



Decades, Generations and Even A Century Ahead of the Supercomputer Model Predictions

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We have likely crossed a climate threshold in the last several years. Our climate is changing faster than it was at the end of the 20th Century and it is likely to accelerate even more in the very near future. Climate Change is no longer the simple burden of minimizing the negative effects of planetary warming. We have likely crossed an unexpected climate threshold. The changes are now happening much faster with greater impacts. There is no known stable climate state warmer than the one that we are leaving and we are leaving our current climate state faster than the worst-case scenarios of the supercomputer climate models.

The challenge is that the breaking news from academia is way out in front of the press. As counter-intuitive as it sounds, the press (in the U.S. at least) is reporting very little of the actual news coming from climate scientists and what news is reported is significantly understated, poorly understood by the press and minimized in priority. The scientists say that climate change is decades, generations and a century or more ahead of their future climate prediction and accelerating rapidly. They say that our planet's population is now headed for extremely hard times, within the current generation, even with significant action to curb greenhouse gas emissions. This means that things will be bad for you and me, and there is nothing we can do about it... But we can keep it from getting worse in the future, and the scientists say it will get a *lot* worse..

The press barely acknowledges that the new "best case scenario" temperature forecasts are five times greater than announced by the Intergovernmental Panel on Climate Change (IPCC) in November of 2007. Or that the sea level rise best case scenario is now twice what the IPCC said was their worst case scenario most recently, The press rarely mentions that most scientists themselves now acknowledge that virtually everything that their models have predicted up to this date has been conservative, and in their words – sometimes frighteningly conservative.

What I am saying here all comes straight from the academic literature; from the scientists research findings – not from blogs or other unreferenced, non-academic sources. I find myself often wandering in a vacuum of knowledge when I am out in the non-academic world because of the poor reporting of the American media. Even my professional environmental colleagues are significantly unaware of what is being discovered by climate scientists. Just why is this?

There are many reasons why climate science is so poorly understood outside of academia, like there are usually many reasons to explain just about anything. The vast complexity of the science may be

the biggest reason. This complexity leaves tremendous numbers of unanswered questions, which gives the appearance of lack of knowledge to an outsider. The different climate scientists themselves sometimes do not know much at all about another scientists work because their specialties are so far disconnected. Aquatic biologists generally don't know a lot about glaciology. Marine chemists generally don't know a lot about terrestrial biology. Sedimentologist generally don't know a lot about atmospheric chemistry and dendrochronologist (tree ring specialists) often don't know a lot about astrophysics. The different branches of science that are deeply involved in the study of climate is mind boggling in itself. But all of these branches of science are deeply interconnected in climate. Is it a wonder that the public knows as much as it does?

The Fairness Doctrine, oddly, struck down long ago in the Reagan years, plays a very important role in public awareness of the science of climate. In the press, it has long been a common practice, generally because of the Fairness Doctrine, to give both sides of an issue equal time. Here is where this philosophy breaks down. By the time climate science information makes it to the public realm, hypothesis and speculation have generally been filtered out of the scientific discussion. These uncertainties have been filtered out by skeptics through the vetting process that starts with the first thought of a hypotheses and ends with a fairly certain conclusion at the completion of the juried peer review process. This peer review process sees hypothesis turn to theory with publication of research results in academic journals. This discussion is about science. Dissenting opinions do not make publication by peer review in science.

These opinions are just that – opinions. The product of the peer review process is far more than opinion. Sometimes a dissenting opinion makes it into an academic journal. But the reflection of this knowledge is most often short lived as the original opinion continues to gain repeated publications by various different scientists. This is the way the industry of science works. But the press does not work this way. They feels obligated to share the dissenting opinions because of years of training in “fairness”. To a journalist or reporter, climate science is no more or less valid than a political stance. How is that journalist supposed to understand the interactions of atmospheric chemistry on oxygen isotope formation? Or the distinction of rafted sediment origin and the implications for an ice free Arctic Ocean?

It matters not that 98% of climate scientists support man-caused climate theory. The “fair” principles of the Fairness Doctrine may be morally correct, and absolutely correct in politics, but this principle just cannot be applied to science. It is commonly reported in the popular media that this winter, or last winter, was colder than (fill in the blank) so that must mean that global warming is a hoax. Last winter was indeed the coldest winter of the 21st century, all nine years of it. And it was the 8th warmest year globally that has ever been recorded, and likely the 8th warmest year in the last 1.35 million years. Another popular media story is that the Arctic has been warmer than today. It sure has, and a paper in the journal science out this month shows that it was this warm about 14 million years ago, not during the 1930's which is what has been commonly reported.

