Water is essential to life on Earth, and precipitation is the hydrologic cycle's key process by which the fresh-water supply gets regenerated. It comes at no surprise, therefore, that substantial research has been conducted toward a better understanding of precipitation formation and its distribution in space and time. Despite a great wealth of papers published in the literature, however, there aren't many textbooks focused on precipitation per se. The book by Ian Strangeways attempts to fill this void. *Precipitation: Theory, Measurement and Distribution* promises to cover a lot of ground in educating the reader about past and present theories of precipitation (discussed in parts 1 and 2), the challenges of measuring precipitation (part 3), and the global distribution of precipitation (part 4). The last section of the book (part 5) discusses envisioned future developments.

Journal articles and textbooks tend to teach us understanding in a straightforward manner. In reality, the path of learning and gaining insights rarely occurs in linear fashion, but instead is littered with dead-ends, detours, and failures of making progress. Strangeways's book presents a refreshing account of knowledge acquired by trial and error throughout many centuries. The historical aspects provide an interesting collection of schools of thought and the journey of discovery across the past few thousand years from the Greeks to the present, and these recollections are nicely spiced up with quotes ranging from ancient philosophers to modern-day researchers.

Strangeways's discussion of the current understanding of precipitation processes, the measurement of precipitation, and the global distribution of precipitation touches on the relevant points, but at a cost of limited depth. The book provides for easy, descriptive reading, but remains qualitative with essentially no analytical or mathematical treatment (e.g., I counted only 13 equations throughout the entire book). Clearly, Strangeways opted for covering breadth rather than depth, which is understandable in light of the vast subject matter (and probably a page limitation imposed by the publisher). However, it would have been helpful to get more pointers for further in-depth reading (i.e., textbooks or review papers that cover key aspects in more detail).

The book draws heavily upon the author's experience of measuring precipitation, which is particularly reflected in chapter 8 (part 3), on "Measuring Precipitation with Rain gauges." It is surprising, though, that Strangeways doesn't include an in-depth discussion of lysimeters, which would be highly educational as the ultimate (albeit expensive) tool to simultaneously measure precipitation, evaporation, and runoff, and discuss their interplay as part of the hydrologic cycle. In chapter 9 ("Measuring Snow"), the book misses the opportunity to introduce the Hotplate Total Precipitation Sensor (see Rasmussen et al. 2005), manufactured and marketed by Yankee Environmental Systems Inc., which represents an intriguing and innovative recent development in precipitation measurement that avoids problems associated with traditional volumetric or weighing rain gauges. In particular, the Hotplate's "sensor head consists of two isolated plates warmed by electrical heaters. During storms, it measures the rate of rain or snow by how much power is needed to evaporate precipitation on the upper plate and keep its surface temperature constant. The second plate, positioned directly under the evaporating plate and heated to the same temperature as the top, is used to factor out cooling from the wind" (quoted from the manufacturer's description: www.yesinc.com/products/data/tps3100/TPS-3100ds.pdf).
The book sketches the mean, trends, and variability of precipitation at the global climate scale (part 4); however, it falls short by not providing a discussion of the great spatial and temporal variability encountered at the meso- and smaller scales, which directly affect our daily lives (e.g., through impacts of severe weather; heavy rainfall and flooding; or freezing rain, snow, and ice). Addressing precipitation variability and extremes across the full range of relevant space and time scales would provide valuable and practical information for observing network and other design purposes (i.e., a topic one could have elaborated on in the book).

In his final section (part 5), Strangeways emphasizes the important need for improved observing capabilities. This is definitely in line with the findings from a 2009 report of the National Research Council titled “Observing Weather and Climate from the Ground Up: A Nationwide Network of Networks,” which provides an assessment of our observational limitations and needs (focused on the United States, but also relevant elsewhere). Unfortunately, Strangeways misses the opportunity in his book to lay out key unanswered scientific questions that need to be addressed in order to make progress in our understanding of precipitation processes and how climatic changes might affect them. It is only through improved process understanding (which arguably requires good observations, but also analytical insights and skillful modeling) that we may be able to learn how to adapt to climate change and provide human society with enough food, fresh water, energy, and safe transportation on the ground, in the air, and in space. In fact, dwelling on that would be a really beneficial topic deserving its own book. Burroughs’s (1997) Does the Weather Really Matter? provides for thought-provoking reading along those lines.

In summary, Strangeways’s book is written from an observational perspective, but lacks depth in terms of facilitating quantitative understanding of precipitation processes. It may be appealing to an audience of generally interested readers, undergraduate students, and possibly science historians. The book might foster a better appreciation of the variety of sources of precipitation data and what it entails to measure precipitation by in situ and remote sensing. However, because of its rather qualitative discussions, this book is not recommended as a text for a graduate course in atmospheric or hydrologic sciences, and it may be of limited value as a reference to professionals needing further practical details. Instead, instructors, students, and researchers looking for an in-depth treatment of precipitation may be better

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—MATTHIAS STEINER

Matthias Steiner is deputy director of the Hydrometeorological Applications Program at the Research Applications Laboratory (RAL) of the National Center for Atmospheric Research (NCAR) in Boulder, Colorado.

