

# BAMS



Bulletin of the American Meteorological Society

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*SURFACE FLUX PROJECT*

*TEACHING ABOUT AEROSOLS*

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## **BIG WIND IN THE WINDY CITY**

**HOW DISASTROUS COULD  
AN URBAN TORNADO BE?**

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# BAMS

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If a large and intense tornado, similar to those observed by "Dopplers On Wheels" over rural areas, crossed an urban or older densely built-up suburban area, extensive damage to structures on an unprecedented scale could occur. In this image of suburban Chicago, swaths of winds exceeding 120, 102, and 76 m s<sup>-1</sup> are shown to extend over a broad area. Nearly all of the thousands of houses within the 76-m s<sup>-1</sup> contours would be destroyed, likely causing numerous fatalities. More details are found in the article by J. Wurman et al., beginning on page 31 of this issue. [Satellite image: USGS; cover illustration: David Gershman (AMS)]

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# READINGS

## GLOBAL WARMING: MYTH OR REALITY?

Marcel Leroux, 2005, 509 pp., \$129.00, hardbound, Springer-Verlag, ISBN 3-540-23909-X

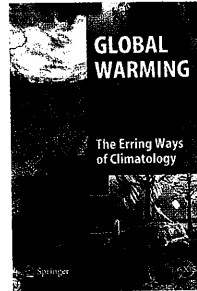
The cover and size of this book hint that it may serve as a bible to those who question that climate change is caused by humans. That would be correct for a part—but only a part—of the book, which is really two books in one.

Marcel Leroux, professor emeritus of climatology in Lyon, France, has long advanced an alternative hypothesis for the general circulation of the atmosphere, one that gives a central role to “Mobile Polar Highs” (MPH), or polar air masses in motion. One purpose of the book is to construct a climatology based on MPHs and explore what phenomena the new scheme can explain. The other purpose is to assert that the greenhouse effect

in the atmosphere does not influence climate change, and thus that humans have no role in contemporary climate changes, which the author asserts are natural.

Beyond these two scientific purposes, the book also criticizes the news media and some scientists for feeding the public the most sensationalistic scenarios of future climates that can be constructed. He is unforgiving with those who feed that journalistic hunger. In a more collegial spirit, he urges the discipline to drop its focus on greenhouse-gas warming, and spend less time on modeling and

more time on developing concepts that may unravel mysteries in climate dynamics. This review will focus only on the two scientific themes.



Leroux wants to construct a theory of general circulation of the atmosphere that is driven by the flow in low levels. He believes that Mobile Polar Highs are a useful concept that can explain the way the weather works. They originate as shallow anticyclones formed by cold air masses that move away from the poles under the influence of gravity, like a density current. The MPH advances through the middle latitudes along a preferred trajectory, pushing aside warmer, moister air, and even reaches the subtropics to sustain the trade-wind belts. While the MPH exists entirely in low levels, the return flow can and does ascend to middle and high levels in the low-pressure zones between neighboring MPHs, where troughs, fronts, and cyclones tend to form. This relatively warm and moist poleward flow, where precipitation and storms are found, is postulated to be driven entirely by the incursion of MPHs. Absent from the scheme are westerly waves, jet streams and jet streaks, and all other upper-air phenomena that a synoptic meteorologist looks for as contributing factors or even precursors of sensible weather.

Leroux partitions atmospheric circulation into six regions called “aerological units” in which MPHs tend to follow the same paths from polar regions into the deep Tropics. Long mountain chains help to divide one aerological unit from another; the region under the influence of the North Atlantic Oscillation

is one such unit. Though he mentions interactions between units, he does not discuss the interactions, and resists notions of global circulations and teleconnections. Leroux downplays well-documented global exchanges of air at middle and high levels.

Leroux extends the MPH concept to explain the advances and retreats of the ice ages. The general circulation is said to be in either a rapid or a slow mode, with north-south (meridional) heat transfers being more frequent in the rapid mode. Glacial climates are dominated by a rapid mode, while interglacial climates, including the present climate, by a slow mode. Leroux deems it significant that the number of MPHs in the Northern Hemisphere has increased since the 1950s: recent Arctic and European climate changes are said to be consequences of this shift. Stronger MPH activity implies more cooling in the western Arctic, though he does not clearly show that the region has cooled. His point is that the present climate is trending toward a rapid mode with more variable and stormy weather, and that the trend is natural.

Similarly, “claimed global warming” is the mean of two different behaviors: cooling along the trajectories of MPHs, and warming everywhere else. The increasing frequency of MPHs, a result of an initial polar cooling, “paradoxically” causes more vigorous transfer of warm air northward. Is the Earth warm-

ing? For Leroux, global warming is a statistical result without real climatic meaning.

