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infrared techniques); 3.7 Analytical methods of detecting breaking events in surface elevation records; 3.8 Statistical methods for quantifying breaking probability and dissipation
4 Fully nonlinear analytical theories for surface waves and numerical simulations of wave breaking4.1 Free surface at the wave breaking; 4.1.1 Simulating the evolution of nonlinear waves to breaking; 4.1.2 Simulation of the breaking onset; 4.1.3 Influence of wind and initial steepness; 4.2 Lagrangian nonlinear models; 5 Wave-breaking probability; 5.1 Initially monochromatic waves; 5.1.1 Evolution of nonlinear waves to breaking; 5.1.2 Measurement of the breaking onset; limiting steepness at breaking; 5.1.3 Laboratory investigation of wind influence; 5.1.4 Distance to the breaking
5.2 Wave-breaking threshold5.3 Spectral waves; 5.3.1 Breaking probability of dominant waves; 5.3.2 Breaking probability of small-scale waves; 5.3.3 Breaking in directional wave fields; 5.3.4 Wind-forcing effects, and breaking threshold in terms of wind speed; 6 Wave-breaking severity; 6.1 Loss of energy by an initially monochromatic steep wave; 6.2 Dependence of the breaking severity on wave field spectral properties; 7 Energy dissipation across the wave spectrum; 7.1 Theories of breaking dissipation; 7.1.1 Probability, quasi-saturated and whitecap models; 7.1.2 Kinetic-dynamic model
7.2 Simulating the wave dissipation in phase-resolvent models7.3 Measurements of the wave dissipation of spectral waves; 7.3.1 Laboratory measurements; 7.3.2 Difference in the spectral distribution of dissipation due to different types of breaking mechanisms; 7.3.3 Field measurements; 7.3.4 Cumulative effect; 7.3.5 Whitecapping dissipation at extreme wind forcing; 7.3.6 Directional distribution of the whitecapping dissipation; 7.4 Whitecapping dissipation functions in spectral models for wave forecasting; 7.5 Non-breaking spectral dissipation
8 Non-dissipative effects of breaking on the wave field

Sommario/riassunto

Wave breaking represents one of the most interesting and challenging problems for fluid mechanics and physical oceanography. Over the last 15 years our understanding has undergone a dramatic leap forward, and wave breaking has emerged as a process whose physics is clarified and quantified. Ocean wave breaking plays the primary role in the air-sea exchange of momentum, mass and heat, and it is of significant importance for ocean remote sensing, coastal and ocean engineering, navigation and other practical applications. This book outlines the state of the art in our understanding of wave breaking and presents the main outstanding problems. It is a valuable resource for anyone interested in this topic: researchers, modellers, forecasters, engineers and graduate students in physical oceanography, meteorology and ocean engineering.