

IGARSS in Yokohama, Japan: Impressions From the First Days

The 39th IEEE International Geoscience and Remote Sensing Symposium (IGARSS 2019) was held 28 July–2 August 2019 in Yokohama, Japan, with the theme “Global Environment Observation and Disaster Mitigation.” The second event of its kind held in Japan (following IGARSS 1992 in Tokyo), IGARSS 2019 filled five floors at the Pacifico Yokohama Convention Center, located directly on Tokyo Bay and easily accessible by subway (Figures 1 and 2). The setup enabled quick transitions between oral and poster sessions as well as the exhibition. Yokohama, a commercial hub with one of the country’s major ports, belongs to the Greater Tokyo Area and is considered the second-largest city in Japan.

The opening and plenary session, held on Monday, 29 July, in the main hall of the conference center, started at 9 a.m. Attendees were informed that Their Majesties the Emperor and Empress of Japan would participate during the opening ceremony. Therefore, the plenary room, with 1,000 attendees, was fully occupied, and two additional rooms provided live streaming for approximately 500 more participants.

OPENING SESSION

WELCOME ADDRESSES

The morning of the first day consisted of the opening and plenary session, awards ceremony, symposium introduction, and opening ceremony with the attendance of His Majesty the Emperor and Her Majesty the Empress. Akira Hirose, general chairman of IGARSS 2019, gave a warm welcome address [Figure 3(a) and (b)]. In 2011, IGARSS had been planned for Sendai, Japan, until the Tohoku earthquake occurred on 11 March. It was the most powerful earthquake ever recorded in the country, a terrific disaster with more than 10,000 fatalities and



FIGURE 1. The Pacifico Yokohama Convention Center, Tokyo, Japan.

unparalleled damage. It forced the IEEE Geoscience and Remote Sensing Society (GRSS) to move the symposium to Vancouver, Canada, on short notice. Eight years later, Hirose and his team were proud to greet more than 2,600 attendees in Yokohama. The participants enjoyed traditional Japanese hospitality, excellent organization for the event, and a great working environment.

IEEE President-Elect Toshio Fukuda presented the organization’s statistics [Figure 4(a)]. He noted that the



YOKOHAMA VISITORS GUIDE

FIGURE 2. The city of Yokohama on Tokyo Bay. The conference center is to the right.

IEEE has approximately 420,000 current Members, plus 120,000 Student Members, in 46 Societies across 160 countries and that more than 4.5 million documents are available in *IEEE Xplore*, via 200 top-cited periodicals and 1,900 conference proceedings. Fukuda emphasized the importance of the IEEE's global public policy and humanitarian efforts, continuing education and certification opportunities, and ethics in technology focus.

The final welcome address was given by GRSS President Paolo Gamba [Figure 4(b)]. The GRSS is a technical soci-

ety that deals with the theory, concepts, and techniques of science and engineering as they apply to the remote sensing of the Earth, its oceans, the atmosphere, and space as well as the processing, interpretation, and dissemination of that information. This year, the GRSS has more than 4,200 members, 78 Chapters, and 13 Student Chapters. The Society sponsors four quality publications [*IEEE Transactions on Geoscience and Remote Sensing*, *IEEE Geoscience and Remote Sensing Letters*, *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing (J-STARS)*, and *IEEE Geoscience and Remote Sensing Magazine*], each having a high impact factor, and a remote sensing code library with a curated online repository of software related to remote sensing. *J-STARS* will become fully open access in 2020, with a very attractive publication fee. Gamba summarized the services provided by the Society to its members and invited all conference participants to join.

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PRESENTATIONS AT THE PLENARY SESSION

After the welcoming addresses, the plenary session (hosted by Akira Iwasaki, IGARSS technical cochair) opened with presentations from four distinguished speakers. Hiroshi Yamakawa, president of the Japanese Aerospace Exploration



(a)

(b)

FIGURE 3. (a) Akira Hirose, IGARSS 2019 general chair. (b) Attendees during the plenary session.



(a)

(b)

FIGURE 4. The welcome address speakers: (a) Toshio Fukuda, 2019 IEEE president-elect, and (b) Paolo Gamba, GRSS president.

