

Introduction to the Special Issue on the 12th Specialist Meeting on Microwave Radiometry and Remote Sensing Applications (MicroRad 2012)

THE 12th Specialist Meeting on Microwave Radiometry and Remote Sensing of the Environment (MicroRad 2012) was held at Villa Mondragone, University of Rome "Tor Vergata," near Frascati, Italy, on March 5–9, 2012. The conference was chaired by Paolo Ferrazzoli (Chair) and Leila Guerriero (Co-Chair), both faculty members at the University of Rome "Tor Vergata." The objective of MicroRad 2012 was to provide an open forum to report and discuss recent advances in the field of microwave radiometry, particularly with application to remote sensing of the environment. The meeting was highly successful, with more than 120 attendees representing 20 countries. There were 76 oral presentations and more than 40 posters. This meeting was the 12th in a series that began in Rome in 1983 when Prof. Giovanni d'Auria of the University of Rome "La Sapienza," Rome, Italy, organized and hosted the Specialist Microwave on Radiometry and Remote Sensing Applications. Five years later, the meeting was revitalized by Paolo Pampaloni of the Istituto di Ricerca sulle Onde Elettromagnetiche, Consiglio Nazionale delle Ricerche, Florence, who organized the second MicroRad in Florence, Italy, in 1988. Since then, MicroRad meetings have been held approximately every 2 1/2 years, alternating between Italy and the USA. Previous MicroRad meetings in the USA were held in Boulder, CO (1992 and 2001); in Boston, MA (1996); in San Juan, Puerto Rico (2006); and in Washington, DC (2010). The other MicroRad meetings in Italy were convened in Rome at "Tor Vergata" (1994) and at "La Sapienza" (2004) and again in Florence (1999 and 2008). MicroRad has become a venue for the microwave radiometry community to provide a common forum to report and discuss recent achievements and to bring together participants from the research community and industry. It is felt that cross fertilization of experience will benefit not only the radiometry community and the conference attendees but also environmental management agencies that need to be informed of new scientific and technological advances to plan for future activities. The MicroRad meetings are also meant to facilitate interaction between the scientific community and industry and to foster benefits that microwave and millimeter-wave radiometry can provide for society, both through the effects of the data products and through economic gain.

The MicroRad 2012 technical program was organized into 13 oral sessions, listed in order of presentation during the conference, as follows:

- 1) The Aquarius Mission;
- 2) Oceans;
- 3) Soil and Vegetation;

- 4) The SMOS Mission;
- 5) SMOS Tests and Field Campaigns;
- 6) Clouds and Precipitation;
- 7) Atmospheric Sounding;
- 8) Snow, Cryosphere, and Frozen Soil;
- 9) Emission Models for Land;
- 10) Radio Frequency Interference (RFI) Detection and Mitigation;
- 11) Calibration and New Technologies;
- 12) Calibration and Intercalibration;
- 13) New Technologies and Future Missions;

MicroRad 2012 began with a guided tour of the outstanding historical venue, Villa Mondragone. Villa Mondragone was named for "mountain dragon" after the heraldic dragon of Pope Gregory XIII, who regularly used the villa as a summer residence. It was where Pope Gregory XIII in 1582 signed the papal bull "*Inter gravissimas*," which initiated the reform of the calendar and created the Gregorian calendar, which is also called the Western calendar and is the most internationally recognized and used calendar to this day. In 1611, the site was chosen as a visual reference during an observation from Rome guided by Galileo Galilei, with a new instrument that he had improved: the telescope. More recently and connected with the topic of MicroRad 2012, it was here in 1932 that the first test was conducted on land for communication using VHF radio, designed and developed by Guglielmo Marconi, between the Villa and the Vatican.

The oral session on Atmospheric Sounding held on Wednesday was organized as a Special Session in Memory of Prof. David Staelin of Massachusetts Institute of Technology (MIT). The co-organizers, who also co-chaired the session, were Frank Marzano of the University of Rome "La Sapienza" and William Blackwell of the MIT Lincoln Laboratory. The session opened with a commemorative talk for Prof. Staelin by William Blackwell, who was one of his many well-known Ph.D. students. The oral session on Emission Models for Land held on Thursday was designated as a URSI oral session and was co-organized by URSI Commission F, Wave Propagation and Remote Sensing.

