

## ***Interactive comment on “Ice melt, sea level rise and superstorms: evidence from paleoclimate data, climate modeling, and modern observations that 2 °C global warming is highly dangerous” by J. Hansen et al.***

**K.M. Towe**

kmtowe@gmail.com

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As a retired geologist and paleobiologist, I have had time to read, several times, and re-examine the 58 pages of science and the 4 pages of “Implications”. I have read the majority of the “short” comments that have been made, many with pointed concern for deficiencies in the paper. I have read Dr. Thorne’s thorough and well-balanced review. I agree with Dr. Thorne. . .

ANY publication with “highly dangerous” in the title must be considered as an extraor-  
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inary claim, one deserving compelling evidence and support. In this instance the subject is “climate change” and “global warming” in particular. If true, the impact has obvious political, social and economic implications. Within these lengthy pages, compelling evidence in support of this extraordinary claim is difficult to locate, and if it exists it certainly has nowhere been specified. The authors themselves are admittedly uncertain. They use “uncertain” “assumed” and “excessive” repeatedly. The flaws, limitations and unrealistic assumptions are straightforwardly admitted, raised and carefully pointed out.

It is puzzling, even remarkable, that such freely admitted uncertainty and ambiguity by so many co-author scientists would give rise to such a dramatic title and conclusion. Especially so for a scientific paper submitted for PRE-publication peer-review. . .but already openly published.

The title says ‘Evidence from Paleoclimate data’. Yet, there seem to be data that are missing? In the late Eocene, 33 million years ago, CO<sub>2</sub> was almost four times higher than it is today, ~1500 ppm. The oceanic pH was half a unit more “acid” than what it is today. Marine carbonate precipitating organisms, including planktic foraminifera, were forming their calcitic shells as they do today. The Antarctic ice sheet started forming. . .after CO<sub>2</sub> dropped to almost double what it is today. There was a reorganization of the climate/ocean system. The climate was warm and equitable.

“Atmospheric carbon dioxide through the Eocene–Oligocene climate transition” Paul N. Pearson, Gavin L. Foster, Bridget S. Wade *Nature* 461, 1110–1113 (22 October 2009)  
Lee R. Kump (*Nature* 2005 436:333) “Palaeoclimate: Å Foreshadowing the glacial era”. “Seawater pH, pCO and [CO<sub>2</sub> – ] variations in the Caribbean Sea over the last 130 kyr: A boron isotope and B/Ca study of planktic foraminifera.” G.L. Foster *Earth and Planetary Science Letters* 271 (2008) 254–266

This is seemingly relevant “fossil” evidence but was given short shrift. . .not even cited, much less discussed. Because? “. . .we limited marginally pertinent material to avoid

an unacceptably long paper”? Should this paleoclimate evidence, some from the Caribbean, not have some comparative relevance? At least as much as two controversial karst cycle derived "boulder" fragments with possible hurricane or tsunami origins?

“A troubling lesson from the Eocene is that scientists are unable to simulate Eocene climate conditions using climate models designed for the modern climate. When CO<sub>2</sub> levels are raised in the computer models to levels appropriate for what scientists think existed during the Eocene, global temperatures rise but high latitude temperatures do not warm as much as what scientists measure, particularly in winter.” <https://www.learner.org/courses/envsci/unit/text.php?unit=12&secNum=4>.

Given (1) all the various historical worldwide measured temperatures that over the years have been repeatedly examined, culled and seasonally adjusted, mostly down . . .and given (2) the uncertainty surrounding the amplitudes of future natural variability. . . jet streams and ENSO, plus unpredictable explosive volcanic eruptions, how can any such far-reaching forecast from an admittedly uncertain model be regarded as anything but uncertain itself?

Yes, such revised model analysis is a necessary experiment and a useful model exercise. But, surely this is not yet one that rises to a level requiring reader, editorial, and policy maker acceptance of such an extraordinary claim. It is easy to agree with Dr. Thorne: “further analyses are required to reach such a point.” It is easy to agree with Dr. de Rougement: “To speak of a possibility does not imply that the event is probable.” And especially easy to disagree with Mr. Nissen and his misuse of “Compelling”

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Interactive comment on Atmos. Chem. Phys. Discuss., 15, 20059, 2015.