Agency (JAXA), Tokyo, presented “Space Technology for a New Era” [Figure 5(a)]. He showcased the *Hayabusa 2* mission (initiated in 2014), which touched down twice on the asteroid Ryugu and is scheduled to return to Earth in 2020. JAXA’s operating missions include the *Greenhouse Gases-Observing Satellite* [GOSAT (also known as *Ibuki* and launched in 2009)]; *Global Change Observation Mission-Water Satellite 1* [GCOM-W (*Shizuku*, 2012)]; Global Precipitation Measurement Mission Dual-Frequency Precipitation Radar, in partnership with NASA (2014); *Advanced Land-Observing Satellite 2* [ALOS 2 (*Daichi-2*, 2014)]; Global Change Observation Mission-Climate (*Shikisai*, 2017); and GOSAT-2 (*Ibuki-2*, 2018). Future missions include the ALOS 3 (optical, 2020), ALOS 4 [synthetic-aperture radar (SAR), 2020], and *Earth Clouds, Aerosols, and Radiation Explorer* (i.e., *EarthCARE*) with a cloud-profiling radar, in partnership with the European Space Agency (ESA) (2021). Yamakawa presented several impressive contributions by JAXA’s missions to long-term global observations, including carbon dioxide concentration variations in the atmosphere, deforestation, precipitation, floods, and sea ice monitoring. Furthermore, JAXA’s satellites play an important role in supporting sustainable development goal indicators as well as disaster relief operations through fast data acquisition, analysis, and distribution to users.

Sandra A. Cauffman, acting director of NASA’s Earth Science Division, Washington, D.C., presented “NASA Earth

Science Overview” [Figure 5(b)]. She emphasized NASA’s approach for a comprehensive suite of missions and instruments to measure important quantities and so help advance Earth system science, including climate studies, spaceborne data acquisition, research and analysis, and predictive modeling. Spaceborne measurements feature global coverage, high spatial resolution, and frequent revisit. NASA has 16 missions with extended operations (two are small satellites and/or CubeSats), six in primary operation (three are small satellites and/or CubeSats), and seven that are in the implementation phase. Several programs are conducted in partnership with international agencies. Cauffman related how a number of those missions contributed to Earth system science by focusing on the global hydrological cycle.

Prof. Gilberto Camara, secretariat director, Group on Earth Observations (GEO), Geneva, Switzerland, followed with his presentation “Crossing the Valley of Death: How Can the IGARSS Community Contribute to a Better Earth?” [Figure 5(c)]. He began by explaining that the GEO is an intergovernmental organization with the goal of improving the availability of, access to, and use of Earth observations to benefit society. It works to advance and coordinate global EO systems and promote open data sharing. The GEO supports the United Nations 2030 Agenda for Sustainable Development, the Paris climate agreement, and the Sendai



(a)



(c)



(b)



(d)

FIGURE 5. The plenary speakers: (a) Hiroshi Yamakawa, JAXA president; (b) Sandra Cauffman, acting director of NASA’s Earth Science Division; (c) Gilberto Camara, director of the GEO Secretariat; and (d) Franz Ming-Chih Cheng, Sentinel Asia Steering Committee, NARLabs.

Framework for Disaster Risk Reduction. Camara discussed the gap between the research that thousands of worldwide scientists perform and the contributions those scientists make to the decision-making process. Producing replicable knowledge and exposing all the parts of a specific application, including the software code and data, to achieve full results reproduction is import for closing the gap between science and decision making.

Franz Ming-Chih Cheng [Figure 5(d)] gave the final presentation of the plenary, "Sentinel Asia: Evolution and Current Status." He is the director general of the International Affairs Office, National Applied Research Laboratories (NARLabs), Taipei, Taiwan, and a member of the Sentinel Asia Steering Committee. Begun in February 2006, Sentinel Asia is a voluntary initiative involving space and disaster-management agencies that applies remote sensing and Web Geographic Information System (GIS) technologies to assist disaster management in the Asia-Pacific region. Its objectives are 1) to improve safety in society through information and communication technology and space technologies, 2) to improve the speed and accuracy of disaster preparedness and early warnings, and 3) to minimize the number of victims and reduce social/economic losses. Currently, 110 organizations from 28 countries belong to Sentinel Asia. Ming-Chih Cheng discussed the importance of mitigation and preparedness activities, including the production of hazard maps, early warning systems, building capacity for remote sensing and GIS technologies, and recovery activities after a disaster. Since 2007, Sentinel Asia has responded to 300 emergencies. Space-based technology provides a unique contribution to disaster and risk-reduction initiatives in the Asia-Pacific region.

FELLOW RECOGNITIONS AT THE AWARDS CEREMONY

After the plenary speeches, Prof. Alberto Moreira announced the newly elected IEEE Fellows and the presen-

tation of the GRSS major awards for 2019. Six IEEE GRSS members were elevated to Fellow in 2019; five of them attended and were recognized at the plenary session. IEEE President-Elect Fukuda congratulated the Fellows, presented their certificates, and gave them gifts. After the Fellow recognitions, four major awards were presented. GRSS President Gamba congratulated the winners and presented them with certificates and plaques.

