IEEE GEOSCIENCE and REMOTE SENSING Newsletter

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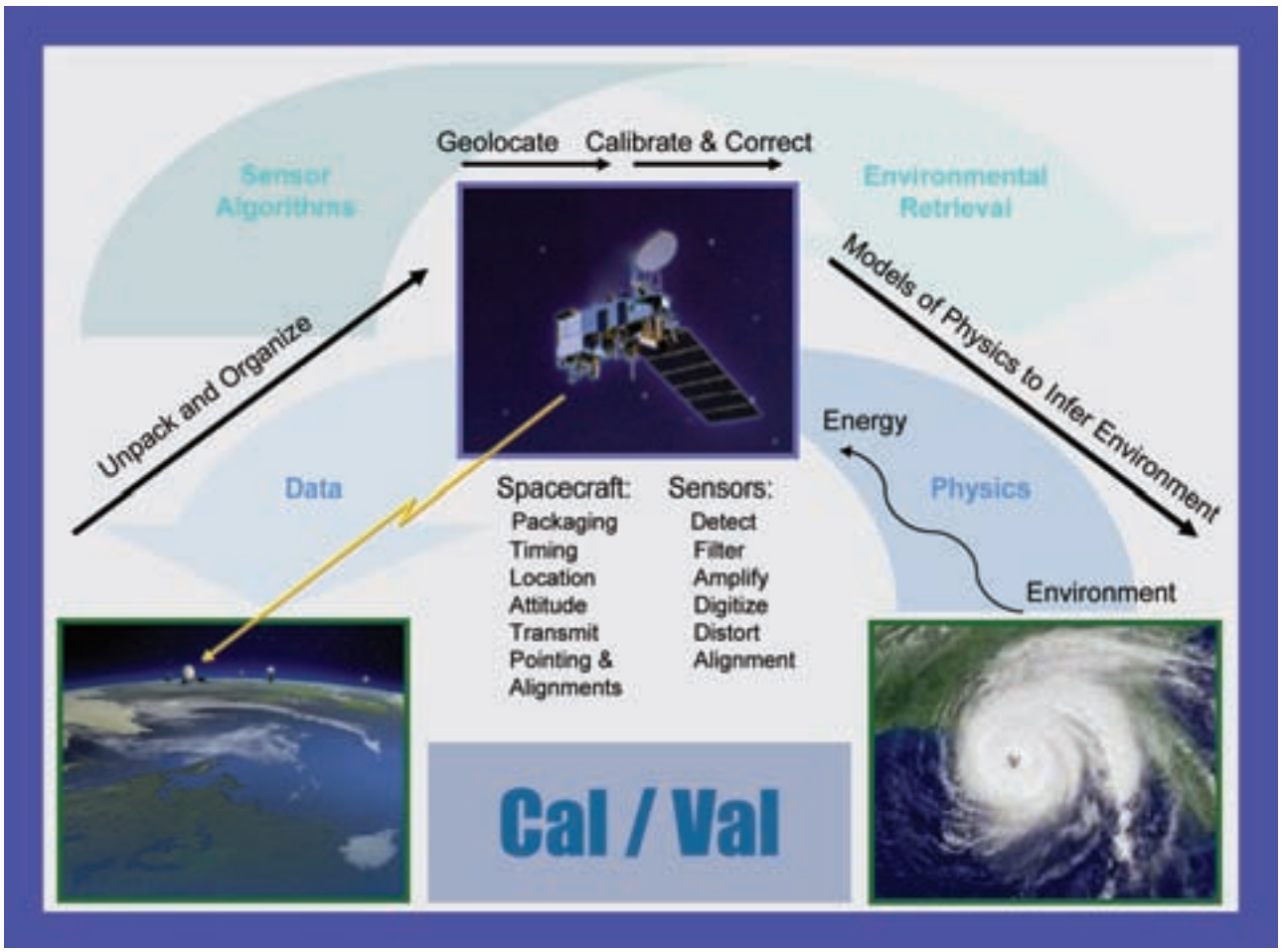

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IEEE
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Input	April 15	July 15	Oct 15	Jan 15

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Editor's Comments

David B. Kunkee, Editor
The Aerospace Corporation
NPOESS Space Systems
8455 Colesville Road, Suite 1450
Silver Spring, MD 20910
Phone: 301-713-4743
Fax: 301-427-2164
E-mail: David.Kunkee@noaa.gov

I hope that you will find this issue of the GRSS Newsletter has something for everyone. As the cover suggests, this month our feature article describes plans for the Calibration and Validation (Cal/Val) of the National Polar-orbiting Operational Environmental Satellite System (NPOESS) Preparatory Project (NPP) written by Karen St. Germain of the NPOESS Integrated Program Office (IPO). NPP is scheduled for launch in 2011 and will fly several important sensors to fulfill operational and climate measurement and monitoring needs. Beginning on page 17, Prof. Martti Hallikainen reports on the Major Society Awards and IEEE Fellow recognitions presented at the IGARSS 2009 Plenary session in Cape Town. The IGARSS plenary was a unique and inspirational event that included senior members of the government of South Africa, and the University of Cape Town and the President of the African Association of Remote Sensing of the Environment, Prof. Tsehaie Woldai. In March of this year, the Newsletter reported on a memorandum of understanding that was signed between AARSE and IEEE GRSS at the ARSE conference in October 2008. I have included a copy of that MOU on page 24 of this issue.

The AdCom has recently voted to establish a new society award, the GRS-S GOLD (Graduates Of the Last Decade) Early Career Award. Information about the new award appears on page 16 along with the information needed for nominations. In this issue we have also re-printed issue 12 of Bill Gail's private sector Newsletter starting on page 25.

I would like to also comment that GRS-S continues to sponsor a diverse collection of quality specialty conferences and workshops related to remote sensing. This has been an area of growth for the society in the past few years and, in my opinion, an important source of information serving the multidisciplinary field of remote sensing. I hope that you find the call for papers and announcements for these meetings near the back of this and future Newsletters.

David Kunkee
Editor GRSS Newsletter

President's Message

Anthony K. Milne
University of New South Wales
School of Biological, Earth,
and Env. Sciences
Sydney, NSW 2052 AUSTRALIA
Phone: 61-2-9385-8097;
61-2-9451-4628
Fax: 61-2-9451-4628
E-mail: t.milne@unsw.edu.au

All members who were able to participate in IGARSS09 in Cape Town will agree that it was an outstanding success. Over 1200 attended and more than 1500 papers were presented. The theme addressing "Earth Observation; Origins to Applications" highlighted the growing importance of remote sensing technologies in providing information for monitoring and managing our planetary resources.

Increasingly GRSS as a research community is being challenged to become more societal and applications oriented. Our new journal J-STARS has been established to encourage the publication of peer reviewed applications-based research. More papers with an applications bias are being presented at IGARSS conferences. This is not to suggest that our more traditional areas such as instrumentation, satellites and sensors, microwave theory etc., are any less important, but that increasingly, remote sensing out in the market place is being seen as part of end-to-end solutions and being incorporated into and with other disciplines. Idiosyncratic one-of pilot studies lacking robust and repeatable methodologies can no longer be the driving force of remote sensing research.

(continued on page 4)

Cover Information: Calibration and Validation (Cal/Val) programs of major remote sensing missions require extensive preparation and planning to ensure viability of data products for a variety of operational forecasting and climate applications. See feature article beginning on page 9.

(President's Message continued from page 3)

The collection and analysis of remotely sensed data has to be oriented towards providing information that contributes to and offers solutions to specific environmental and human problems.

Two immediate and different scaled problems present themselves to our constituency. One is global and the other local. At the United Nations Climate Change Negotiations to be held in Copenhagen in December 2009, decisions will be made in respect to country commitments to reduce greenhouse gas emissions that will impact the long term global climate system. Remote sensing is the only technology that offers the potential to map and monitor surface conditions and contaminants at a 'wall-to-wall' global scale. Hopefully our technologies are or soon will become mature enough to produce validated products to yield quantified repeatable measurements.

At IGARSS2010 in Hawaii next year, the conference focus is on local "Community Remote Sensing", with the emphasis on empowering local communities to be involved in sharing and realizing the benefits of remote sensing. This includes involvement in, for example, citizen designed crowd research, sourcing of data collection, participation in calibration and validating satellite imagery and developing social networks for application implementation. Check out the concept and plans for IGARSS2010 at www.igarss2010.org.

Sincerely
Tony Milne
GRSS President

Newsletter Editorial Board Members:

2009 ADCOM MEMBERS' NAMES AND ADDRESSES

Dr. Anthony K. Milne
President, IEEE-GRSS
University of New South Wales
School of Biological, Earth
and Environmental Sciences
Sydney, NSW 2052 AUSTRALIA
E-Mail: t.milne@unsw.edu.au
(AdCom 2008-2009)

Dr. Alberto Moreira
Exec. VP, IEEE-GRSS
German Aerospace Center (DLR)
Microwaves and Radar Institute
P.O. Box 1116
82230 Wessling/Oberpfaffenhofen
GERMANY
Email: alberto.moreira@dlr.de
(AdCom 2007-2009)

Dr. Thomas J. Jackson
Secretary, IEEE-GRSS
USDA-ARS Hydrology
and Remote Sensing Lab
104 Bldg 007 BARC-West
Beltsville, MD 20705 USA
E-Mail: tom.jackson@ars.usda.gov
(AdCom 2008-2010)

Dr. Jon A. Benediktsson
VP for Professional Activities, IEEE-GRSS
Pro Rector for Academic Affairs
University of Iceland
Main Building, Saemundargata 6
Reykjavik ICELAND
E-Mail: benedikt@hi.is
(AdCom 2008-2010)

Dr. Adriano Camps
VP for Information Resources
Dept. of Signal Theory and Communication
Polytechnic University of Catalonia,
Campus Nord, D4-016
08034 Barcelona SPAIN
E-Mail: camps@tsc.upc.edu
(AdCom 2007-2009)

Dr. Melba M. Crawford
VP for Meetings and Symposia, IEEE-GRSS
AGR Lilly Hall
Purdue University
915 W. State Street
W. Lafayette, IN 47907-2054 USA
E-Mail: mcrawford@purdue.edu
(AdCom 2009-2011)

Dr. Steven C. Reising
VP for Technical Activities, IEEE-GRSS
Electrical and Computer Engineering
Department
1373 Campus Delivery
Colorado State University
Fort Collins, CO 80523-1373 USA
E-Mail: reising@ieee.org
E-Mail: steven.reising@colostate.edu
(AdCom 2009-2011)

Dr. Karen M. St. Germain
VP for Operations and Finance, IEEE-GRSS
NPOESS Integrated Program Office
8455 Colesville Road, Suite 1450
Silver Spring, MD 20910 USA
E-Mail: Karen.StGermain@noaa.gov
(AdCom 2009-2011)

Dr. Lorenzo Bruzzone
University of Trento
Dept. Information Eng. and Computer
Science
Via Sommarive 14
I-38050 TRENTO ITALY
E-Mail: lorenzo.bruzzone@dit.unitn.it
(AdCom 2009-2011)

Dr. Jocelyn Chanussot
GIPSA Lab, INP Grenoble
BP-46, 38402 St. Martin d'Heres
FRANCE
Email: Jocelyn.chanussot@gipsa-lab.inpg.fr
(AdCom 2009-2011)

Dr. William J. Emery
CCAR Box 431
University of Colorado
Boulder, CO 80309-0431 USA
E-Mail: Emery@colorado.edu
(AdCom 2008-2010)

Dr. Paolo Gamba
Editor, Geoscience and Remote Sensing Letters
University of Pavia
Dept. Of Electronics
Via Ferrata 1
27100 Pavia ITALY
E-Mail: paolo.gamba@unipv.it

Dr. James A. Gatlin
Director of Finance, IEEE-GRSS
Goddard Space Flight Center (Retired)
Greenbelt, MD 20771 USA
E-Mail: j.gatlin@ieee.org

Dr. Ya-Qiu Jin
Fudan University
Key Laboratory for Wave Scattering
and Remote Sensing Information
Shanghai 200433 CHINA
E-Mail: yqjin@fudan.ac.cn
(AdCom 2009-2011)

