

Commentary on: **NC CRC 2010 SLR Report Addendum** (4/24/12)

On the same day that the NC Coastal Resources Commission's (CRC) *Sea Level Rise (SLR) Report Addendum* was received, "[The Ideology of Catastrophe](#)" appeared in the *Wall Street Journal*. Some might consider that Karma, but maybe it's just the system working towards an inevitable equilibrium.

In that insightful *WSJ* article there are many memorable quotes, like:

"My point is ... to understand why apocalyptic fear has gripped so many of our leaders, scientists and intellectuals, who insist on reasoning and arguing as though they were following the scripts of mediocre Hollywood disaster movies."

It's not apparent that the author read the initial CRC "science panel" report, or it's newly minted *Addendum*, but his observations are uncannily prescient.

Let's briefly review where we are here. In 2010 a distinguished nineteen member science panel ("Panel") authored the "[NC SLR Assessment Report](#)". Its main conclusion was that a 39 inch sea level rise for NC by 2100 "is considered likely." This assertion was primarily based on the 2007 work of researcher [Stefan Rahmstorf](#), their most frequently cited source.

The introduction of that Report makes these statements (my emphasis):

"The Science Panel offered to prepare a report, **based on a review of the published literature**, of the known state of SLR for North Carolina... This report synthesizes the **best available science** on SLR as it relates specifically to North Carolina.... The intent of this report is to provide North Carolina's planners and policy makers with **a scientific assessment** of the amount of SLR likely to occur in this century.... the Science Panel recommends that **a rise of 39 inches be adopted** as the amount of anticipated rise by 2100, **for policy development and planning purposes.**"

In early 2011, the CRC started holding meetings with legislators of some NC coastal counties. A layman's translation of these gatherings is that they were to notify local representatives that new rules and regulations would likely be soon imposed by the state, due to this impending 39 inch SLR threat.

I was contacted by some of my county legislators, and asked to investigate whether or not this CRC *Report* was truly science-based. To assist in this effort, I solicited the help of some thirty internationally recognized SLR experts, who graciously volunteered free insightful commentary. The result was a two-part *Critique* that was issued in March of 2011:

- a) [Part 1](#): is an overview, and is about what a scientific assessment *should* be. [Note that the Panel's *Report* claims to be a *scientific assessment*.]
- b) [Part 2](#): goes into the details of many of the *Report's* errors and omissions, line by line, with citations from some of the independent SLR experts.

Among other things, the *Critique* concluded that the CRC Panel's *Report*:

- 1) was **not** a scientific assessment of the NC SLR issue,
- 2) did **not** do a *balanced* literature search regarding SLR,
- 3) did **not** synthesize the "best available science" on SLR,
- 4) made several unsupported assumptions in coming to their conclusions, and
- 5) ignored their main researcher's latest data (at the time of the report).

In short, the CRC *Report* appears to be a classical case of [Confirmation Bias](#).

Our expectation was that the Panel would: **a)** acknowledge the indisputable accuracy of the *Critique's* observations, **b)** go back to the drawing board to generate a truly science-based assessment of the NC SLR situation, *and* **c)** make at least a modest effort to reach out to us to coordinate the new report, so that realistic NC planning and policies could then be implemented.

Disappointingly, none of those actions have happened so far.

Instead there has been a concerted "circle the wagons" effort, combined with a PR campaign to defend their report, while attacking those who don't agree with the CRC *Report* as being "anti-science" or worse.

In our experience, when **scientists** have their findings disputed, they reach out to their critics and say: "We appreciate your skepticism, and are genuinely interested in hearing your perspective. Let's sit down together and work out a better report." [Note: *skepticism is a core ingredient of real science.*]

Also in our experience, when **political agenda promoters** have their findings disputed, they respond quite differently. They typically attack their critics saying things like: "You're not [credible](#). You're [anti-science](#). You have other [agendas](#). You're publishing [misinformation](#). You have [misconceptions](#)." Etc.

So this is where we were, when the *Addendum* was released in April, 2012.

The CRC *Report* [Addendum](#) took the tactic of self-posing four questions for themselves to then answer. Although those four questions have some merit, only one actually addresses any of the main five (5) points made in the *Critique* (see above).

So, to begin with, none of these issues identified in the original *Critique* have been adequately dealt with. In other words, the *CRC Report* still:

- 1) is **not** a scientific assessment of the NC SLR issue,
- 2) does **not** do a *balanced* literature search regarding SLR,
- 3) does **not** synthesize the “best available science” on SLR, *and*
- 4) makes several unsupported assumptions in coming to their conclusions.

Let’s look at the four questions the CRC Panel asked themselves, and see if the answers actually improve the scientificness of the original *Report*.

1 - Why does the report apply the Duck gauge, which has the highest rate and shortest record, to the entire coast? Why not use Wilmington for the south?

Why this is a BIG deal is that the Duck gauges show a 100% higher relative SLR rate than do the Wilmington gauges!

An additional **significant** consideration is that (at the time of the *Report*) the Duck gauges had been there 33 years, while the Wilmington gauges had been in existence **102 years**. NOAA may indeed accept 30 years as a minimum time period, but that is more out of necessity, rather than a figure that assures high quality results.

In fact, studies of different duration SLR measurements have concluded, for example “For San Francisco, the longest continuous record (140 years) in the US, it was found that 30 year trends computed anywhere in the entire series varied from -2 to +5 mm per year.” And “The conclusion that can be drawn from all of this is that **50 years is the absolute minimum** sea level record length that should be considered.”

It is also known that the northern part of the NC coast is affected by subsidence due to geological factors. Another thought is that the Duck area has been heavily developed throughout the time data has been collected. Ground water extraction is known to contribute to land subsidence, so it’s possible that some of the SLR measure by the Duck tide station could be due to such subsidence.

So, after reading through their commentary regarding question #1, there were no significant reasons put forth for not using the Wilmington data.