FOR FURTHER READING


In recent years, the accessibility of electronic publishing has led to a rapid increase in the number of publications that we might call popular interest local books. Most are small paperbacks, with copious black and white illustrations and a rather short text written in a breezy style, delving into some aspect of local history or environment. Great Hurricanes of North Carolina is a representative of this genre, and has its typical strengths and weaknesses. The strength is that it introduces the readership to the reality of hurricanes as major destructive forces along the North Carolina coast. Written in a straightforward manner by an historian, the emphasis is on the impact of these events on people and property, inevitably emphasizing death and destruction. The book starts with a brief historical overview of hurricane frequency and impact along the Carolina coast, and our evolving observation and understanding of these storms. Thereafter, a chronological approach is adopted, starting with the storm of 1775. For that event and the five storms of the succeeding century somewhat subjectively defined as “great,” most of the information presented consists of quotes from reports or letters based on eyewitness accounts. This commonly leads to statements about the names and number of people or vessels lost at sea, and a few comments about land-based destruction. This rather fragmentary evidence is not synthesized to give character to each individual storm, and so they all begin to blend together. The situation improves in the late nineteenth century as observations, both instrumental and human, increase. Wind speeds, storm surge, and barometric pressure values begin to appear, and there is more regard for the track, both prior to and upon landfall in North Carolina. Although these are often given as seemingly random facts, these later chapters do contain basic considerations of hurricane character, such as the nature of the eye and eyewall, the importance of the right front quadrant, or the impact of the speed of movement. The final chapter is a brief look at the storms of the late twentieth century, which leads to an epilogue stressing the fact that these storms have always been with us, and will continue to arrive. Concern is expressed here that the region is now much more heavily populated, and should one of the major storms described earlier in the book come ashore now, disaster is more or less guaranteed. The entire book in many ways seems to be working to that final set of statements. That probably is its greatest strength.

Looking back at the Bulletin of November 1927:

Meteorological Robots

The New York Times for Sunday, October 23, 1927, contained a vivid account of the possible uses to which the “Electrical Man” recently invented by R. J. Wensley, of the Westinghouse Company, might be put. Actually the “Televox” has been designed to perform certain duties in automatic substations, and is already in use recording the height of water in Washington reservoirs. But the illustrator, with soaring imagination, pictured a box-like creature with the arms of a man, turning on an electric light, lighting the oven, sounding with a pole in a mountain reservoir, and recording with a pencil temperatures in a notebook. It is this last that suggests the Weather Bureau of the future. Gone are the Section Directors, Assistant Meteorologists, and Junior Observers who at present draw munificent salaries from a generous government. Instead there are thousands of meteorological robots distributed throughout the country, and in Washington a Chief who can sing, because it is music that strikes a responsive chord in the robot breast. Thus at the appointed time the Chief at his Washington desk lifts the receiver from his phone and sings “tum tum ti ta” (How’s the weather in Tonopah?), and back comes the requisite data without a hitch. Besides the benefit to the tax payers of such an army of robots drawing no salaries and eating no food, there would be the added advantage of a calm and contented citizenry. No longer would a irate citizen call up a station to know why it is raining when the forecast said fair. If he did he would be met by a dignified silence.

—Bull. Amer. Meteor. Soc., 8, 174
My major concern is that there are some weaknesses that may prevent the reader from penetrating far enough to get the full impact and validity of that final message. The text is often repetitive in words and phrases. There are few illustrations—fewer than is usual for this type of book—and several for the various early storms also seem somewhat interchangeable. To differentiate storms, and to reinforce the final warning, we need to be made more aware—through maps and diagrams—of the different tracks hurricanes can take. Some mention of the tracks of hurricanes occurring between the “great” ones would give some context on how a small difference in track can have a major difference in impact. Somewhat fuller references to impacts inland of the coast, currently given mostly in passing, would reinforce this idea. Only then can we really appreciate the changing potential for damage, not just from track changes but also from social changes within the state. The scattering of such ideas through the text would at least make the dire warning of the final section a logical conclusion to the narrative.

From a meteorological perspective, these comments suggest that a final editing of the text was needed. Like many books of this genre, I get a feeling of superficiality. The general outline is reasonable, and there seems to be little wrong with the facts, but the work doesn’t go beyond a simple collection of facts. Each storm is treated as an isolated, largely independent event. The author has made no attempt at a synthesis, so we don’t have insights into the nature of hurricanes, or into the nature of the people who sailed on and lived near the waters where the storms have an impact—or into the disaster waiting to happen. Taken together, the few references to atmospheric processes scattered throughout the work do describe the basic meteorological features of hurricanes. But without an index, there is no possibility of tracking them down.

Who, then, is the intended audience? There is already a well-received and well-established comprehensive study of coastal hurricanes in North Carolina (Barnes 2001), meeting the needs of local residents and interested visitors alike. The audience for most books of the genre involved here seems to be local residents who will readily connect with the stories and pictures in the book. In this case they will need a detailed knowledge of the location of settlements—even small settlements—all along the North Carolina coast, and of the previous and current names of these places. The book contains few pictures, and there don’t seem to be many connection points for local people. The small format and brevity of the book seem to suggest the work is more likely to appeal to the casual visitor to the state rather than the permanent resident. Indeed, I envision a reader sitting on the beach on a sunny summer day immersed in past events that couldn’t possibly happen to him or her in modern times. Or could they?

—PETER J. ROBINSON

Peter J. Robinson, CCM, is professor of geography at the University of North Carolina, Chapel Hill, and director of the NOAA Southeast Regional Climate Center.

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