Towards improved treatment of parameter uncertainty in hydrologic modeling
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17 October 1998: I will never forget my excitement as I boarded an Icelandair Boeing at Schiphol Airport in The Netherlands, and headed off for the beginnings of an unimagined future. I certainly had no thoughts of where this journey would ultimately take me. Now, after about 200,000 kilometers of travel - and about 4.5 years since joining the University of Amsterdam as PhD-student, the first part of this unexpected journey has been completed.

A career outside Holland was not my original intention when I fled the wonderful scenery and canals of Amsterdam to pursue the uncertain dream of making a place for myself in the scientific arena. I had hoped to find a home and job close to family and friends, but after thinking about this lifestyle, I eventually opened myself for more challenging ambitions. After a few years of chasing these goals, I am delighted to present the first results of my journey in this thesis. This book provides a comprehensive chapter-by-chapter overview of the scientific research that has been conducted by me and colleagues during my PhD-appointment.

Successfully completing a PhD requires hard-work, dedication, creativity, but perhaps most importantly, teamwork. With great pleasure and enthusiasm, I have pleasantly worked with various individuals during the course of my PhD-research. I would, therefore, like to take the opportunity to thank all the members of the team, who made the first steps of my journey easier by exuding enthusiasm for my research and helping me along the way.

I would like to start by gratefully acknowledging my PhD-advisor Willem Bouten. Willem, your open mind, creativity, and critical attitude have always stimulated me to optimize my own functioning and performance. Due to your involvements from the early days on, I was eventually able to parlay an inexperienced researcher and writer into the beginnings of a career as scientist. You have also given me more than sufficient opportunity to explore myself and visit various experts in hydrologic sciences in the United States to further facilitate the progress of my research.

As I revisit the various stages of my PhD-research, I notice that the environment in Amsterdam was always created in such a way that I was able to optimally exploit my own talents. For this, I am very grateful to Koos Verstraten, my other advisor at the University of Amsterdam. Koos, I have always been impressed by your people managing skills and touched by your personal interest in me and my life. Moreover, you have afforded me many lessons in humility and how to manage people in a department with diverse interests, research disciplines and goals.
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In the second year of the PhD-journey (2001), I made a work visit of about six months, to the University of Arizona, Tucson to work closely with Hoshin Gupta and Soroosh Sorooshian, to facilitate meeting the objectives of the research. This all seems a long way from the start of my PhD-appointment, although the visit was foreseen in 1999 during the initial writing of the research proposal for the Netherlands Organization for Scientific Research. Hoshin, the free and unfettered exchange of ideas during our research conversations have built the framework for Chapters 3 and 5 in this thesis. Your active involvement and expertise and gift to explain complex mathematical systems engineering concepts in simple language have stimulated me in the development of the various papers in this thesis. Soroosh, due to your always-busy traveling schedule, we only had a few moments to meet in the last few years. Nonetheless, I would like to express my gratitude for your interests in my research and family and the financial support of SAHRA and other NSF projects. Your international reputation and skills as an entrepreneur continue to inspire me.

During the early stages of my first visit to Tucson, I had mysterious company. By pure-luck and a lot of persistence, I met Roya, my future wife (three days after my PhD-graduation we will get married). She and her extraordinary family and culture have made me morph from a Dutchman to a man of the world. Roya also made me finally come to accept and embrace a career outside Europe, far from childhood friends and family. I am very grateful to her and her family for their love, support, hospitality, generosity and most importantly, for taking me into their hearts along the way.

Throughout the summer of 1999 and 2003, I spent a total of nine months visiting Jan Hopmans at the University of California, Davis to work on unsaturated flow and transport modeling. These visits helped me lay the foundation for Chapters 2 and 4 in this thesis. Jan, much of the research in these two Chapters would not have been possible without your active involvement, suggestions, and financial support. I am very pleased with our mutual research interests and thankfully appreciate the opportunity you provided to visit Davis and work together.

On a personal note, I would like to express my appreciation to all of my colleagues in Amsterdam, Tucson, and Davis for their help, sympathy and humor. I am also gratefully indebted to the various co-authors of my papers for their hard-work and dedication, including all individuals who successfully applied the various developments in this thesis to other research disciplines. Sometimes I think it would have been nice to have all my published papers as chapters in this thesis, but then again, it may be a service to potential readers that they are
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destined to remain in journals only. Thanks are also due to my friends for their labored efforts and help to build an enigmatic and versatile life outside the University.

Finally, I would like to thank my parents, two distinguished and unique members of the team. They gave me the opportunity and support to study and to be educated to the University level. Their unconditional love, trust, belief, and endless support, in all possible ways, led to this thesis.

Amsterdam, 8 May 2004.
Jasper Vrugt