IEEE FELLOW AWARDS

The title of Fellow recognizes an individual's unusual distinction in the profession and is conferred only by invitation of the IEEE Board of Directors to a person of outstanding and extraordinary qualifications and experience in IEEE-designated fields. The IEEE bylaws limit the number of Members who can be advanced to Fellow grade in any one year to one per 1,000 of the IEEE Membership, exclusive of students and affiliates. To qualify, the candidate must be a Senior Member and nominated by an individual familiar with his or her achievements. Endorsements are required from at least five IEEE Fellows and an IEEE Society best qualified to judge. The GRSS Fellow Committee completes the first ranking of the nominations. After this, members of the IEEE Fellow Committee, composed of approximately 50 IEEE Fellows, carefully evaluate all nominations (taking note of the Society rankings) and present a list of recommended candidates to the IEEE Board of Directors for the final election.

The GRSS performs above the average with respect to the number of elected Fellows every year. Following are the GRSS members elevated to Fellow status, effective 1 January 2019 (Figure 6):

- ▶ William Blackwell, Massachusetts Institute of Technology (MIT) Lincoln Laboratory, Lexington, Massachusetts, United States
- ▶ Bruce Campbell, Smithsonian Center for Earth and Planetary Studies, Washington, D.C., United States
- ▶ Shutao Li, Hunan University, Changsha, China



FIGURE 6. IEEE President-Elect Fukuda (left) and GRSS President Gamba (right) pose with the 2019 IEEE Fellows nominated by the GRSS who attended the symposium (second from left): Prof. Liangpei Zhang, Prof. Jeffrey Walker, Dr. William Blackwell, Prof. Shutao Li, and Prof. Marwan Younis.

- ▶ Jeffrey Walker, Monash University, Melbourne, Australia
- ▶ Marwan Younis, German Aerospace Center (DLR), Oberpfaffenhofen, Germany
- ▶ Liangpei Zhang, Wuhan University, China.

WILLIAM BLACKWELL



William Blackwell received his Fellow Award with the citation “for contributions to atmospheric remote sensing algorithms and instrumentation.” He is the associate leader of the Applied Space Systems Group at MIT Lincoln Laboratory, where he oversees projects involving atmospheric remote sensing including the development and calibration of airborne and spaceborne microwave sensors, retrieval of geophysical products from remote radiance measurements, and application of electromagnetic, signal processing, and estimation theory. He served as associate editor of *IEEE Transactions on Geoscience and Remote Sensing* and *IEEE Geoscience and Remote Sensing Magazine* as well as cochair of the GRSS Remote Sensing Instruments and Technologies for Small Satellites Working Group, NASA Aqua Science Team, and National Academy of Sciences Committee on Radio Frequencies. He is the principal investigator on the NASA Time-Resolved Observations of Precipitation Structure and Storm Intensity With a Constellation of Smallsats Earth Venture mission and the Microsized Microwave Atmospheric Satellite mission. Previously, he was the Atmospheric Algorithm Development team leader for the National Polar-Orbiting Operational Environment Satellite System’s microwave imager/sounder. He has more than 140 publications related to atmospheric remote sensing data analysis.

BRUCE CAMPBELL



The Fellow Award recognition for Bruce Campbell carried the citation “for contributions to radar remote sensing for planetary science.” Campbell received his B.S. degree in geophysics from Texas A&M University, College Station, in 1986 and his Ph.D. degree in geology and geophysics from the University of Hawaii at Mānoa, Honolulu, in 1991. Since 1992, he has been with the Smithsonian’s Center for Earth and Planetary Studies at the National Air and Space Museum, Washington, D.C. His research focuses on the surface and subsurface geology of the moon, Mars, Venus, and the icy moons of the outer planets, resulting in more than 100 publications as author or coauthor. He led several proposal teams for an orbital radar mission to Mars, cochaired a 2015 study group for the next Mars orbiter mission, and participated on teams developing new mission concepts for Venus. He is a science team member for radar sounder instruments on the *Mars Reconnaissance Orbiter*, the *Jupiter Icy Moons Explorer*, and the *Europa Clipper* missions. As part of

the National Air and Space Museum, he tries to bring the excitement and discoveries of planetary exploration to visitors. (Campbell was unable to attend the ceremony.)

SHUTAO LI



Shutao Li earned the citation “for contributions to image fusion and classification in remote sensing.” He received his B.S., M.S., and Ph.D. degrees from Hunan University, China, in 1995, 1997, and 2001, respectively. Since 2004, he has been a full professor in the College of Electrical and Information Engineering, Hunan University. His research interests include compressive sensing, sparse representation, image processing, pattern recognition, and remote sensing. He has authored or coauthored more than 200 refereed journal and international conference papers and received over 10,000 citations on Google Scholar. He is founder and head of the Hunan Key Laboratory of Visual Perception and Artificial Intelligence and the International Joint Research Center for Hyperspectral Imaging and Processing. Li is associate editor of *IEEE Transactions on Geoscience and Remote Sensing* and *IEEE Transactions on Instrumentation and Measurement*, chair of the GRSS Changsha Chapter, and an editorial board member of *Information Fusion* and *Sensing and Imaging*.

