
Contents

1	Introduction	1
	Wave Kinematics	2
2	Kinematic Generalization	9
3	Equations of Motion; Surface Gravity Waves	19
	First Wave Example: Surface Gravity Waves	20
	Boundary Conditions	23
	Plane Wave Solutions for Surface Gravity Waves: Free Waves ($p_a = 0$)	26
4	Fields of Motion in Gravity Waves and Energy	33
	Energy and Energy Propagation	35
	Addendum to Lecture	39
5	The Initial Value Problem	41
	Discussion	49
6	Discussion of Initial Value Problem (<i>Continued</i>)	53
7	Internal Gravity Waves	59
	Group Velocity for Internal Waves	65
8	Internal Waves, Group Velocity and Reflection	67
9	WKB Theory for Internal Gravity Waves	75
	Normal Modes (Free Oscillations)	79
10	Vertical Propagation of Waves: Steady Flow and the Radiation Condition	91
11	Rotation and Potential Vorticity	107
12	Large-Scale Hydrostatic Motions	119
	Potential Vorticity: Layer Model	120
	Rossby Adjustment Problem	123
	Energy	129

13 Shallow Water Waves in a Rotating Fluid; Poincaré and Kelvin Waves	133
Channel Modes and the Kelvin Wave	136
The Kelvin Mode	142
14 Rossby Waves	149
15 Rossby Waves (<i>Continued</i>), Quasi-Geostrophy	159
Quasi-Geostrophic Rossby Waves	169
16 Energy and Energy Flux in Rossby Waves	173
The Energy Propagation Diagram	175
The Reflection of Rossby Waves	177
The Spin-Down of Rossby Waves	180
17 Laplace Tidal Equations and the Vertical Structure Equation	183
18 Equatorial Beta-Plane and Equatorial Waves	193
The Equatorial Beta-Plane	194
19 Stratified Quasi-Geostrophic Motion and Instability Waves	205
Topographic Waves in a Stratified Fluid	208
Waves in the Presence of a Mean Flow	209
Boundary Waves in a Stratified Fluid	211
Baroclinic Instability and the Eady Model	213
20 Energy Equation and Necessary Conditions for Instability	221
General Conditions for Instability	227
21 Wave–Mean Flow Interaction	231
Problems	239
References	249
Index	253