One SLR expert wrote: “**They really never show convincingly the reason for selecting Duck over Wilmington, or at least for averaging the two.**” *Amen*

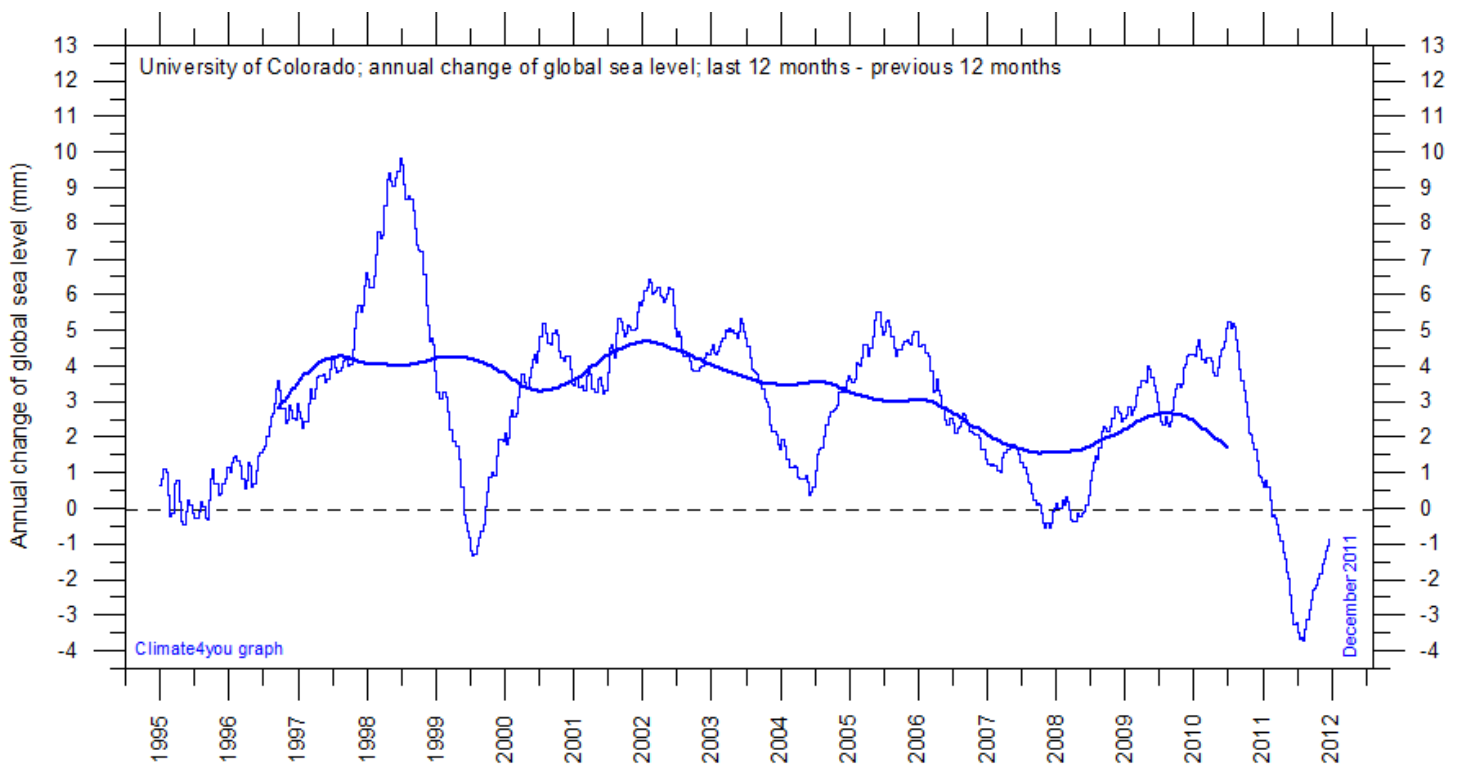
CONCLUSION: *This answer does **not** satisfactorily explain why Duck (NC) tide gauges were exclusively used in the original Report.*

2 - Why is acceleration expected this century when past data shows none?

Giving credit where it is due, the *Addendum* does list some examples of SLR experts who disagree with the conclusions of Rahmstorf. That was an extremely serious omission in the original *Report*. When more credible SLR experts conclusions are combined, there is a wash in their SLR predictions.

A recent paper ([Ray and Douglas: 2011](#)) says regarding the "near-linearity" in their analysis of data from 1900 to 2007: "...there is no statistically significant acceleration in global mean sea level over this period."

Another recent study ([Watson: 2011](#)) states: "The Australasian region has four very long, continuous tide gauge records, at Fremantle (1897), Auckland (1903), Fort Denison (1914), and Newcastle (1925), which are invaluable for considering whether there is evidence that the rise in mean sea level is accelerating over the longer term at these locations in line with various global average sea level time-series reconstructions. These long records have been converted to relative 20-year moving average water level time series and fitted to second-order polynomial functions to consider trends of acceleration in mean sea level over time. The analysis reveals a consistent trend of weak *deceleration* at each of these gauge sites throughout Australasia over the period from 1940 to 2000."



Here is a current graph from the University of Colorado's site. *Where's the acceleration?*

World famous oceanographer Dr. Willem de Lange wrote:

“Table 1 of the CRC Panel’s *Addendum* is very misleading. Sea-level rise involves major decadal variations. Selecting short periods of time and comparing the rates tells you nothing useful. I suspect if you choose different periods you will get different results (see the Holgate entry in the table). The long duration ones in the table don’t mention when the acceleration occurred (late 19th to early 20th Century), and that they show deceleration since.

“There are growing numbers of studies showing this for tide gauge data worldwide – recently for [German Bight and North Sea](#).

“Table 2 of the *Addendum* is based primarily on the work of a very small number of researchers whose results are not consistent with observations. These are the papers that support the 39”SLR.”