JEFFREY WALKER



Jeffrey Walker’s Fellow Award citation reads “for contributions to surface modeling in passive microwave remote sensing.” He received B.S. degrees in civil engineering and surveying, with honors and a University Medal, from the University of Newcastle, Australia, in 1995. He received his Ph.D. degree in water resources engineering from the same university in 1999. His Ph.D. thesis was among the earliest research on the estimation of root-zone soil moisture from the assimilation of remotely sensed surface-soil moisture observations. Walker joined the NASA Goddard Space Flight Center, Greenbelt, Maryland, to implement his soil moisture work globally. In 2001, he moved to the Department of Civil and Environmental Engineering at the University of Melbourne as a lecturer and continued his work, including the development of the only Australian airborne capability for simulating new satellite missions to measure soil moisture. In 2010, he was appointed professor in the Department of Civil Engineering at Monash University, where he continues his research. He contributes to soil-moisture satellite missions at NASA, the ESA, and JAXA as a science team member of the Soil Moisture Active Passive mission, Calibration and Validation (Cal/Val) Soil Moisture and Ocean Salinity mission, and Cal/Val Global Change Observation Mission–Water, respectively.

MARWAN YOUNIS



Marwan Younis was honored by the Fellow Award with the citation “for contributions to digital beam-forming techniques for spaceborne radar systems.” He received his B.S. degree in electrical engineering from the University of Baghdad, Iraq, in 1992 and his M.S. and Ph.D. degrees in electrical engineering from the Universität Karlsruhe, Germany, in 1997 and 2004, respectively. From 1998 to 2004, he was a research scientist with the Institut für Höchstfrequenztechnik und Elektronik, Universität Karlsruhe. Since 2005, he has been with the Microwaves and Radar Institute of the DLR, Oberpfaffenhofen, Germany. He is head of the SAR Techniques Group there and a professor of spaceborne radar systems at the Karlsruhe Institute for Technology. His research interests include SAR systems and techniques; multiple input/multiple output SAR; digital beamforming; and SAR performance, calibration, and antennas. He serves on the GRSS Administrative Committee (AdCom) and as associate editor of *IEEE Geoscience and Remote Sensing Letters*. He received the Hermann-Billing award for his Ph.D. thesis in 2005.

LIANGPEI ZHANG



Liangpei Zhang’s Fellow Award certificate recognizes him “for contributions to image processing of remote sensing data.” He received his B.S. degree in physics from Hunan Normal University, Changsha, China, in 1982; his M.S. degree in optics from the Xi’an Institute of Optics and Precision Mechanics, Chinese Academy of Sciences, Xi’an, in 1988; and his Ph.D. degree in photogrammetry and remote sensing from Wuhan University, China, in 1998. He is a Chang-Jiang Scholar Chair Professor, appointed by the China Ministry of Education, and a principal scientist for the China State Key Basic Research Project, appointed by the Ministry of National Science and Technology, to lead the country’s remote sensing program. He has written more than 700 research papers and six books, and he holds over 30 patents. His research interests include hyperspectral remote sensing, high-resolution remote sensing, image processing, and artificial intelligence. He is the founding chair of the GRSS Wuhan Chapter. His research teams scored first place in the GRSS 2018 Data Fusion Contest and won the top three prizes in the GRSS 2014 Data Fusion Contest. In addition, his students have been selected as winners and finalists of the IGARSS Student Paper Contest. He serves as associate editor of *IEEE Transactions on Geoscience and Remote Sensing*.

GRSS MAJOR AWARDS

The Society posts its call for nominations for the GRSS Education Award, GRSS Outstanding Service Award, GRSS Industrial Leader Award, and GRSS Distinguished Achievement

Award on its website and announces the call in its newsletter. Nomination forms are available at <http://www.grss-ieee.org/about/awards/>. Any member, with the exception of those on the GRSS AdCom, can submit nominations. Typically, three to five people are nominated every year. An independent Major Awards committee makes the selection, which is approved by the GRSS president and AdCom. The following major awards were presented (with the Industry Leader Award being presented for the second time):

- ▶ GRSS Education Award
- ▶ GRSS Outstanding Service Award
- ▶ GRSS Industry Leader Award
- ▶ GRSS Distinguished Achievement Award.

