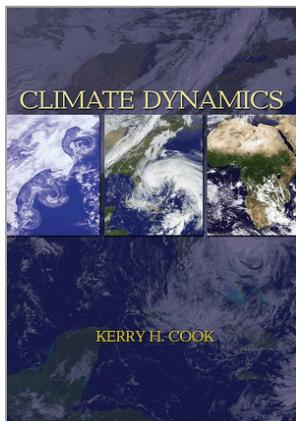




Climate Dynamics

A book review



By Kerry H. Cook

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Limiting climate change and mitigating its adverse effects is certainly one of the major challenges of today and for decades to come. It will also require cooperation across many disciplines from humanities to engineering and the natural sciences. As a consequence, it is of great importance that a wide array of audiences is equipped with a basic knowledge of the climate system's fundamental processes and feedbacks. Not only will this promote a better understanding of the Earth system, but will also lead to more informed discussions about climate science and its implications for society and policy decisions.

[Climate Dynamics](#), by Kerry H. Cook, is a short, accessible introductory textbook aimed at undergraduate students. It does not assume prior knowledge in Earth or atmospheric sciences and is thus intended for a broader audience of future engineers, scientists and policymakers. The book has a quantitative approach, which introduces the fundamental equations of the climate system and develops, for instance, a series of simple concept models for the illustration of the greenhouse effect. It is therefore recommended that readers have a basic understanding of calculus and physics. However, pages are never overloaded with equations.

This concise textbook is based on Cook's 20 plus years of experience teaching courses in climate dynamics at Cornell University and the University of Texas at Austin. While the book itself appears to be based on lecture notes, this is not necessarily a disadvantage, considering the author's expertise and the number of students the material was likely tested on. The text is precise and well written and the high-quality grayscale illustrations support the concepts and introduce students to the commonly found visualisations of the field. However, sometimes figures are accompanied by bullet-point style explanations rather than comprehensive text. The chapters are often relatively short and introduce key concepts in a clear

manner, though a few more words would probably help novice climate students to make the most of their reading.

Climate Dynamics is divided into three parts: chapters 1–3 provide a description of the mean climate state and its variability on all timescales from seasonal variation to solar and orbital forcings. At the same time the reader is given an introduction to basic climate variables, their observation and typical presentation. Chapters 4–6 introduce the climate system's fundamental processes, such as radiation, thermodynamics and heat fluxes as well as the forces that make up atmospheric dynamics. The following chapters 7–9 show the reader how these processes lead to global atmospheric and oceanic circulations as main pathways for balancing the global energy budget. The final chapters 10–12 address climate change through changing atmospheric composition and atmospheric feedbacks and give a very brief introduction to climate modelling, but do not discuss the magnitude or impacts of climate change.

Climate Dynamics really shines when it devotes time and space to certain key processes such as the greenhouse effect. Over several pages a sequence of quantitative and increasingly realistic models of the atmosphere with radiation-absorbing layers are introduced, which greatly help the reader understand the principal cause and mechanism of current climate change. The same is to be said for the description of climate variability and its different timescales, a topic rarely understood in public discussion. However, due to the shortness of the text and its concise style, the book may not satisfy the curious reader who would like to get a deeper understanding of the climate system. For example, it misses a chance to point the reader to additional readings.

Overall, the book is an excellent basis for outlining an undergraduate climate dynamics course that can be taught in one term. It introduces and describes all processes and parts of the climate system that are necessary for its understanding.

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More information

A supplementary Solutions Manual, restricted to professors using the text in their courses, is available for this book: <http://press.princeton.edu/titles/10041.html>.