The stigma against environmentalist plays a big role in the difficulty of some to understand. They see environmentalists as overly alarmist 70s hippies who thought that by the year 2000 all would be waste and death in a sea of pollution. These were the environmentalists who, in the 1970s, led the charge to show that the world was going to die in a global cooling spiral diving into the depths of the next ice age because of pollution. But several studies of the popular media and academic papers published at the time show that the predominant concerns and the majority of media events, and the vast majority of academic papers on the subject were concerned with global warming.

The long-term implications of climate change are another thing that jades the public perception. We have been told for decades that climate change is coming and that it is really bad. Yet, where is this bad climate change? Nearly everyone I ask says that they have not been affected, personally, by climate change. (The bad changes are just beginning, or are occurring significantly in remote and high altitude areas, such as polar and mountain regions which are much more heavily affected by a process called polar amplification.)

The public here is like the media. The media reported the bad things about climate change for nearly two decades, but now they have lost much of their interest. Why have they lost interest? One reason could be that they kept getting beat over the head for being alarmist for reporting on things that were not to happen for thirty or a hundred years yet. Now these things that were being reported in the 1980s and 90s are happening generations ahead of schedule and it does not make much in the way of news. When the computer models are updated to reflect new knowledge and new data and the temperature at the end of the century will now be twice as warm as what it was projected to be in the year 2000, it does not make much news either.

Religion too, plays a big role in the spread of disbelief. Creationists' views are very widespread in this country. Impossible is a good word to use to describe their understanding of climate information derived from millions of years of sedimentary records or hundreds of thousands of years of ice records.

Contrarians play an enormous role in the spread of doubt in the discussion. A contrarian is one who holds to a belief when proven wrong. Skeptics are not contrarians. Skeptics were invented by the industry of science long, long ago to keep themselves honest. Skeptics ask the hard questions. If their questions cannot be answered, the hypothesis dies. If their questions are answered, the hypothesis turns into theory.

Politicians and big business run this country, not you and I. We elect the leaders, then they work with the lobbyist to make law. This is how it is done, save for a few tiny places where citizens advocacy groups make small impacts. The impact that politicians and big business have is exceedingly large, although it would not be as large if there were more knowledge about the facts. So it is the vast complexity of climate science that is the biggest problem in understanding the climate crisis.

All in all, forty-one percent of the U.S. public thinks the press is exaggerating when in fact, the press is asleep at the wheel.

CO₂ in our atmosphere today is increasing 20,000 (twenty thousand) times faster than anything that has occurred in the last 65 million years and the last time there was more CO₂ in the atmosphere than there is today was 50 million years ago and there was no ice on Antarctica.

The most likely scenario for global temperature increase, coming out of what has been billed as an Emergency Climate Summit in Copenhagen, March 10-12, is an increase of 10 to 13 degrees F by 2100. This is worse than the worst case scenario predicted by the IPCC. And this is just the warming predicted by the year 2100.

Word from NASA researchers is that climate changes today are happening faster than predicted, their impacts are greater and if we stopped emitting greenhouse gasses completely tomorrow morning, the impacts are unstoppable and irreversible for 1,000 years. The warming in the pipeline, that additional

warming already built in to our climate system because of the great buffering capacity of our oceans, will create significant temperature changes for centuries.

The most important climate modeler in the world (Hansen at NASA GISS) thinks that 20 to 40 degrees F of warming could send the Earth into the Venus Syndrome. We are already committed to more than half of this warming the warming will not stop at the year 2100. The newest research shows the climate lag to be longer and the impacts greater and centuries longer than expected previously. Changes by 2200 could put us in range of the Venus Syndrome. Regardless, 10 to 13 degrees of heating on this planet could, similarly to what has happened on this planet in the past, create massive extinction and tremendous difficulty for humanity.

