

Meteorology

for Scientists and Engineers

Third Edition

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Vancouver, Canada



Meteorology for Scientists and Engineers, 3rd Edition

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2020-2207 Main Mall
Vancouver, BC, Canada V6T 1Z4

This work is available at
http://www.eos.ubc.ca/books/Practical_Meteorology/

ISBN-13: 978-0-88865-178-5

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Scene is a July 1996 thunderhead over southern Arizona, USA.

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This is a book on practical meteorology. I wrote it for students and professionals in science and engineering who want to understand basic concepts, but who don't need to derive equations.

To make this book more accessible, I converted all the equations into algebra. With algebraic approximations to the atmosphere, you can see the physical meaning of each term, and you can plug in numbers to get usable answers.

No previous knowledge of meteorology is needed — I start from the basics. Your background should include basic algebra, trig, and classical physics. This book could serve the fields of Atmospheric Science, Meteorology, Environmental Science and Engineering, Air Quality Meteorology, Climatology, and Geography.

Readers like you have asked to see solved examples of the concepts, to enhance your understanding and speed your ability to apply them to your own situations. To fill this need, I have added "Solved Example" boxes for almost every equation in the book.

This book is designed to be both a textbook and a reference. As a textbook, the end of each chapter includes extensive homework exercises in the following categories: Numerical Exercises, Understanding & Critical Evaluation, Web-Enhanced Questions, and Synthesis Questions.

Although a hand calculator can be used for some of the homework exercises, other exercises are best solved on a computer spreadsheet such as Excel or using a mathematical program such as Matlab, Mathematica, or Maple. I used Excel for my solved examples and most of my graphs.

As a reference, I included in this book many tables, figures and graphs, and have a detailed index. Also, appendices include values of key constants and conversion factors.

This third edition has a new format. The body of the text runs mostly in the inside columns of each page. The outside columns on each page contain the supporting figures, graphs, tables, and solved examples. Other special boxes in these outside columns include Focus, On Doing Science, and Science Graffiti. At the request of some readers, I've added

Beyond Algebra boxes that use calculus, differential equations and other advanced techniques, but you may safely ignore these boxes if you wish.

New to this edition is a chapter entitled Remote Sensing, which covers weather radar and satellites. Also new is a chapter on Weather Reports & Map Analysis. Many other chapters are greatly expanded and updated. I intentionally omitted large color photographs and maps from this book, partly to keep the price down, and partly because most readers can access such images via the internet.

For instructors, I inserted a bullet next to the most important equations, to help focus the learning. Also, the book contains too much material to cover in one term, so instructors should select the subset of chapters to cover.

ACKNOWLEDGEMENTS

A large number of students have used earlier drafts, allowing me to fix typos and make clarifications thanks to their careful scrutiny. I am indebted to the following additional experts for their suggestions to this 3rd edition: Phil Austin, William Beasley, Allan Bertram, Brian Black, Dominique Bourdin, Brian Cheng, Luca Delle Monache, Xingxiu Deng, Dennis Driscoll, Charlotte Gabites, Paul Greeley, William Hsieh, Katelyn Janzen, Chris Jeffery, Alison Jolley, Doug McCollor, Mathias Mueller, Laurie Neil, Lorne Nelson, Thomas Nipen, Robert Nissen, Anders Persson, Chris Pielou, Robert Rabin, Curt Rose, Alyson Shave, John Spagnol, Gert-Jan Steeneveld, David Stensrud, Haizhen Sun, Bruce Thomson, Greg West, May Wai San Wong, Yongmei Zhou, and Jeff Zong.

The 3rd edition builds upon the earlier editions. As stated in the 2nd edition, I am grateful to the following additional experts: Susan Allick Beach, Larry Berg, Bob Bornstein, David Finley, Maria Furburg, Josh Hacker, Phoebe Jackson, Scott Krayenhoff, Stephanie Meyn, Scott Shipley, Zbigniew Sorbjan, George Taylor, and Dave Whiteman.

Suggestions for the 1st edition came from: Horst Böttger, John Cassano, Judy Curry, C. Dale Elifrits, Jon Foley, Kit Hayden, Jim Hoke, Ed Hopkins, Dave Houghton, Jon Kahl, Ian Lumb, Mankin Mak, Jon Martin, Paul Menzel, Richard Peterson, Robert Sica, Greg Tripoli, and Pao Wang.

I thank the faculty and staff at the University of Wisconsin - Madison and the University of British Columbia - Vancouver, who were very supportive while I wrote the three editions during my tenures as professor. Storm photographs are reproduced with permission of the copyright holders: Warren Faidley, Gene Moore, and Gene Rhoden. I apologize for any names that I forgot. Any remaining errors are my own.

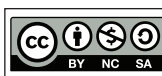
I especially thank my wife Linda for her patience and understanding.

Roland Stull

FOCUS • About the Author

Roland Stull holds a Bachelor’s degree in Chemical Engineering and a Ph.D. in Atmospheric Science. He is a Certified Flight Instructor (CFI) and a Certified Consulting Meteorologist (CCM).

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