

1. Record Nr.	UNINA9910791166703321
Autore	Houze Robert A., Jr.
Titolo	Cloud dynamics // Robert A. Houze, Jr
Pubbl/distr/stampa	Oxford, England : , : Academic Press, , 2014 ©2014
ISBN	0-08-092146-9
Edizione	[Second edition.]
Descrizione fisica	1 online resource (457 p.)
Collana	International Geophysics Series, , 0074-6142 ; ; Volume 104
Disciplina	551.57/6
Soggetti	Clouds - Dynamics
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Includes index.
Nota di contenuto	Front Cover; Cloud Dynamics; Copyright; Dedication; Contents; Preface; List of Symbols; Part I: Fundamentals; Chapter 1: Types of Clouds in Earth's Atmosphere; 1.1. Atmospheric Structure and Scales; 1.2. Cloud Types Identified Visually; 1.2.1. Genera, Species, and Stages; 1.2.2. Low Clouds; 1.2.3. Middle Clouds; 1.2.4. High Clouds; 1.2.5. Orographic Clouds; 1.2.6. Noctilucent Clouds; 1.3. Precipitating Cloud Systems; 1.3.1. Mesoscale Convective Systems; 1.3.2. Tropical Cyclones; 1.3.3. Extratropical Cyclones; 1.4. Satellite Cloud Climatology; Chapter 2: Atmospheric Dynamics 2.1. The Basic Equations 2.1.1. Equation of Motion; 2.1.2. Equation of State; 2.1.3. Thermodynamic Equation; 2.1.4. Mass Continuity; 2.1.5. Water Continuity; 2.1.6. The Full Set of Equations; 2.2. Balanced Flow; 2.2.1. Quasigeostrophic Motion; 2.2.2. Semigeostrophic Motions; 2.2.3. Gradient-Wind Balance; 2.2.4. Hydrostatic Balance; 2.2.5. Thermal Wind; 2.2.6. Cyclostrophic Balance; 2.3. Anelastic and Boussinesq approximations; 2.4. Vorticity; 2.5. Potential Vorticity; 2.6. Perturbation Forms of the Equations 2.6.1. Average and Perturbation Forms of the Equation of State and Continuity Equation 2.6.2. Flux Forms and Linearization of the Thermodynamic and Water-Continuity Equations; 2.6.3. Flux Form and Linearization of the Equation of Motion; 2.6.4. Eddy Kinetic Energy Equation; 2.7. Oscillations and Waves; 2.7.1. Buoyancy Oscillations; 2.7.2. Gravity Waves; 2.7.3. Inertial Oscillations; 2.7.4. Inertio-Gravity Waves; 2.8. Adjustment to Geostrophic and Gradient Balance; 2.9.

Instabilities; 2.9.1. Buoyant, Inertial, and Symmetric Instabilities; 2.9.2. Kelvin-Helmholtz Instability
2.9.3. Rayleigh-Benard Instability
2.10. Representation of Eddy Fluxes;
2.10.1. K-Theory; 2.10.2. Higher Order Closure; 2.10.3. Large Eddy Simulation; 2.11. The Planetary Boundary Layer; 2.11.1. The Ekman Layer; 2.11.2. Boundary-Layer Stability; 2.11.3. The Surface Layer;
Chapter 3: Cloud Microphysics; 3.1. Microphysics of Warm Clouds;
3.1.1. Nucleation of Drops; 3.1.2. Condensation and Evaporation; 3.1.3. Fallspeeds of Drops; 3.1.4. Continuous Collection; 3.1.5. Stochastic Collection; 3.1.6. Spontaneous and Collisional Breakup of Drops and Modification of the Stochastic Collection Formulation
3.2. Microphysics of Cold Clouds
3.2.1. Homogeneous Nucleation of Ice Particles; 3.2.2. Heterogeneous Nucleation and Other Processes Forming Small Ice Particles in Clouds; 3.2.3. Vapor Deposition and Sublimation; 3.2.4. Aggregation and Riming; 3.2.5. Hail; 3.2.6. Ice Enhancement; 3.2.7. Fallspeeds of Ice Particles; 3.2.8. Melting; 3.3. Types of Microphysical Processes and Categories of Water Substance in Clouds; 3.4. Water-Continuity Equations; 3.5. Bin Water-Continuity Models; 3.5.1. General; 3.5.2. Bin Modeling of Warm Clouds; 3.5.3. Bin Modeling of Cold Clouds
3.6. Bulk Water-Continuity Models

Sommario/riassunto

As models of the Earth/atmosphere system and observations become ever more sophisticated, and concerns about climate change and societal impacts of extreme weather and its forecasting grow, understanding the role of clouds in the atmosphere is increasingly vital. Cloud Dynamics, Second Edition provides the essential information needed to understand how clouds affect climate and weather. This comprehensive book examines the underlying physics and dynamics of every specific type of cloud that occurs in the Earth's atmosphere, showing how clouds differ dynamically depending on whether they oc
