
[Reuters http://www.reuters.com/article/worldNews/idUSTRE51Q22X20090227](http://www.reuters.com/article/worldNews/idUSTRE51Q22X20090227)

Even this is unassuming and lacks realistic detail based on public perception of the issue. What does the point of no return mean to the public? It means that it's going to get warmer because of global warming and that we are going to see more droughts, more hurricanes, more mosquitoes and less snow. What does it mean to the climate scientist? The climate scientist is not really sure what it means, but he knows that in the past, our Earth's climate has reacted much more violently than just warming would imply. He knows that 30% of the planet has been covered by ice repeatedly, and that global temperatures, in just the last 100,000 years have jumped back and forth by 12 degrees F in less than two decades per jump, and sometimes less than two years. And he knows that this would devastate the world if it were to occur today. The scientists know that all their models are now considered to be conservative, either because they have really screwed up their calculations, or because climate is now changing much faster than it was when they wrote the models, or both.

The scientists know that there are two known stable climate states: ice age cold and interglacial warmth. We are in interglacial warmth now and the Earth is as warm as it has ever been in time frames that matter. There is no known warm state that is warmer than today, let alone a warm *stable* state. The scientists also know that those *nonlinear motions of thermodynamic behaviors* quoted above, are really nasty, explosive physical forces that shape the behavior of environments. They have thresholds beyond which all hell breaks loose - like the boiling point of water - only our atmosphere will boil off far, far below the boiling point of water. This threshold is nearly 100 degrees below the boiling point, at sea level. The scientists know simple things that have profound relationships for our planet: like the physics of ice freezing and thawing. They know that it takes eight times more heat to raise the temperature of ice from 31 to 32 degrees than it does to raise it from 30 to 31 degrees (the heat of fusion is what they call it). This means that ice melting is an unstoppable and irreversible event in time frames that matter to the ice, or to Humankind in the case of an ice sheet. This is a peculiar

characteristic of ice that will lead to the passenger compartment of the long slow train completely flooding with water at some point before it rolls off the cliff.

But you know, none of the above really gives the reader an idea of the extreme nature of what we are facing. Long, long before we get to the point where the train is about to run off the cliff, where the passenger compartment fills with water, where our planet's coastal infrastructure is flooded by dynamical ice sheet disintegration, our forests will die off and our oceans will die. The forests, the great northern forests, with 27 times as much CO₂ as the tropical forest on the planet, are already in a very significant decline and in about thirty years will contain less than a quarter of the carbon as they do today. This means that all that carbon in the forest today, nearly as much carbon as man has burned in the history of the world, will be released in about the next 50 or 60 years, and the forests ability to take carbon out of the atmosphere will be reduced by 75%.

The dieing forests will be susceptible to massive forest fires, the like of which mankind has never witnessed, but that have probably occurred often on our planet during abrupt climate changes in the past. Think of California's fire season multiplied by 100,000. These fires will put decades of current day carbon emissions into our atmosphere in just a few seasons.

The resulting warming will send the permafrost melt into an extraordinary methane generation cycle releasing a significant portion of the carbon stored there whose latest estimates are 2,000 times the current atmospheric content of carbon dioxide.

The extreme oceans on the planet are already exhibiting signs of significant dysfunction. They are acidifying generations ahead of schedule. The Antarctic Ocean is forecast now to lose it's ability to support a significant portion of its primary productivity in just thirty years, which is 40 or 70 years ahead of the worst case scenario. When this happens, not only will there be no food at the bottom of the food chain - which means that virtually everything will starve to death, but the oceans will stop absorbing a significant amount of carbon dioxide. All of that primary productivity uses carbon dioxide to make their microscopic shells. All that life also generates oxygen. Half of the oxygen on the planet is derived from primary ocean productivity, the other from those dead and or burned down forests that are about to happen. The phrase *abrupt climate change* just does no do justice to theses concepts.

The whole story is even more frightening. One of the most widely accepted of the Oh-My-God hypotheses these days is the melting of methane clathrates on the ocean floor. Scientists still don't really have a clue, but more and more of them are including some discussion of it in their writings. Methane is released in the decomposition of organic matter. As all of that primary productivity in the oceans dies (naturally) and sinks to the ocean floor, it release methane. This methane, released in the ocean sediments below about 2,000 feet, freezes at above the freezing point of water. (Methane freezes at sea level pressure at about minus 296.5 degrees F, but at 2,000 feet under the ocean it freezes at 40 degrees above zero. Not everything is like water. Water is a very special thing.) The oceans have lowered by up to about 400 feet during past ice ages because ice gets locked up on land and doesn't melt. As the ocean level lowers, the pressure on the methane lowers and the melting point climbs rapidly and all the methane melts. In the hypothesis, this creates an abrupt climate change because methane is a very powerful greenhouse gas and there is more frozen methane on the ocean floor than all oil, coal, oil shale and tar sands ever in existence burned and unburned.

This violent change of climate of a dozen degrees or so degrees changes habitats so drastically that species cannot migrate far enough, find the right kind of food, or just die of heat exhaustion. The most extreme of these abrupt changes ever seen killed 95% of all species on Earth.

But the public and the media still can not see that there is no known stable climate state warmer than the one we are leaving today. They can't see that our train is now hurtling towards this obvious cliff. They don't understand that the climate lag, or the built in change in our climate that the scientists say is yet to come will only increase the speed of the train. They understand that we get another 2 or 3 degrees of climate change free because of the climate lag - even if we were to stop all greenhouse gas emissions completely today. But they do not understand what it means.

We as a society don't have a clue that Greenland goes Postal in another 2 or 3 degrees. That peculiar thing about ice melting means that Greenland, once it passes some yet unknown average temperature in the Greenland area, will melt completely and uncontrollably and obliterate everything within a dozen or twenty feet of sea level. Estimations of the time frame for this to happen were 10,000 to 20,000 years a couple of decades ago, 1,000 years a decade ago, and a few scientists have started talking about a couple of hundred years since the Big Melt began in 2004 and we started having all those icequakes that are 1,000 times more powerful than anything ever observed.

Think of the spring thaw up north in Minnesota. When the time comes, all that snow they get melts fast. It floods and everyone goes sand bagging and it's all because of that peculiarity of water known as the heat of fusion. Once ice gets enough heat in it to melt, get the sand bags out.

This melt is on top of the four feet expected because of ocean warming expansion and the melt of glaciers already ongoing. When we add in a similar amount of melt from Antarctica, and *do not count possible collapse of the West Antarctic Ice Sheet*, sea level rise could go six or eight feet per century or half to two thirds of a foot per year. This is a violent climate change that will create strife like we have never known. The following quote from a recent US Geological Survey report about sea level rise makes a sobering statement: "Nearly one-half of the 6.7 billion people around the world live near the coast and are highly vulnerable to storms and sea-level rise." Earth's society will simply not be able to accommodate even a relative small portion of the sea level rise coming from Greenland alone. And Greenland is now melting and discharging ice at a rate that could be two to three times that of the late 20th century.

Then there is Antarctica. Just a decade ago, most scientists across the entire planet understood that Antarctic was a very stable place, that it was even increasing in ice volume and the chance for it to start melting or discharging more than it gained were very slim and would remain very slim until at least the year 2100. Well, in 2003, NASA sent up a pair of new gravity measuring satellites that are 100 times more powerful than their predecessors. The satellites not only tell us something vastly different about Antarctica today, but they have been better able to recalibrate the previous satellites data. We now know with great accuracy, that Antarctica is not only losing more ice through melt and iceberg discharge than it is gaining, but it has caught up to Greenland's discharge rate and is rapidly accelerating beyond.