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Nota di contenuto	Part I Background and Preliminaries: Chapter 1- The Governing Equations and Dry Dynamics -- Chapter 2- Moisture and moist thermodynamics -- Chapter 3- Observations of tropical climate dynamics and convectively coupled waves -- Chapter 4- Introduction to stochastic processes, Markov chains, and Monte Carlo Simulation -- Part II The Deterministic Multicloud Model: Chapter 5- Simple models for moist gravity waves -- Chapter 6- The Multicloud Model with Congestus Preconditioning -- Chapter 7- Convectively Coupled Equatorial Waves in the Multicloud Model -- Chapter 8- Convective Momentum Transport and Upscale Interactions in the MJO -- Chapter 9- Implementation of the Multicloud Model in an Aquaplanet Global Climate Model -- Part III The Stochastic Multicloud Model: SMCM: Chapter 10- Stochastic birth and death models for clouds -- Chapter 11- Implementation of the SMCM in a Global Climate Model -- Chapter 12- SMCM in CFS: Improving the tropical modes of variability --

Glossary -- References.

Sommario/riassunto

This book is a survey of the research work done by the author over the last 15 years, in collaboration with various eminent mathematicians and climate scientists on the subject of tropical convection and convectively coupled waves. In the areas of climate modelling and climate change science, tropical dynamics and tropical rainfall are among the biggest uncertainties of future projections. This not only puts at risk billions of human beings who populate the tropical continents but it is also of central importance for climate predictions on the global scale. This book aims to introduce the non-expert readers in mathematics and theoretical physics to this fascinating topic in order to attract interest into this difficult and exciting research area. The general thyme revolves around the use of new deterministic and stochastic multi-cloud models for tropical convection and convectively coupled waves. It draws modelling ideas from various areas of mathematics and physics and used in conjunction with state-of-the-art satellite and in-situ observations and detailed numerical simulations. After a review of preliminary material on tropical dynamics and moist thermodynamics, including recent discoveries based on satellite observations as well as Markov chains, the book immerses the reader into the area of models for convection and tropical waves. It begins with basic concepts of linear stability analysis and ends with the use of these models to improve the state-of-the-art global climate models. The book also contains a fair amount of exercises that makes it suitable as a textbook complement on the subject.