

BOOK REVIEW

Measuring Global Temperatures: Their Analysis and Interpretation



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This book documents how global surface temperature anomalies (GSTAs) and multidecadal trends are obtained. While ocean heat content change is a more robust metric with which to diagnose global warming, GSTAs have become a primary icon in the climate change debate.

The book begins with a brief overview chapter of the Earth's radiative energy budget followed by two chapters on measurement approaches to monitoring temperature, including an interesting discussion of temperature scales. Chapters 4–6 concern measuring land and ocean temperatures. Chapters 7 and 8 discuss global networks and how point measurements are converted to obtain global averages. Chapter 9 focuses on changes in time of temperatures, including maximum and minimum values. This is followed by a short chapter on temperature profiles through the atmosphere and a final chapter of recommendations for future observations of this metric.

This relatively short book is a valuable reference on measuring surface temperatures, but it suffers in several substantive ways. For instance, the first sentence in the book reads, "Temperature is probably the most influential of all climatic variables." However, I suspect that water may be even more important because civilized society and diverse natural environments have developed from very cold to hot climates wherever there is sufficient water. For example, there is an

absence of almost any form of life in the hot and arid Sahara desert, while abundant flora and fauna exist in the hot but humid Congo Basin. Only when temperature extremes become so cold that vegetation cannot develop, such as in inland Antarctica, does temperature become a dominant climate variable.

The book raises questions on the robustness of the surface temperature data over land as a diagnostic of GSTA, for example, on page 119, where the author writes that "...within small areas the effects of climate change will be similar, and so the measurements should match each other." By making this assumption, local site difference issues are masked. Recent publications not discussed by the author quantitatively document a number of systematic biases and uncertainties at observing sites, for example, due to the extent that (1) temperature trends are a function of height near the ground, particularly for minimum temperatures; (2) concurrent trends in absolute humidity affect dry bulb temperature trends at the same site; (3) poor station siting exists even in rural areas; and (4) statistical uncertainties are introduced at each step in converting point measurements to larger-scale averages that have not been properly accounted for. Although there is an informative brief discussion on several of these issues, the author neglected peer-reviewed papers that quantify several of them. Because the trend in the global average lower tropospheric temperature anomalies has been essentially flat for

more than 12 years, yet the global average surface temperatures are reported to continue to rise, this divergence over time may be a result of systematic warm biases in point surface observations, which are incompletely discussed by the author.

The author does, however, seem to agree with this view to some extent. For example, with respect to urban effects on temperatures, he writes, "What matters [with respect to changes in urban temperature bias] is whether the bias changes over time as the city grows and changes. The chances are that the bias probably will increase, since cities are growing ever more rapidly as the world population grows, especially in developing countries." Unfortunately, despite published papers that are available, he devotes only a single sentence to the possibility that other land use changes can affect GSTAs.

The author does provide an overview of how surface air temperatures can change in response to atmospheric circulation pattern changes. He writes, "If atmospheric patterns change, it is likely there will be a shift of temperature." He refers to a shift in the North Atlantic Oscillation from one state to another as one example. The lack of corresponding warming within the troposphere relative to the surface air at higher Northern Hemisphere latitudes is an issue he emphasizes in chapter 10. He writes, "The lack of an equivalent rise in the troposphere [of temperature] in the high northern latitudes in winter to match that at the surface points to the possibility that increased cloud cover may have caused the extra surface warming." Such changes in cloud cover might be a result of circulation changes.

My recommendation is that readers purchase this book to obtain an incomplete but well-written overview of the current status of diagnosing the global average surface temperature. While it suffers from incomplete coverage of the topic, the book is still a useful reference to have.

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