The stated basis that the CRC Report authors are using to justify their projected acceleration, are **expectations**. And these “Expectations of an increase in the rate of sea-level rise in this century are based primarily on *projections* of increases in temperature, *and* increasing rates of glacial ice melting.”

In other words, *some* computer models say that these things **might** happen.

How many of these SLR models (including those from the IPCC) have been independently and rigorously validated? *None that we are aware of.*

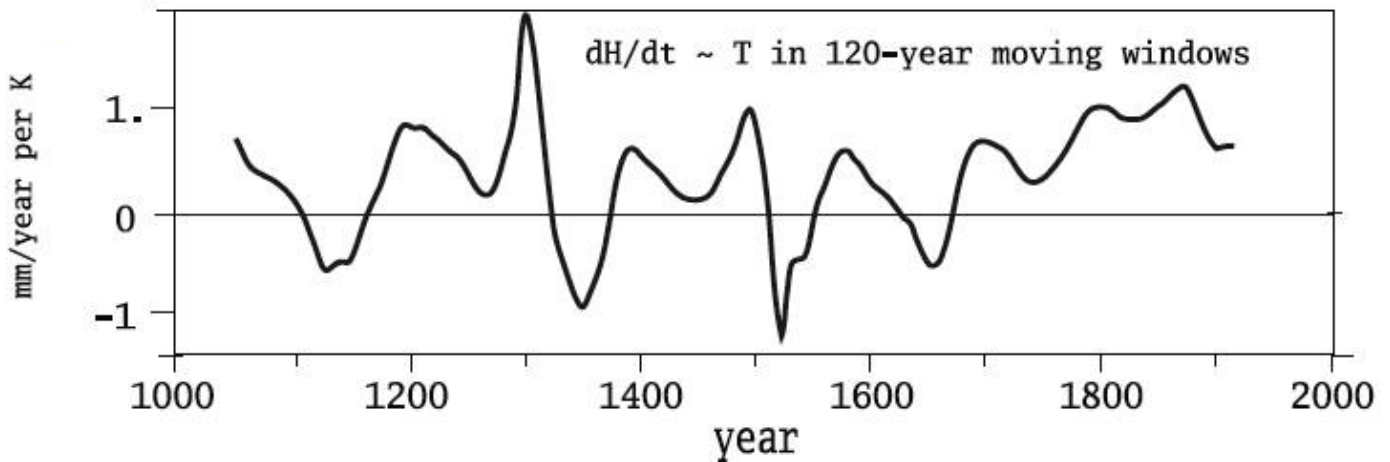
“The extreme estimates of Rahmstorf et. al. are likely based on climate sensitivity that has not shown up since 1993. The 3.2 mm/year estimate from the Jason data is clearly not accurate as the current 13 month average appears to be less than 1 mm/year.

“A real-world projection based on actual satellite data and low climate sensitivity would match the *low* estimates of the 2007 IPCC predictions.”

In any case it’s good that the Panel is more carefully spelling out the rationale for their guesses, as these were not made very clear in the original *Report*.

What they are still not saying is that: **1)** the computer models have yet to show consistent results in predicting anything in this area [in fact almost none of the predictions have matched observations beyond their calibration periods], and **2)** on every iteration of their reports so far, the IPCC has *reduced* their projections for SLR, not increased them.

Additionally their expectation is built on another unproven assumption: *that there is some linear relationship between SLR and increased global temperatures*. Unfortunately for the Panel, independent [studies](#) have refuted this assumption. Below is a sample graph from one such report.



This is the plotted relationship between global mean temperature and global mean sea level. *Where is there any linearity?*

Lastly a significant concern is the degree of accuracy claimed by some of these experts (e.g. in Tables 1 & 2). That annual SLR can supposedly be measured in hundredths of a millimeter simply strains all credulity. What such claims really indicate is the scientific immaturity of the whole field of SLR.

CONCLUSION: *This answer does explain the Panel's opinions about the future, but it is **not** a satisfactory explanation for those of us who expect to see objective, empirical evidence as the basis for future NC coastal policy changes.*

3 - Why does the report accept the IPCC's AR4 emissions and temperature projections, but not the IPCC's SLR projections?

The first part of the Addendum's answer to this question is worthy of note: "IPCC AR4 (2007) emissions and temperature projections have been shown to be relatively accurate, with observed temperature increase following the maximum rate of the projected increase."

This was and is the starting point to make readers believe that IPCC predictions are accurate — *but the opposite is actually the case.*

One SLR expert wrote me:

"As everyone closely following this matter knows, IPCC predicted a rise of global mean temperature of 0.2°C per decade, due to CO₂ increase. However, the temperature had fallen slightly (or has stagnated) the last 15 years *despite* increasing CO₂ concentration (which rose 2 ppm/year). How the authors can state that temperature and CO₂ emissions are predicted "relatively accurate" is hard to understand.

“The IPCC estimated that they could add -0.01 m to 0.17 m to its high-scenario 95%-confidence level of 0.59 m. So, their maximum 95%-confidence limit could be as much as 0.76 m. By accepting a rise as great as 0.76 m, one has to assume the maximum of 6 CO₂ emissions and temperature increase scenarios of IPCC, take the 95%-confidence limit, that has only 1 chance in 40 of being exceeded, and add the maximum level that IPCC says that Greenland and Antarctica could contribute.

“The CRC Panel projects a 1.00 m SLR, over 30% higher than the absolute maximum projected by the IPCC SLR experts.”

The Addendum also says: “It has since been shown that the contribution of melting ice sheets (the cryosphere) to SLR is increasing and will likely be a significant contributor to SLR during the 21st century (Rignot et al., 2011)”

It’s a bit confusing that they show a 2011 study as a basis for their 2010 projections. Our *Critique* was about why they wrote what they did in 2010.