Dr. Roger King
Mississippi State University
Box 5405
Mississippi State,
MS 39762-5405 USA
FAX: 662-325-5433
E-Mail: rking@engr.msstate.edu
(AdCom 2007-2009)

Dr. Ellsworth LeDrew
Editor J-STARS
University of Waterloo
Dept. of Geography and Env. Management
200 University Ave. West
Waterloo, ON N2L 3G1 CANADA
E-Mail: ells@uwaterloo.ca

Dr. David M. Le Vine
NASA Goddard Space Flight Center
Code 614.2
Greenbelt, MD 20771 USA
E-mail: David.M.LeVine@nasa.gov
(AdCom 2007-2009)

Dr. Wooil M. Moon
University of Manitoba
Geophysics Dept.
Faculty of Environment and Earth Resources
Winnipeg, MB R3T 2NT CANADA
E-Mail: wmoon@cc.umanitoba.ca
(AdCom 2007-2009)

Dr. Jay Pearlman
2241 Prescott Ave., SW
Seattle, WA 98126 USA
E-Mail: jay.pearlman@ieee.org
(AdCom 2008-2010)

Dr. Christopher Ruf
Editor TGARS
University of Michigan
1533 Space Research Building
2455 Hayward St.
Ann Arbor, MI 48109-48109 USA
Email: cruf@umich.edu

Dr. Kamal Sarabandi
IEEE Remote Sensing Series Book Editor
Dept. of Electrical Eng. & Computer Science
Ann Arbor, MI 48109-2122 USA
E-Mail: saraband@eecs.umich.edu
(AdCom 2008-2010)

Dr. Motoyuki Sato
IGARSS'11 General Chairman
Center for Northeast Asian Studies
Tohoku University
980-8576 Sendai JAPAN
E-mail: sato@cneas.tohoku.ac.jp
(AdCom 2008-2010)

Dr. Leung Tsang
Past President, IEEE GRSS
University of Washington
Box 352500
Seattle, WA 98195 USA
E-Mail: tsang@ee.washington.edu

Dr. Andrew J. Blanchard
Honorary Life Member, IEEE-GRSS
and Senior Council
University of Texas Dallas
MS AD23
Richardson, TX 75083 USA
E-Mail: ablanch@utdallas.edu

Dr. Keith R. Carver
Honorary Life Member, IEEE-GRSS
University of Massachusetts
Dept. of Electrical & Computer Engineering
Amherst, MA 01003 USA
E-Mail: kcarver@ecs.umass.edu

Dr. Martti T. Hallikainen
Honorary Life Member, IEEE-GRSS
Helsinki University of Technology
Dept. of Radioscience and Engineering
P. O. Box 3000
FIN-02015 TKK FINLAND
E-Mail: Martti.Hallikainen@tkk.fi

Dr. Kiyo Tomiyasu
Honorary Life Member, IEEE-GRSS
Retired
890 East Harrison Ave., #30
Pomona, CA 91767 USA
E-Mail: k.tomiyasu@ieee.org
E-Mail: ektom2@verizon.net

Dr. Fawwaz T. Ulaby
Honorary Life Member, IEEE-GRSS
The University of Michigan
4080 Fleming Building
Ann Arbor, MI 48109-1340 USA
E-Mail: ulaby@eecs.umich.edu

Dr. Werner Wiesbeck
Honorary Life Member, IEEE-GRSS
University of Karlsruhe (TH)
Institute for High Frequency and Electronics
Kaiserstrasse 12
76131 Karlsruhe GERMANY
E-Mail: werner.wiesbeck@ihe.uka.de

Dr. Harold Annegarn
IGARSS'09 General Chairman
Department of Geog., Environmental
Management & Energy Studies
University of Johannesburg
P.O. Box 524
Auckland Park 2006 Johannesburg
REPUBLIC OF SOUTH AFRICA
E-Mail: hannegarn@gmail.com

Dr. Wolfgang-Martin Boerner
Rep. on Asian Affairs
UIC-ECE/CSN, m/c154
900W Taylor St., SEL.W 4210
Chicago, IL 60607-7018 USA
Email: wmbiuic@yahoo.com

Dr. Shannon Brown
GOLD Rep. and FARS Co-Chair
Jet Propulsion Laboratory
4800 Oak Grove Drive
Pasadena, CA 91109 USA
E-Mail: Shannon.Brown@jpl.nasa.gov

Dr. Kuan Shan Chen
Deputy Editor-In-Chief J-STARS
National Central University
Chungli, TAIWAN
E-Mail: dkschen@csrsr.ncu.edu.tw

Yves-Louis Desnos
General Co-Chair IGARSS'12
ESA/ESRIN ITALY
E-Mail: Yves-Louis.Desnos@esa.int

Dr. Liping Di
Data Archiving and Distribution
Technical Committee Chair
Dept. Geography and Geoinformational
Science
George Mason University
Fairfax, VA 22030-4444 USA
E-Mail: ldi@gmu.edu

Dr. William B. Gail
Director Corporate Relations, IEEE GRSS
Vexcel Corporation
1690 38th St.
Boulder, CO 80301 USA
E-Mail: bill.gail@vexcel.com

Dr. Sonia C. Gallegos
Rep. on Latin American Affairs
Naval Research Lab
Code 7333
Stennis Space Center, MS 39529 USA
E-Mail : gallegos@nrlssc.navy.mil

Dr. Albin J. Gasiewski
Senior Counsel
Dept. of Electrical and Computer
Engineering
University of Colorado at Boulder
0425 UCB/ ECOT 246
Boulder, CO 80309-0425 USA
E-Mail: al.gasiewski@colorado.edu

Dr. David G. Goodenough
Senior Counsel
Nominations Committee Chair, IEEE GRSS
Pacific Forestry Centre
Natural Resources Canada
506 West Burnside Road
Victoria, BC V8Z 1M5 CANADA
E-Mail: dgoodeno@nrcan.gc.ca

Dr. Eastwood Im
Instrumentation and Future Technologies
Technical Committee Co-Chair
Jet Propulsion Laboratory, M.S. 180-401
California Institute of Technology
4800 Oak Grove Drive
Pasadena, CA 91109 USA
E-mail: eastwood.im@jpl.nasa.gov

Dr. Joel T. Johnson
Frequency Allocations in Remote Sensing
Technical Committee Chair
The ElectroScience Laboratory
The Ohio State University
1320 Kinnear Rd.
Columbus, OH 43212 USA
Email: Johnson@ee.eng.ohio-state.edu

Dr. Siri Jodha Singh Khalsa
IEEE Standards Committee
and ISO TC-211 Representative
UCB 449
Boulder, CO 80309-0449 USA
E-mail: sjsk@nsidc.org

Dr. Nahid Khazenie
Senior Council
8509 Capo Ct.
Vienna, VA 22182 USA
E-mail: n.khazenie@ieee.org

Dr. David B. Kunkee
Newsletter Editor
The Aerospace Corporation
NPOESS Space Systems
8455 Colesville Road, Suite 1450
Silver Spring, MD 20910
Email: David.Kunkee@noaa.gov

Mr. Charles A. Luther
Senior Counsel
Rep. on African Affairs
1113 Villamay Blvd.
Alexandria, VA 22307 USA
E-Mail: chucklutherr@aol.com

Mr. Granville E. Paules III
Director of Education, IEEE GRSS
Kelly, Anderson, and Associates Inc.
424 North Washington St.
Alexandria, VA 22314 USA
E-mail: gpaules@kellyanderson.com

Dr. Paul Racette
GRSS PACE Rep.
NASA/GSFC Code 555
Greenbelt, MD 20771 USA
E-Mail: Paul.E.Racette@nasa.gov

Dr. H. (Rama) Ramapriyan
Data Archiving and Distribution
Technical Committee Co-Chair
NASA Goddard Space Flight Center
Greenbelt, MD 20771 USA
E-Mail: rama.ramapriyan@nasa.gov

Dr. R. Keith Raney
GRSS Rep. to Soc. on Social Implications of
Technology
Johns Hopkins Univ. Applied Physics Lab
Space Dept.
Johns Hopkins Rd.
Laurel, MD 20723-6099 USA
E-Mail: keith.raney@jhuapl.edu

Dr. Jim Stiles
GRSS Rep. IEEE Sensors Council
University of Kansas
Dept. of EECS 2001 Eaton Hall
1520 W. 15th St.
Lawrence, KS 66045-7621
E-mail: jstiles@eecs.ku.edu

Dr. Martin Suess
Instrumentation and Future Technologies
Technical Committee Co-Chair
ESA European Space Technology and
Research Centre
Kaplerlaan 1 2200 AG
Noordwijk ZH THE NETHERLANDS
E-mail: martin.suess@ieee.org

Dr. David Weissman
Publicity Chairman, IEEE GRSS
Hofstra University, Dept. of Engineering
104 Weed Hall
Hempstead, NY 11549 USA
Email: eggdew@hofstra.edu

Mr. Peter Woodgate
IGARSS'13 General Chairman
Australian Cooperative Research Centre
for Spatial Information (CRCSI)
723 Swanston St.
Carlton, Victoria, 3053 AUSTRALIA
E-Mail : pwoodgate@crcsi.com.au

Dr. Lixin Wu
UARS Technical Committee Co-Chair
China Univ. of Mining and Technology
Beijing Campus
Northeastern University
Beijing CHINA
E-Mail: wlx@cumtb.edu.cn

GRS-S Chapters and Contact Information

Chapter Location	Joint with (Societies)	Chapter Chair	E-mail Address
Region 1: Northeastern USA			
Boston Section, MA	GRS	William Blackwell	wjb@ll.mit.edu
Springfield Section, MA	AP, MTT, ED, GRS, LEO	Paul Siqueira	siqueira@ecs.umass.edu
Western New York	GRS	John Kerekes	kerekes@cis.rit.edu
Region 2: Eastern USA			
Washington DC & Northern VA	GRS	James Tilton	j.tilton@ieee.org
Region 3: Southeastern USA			
Atlanta Section, GA	AES, GRS	Greg Showman	greg.showman@gtri.gatech.edu
Eastern North Carolina Section	GRS	Linda Hayden	haydenl@mindspring.com
Region 4: Central USA			
Southeastern Michigan Section	GRS	Mahta Moghaddam	mmoghadd@eecs.umich.edu
Region 5: Southwestern USA			
Denver Section, CO	AP, MTT, GRS	Michael Janezic	janezic@boulder.nist.gov
Houston Section, TX	AP, MTT, GRS, LEO	Christi Madsen	cmadsen@ee.tamu.edu
Region 7: Canada			
Quebec Section, Quebec	AES, OE, GRS	Xavier Maldague	maldagx@gel.ulaval.ca
Toronto Section, Ontario	SP, VT, AES, UFF, OE, GRS	Sri Krishnan	krishnan@ee.ryerson.ca
Vancouver Section, BC	AES, GRS	Rob Leitch	rleitch@mdacorporation.com
Ottawa Section	OE, GRS	Hilmi Dajani	hdajani@site.uottawa.ca
Region 8: Europe and Middle East			
France Section	GRS	Josselyn Chanussot	Jocelyn.chanussot@gipsalab.grenoble-inp.fr
Central Italy Section	GRS	Nazzareno Pierdicca	nazzareno.pierdicca@uniromal.it
South Italy Section	GRS	Maurizio Migliaccio	maurizio.migliaccio@uninav.it
Germany Section	GRS	Irena Hajnsek	irena.hajnsek@dlr.de
Russia Section	GRS	Anatolij Shutko	anatoli.shutko@email.aamu.edu ashutko@mail.ru
Spain Section	GRS	J. M. Lopez-Sanchez	juanma-lopez@ieee.org
Ukraine Section	AP, NPS, AES, ED, MTT, GRS EMB	Oksana V. Shramkova	o.shramkova@gmail.com
United Kingdom & Rep. of Ireland (UKRI) Section	GRS, OE	Yong Xue	y.xue@londonmet.ac.uk
Student Branch, Spain Section	GRS	Pablo Benedicto	pablo27@casal.upc.edu
Islamabad Section	GRS/AES	M. Umar Khattak	ukhattak@hotmail.com
Region 9: Latin America			
Student Branch, Colombia Section	GRS	Leyini Parra Espitia	leyiniparra@ieee.org
Region 10: Asia and Pacific			
Beijing Section, China	GRS	Chao Wang	cwang@rsgs.ac.cn
Seoul Section, Korea	GRS	Joong-Sun Won	jswon@yonsei.ac.kr
Taipei Section, Taiwan	GRS	Kun-Shan Chen	dkschen@csrsr.ncu.edu.tw
Japan Council	GRS	Yoshikazu Iikura	iikura@cc.kirosaki-u.ac.jp

GRS-S MEMBER HIGHLIGHTS

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You can also visit the GRS-S website: http://www.grss-ieee.org

FROM THE CHAPTERS CHAIR

Lorenzo Bruzzone
Chapter Activities Chair, IEEE GRSS
University of Torento
Department of Information Eng. and Computer Science
Via Sommarive 14
I-38050 Torento, Italy
E-mail: lorenzo.bruzzone@dit.unitn.it

I would like to announce that the IEEE GRS-S has established for the 2009 the IEEE GRS-S Chapter Excellence Award. This award (which consists of an award of US$1000 and a certificate) is aimed at recognizing a chapter that has promoted outstanding activities during 2009. Any of the chapter chairs that would like to submit their chapters as a candidate for this prize should send a short report (no more than 3 pages) related to their 2009 activities to Prof. Lorenzo Bruzzone (bruzzone@ing.unitn.it) and in cc to Prof. Jón Atli Benediktsson (benedikt@hi.is). The deadline for submitting the report is January 20th, 2010. The award will be announced at IGARSS 2010.

