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F. Joseph Turk   *Editors*

Satellite Precipitation Measurement

Volume 2

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Sognatore è un uomo con i piedi fortemente appoggiati sulle nuvole[*]

Ennio Flaiano (1910–1972)

[*]*Dreamer is a man with his feet firmly resting on the clouds*

In memory of
Arthur Y. Hou (1947–2013)

Preface

This book is published 13 years after the book *Measuring Precipitation from Space: EURAINSAT and the Future* (V. Levizzani, P. Bauer, and F. J. Turk, Eds., Springer, ISBN 978-1-4020-5835-6), but it is not a revised edition of the previous. It is a new book that aims to construct a quasi-complete picture of the science and applications of satellite-derived precipitation measurements at the present time.

The book comes out at the end of a very exciting era of precipitation measurements from space. The Tropical Rainfall Measuring Mission (TRMM), launched in November 1997, ended its long life in space in April 2015 providing an unprecedented 17-year-long dataset of tropical precipitation and lightning. The Global Precipitation Measurement (GPM) mission, launched in February 2014, is now in space as TRMM's natural successor with a more global perspective that extends precipitation radar observations to the Arctic and Antarctic circles. At the same time, the CloudSat mission, launched in April 2006, is in its 13th year in space and focuses on cloud structure, which is essential for improving precipitation retrievals. These are just a few examples of precipitation-oriented missions that continuously provide data from geostationary and low Earth orbits in a truly cooperative effort worldwide. This effort involves many agencies and a broad range of countries who collaborate in a genuine way to observe global precipitation.

It is by realizing the significance of this historical moment and the need to think about what is important for the future that the community joined in the effort of writing a book with the goal of serving the precipitation community itself, the scholars, the students, the stakeholders, the end users, and all the readers interested in knowing the progress of satellite precipitation studies. The most recent achievements in precipitation monitoring from space drive us into the future of measuring not only heavy rainfall but less intense rainfall, snowfall, and even hailfall. Such a scientific framework would not have even been conceivable 13 years ago and is only possible thanks to the relentless effort of the worldwide space and precipitation communities.

Naturally, we realize that at the time of the printing of this book, the field will already have made advances and thus part of the material may already be a bit

outdated. However, in this era of rapidly evolving technological developments, sensors that take years to design, build, and launch are already considered old. This is particularly true nowadays when the progress in approaching new scientific challenges is particularly fast.

Since 2007, science has made substantial progresses toward transforming satellite rainfall "estimates" into accurate "measurements" and producing operational rainfall products readily available for a wide field of applications ranging from climate research and numerical weather prediction to hydrology, agriculture, health, civil protection, and much more. Satellite-derived precipitation products are now being considered as a valuable tool for a number of applications that benefit society and save lives. This is perhaps the most important achievement of all.

This book represents a significant effort, and each author has provided high-quality material in the topics of current and future mission contributions, observations of precipitation using the suite of precipitation satellites, retrieval techniques, validation, and applications. The result is a book that not only photographs the state of the art of the discipline but also projects it into the future.

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Acknowledgments

each one of us. Other colleagues left us in recent times, and we want to honor them as well: David (Dave) H. Staelin (1938–2011), David I. F. Grimes (1951–2011), and James (Jim) A. Weinman (1930–2012). They all left us much too soon, and we miss them, but their work is here to testify to their essential contribution to the advancement of science and to meet the needs of mankind.

Two major international organizations gave us the opportunity to work together with a global strategy for the future: the International Precipitation Working Group (IPWG) and the World Meteorological Organization (WMO).

The senior editor (Vincenzo Levizzani) would like to recognize the ceaseless work of his coeditors in effectively putting together the material of their respective sections: F. Joseph (Joe) Turk for Section 1, Christian (Chris) D. Kummerow for Sections 2 and 3, Christopher (Chris) Kidd for Section 4, Kenji Nakamura for Section 5, and Dalia B. Kirschbaum for Section 6. Their commitment and competence largely influenced the quality level of this book.

Finally, our families are part of the project through their understanding and their moral and practical support. Without them, the writing of this book would have never even started.

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Contents of Volume 2

Contents of Volume 1

List of Figures