The meeting consisted of a serial sequence of oral presentations (i.e., no parallel sessions) organized into the sessions listed above, with two additional sessions on Monday morning and Wednesday afternoon at which posters related to these topics were presented. The poster sessions were very well attended and provided an opportunity to both socialize and to learn in more detail about recent work in microwave radiometry. A feature of this meeting that was continued from the two previous MicroRad meetings was the encouragement of poster presentations by giving awards for outstanding poster presentations. The poster award ceremony was held on Thursday

evening. The winners of the MicroRad 2012 Poster Awards are the following:

- 1) William Blackwell, Christopher Galbraith, Timothy Hancock, Vince Leslie, Idahosa Osaretin, Mike Shields, Paul Racette, and Lawrence Hilliard for their presentation entitled "Design and Analysis of a Hyperspectral Microwave Receiver Subsystem";
- 2) Gian Luigi Liberti, Claudio Tranterici, and Michele Buzzicotti for their presentation entitled "Validation of TMI-derived Total Precipitable Water Vapour with Operational Soundings."

The conference banquet was held at the top-quality Cacciani Restaurant in Frascati. The chef performed the final steps of cooking the pasta right in front of the attendees, also requesting the help of one of the younger attendees in the party to put on an apron and mix the pasta with the sauce. At the end of the banquet, Paolo Pampaloni, on behalf of the Centro di Telerilevamento a Microonde (CETEM), presented the highly prestigious Golden Florin Award to two recipients, Calvin T. Swift "for outstanding contributions to development of passive microwave remote sensing instrumentation" and Edgeworth R. Westwater "for pioneering, continued and substantial theoretical and experimental contributions to microwave radiometry for atmospheric remote sensing." Since neither of the awardees was able to attend MicroRad 2012, Christopher Ruf accepted on behalf of Calvin Swift and Steven Reising accepted on behalf of Edgeworth Westwater. They subsequently delivered the Golden Florins and certificates to the awardees in the USA.

MicroRad 2012 would not have been possible without the contributions of many people and institutions that helped make the meeting a success with their kind attendance, the presentation of interesting papers and posters, the participation in MicroRad events, and the accomplishment of many tasks. The organizers are grateful to the MicroRad Permanent Steering Committee for its help and support and to the Technical Committee, as well as to all who helped review papers and abstracts. This would not have been possible without the hard work and dedication of the organizing committee consisting of Simonetta Paloscia (Technical Program Chair), Steven Reising (Technical Program Co-Chair), Giovanni Schiavon, Fabio Del Frate, Rachid Rahmoune, Antonio Perrone, Maurizio Saltali, and Roberta Abbate.

The meeting also would not have been possible without the sponsorship of the IEEE, the IEEE Geoscience and Remote Society (IEEE GRSS), the IEEE GRSS Central Italy Chapter, and the International Union of Radio Science and the contributions from the Tor Vergata University of Rome, the European Space Agency, and CETEM.

The meeting concluded with the announcement that the next MicroRad Specialist Meeting will be held in Pasadena, CA, USA, on March 24–28, 2014, and will be organized by Shannon Brown of California Institute of Technology's Jet Propulsion Laboratory.

Authors of accepted papers were encouraged to submit conference papers of four to six pages. These comprise the conference proceedings and are available on IEEE Xplore. The conference proceedings were also published on CD-ROM and distributed to all MicroRad 2012 participants after the meeting.

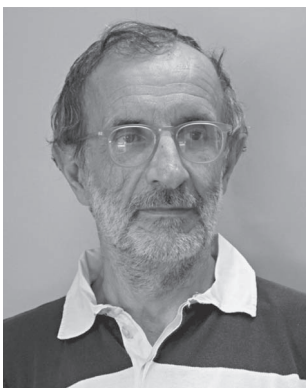
From the papers presented at MicroRad 2012 and others submitted specifically for this special issue, 12 were selected for inclusion in the special issue. The papers were carefully peer reviewed with the usual standards of the IEEE TGRS. As is evident from the table of contents, these papers span a broad range of microwave radiometry and remote sensing applications and reflect the interest in MicroRad and the vitality of research in this area.

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Paolo Ferrazzoli (M'94–SM'06) graduated from the University "La Sapienza" of Rome, Rome, Italy, in 1972.

In 1974, he joined Telespazio s.p.a., where he was mainly active in the fields of antennas, slant-path propagation, and advanced satellite telecommunication systems. In 1984, he joined Tor Vergata University of Rome, where he is presently working, teaching microwaves and propagation. His current research is focused on microwave remote sensing of vegetated terrains, with particular emphasis on electromagnetic modeling. He has been involved in international experimental remote sensing campaigns such as Agriculture and SAR (AGRISAR), Agriculture and Scatterometer (AGRISCATT), MAESTRO-1, Mutisensor Airborne Campaign (MAC)-Europe, and Shuttle Imaging Radar (SIR)-C/X-Synthetic Aperture Radar (SAR). He has participated in the coordinating team of the European Radar-Optical Research Assemblage (ERA-ORA) Project, funded by European Economic Community, establishing a collaboration among several European researchers working in radar applications.