GRSS EDUCATION AWARD

The Education Award was established to recognize an individual who has made significant educational contributions to the field of geoscience and remote sensing. In selecting an individual, factors considered are the significance and innovativeness of the educational contribution and the extent of its overall impact. The contribution can be made at any level, including K–12, undergraduate and graduate teaching, professional development, and public outreach. It can also be in any form (e.g., textbooks, curriculum development, or education program initiatives). GRSS membership or affiliation is required. The awardee receives a certificate and plaque.

The 2019 GRSS Education Award was presented to Sebastiano B. Serpico (Figure 7), University of Genoa, Italy, with the citation “in recognition of his outstanding educational contributions to geoscience and remote sensing.” He received his M.S. degree in electronic engineering and his Ph.D. degree in telecommunications from the University of Genoa, Italy. He is a full professor of telecommunications at the Polytechnic School of the University of Genoa and a member of the Academic



FIGURE 7. Prof. Sebastiano Serpico (right) receives the GRSS Education Award from GRSS President Prof. Paolo Gamba.

Senate. He teaches telecommunications, pattern recognition, and remote sensing there and has also taught at the University of Cagliari, Italy, and University of Trento, Italy. His research interest is pattern recognition for remote sensing image analysis. Serpico is head of his university's Image Processing and Pattern Recognition for Remote Sensing Laboratory and has supervised more than 70 M.S. degree students and many Ph.D. degree candidates in information and communications technology. Some of his students became well-known experts.

Serpico contributed to the foundation and management of two engineering programs, one in telecommunications engineering and one in engineering for natural risk management. From May 2003 to April 2019, he was chair of the Institute of Advanced Studies in Information and Communication Technologies, Genova, Italy. He was project manager on numerous research initiatives and an evaluator of project proposals for European Union, Italian Space Agency, and Italian Ministry of Education and Research programs. He has authored or coauthored more than 200 articles published in journals and conference proceedings, and he received the Best Paper Award at the 2010 IEEE Workshop on Hyperspectral Image and Signal Processing and the Interactive Symposium Paper Award at IGARSS 2016. He is an associate editor of *IEEE Transactions on Geoscience and Remote Sensing* and guest-edited two special issues of that publication as well as one special issue of *Proceedings of the IEEE*. From 1998 to 2002, he chaired Society of Photographic Instrumentation Engineers and EUROPTO conferences on signal and image processing for remote sensing. He was cochair of IGARSS 2015 in Milan, Italy.

GRSS OUTSTANDING SERVICE AWARD

The GRSS Outstanding Service Award was established to recognize an individual who has given service for the ben-

efit and advancement of the Society. The award is considered annually but is not presented unless a suitable candidate is identified. The following factors are suggested for consideration: leadership innovation, activity, service duration, breadth of participation, and cooperation. GRSS membership is required. The awardee receives a certificate and plaque.

The 2019 Outstanding Service Award (Figure 8) was presented to Paolo Pampaloni, head of research at the Institute of Applied Physics, Italian National Research Council, Florence, with the citation "in recognition of his outstanding services for the benefit and advancement of the IEEE Geoscience and Remote Sensing Society." (Pampaloni could not be present; Simone Pettinato accepted the award on his behalf.) His research focuses on active and passive microwave remote sensing. From 1968 to 1979, he was involved in radio astronomy with the Arcetri Astrophysical Observatory, Florence. Since 1980, he has been with the Italian National Research Council, Rome. From 1983 to 1996, he was an ESA consultant for microwave radiometry as a member of various working and advisory groups. He served as an X-band-SAR (X-SAR) project scientist, deputy team leader of the X-SAR/Spaceborne Imaging Radar-C project, and principal investigator or coprincipal investigator of several international projects. Pampaloni held positions as adjunct professor, tutor, external referee, and examiner of Ph.D. students at several institutions. He was the Italian official member of the International Union of Radio Science (URSI) Commission F: Wave Propagation and Remote Sensing (2005–2013) and president of the Microwave Remote Sensing Center [CeTeM (1993–2011)]. He was general chair of the Joint CeTeM-IEEE GRSS Specialist Meeting on Microwave Radiometry (MicroRad) in 1988 and 1999, and he is a permanent member of the MicroRad Steering Committee.

