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Planform selection; Vertical transport; Height of the finger zone; 6 Collective instability; 6.1 Approaches; 6.2 Parametric flux-gradient model; 6.3 Physical interpretation; 6.4 Specific solutions; 6.5 Nonlinear effects; 7 Thermohaline intrusions
7.1 Linear theoryPhysical interpretation; The -instability; Preferred scales; Similarity argument; Multiscale model; 7.2 Extensions: rotation, baroclinicity and ambient turbulence; Rotation; Baroclinicity; Ambient turbulence; 7.3 Nonlinear effects; 7.4 Laterally bounded fronts; 7.5 Sidewall heating experiments; 7.6 Oceanographic observations; Success stories; Alternative arguments; Complications; 8 Thermohaline staircases; 8.1 Observations; Salt-finger staircases; Diffusive staircases; 8.2 Staircase origins; Collective instability mechanism; Thermohaline intrusion mechanism
Metastable equilibria mechanismApplied flux mechanism; Negative density diffusion; 8.3 Instability of the flux-gradient laws; 8.4 Mechanics of layer-merging events; 9 The unified theory of secondary double-diffusive instabilities; 10 Double-diffusion in active environments; 10.1 The interaction of salt fingers with shear flow; 10.2 Low fluxes and thick interfaces; 10.3 The interaction with intermittent turbulence; 10.4 Microstructure signatures of salt fingers in the ocean; Spectral characteristics; Analysis of dissipation measurements; Anisotropy of salt fingers
10.5 Inverse modeling of thermohaline staircases11 Large-scale consequences; 11.1 Effects of salt fingers; Density stratification and the Meridional Overturning Circulation; The T-S relation and the pattern of density ratio; Regional effects; Biogeochemical applications; Salt fountains in the ocean; 11.2 Effects of diffusive convection; 12 Beyond oceanography; 12.1 Astrophysics; Semiconvection; Fingering convection; 12.2 Geology and geophysics; 12.3 Chemistry; 12.4 Materials science and engineering; Solidification of metal alloys; Solar ponds; 12.5 Other applications
13 Perspectives and challenges

Sommario/riassunto

Double-diffusive convection is a mixing process driven by the interaction of two fluid components which diffuse at different rates. Leading expert Timour Radko presents the first systematic overview of the classical theory of double-diffusive convection in a coherent narrative, bringing together the disparate literature in this developing field. The book begins by exploring idealized dynamical models and illustrating key principles by examples of oceanic phenomena. Building on the theory, it then explains the dynamics of structures resulting from double-diffusive instabilities, such as the little-understood phenomenon of thermohaline staircases. The book also surveys non-oceanographic applications, such as industrial, astrophysical and geological manifestations, and discusses the climatic and biological consequences of double-diffusive convection. Providing a balanced blend of fundamental theory and real-world examples, this is an indispensable resource for academic researchers, professionals and graduate students in physical oceanography, fluid dynamics, applied mathematics, astrophysics, geophysics and climatology.