

## Contents

### Introduction: Motivation, Objectives, Target

*Harro Heyer*

- Models of Coastal Waters in Germany –  
Performance and Application Examples 1

### Existing Data Base

*Ralf Weisse, Lidia Gaslikova, Beate Geyer, Nikolaus Groll and Elke Meyer*  
coastDat – Model Data for Science and Industry 5

*Angela Schäfer and Roland Koppe*

- The Marine Network of Integrated Data Access and the Data Portal  
German Marine Research 19

*Rainer Lehfeldt and Johannes Melles*

- MDI-DE – German Marine Data Infrastructure 29

*Ronny Beyer, Axel Orths and Lothar Neumann*

- Data Management Centre of the Federal Waterways and Shipping Agency,  
Northern Region Office 45

*Oliver Lojek, Knut Krämer, Anna Zorndt, Nils Goseberg and Torsten Schlurmann*

- Velocity and Turbulence Measurements at the Ems Barrage 55

### Modelling Foundations

*Hans Burchard, Ulf Gräbe, Peter Holtermann, Knut Klingbeil and Lars Umlauf*

- Turbulence Closure Modelling in Coastal Waters 69

*Bert Putzar and Andreas Malcherek*

- Modelling of Sediment Transport and Morphodynamics 89

*Arne Hammrich and Dagmar Schuster*

- Fundamentals on Ecological Modelling in Coastal Waters Including an  
Example from the River Elbe 107

*Livia Mittelbach, Martin Pohl, Peter Schulze and Heinz Konietzky*

- Numerical Simulation of Rip-Rap Revetments in Tidal Areas 119

<i>Emil Stanev and Johannes Schulz-Stellenfleth</i> Methods of Data Assimilation	133
<i>Cordula Berkenbrink and Hans Dieter Niemeyer</i> Analysis of Salinity Alterations due to Estuarine Waterway Deepening by Artificial Neural Networks	153
<i>Anja Brüning and Elimar Precht</i> Statistical Analyses of Metocean Data for Offshore Wind Design in German Waters	167
<i>Marko Kastens</i> Statistical Estuary Data Analysis in Models and Measurements – Some Methods and their Limitations	185
<i>Andreas Schöl, Birte Hein, Jens Wyrwa and Volker Kirchesch</i> Modelling Water Quality in the Elbe and its Estuary – Large Scale and Long Term Applications with Focus on the Oxygen Budget of the Estuary	203
<b>Applied Modelling: Hydrodynamics</b>	
<i>Joanna Staneva, Arno Behrens and Nikolaus Groll</i> Recent Advances in Wave Modelling for the North Sea and German Bight	233
<i>Silvia Maßmann, Frank Janssen, Thorger Brüning, Eckhard Kleine, Hartmut Komo, Inge Menzenhauer-Schumacher and Stephan Dick</i> An Operational Oil Drift Forecasting System for German Coastal Waters	255
<i>Thorger Brüning, Frank Janssen, Eckhard Kleine, Hartmut Komo, Silvia Maßmann, Inge Menzenhauer-Schumacher, Simon Jandt and Stephan Dick</i> Operational Ocean Forecasting for German Coastal Waters	273
<i>Elisabeth Rudolph</i> Storm Surges in the Elbe, Jade-Weser and Ems Estuaries	291
<i>Jana Kristandt, Benedict Brecht, Helmut Frank and Heiko Knaack</i> Optimization of Empirical Storm Surge Forecast – Modelling of High Resolution Wind Fields	301
<i>Mohamed Tayel and Hocine Oumeraci</i> Extreme Storm Surge Prediction Using Hydrodynamic Modelling and Artificial Neural Networks	319

- Guntram Seif*  
Hydrodynamic Numerical Models Suitable for Application to the  
German Fairways and Ports at the Baltic Sea Coast 343
- Gerald Herrling, Johanna Elsebach and Anne Ritzmann*  
Evaluation of Changes in the Tidal Regime of the Ems-Dollard and  
Lower Weser Estuaries by Mathematical Modelling 353

### **Applied Modelling: Sediment Transport**

- Manfred Zeiler, Peter Milbradt, Andreas Pliß and Jennifer Valerius*  
Modelling Large Scale Sediment Transport in the German Bight (North Sea) 369
- Frank Kösters, Iris Grabemann and Reiner Schubert*  
On SPM Dynamics in the Turbidity Maximum Zone of the Weser Estuary 393
- Holger Weilbeer*  
Sediment Transport and Sediment Management in the Elbe Estuary 409
- Dennis Oberrecht and Andreas Wurpts*  
Impact of Controlled Tidal Barrier Operation on Tidal Dynamics  
in the Ems Estuary 427
- Monika Donner and Oliver Stoschek*  
Simulation of High Suspended Sediment Concentrations and  
Options for a Reduction in the Lower Ems 435
- Dennis Oberrecht and Andreas Wurpts*  
Investigations of Rheological Flow Properties Based on Lab Data of  
Fluid Mud Samples and an Extended Model Approach 455
- Denise Wehr*  
A Numerical Model for Fluid Mud Dynamics in Estuarine Systems –  
Overview and Outlook 463

### **Applied Modelling: Coastal Defense**

- Jan-Moritz Müller and Gabriele Gönner*  
Recent Developments in Hamburg's Coastal Protection 473
- Ulrich Winskowsky and Birgit Matelski*  
Model-Based Verification of Dikes along the West Coast of Schleswig-Holstein 481

<i>Cordula Berkenbrink and Hans Dieter Niemeyer</i> Integrated Design of Sea- and Estuarine Dikes	491
<i>H. Oumeraci, A. Kortenhaus, A. Burzel, M. Naulin, D. R. Dassanayake, J. Jensen, T. Wahl, C. Mudersbach, G. Gönner, S. Thumm, B. Gerkenmeier, P. Fröhle, K.-F. Daemrich, E. Pasche and G. Ujeyl</i> XtremRisK – Integrated Flood Risk Analysis for Extreme Storm Surges at Open Coasts and in Estuaries: Key Results and Lessons Learned	503
<b>The Coast Under Global Change</b>	
<i>Arne Arns, Jürgen Jensen and Thomas Wahl</i> A Consistent Return Level Assessment Considering Present Day and Future Mean Sea Level Conditions	525
<i>Anna C. Zornidt and Torsten Schlurmann</i> Investigating Impacts of Climate Change on the Weser Estuary	541
<i>Rita Seiffert and Fred Hesser</i> Investigating Climate Change Impacts and Adaptation Strategies in German Estuaries	551
<i>Hans Dieter Niemeyer, Cordula Berkenbrink, Anne Ritzmann, Heiko Knaack, Andreas Wurpts and Ralf Kaiser</i> Evaluation of Coastal Protection Strategies in Respect of Climate Change Impacts	565
<b>Authorindex</b>	579