Mr. Ferrazzoli has been a member of the Science Advisory Group of the European Space Agency-Soil Moisture and Ocean Salinity Project. He was Chair of the MicroRad 2012 International Meeting, and a member of the Technical Program Committees of the IGARSS 2012 and IGARSS 2013 conferences.



Leila Guerriero received the M.S. degree in physics from the University of Rome “La Sapienza,” Rome, Italy, in 1986 and the Ph.D. degree in electromagnetism from Tor Vergata University, Rome, Italy, in 1991. Since 1994, she has been a Permanent Researcher at Tor Vergata University, where she is now Associate Professor teaching a course on Satellite Earth Monitoring.

In 1988, she was involved with a cooperation between the Jet Propulsion Laboratory, Pasadena, CA, USA and the Italian National Research Council for investigations on geophysical applications of imaging spectrometry in infrared and visible remote sensing. In 1995, she participated in the European Space Agency (ESA) project concerning polarimetric radiometry of the sea surface. In 1999–2001, she participated in the European Economic Community’s concerted action European RADar–Optical Research Assemblage to improve radar data analysis and utilization. More recently, she has been involved in ESA projects on the “Use of Bistatic Microwave Measurements for Earth Observation” and “GNSS’R for land monitoring.” Since 1994, she has been a Permanent Researcher with Tor Vergata University, where she is currently

an Associate Professor, holding a course on satellite earth monitoring. Her activities at Tor Vergata University are mainly focused on modeling microwave backscattering and emissivity from agricultural and forested areas.



Simonetta Paloscia (M’92–SM’06–F’12) received the M.S. degree in agricultural sciences from the University of Florence, Florence, Italy, in 1979.

After graduation, she joined the National Research Council (CNR), IATA, where she worked on agrometeorology and remote-sensing studies concerning agricultural crops. Since 1987, she has been with the Institute of Applied Physics, (CNR-IFAC), Florence, where she continued studying natural surfaces using microwave and infrared remote-sensing techniques. Her current research focuses on the study of microwave emission and scattering of soil (both bare and snow-covered) and vegetation. Since 2001 she has been a Senior Scientist, and since January 2004 she has been the leader of the Microwave Remote Sensing group at IFAC. She had participated in various microwave remote-sensing campaigns (SAR-580, AGRISAR, AGRISCATT’87, AGRISCATT’88, MAC’91, and SIR-C/X-SAR), where she has coordinated the activities of ground-truth data collection. She was co-investigator of the SIR-C/X-SAR and ERS-1 projects, and Principal Investigator of the JERS-1 project. She participated in European Projects where

she is co-investigator in NOPEX-Forest Dynamo, ReSeDA, and ENVISNOWEC Programs and is scientifically responsible for the FLAUBERT and FLOODMAN. Since 1996, she has been a Principal Investigator with the science team of NASDA (Japan Space Agency), in the context of the project Advanced Earth Observing Satellite, for the use of AQUA/AMSR-E microwave data in algorithms for measuring soil moisture and vegetation biomass from satellites. She was member of organizing committees of several international meetings, including the Specialist Meeting on Microwave Radiometry and Remote Sensing Applications, held in Florence in 1988, 1999, and 2008, and the annual IEEE International Geoscience and Remote Sensing Symposium (IGARSS). She is a regular referee of the following international journals: IEEE TRANSACTIONS ON GEOSCIENCE AND REMOTE SENSING and *International Journal of Remote Sensing*. She is also an Associate Editor of the *International Journal of Remote Sensing*. She became a Senior Member of IEEE in 2006, and an IEEE Fellow in 2012. She is also President of the GRS Central Italy Chapter and Vice-Chair of URSI Commission F. She is the author and coauthor of more than 70 papers and chapters published in international journals and books and of more than 100 papers published in proceedings of international meetings.



Steven C. Reising (S'88–M'98–SM'04) received the B.S.E.E. (*magna cum laude*) and M.S.E.E. degrees in electrical engineering from Washington University in St. Louis, Saint Louis, MO, USA, and the Ph.D. degree in electrical engineering from Stanford University, Stanford, CA, USA, in 1998, where he was supported by a National Aeronautics and Space Administration (NASA) Earth Systems Science Fellowship and advised by Prof. Umran S. Inan. At Stanford, his research focused on low-frequency remote sensing of lightning and its energetic coupling to the ionosphere, which produces chemical changes and transient optical emissions. He is currently Full Professor of electrical and computer engineering with Colorado State University (CSU), Fort Collins, CO, USA, where he served as Associate Professor from 2004 to 2011. Shortly before joining the CSU faculty in 2004, he received tenure at the University of Massachusetts Amherst, Amherst, MA, USA, where he had been an Assistant Professor of electrical and computer engineering since 1998. During the summers of 1999, 2000, and 2003, he was a Summer Faculty Fellow in the Remote Sensing Division of the Naval Research Laboratory in Washington, DC.