Best regards
Lorenzo

CALL FOR NOMINATIONS

GRS-S Distinguished Achievement Award (DAA)

Eligibility: IEEE membership is not required but is recommended.

The Distinguished Achievement Award was established to recognize an individual who has made significant technical contributions, usually over a sustained period, within the scope of the Geoscience and Remote Sensing Society. In selecting the individual, the factors considered are quality, significance and impact of the contributions; quantity of the contributions; duration of significant activity; papers published in archival journals; papers presented at conferences and symposia; patents granted; advancement of the profession. The award is considered annually and presented only if a suitable candidate is identified. The awardee receives a plaque and a certificate.

GRS-S Education Award (EA)

Eligibility: Member or Affiliate Member of the IEEE GRS-S

The purpose of this award is to reward significant educational contributions in the field of remote sensing. The award shall be considered annually, but will only be awarded when an outstanding recipient is identified.

GRS-S Outstanding Service Award (OSA)

Eligibility: Must be an IEEE GRS-S member.

The Outstanding Service Award was established to recognize an individual who has given outstanding service for the benefit and advancement of the Geoscience and Remote Sensing Society. The award shall be considered annually but not be presented if a suitable candidate is not identified. The following factors are suggested for consideration: leadership, innovation, activity, service, duration, breadth of participation and cooperation. The awardee receives a certificate.

Nomination Items:

- Nomination letter
- Candidate biography
- CV with pertinent achievements
- List of publications (only DAA)

Deadline: Dec. 20. 2009

Please send the nomination directly to (electronic submission is appreciated):
Prof. Werner Wiesbeck
Chair, GRS-S Major Awards Committee
University of Karlsruhe (TH)
Kaiserstrasse 12
76131 Karlsruhe, GERMANY
E Mail: werner.wiesbeck@kit.edu

IN MEMORIAM

Dr. David Hogg, former NOAA scientist and technical manager, died August 9, 2009, in Calgary, Alberta, Canada. After serving with the Canadian Armed Services during World War II, he received his Ph.D. from McGill University, Montreal, Canada in 1953, and joined Bell Laboratories in Holmdel, New Jersey in the same year. During his distinguished career at Bell Laboratories (1953–1977), he was closely associated with the Nobel Prize winning physicists Arno Penzias and Robert Wilson. He also published fundamental research in radio propagation, antenna design, and attenuation from rainfall. Dr. Hogg was elected to the National Academy of Engineering in 1978 for his work at Bell Labs. He joined the NOAA Wave Propagation Laboratory (now ESRL/PSD) in 1977 and was chief of the Environmental Radiometry and Radio Meteorology Program Areas (1977–1986). He was instrumental in the design and implementation of Wind Profilers, Radiometric Profilers, and many of their applications to remote sensing of the atmosphere. In addition to his membership in the NAE, he was a Life Fellow of the Institute of Electrical and Electronic Engineers, was awarded the IEEE Geoscience and Remote Sensing Society's Distinguished Achievement Award in 1984, and received a U. S. Department of Commerce Silver Medal in 1983. There will be a Memorial Service for Dr. Hogg in Boulder around October 10, 2009.

FEATURE

THE CALIBRATION AND VALIDATION PROGRAM FOR THE NATIONAL POLAR-ORBITING OPERATIONAL ENVIRONMENTAL SATELLITE SYSTEM PREPARATORY PROJECT (NPP)

Karen M. St. Germain *Senior Member, IEEE*

Abstract—**The National Polar-orbiting Operational Satellite System (NPOESS) program will launch its second risk reduction mission, the NPOESS Preparatory Project (NPP) in 2011. NPP is collaboration between the NPOESS program (for risk reduction) and the NASA's Earth Science program (for continuity of earth science measurements). The NPP sensors will measure 24 environmental data products, and require a comprehensive pre- and post-launch Calibration and Validation program to ensure sensor and data product performance. This paper describes a comprehensive approach to the NPOESS Calibration and Validation program, based on lessons learned over two decades of experience in both operational and science remote sensing.**

Index Terms—**Remote Sensing**

Introduction

The NPOESS program will launch its second risk reduction mission, the NPOESS Preparatory Project (NPP) in 2011. NPP is a collaboration between the NPOESS program (for risk reduction) and the NASA Earth Science program (for continuity of earth science measurements). The NPP platform will carry five remote sensing instruments, covering the electromagnetic spectrum from microwaves to visible waves. Each of these instruments will be flying for the first time on NPP, although some have substantially more legacy than others.

The Cross-track Infrared Sounder (CrIS) is a hyperspectral instrument that will provide measurements in the infrared over the long to short wave range, from 650 to 2550 cm^{-1} (15.4 to 3.92 μm) In the US, the legacy experience for CrIS comes from the Atmospheric Infrared Sounder (AIRS), currently flying on the NASA EOS missions. In sensor operation, CrIS bears greater resemblance to the Infrared Atmospheric Sounding Interferometer (IASI), flying aboard the EUMETSAT METOP series. The CrIS instrument will work with its microwave counterpart, the Advanced Technology Microwave Sounder (ATMS), to produce atmospheric temperature, moisture, and pressure profiles under most weather conditions. The ATMS traces its legacy to the successful series of Advanced Microwave Sounding Units (AMSUs) currently flying as part of the National Oceanic and Atmospheric Administration (NOAA) Polar Operational Environmental Satellite (POES) system.

The Ozone Mapping and Profiler Suite (OMPS), will monitor atmospheric ozone in three ways: total column ozone, vertical ozone profile, and limb ozone profile. The nadir instruments trace their heritage to the Solar Backscatter Ultraviolet radiometer (SBUV)/2 and the Total Ozone Mapping Spectrometer (TOMS). The Limb profiler is being flown as an experimental sensor aboard NPP, and will provide a higher spatial resolution vertical profile than the nadir instrument. The OMPS sensor measurements are made between 250 and 380 nm.

The Visible/Infrared Imager/Radiometer Suite (VIIRS) collects visible and infrared imagery and radiometric data over the wavelength range 412 nm to 12.01 μm. Although there are differences in sensor operation, the closest VIIRS predecessor is the Earth Observing System (EOS) Moderate-resolution Imaging Spectroradiometer (MODIS) instrument (with additional enhanced capability for imagery across the terminator). Data products from VIIRS range from ocean surface products to cloud properties and land surface characterization.

In planning the Calibration and Validation (Cal/Val) campaign for this first launch, we first consider lessons learned from previous Cal/Val campaigns, from both operational and science missions.

Cal/Val Overview

The highest objective of any Cal/Val program must be the accomplishment of the mission for which the program was chartered. In the case of NPOESS, the required National Mission Capabilities are captured in a requirements document (the Integrated Operational Requirements Document, IORD II), which outlines the performance attributes needed for each environmental data product. Fully accomplishing this goal means establishing that the data products meet required performance and are operationally viable. The term "operational viability" means that the products are suitable for inclusion in civilian and defense mission support, with robust performance, minimum down time, and low data latency. Elements of this include a full understanding of data product performance (e.g. error statistics), and rapid resolution of performance issues. For the NPOESS program, the Cal/Val program also plays a role in establishing contractual compliance of the work of the prime contractor.

Lessons Learned from Heritage Programs

System View

An earth remote sensing system is a physical system, comprised of the phenomena to be sensed, the space borne system making the measurements, and the processing system that packages, transmits, and processes the data. A simple depiction of such a system is shown in Figure 1. The ground processing system executes a series of operations that essentially "walk backward" through the physical system (black arrows in Figure 1), eventually yielding a representation of the environmental phenomena of the earth and atmosphere.

These operations fall in to three major categories. The first stage involves unpacking and organizing the data, creating the Level 0 products, or Raw Data Records (RDRs) in NPOESS parlance. Then, the raw data are geolocated and calibrated using information from the spacecraft, the internal calibration targets, and knowledge of sensor performance attained during the pre-launch testing. This process produces radiance measurements and creates the Level 1 products (Sensor Data Records, or SDRs). Finally, the radiances are processed through algorithms to infer properties of the environment from which the emission originated. The output of these processes are the Environmental Data Records (EDRs), which are commonly known as Level 2 products. For a microwave sensor there is often one additional intermediate step between the SDR and EDR, where additional antenna pattern corrections are applied. This output of this step is called a Temperature Data Record, or TDR.

The algorithms to produce the RDRs, SDRs, and EDRs require input data from the spacecraft (e.g. timing, navigation and pointing information) and the sensors (e.g. temperatures, voltages, sensor state and position). They may also require definable databases such as sensor characterization tables, environmental models and field of view models. Ultimately, the success of the algorithms in accurately reversing the measurement process depends upon a correct interface between the algorithm and each component of the system.

A quick survey of past programs gives us insight on what drives the pace and success of the post-launch Cal/Val effort. Over three generations of first-launch microwave sensors, the length of the Cal/Val program has been dominated by sensor performance and sensor interface issues. Some examples are: 1) Timing and position (dominated by spacecraft flight software, hardware, and spacecraft to sensor alignment), 2) Channel Polarization (inaccurately determined prior to launch), 3) Calibration target errors (dominated by calibration target materials and uniformity of target temperature, 4) Antenna Properties or Field of View Intrusions (dominated by completeness of pre-launch pattern measurements and knowledge of the complete system geometry). System Engineering and management challenges pre-launch have also caused considerable delay in post-launch Cal/Val, particularly with issues of format and documentation errors or inconsistencies and unavailability of pre-launch data or analyses.

A similar analysis for MODIS on Terra (the first VIIRS-like instrument), yields similar lessons. Sensor performance and sensor interface issues once again dominated the Cal/Val program. For example: 1) Electronic and optical cross-talk (driven by focal plane and filter performance), 2) Optical path performance (dominated by A/B side mirror differences and polarization geometry), and 3) Calibration errors due to reflected solar energy contamination of the cold space calibration view.

