Guest Editorial
Special Section on Meteorology, Climate, Ionosphere, Geodesy, and Reflections From the Ocean Surfaces: Studies by Radio Occultation Methods

IN THIS special section on different studies by Radio Occultation (RO) Methods, you can find several papers dealing with the state of the art of fundamental aspects of the problem, with special emphasis on the recent FORMOSAT-3/COSMIC LEO satellite constellation.

Indeed, recent RO space missions have been proved successful in addressing a broad range of scientific questions in Atmosphere: Climate, Meteorology, including Weather Prediction, Vertical Profiles of the Temperature, Pressure, Density, and Horizontal Wind in the Stratosphere and Troposphere, Humidity Vertical Distribution in the Troposphere, Internal Wave activity, etc. Therefore, the RO data have been used in studies that went well beyond the RO retrieval algorithm research. In April 1995, the U.S. launched a pioneering small satellite Microlab-1 to examine extensively and explore the RO method for investigating the atmosphere and ionosphere using two GPS L-band signals (GPS/MET experiment). Following the successful GPS/MET experiment, many national programs of RO monitoring have been realized in Germany (CHAMP), Denmark (OERSTED), Argentina (SAC-C), GRACE, METOP, and Taiwan (FORMOSAT-3/COSMIC). NASA-EOS, NASA-GFZ, and Korea are planning to launch RO programs ICESAT/GLAS, TERRA-SAR, and KOMPSAT-5.

Among the current RO space missions, the FORMOSAT-3/COSMIC represents a milestone of its kind. The project has been aimed to place six small microsatellites into six different orbits at 700–800 km above the Earth's surface. These satellites orbit around the Earth to form a unique low Earth orbit constellation that will receive signals transmitted by the U.S. GPS satellites. They provide over 2500 soundings of the ionosphere and atmosphere data per day globally. Ultimately, the FORMOSAT-3/COSMIC datasets are demonstrating the current need of improved weather forecasting, increased capability of climate research, better prediction of space weather, and the advances of fundamental global gravity research.

Currently, the RO approach offers precise accuracies and resolutions that rival those of the instruments onboard weather balloons, while filling in large global coverage gaps. Since the beginning of the RO research, such precise global measurements of atmospheric parameters have never been accomplished before from space.

In this special section, you can find several papers dealing with the state of the art of fundamental aspects of the problem. In two works by Liou *et al.*, introductions on both the FORMOSAT-3/COSMIC Constellation deployment and on the Constellation system performance are summarized. Moreover, the same authors provide details on the data retrieval algorithm in the same mission. Results corresponding to a previous GPS occultation mission, the German CHAMP satellite, in terms of water-vapor and temperature profiles, are summarized in Heise *et al.* Their comparisons of the water-vapor and temperature profiles, with *in situ* aircraft data and with the European Centre for Medium range Weather Forecasting analyses, are promising. To get such challenging results, very good knowledge of the satellite orbit is required. In this context, the derivation of temporal gravity variations from the orbit dynamical problem in the FORMOSAT-3/COSMIC satellite is well covered in Hwang *et al.* Another interesting paper by Xie *et al.* ends the special section, showing that other platforms can support the atmosphere profiling by RO methods, such as airborne Global Navigation Satellite System receivers.

YUEI-AN LIOU, *Guest Editor*
College of Electrical Engineering
and Computer Science
Center for Space and Remote Sensing Research
National Central University
Chung-Li 320, Taiwan

MANUEL HERNANDEZ-PAJARES, *Guest Editor*
Technical University of Catalonia
08034 Barcelona, Spain

V. CHANDRASEKAR, *Guest Editor*
Colorado State University
Fort Collins, CO 80523 USA

EDWARD R. WESTWATER, *Guest Editor*
NOAA-CU Center for Environmental Technology
Cooperative Institute for Research
in Environmental Science
Boulder, CO 80309 USA

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Yuei-An Liou (S'91–M'96–SM'01) received the B.S. degree in electrical engineering from the National Sun Yat-Sen University, Kaohsiung, Taiwan, in 1987and the M.S.E. degree in electrical engineering, the M.S. degree in atmospheric and space sciences, and the Ph.D. degree in electrical engineering and atmospheric, oceanic, and space sciences from the University of Michigan, Ann Arbor, in 1992, 1994, and 1996, respectively.

