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energy equation; 1.2. Enthalpy, rotation, mixing, saturation; 1.2.1. Assessment of internal energy; 1.2.2. Assessment of enthalpy; 1.2.3. Assessment for the total enthalpy; 1.2.4. Case of a coordinate frame of reference in rotation; 1.2.5. The case of humid, saturated air; 1.2.6. Boussinesq's approximation; 1.2.7. General report on global equations; 1.2.8. General assessment of local equations; 1.3. Thermodynamic relations, relations of state and laws of behavior 1.3.1. Constituent laws of the Newtonian fluid 1.3.2. Navier-Stokes equations; 1.4. Turbulent flow; 1.4.1. Reynolds experience; 1.4.2. Reynolds equations; 1.4.3. Turbulent kinetic energy equation; 1.4.4. Properties of turbulent flows; 1.5. Dynamics of geophysical fluids; 1.5.1. Geostrophic movement; 1.5.2. Buys-Ballot's rule; 1.5.3. Ekman's layer; 1.5.3.1. Putting into an equation for the horizontal plane; 1.5.3.2. Ekman's atmospheric layer; Chapter 2. 3D Navier-Stokes Equations; 2.1. The continuity hypothesis; 2.2. Lagrangian description/Eulerian description; 2.3. The continuity equation 2.4. The movement quantity assessment equation 2.4.1. Pressure force; 2.4.2. The force of the Earth's gravity; 2.4.3. The viscosity force; 2.5. The energy balance equation; 2.6. The equation of state; 2.7. Navier-Stokes equations for a fluid in rotation; Chapter 3. Models of the Atmosphere; 3.1. Introduction; 3.2. The various simplifications and corresponding models; 3.2.1. General form of the equations; 3.2.2. Water in the atmosphere; 3.2.3. Traditional approximation and non-hydrostatic equations; 3.2.4. Hydrostatic hypothesis and primitive equations 3.2.5. Primitive equations with the pressure vertical coordinate 3.2.6. The equations of the "shallow water" model; 3.2.7. Equations of the "zero divergence" model; 3.2.8. System of equations used for weather forecasting; 3.3. The equations with various systems of coordinates; 3.3.1. Vector operators with curvilinear coordinates; 3.3.2. The equations with geographical coordinates; 3.3.3. The equations with a conformal projection; 3.4. Some typical conformal projections; 3.4.1. The polar stereographic projection; 3.4.2. The Mercator projection; 3.4.3. The Lambert projection 3.5. The operational models

Sommario/riassunto

This series of five volumes proposes an integrated description of physical processes modeling used by scientific disciplines from meteorology to coastal morphodynamics. Volume 1 describes the physical processes and identifies the main measurement devices used to measure the main parameters that are indispensable to implement all these simulation tools. Volume 2 presents the different theories in an integrated approach: mathematical models as well as conceptual models, used by all disciplines to represent these processes. Volume 3 identifies the main numerical methods used in all these scientific