Pampaloni served as general chair of IGARSS 1995 and chair of the IEEE Central and South Italy Section (2002–2005) and the unified IEEE Italy Section (2005–2006). He was a member of the GRSS Major Award committee (2010–2017), a member of the GRSS Publication Awards committee (2008), guest editor of the IGARSS 1995 *IEEE Transactions on Geoscience and Remote Sensing* special issue, and guest coeditor of the *IEEE Transactions on Geoscience and Remote Sensing* special microrad issue (2009). Since 1997, he has been associate editor of *IEEE Transactions on Geoscience and Remote Sensing*. He founded the Golden Florin Award in 1995 (which since 2014 has been included among the GRSS major awards), and he chairs the Joint CeTeM-GRSS Golden Florin Award Committee. He authored or coauthored more than 180 papers in international journals and conference proceedings and seven monographs, and he edited three books with VSP Press. He presented invited papers at the Global Atmospheric System Studies Conference and the Progress in Electromagnetic Research Symposium as well as URSI and IGARSS meetings. He is Life Fellow of the IEEE.



FIGURE 8. Simone Pettinato (right) receives the 2019 GRSS Outstanding Service Award on behalf of Prof. Paolo Pampaloni from GRSS President Gamba.

GRSS INDUSTRY LEADER AWARD

The GRSS Industry Leader Award was established to recognize an individual who has made significant contributions to the industrial and/or commercial remote sensing discipline over a sustained period. Individuals are considered if they 1) are a GRSS member, 2) contribute to remote sensing system engineering, science, and/or technology, 3) contribute to the dissemination and commercialization of remote sensing products, and 4) demonstrate leadership to promote remote sensing science and technology. The selection criteria are significance, quality and impact of activities and contributions, and achievements. The award is presented annually if a qualified candidate can be identified.

The 2019 GRSS Industry Leader Award was presented to Walter Scott (Figure 9), executive vice president and chief executive officer, Maxar Technologies, Westminster, Colorado, with the citation “in recognition of outstanding contributions to the private sector of remote sensing.” Scott oversees development of the company’s commercial remote sensing systems (from its DigitalGlobe subsidiary), research, software architecture, and government relations/public policy. He founded DigitalGlobe in 1992 as WorldView Imaging Corporation, the first company to receive a high-resolution commercial remote sensing license from the U.S. government (in 1993) under the 1992 Land Remote Sensing Policy Act. WorldView became EarthWatch in 1995, and Scott managed the development of its commercial remote sensing satellites. He secured the first-ever export license for the launch of a U.S.-manufactured imaging spacecraft on Russian launch vehicles (*Start-1* and *Cosmos*). The company became DigitalGlobe in 2001 and, with the launch of the *QuickBird-2* satellite that year, offered the world’s highest-resolution commercial satellite imagery. Today, DigitalGlobe operates a five-satellite imaging constellation with the best revisit and highest capacity in the industry.

From 1986 to 1992, Scott was with the Lawrence Livermore National Laboratory, California. In 1987, he joined



FIGURE 9. The 2019 GRSS Industry Leader Award recipient, Dr. Walter Scott (right), poses with GRSS President Prof. Paolo Gamba.

a small team developing a concept for a highly distributed constellation of space-based interceptors, known as “Brilliant Pebbles,” for the Strategic Defense Initiative Organization (SDIO). In late 1987, he became the effort’s program leader, responsible for creating a series of hardware prototypes and conducting flight experiments. During 1989, he led the program through more than 20 reviews of technical feasibility, system performance, military operability, and estimated cost, resulting in the 1990 adoption of Brilliant Pebbles for the SDIO’s space segment. Late in 1991, he became assistant associate director of SDIO’s Physics Department and was responsible for developing new space-related programs and identifying promising technologies.

Scott received his B.A. degree in applied mathematics, magna cum laude, from Harvard College, Cambridge, Massachusetts, and his M.S. and Ph.D. degrees in computer science from the University of California, Berkeley. He was named Entrepreneur of the Year in Emerging Technology for the Rocky Mountain Region by Ernst & Young in 2004 and inducted into the Geospatial Hall of Fame in 2017. He served on the National Research Council’s Committee on Earth Science and Applications from Space, Washington, D.C., and the board of directors of the Open Geospatial Consortium, Wayland, Massachusetts. He is a member of the *Landsat* Advisory Group, supporting the United States Geological Survey, Reston, Virginia, and he sits on the Air Force Research Laboratory Space Vehicles Directorate Independent Advisory Team, Wright-Patterson Air Force Base, Ohio.

GRSS DISTINGUISHED ACHIEVEMENT AWARD

The GRSS Distinguished Achievement Award was established to recognize an individual who has made significant technical contributions within the scope of the GRSS, usually over a sustained period. In selecting an individual, the factors considered are quality, significance, and impact of the contributions; the quantity of the contributions; the duration of significant activity; papers published in archival journals; papers presented at conferences and symposia; patents granted; and advancement of the profession. IEEE Membership is preferable but not required. The award is considered annually and presented only if a suitable candidate is identified. The awardee receives a plaque and a certificate.