Another expert contributed:

“Many studies of mountain glaciers, Greenland, and the Antarctic focus only on the ice melt at the edges and do not consider the accretion of ice beyond the edges. Not including the accretion of snow and ice is misleading, whether intentional or not.”

“In any case the NOAA data seems to say that glaciers have been *increasing* in the most recent time period, so that may cast some doubt on the Panel’s assertion here.”

CONCLUSION: *This answer does **not** explain why the Panel’s projection is over 30% higher than the highest, most speculative IPCC numbers.*

4 - How does updated work by Church & White, Rahmstorf, and others affect the Panel's assessment?

Not sure where this question came from. Why not ask: “How does the updated work by Holgate and others affect the Panel’s assessment?”

We did state in the *Critique* that Rahmstorf’s 2009 SLR projections were less than his 2007 SLR guesses, and asked why the 2010 CRC Report did not include those figures. Unfortunately this *Addendum* studiously avoids answering that raised question.

We again must again object to the Panel's continued heavy reliance on the work of researcher Rahmstorf. The oceanography literature is replete with numerous criticisms of his speculative and selective methodology — yet the Panel seems oblivious to this reality. A few examples:

"Rahmstorf (2007) presented an approach ... based on a proposed linear relationship ... We find no such linear relationship. Although we agree that there is considerable uncertainty in the prediction of future sea-level rise, this approach does not meaningfully contribute to quantifying that uncertainty"

[Holgate, S., Jevrejeva, S., Woodworth, P., and Brewer, S., 2007. Comment on "A semi-empirical approach to projecting future sea level rise." Science, 317, 1866.](#)

"... this statistical analysis (Rahmstorf, 2007) is based on an application of statistics ... violating basic assumptions of the statistical methods used."

[Schmith, T., Johansen, S., and Thejll, 2007. Comment on "A Semi-Empirical Approach to projecting Future Sea-Level Rise", Science, 317, 1866c.](#)

"Rahmstorf and Vermeer (2011) have been selective in showing only data that appear to match their modeling and not the data that strongly disagree"

[Houston, J.R. and Dean, R.G., 2011b. Discussion of "Sea-Level Acceleration Based on U.S. Tide Gauges and Extensions of Previous Global-Gauge Analyses" by J.R. Houston and R.G. Dean \(Journal of Coastal Research, 27\[3\], 409-417, 2011\): Response to Discussion by S. Rahmstorf and M. Vermeer \(2011\).](#)

"No physically-based information is contained in such models ..." and "The physical basis for the large estimates from these semi-empirical models is therefore currently lacking."

[IPCC \(International Panel on Climate Change\), 2010. Workshop Report of the Intergovernmental Panel on Climate Change Workshop on Sea Level Rise and Ice Sheet Instabilities \[Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S. Allen, and P.M. Midgley \(eds.\)\]. IPCC Working Group I Technical Support Unit, University of Bern \(Switzerland\) \[This was based on a meeting of 100 sea level and climate change experts.\]](#)

"Put in simple terms, Rahmstorf hypothesis, apart from being dubious from the statistical point of view, it is not being confirmed by the most recent ice-sheet and glacier models. Those physically-based models, as opposed to the statistical framework of Rahmstorf, indicate a much lower increase of global sea-level as a function of increasing temperature." — [Dr. Eduardo Zorita](#)

Tom Moriarty has a 12-part [series](#) that devastates Rahmstorf (2007), as well as Vermeer and Rahmstorf (2009).

We do agree with "the Panel's position that high quality data sets with good spatial and temporal coverage are needed to support sea-level rise studies."

Unfortunately, manipulating the satellite data has become the next tactic dujour as is explained [here](#), so true scientists need to be ever vigilant.

CONCLUSION: *This answer does **not** explain why the Panel is enamored with an outlying researcher who is making highly speculative projections.*

5 - Summary

The concluding section of the *Addendum* states: “It is helpful to put the North Carolina SLR Assessment Report into perspective.”

We are in full concurrence with that position, but do not consider an “appeal to authority” (what follows in the *Addendum’s* Summary) to be the proper perspective. Consensus is the basis for politics, not science. If the Panel has a strong case to make for their insistence on a 39” SLR by 2100, then make it.

To say some people in some other states agree, is not proof of anything. The ironic thing is that some of these other states are likely justifying their specious claims based on what the NC CRC Panel did — circular reasoning.

Our Summary of the CRC Panel’s Addendum:

Despite this *Addendum*, essentially all of the deficiencies identified in the original *Critique* (see page 3, above) remain unaddressed and unmitigated.

The Panel has mistakenly chosen to put essentially all of their eggs into the Rahmstorf/Church (et. al.) basket. There are two fatal flaws with this strong reliance on Rahmstorf and others with similar predispositions:

- 1 - their future SLR guesses have no assigned probability, so their conclusions are **not applicable for determining coastal policy**, plus
- 2 - their SLR methodology is speculative, unsound, and unproven.

In addition to what appears in the body here, a further explanation of each of these critical points is provided in Appendix 1, Appendix 2a and Appendix 2b.

The *Addendum* should have corrected the contradictory messages about **probability** that were in the original Report. On the one hand ([page 12](#)) they correctly state that they do **not** have sufficient scientific data to establish probabilities for their SLR projections.

Yet in other places (e.g. also page 12!) they make very probabilistic assertions that are totally inconsistent with not having such probability (e.g. “A 39 inch rise is considered **likely**...”). Since the term “likely” indicates a probability of over 50%, it appears that they are trying to have it both ways.

