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Nota di contenuto	Description of the world's oceans. Surface forcing for the world's oceans ; Temperature, salinity, and density distribution in the world's oceans ; Various types of motion in the oceans ; A survey of oceanic circulation theory -- Dynamical foundations. Dynamical and thermodynamic laws ; Dimensional analysis and nondimensional numbers ; Basic concepts in thermodynamics ; Thermodynamics of seawater ; A hierarchy of equations of state for seawater ; Scaling and different approximations ; Boussinesq approximations and buoyancy fluxes ; Various vertical coordinates ; Ekman layer ; Sverdrup relation, island rule, and the [Beta]-spiral -- Energetics or the oceanic circulation. Introduction ; Sandstrom's theorem ; Seawater as a two-component mixture ; Balance of mass, energy, and entropy ; Energy equations for the world's oceans ; Mechanical energy balance in the ocean ; Gravitational potential energy and available potential energy ; Entropy balance in the oceans -- Wind-driven circulation. Simple layered models ; Thermocline models with continuous stratification ; Structure of circulation in a subpolar gyre ; Recirculation ; Layer models

coupling thermocline and thermohaline circulation ; Equatorial thermocline ; Communication between subtropics and tropics ; Adjustment of thermocline and basin-scale circulation ; Climate variability inferred from models of the thermocline ; Inter-gyre communication due to regional climate variability -- Thermohaline circulation. Water mass formation/erosion ; Deep circulation ; Haline circulation ; Theories for the thermohaline circulation ; Combining wind-driven and thermohaline circulation -- Appendix. Definition of the oceanic sensible heat flux.

Sommario/riassunto

The interaction between ocean circulation and climate change has been an active research frontier in Earth sciences in recent years. Ocean circulation, and its related geophysical fluid dynamical principles, are now taught at graduate level in many Earth and atmospheric science departments. This is the first advanced textbook to discuss both wind-driven and thermohaline-driven processes - two important aspects of large-scale ocean circulation. It provides a concise introduction to the dynamics and thermodynamics of oceanic general circulation. This includes sea water thermodynamics and the energetics of the ocean circulation; an exhaustive theory of wind-driven circulation; thermohaline circulation with discussions on water mass formation/erosion, deep circulation, and the hydrological cycle; and interactions between wind-driven and thermohaline circulation. Highly illustrated to help the reader establish a clear mental picture of the physical principles involved, the book is invaluable for advanced courses in ocean circulation and as a reference for oceanographers and Earth scientists.