Ulrich Foelsche
Gottfried Kirchengast
Andrea Steiner

Atmosphere and Climate
Studies by Occultation Methods
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Editors

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With 134 Figures, 21 in color
Preface

Since the early use of the occultation measurement principle for sounding planetary atmospheres and ionospheres, its exploitation in atmospheric remote sensing has seen tremendous advances. In this book we focus on sensors on Low Earth Orbit (LEO) satellites, which exploit solar, lunar, stellar, GNSS (Global Navigation Satellite Systems), and LEO-crosslink signals for observing the Earth's atmosphere and climate.

The methods all share the key properties of self-calibration, high accuracy and vertical resolution, global coverage, and (if using radio signals) all-weather capability. The atmospheric parameters obtained extend from the fundamental variables temperature, density, pressure and water vapor via trace gases, aerosols and cloud liquid water to ionospheric electron density. Occultation data are therefore of high value in a wide range of fields including climate monitoring and research, atmospheric physics and chemistry, operational meteorology, and ionospheric physics.

The 2nd International Workshop on Occultations for Probing Atmosphere and Climate – OPAC-2 – was held September 13–17, 2004, in Graz, Austria. OPAC-2 aimed at providing a casual forum and stimulating atmosphere fertilizing scientific discourse, co-operation initiatives, and mutual learning and support amongst members of all different occultation communities. The workshop was attended by 40 participants from 12 different countries who actively contributed to a scientific programme of high quality and to an excellent workshop atmosphere, which was judged by the participants to have fully met the aims expressed.

The programme included 7 tutorial lectures and 15 invited presentations, complemented by about 30 contributed ones, including 11 posters, and an occultation software demonstration. It covered occultation science from occultation methodology in general via different occultation methods and new concepts to use and applications of occultation data in atmosphere and climate science. The detailed programme and all further workshop information will continue to be available online at the OPAC-2 website at http://www.uni-graz.at/opac2.

This book was compiled based on selected papers presented at OPAC-2 and well represents in its six chapters the broad scope of the workshop. Results from the radio occultation experiment onboard CHAMP, which is now over five years in orbit, are collected in chapter 1 while chapter 2 comprises results from the stellar occultation experiment GOMOS onboard ENVISAT. Wave optics algorithms turned out to be very useful for the processing of radio occultation data in the lower troposphere; they are covered in chapter 3. Chapter 4 deals with future occultation missions and with the novel LEO-LEO crosslink concept. Radio occultation data are now increasingly used in numerical weather prediction and atmos-
pheric studies as well as in climate monitoring and change research. This is re-
lected by the significant amount of articles in chapter 5 and chapter 6, respec-
tively.

We cordially thank all OPAC-2 colleagues, who contributed as authors and co-
authors to the book, for the effort and diligent work invested into their papers and
for largely observing the length target. All papers were subjected to a peer review
process, involving two independent expert reviewers per paper from the commu-
nity of OPAC-2 participants and beyond. We also very much thank these review-
ers for their important service to coherently ensure scientific correctness and high
quality of the book from first to last page.

The reviewers, in alphabetical order, were C. O. Ao, G. Beyerle, C. Boone, M.
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(see the OPAC-2 website noted above for details) and the sponsors of the START
Program No. Y103-N03 (Federal Ministry for Education, Science, and Culture;
Austrian Science Fund) for providing the material support enabling the realization
of the book.

We hope that, in the spirit of the OPAC-2 aims, the book will become a useful ref-
ence for the members of the occultation-related community but also for mem-
ers of the science community at large interested in the present status and future
promises of the field of occultations for probing atmosphere and climate.

Graz, January 2006

Ulrich Foelsche
Gottfried Kirchengast
Andrea K. Steiner
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