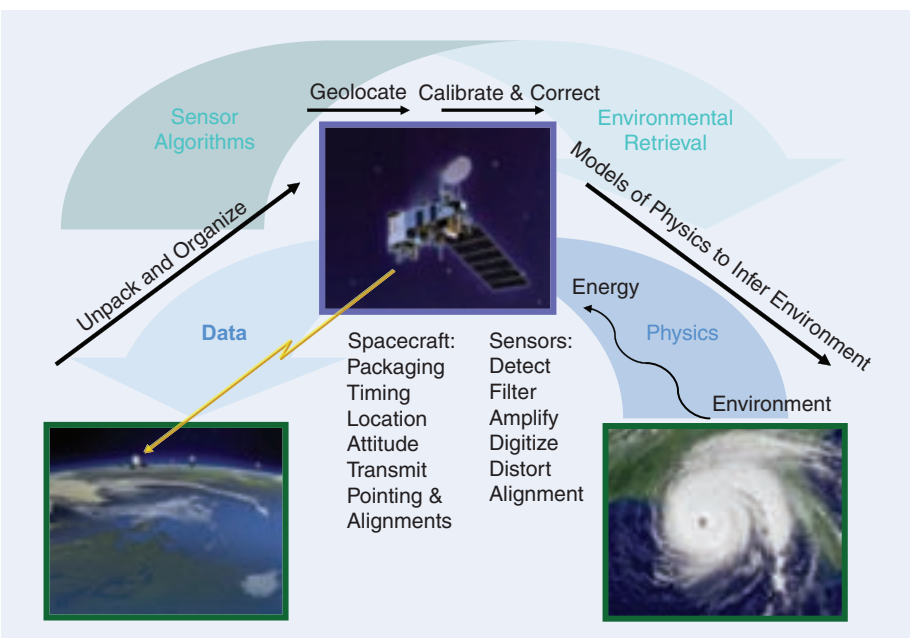


Figure 1. Remote sensing mission data processing flow showing measurements and collection of data (RtoL) and the retrieval process (LtoR).

Most first-flight systems also suffer from incomplete sensor models, ultimately limited by the completeness of the pre-launch test program.

The time required for the validation of the EDRs is dominated by the maturity of the science *from a space platform* for that product. When well-understood heritage algorithms are simply "tuned" for the new instrument characteristics and the sensor changes are minimal, the Cal/Val period is minimized. However, for cases where no heritage product exists and new science understanding must be developed post launch, the EDR validation is rarely complete in less than two years.

From these experiences we take the following lessons. First, pre-launch test and analysis focus is critical for building the foundation for eventual high-quality data products.

This requires a strong pre-launch sensor data analysis team. Second, even with a strong pre-launch program, sensor engineering and expertise will be needed after launch, so team continuity from pre- to post-launch must be a key consideration. Third, during the initial stages of a post launch Cal/Val, sensor performance "features" will require compensation in the ground processing algorithm. In many cases large errors will have to be corrected before moderate or smaller errors can even be identified. This means that a rapid and affordable algorithm update process is needed to keep the Cal/Val team moving at top speed. Finally, extensive involvement from the user community in the early stages is of great benefit in assessing the operational viability of the products and prioritizing the implementation of corrections. This last point always carries some programmatic risk, but it is a risk well worth taking for the long term health of the program.

NPP Cal/Val Guiding Philosophy

As an outcome of studying the successes and challenges of heritage Cal/Val programs, we established the guiding philosophy for the NPP Cal/Val program. There are seven key points: 1) Sensor performance and characterization are the cornerstone of all data products. 2) Experience and resources from past operational and science missions should be fully exploited and incorporated into the NPP and NPOESS Cal/Val plans, 3) Customer and User satisfaction is achieved through their participation in the Cal/Val process, 4) Customer and User proficiency with the operational algorithms is essential to efficient Cal/Val and community buy-in of the data, 5) A quick, cost-effective, global view of performance can be achieved through early comparisons with data from other space-based sensors, global surface models, surface networks, and direct radiance assimilation comparisons, 6) Targeted campaigns and special studies should be planned and executed with knowledge of the global performance, and 7) Corrective actions must be handled with customer involvement and in accordance with established program priorities. These concepts form the foundation of the NPP Cal/Val program.

The NPP Cal/Val Program

Phases of the Cal/Val Program

There are four primary phases of the NPP Cal/Val program. The pre-launch phase covers the period during which the sensors are in development, test, and integration, and the ground system is being built. The Early Orbit Check-out (EOC) covers the period of post-launch sensor activation, and typically lasts for 30 to 100 days. The Intensive Cal/Val (ICV) covers the period between activation and the declaration of operational readiness for each product. The duration of the ICV varies, but for a first-launch sensor it is typically an 18 month process, even in the absence of the need for new science development. Finally, the Long-Term Monitoring (LTM) phase extends through the life of the sensors to ensure that data products continue to meet their performance requirements, anomalies are appropriately handled, and upgrades are implemented as needed.

The specific activities during each of these phases are different for each data product type (RDR, SDR, and EDR). In the next section we present the NPP Cal/Val program overview for each phase of the program and for each product chain. The product chain threads may be understood as representing the basic sensor functionaility (RDR), the calibratability of the sensor (SDR), and the functionality and performance of the retrieval algorithms (EDR).

The Pre-Launch Phase

For the RDR product chain, the pre-launch Cal/Val effort seeks to answer the question "What are the criteria that establish the sensor as a stable, configurable, and functioning instrument capable of meeting its performance requirements?" The activities include verifying operational modes and data formats, analyzing the ambient and thermal/vacuum performance measurements, tuning parameters such as gain and offsets, establishing air-to-vacuum and temperature sensitivities, and developing look-up-tables and sensor constants. Another important component during this phase is looking ahead and developing the post-launch sensor team.

At the same time the SDR product chain team, in a closely related activity, seeks to answer the question "Do the SDR algorithms (in their operational implementation) capture how the sensor actually works as built? And is the product compliant with requirements?" The primary activities during this period focus on making pre-launch measurements to established standards (e.g. NIST), establishing the completeness of the sensor test program, developing sensor error budgets and populating them with as-built numbers, analyzing test data, developing look-up-tables and sensor constants and their documentation, participating in "fix-or-fly" decisions, and identifying any liens (due to as-built performance) that may alter the on-orbit operations concept of the sensor.

Finally, there are important activities prior to launch for the EDR product chains. The EDR team works to establish the answer to the question "Are the algorithms (as implemented in the operational processing system) stable, tunable, well understood, and working with realistic sensor and system performance characteristics?" For the NPP system, proxy data are available from heritage instruments. These data are adjusted to reflect sensor differences and are used for assessing algorithm performance under both normal and stressing conditions. In addition, we run these data through the operational processing system to establish the robustness of the system. Synthetic data (data generated through modeling) are used to establish algorithm sensitivities. We also make, at this stage, an initial assessment of areas where more research, added on-orbit resources, post-launch campaigns, or other mitigation may be needed.

The Early Orbit Check-out Phase

The most fundamental question, answered in the early post-launch RDR verification, is "Is the sensor operating as it was tested on the ground?" This question is answered by analysis of engineering data (e.g. voltages, currents, and temperatures), telemetry data, and calibration data. Bringing about a positive response to this question may require instrument tuning or adjustment. This is also the activity that establishes instrument baseline performance and represents the beginning of on-orbit instrument trending. If the RDR verification does not verify that the sensor is operating as expected, then a sensor anomaly resolution activity is activated, drawing on the sensor development, systems engineering, and Cal/Val teams. RDR verification lays the foundation for a closely related activity: SDR verification and tuning.

The SDR verification during EOC answers the question "Taken together, are the RDR and SDR algorithms producing radiances that are reasonable (spectrally and radiometrically) and geolocated?" This initial assessment is intended to find large errors and systematic performance issues. The primary tools for this analysis are radiance comparisons with other space borne sensors, model and analysis fields processed through radiative transfer models. This is also the prime opportunity for executing spacecraft maneuvers to position the sensors to observe more "pure" scenes such as deep space or well understood scenes such as the moon. After launch, radiance errors are most typically handled through modification of the SDR algorithm. In such a circumstance the SDR team will work very closely with the sensor anomaly team to establish a correction approach that is as faithful as possible to the established root cause of the unexpected behavior. Often the SDR verification activity is informed by the EDR verification activity, especially where the previously mentioned forms of radiance comparison are technically difficult or expensive.

The EDR verification activities in the EOC phase are designed to answer the question "Are the EDR algorithms functioning and valid over a subset of nominal conditions?" The first element of this activity is establishing that all inputs from the sensor are available and reasonable. In many cases the EDR algorithm must be activated or tuned using correlative analysis with independent data sets. The EDRs are compared with similar products from other space borne sensors or model/analysis fields to establish that the large scale patterns are reasonable. The Cal/Val team also looks at performance comparisons under selected conditions such as the sensor operating range (e.g. is the sensor performance varying with its orbital position/temperature?). Such an outcome will immediately be fed back to the SDR and RDR activities for investigation. The EDR verification activity also assesses the performance over a range of stressing environmental conditions (e.g. extreme surface temperature, temperature inversions, absorbing aerosols). This phase also marks the beginning of the generation of matchup data sets with other sources of correlative measurements such as ocean surface buoys, operational radiosondes, etc. For these matchup data sets, the associated RDR, SDR, EDR, calibration and engineering data will be captured so that the matchup dataset may be efficiently regenerated upon implementation of an SDR or EDR algorithm correction.

The Intensive Cal/Val Phase

Just as the EOC is intended to identify and correct or mitigate major sensor or system anomalies, the Intensive Cal/Val (ICV) phase is intended to identify and correct or mitigate moderate to minor sensor or system anomalies.

The primary focus of the RDR product chain is to establish the sensor stability by answering the question "Is the sensor and its calibration stable over the sensor's range of operating conditions?" The answer to this question is established primarily through correlative analysis involving a host of system variables. These variables include position in orbit, seasonal variations, sensor operating state (and the operating states of neighboring sensors and transmitters), and the like. Performance is established through detailed analysis of telemetry and calibration data, correlation analysis, and early trend analysis. Unexpected findings during this activity may result in a modification of the sensor operations concept (e.g. table uploads, calibration frequencies, etc.)

Again, in a closely related activity, the SDR validation establishes the foundation for all future EDR work. The question to be answered by this activity is "Are the SDRs precisely geolocated, stable, and valid to expected levels (accuracy and precision) over conditions seen to date. There are a number of activities that support SDR validation, and only the primary ones are discussed here. First, the analyses that were begun during the EOC are continued and expanded. For example, analyses of accumulated comparisons with radiances and environmental products from other space based sensors and model fields will be continued. With the increasing comparison statistics, performance will be stratified, for example, in a zonal average global sense. Other statistical analysis techniques such as vicarious calibration approaches are viable at this stage, and will be used to provide a very reliable performance point for trending over the life of the sensor. Spacecraft maneuvers may continue into this phase as needed, although they may become difficult to schedule as some of the data begin to see operational use. Aircraft under-flights, with calibration targets independently calibrated to national standards may take place during this phase. Sensor error budgets established prior to launch are key to the success of the SDR validation, particularly as they may provide insight into unexpected sensor behaviors.

Finally, in recent years, a new approach to SDR validation has emerged through collaboration with the operational user community. Radiance assimilation into off-line instantiations of operational numerical weather prediction or analysis systems will be used to provide very sensitive indications of areas or conditions under which the sensor provided radiances

deviate from expected values. An additional benefit of this interaction is that the operational users gain early familiarity with the new sensor data sets, their formats and performance attributes, allowing for earlier and more efficient operational use of the validated radiance data products.

Long-Term Monitoring Phase

At the conclusion of the ICV, all data products should be meeting performance expectations and should be viable for operational use. Product lines will likely reach this state at different times, depending on instrument performance and algorithm maturity at launch. We then will enter the Long-Term Monitoring (LTM) phase where the instrument and products are scrutinized for trends, finer adjustments may be made to the processing algorithms, and handling of sensor degradation becomes the primary focus.

During LTM, the RDRs (including telemetry, engineering, and calibration data) trending and analysis continue. The question of interest is "Is the sensor stable over seasons and is degradation as expected?" Mitigation approaches include tuning of the warning thresholds and recognizing changes in sensor operating state. As the sensors age, modification of their operations concepts may be required to maintain performance. These may include more frequent table uploads, and adjustments to operating set points.

For the SDR product chain, the question during LTM is "Are the SDR algorithms and supporting look-up tables and sensor constants optimized as the sensor ages?" Continuous tracking of radiance performance (in addition to the RDR trending) is central to answering this question. During this phase mitigation approaches will have to be developed to handle changes to redundant side (A/B side) subsystems as necessary. Typical issues also include degradation of sensor electronics, calibration targets, and optical surfaces. In some cases complete loss of a channel has occurred. Mitigation of these performance changes ranges from simple updates to Look-Up Tables (LUTs) to a reformulation of the SDR algorithm. These adjustments are most critical for the long term utility of the NPP data. Issues uncovered and mitigated in the SDR production are almost always accompanied by adjustments to EDR product chains as well.

