

Nguyen Xuan Thinh (ed.)



Modelling and Simulation of Ecosystems

Workshop Kölpinsee 2015

RHOMBOS

PREFACE

Since 1997 the GI expert group “Simulation in environmental and geosciences” and the GI-ASIM expert group “Simulation in environmental science, geology, medicine and biology” (SUGMB) have held the annual workshop “Modelling and Simulation of Ecosystems” in the seaside resort Kölpinsee / Usedom Island in order to promote and develop modelling and simulation in theory and practice as well as simulation applications in ecology, environmental and spatial planning further. The idea of this workshop was originally proposed by Prof. Dr. R. habil. Grützner and the scientific chair who managed and moderated the workshop for fifteen times until 2011 was Prof. Dr. habil. A. Gnauck (BTU Cottbus). After the retiring of Prof. Dr. habil. A. Gnauck, the technical committee “Computer science for environmental protection, sustainable development and risk management” of the German Society for Computer Science e. V. (GI) entrusted Prof. Dr. habil. Nguyen Xuan Thinh (TU Dortmund University) with leading the workshop. During the 15th workshop on 26th to 28th October 2011, the baton was officially passed on in the presence of the spokesperson of the technical committee Dr. W. Pillmann (Wien) and the spokesperson of the expert group Prof. Dr. J. Wittmann (HTW Berlin).

The workshop always takes place in the last week of October in the hotel “Zur Ostsee” in seaside resort Kölpinsee / Usedom Island. This traditional workshop offers an ideal platform to stay informed about the current status of modelling and simulation in environmental and geosciences, to incorporate your own ideas and solution approaches and to discuss with experts in a pleasant atmosphere without pressure of time. Numerous Ph.D. students have benefited from this workshop as a proven accompanying platform for their successful doctoral thesis. Also, many ideas for projects as well as manifold and fruitful cooperations in research and teaching have emerged from this conference series.

The Department of Spatial Information Management and Modelling (RIM) at TU Dortmund University organized and led the workshop from 2012 until 2015. The number of participants within these years varied between 20 and 27. Due to ownership changes of the hotel, the 19th workshop in 2015 was the last one that could take place in the hotel “Zur Ostsee” in seaside resort Kölpinsee / Usedom Island. The 19th workshop was attended by 20 researchers and research students. The presentations were divided in the following sessions:

- Modelling and Simulation in the Course of Climate Change
- System Modelling
- Energy Modelling and Planning
- Fuzzy-Modelling and Evaluation
- Water Modelling and Management
- Modelling Approaches

Mirschel, Wieland, Gutzler, Helming and Luzzi describe that the farming sector will have to adapt to changing conditions due to climate change. They develop three scenarios for agricultural areas in the federal state of Brandenburg, Germany under the estimated climate in 2025. The impacts on agricultural yield, additional water demand and the resulting additional yield are examined by using Spatial Analysis and Modeling Tool (SAMT).

The article of **Sauer** presents a database solution for climate change simulation models as a comfortable and time-saving alternative for using ASCII data. A water balance simulation of the federal state of Saxony, Germany with PostgreSQL, R and ArcEGMO serves as example.

In their contribution, **Tra** and **Thinh** create a climate response function for the Vu Gia-Thu Bon River Basin for the assessment of drought and water shortages. A MIKE BASIN model is used to determine the water system with parametrically varied precipitation and temperature representing future climate states. Also, problematic conditions that would require adaptation actions are identified.

Balschmiter suggests a combination of Drupal 8 and the module SimIT to manage agricultural simulation models and integrate the relevant climate data for non-computer scientists. Web-GIS is then used to present the results of the simulation in interactive maps.

In his paper, **Owsiński** describes the system of simple forecasting models that were built for the capital province in Poland. The models are developed for application in the smallest administrative units LAU2, i.e. municipalities, and require only modest workstation type equipment.

Holnicki and **Kaluszko** deal with the urban scale analysis of particulate matter pollution in Warsaw metropolitan area. The annual mean concentrations of 2012 are computed by the regional scale modeling system CALMET/CALPUFF. The resulting concentration map indicates the regions and pollutants where the limit values are exceeded.

A comparison between official and open source geodata is performed by **Horst** by the example of identifying suitable sites for wind turbines with Boolean overlay technique in Germany. Results show that the total area of Germany suitable for wind areas is very similar. However, the area of suitable sites within the federal states indicates a higher discrepancy.

Wieland and **Rogasik** re-implement SAMT into Python/Cython, which is therefore opened up for a variety of modern processes like the in “scikit” included Machine Learning. Also, its maintainability is improved. The new SAMT2 can be used for complex simulations.