The 2019 GRSS Distinguished Achievement Award was presented to Prof. V Chandrasekar (Figure 10), Colorado State University (CSU), Fort Collins, with the citation “for contributions that have led to the affirmation of weather-radar dual polarization technology and small radar networks in meteorology.” Chandrasekar received his B.S. degree in 1981 from the Indian Institute of Technology (IIT) Kharagpur, India, and his Ph.D. degree in 1987 from CSU, where he is a University Distinguished Professor. He has been involved in the research and development of ground and spaceborne weather radar systems for several decades and played a key role in establishing the CSU–Chicago National Radar Facility as one of the most advanced



FIGURE 10. Prof. V Chandrasekar (right) receives the 2019 GRSS Distinguished Achievement Award from GRSS President Gamba.

meteorological radar systems available for research. Chandrasekar has been a visiting professor at the National Research Council of Italy, Rome; an affiliate scientist at the NASA Jet Propulsion Laboratory, Pasadena, California; a NASA Goddard Distinguished Visiting Scientist; and a Distinguished Professor at the University of Helsinki, Finland, and IIT Kharagpur. He served as research director for the Center for Collaborative Adaptive Sensing of the Atmosphere at the National Science Foundation Engineering Research Centers, Alexandria, Virginia. He has coauthored two textbooks, five general books, and more than 245 journal articles. He has served as an academic advisor for more than 40 Ph.D. degree students.

In addition to the IEEE, Chandrasekar is a fellow of URSI; the American Meteorological Society, Boston; and

the National Oceanic and Atmospheric Administration (NOAA) Cooperative Institute for Research in the Atmosphere, Silver Spring, Maryland. He has won numerous awards, including the NASA Technical Contribution Award, NASA Group Achievement Award for the Algorithm Team and Post Launch Team for Global Precipitation Management, Outstanding Advisor Award, CSU Innovations Award, and NOAA/National Weather Service Directors Medal of Excellence. He served as general chair of IGARSS 2006, and he is the international chair of URSI and URSI Commission F: Wave Propagation and Remote Sensing. He has also been chief editor of *Journal of Atmospheric and Oceanic Technology*.

The major award winners are pictured together in Figure 11.

SYMPOSIUM INTRODUCTION AND TECHNICAL PROGRAM

Prof. Hiroyoshi Yamada, Prof. Irena Hajnsek, and Prof. Akira Iwasaki, technical program cochairs, introduced IGARSS (Figure 12) and provided statistics regarding paper submissions and participant registration (Table 1). China had the highest number of paper submissions, followed by the United States, Japan, Germany, India, France, Italy, Canada, and Brazil.

The technical program was organized in 13 parallel sessions; nine technology, industry, and education forums; and 20 parallel poster sessions. In addition, 4-min short presentations of interactive content for selected posters were held in a separate room, followed by interactive discussions in the poster area. In accordance with the symposium's theme, four special subthemes were selected for presentation during the oral sessions and the plenary session, including monitoring natural disasters and hazards, new space initiatives in remote sensing, big data and machine learning, and identification of remote sensing indicators for climate change.



FIGURE 11. The GRSS major award recipients pose with GRSS Major Awards Chair Alberto Moreira (left) and GRSS President Gamba (right): (from left) Prof. Chandrasekar, Dr. Scott, Dr. Pettinato (for Prof. Pampaloni), and Prof. Serpico.

Prof. Yamada made the final remarks for the introduction and technical program. He thanked the reviewers, theme coordinators, session organizers, and session chairs for their contributions and recognized the 120 local organizers and volunteers. The Monday morning session was organized by Hirose, Yamada, Hajnsek, and Iwasaki. Figure 13 shows the IGARSS 2019 core team, who worked very hard to make the symposium a great success!

OPENING CEREMONY

The opening ceremony started at noon with the highly anticipated participation of Their Majesties the Emperor and Empress. The Emperor of Japan is the symbol of the State and of the unity of the people in Japan. On April 30, 2019, the former Emperor (the Emperor Emeritus at present) declared his abdication in a historic ceremony at the Imperial Palace in Tokyo after his 30-year reign. On the following day, his eldest son, the Crown Prince, acceded to the throne as the 126th Emperor of Japan. A new era—called *Reiwa*, meaning “beautiful harmony”—began since then. In Japanese, the emperor is called *Tennō* or “heavenly sovereign.”