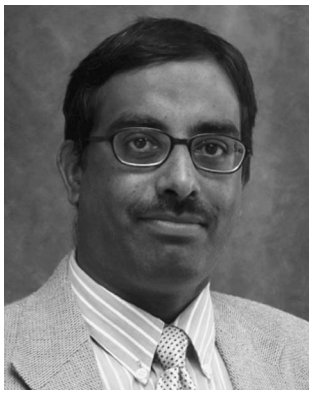
From 1989 to 1990, he was a Research Assistant with the Robotics Laboratory, National Taiwan University, Taipei, Taiwan. From 1991 to 1996, he was a Graduate Student Research Assistant with the Radiation Laboratory, University of Michigan, where he developed land–air interaction and microwave emission models for prairie grassland. He was a Member of the faculty with the Center for Space and Remote Sensing Research (CSRSR), the Institute of Space Sciences, and the Department of Electrical Engineering, National Central University (NCU), Chungli, Taiwan, in 1996, 1997, and 2005, respectively, where he is currently a Professor and the Director of CSRSR. He was the Division Director with the Science Research Division, National Space Organization (NSPO), Hsinchu, Taiwan, in 2005, where he continued to serve as an Advisor in 2006. From August 2006 to July 2007, he was the Chair Professor and the Dean with the College of Electrical Engineering and Computer Science, Ching Yun University, Chungli. His current research activities include GPS meteorology and ionosphere, remote sensing of the atmosphere and land surface, land surface process modeling, and application of neural networks and fuzzy systems in inversion problems. He is a Principal Investigator on many research projects sponsored by the National Science Council (NSC), Council of Agriculture, NSPO, Civil Aeronautics Administration, Ministry of Interior and Water Conservancy Agency of Taiwan, and the Office of Naval Research of USA. He has over 70 referral papers and more than 200 international conference papers. He is a Member of the Editorial Advisory Board of *GPS Solutions*, and he served as the Guest Editor for the June 2005 Special Issue of "GPS Radio Occultation Experiments" of *GPS Solutions*. He is a Referee for *Terrestrial, Atmospheric and Oceanic Sciences*; *Asian Journal of Geoinformatics*; *International Journal of Remote Sensing*; *Earth, Planets, and Space*; *Water Resources Research*; *Environmental Modeling and Software*; *Remote Sensing of Environment*; *Journal Geophysical Research*; *and Annales Geophysicae.*

Dr. Liou served as a Leading Guest Editor for the IEEE TRANSACTIONS ON GEOSCIENCE AND REMOTE SENSING (TGRS) special issue "Meteorology, Climate, Ionosphere, Geodesy, and Reflections from the Ocean surfaces: Studies by Radio Occultation Methods." He also serves as the Associate Editor of the IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing starting 2008. He is listed in Who's Who in the World. He was a recipient of the Annual Research Awards from NSC in 1998, 1999, and 2000; The First Class Research Awards from NSC in 2004, 2005, and 2006; and the NCU Outstanding Research Awards in 2004 and 2006. He was awarded with "Contribution Award to FORMOSAT3 National Space Mission" by NSPO in 2006. He is a member of the American Geophysical Union, the American Meteorological Society, and the International Association of Hydrological Sciences. He was awarded with Honorary Life Member of The Korean Society of Remote Sensing in 2007. He was elected as a Foreign Member of the Russian Academy of Engineering Sciences in 2008. He was awarded with Outstanding Alumni Award by the University of Michigan Alumni Association in Taiwan in 2008. He is a referee for the IEEE TGRS.

Manuel Hernandez-Pajares was born in Valverde de Leganes, Spain, on November 12, 1962. He received the degree in physics and the Ph.D. degree in astronomy from the University of Barcelona, Barcelona, Spain, in 1985 and 1990, respectively.

He then joined the Cartographic Institute of Catalonia, Barcelona, where he worked on Global Positioning System (GPS) applications. Since 1993, he has been an Associate Professor with the Technical University of Catalonia (UPC), Barcelona, working first on the applications of neural networks to astronomy and then on new algorithms for precise atmospheric sounding and satellite navigation using GPS and GALILEO data. Such research activity has been developed in the research group of Astronomy and Geomatics (gAGE/UPC), producing several achievements in collaboration with his gAGE/UPC colleagues Dr. M. Juan and Dr. J. Sanz: the development of tomographic models optimized for electron content estimation from ground- and space-based GPS data (1996), the development of a wide-area RTK algorithm for GPS (1999, in collaboration with Dr. O. Colombo from GSFC/NASA), and the invention of instantaneous wide-area RTK algorithms for three-frequency systems (2002, under European Space Agency (ESA) contract and international patent). He has been the Principal Investigator of 15 national and international scientific projects, including the International Consortia funded by the ESA and Galileo JU/GSA. He has authored about 40 papers in peer-reviewed journals with JCR index, 65% of which are within the first and second ISI impact index quartiles, and coauthored two GPS processing books. He has also presented more than 100 papers in meeting proceedings. He is a coholder of four patents. He is a reviewer for several international journals and has been invited to participate and chair in several international meetings.