The question "Are the EDR products valid over the full range of conditions and operationally viable?" dominates the EDR product chain team during the long term monitoring phase. Continued analysis of accumulated comparisons with both space borne sensor and correlative data sets will be used to validate the data products under stressing and important conditions, even if such conditions are not uncommon. In some cases special campaigns for poorly understood conditions may be needed, in accordance with program priorities. Of course the most fundamental activity will revolve around adapting EDR products to accommodate sensor channel loss or performance degradation.

The specifics of the activities during each Cal/Val phase, and for each product chain are captured in individual Calibration and Validation plans, but all follow the general structure captured here.

The NPP Cal/Val Teams

An examination of the activities described in the previous sections will reveal that the expertise required to execute a successful Cal/Val varies with product chain and phase of the program. Figure 2 is a graphical depiction of this concept.

In the upper left hand corner of this matrix the required expertise is focused on the sensor performance and engineering considerations. Activities in the lower right quadrant are more focused on the environmental data side, required expertise in the physics of the earth environment and an understanding of how the EDRs are to be used to support operational mission. In other words, the needed expertise shifts from sensor engineering (typically with a strong sensor developer presence) to Government customers over time and product chain. The NPP Cal/Val teams have been constructed to accommodate these varying expertise requirements.

The NPOESS program has two components; the Integrated Program Office (IPO), and the Prime Contractor. From the Cal/Val perspective there are several important considerations that flow from this structure. First, the prime contractor holds most of the sensor development contracts and the systems engineering responsibility. In addition, the prime contractor is responsible for the development of the ground processing system. The prime contractor's performance requirements are captured in the contract they have signed with the Integrated Program Office.

The IPO, on the other hand, is the primary interface with the Government customer/user community, and as such is well positioned to work with the users to ensure program priorities are achieved. The program commitments to the

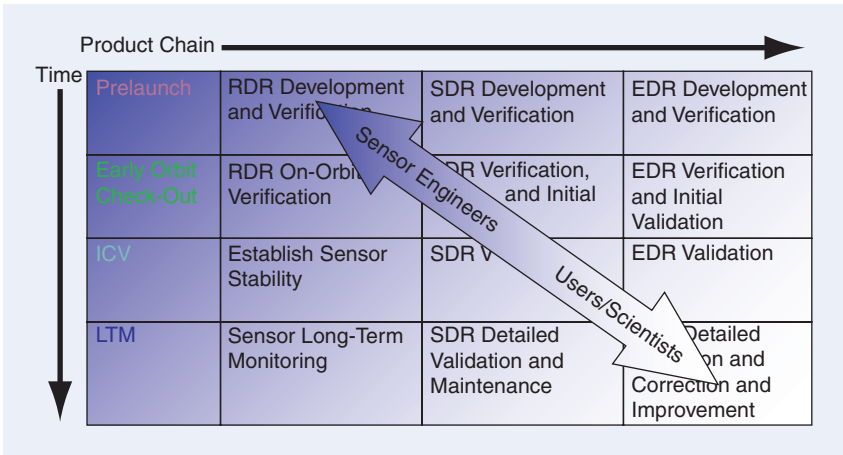


Figure 2. Expertise required during Cal/Val as a function of time and data products.

customers are captured in the governing requirements document, the IORD. The IPO also has the ability to draw upon technical expertise from within the Government and academia far more readily that the prime contractor. With this construct in mind, Cal/Val teams were created to best draw upon the resources available to the IPO and the Prime Contractor.

The RDR & SDR Cal/Val Teams

The RDR and SDR Cal/Val efforts are led by the prime contractor. Their responsibilities include development of the RDR and SDR algorithms and LUTs, performance verification of the sensors, and post-launch calibration and validation of the SDR products. To support this activity, they will carry a core team for each sensor, consisting of members of the sensor development team, the algorithm developers and the calibration specialists. The IPO will augment this contractor team with experts from government and academia, especially when such experts bring strong heritage expertise. In the case of the VIIRS instrument, the IPO has worked closely with NASA to bring the lessons learned from the Moderate-resolution Imaging Spectroradiometer (MODIS) calibration team to the VIIRS SDR team. For each sensor, the Government team is lead by an identified sensor science lead. The sensor science lead is responsible for leading the Government SDR team and coordinating their activities with the prime contractor. The RDR and SDR validation programs are captured in sensor specific calibration and validation plans, with the detailed task descriptions and responsibilities further enumerated in an integrated task network. This task network is the management tool that the leads will use to coordinate the work of the team, adapting as necessary as understanding of sensor performance and issues evolves.

The EDR Cal/Val Teams

The EDR Cal/Val activities are led by the IPO team, which is organized by discipline area. The IPO has six environmental product teams: imagery and cloud mask products, ocean surface products, land surface products, atmosphere products (cloud and aerosol properties), ozone, and sounder products. For each product team, the IPO sought leadership from a center of expertise. Each of these team leads has put together a plan and a supporting team (from across the stakeholder agencies) to execute their Cal/Val program. The IPO provides the resources for these efforts and coordinates across the discipline area teams. Examples of coordination activities include optimizing any field campaigns for maximum benefit across teams and developing an infrastructure that supports all of the discipline teams.

The imagery and cloud mask team is led by the Air Force Weather Agency and The Aerospace Corporation because they are the most involved users of the imagery data products.

The ocean surface product (sea surface temperature and ocean color/chlorophyll) team is led by the Naval Research Laboratory and the Naval Oceanographic Office, both located at Stennis Space Center. They were asked to lead the oceans effort because of their resident technical expertise and because their operational missions are most sensitive to the quality of these ocean products.

The land surface products team leadership is provided by the NOAA National Climatic Data Center (NCDC) in Asheville, NC. NCDC was selected because of their in-house technical expertise, their working partnerships with other stakeholders, and their wealth of independent data sets.

The sounder product team is led by NOAA/National Environmental Satellite, Data, and Information Service (NESDIS) Center for Satellite Applications and Research (STAR) because of the close connection between the NOAA operational weather mission and the sounder product quality.

The ozone products from the nadir instrument will be led by NOAA/NESDIS STAR, in close cooperation with the NASA team leading the validation of the ozone limb sensor products.

Finally, the atmospheric products, which include cloud properties and aerosol properties, will be led by NASA Goddard Space Flight Center. This is the only product team that does not have direct ties to operational missions. This is due to the fact that this subset of the EDRs does not have operational heritage, but does have strong heritage from within the NASA EOS program, and in particular, the MODIS science team.

The Clouds and the Earth's Radiative Energy System (CERES) sensor is also flying on NPP, but the NASA Langley Research Center Science Directorate owns the Cal/Val responsibilities under the terms of the sensor manifest agreement. Every effort will be made to coordinate with the Langley team avail them of the infrastructure that supports the rest of the Cal/Val teams.

Correlative Data Sets

The SDR and EDR Cal/Val teams have identified an extensive preliminary list of correlative data sets that are available in the post-launch Cal/Val effort. These data sets are generally of four types: space borne sensors, global fields & models, airborne sensors, networks and deployables and currently include over 32 space-based sensors, 6 individual global fields/models, 12 separate ground based networks and 13 separate deployable/airborne data sources.

The NPP Cal/Val Support Infrastructure

An important benefit of embracing a community based Cal/Val program is in bringing not just heritage experience, but also heritage tools to benefit the NPP program. This approach provides savings in both development cost and tool verification. However, there are some functions that are best done with centralized resources, to establish a common infrastructure for the benefit of all of the Cal/Val teams. That common infrastructure is described here. The infrastructure is called the Government Resource for Algorithm Verification, Integration, Test and Evaluation (GRAVITE). GRAVITE has

four main components, the technical library, the central processing and distribution capability, the software repository, and a whole system triage tool.

The Technical Library

The NPP system produces 24 EDRs which are supported by 70 algorithms implemented in the ground system (not including CERES products, which are developed and maintained by NASA Langley). The documentation for this complex system is extensive and development/update cycles for the documentation are not, in most cases, synchronized. The technical reference library is intended to be the primary resource for the accurate information, available in a timely manner to support rapid post-launch Cal/Val activities. The goal is to use graphical representations of the system to allow the user to rapidly identify the detailed information needed – whether that is format information, algorithm flow diagrams, or sensor descriptions.

Tied in to the technical library is a repository of all pre-launch instrument test data and telemetry. This repository also includes instrument test procedures, test logs, and analysis reports. These items are the basis for pre-launch instrument performance assessments made by the SDR Cal/Val team that inform the sensor requirements sell-off process. A set of tools that allows querying of the test data by telemetry parameters (e.g. instrument state or optical bench temperature) is also included for convenience in searching the data.

The Central Processing and Data Distribution

The central processing and data distribution capability is located within the NOAA facility that will process NPP data operationally. These assets support the collection, storage distribution and reformatting of mission, ancillary, auxiliary and correlative data to support the geographically distributed Cal/Val teams. The central processing capability is intended to perform functions that either benefit multiple Cal/Val teams (e.g. SDR work) or where reduction in data flow results (e.g. matchup generation).

Software Repository

A shared access software repository is provided which contains algorithm processing modules from the IDPS operational code, tools to run these modules on a "scientist-friendly" platform such as Linux, and a platform for sharing analysis software tools, all with configuration management and change tracking. This capability is especially important for managing, vetting, testing, and verifying any changes to the operational code that may be proposed by the Cal/Val team.

System Visualization Tools

Heritage Cal/Val programs have demonstrated that anomalies observed are often traceable to sensor geometry relative to the satellite, earth, sun or other satellites. The ability of the Cal/Val team to visualize these relationships, and correlate them to the mission data and telemetry is the key to rapid issue resolution. The infrastructure team is developing such a capability and expects to demonstrate this tool to the Cal/Val team 6-8 months prior to launch. The software will be freely distributed to the Cal/Val team, and will run in a desktop environment. In addition, these tools will be available to Cal/Val scientists visiting the IPO.

Conclusions

The NPP program is the pathfinder for the NPOESS program in many ways, including development and maturation of the Calibration and Validation Program. The Integrated Program Office has put together discipline teams, lead by internationally recognized experts, to plan and execute the Cal/Val. This planning takes as a basis the most effective heritage approaches and tools, but updates these in light of availability of data sources, known sensor performance and issues, recent scientific developments. The phases of the Cal/Val program have been identified and are designed to optimize the impact of the available resources. The details of these plans are captured in 11 volumes, which will be released to the broader community in 2010.

Karen M. St. Germain (SM'02) received the BS degree in electrical engineering from Union College, Schenectady, NY in 1987, and the Ph.D. degree from the University of Massachusetts, Amherst, in 1993. She joined NOAA in 2004 and is currently Chief of the Data Products Division at the National Polar-Orbiting Operational Environmental Satellite System (NPOESS) Integrated Program Office. NPOESS is the next generation operational weather and environment satellite system supporting U.S. National civilian and defense weather prediction and environmental observation. Dr. St. Germain is responsible for demonstrating the scientific integrity of the data processing algorithms, pre- and post-launch sensor calibration and data product validation for the nine NPOESS sensors and the 38 operational earth, atmosphere and space environmental data products.

Dr. St. Germain has been a member of the IEEE Geoscience and Remote Sensing Society since 1988. She served as an associate editor of the IEEE GRSS Newsletter from 1994 to 1996, and was elected to the AdCom in 1997. She served as the Membership Chairman from 1997 to 1998, as the Vice President for Meetings and Symposia from 1998 to 2001, and currently serves as the Vice President for Operations and Finance. Dr. St. Germain was Co-Chairman of the Technical Program for IGARSS 2000. She served on the U.S. National Academy of Sciences National Research Council Committee on Radio Frequencies (CORF) from 2000–2007 and served as the chairman from 2005–2007. Dr. St. Germain is the general co-chair of IGARSS 2010 and hopes to see you all in Hawaii.

