

# Contents

<b>1</b>	<b>Introduction</b> . . . . .	<b>1</b>
1.1	General Aspects of Earth System Science ( <i>Gerrit Lohmann, Klaus Grosfeld, Dieter Wolf-Gladrow, Vikram Unnithan, Justus Notholt and Anna Wegner</i> ) . . . . .	1
1.2	The Structural and Educational Concept in an Interdisciplinary Research School for Earth System Science ( <i>Klaus Grosfeld, Gerrit Lohmann, Dieter Wolf-Gladrow, Annette Ladstätter-Weißmayer, Justus Notholt, Vikram Unnithan and Anna Wegner</i> ) . . . . .	3
<b>2</b>	<b>Remote Sensing and Modelling of Atmospheric Chemistry and Sea Ice Parameters</b> . . . . .	<b>9</b>
2.1	NO <sub>2</sub> Pollution Trends Over Megacities 1996–2010 from Combined Multiple Satellite Data Sets ( <i>Andreas Hilboll, Andreas Richter and John P. Burrows</i> ) . . . . .	9
2.2	A Brief Example on the Application of Remotely Sensed Tracer Observations in Atmospheric Science—Studying the Impact of Stratosphere–Mesosphere Coupling on Polar Ozone Variability ( <i>Christoph G. Hoffmann, Matthias Palm, Justus Notholt, Uwe Raffalski and Gerd Hochschild</i> ) . . . . .	15
2.3	Contamination of the Western Pacific Atmosphere ( <i>Theo Ridder, Justus Notholt, Thorsten Warneke and Lin Zhang</i> ) . . . . .	19
2.4	Three Dimensional Model Simulations of the Impact of Solar Proton Events on Nitrogen Compounds and Ozone in the Middle Atmosphere ( <i>Nadine Wieters, Horst Winkler, Miriam Sinnhuber, Jan Maik Wissing and Justus Notholt</i> ) . . . . .	23

2.5	Evaluation of the Coupled and Extended SCIATRAN Version Including Radiation Processes Within the Water: Initial Results ( <i>Mirjam Blum, Vladimir Rozanov, Tilman Dinter, John P. Burrows and Astrid Bracher</i> ). . . . .	28
2.6	Improving the PhytoDOAS Method to Retrieve Coccolithophores Using Hyper-Spectral Satellite Data ( <i>Alireza Sadeghi, Tilman Dinter, Marco Vountas, Bettina Taylor and Astrid Bracher</i> ) . . . . .	31
2.7	Primary Productivity and Circulation Patterns Downstream of South Georgia: A Southern Ocean Example of the “Island Mass Effect” ( <i>Ines Borrione, Olivier Aumont, and Reiner Schlitzer</i> ) . . . . .	38
2.8	Summer Sea Ice Concentration Changes in the Weddell Sea and Their Causes ( <i>Sandra Schwegmann, Ralf Timmermann, Rüdiger Gerdes, and Peter Lemke</i> ). . . . .	42
2.9	Validation of the Snow Grain Size Retrieval SGSP Using Six Ground Truth Data Sets ( <i>Heidrun Wiebe, Georg Heygster, and Eleonora Zege</i> ) . . . . .	46
	References . . . . .	50
<b>3</b>	<b>Earth System Modelling and Data Analysis</b> . . . . .	<b>57</b>
3.1	The Last Interglacial as Simulated by an Atmosphere–Ocean General Circulation Model: Sensitivity Studies on the Influence of the Greenland Ice Sheet ( <i>Madlene Pfeiffer, and Gerrit Lohmann</i> ) . . . . .	57
3.2	Simulated Caribbean Climate Variability During the Mid-Holocene ( <i>Wei Wei, and Gerrit Lohmann</i> ) . . . . .	64
3.3	Oceanic $\delta^{18}\text{O}$ Variation and its Relation to Salinity in the MPI-OM Ocean Model ( <i>Xu Xu, Martin Werner, Martin Butzin, and Gerrit Lohmann</i> ) . . . . .	70
3.4	Ocean Adjustment to High-Latitude Density Perturbations ( <i>Sagar Bora, Sergey Danilov, and Gerrit Lohmann</i> ). . . . .	74
	References . . . . .	79
<b>4</b>	<b>Geotectonics</b> . . . . .	<b>83</b>
4.1	Continental Deformation of Antarctica During Gondwana’s Breakup ( <i>Florian Wobbe, and Karsten Gohl</i> ) . . . . .	83
	References . . . . .	88
<b>5</b>	<b>Climate Archives</b> . . . . .	<b>91</b>
5.1	The Inorganic Carbon System in the Deep Southern Ocean and Glacial-Interglacial Atmospheric $\text{CO}_2$ ( <i>Franziska Kersten, and Ralf Tiedemann</i> ) . . . . .	91

5.2 The Significance of the Long Lived (>400 Years) Bivalve *Arctica Islandica* as a High-Resolution Bioarchive (Jacqueline Krause-Nehring, Thomas Brey, Simon Thorrold, Andreas Klügel, Gernot Nehrke, and Bernd Brellochs). . . . . 97

5.3 Sub-Annual Resolution Measurements of Dust Concentration and Size in Different Time Slices of the NorthGRIP Ice Core (Katrin Wolff, Anna Wegner, and Heinz Miller). . . . . 103

References . . . . . 109

**6 Ecosystems and Climate Change. . . . . 113**

6.1 Predicting Habitat Suitability of Cold-Water Coral *Lophelia pertusa* Using Multiscale Terrain Variables (Ruiju Tong, Autun Purser and Vikram Unnithan) . . . . . 113

References . . . . . 118

**7 Geoinformatics . . . . . 119**

7.1 Resource-Aware Decomposition and Orchestration of Geoprocessing Requests in a SOA Framework (Michael Owonibi and Peter Baumann) . . . . . 119

7.2 A Specification-Based Quality Model to Improve Confidence in Web Services of Multidisciplinary Earth System Science (Jinsongdi Yu, and Peter Baumann) . . . . . 124

References . . . . . 128

**8 Geoengineering . . . . . 129**

8.1 Feasibility Study of Using a Petroleum Systems Modeling Software to Evaluate Basin Scale Pressure Evolution Associated With CO<sub>2</sub> Storage (Christian Ihrig, and Vikram Unnithan) . . . . . 129

References . . . . . 134



<http://www.springer.com/978-3-642-32234-1>

Earth System Science: Bridging the Gaps between  
Disciplines

Perspectives from a Multi-Disciplinary Helmholtz  
Research School

Lohmann, G.; Grosfeld, K.; Wolf-Gladrow, D.; Unnithan,  
V.; Notholt, J.; Wegner, A. (Eds.)

2013, XI, 134 p. 61 illus., 52 illus. in color., Softcover

ISBN: 978-3-642-32234-1