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4.4 Energy and angular momentum4.5 The shallow atmosphere approximation; 4.6 The beta effect and the spherical Earth; Chapter 5 Scale analysis and its applications; 5.1 Principles of scaling methods; 5.2 The use of a reference atmosphere; 5.3 The horizontal momentum equations; 5.4 Natural coordinates, geostrophic and gradient wind balance; 5.5 Vertical motion; 5.6 The vertical momentum equation; 5.7 The mass continuity equation; 5.8 The thermodynamic energy equation; 5.9 Scalings for Rossby numbers that are not small; Chapter 6 Alternative vertical coordinates
6.1 A general vertical coordinate6.2 Isobaric coordinates; 6.3 Other pressure-based vertical coordinates; 6.4 Isentropic coordinates; Chapter 7 Variations of density and the basic equations; 7.1 Boussinesq approximation; 7.2 Anelastic approximation; 7.3 Stratification and gravity waves; 7.4 Balance, gravity waves and Richardson number; 7.5 Summary of the basic equation sets; 7.6 The energy of atmospheric motions; Theme 2 Rotation in the atmosphere; Chapter 8 Rotation in the atmosphere; 8.1 The concept of vorticity; 8.2 The vorticity equation 8.3 The vorticity equation for approximate sets of equations8.4 The solenoidal term; 8.5 The expansion/contraction term; 8.6 The stretching and tilting terms; 8.7 Friction and vorticity; 8.8 The vorticity equation in alternative vertical coordinates; 8.9 Circulation; Chapter 9 Vorticity and the barotropic vorticity equation; 9.1 The barotropic vorticity equation; 9.2 Poisson's equation and vortex interactions; 9.3 Flow over a shallow hill; 9.4 Ekman pumping; 9.5 Rossby waves and the beta plane; 9.6 Rossby group velocity; 9.7 Rossby ray tracing; 9.8 Inflexion point instability; Notes
Chapter 10 Potential vorticity

Sommario/riassunto

This book gives a coherent development of the current understanding of the fluid dynamics of the middle latitude atmosphere. It is primarily aimed at post-graduate and advanced undergraduate level students and does not assume any previous knowledge of fluid mechanics, meteorology or atmospheric science. The book will be an invaluable resource for any quantitative atmospheric scientist who wishes to increase their understanding of the subject. The importance of the rotation of the Earth and the stable stratification of its atmosphere, with their implications for the balance of larger-scale flow