Consider this recent paper ([Exposing Compounding Uncertainties in Sea Level Rise Assessments](#)), which is specifically about the Carolina coastline. It shows this interesting table of uncertainties, and then makes some relevant comments:

Table 1. *Compounding uncertainties in SLR assessments. SLR, sea level rise; DEMs, digital elevation models.*

Compounding Uncertainties	Key Uncertainties	Uncertainties in the Carolinas	Research Priorities
1. Measuring and monitoring sea level	Geographical bias in distribution of tide stations	Most tide stations with records exceeding 50 y are located near large cities	Establish long-term tide stations/satellite altimetry where data are limited
	Determining correction factors for vertical movement of land	Well understood in the Carolinas	Improve understanding of vertical movements of land where data are limited
	Nonuniform data quality	Springmaid Pier, South Carolina: Questionable data during early 1970s	Standardize methods and report periods of questionable data
2. Determining trends in sea level change	Short-term sea level variability.		
	Sensitivity of trend analysis to start and end date	Springmaid Pier, South Carolina 1957–99: 5.17 ± 0.49 mm/y 1957–2006: 4.09 ± 0.76 mm/y	Report sea level trends using similar start and end dates when comparing regional changes in sea level
3. Predicting sea level change		Few tide gauge stations with measurements greater than 50 y	Establish long-term sea level measurements where data are inadequate
	Selection of statistical test and data to quantify long-term changes in sea level		
4. Predicting shoreline change	Abrupt climate change, climate sensitivity, future temperature change, Greenland and Antarctica, SLR budget	Limited ability to predict the rate and magnitude of sea level change	Improve understanding of the sea level budget, including the factors and their interactions; scenario analysis
5. Modeling coastal elevations	Shoreline response to climate change, including SLR	Limited understanding of how shorelines will respond to climate change	Improve understanding of how different shorelines will respond to change
	Biological processes	Lack of understanding of the factors and interactions that guide the formation and response of coastal wetlands to SLR	Collect information on sedimentation rates, hydrology, tides, and salinity; identify tolerances and thresholds
	Human dimensions	Limited understanding of (1) coastal manager data and information needs; (2) perceptions of SLR; (3) level of risk society is willing to accept; (4) tradeoffs that will arise with allocation of scarce resources; (5) population and land use changes	Identification of data and information needs of coastal managers, perceptions of SLR, levels of risk society is willing to accept, tradeoffs that will arise with the allocation of scarce resources
6. Quantifying impacts	Accuracy and sensitivity of existing elevation data to model SLR scenarios	Vertical elevation error for 1:24000 DEMs ranges from 1 to 4 m in Charleston, South Carolina	Obtain higher resolution DEMs; improve accuracy of existing DEMs by using source data (e.g., land cover)
	Inadequate methods to quantify the “Hidden costs of coastal hazards”	Limited ability to quantify interruptions to businesses, families, and long-term health issues; loss of ecosystem services	Develop methods to make noneconomic and economic values and losses compatible

“It is not apparent that we can quantify all of the sources and types of compounding uncertainties in SLR assessments. These challenges arise mainly from two factors.

“**First**, we do not know how to quantify all of the individual sources of uncertainty. The accuracy of DEMs, tidal gauge records, and census data can all be quantified, yet it is not apparent that we know how to quantify all of the uncertainties associated with shoreline change.

“**Second**, even if each source of uncertainty could be quantified, current methods do not allow us to quantify the magnitude of compounding uncertainties.

“Although it is possible to quantify compounding uncertainties involved in determining the population at risk to SLR, since population data and DEM accuracy are both based on probability distributions, it is not possible to integrate other sources of uncertainty such as shoreline erosion or changes in policy into this calculation. A review of the state of SLR research along the Carolina coastline indicated that critical gaps and uncertainties remain in our understanding of SLR.”

So it would have been refreshingly honest if the *Addendum* came right out and said the truth: **“This 39 inch SLR number is just a guess, and this conjecture is based on several unproven assumptions. As such it should not be the basis for any NC policy changes.”**

The *Addendum* could then have ended on a positive note, advocating that NC commission a genuine scientific assessment of the NC SLR situation.

An excellent [report](#) was recently published about what such an assessment should include to be considered scientific. Note the six “Best Practices” listed:

- 1) Aim for falsifiability,
- 2) Take care of Transparency and Reproducibility,
- 3) Include perspectives from opposing schools of thought,
- 4) Avoid unnecessary controversy related to jargon,
- 5) Make appropriate use of statistical methods, and
- 6) Use available data to test old as well as new predictions.

So, if the *Addendum* had made those honest admissions, as well as those sound recommendations, we’d all be on the same page. We could then move forward in making a genuine “scientific assessment” of the NC SLR issue, using the “best available science” — which are the stated objectives in the original *CRC Report*.

Our fervent hope is that this will happen with *Addendum II*.

John Droz, jr,

Physicist & environmental advocate; Morehead City, North Carolina

Senior Fellow: [American Tradition Institute](#)

[NC-20](#) Board of Directors, and Science Advisor

Let’s end this part by quoting more from the [WSJ article](#) we started with:

“Authors, journalists, politicians and scientists compete in their portrayal of abomination, and claim for themselves a hyper-lucidity: they alone see the future clearly while others vegetate in the darkness. The fear that these intellectuals spread is like a gluttonous enzyme that swallows up an anxiety, feeds on it, and then leaves it behind for new ones... A time-honored strategy of cataclysmic discourse, whether performed by preachers or by propagandists, is the retroactive correction... Another result of the doomsayers' certainty is that their preaching, by inoculating us against the poison of terror, brings about petrification. This may even be the goal of the noisy panic: to dazzle us in order to make us docile.”

Appendix 1

This was written by [Dr. James Houston](#) (Director Emeritus, Engineer Research and Development Center, US Army Corps of Engineers) specifically about the *Addendum to the CRC 2010 NC SLR Assessment Report*. He criticized the Rahmstorf et. al. numbers as being specious, but advocated emphasizing an even more important point...

Rather than show the numbers to be wrong, show they are irrelevant. **Numbers without probabilities are irrelevant!**

Suppose I project a 100 meter flood should a meteor hit the Atlantic off NC. It would be difficult to show the number is wrong because a hit is possible, and should it strike close enough, 100 meters is possible. Even the ultra conservative Nuclear Regulatory Commission does not design for such an event — so why would NC consider it?

