



Atmospheric Convection

By Kerry A. Emanuel



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This graduate-level meteorology text and reference provides a scientifically rigorous description of the many types of convective circulations in the Earth's atmosphere. These range from small-scale, convectively driven turbulences in the boundary layer to precipitating systems covering many thousands of square kilometers. The text introduces the principal techniques used in understanding and predicting convective motion: theory, field experiment, and numerical modelling. Part I explores dry convection, including turbulent plumes and thermals from isolated buoyancy sources, Raleigh-Benard convection, and turbulent convection in the planetary boundary layer. Emphasis is placed on applying theoretical understanding and lessons from experiments. Part II offers a complete treatment of the thermodynamics of moist and cloudy air, including fundamental laws, conserved quantities, graphical techniques, and stability. Part III explores the characteristics of individual convective clouds, thunderstorms, squall lines, mesoscale convective systems, and slantwise convection. Part IV studies the ensemble effects of convective clouds, including stratocumulus at trade cumulus boundary layers and the representation of convective clouds in numerical models. Each chapter is followed by a set of exercises.



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"[A]n excellent monograph by a leading atmospheric scientist...will be consulted by everyone interested in the complexities of dynamical meteorology and in the improvement of practical methods of climate and weather prediction."--Physics Today

"Exceptionally interesting....Stimulating....Moist convection is not easy to characterize by models that can be analyzed analytically and yet illuminate essential physical mechanisms. The strength of this book is to blaze an intellectual trail through the field by collecting such models and presenting them and their assumptions completely and clearly enough that readers can derive and understand for themselves all essential equations and results....A major contribution that belongs on the bookshelf of any scholar of the subject. Its orientation toward conceptual models also makes it particularly useful for and accessible to researchers in areas such as climate dynamics....Makes a nice (and affordable) textbook on atmospheric convection for mathematically inclined advanced graduate students and it includes exercises of all levels of difficulty." --Christopher S. Bretherton, University of Seattle, Bulletin of the American Meteorological Society

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About the Author

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