NEW AWARD ESTABLISHED FOR EARLY CAREER MEMBERS

The GRSS Administrative Committee has voted to adopt a new award for early career GRSS members, specifically GOLD members. The IEEE Graduates Of the Last Decade (GOLD) is a program within IEEE to increase the value of services and programs for young members. If you are within 10 years of your first professional degree, you are automatically a GOLD member. Details about the award can be found below. The GRSS is currently working to further develop programs and provide services within GRSS geared to young members.

GRS-S GOLD Early Career Award

Description: The GRSS GOLD Early Career Award is to promote, recognize and support young scientists and engineers within the Geoscience and Remote Sensing Society that have demonstrated outstanding ability and promise for significant contributions in the future.

Award Items: Certificate and US$ 1500,—Honorarium.

Selection Factors: Quality, significance and impact of contributions, papers published in archival journals – papers presented at conferences and symposia, patents, demonstration of leadership, and advancement of profession.

Eligibility: The candidate must be an IEEE GRSS Graduate of the Last Decade (GOLD) member (defined as any IEEE member within 10 years of their first professional degree) at the time of nomination and making contributions in a GRSS field of interest. Previous award winners are ineligible.

Nomination: A nomination package must be submitted by an IEEE GRSS member, consisting of the following:

A nomination letter, no more than 2-pages in length, from a GRSS member A complete curriculum vitae of the candidate.

Two recommendation letters from individuals familiar with the candidate's technical contributions and achievements.

Evaluation: The evaluation should be done by the Major Awards Committee.

Presentation: The award shall be presented at an awards ceremony during IGARSS of the following year.

Publicity: A feature publication will be published in the IEEE Transactions on Geoscience And Remote Sensing and/or in the GRS-S Newsletter.

Timetable: Dec. 15. – nominations are due for awards in the following year

REPORTS

MAJOR GRS-S AWARDS AND FELLOW RECOGNITIONS AT THE IGARSS 2009 PLENARY SESSION

Martti Hallikainen, *IEEE GRS-S Awards Committee Co-Chair*

Three Major GRS-S Awards were presented and six 2009 IEEE Fellows were recognized at the IGARSS 2009 Plenary Session on Monday, July 13th, in Jameson Hall, University of Cape Town, in Cape Town, South Africa.

IGARSS 2009 was opened with the Plenary Session with distinguished guests, including the Minister of Science and Technology, the Hon. Naledi Pandor, MP; Dr. Max Price, Vice Chancellor, University of Cape Town; and Professor Tsehaie Woldai, President of the African Association of Remote Sensing of the Environment (AARSE). Welcome addresses highlighted our Geoscience and Remote Sensing Society, South African space and remote sensing activities, and AARSE activities.

Dr. Max Price, Vice Chancellor of the University of Cape Town, giving his speech; at right other Plenary speakers and members.

IGARSS'09 General Co-Chair Harold Annegarn chaired the Plenary Session. He presented impressive figures concerning participation in the first IGARSS organized in Africa: 2,083 abstracts submitted, 1,885 papers accepted, 211 oral sessions, 100 poster sessions, and 1,250 pre-registered participants.

IEEE GRS-S President Tony Milne congratulated Prof. Harold Annegarn and his team on the successful organization of IGARSS'09. He invited attendees to join the GRS Society and listed several advantages of the membership including making a bigger impact on remote sensing through the Society, readily accessing our premier journals, participation in our six Technical Committees, attending IGARSS at a reduced rate, and utilizing Society resources.

IGARSS 2009 General Chair Harold Annegarn opening the symposium.

IEEE GRS-S President Tony Milne giving an insight to our Society.

Dr. Max Price welcomed IGARSS attendees to the University of Cape Town, which was founded in 1829 as the South African College. It is the oldest university in South Africa and has over 20,000 students and a staff of 2,500.

Minister Naledi Pandor discussed in her speech South African space and remote sensing activities. South Africa is in the process of setting up a national space agency, which was authorized by President Kgalema Motlanthe earlier this year. The agency will implement a national space program.

The Minister of Science and Technology, The Hon. Naledi Pandor, MP, presenting South African space and remote sensing activities.

Professor Tsehaie Woldai, President of the African Association of Remote Sensing of the Environment

Professor Tsehaie Woldai, President of the African Association of Remote Sensing of the Environment, discussing AARSE activities.

(AARSE), discussed AARSE history, activities, and future plans, and told that the Association has 1212 individual members in 28 African countries and 25 organizational members. AARSE is an organizational member of GEOSS since 2004.

After the welcoming addresses GRS-S President Tony Milne recognized the six new IEEE Fellows affiliated with GRS-S and presented the three GRS-S Major Awards; he was assisted by GRS-S Awards Committee Co-Chair Martti Hallikainen.

IEEE Fellow Awards

The grade of IEEE Fellow recognizes unusual distinction in the profession and shall be conferred only by invitation of the IEEE Board of Directors upon 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 mil, that is 1 in 1000, of the Institute membership, exclusive of students and affiliates. To qualify, the candidate must be a Senior Member and be nominated by an individual familiar with the candidate's achievements. References and evaluations are required from at least five IEEE Fellows and the IEEE Society best qualified to judge, respectively. The IEEE Fellow Committee, comprising 52 IEEE Fellows, carefully evaluates all nominations and presents a list of recommended candidates to the IEEE Board of Directors for the final election.

The following GRS-S members were elevated to the Fellow status effective January 1st 2009:

- Prof. Mahta Moghaddam from the University of Michigan, Ann Arbor, MI, USA
- Prof. Ian G. Cumming from the University of British Columbia, Vancouver, Canada
- Prof. Helmut Rott from the University of Innsbruck, Innsbruck, Austria
- Prof. Sebastiano B. Serpico from the University of Genoa, Genoa, Italy
- Prof. Yisok Oh from the Hongik University, Seoul, Korea
- Dr. Simon H. Yueh from the Jet Propulsion Laboratory, Pasadena, CA, USA

Prof. Mahta Moghaddam was recognized with the citation**:** ***"For contributions to forward and inverse scattering techniques for radar remote sensing."***

Mahta Moghaddam.

Mahta Moghaddam received the B.S. degree (with highest distinction) from the University of Kansas, Lawrence, in 1986 and the M.S. and Ph.D. degrees from the University of Illinois, Urbana-Champaign, in 1989 and 1991, respectively, all in electrical and computer engineering. From 1991 to 2003, she was with the Radar Science and Engineering Section, NASA Jet Propulsion Laboratory (JPL), California Institute of Technology, Pasadena, before joining the faculty of the Radiation Laboratory in the EECS department at Michigan.

Dr. Moghaddam has introduced innovative approaches and algorithms for quantitative interpretation of multi-channel SAR imagery based on analytical inverse scattering techniques applied to complex and random media. She has also introduced a quantitative approach for data fusion by combining SAR and optical remote sensing data for nonlinear estimation of vegetation and surface parameters. She has led the development of novel radar instrument and measurement technologies for subsurface and subcanopy characterization.

Dr. Moghaddam's research group is engaged in a variety of research topics related to applied electromagnetics, including the development of advanced radar systems for subsurface characterization, mixed-mode high resolution medical imaging techniques, and smart sensor webs for remote sensing data collection and validation. She has been the Principal and Co-investigator on numerous research projects, and has authored or coauthored over 160 publications. Dr. Moghaddam is a member of URSI Commission B.

Prof. Moghaddam was not able to be present at the Plenary Session.

Prof. Ian G. Cumming was recognized with the citation: ***"For achievements in synthetic aperture radar signal processing."***

Ian G. Cumming.

Ian G. Cumming (S'63–M'66–SM'05–LSM'06) received the B.Sc. degree in engineering physics from the University of Toronto, Toronto, ON, Canada, in 1961, and the Ph.D. degree in computing and automation from Imperial College, University of London, London, U.K., in 1968. In 1977, he was with MacDonald, Dettwiler and Associates Ltd., Richmond, BC, Canada, where he developed SAR signal processing algorithms, including Doppler estimation and autofocus routines. He has been involved in the algorithm design of digital SAR processors for SEASAT, SIR-B, ERS-1/2, J-ERS-1, and RADARSAT, as well as several airborne radar systems. He was a Visiting Scientist with the German Aerospace Center (DLR), Oberpfaffenhofen, for one year in 1999. Since 1993, he has been with the Department of Electrical and Computer Engineering, University of British Columbia, Vancouver, BC, Canada, where he is the MacDonald Dettwiler/NSERC Industrial Research Chair in radar remote sensing. The Radar Remote Sensing Laboratory has published papers in the fields of SAR processing, SAR data encoding, satellite SAR two-pass interferometry, airborne along-track interferometry, polarimetric radar image classification, and SAR Doppler estimation.

Prof. Cumming was not able to be present at the Plenary Session.

Prof. Helmut Rott was recognized with the citation:

"For contributions to microwave techniques for evaluating climate change."

Helmut Rott (M'87–SM'03) received the Ph.D. degree in meteorology and physics from the University of Innsbruck, Innsbruck, Austria, in 1974, and the habilitation in meteorology in 1985.

Helmut Rott (right) with GRS-S President Tony Milne.

He is professor at the Institute of Meteorology and Geophysics, University of Innsbruck, and co-founder and co-director of the scientific spin-off company ENVEO IT GmbH. He was a visiting professor at the University of Munich, Germany, in 1989/1990. His research interests include microwave signatures and inversion methods, spaceborne microwave radiometry, SAR interferometry, satellite applications for cryospheric research and hydrology, natural hazards monitoring, and atmospheric radiative transfer. He participated in several scientific expeditions to Antarctica, Greenland and Patagonia, performing field measurements on microwave interactions with snow and ice as basis for the inversion of satellite observations. His studies on ice shelves and glaciers at the Antarctic Peninsula provided new insights on the vulnerabilty of polar ice masses to global warming.

He has been Principal Investigator in the SIR-C/X-SAR, ERS-1, ERS-2, SRTM, Envisat, Radarsat and ALOS-PALSAR programs. Since 1988 he has been serving on several scientific advisory commitees of the European Space Agency (ESA). Presently he is member of ESA's Earth Science Advisory Committee and the SAR Advisory Group. He has held offices in several international scientific associations. Currently he is member of the Scientific Steering Group of the Climate and Cryosphere Project (CliC) of the World Climate Research Programme. From 1999 to 2008 he served on the editorial team of the Journal of Glaciology. He was elected Corresponding Member of the International Academy of Astronautics in 2006. He chairs the science team for CoReH2O, a dual frequency SAR mission for snow and ice observations that has been proposed to ESA in response to recent Call for Earth Explorer Missions. CoReH2O has been selected by ESA for Phase-A study.

Sebastiano B. Serpico (right) with GRS-S President Tony Milne.

Prof. Sebastiano B. Serpico was recognized with the citation:

"For contributions to pattern recognition for remote sensing image analysis."

Sebastiano B. Serpico received the Laurea degree in electronic engineering (1982) and the Doctorate in telecommunications (1989) from the University of Genoa, Genoa, Italy. He is currently a Full Professor of telecommunications at the Faculty of Engineering of the University of Genoa, where he teaches pattern recognition, environmental remote sensing, signal theory, and electrical communications. His current research interests include the application of pattern recognition and image analysis (feature selection, classification, change detection, data fusion) to remote sensing and biomedical data. He is author or coauthor of more than 150 scientific articles.

From 1995 to 1998, Dr. Serpico was Head of the Signal Processing and Telecommunications (SP&T) Research Group of the Department of Biophysical and Electronic Engineering and is currently Head of the SP&T laboratory. He has been the project manager or scientific coordinator of several national and European research projects; he was an evaluator of project proposals for several EU programmes. He is the Chairman of the Institute of Advanced Studies in Information and Communication Technologies (ISICT).

From 1998 to 2002 he was the Chairman of the SPIE/EUROPTO series of annual conferences on "Image and Signal Processing for Remote Sensing." In 2003 he was one of the chairmen of the "IEEE Workshop on Advances in Techniques for Analysis of Remotely Sensed Data" (NASA, Greenbelt MD, USA). He was a member of the technical/scientific committees of numerous international conferences and workshops; in particular, he was Theme Coordinator or Session Organizer for the IEEE IGARSS conferences from 2006 to 2009. He co-edited two Special Issues of the Transactions on Geoscience and Remote Sensing (TGARS). Since 2001, he has been an Associate Editor of TGARS.

