

Interfaces in coupling of hydrogeological modeling systems

Berichte aus der Geowissenschaft

Wolfgang Gossel

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hydrogeological modeling systems**

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Preface

The idea for this book was developed during long periods of numerical hydrogeological modeling with very interesting topics and for diverse applications. In all cases, the numerical groundwater models were not alone. They were surrounded by hydrological models for groundwater recharge, runoff modeling of small creeks and large rivers, modeling of the unsaturated zone and surface runoff, preferential flows and even climatic developments. On the other hand, there were geological models of unconsolidated and hard rocks with simple and complex structures, with anthropogenic impacts on the geology over time, for local projects and for regional areas. And for these modeling approaches – sometimes at the cutting edge of research – new questions arose: How can this modeling system be connected to this one? How should the interface be established? In most cases, a technical or practical solution was found quickly, either via a simple data transfer or via some kind of coupling. However, a systematical view on these interfaces was lacking: How do they influence the stability of the whole modeling approach? Where are these interfaces weak and where are they strong? What makes them weak or strong? How will they influence the results?

Many questions were discussed over a long period of time with a lot of colleagues, starting at the company WASY (Berlin, Germany) where I have to thank Helge Albert, Bernd Pfützner, Wolf Pagenkopf, Stefan Kaden, Ingo Michels, Andreas Krone, and especially Junfeng Luo, Katherina Fröhlich, “Bertram” Monningkoff, Ulrich Schott and Peter Schätzl. At the Free University of Berlin, some field methods that provided another perspective on hydrogeological parameters were discussed; many thanks to Asaf Pekdeger (†) and Andreas Winkler. During this time, discussions with Maria Schafmeister about geostatistical applications in numerical models were very interesting and opened new horizons. During my time at the Geological Survey of Germany, Klaus Krampe and Peter Winter were the heads of the department in which I had the chance to set up a large model that involved some interesting facets of field investigations and geological modelling, and they gave me the chance to contribute to the Hydrological Atlas of Germany. The numerical groundwater modeling does not stand alone; the consideration of environmental aspects, biological settings, landscape planning, and urban planning is essential for scientific research in some case studies in order to gain a better understanding of interdependencies. The discussions with specialists of these fields in an NGO (Friends of the Earth) were very helpful, but they also demonstrated the political consequences of scientific work in water resources planning. My work in the Advisory Board of the Berlin Waterworks was also an influential factor for this book, and I must thank Ursula Chowanietz, Arno Deistler, Bernhard Forner, Christiane Bongartz, Wolfgang Herrmann, Claudia Lohmann, Juliane Hollender, Martina Schäfer and Michael Weber for their support during this time. The focus of the book was developed in a scientific way during my time at the University of Halle. The case studies were developed in cooperation with A.M. Ebraheem (who set up the first 3d modeling approaches of the Nubian Aquifer System) and doctoral students in the working group Hydrogeology and Environmental Geology, led by Peter Wycisk. I am very grateful for all the collaboration partners, especially Ahmed M. Sefelnasr (hydrogeological modeling of the Nubian Aquifer System, focus Egyptian oases), Ronny Lähne (hydrogeological modeling of the subrosion valley Unterwerra), Tobias Hubert (geological modeling of the Bitterfeld area), Reiner Stollberg (ongoing hydrogeological modeling of the Bitterfeld area, based on the hydrogeological model that is presented in this book), and Christian Neumann (runoff measurements of the creeks in the Bitterfeld area). Additionally, some diploma students contributed to the success of this work: Oliver Neef (local hydrogeological

model of Bitterfeld), Raik Richter (interpolation of physicochemical parameters in the Bitterfeld area), Mark Pohlert (geological modeling of the town of Halle), Andreas Wollmann (detailed geological modeling of Bitterfeld), and Dirk Schlesier (geological modeling of the town of Halle). The work performed during the last seven years was made possible by the University of Halle. From the colleagues at the University I am very grateful for a vivid exchange of ideas to Michael Falkenhagen, Kurt Friese, Herbert Pöllmann and Ian Lerche. The colleagues Norbert Hauschke, Dorothee Mertmann, Jochen Mezger and Angelika Schöner were always open for a well-meant talk. The German version of this book was submitted and accepted as a habilitation thesis in 2008. The reviewers of the thesis were Peter Wycisk, Martin Sauter, and Gunnar Nützmann. I am thankful for several hints given to me that helped to enhance the thesis of this book.

Additionally I want to thank my parents and my sister for their support in several steps of my life and for the patience they brought up during the time to finish the book.

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