The meteorite that put an end to the dinosaurs 65 million years ago is now believed to have caused a CO2 feedback that resulted in 10 degrees F of warming, which, along with ocean acidification was responsible for the extinction of 85% of all species on the planet over a several thousand-year period. The global cooling that followed the meteorite impact for several years certainly killed massive amounts of life, but the more plausible scenario today is one of a CO2 feedback warming over a thousand or more years that was responsible for most of the extinction event.

The power of these natural abrupt climate changes is in the feedback. Massive climate feedback mechanisms are starting to get noticed in the journals. Almost all of the climate scientists are now saying that the IPCC Fourth Assessment from November 2007 was very conservative. Arctic sea ice decline is 70 to 90 years ahead of schedule. Antarctic Ocean acidification is 40 to 70 years faster than the most recent predictions. Melt and discharge of ice from the Greenland Ice Sheet more than doubled between 1996 and the years 2005, and 2007 saw the greatest surface melt on Greenland ever recorded with a surface melt area more than triple that of 1996.

The list gets more compelling every day. Ocean acidification was last as fast as it is today at the end of the Mesozoic geologic era during the great dinosaur extinction. Antarctica has gone from the most widely accepted stable ice place on the planet to one that is losing ice as fast as Greenland, in just a single decade, 100 years ahead of schedule. Forty million acres of trees are dead in the North American Rockies equaling, using the math calculations of the U.S. Forest Service's Mountain Pine Beetle Infestation Incident Commander, eighteen and a half billion trees (with a B). The Canadian Forest Service says that Canadian forests have turned from moderate carbon sinks to significant carbon emitters.

The beetle pandemic is increasing and there is no end in sight. This outbreak is ten times bigger than anything that has ever occurred before and it is only one of a number of other major forest insect infestations and disease infections being caused by climate change across the world.

These impacts are all happening now and most if not all of them will get worse, likely faster than they are worsening now. New surprises will begin. Some of them will be rapidly devastating. None of them will go away. Very few of them will get better.

This is all happening at a time when science is actually geared up and paying close attention. But it is happening at a time when the U.S. media is almost completely unresponsive. The legacy of the Bush Administration has created a scientifically comatose press corp. The US public sees climate change as pretty much a non-issue any more thanks to the non-reporting of the Press. U.S. citizens rank climate

change 20th on a list of national priorities. The media drives public knowledge in this world and, likely for many reasons, they have lost their ability to investigate.

Abrupt climate changes have happened repeatedly in the prehistoric past, with extreme impacts on the planet and its life forms. Ice records show that changes nearly ten times greater than what we have seen since the beginning of the industrial revolution have happened 24 times naturally in the last 100,000 years alone. They happen with speed beyond anything previously understood by climate scientists. These global abrupt changes, averaging 10 degrees across the planet, happen in a few decades or even just a few years. There are many tipping points in our climate. We have likely found a few of the minor ones. But what has been caused by 6.7 billion people on this planet to date is nothing like the tipping points in prehistory. Yes, mankind is a small and insignificant thing in relative terms. But so is the difference in the sun's energy that strikes the earth when it changes its tilt from 21 to 23 degrees naturally every one hundred thousand years or so. This small change in the amount of sun that hits the northern hemisphere, where most of the land is, is enough to change the planet's average temperature ten degrees and push the planet into and out of ice ages.

How can this be? The scientists have calculated that the change in energy absorbed by the planet is only a small fraction of those ten degrees. The reaction comes from climate feedback. Like feedback from a microphone, these things happen abruptly and often relatively explosively. A population explosion is a good example of an environmental feedback similar to a climate feedback. The feedbacks are the things to be wary of. The Arctic ice albedo feedback is one feedback to be wary of. Ice and snow reflect 90 percent of the sun's energy harmlessly back into space. Vegetation, rock or water absorb 70% to 90% of the sun's energy and change it to heat energy that can be trapped on the planet by our ever-increasing load of greenhouse gasses. The ocean's CO₂ absorptive capacity is another example. As the oceans warm, they hold less CO₂, just like the difference between warm soda water and cold soda water. A feedback also occurs as the oceans absorb more CO₂ because it changes their acidity. Small changes in ocean chemistry, like small changes in an aquarium's chemistry, can have devastating results on that aquatic ecosystem. Ocean acidification is 40 to 70 years ahead of schedule in the great southern ocean around Antarctica.