Their response may be that it is not possible to determine probabilities, and that is why they use a range of possible SLRs. The answer to that should be that IPCC determines probabilities, and a number without a probability is valueless. Without an associated probability, we don't know if the bottom number in the report has 1 chance in a billion of being equaled/exceeded, or 99 chances in 100 of being equaled/exceeded.

A telling question is to ask the probabilities of exceedance for the sea level rises they project for the 21st century. None of the typical projections (e.g. Rahmstorf) have associated exceedance probabilities, but are guesses of maximum possible rises. However, **no one uses maximum possible projections for planning/design.**

IPCC projections all have exceedance probabilities. The primary reason that IPCC projections are less than Rahmstorf, etc, is not due to IPCC's lack of fully considering Greenland/Antarctic contributions, or because there is new knowledge. The primary difference is due to the fact that IPCC projections are apples (*they have probabilities*) and Rahmstorf, etc., projections are oranges (*they lack probabilities and are typically maximum possible rises*).

Of course a **maximum** possible projection is going to be larger than the IPCC's 95%-confidence level projection that has a 2.5% chance of exceedance!

Typical projects in North Carolina plan and design for a 100-year flood (1% annual chance annually in being equaled or exceeded). The 100-year flood has a 63% chance of being exceeded in a 100-year period [(1 minus .01 to the 100th power) X 100%]. One cannot couple 100-year flood data with sea level rise data whose probability is unknown. We don't consider the maximum possible hurricane or even the 100,000-year hurricane for typical coastal planning, so why would we consider maximum possible sea level rise levels?

By the way, the Dutch design for the 10,000-year storm and do not use Rahmstorf, etc., because they know these studies have no associated probabilities. Similarly, the UK designed the flood defenses for London based on a 1,000-year storm - also not using maximum possible projections that lack probabilities.

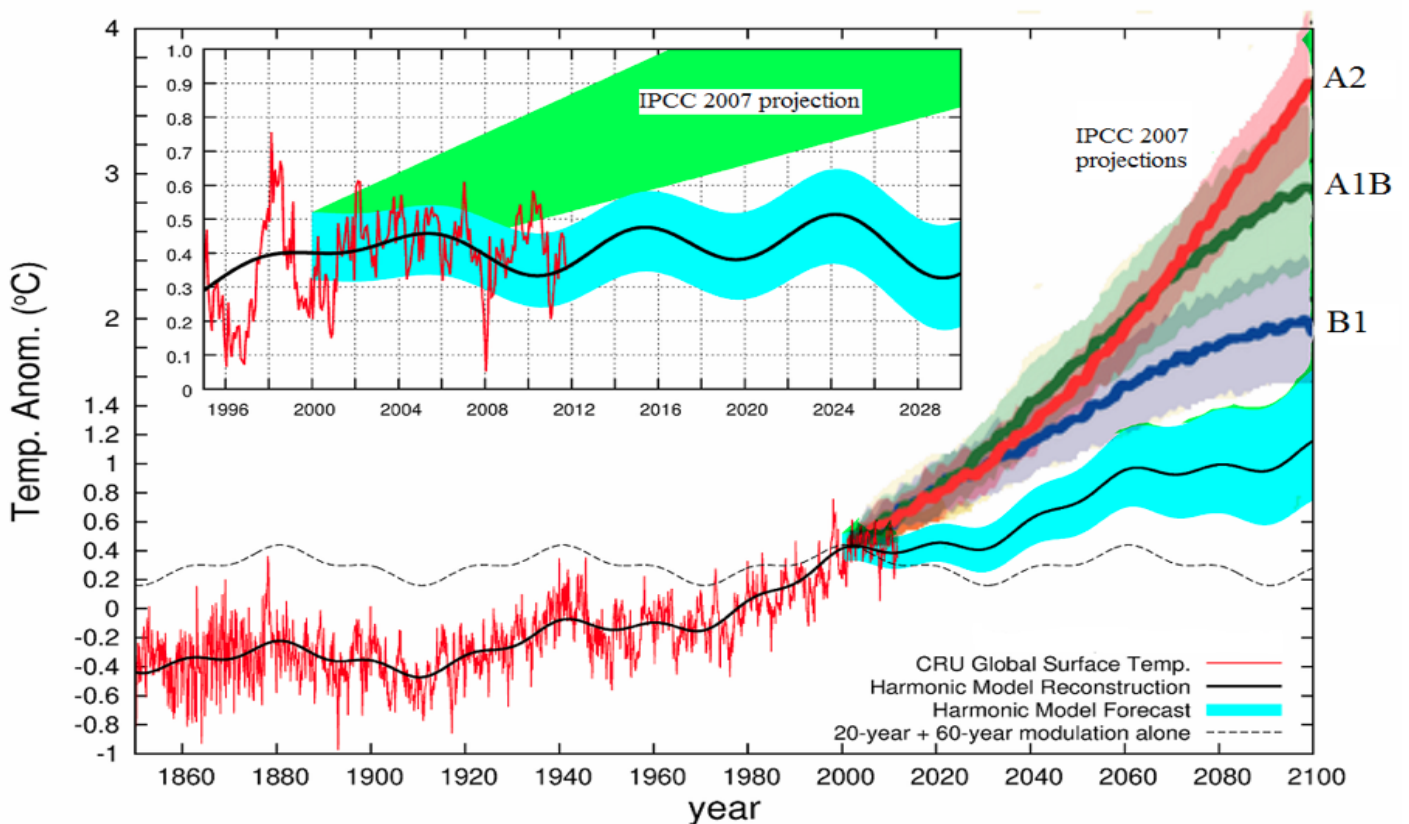
Appendix 2a

From Duke University physicist [Dr. Nicola Scafetta](#) (who is currently studying solar and astronomical causes of climate change):

There are new studies that are stressing the importance in climate systems of a significant natural cyclical variability (for example, decadal, bidecadal and 60-year cycles, but also secular and millennial cycles).

