

## ON PREDICTING CALAMITIES

Reading the recent lead article in *Science* on “Climate Impact of Increasing Atmospheric Carbon Dioxide” by Hansen *et al.* (1981) made me reflect on the growing problem of how to separate good science from good fiction, especially when the press coverage usually picks up the latter. The first 7 pages of this paper are results of sound scientific analysis of two well posed questions: What has been the history of earth’s surface temperature in the last century and how can one explain the significant departures from the normal? The authors invoke the changes in the atmospheric CO<sub>2</sub>, stratospheric dust and solar activity as the three pacing variables and are able to ‘reproduce’ most of global temperature excursions of the last 100 years. The analysis can be called good science although it will be challenged by many of our colleagues who have yet to understand how does one get the “average global temperature” in the first place, what is the ‘real’ evidence of variation in the solar flux in the past decades and how good are the atmospheric models in which cloud feed back is ignored.

However the big problem with the paper is when the authors proceed to project into the future and begin to talk about the impending calamities such as “global warming of almost unprecedented magnitude which would approach the warmth of mesozoic, the age of dinosaur” “hot dry conditions in western U.S., Canada and large part of Central Asia”, “rise of sea level by 5 to 6 m flooding 25% of Louisiana and Florida and 10% of New Jersey”. It is ironical that on the same page the authors do mention a number of caveats: “Models do not yet accurately simulate many parts of the climate system especially the ocean, clouds, polar sea ice, and ice sheets. Evidence from past climate is also limited, since the few recent warm periods were not as extreme as the warming projected to accompany full use of fossil fuels, and the climate forcings and rate of climate change may have been different”. To this we can add others. Is it established that as much as 50% of all CO<sub>2</sub> added to the atmosphere *will* stay in the atmosphere? Do we know anything about the deep ocean circulation and its effect on modulating global climate in the time scale of a century? Do we have any estimates for the melting time of polar ice which are better than a factor of 10? The question I have been asking myself is how, despite all of these caveats, can a thoughtful scientist proceed to make such precise predictions for the year 2020?

I guess the answer lies in the fact that some of us feel compelled to emphasize the worst case in order to get the attention of the decision makers who control the funding. However, at the same time, by not giving equal weight to both sides of the argument our scientific credibility erodes somewhat. In the process, the situation in the areas of earthquake and climate research is getting particularly sad because both the funding *and* credibility seem to be going down.

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**Reference**

Hansen, J. *et al.*: 1981, *Science* **213**, 957.