

in reducing eutrophication in the Baltic Sea. The session on "Hydrological modeling, water management and extreme hydrological events" featured presentations on the variability of extreme events like storm surges, droughts and extreme precipitation, and recent attempts to forecast those events. A new project to exploit high-resolution modeling of surface currents for environmental management of the Baltic Sea (optimization of ship routing, identification of environmental risk areas, etc.) was introduced in several presentations. A dedicated session on "Regional adaptation to climate change" presented examples of regional adaptation projects in northern Europe. A special highlight was a multimedia presentation designed to be presented in a multimedia theatre dome, with the aim of demonstrating scientific findings on global and regional climate change in a comprehensive way to non-experts.

The conference was jointly organized by the Institute of Oceanology in Sopot, the University of Szczecin, the Research Centre of Agriculture and Forest Environment, Poznań, the West Pomeranian University of Technology, Szczecin (all Poland), and the International BALTEX Secretariat at GKSS Research Centre Geesthacht, Germany. A special journal issue featuring selected full papers presented at the 6th Study Conference on BALTEX will be published by Oceanologia. Further information on BALTEX and the 6th Study Conference, including a proceedings volume containing the extended abstracts of accepted presentations, is available at the BALTEX web site: www.baltex-research.eu.

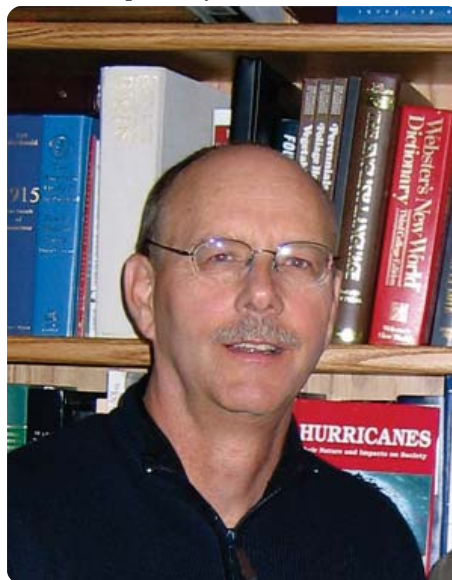
Interview with Roger A. Pielke Sr.

Hans von Storch

Roger A. Pielke Sr. is currently a Senior Research Scientist at the Cooperative Institute for Research in Environmental Sciences (CIRES) at the University of Colorado and a Professor Emeritus of the Department of Atmospheric Science, Colorado State University. Pielke has studied weather and climate on local, regional and global scales using both models and observations throughout an over 40 year career. He has authored, co-authored and co-edited several books including "Mesoscale Meteorological Modeling" (1984; 2002), "The Hurricane" (1990), "Human Impacts on Weather and Climate" (1995; 2006), "Hurricanes: Their Nature and Impacts" (1997) and "Storms" (1999). Roger Pielke Sr. was elected a Fellow of the AMS in 1982 and a Fellow of the

American Geophysical Union in 2004. He has served as Chief Editor of the Monthly Weather Review and Co-Chief Editor of the Journal of the Atmospheric Sciences. He is currently serving on the AGU Focus Group on Natural Hazards (August 2009-present) and the AMS Committee on Planned and Inadvertent Weather Modification (October 2009-present). Dr. Pielke has also published over 350 papers in peer-reviewed journals, 50 chapters in books, and made over 700 presentations during his career to date. A listing of papers can be viewed at the project website:

<http://cires.colorado.edu/science/groups/pielke/pubs/>. He is among one of three faculty and one of four members listed by ISI HighlyCited in Geosciences at Colorado State University and the University of Colorado at Boulder, respectively.



Roger A. Pielke Sr.

Prof Pielke, you are an atmospheric scientist - what were the main scientific issues you have tackled in your long professional career?

Our research team has investigated a wide range of climate processes. This includes studies in meteorology, hydrology, ecology and oceanography. Among our findings has been the clear demonstration of the close coupling between land surface processes and weather. I have also worked extensively to improve our understanding of the transport and dispersion of air pollution, as well as ways to reduce the risk from this environmental hazard.

How do you weigh the role and the potentials of models?

Models are powerful tools with which to understand how the climate system works on multi-decadal time scale as long as there are

observations to compare reality with the model simulations. However, when they are used for predictions of environmental and societal impacts decades from now in which there is no data to validate them, such as the IPCC predictions decades into the future, they present a level of forecast skill to policymakers that does not exist. These predictions are, in reality model sensitivity studies and as such this major limitation in their use as predictions needs to be emphasized. Unless accompanied by an adequate recognition of this large uncertainty they imply a confidence in the skill of the results that does not present.

You have become known for dissenting views in the present debate about the perspective of anthropogenic climate change. For example, you stress the role of land uses changes as another key driver in influencing our climate. Could you outline your position?