The presence of Their Majesties the Emperor and Empress was a great honor for all participants of IGARSS. When Their Majesties the Emperor and Empress came to the stage, all participants of the opening ceremony stood and applauded. After short welcome remarks by the IGARSS General Chairman Prof. Akira Hirose, GRSS President Prof. Paolo Gamba, the President of the Science Council of Japan Prof. Juichi Yamagiwa, and IEEE President-Elect Prof. Toshio Fukuda, His Majesty gave a congratulatory address to all attendees of the opening ceremony. His Majesty mentioned the main theme of IGARSS 2019, “Global Environ-



FIGURE 12. IGARSS 2019 technical co-chairs, (from left) Prof. Akira Iwasaki, Prof. Hiroyoshi Yamada, and Prof. Irena Hajnsek, introduced the IGARSS symposium.

ment Observation and Disaster Mitigation” and that this symposium aims at achieving more precise, accurate, and frequent observation, assessment, and analysis of global environmental changes such as global warming, climate change, and degradation of water environment. Being involved in the field of hydrology, or water issues, His Majesty the Emperor mentioned that the remote cause of the frequent disasters of recent extreme rainfalls, floods, and droughts lies in such climate changes, and that we need more precise, accurate, and global data and their analysis to develop effective measures for preservation of the global environment. His Majesty also mentioned that, for

TABLE 1. IGARSS 2019 PRESENTATIONS AND ATTENDANCE.

PAPERS SUBMITTED	PAPERS ACCEPTED	ORAL PAPERS	POSTER PAPERS	ORAL SESSIONS	POSTER SESSIONS	TOTAL REGISTERED	STUDENTS
3,102	2,610	1,062	1,548	217	150	2,725	844



FIGURE 13. The members of the IGARSS 2019 organization and support team.



FIGURE 14. The opening ceremony with the participation of Their Majesties the Emperor and Empress. From left to right: Chair of Technical Program Committee Prof. Yamada (standing); IEEE President-Elect Prof. Toshio Fukuda; President of the Science Council of Japan Prof. Juichi Yamagiwa; GRSS President Prof. Paolo Gamba; the IGARSS General Chairman Prof. Akira Hirose; Their Majesties the Emperor and Empress; and, at the right, the Japanese Minister of State for Special Missions, Minister Takuya Hirai; the Governor of Kanagawa Prefecture, Yuji Kuroiwa; and the Mayor of Yokohama City, Fumiko Hayashi.



FIGURE 15. His Majesty the Emperor during His congratulatory address at the pedestal and Her Majesty the Empress next to the table.

this purpose, the IGARSS symposium would provide an important contribution to better understanding of the effects caused by climate change, which is essential for providing recommendations for its mitigation. His Majesty concluded His remarks by expressing His sincere wish that the IGARSS symposium provides all participants with a forum for interdisciplinary discussion towards a sustainable future of our irreplaceable planet.

After the address of His Majesty the Emperor, congratulatory addresses were made by the Japanese Minister of State for Special Missions, Minister Takuya Hirai, by the Governor of Kanagawa Prefecture, Yuji Kuroiwa, and by the Mayor of

Yokohama City, Fumiko Hayashi. A short welcome message was also sent to all attendees of the opening ceremony by the Japanese Prime Minister, Shinzō Abe. The closing remarks were given by the chair of the Technical Program Committee, Prof. Hiroyoshi Yamada. After that, Their Majesties the Emperor and Empress left the podium with all participants standing and giving a grand applause in Their honor.

Figures 14 and 15 depict the ceremony.

FUTURE EDITIONS OF IGARSS

The GRSS AdCom met two days before IGARSS 2019 to discuss the Society's operational and technical issues and



FIGURE 16. The GRSS AdCom and supporting GRSS members meet before IGARSS 2019.

make important decisions. The site for IGARSS 2023 was selected, and the roadmap for future conferences was confirmed:

- ▶ IGARSS 2020, Waikoloa, Hawaii, United States, 19–24 July
- ▶ IGARSS 2021, Brussels, Belgium, 11–16 July
- ▶ IGARSS 2022, Kuala Lumpur, Malaysia, 17–22 July
- ▶ IGARSS 2023, Pasadena, California, United States, 16–21 July.

You are cordially invited to participate in future symposia; in particular, we look forward to meeting all of you at IGARSS 2020 in Waikoloa. Since the successful symposium held there in 2000, it has been a GRSS tradition to hold the IGARSS in Hawaii every 10 years. This time, the Big Island of Hawaii, which has 10 of the world’s 14 climate zones,

was selected. It is well known for having the longest-active and largest volcano (Mauna Loa). The theme of the 2020 symposium is “Remote Sensing: Global Perspectives for Local Solutions.”

The GRSS AdCom (Figure 16) holds three meetings per year around the world—this year, they were held in North America (San Francisco), Asia (Yokohama), and Europe (Athens, Greece). Its goals are to promote the position of remote sensing within the IEEE and the scientific community as a whole; to perform the organizational tasks needed to run the Society, its publications, conferences, and many other programs; and to develop the vision of remote sensing.

GRS



IMAGE LICENSED BY GRAPHIC STOCK

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