The IPCC models have been tested on whether they are able to reproduce such a variability and **they have failed** (e.g. see my paper, below). The 60 year cycle was in its warming phase from 1970 to 2000, which was misinterpreted by the scientific climate community as a sudden acceleration in the warming due to human activity. This erroneous belief is behind the calibration of the climate models used for the 21st projections. However, the temperature has been steady since 2000 while the IPCC model projected a significant warming at a rate of about $+0.2$ °C/decade. In fact, the 60-year cycle turned into its cooling phase which also explains the relative absence of SLR since about 2000.

Preliminary studies that take into account this natural variability imply that the IPCC projections for the 21st century are significantly overestimated — by something like **a factor of about two or three!** Thus whatever is deduced from the current IPCC projections (such as the 21st century SLR projections) may be wrong by the same factor, when using the same physical assumptions.



Alternative interpretations of climate change based on natural cyclical variability are being developed, and at the moment, they are found to agree with the data *much better than the IPCC models*. The projection results based on this new understanding **significantly** differ from the IPCC results. In a few years the problems will be fully clarified.

Thus, given the enormous costs of erroneous policies may have on the society, a reasonable message needs to be: *“let us wait at least 5 years to see how science will develop. There is no need to hurry, as the temperature and the SLR is not rising in any dangerous way!”*

Sample Cyclical Variability Studies

N. Scafetta, (2012). “Testing an astronomically based decadal-scale empirical harmonic climate model versus the IPCC (2007) general circulation climate models” [Journal of Atmospheric and Solar-Terrestrial Physics](#), in press. DOI: 10.1016/j.jastp.2011.12.005.

[This shows that all IPCC general circulation models do not reproduce the decadal and multi-decadal cycles (9.1, 10-11, 20, 60 year) observed in the temperature since 1850. The paper also proposes alternative projections for the 21st century based on the assumption that these cycles continue in the 21st century.]

Concerning the topic of sea level rise there are several studies where the cycles are observed. For example:

Jevrejeva, S., Moore, J.C., Grinsted, A., Woodworth, P.L., 2008. [Recent global sea level acceleration started over 200 years ago?](#) *Geophysical Research Letters* 35, L08715, where the 60-year cycle in the sea level rise is quite clear.

About the millennial cycle and other secular cycles in the climate system there is a lot of information here:

N. Scafetta, “Multi-scale harmonic model for solar and climate cyclical variation throughout the Holocene based on Jupiter-Saturn tidal frequencies plus the 11-year solar dynamo cycle.” [Journal of Atmospheric and Solar-Terrestrial Physics](#) in press (2012).

Humlum, O., Solheim, J.-K., Stordahl, K., 2011. Identifying natural contributions to late Holocene climate change. [Global and Planetary Change](#) 79, 145–156.

Appendix 2b

The [Yale Climate Change Forum](#) has another critique about the unsoundness of Rahmstorf's methodology — which is the foundation of the CRC Panel's SLR speculation. The author is [Tom Moriarty](#), a Senior Scientist at the US Department of Energy's National Renewable Energy Laboratory, and a SLR expert. Note that this discussion started with an article about the *CRC 2010 NC SLR Assessment Report*...

Despite Sara Peach's appeal to *the NC 2010 SLR Assessment Report's* list of peer reviewed sources, there are very few actual peer-reviewed sources for that report.

One of those fundamental peer reviewed sources was Vermeer and Rahmstorf (PNAS, 2009). This paper is so profoundly flawed that it makes a mockery of the peer review process.

The Vermeer/Rahmstorf model is of the form: $dH/dt = a(T(t) - T_0) + bDT/dt$
Where H is sea level and a, T_0 and b are fit parameters

They fit their model to 120 years of historical temperature and sea level data. This is not super-computer stuff, and anybody can reproduce their results on their home PC. I have. Once the best fit values of a, T_0 , and b were found they applied the model to IPCC temperature scenarios for the 21st century to make sea level rise projections.

The odd thing is, they found b to be negative. It is not just me who finds this odd – Vermeer expressed this point himself. In an online forum he says “negative b. Hmmm, strange. That was for real data from the real Earth.”

Undaunted, they plowed ahead, giving a very limp plausibility explanation for the negative “b.” (Funny though, I wonder if they would have felt the need to give a plausibility argument if b had been positive. They apparently did not feel the need to ‘explain’ the signs of a or T_0 .)

Their plausibility argument goes something like this: Rapidly increasing temperatures (dT/dt is large) causes a delayed response in glaciers moving into the sea, which causes a delayed sea level rise, which explains a negative b. But that explanation is ridiculously flawed, because a negative b doesn't just result in a delayed of sea level rise increase – it actually REDUCES the sea level rise rate for a set of realistic temperature scenarios. For example, take any IPCC temperature scenario for the 21st century for the 21st century, $T(t)$ and apply Vermeer's and Rahmstorf's model to it to derive dH/dt . Now consider dH'/dt by adding this to it: $T'(t) = C \exp(-a/b) \Gamma(t-t')$

You can choose C and gamma such that $T(t) + T'(t)$ is a realistic temperature scenario when compared the many IPCC temperature scenarios for the 21st. Of course, a and b are defined by Vermeer and Rahmstorf.

Let's assume C is positive. If you choose $\gamma=1$, you will get a temperature scenario such where $T(t) + T'(t)$ is greater than $T(t)$ for all t, yet dH'/dt will be exactly the same as dH/dt .

