

Contents

	<i>Prologue</i>	<i>page vii</i>
1	Atmospheric phenomena and their study	1
	1.1 Models as scientific tools	4
	1.2 Forces in a rotating frame of reference	7
	1.3 Governing equations	9
	1.4 Boussinesq approximation	14
	1.5 Atmospheric stratification	18
	1.6 Atmospheric numerical models	23
2	Scale analysis of the governing equations	25
	2.1 Order of magnitude analysis	26
	2.2 Dimensionless numbers	32
3	Small scale dynamics	37
	3.1 Reynolds decomposition	37
	3.2 The atmospheric boundary layer	42
	3.3 Sea breezes	57
4	Large scale dynamics	69
	4.1 Height, pressure and the geopotential	69
	4.2 Geostrophic dynamics	71
	4.3 Non-geostrophic dynamics and the shallow water model	72
	4.4 Vertical shear of the geostrophic wind	74
	4.5 Vorticity in the atmosphere	77

5	Waves in the atmosphere	83
5.1	The analysis of propagating waves (briefly)	84
5.2	Simple wave types	85
	<i>Epilogue</i>	94
	<i>Appendix A Dimensional analysis and scales</i>	96
	<i>Bibliography</i>	100
	<i>Index</i>	102