

CONTENTS

KEY WORDS	i
LIST OF FIGURES AND TABLES	ii
ABSTRACT	vi
CHAPTER 1	
INTRODUCTION	1
1.1 Introduction to scattering problems	4
1.11 Coherent and noncoherent scattering	4
1.12 Coherent scattering problems	5
1.13 Noncoherent scattering problems	5
1.14 Interlocking problems	7
1.15 Anisotropic scattering problems	9
1.2 Summary of the work done	33
References	37
CHAPTER 2	
SOLUTION OF RADIATIVE TRANSFER PROBLEMS IN AN ATMOSPHERE SCATTERING ANISOTROPICALLY	
2.1 Introduction	45
2.2 Exact solution of the equation of transfer with planetary phase function	51
2.21 Basic equation and its solution	51
2.22 Intensity at any optical depth	55
2.23 Determination of constants A and B	61
2.3 An exact solution of the equation of transfer with three-term scattering indicatrix in an exponential atmosphere	63
2.31 Basic equation and boundary conditions	63
2.32 Solution for emergent intensity	65

2.4	Solution of the equation of transfer for conservative anisotropically scattering phase function	72
2.41	Formulation of the problem	72
2.42	Solution of the equation of transfer	73
2.43	Application	82
2.44	Conclusion	83
2.5	Solution of a radiative transfer problem with a combined Rayleigh and isotropic phase matrix	84
2.51	Basic matrix transfer equation and boundary conditions	84
2.52	Solution for emergent intensity matrix	85
2.53	Conclusions	89
2.6	Time-Dependent scattering and transmission function in an anisotropic two-layered atmosphere	90
2.61	Formulation of the problem	90
2.62	Principle of invariance	93
2.63	Integral equations for the scattering and transmission function	95
2.64	The reduction of the integral equations	102
2.65	Legendre expansion of the phase function and the principle of invariance	107
2.66	Auxiliary functions and their functional relations	110
	References	119

CHAPTER 3

SOLUTION OF RADIATIVE TRANSFER PROBLEMS IN AN ATMOSPHERE SCATTERING COHERENTLY

3.1	INTRODUCTION	122
-----	--------------	-----

3.2	An approximate solution of the equation of transfer for coherent isotropic scattering in an exponential atmosphere by the method used by Eddington	123
3.21	Equation of transfer	123
3.22	Solution of the equation	125
3.23	Residual intensity	127
3.3	An exact solution of the equation of transfer for coherent scattering in an exponential atmosphere by the method of Laplace transform and Wiener-Hopf technique.	128
3.31	Equation of transfer	128
3.32	Solution for emergent intensity	129
3.4	Solution of the equation of transfer for coherent scattering in an exponential atmosphere by Busbridge's method	132
3.41	Equation of transfer	132
3.42	Solution for emergent intensity	134
3.5	Solution of the equation of transfer for coherent scattering in an exponential atmosphere by the method of discrete ordinates	137
3.51	Equation of transfer	137
3.52	Solution for emergent intensity	137
3.53	The elimination of the constants and expression of the law of diffuse reflection in closed form	139
3.54	Conclusion	144
	References	146

CHAPTER 4

SOLUTION OF RADIATIVE TRANSFER PROBLEMS IN AN ATMOSPHERE SCATTERING NONCOHERENTLY

4.1	INTRODUCTION	147
4.2	Solution of the equation of transfer for interlocked multiplets by the method of discrete ordinates with the planck function as a nonlinear function of optical depth	152
4.21	The equation of transfer	152
4.22	Solution	153
4.23	The elimination of the constants and the expression of the law of diffuse reflection in closed form	158
4.24	Conclusion	164
4.3	Solution of the equation of transfer for interlocked multiplets with planck function as a nonlinear function of optical depth	165
4.31	Equation of transfer	165
4.32	Scattering function	167
4.33	H-function	168
4.34	Emergent Intensity	168
4.4	On calculation of interlocked multiplets lines in M-E model	171
4.41	The equation of transfer	171
4.42	Calculation for a doublet	175
4.43	Calculation for a triplet	179
	References	209

CHAPTER 5

SOLUTION OF RADIATIVE TRANSFER PROBLEMS IN A FINITE ATMOSPHERE

5.1	INTRODUCTION	211
5.2	Exact solution of the equation of transfer in a finite atmosphere by the method of Laplace	

transform and linear singular operator	214
5.21 Basic equation and boundary conditions	214
5.22 Integral equations for surface quantities	215
5.23 Linear singular integral equations	218
5.24 Theory of linear singular operators	220
5.25 Solution for surface quantities	224
5.3 The Time-Dependent X- and Y- functions	226
5.31 Basic equation	226
5.32 Fredholm equation	231
5.4 An exact linearization and decoupling of the integral equation satisfied by Time-Dependent X- and Y- functions	235
5.41 Analysis	235
References	240
Appendix I	241
Appendix II	242
Appendix III	244