

Contents

1	Introduction	1
2	The energy balance of deep-water ocean waves.	10
2.1	Preliminaries.	12
2.2	Linear Theory.	18
2.3	Wave groups.	21
2.4	The energy balance equation.	29
2.5	Kinematic part of the energy balance equation.	36
2.6	Empirical laws for wave growth.	42
2.7	Summary of Results.	72
3	On the generation of ocean waves by wind.	74
3.1	Linear theory of wind-wave generation.	81
3.2	Numerical solution and comparison with observations.	90
3.3	Effects of turbulence.	97
3.4	Quasi-linear theory of wind-wave generation.	118
3.5	Parametrization of Quasi-linear Theory.	158
3.6	Summary of Conclusions.	167
4	Non-linear wave-wave interactions and wave-dissipation.	169
4.1	Evolution equation for deep-water waves derived from a Hamiltonian.	171
4.2	Finite amplitude effects on dispersion relation and the instability of finite amplitude deep-water waves.	182
4.3	Nonlinear Schrödinger Equation and long-time behaviour of the Benjamin-Feir Instability.	189
4.4	Beyond the Zakharov Equation: five-wave interactions.	203

4.5	Statistical approach to nonlinear interactions.	206
4.6	Discussion of the assumptions underlying the statistical approach.	222
4.7	Consequences of four-wave interactions.	237
4.8	Parametrization of nonlinear transfer.	252
4.9	Wave dissipation.	258
4.10	Summary of Conclusions.	266
4.11	Appendix: Nonlinear transfer coefficients.	268
5	Wave forecasting and wind-wave interaction.	271
5.1	Numerics of the wave prediction model.	276
5.2	Simulation of simple cases.	291
5.3	Impact of sea state on the atmosphere.	301
5.4	Impact of sea state on the ocean circulation.	318
5.5	Verification of analysis and forecast.	327
5.6	Summary of conclusions.	355