

Data Assimilation for Atmospheric, Oceanic and Hydrologic Applications

Seon K. Park · Liang Xu (Eds.)

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for Atmospheric, Oceanic
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 Springer

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To
Yoshi and Koko
SASAKI



Two views of Yoshi lecturing 4/79, JML: Drawn by John M. Lewis, using a bamboo pen and India ink, when he attended Yoshi's lecture on variational data assimilation at University of Oklahoma in April 1979 (provided by Francois-Xavier Le Dimet).

Preface

Data assimilation (DA) has been recognized as one of the core techniques for modern forecasting in various earth science disciplines including meteorology, oceanography, and hydrology. Since early 1990s DA has been an important session topic in many academic meetings organized by leading societies such as the American Meteorological Society, American Geophysical Union, European Geophysical Union, World Meteorological Organization, etc.

Recently, the 2nd Annual Meeting of the Asia Oceania Geosciences Society (AOGS), held in Singapore in June 2005, conducted a session on DA under the title of “*Data Assimilation for Atmospheric, Oceanic and Hydrologic Applications.*” This first DA session in the 2nd AOGS was a great success with more than 30 papers presented and many great ideas exchanged among scientists from the three different disciplines. The scientists who participated in the meeting suggested making the DA session a biennial event.

Two years later, at the 4th AOGS Annual Meeting, Bangkok, Thailand, the DA session was officially named “*Sasaki Symposium on Data Assimilation for Atmospheric, Oceanic and Hydrologic Applications,*” to honor Prof. Yoshi K. Sasaki of the University of Oklahoma for his life-long contributions to DA in geosciences. At the 5th AOGS Annual Meeting, Busan, Korea, in June 2008, two special events were hosted along with the Symposium – “*Special Lecture on Data Assimilation*” and “*Dinner with Yoshi.*” The special lecture was presented by Prof. Sasaki with a title of “Challenges in Data Assimilation.” More than 50 scientists participated in the dinner and enjoyed talking with Yoshi.

Some papers of this volume are selected from the Symposium while others are invited. The first chapter of this book, titled “Sasaki’s Pathway to Deterministic Data Assimilation,” is contributed by John Lewis, one of Yoshi’s students. I. Michael Navon provides a comprehensive review of data assimilation for numerical weather prediction. Milija Zupanski, another student of Yoshi, addresses theoretical and practical aspects of the ensemble data assimilation, especially for the maximum likelihood ensemble filter. François-Xavier Le Dimet, who worked with Yoshi as a postdoctoral scientist and served as a co-convener of the Symposium, reviews variational data assimilation in hydrology. Most notably, Yoshi himself has contributed

a chapter, “Real Challenge of Data Assimilation for Tornadogenesis,” which introduces a new theory based on the entropic balance.

Through prominent contributions by other scientists in DA, this book has a good mixture of collected papers in both theory and applications. Theoretical and methodological aspects span variational methods, ensemble Kalman filtering, particle filtering, the maximum likelihood ensemble filter, representer method, genetic algorithm, etc., with applications to parameter estimation, radar/satellite assimilation, data assimilation for land surface/water balance modeling, oceanic and meteorological data assimilation, adaptive (targeting) observations, and radar rainfall estimates. We hope this book will be useful to individual researchers and graduate students as a reference to the most recent research developments in the field of data assimilation. We appreciate Jeffrey Walker of the University of Melbourne, Boon Chua of Oregon State University, Lance Leslie of the University of Oklahoma, and Chun-Chieh Wu of National Taiwan University, who served as the co-convenor of the Symposium previously. We are very honoured to dedicate this book to Yoshi and his lovely wife, Koko.

June 2008

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