He is a member of the IEEE Geoscience and Remote Sensing Society and of the International Association for Pattern Recognition Society (IAPR).

Prof. Yisok Oh was recognized with the citation:

"For contributions to microwave remote sensing of soil moisture and surface roughness."

Yisok Oh.

Yisok Oh (S'88–M'94–SM'03) received the B.E. degree in electrical engineering from Yonsei University, Seoul in 1982, the M.S. degree in electrical engineering from the University of Missouri-Rolla in 1988 and the Ph.D. degree in electrical engineering from the University of Michigan, Ann Arbor in 1993. He is presently a Professor in the School of Electronic and Electrical Engineering at Hongik University, Seoul, Korea, where he has taught since 1994 and served as the School Chair from 2003 to 2005. He also served as the Chairman of the Radio Science and Engineering Department at the school from 1995 to1999. He was the Publicity/Publication Chair of the IGARSS 2005, the Chair (2006–2008) and the Vice-Chair (2000–2005) of the IEEE GRS-S Korea Chapter. He received the Korea Electromagnetic Engineering Society Outstanding Service Award in 2005.

Dr. Oh has developed a polarimetric microwave scattering model for soil surfaces, an inversion technique for simultaneous retrieval of both soil moisture and surface roughness from radar measurements, and the criteria for precise measurements of the soil surface roughness parameters. Currently, his research is focused on both theoretical and experimental developments of an improved polarimetric scattering model for vegetated surfaces, and its application to polarimetric SAR data analysis/ classification, and an enhanced inversion algorithm for retrieving soil moisture from radar measurements of vegetated surfaces.

Prof. Oh was not able to be present at the Plenary Session; Mr. Hwang Ji-Hwan received the recognition on his behalf.

Dr. Simon H. Yueh was recognized with the citation:

"For contributions to polarimetric radar and radiometer remote sensing."

Simon H. Yueh received the Ph.D. degree in Electrical Engineering in January 1991 from the Massachusetts Institute of Technology. He was a postdoctoral research associate at the Massachusetts Institute of Technology from February to August 1991. In September 1991, he joined the Radar Science and Engineering Section at the Jet Propulsion Laboratory (JPL). He was the supervisor of radar system engineering and algorithm development group from 2002–2007. He became the deputy manager of Climate, Oceans and Solid Earth section in July 2007, and was promoted to the section manager in March 2009. He is also serving as the instrument scientist for the National Aeronautics and Space Administration (NASA) Aquarius mission for global sea surface salinity observations. He has been the Principal/Co-Investigator of numerous research projects, including the polarimetric wind radiometer research; airborne scatterometer project for hurricane wind measurements; Passive/Active L-band Sensor (PALS) project; NASA Instrument Incubator Project for a mission concept using a large mesh-deployable antenna for soil moisture and ocean salinity sensing; the airborne polarimetric radar (POLSCAT) for ocean wind velocity measurements; the POLSCAT/Cold Land Processes Experiments (CLPX-1 and -2) in 2002–2004 and 2006–2008; the Advanced Component Technology lightweight dual-frequency antenna feed project, and the Aquarius PALS High Wind Campaign in 2009. He is leading the development of Snow and Cold Land Processes mission concept at JPL. He has authored four book chapters and published more than 150 publications and presentations. He received the 2002 IEEE GRSS Transactions Prize Paper Award, the 2000 Best Paper Award in the IEEE International Geoscience and Remote Symposium 2000, and the 1995 IEEE GRSS Transactions Prize Paper award for a paper on polarimetric radiometry. He received the JPL Lew Allen Award in 1998 and Ed Stone Award in 2003.

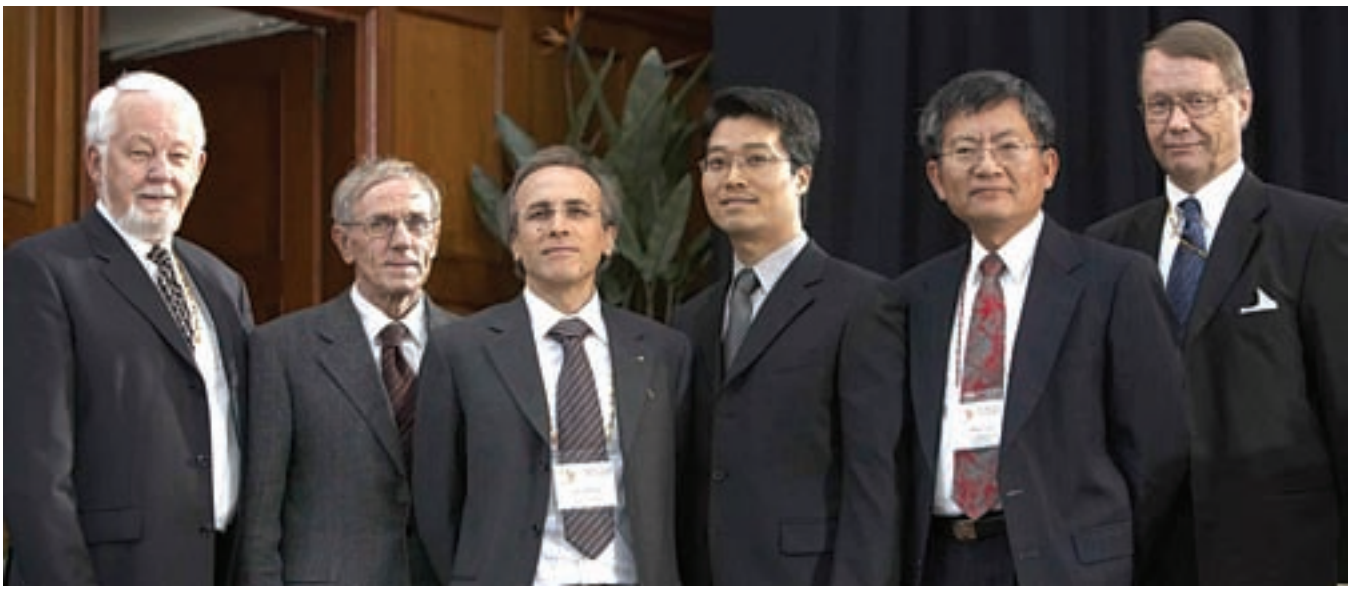
Simon H. Yueh (right) with GRS-S President Tony Milne.

IEEE GRS-S Major Awards

The call for nominations for the *GRS-S Distinguished Achievement Award, GRS-S Outstanding Service Award* and the *GRS-S Education Award* are published in the GRS-S Newsletter. Any member, with the exception of GRS-S AdCom members, can make nominations to recognize deserving individuals. Typically the lists of candidates comprise five to seven names. An independent *Major Awards Committee* makes the selection, which is approved by the GRS-S AdCom.

IEEE GRS-S Distinguished Achievement Award

The **Distinguished Achievement Award** was established to recognize an individual who has made significant technical contributions, within the scope of GRS-S, usually over a sustained period. When selecting the individual, the factors considered are quality, significance and impact of the contributions; quantity of the contributions; duration of significant activity; papers published in archival journals;



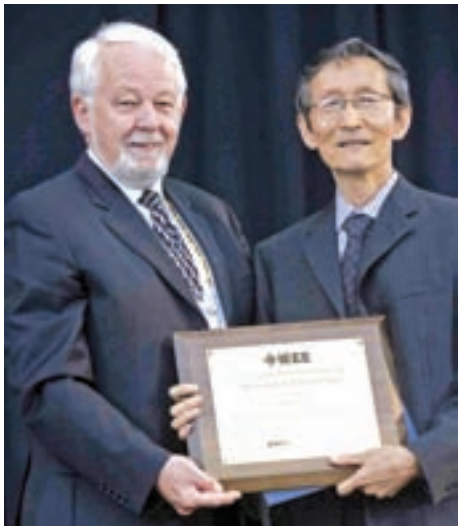
IEEE 2009 GRS-S Fellows that were present (from left) with GRS-S President Tony Milne: Helmut Rott, Sebastiano Serpico, Hwang Ji-Hwan (he received the recognition on behalf of Yisok Oh), Simon Yueh, and GRS-S Awards Co-Chair Martti Hallikainen at right.

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 ***2009 IEEE GRS-S Distinguished Achievement Award*** was presented to ***Dr. Jong-Sen Lee*** with the citation:

"For significant technical contributions in the field of Synthetic Aperture Radar (SAR), polarimetric and interferometric SAR information processing and applications."

Jong-Sen Lee (M'69–SM'91–F'97–LF'05) received his Ph.D. in engineering (control theory) and A.M. in applied mathematics from Harvard University in 1965 and 1969, respectively. After graduated from Harvard, he joined US Naval Research Laboratory (NRL) as an electronics engineer. He retired in 2006 after 37 years service as the Head of the Image Science Section, Remote Sensing Division. Upon his retirement, he received the distinguished Navy Meritorious Civilian Service Award for his significant and sustained contributions toward SAR and polarimetric SAR research. Each year at NRL, only one or two researchers receive this distinguished award. From 2006 to the present, he is a consultant at NRL, and as a Visiting Chair Professor, he has been lecturing at the Center for Space and Remote Sensing Research, National Central University, Chung-Li, Taiwan.



The 2009 IEEE GRS-S Distinguished Achievements Award recipient Jong-Sen Lee (right) receiving a plaque and a certificate from GRS-S President Tony Milne.

Dr. Lee's professional expertise encompasses Synthetic Aperture Radar (SAR) and polarimetric SAR information processing including radar polarimetry, polarimetric SAR speckle statistics, speckle filtering, ocean remote sensing using polarimetric SAR, supervised and unsupervised polarimetric SAR terrain and land-use classification, digital image processing, radiative transfer, and control theory. He has contributed toward the pertinent current state-of-arts, and published more than 75 journal papers, six book chapters and more than 200 conference proceedings. These papers have been widely referenced as is reflected by the accumulated citation counts of a total greater than 3000 (compiled by Google Scholar on November 12, 2008). Jointly with Professor Eric Pottier, he completed a self-contained SAR remote sensing textbook entitled "*Polarimetric Radar Imaging: From basics to Applications.*" Taylor and Francis (CRC) published the book in January 2009.

Dr. Lee is a Life Fellow of IEEE for his contribution toward information processing of SAR and polarimetric SAR imagery. He was presented the Best Paper Award (jointly with E. Pottier) and the Best Poster Award (jointly with D. Schuler) at the Third

and Fourth European Conference on Synthetic Aperture Radar (EUSAR 2000 and EUSAR 2002), respectively. A U.S. Patent entitled "*Terrain Slope Measurement Using Polarimetric SAR*" was granted to him in 1996, with co-recipient, Dale Schuler. He is an Associate Editor of the IEEE *Transactions on Geoscience and Remote Sensing.*

IEEE GRS-S Outstanding Service Award

The **Outstanding Service Award** was established to recognize an individual who has given outstanding service for the benefit and advancement of the Geoscience and Remote Sensing Society. The award shall be considered annually but will not be presented unless a suitable candidate is identified. The following factors are considered: leadership innovation, activity, service, duration, breadth of participation and cooperation. GRS-S membership is required. The awardee receives a certificate.

William Emery (right) receiving the 2009 IEEE GRS-S Outstanding Service Award from GRS-S President Tony Milne.

The **2009 Outstanding Service Award** was presented to **Prof. William (Bill) Emery** with the citation:

"In recognition of his outstanding service for the benefit and advancement of the IEEE Geoscience and Remote Sensing Society."