This is true even if you relax the necessity of choosing C and γ to yield a realistic $T(t) + T'(t)$ (say an additional 1 degree increase for the 21st century over $T(t)$). You could make the temperature go up 10 degrees or a 100 degrees – it won't make any difference to the Vermeer's and Rahmstorf's model – dH'/dt will be exactly the same as dH/dt .

Now suppose you choose $\gamma > 1$. Start by choosing C and γ to yield a realistic $T'(t)$ (say an extra half a degree or degree by the end of the 21st century). You will find the bizarre situation where $T(t) + T'(t)$ is greater than $T(t)$ for the entire 21st century, but dH'/dt is lower than dH/dt for the entire 21st century. Now choose ridiculous values of C and/or γ (say $T'(t)$ adds 100 degrees over the 21st century) and you will see dH'/dt plummeting while sea level rise rates skyrocket.

The reverse situation is true if you choose $\gamma < 1$. You will find $T(t) + T'(t)$ is less than $T(t)$ for the entire 21st century, but dH'/dt is greater than dH/dt for the entire 21st century.

This is the math speaking, not me. It is a direct result of Vermeer's and Rahmstorf's model and a negative b. It is incontrovertible. Yet somehow their paper passed peer review.

The Vermeer/Rahmstorf model is the progeny of Rahmstorf's simpler 2007 model (Science, 2007). Presumably, this Science paper also passed peer review. However, six months after it was published Rahmstorf kindly sent me the code he used, and noted "you are the first outside person to test this code."

Huh? I thought it had been peer reviewed!

Apparently any peer review of this fundamental part of the Science paper must have been done by some "inside" person.

My conclusion from the Climategate emails is that there is one type of peer review for the "inside" and a different type of review for the "outside."

Anyway, if you are interested, you can see an examples of the bizarre results of Vermeer and Rahmstorf's model [here](#).

Be sure to check my math [here](#)...

Or for a broader long-winded, overview see [this](#).

— continued —

A reader ("Xerxes") then objected to some of what Tom Moriarty wrote (above):

The first term in Vermeer and Rahmstorf's model $a(T(t) - T_0)$ is a linear function describing the expansion of seawater with increasing temperature.

There's no need for a plausibility argument, it's just physics, and a is a positive number because expansion and temperature are directly correlated. The T_0 is just the starting temperature from the year they began the fit.

The second term fits the rate of change of temperature with sea level rise. As they say in the paper, it accounts for the increase in the number of man-made reservoirs. The fact that b is negative, is really not that surprising at all. During times of rapid temperature increases, more water is driven into the atmosphere due to evaporation, which is then trapped by the reservoirs.

But then you make this bizarre substitution of an exponential function for the temperature and claim that you get unrealistic values for dH/dt . The derivative of the exponential function is the exponential function times the coefficient on t , so by setting $\gamma = 1$, you can come up with $dH/dt = 0$ for all time!

You say this is the math speaking, not you. No, this is you pulling a function out of thin air that has no basis in reality, and was never used by Vermeer and Rahmstorf, just so you could attempt to prove your point. They never made this substitution and I'm sure never had any intention to do so. You could just have easily chosen $T(t) = 0$ and gotten the same result.

Your argument is complete and utter nonsense.

Tom Moriarty then promptly replied:

Xerxes,
Thank you for the comments.

Vermeer and Rahmstorf derived the fit values for a , b , and T_0 with 20th century sea level data and temperature data. Once these values were derived, they could apply their model to various temperature projections for the 21st century and make sea level projections.

The IPCC 4th Assessment Report provided 342 different temperature scenarios for the 21st century. They came from 19 different atmosphere-ocean general circulation models, each put through three different carbon cycle feedback models and six different CO₂ emission scenarios. Every one of those 342 temperature scenarios was unique in some way. The point is that the Vermeer/Rahmstorf model should be able to handle any reasonable temperature scenario.

In light of those 342 temperature scenarios there is nothing particularly unusual about my hypothetical scenario. For example, if you look at figure 3, [here](#) you will see three simple scenarios nestled between the IPCC A1T and A1F1 average scenarios used by Vermeer and Rahmstorf. Please take a look. My three simple scenarios are not unusual or outrageous compared with all the other scenarios used by Vermeer and Rahmstorf. They are perfectly reasonable, and the Vermeer/Rahmstorf model should easily handle them.

Now, sea level rise rate can be easily calculated with the Vermeer/Rahmstorf model for all five temperature scenarios shown in figure 3 (The IPCC A1T and A1F1 and my three additional scenarios) Figure 4 shows the results when the Vermeer/Rahmstorf model is applied to those five temperature scenarios. There is no mistake. My three scenarios, which have higher temperatures than the the A1T scenario all for every year of the 21st century yield exactly the same sea level rise rate as the A1T scenario. I could just as easily have created temperature scenarios lower every year that also produced sea level rise rates exactly the same as A1F.

Yes, you are right that choosing "by setting $\gamma = 1$, you can come up with [the additional] $dH/dt = 0$ for all time!" The relevant point is that by setting $\gamma = 1$ you can increase or decrease the temperature (depending on the sign of C) without effecting the the sea level rise rate at all according to the Vermeer/Rahmstorf model! How can that be?

But there is nothing special about $\gamma = 1$. It is chosen only as a simple and obvious example: it changes the temperature without any change in the sea level rise rate. You seem to have grasped the point that the additional sea level rise rate is zero. But the increased temperature does not seem to have sunk in.

But things get even stranger when different values of γ are chosen. If $\gamma > 1$, (and letting C be positive) and adding the result to the IPCC A1T temperature scenario, then the temperature will be HIGHER every year of the century while the sea level rise rate will be LOWER every year of the century.

Conversely if $\gamma < 1$, (and letting C be positive) and adding the result to the IPCC A1T temperature scenario, then the temperature will be LOWER every year of the 21st century while the sea level rise rate will be HIGHER every year of the century. It is incontrovertible.

This is the very reason that the Vermeer/Rahmstorf model must be rejected.