His research interests span a broad range of remote sensing disciplines, including passive microwave and millimeter-wave remote sensing of the oceans, atmosphere, and land; microwave circuits and radiometer systems; lidar systems for sensing of temperature and winds in the middle and upper atmosphere; and atmospheric electrodynamics. He has been the Principal Investigator of 12 grants from the National Science Foundation (NSF), NASA, Office of Naval Research (ONR), National Polar-orbiting Operational Environmental Satellite System Integrated Program Office (subcontract through the Naval Research Laboratory), European Space Agency (subcontract through the Sapienza University of Rome), and Ball Aerospace and Technologies Corporation.

Dr. Reising has served as the Vice President of Information Resources (2011–present) and the Vice President of Technical Activities (2008–2010) of the IEEE Geoscience and Remote Sensing Society (GRSS). He has served as an elected member of the IEEE GRSS Administrative Committee continuously since 2003, after three-year terms as Editor of the GRSS Newsletter (2000–2002) and Associate Editor for University Profiles (1998–2000). He has been an Associate Editor of the IEEE TRANSACTIONS ON GEOSCIENCE AND REMOTE SENSING LETTERS (GRSL) since its founding in 2004. He has been a Guest Editor of IEEE TRANSACTIONS ON GEOSCIENCE AND REMOTE SENSING for the International Geoscience and Remote Sensing Symposium (IGARSS) 2008 Special Issue published in November 2009 and the Special Issue on Microwave Radiometry and Remote Sensing Applications published in July 2007. He has served as a recent reviewer for IEEE TRANSACTIONS ON GEOSCIENCE AND REMOTE SENSING (TGRS), GRSL, the IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES, the *Journal of Atmospheric and Oceanic Technology*, the *Journal of Geophysical Research—Oceans*, *Marine Geodesy*, *Atmospheric Chemistry and Physics*, the *Journal of Oceanography*, and *Radio Science*. He was the recipient of the NSF CAREER Award (2003–2008) in the areas of physical and mesoscale dynamic meteorology and the ONR Young Investigator Program Award (2000–2003) for passive microwave remote sensing of the oceans. His Ph.D. student Sharmila Padmanabhan was the recipient of the Second Prize Student Paper Award at IGARSS 2003 in Toulouse, France, and the International Union of Radio Science (URSI) Young Scientist Award in New Delhi in 2005. Three of his undergraduate senior design students won two consecutive Best Paper Contests from the IEEE Denver Section and the IEEE Solid-State Circuits Society in 2007 and 2008. He was awarded the Barbara H. and Joseph I. Goldstein Outstanding Junior Faculty Award in 2004, the Lilly Teaching Fellowship for 2001–2002, and a Young Scientist Award at the URSI General Assembly in Toronto, Canada, in 1999. While at Stanford, he received first place in the United States National Committee (USNC) URSI Student Paper Competition at the 1998 National Radio Science Meeting in Boulder, CO, USA. In organizing scientific meetings, he was one of two Technical Program Cochairs of the IEEE IGARSS 2008 in Boston, MA, USA, with over 1700 attendees. He served as the General Chair of MicroRad'06, the 9th Specialist Meeting on Microwave Radiometry, held in March 2006 in San Juan, Puerto Rico, with 126 attendees from 15 countries. He was the Local Arrangements Chair for IGARSS 2006 in Denver, with over 1250 attendees. He has been an active participant in each IGARSS Technical Program Committee from 2001 up to the present. He serves the URSI as the Chair (2012–2014) and previously as Secretary and Chair-Elect (2009–2011) of its USNC, consisting of ten scientific commissions focusing on the theory and applications of electromagnetics and radio waves from ultralow frequencies to terahertz. Previously, he chaired its annual Student Paper Prize Competition at the National Radio Science Meeting in Boulder each year from 2004–2008 and at the URSI North American Radio Science Meeting in Ottawa in 2007. He chaired the first and second URSI International Student Paper Prize Competitions at the URSI General Assemblies and Scientific Symposia in Chicago and Istanbul in 2008 and 2011, respectively. He served as the Secretary of USNC-URSI Commission F (2006–2008) and is a member of URSI Commissions F, G, and H, the American Meteorological Society, the American Geophysical Union, Tau Beta Pi, and Eta Kappa Nu.