My perspective is summarized in a recent publication with 18 other Fellows of the American Geophysical Union in an EOS article titled "Climate change: The need to consider human forcings besides greenhouse gases" [Pielke Sr. et al., 2009]. We wrote "the 2007 Intergovernmental Panel on Climate Change (IPCC) assessment did not sufficiently acknowledge the importance of these other human climate forcings in altering regional and global climate and their effects on predictability at the regional scale" and because "global climate models do not accurately simulate (or even include) several of these other first order human climate forcings, policymakers must be made aware of the inability of the current generation of models to accurately forecast regional climate risks to resources on multidecadal time scales."

If you were right, how would the range of options for response measures for limiting man-made climate change within certain bounds differ from what is commonly considered?

We need to recognize that the IPCC starts from an inappropriately narrow perspective that the human input greenhouse gases is the dominate environmental concern in the coming decades and then the IPCC presents policymakers with a resulting broad range of expected regional and local impacts. This is, however, at best a flawed significantly, incomplete approach.

The IPCC process should be inverted. In our 2009 EOS article that I referred to above, we recommend that the next assessment phase of the IPCC (and other such

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assessments) broaden its perspective to include all of the human climate forcings. It should also adopt a complementary and precautionary resource based assessment of the vulnerability of critical resources (those affecting water, food, energy, and human and ecosystem health) to environmental variability and change of all types. This should include, but not be limited to, the effects due to all of the natural and human caused climate variations and changes.

After these threats are identified for each resource, then the relative risk from natural- and human-caused climate change (estimated from the GCM projections, but also the historical, paleo-record, and worst case sequences of events) can be compared with other environmental and social risks in order to adopt the optimal mitigation/adaptation strategy.

The issues we should focus on can be summarized in this set of questions:

1. Why is this resource important? How is it used? To what stakeholders is it valuable?
2. What are the key environmental and social variables that influence this resource?
3. What is the sensitivity of this resource to changes in each of these key variables? (this includes, but is not limited to, the sensitivity of the resource to climate variations and change on short (e.g. days); medium (e.g. seasons) and long (e.g. multi-decadal) time scales.
4. What changes (thresholds) in these key variables would have to occur to result in a negative (or positive) response to this resource?
5. What are the best estimates of the probabilities for these changes to occur? What tools are available to quantify the effect of these changes. Can these estimates be skillfully predicted?
6. What actions (adaptation/mitigation) can be undertaken in order to minimize or eliminate the negative consequences of these changes (or to optimize a positive response)?
7. What are specific recommendations for policymakers and other stakeholders?

I have been commissioned as Chief Editor of a set of five books which will apply this bottom-up, resource based perspective.

You have retired a few years ago from your active duty as a professor at Colorado State University. Did retirement present for you a loss of opportunities, for instance with respect to teaching, or an opening of new possibilities?

I continue to work with graduate students

at the University of Colorado, and at other institutions including Purdue University and the University of Alabama at Huntsville. I continue to be active in research and mentoring of younger scientists.

What would you consider the most two significant achievements in your career?

First, the opportunity to mentor graduate students and postdoctoral research staff, a number of who have become leaders in atmospheric and climate science has been an achievement I am proud of. Second, the perspective that climate is an integrated nonlinear physical, chemical and biological system, which requires the understanding of all components of the atmosphere, ocean, land and cryosphere, is starting to become more widely accepted. I have sought to promote this view over the last 20 year. This broader view of climate as a complex, nonlinear geophysical system is more scientifically robust than has been presented in the IPCC reports.

When you look back in time, what were the most significant, exciting or surprising developments in atmospheric science?

The ability to monitor the climate system from space has provided a much better understanding of climate as a system. We also are developing an improved recognition of the difficult challenges we face in seeking to skillfully predict climate decades from now. In terms of negative developments, the bias in the funding of climate science research which tends to exclude perspectives that differ from the IPCC viewpoint is a major concern. Also, the introduction in the last 10-15 years of the publication in peer reviewed research papers of climate forecasts and impacts decades into the futures. Their publication subverts the scientific process since these predictions are not testable until after that time period has elapsed.

Is there a politicization of atmospheric science?

Very definitely. There is a clear intent, for example, in the climate assessment report process to exclude scientists who disagree with the IPCC perspective from research papers and from funding. This was exemplified in the CRU e-mails, but it is a much wider problem as I have documented on my weblog, testimony to the U.S. Congress and in Public Comments.

What constitutes "good" science?

"Good" science is completed when hypotheses are presented and tested with real world data to see if they can be refuted. Unfortunately, the IPCC uses multi-decadal global climate model predictions as a basis

for policy action yet these model predictions cannot be tested since we need to wait decades to obtain the real world data. Even in hindcasts of the last few decades, these models have shown no regional predictive skill.

What is the subjective element in scientific practice? Does culture matter? What is the role of instinct?

Science needs to advance by following the scientific method. This needs to be independent of culture or any other external influence.

For further reading about the opinions and views of Dr. Pielke Sr.'s refer to his blog: <http://pielkeclimatesci.wordpress.com/References>

Pielke, R., Sr., et al. (2009), Climate Change: The Need to Consider Human Forcings Besides Greenhouse Gases, *Eos Trans. AGU*, 90(45), doi:10.1029/2009EO450008.

The opinions presented in the interview do not necessarily represent those of the interviewer or the AGU.