An evaluation of sustainable agricultural land suitability is carried out by **Kiet** and **Thinh** by application of fuzzy set theory in Soc Trang province, Viet Nam.

In their article, **Studzinski**, **Wojtowicz** and **Ziolkowski** use MOSKAN-W to create and calibrate a hydraulic model of the water supply and water distribution network of Upper Silesian, Poland.

Elmorshdy and **Thinh** evaluate disparities between land use practices and the laws and policies used for governing the coastal cities of Egypt. A multi-temporal analysis of Landsat satellite imagery is conducted and land use changes are detected during the last 30 years. Also, projects, initiatives, policies and legislations implemented are investigated for the governance of the coastal zones.

Yang and **Thinh** introduce an integrated structure of storm flood simulation and urban flood management based on agent-based modeling and simulation for Changsha City, China. A distributed hydrological model integrating Cellular Automata is developed for inundation simulation and citizens' behaviors are simulated in the inundation scenario.

Malinowski considers topological models of water supply networks and presents appropriate methods for computing their reliability parameters depending on the structure of their network.

Statistical methods are used by **Poglitsch** and **Behnisch** to investigate the network of relationships between variables that affect land consumption in Germany.

In the last contribution, **Hennersdorf, Reißmann, Lehmann** and **Deilmann** apply a production theoretical benchmark concept of “Data Envelopment Analysis” to examine the ecological and economic efficiency of cities. The analysis is performed for 116 cities in Germany and both, the assumption of constant economies of scale and variable economies of scales are investigated.

I would like to express my deepest gratitude to all the authors for their exemplary work and their very cooperative collaboration in the creation and improvement of the contributions. Special thanks go to Katja Schimohr and Christian Mützel. They have created the PDF file of the book with great efforts. Without their efforts this volume would not have been possible. Mr. Bernhard Reiser, publisher Rhombos, I express my great thanks for his excellent support and his valuable suggestions for improving the book layout and for the design of the cover of the book. Finally, I wish to thank the Family Kirsch, the owners of the Hotel „Zur Ostsee“, for the best hospital quality and support of our 19 workshops from 1997 until 2015.

Nguyen Xuan Thinh

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Contents

Modelling and Simulation in the Course of Climate Change

Mirschel, W.; Wieland, R.; Gutzler, C.; Helming, K.; Luzi, K.

Auswirkungen landwirtschaftlicher Anbauszenarien auf Ertrag und
Zusatzwasserbedarf im Land Brandenburg im Jahr 2025..... 1

Sauer, A.

Aufbereitung, Auswertung und Visualisierung der Ergebnisse von
Wasserhaushaltssimulationen für Sachsen mit ArcEGMO
auf Basis von 10 alternativen Klimaprojektionen 21

Tra, T.V.; Thinh, N.X.

Creating a climate response function in place of downscaling in the VG-TB River Basin 37

Balschmiter, T.

Landwirtschaftliche Simulationsmodelle mit dem Content Management System Drupal 8 .. 49

System Modelling

Owsiński, J.

A system of forecasting models for a province in Poland 59

Holnicki, P.; Kaluszko, A.

Computer Analysis of an Urban Scale PM₁₀ Pollution 79

Energy Modelling and Planning

Horst, D.

A comparison between official and open source geodata for the identification
of suitable sites for wind turbines in Germany 91

Fuzzy-Modelling and Evaluation

Wieland, R.; Rogasik, H.

Spatial Analysis and Modelling Tool – Version 2 (SAMT2) 101

Kiet, N.H.; Thinh, N.X.

Apply fuzzy set theory in evaluating sustainable agricultural land suitability
- Case study in four coastal districts in Soc Trang province, Viet Nam 113

Water Modelling and Management

Studzinski, J.; Wojtowicz, P.; Ziolkowski, A.

Erstellung und Kalibrierung des hydraulischen Modells des Oberschlesischen
Wasserversorgungs- und Verteilungsnetzes 133

Elmorshdy, M.; Thinh, N.X.

Application of Remote Sensing and GIS in coastal zone management;
Alexandria governorate, Egypt as a case study 147

Yang, M.; Thinh, N.X.

Storm Flood Simulation and Flood Risk Management 169

Modelling Approaches

Malinowski, J.

Computation of performance measures for water supply networks in relation to their
topological models 191

Poglitsch, H.; Behnisch, M.

Räumliche Zusammenhänge erklärt am Beispiel
der Flächeninanspruchnahme in Deutschland 203

Hennersdorf, J.; Reißmann, D.; Lehmann, I.; Deilmann, C.

Data Envelopment Analysis für Städte - Untersuchung ökologischer
und ökonomischer Effizienz von Städten unter Nutzung
eines Benchmark-Konzeptes der Produktionswirtschaft 215

List of Authors 227