

Preface to the Second Edition

I had not intended that 21 years should pass between the first edition of this book and the second, but much else has intervened to command my attention and time. The timing of this second edition is nonetheless propitious, as I started in earnest just after finishing participation in the Intergovernmental Panel on Climate Change (IPCC) Working Group I Fifth Assessment in late 2013. So I had good familiarity with a recent summary of the state of knowledge as a starting point. Another advantage of waiting so long is that the easy availability of data sets and modern tools to manipulate them made it possible for me to make most of the new figures myself. The second edition is thus heavy with color figures of data from observations and models.

The basic outline of the book is the same as that of the first edition, except that I have added a new Chapter 8 on natural internal variability that is captured by the instrumental record. This chapter makes use of some statistical and mathematical techniques that I do not explain in detail, but I feel that by looking at the pictures and trusting me, the student will gain an intuitive sense of the structures of atmospheric and oceanic variability. The first seven chapters are suitable for a course for undergraduate science majors, and the final six chapters are more appropriate for an introductory overview course for graduate students. When I use the book to teach third-year atmospheric sciences majors, I go through the first seven chapters and mix in material from Chapters 9, 12, and 13 to add spice and relevance.

Many people contributed to the second edition. Marc L. Michelsen made many of the figures in Chapter 6 and on many occasions rescued me when my own computer skills led me into blind alleys. Bryce E. Harrop did the radiative–convective equilibrium calculations in Chapters 3 and 13. I wanted to update Manabe and Wetherald (1967) with more physical clouds, but I have to say that modern calculations are not very different from theirs. Paulo Ceppi provided me with multimodel mean data from CMIP5. Mark D. Zelinka generated some key figures in Chapter 11. I have made liberal use of figures from the IPCC Fifth Assessment, and I am grateful to the IPCC authors for producing them and the IPCC for letting me use them here. I thank all the people who created data sets and put them on the web in handy format. Some of these are acknowledged in figure captions.

A number of people have used the first edition over the years and provided feedback, and some have used the draft of second edition

and provided editorial and content suggestions. I will forget to mention some of them, and for that I apologize. David W. J. Thompson used the draft of second edition in a class and provided a particularly insightful critique of the new Chapter 8. Donald J. Wuebbles also used the draft and provided suggestions and corrections. Tsubasa Kohyama did a very careful edit of most chapters of the second edition. Hansi K. A. Singh read Chapter 7 and provided comments that improved it. Casey Wall provided useful suggestions on the later chapters. Sara Berry, Paulo Ceppi, Bryce Harrop, Tsubasa Kohyama, Daniel McCoy, and Casey Wall helped with proof correction. Many students helped me involuntarily by using the book in class, and I thank them also for the insights I gained from their work. My present and former graduate students have taught me a lot. It is also a great boon for me to work in the Department of Atmospheric Sciences at the University of Washington, where excellence is combined with collegiality to good effect.

I am grateful for continued climate research support from the federal government through the National Science Foundation, National Aeronautics and Space Administration, National Oceanographic and Atmospheric Administration, and the Department of Energy. Climate research is a public good activity and without the support of the US taxpayer we would know much less about climate and the particular challenges that climate change presents to the world. Of course, other nations have also contributed greatly to what we have learned, and US citizens have benefited from their efforts too.

The dedication of the second edition remains the same as the first – to my family – who share their love and strengthen my spirit. It is also good to have great friends and colleagues. Thanks.

Dennis L. Hartmann
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