Dr. Hernandez-Pajares is a member of the International Astronomical Union (since 1991), the European Geophysical Society (since 1995), the American Geophysical Union (since 1997), the Institute of Navigation (ION, since 1999) and IEEE since 2001. He has been the Chairman and Product Coordinator of the International GNSS Service Ionosphere WG from 2002 to 2007 and an Associate Member since 1998. He belongs to several international working groups related to the International GPS Service, the ESA, and the International Association of Geodesy and Geophysics. He was a corecipient of three Best Presentation Awards from the ION. In 2008, he was granted the Chair Professor habilitation in Sciences in Catalonia.



V. Chandrasekar (S'83–M'87–F'03) is currently a Professor at Colorado State University (CSU), Fort Collins. He has been actively involved with research and development of weather radar systems for over 25 years and has about 30 years of experience in radar systems. He has played a key role in developing the CSU-CHILL National Radar Facility as one of the most advanced meteorological radar systems available for research, and continues to work actively with the CSU-CHILL radar supporting its research and education mission and is a Co-Principal Investigator and engineering leader of the facility. He serves as the Deputy Director of the NSF-ERC, Center for Collaborative Adaptive Sensing of the Atmosphere. He is an avid experimentalist conducting special experiments to collect *in situ* observations to verify the new techniques and technologies. He is coauthor of two textbooks, *Polarimetric and Doppler Weather Radar* (Cambridge Univ. Press) and *Probability and Random Processes* (McGraw-Hill). He has served as academic advisor for over 50 graduate students.

Dr. Chandrasekar has served as a member of the National Academy of Sciences Committee on "Weather Radar Technology beyond NEXRAD" and was the General Co-Chair for the IGARSS'06 Symposium. He has received numerous awards including the Abell Foundation Outstanding Researcher Award, NASA Technical Contribution Award, NOAA/NWS Director's Medal of Excellence, Outstanding Advisor Award, as well as the Distinguished Diversity Services Award. He is a Fellow of the AMS and CIRA.

Edward R. Westwater (SM'91–F'01) received the B.A. degree in physics and mathematics from the Western State College of Colorado, Gunnison, in 1959, and the M.S. and Ph.D. degrees in physics from the University of Colorado, Boulder (CU) in 1962 and 1970, respectively.

From 1960 to 1995, he was with the U.S. Department of Commerce. Since 1995, he has been with the Cooperative Institute for Research in Environmental Science (CIRES), Department of Electrical and Computer Engineering (ECE), CU, and joined the U.S. National Oceanic and Atmospheric Administration-CU Center for Environmental Technology (CET), ECE, in 2006. He presented the American Meteorological Society's Remote Sensing Lecture in 1997. From 1999 to 2002, he served as an Associate Editor of *Radio Science*, and from 2000 to 2002, he was the Chairman of the International Union for Radio Science Commission F. He was the Chairman and Organizer of the 1992 International Specialists Meeting on Microwave Radiometry and Remote Sensing Applications (MicroRad) and was a Co-Organizer of MicroRad 2001. He is currently a Research Professor at CET and CIRES. He is the author or coauthor of more than 275 publications. His research interests are microwave absorption in the atmosphere, remote sensing of the atmosphere and ocean surface, microwave and infrared radiative transfer, ground- and satellite-based remote sensing by passive radiometry, and the application of mathematical inversion techniques to problems in remote sensing.

Dr. Westwater is a member of the American Meteorological Society, the American Geophysical Union, and the Mathematical Association of America. He received the 15th V. Vaisala Award from the World Meteorological Society in 2001 and the Distinguished Achievement Award from the IEEE Geoscience and Remote Sensing Society in 2003. He served as a Guest Editor of the IEEE TRANSACTIONS ON GEOSCIENCE AND REMOTE SENSING (TGARS) Special Issue devoted to MicroRad 2004 and of the TGARS Special Issue devoted to MicroRad 2006 and is currently an Associate Editor of TGARS.