

TABLE OF CONTENTS

TABLE OF CONTENTS	I
LIST OF TABLES	IV
LIST OF FIGURES	VI
LIST OF SYMBOLS.....	XI
LIST OF ACRONYMS	XIII
CHAPTER 1 INTRODUCTION.....	1
1.1. Background	1
1.2. Retrieval of Oceanic Constituents from Ocean Colour Measurements at Sea Level	3
1.2.1. The Forward Problem	3
1.2.2. The Inverse Problem	4
1.3. Retrieval of Oceanic Constituents from Ocean Colour Measurements Taken at Top of Atmosphere	6
1.4. Objectives and Outline	7
CHAPTER 2 THEORETICAL BACKGROUND	9
2.1. Concepts and Definitions	9
2.1.1. Radiometric Concepts.....	9
2.1.2. Inherent Optical Properties	9
2.1.3. Apparent Optical Properties.....	11
2.2. Optical Properties of Sea Water.....	11
2.2.1. Pure Seawater	12
2.2.2. Phytoplankton	12
2.2.3. Suspended particulate matter	15
2.2.4. CDOM (Yellow Substance).....	17
2.2.5. Classification of Waters.....	18
2.3. Radiative Transfer Simulations.....	18
2.4. Artificial Neural Network	20
CHAPTER 3 RETRIEVAL OF THE PIGMENT CONCENTRATION IN CASE I WATERS	22
3.1. Introduction	22
3.2.Data Sets	23
3.2.1. Training Data	23
3.2.2. Validation Data: the SeaBAM Data Set.....	24
3.2.3. Test Data: the COASTLOOC Data Set	26
3.3. ANN-based Pigment Retrieval in Case I Waters	26

3.3.1. Parameters affecting the performance of an ANN.....	26
3.3.2. ANN Training	27
3.3.3. Determining ANN Architecture and Noise Adding for Optimal Pigment Retrieval.....	28
3.3.4. Best ANN for Pigment Retrieval	29
3.4. Evaluating the Performance of the ANN-based Pigment Retrieval Algorithm ...	30
3.4.1. Assessing the Performance of the Trained ANN	30
3.4.2. Comparison with Existing Empirical Algorithms.....	32
3.4.3. Resistance against Noise.....	34
3.5. Conclusions	35
CHAPTER 4 MODELLING THE BACKSCATTERING PROBABILITY OF MARINE PARTICLES IN CASE II WATERS	38
4.1. Background	38
4.2. The COASTLOOC Data Set.....	38
4.3. Inherent Optical Properties of Oceanic Constituents in Case II Waters	41
4.4. Comparing <i>in-situ</i> Data and Simulations of the Marine Light Field Using Petzold's Phase Function for Marine Particles	42
4.5. Modelling the Marine Particle Phase Function in Case II Waters	43
4.6. Discussion	48
CHAPTER 5 RETRIEVAL OF OCEANIC CONSTITUENTS IN CASE II WATERS.....	51
5.1 . Introduction.....	51
5.2.Data Sets	52
5.2.1. Training Data	52
5.2.2. <i>In-situ</i> Measurement Data Sets	55
5.2.3. Data Processing.....	55
5.3.Retrieval of the Oceanic Constituents with ANN	57
5.3.1. Artificial Neural Network	57
5.3.2. ANN Training	58
5.3.3. Determining ANN Architecture and Noise Adding for Optimal Oceanic Constituent Retrieval	58
5.4.Evaluating the Performance of the ANN-based Oceanic Constituents Retrieval Algorithms	63
5.4.1. Assessing the Performance of the Trained ANN.....	63
5.4.2. Comparison with Existing Retrieval Algorithms.....	68
5.5. Conclusions	69
CHAPTER 6 RETRIEVAL OF OCEANIC CONSTITUENTS CONCENTRATIONS IN CASE II WATERS FROM MERIS DATA	70
6.1. Background	70

6.2. Simulated Data Sets	70
6.2.1. Atmosphere	70
6.2.2. Water	73
6.2.3. Sea Surface State	74
6.2.4. Ranges of the Related Parameters	74
6.2.5. RT Simulations	75
6.2.6. Creation of ANN Training Data Set	76
6.3. Artificial Neural Networks	77
6.3.1. Structure of the ANN for Retrieval of the Constituents	77
6.3.2. Performance of the ANN-based Algorithm with Simulated Data	77
6.4. Application to the MERIS Imagery	84
6.5. Conclusion	92
CHAPTER 7 SUMMARY	93
7.1. Conclusion	93
7.2. Future Work	93
REFERENCES	95