The other purpose of the book is to refute the notion that the greenhouse effect plays a key role in climate change at any time. The basic greenhouse effect is a reasonable hypothesis for the author, but “has never been demonstrated as far as climate is concerned.” Leroux gives a brief and informative history of the science of the greenhouse effect and the role of CO<sub>2</sub>; his account should be compared with a book on the subject by Spencer Weart (2003). Leroux’s reporting of the main findings of the Intergovernmental Panel on Climate Change (IPCC) is brief but fair, at least until he passes judgments on them.

Leroux has no doubt that CO<sub>2</sub> and other gases, especially water vapor, exert a greenhouse warming effect. But he regards assumptions that the effect actually does change climate to be a “house of cards.” Water vapor exerts the largest greenhouse effect of all the gases in the atmosphere, he notes, but the IPCC devoted little attention to that fact. Suspicious of that omission, Leroux asks whether water vapor concentrations and the greenhouse warming associated with water vapor might evolve independently of CO<sub>2</sub> concentrations, and demands a careful analysis of the dependence of one on the other.

He does not accept reconstructions of temperature covering the past 1,000 years, mainly because he deems that instrumental data and proxy records are incompatible. He rejects the famous “hockey stick” curve of Mann (1999) as suffering from incorrect, and perhaps deceptive, handling of data. [Leroux points out that Mann was later obliged to publish two corrections, although Mann’s conclusions remained intact.]

On the use of models, a quotation best conveys the author’s message: “Analysts tend to consider that the way of the model will lead to analysis of climate. Consulting synoptic charts, perusing data . . . trying to understand the way weather works, establishing the dynamics of phenomena . . . all seem out of fashion. Diagnostic studies establish teleconnections, but do not try to show causal links. Method is no longer interested in physical reality.” When two phenomena are shown to be linked, Leroux says there is a covariation, but a statistical link by itself does not show cause and effect. Leroux faults the common practice of demonstrating a statistical correlation, but implying a physical cause: “Links do not explain anything.” For this reason, Leroux regards the correlation in past climates between CO<sub>2</sub> levels and surface temperatures, which are actually depicted in several figures in the book, to be of no consequence.

“Meteorology and climatology are not able to claim an ability to predict the future, as they do not understand the present weather.” In writing that statement, Leroux does not represent the dynamical school of meteorology fairly. He does not seem to appreciate how baroclinic wave theory can describe the evolution of surface high- and low-pressure centers, with all the weather that ensues.

Arithmetic averages of weather observations or of model data in space or in time are climatically meaningless when the weather consists of very different regimes, the author insists. For him, an average trade wind in the Tropics has meaning because the trade wind tends to be constant, but in Europe, where northerly and southerly winds alternate, an average wind (even a resultant vector) has little significance. He extends the notion to temperature and pressure: the Icelandic Low is called a “statistical fiction.” But it is hard to develop climatology when you can not use averages. What can one say about a region’s climate? Leroux could, but does not, use statistical measures for climate variability. He does employ averaged quantities in many graphs. Perhaps his favored alternative is to describe and map out the evolution of airstreams and associated weather, but in practice, that is one reason the book is so lengthy.

If you read only one chapter, read the “General Conclusion.” Whereas much of the book bogs down in long-winded analysis, numbing detail, and tangential judgments, Leroux summarizes his key points well here. He admits that the MPH concept *was not needed* in a book on the greenhouse effect, but quickly contends that the concept explains extreme weather and climate events better than the models can, and that it offers a solution to the “conceptual impasse” in which meteorology finds itself.

Climatology is wasting its time and selling its soul in dwelling on greenhouse warming, the author asserts. To what should the discipline turn its attention? Climate science might develop conceptual rather than model-based explanations of climatic processes, he replies. Leroux makes valid points about the known deficiencies of numerical models, and about a science driven by modeling. Models lead one to understand the planet using a reductionist approach. I agree with that point: atmospheric science would do well to develop a conceptual understanding based on testable theories of the general circulation.

Synoptic meteorologists and climatologists might want to consider Leroux’s depiction of an MPH-driven general circulation, which only starts to appear in chap-

ter 8. Weather amateurs may find the discussion lengthy and dry; readers would do well to consult a more concise and accessible journal article by Leroux (1993).

Among the book's flaws, the bibliography has some important citations in error. Satellite images are widely used, but Leroux does not annotate the images at all—it is hard to find the features being discussed. The writing constantly switches from factual to judgmental. I like to follow a scientific argument, but caustic commentary thrown in for emotional effect is not only annoying, but interferes with comprehension. This book is lengthy, tedious, and full of judgments.

I suspect Leroux will not gain adherents to his thinking about the greenhouse effect through this book. He writes more about what he does not accept than about what he does accept. The arguments could be more quantitative, but often are not quantitative enough. Since this book was published, even the U.S. Climate Change Science Program has published more evidence that suggests that, contrary to earlier thinking, the bulk of the atmosphere has been warming in step with the surface (Karl et al. 2006). Though provocative, the two theories in the book do not really reinforce each other, and remain unpersuasive.

—MICHAEL A. FORTUNE

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