

## ***Interactive comment on “Agnotology: learning from mistakes” by R. E. Benestad et al.***

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Received and published: 4 July 2013

This discussion is dominated by a clash between two factions of climate science which both adhere to pre-world war scientific paradigms. Both ignore well-established insights about the dynamics of complex natural systems originating from Kolmogorov’s discovery of the importance of scaling laws in physics and brought to maturity by Mandelbrot.

Nicola Scafetta advocates the view that oscillations in the climate system (including their phase) have to be predictable. But there is no physical justification for such an assumption. A toy-model counterexample is a damped harmonic oscillator subject to a stochastic force. The oscillator could be a natural mode in the climate system and the stochastic force could be the forcing of global temperature from atmospheric weather systems. This stochastically forced oscillator has a preferred frequency, but the phase

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will drift chaotically. If the physics of a climate oscillation is of this nature any theory that predicts the phase must be wrong, as will any theory that contends it can predict what is unpredictable. My personal impression is that many of Scafetta's theories belong here.

Scafetta contends that any theory (e.g., the GCM-type climate models) that cannot predict the phase of climate oscillations "are flawed in the sense they are missing something". The basis for his conclusion, however, is an unspoken assumption that the oscillation is not internal with a stochastic drift of phase, but driven by, and synchronized with, some (mystical) external forcing. This is one of a myriad of conclusions in Scafetta's work that are implicitly based on untold biases and assumptions.

Rasmus Benestad, on the other hand, recognizes the existence of chaotic unpredictability, but believes that this precludes the existence of long-term persistence (LTP). Such persistence may give rise to large internal variability on long time scales that can be incorrectly interpreted as forced trends. This, and other strange ideas about the dynamics of complex systems can be found in dr. Benestad's blog contributions in the debate about LTP on [climatedialogue.com](#). Benestad misses the well-known fact that even though microstates can be unpredictable due to chaos, complex systems ubiquitously exhibit self-organization and order on macroscale. What about the red spot on Jupiter? According to Benestad it does not exist because Jupiter's weather systems are chaotic. He claims that the omnipresence of self-similar scaling in many geophysical systems is an illusion because the various systems are governed by different physics. By this statement he dismisses completely statistical physics where deep universal laws emerge from statistical principles and largely independent of first physical principles.

The existence of emergent laws, arising on increasingly higher level of description of complex systems, and which cannot be deduced in a straightforward way from the microscopic laws of physics, is perhaps the most fundamental new insight in physics since quantum theory. I recommend reading of the introductory chapter in the recent book

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by S. Lovejoy and D. Schertzer: Weather and climate: emergent laws and multifractal cascades.

In different ways, Scafetta and Benestad are both “denialists” in the sense that they keep on refuting to accept modern scientific developments. Ironically, by perpetuating ignoring these insights they both contribute to the cultural production of ignorance. Benestad seems to have learnt very little about long-term persistence during the seven years since he wrote his first blog on RealClimate the Cohn and Lins paper, so in that context he does not seem to be the right person to write about “learning from mistakes.”

There is need for debate around the paradigms underlying climate science. This paper, and this discussion, has not served the purpose very well.

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Interactive comment on Earth Syst. Dynam. Discuss., 4, 451, 2013.

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