It is feared that this acidification will cause a great extinction event in about 30 years. That is, it is feared that many of the species of the masses of life called primary productivity will be extinct in 30 years in the great southern ocean. This extinction event will be such that many of the species of algae and plankton will not be able to survive in the ocean when it reaches certain acidity. These species will all be dead at that time in about 30 years. A diminishment of quantity and diversity has already been seen that is quite severe in some areas. This "primary productivity" is responsible, ocean wide, for a little less than half of the carbon sequestration that naturally occurs on the planet. The great southern ocean is not just the canary in the coalmine. The polar oceans are responsible for the lion's share of primary productivity in the world's oceans, and primary productivity is responsible for the lion's share of the natural CO₂ sequestration in the world's oceans. So as the algae and plankton die, carbon dioxide concentrations go up in the atmosphere. As the carbon dioxide goes up in the atmosphere, the oceans become more acidic and the cycle repeats itself in an ever-increasing spiral.

Most of the rest of the other half of the natural carbon dioxide sequestration comes from land based plants. The vast majority of which are trees. We have seen a glimpse of the future in the 16.5 billion trees killed in North America in this ongoing unprecedented pine beetle pandemic. The Canadian Forest Service has confirmed that the forests of British Columbia have changed from CO₂ sinks to sources. The pandemic is not slowing and is in fact accelerating and it is not the tropical jungles that

are the key to the natural land based carbon sequestration across the planet. Tropical forests achieve their great value in their biodiversity. Their great carbon absorption is relatively small compared to the rest of the forest of the world and mainly compared to the great northern forests. The forests of the north cover 17 percent of the Earth's land surface and contain seven times more carbon than tropical forests that cover only 5% of the Earth's land surface. It is the carbon sequestration in the thick organic rich soils of the north that make the difference. The carbon in the jungles is mostly stored above ground; the soils are thin and poor. In the north there is much carbon above ground, but there are vast amounts of carbon below ground as decomposition takes place much less rapidly because the soil is frozen in winter, and winters in the north can take up much of the calendar year.

The forests are dying because the planet is warming. The warmth allows the bugs to proliferate – remember when scientists said there would be more insect infestations on a warmer planet? They didn't just mean mosquitoes and cockroaches. So as the planet warms, the forests become more stressed and the insect population increases. The warmer it is, the greater the insect population. As more trees die, less carbon dioxide is absorbed and more remains in the atmosphere. This makes it warmer and the cycle intensifies.

These are feedback mechanisms and they create climate change *after* the Earth changes the way that it absorbs the sun's energy. These extreme and ecologically violent abrupt changes have occurred naturally 24 times in the last 100,000 years alone. They all happened most likely because of natural feedback mechanisms. The bottom line is that in order to prevent what the scientists call dangerous anthropogenic climate interference (manmade planetary catastrophe), we need to get our CO₂ level down to something much closer to the level it has been for the last 65 million years, which was about 280 ppm CO₂. The best estimate of a safe CO₂ level today is down around 350 ppm CO₂. Our level today is above 385 ppm and climbing rapidly, so this means we have to start taking CO₂ out of the atmosphere, not just limiting the amount that we put in.

Won't this be horribly expensive? Sure – but so was the Great Depression and World War II. Paying the cost of something that is very expensive is something that our planet has done before. This is no different. The deficit spending in the 30's and 40s was far greater, scaled to gross domestic product, than the current economic bailout. By far greater, I mean over 100 times greater when compared to the real value, of our nation or the world. In the 30s and 40s, the population was much, much less and the standard of living was much lower. The comparisons today of spending during our current economic crisis similar to World War II and the Great Depression are based simply on adjustments for inflation. Our society, scaled for the increase in gross domestic product, is worth 180 times more today than it was then. If we are capable of spending that huge of a proportion of our gross domestic product on something as serious as a World War back then, why are we not capable of spending the same amount on something far more serious?

The results of World War, if negative, would have been the domination of the free world by fascists or imperialists or both. The results of climate change, as we are coming to understand it today, could destroy the planet if left alone or addressed in a relatively small way for much longer. The consensus today is that we have to make immense progress between 2012 and 2020 or our boat is sunk. And as the leading edge thinking is going in academia, cap and trade will be too little too late. This may have worked when Kyoto was conceived, but not any more.

So, what is the cost of removing some of this vast amount of CO₂ that we have been storing in our atmosphere since the age of the industrial revolution? Like WW II, it is negligible compared to the consequences.

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