William (Bill) Emery received his Ph.D. in Physical Oceanography from the University of Hawaii in 1975. After working at Texas A&M University he moved to the University of British Columbia in 1978 where he created a Satellite Oceanography facility and education/research program. He was appointed full professor in Aerospace Engineering Sciences at the University of Colorado, Boulder Campus in 1987. He is active in the analysis of satellite data for oceanography, meteorology and terrestrial physics (vegetation, forest fires, sea ice, urban change detection, etc.). His research focus areas are satellite sensing of sea surface temperature, mapping coastal ocean surface currents from altimetry and sequential imagery (infrared and ocean color), sea ice motion, and terrestrial surface processes. He has recently been working in urban image analysis using high-resolution optical imagery and synthetic aperture radar data. In addition his group writes image navigation and analysis software and has established/operated data systems for the distribution of satellite data received by their own antennas. He is an associate member of the Laboratory for Atmospheric and Space Physics (LASP), and an affiliate member of NOAA's Cooperative Institute for Research in Earth Science (CIRES), and an affiliate member of the Dept. of Atmospheric and Ocean Sciences (ATOC). He is a co-author of 2 textbooks on physical oceanography, has translated 3 oceanographic books (German to English) and has authored over 150 refereed publications. He is a member of the Administrative Committee of the Geoscience and Remote Sensing Society of the IEEE, and the past (2003–2008) Editor in Chief of IEEE Geoscience and Remote Sensing Letters (GRSL). He received the GRSS Educational Award in 2004.

IEEE GRS-S Education Award

The **Education Award** was established to recognize an individual who has made significant educational contributions to the field of GRS-S. When selecting the individual, the factors considered are significance of the educational contribution in terms of innovation and the extent of its overall impact. The contribution can be 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, and educational program initiatives). IEEE GRSS membership or affiliation is required. The awardee receives a certificate.

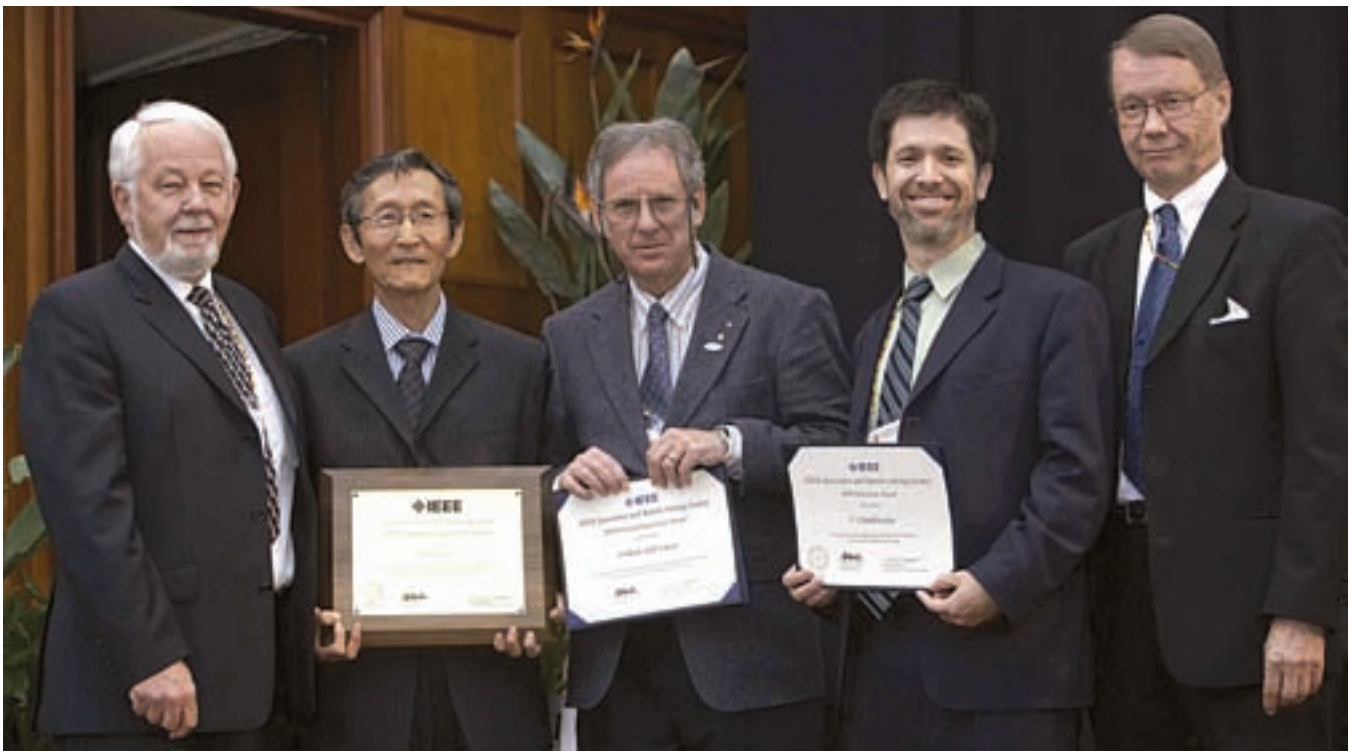
The **2009 Education Award** was presented to ***Prof. V. Chandrasekar*** with the citation:

"In recognition of his significant educational contributions to Geoscience and Remote Sensing."

V. Chandrasekar, recipient of the 2009 IEEE GRS-S Education Award.

V. Chandrasekar (S'83–M'87–F'03) is currently a Professor at Colorado State University (CSU), Fort Collins. He received his undergraduate degree from the Indian institute of Technology, Kharagpur, India and Ph.D. from Colorado State University. He has been actively involved with research and development of weather radar systems for over 25 years. 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-PI and the engineering leader of the facility. He has also been a director of the "Research Experiences for Undergraduate Program", for over 15 years, promoting research in undergraduate Curriculum.

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



GRS-S President Tony Milne (left), Jong-Sen Lee, William Emery, Steven Reising (he received the Education Award on behalf of V. Chandrasekar), and the Awards Co-Chair Martti Hallikainen.

collect in situ observations to verify the new techniques and technologies. He served as the College leader for promoting International Research Collaboration.

He is coauthor of two textbooks namely, 1) *Polarimetric and Doppler Weather Radar* (Cambridge, U.K.: Cambridge Univ. Press) and 2) *Probability and Random Processes* (New York: 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 that wrote the NRC books, "*Weather Radar Technology beyond NEXRAD*" and "*Flash Flood Forecasting in Complex Terrain*." He served as the General Co-Chair for the IGARSS'06 Symposium and serves as the Editor of the Journal of Atmospheric and Oceanic Technology.

He has been a visiting professor of National Research Council of Italy, University of Helsinki and an affiliate scientist of the National Center For Atmospheric Research.

He has received numerous awards including, Halliburton Foundation Research award, the Abell Foundation Outstanding Researcher Award, NASA Technical Contribution Award, University Outstanding Advisor Award, Distinguished Diversity services award, the Abell Foundational Award for International Contributions and the NOAA/ NWS Director's Medal of Excellence. He is a Fellow of the IEEE, American Meteorological Society and NOAA/ CIRA.

Prof. Chandrasekar was not able to be present at the Plenary Session; Prof. Steven Reising received the award on his behalf.

After the Awards Ceremony the Plenary Session was continued with the following presentations:

- Dr. Jose Achache, Secretariat Director, Group on Earth Observation (Geneva): Reflections on the successes and prospectus of the Global Earth Observation System of Systems.
- Dr. Wilbur Ottichilo, Member of Parliament, Kenya (former Director General, Regional Centre for Mapping of Resources for Development, Nairobi; and former Vice-President for East African Region, African Association for Remote Sensing of the Environment): Geospatial and spatial sciences – A perspective in terms of African development.
- Dr. Masami Hato, ASTER GDS Project manager, ERSDAC, Japan: ASTER and global digital elevation model G_DEM.

We hope to see you in Honolulu, Hawaii at the 30th anniversary IGARSS, July 25th to 30th, 2010.

Martti Hallikainen

The March 2009 issue of the GRSS Newsletter reported on a memorandum of understanding between the IEEE GRSS and the African Association of Remote Sensing of the Environment (AARSE) at the AARSE Conference in Accra, Ghana (p. 19). A copy of that memorandum, that was signed by IEEE GRSS President Tony Milne and AARSE President Tsehaie Woldai during the conference, appears below.

MEMORANDUM OF UNDERSTANDING BETWEEN THE IEEE GEOSCIENCE AND REMOTE SENSING SOCIETY (IEEE-GRSS) & THE AFRICAN ASSOCIATION OF REMOTE SENSING OF THE ENVIRONMENT (AARSE)

HAVING regard to the common interest of IEEE – GRSS and AARSE in developments and applications of geoscience and remote sensing;

RECOGNIZING that both IEEE-GRSS and AARSE organize regular conferences on developments and applications of geosciences and remote sensing;

WISHING to develop closer relationships between participants in the two organizations that will lead to collaboration in organisation of conferences, training programmes and related joint developments and applications of geoscience and remote sensing;

Therefore IEEE-GRSS and AARSE **HEREBY AGREE** that:

1) The two Societies will use their best endeavours through cooperation and, where appropriate, joint ventures, to promote the science and applications of geoscience and remote sensing for the betterment of humankind.
2) Each Society will encourage collaboration between relevant IEEE-GRSS Technical Committees and relevant AARSE Committees.
3) Each Society will endeavour to organize joint technical sessions in conjunction with events of the other. GRSS events at AARSE conferences may include workshops, technical sessions, and tutorials. AARSE events at GRSS conferences may similarly include workshops, technical sessions and tutorials.
4) Each Society will insert a link on its home page to the other organization and each will list the other's events in their events calendars.
5) Each Society will provide a complimentary literature display area at relevant events for the other Society.
6) In carrying out these activities, each Society will be presumed to cover its own direct costs in carrying out any joint activities.

PRIVATE SECTOR NEWS

Remote Sensing News for and About the Private Sector

William B. Gail,
Director of Corporate Relations,
IEEE GRSS
Microsoft Corporation
1690 38th Street
Boulder, CO 80301
Phone: 303-513-5474
E-mail: bgail@microsoft.com

The Quarterly Newsletter of the IEEE Geoscience and Remote Sensing Society (GRSS) Private Sector Liaison Group
Editor: *Bill Gail*, Microsoft Corporation (+1.303.513.5474)
Visit the *GRSS website* and the *GRSS Private Sector Liaison Group website*
Read the *GRS Newsletter*, join a *GRSS technical committee*, or *contribute* to this newsletter

In This Issue – July 20, 2009 – Issue #12

1. Stretching Our Minds – Brief Editorial

What are the limits of remote sensing? We know the common use of the term: a means for observing, from a distance, physical things as they occur. For most of our daily work, this definition is adequate. But, by stretching our minds a bit, we can begin to see how this interpretation is overly constraining – it only scratches the surface of what is possible. Stretching ourselves to understand remote sensing's limits is a simple exercise with potentially large payoff. First, it encourages us to expand the forefront of remote sensing into new applications, some of which we may believe are not even feasible. With this comes the incentive to innovate new technologies that will make such breakthroughs possible. Second, the thought process itself can help us understand how to better perform the remote sensing work we already do. The following sections examine this topic from several perspectives, with apologies for an emphasis on higher priority given to being thought-provoking than to being technically precise.

2. IGARSS 2010 in Honolulu

With *IGARSS* 2009 just finishing up in Cape Town, attention turns to *next year's 30th anniversary IGARSS* to be held July 26–30 in Honolulu. The theme will be 'Remote Sensing: Global Vision for Local Action'. For those who have attended previously, you know that *IGARSS* is the premier remote sensing conference for bringing together government, academia, and industry. Historic attendance has been running about 1500. A variety of tutorial sessions are planned with interest to the private sector. A special addition will be a plenary session and associated participatory project focused on the emerging topic of 'community remote sensing' – this is of particular interest to the private sector with its potential for reaching large consumer groups (for more information on participating, contact Plenary Chair *Bill Gail*). For additional information on the conference and opportunities to exhibit, contact Bryan Stewart (*bstewart@cmsworldwide.com*). Future symposia include *Sendai (2011)*, Munich (2012), and Melbourne (2013).

3. Remote Sensing of the Past – Monitoring What Was

Can today's remote sensing instruments observe the past? Examples abound of both optical and radar remote sensing being used to investigate things that occurred prior to when the observation was made. Synthetic aperture radars flown on the Space Shuttle fifteen years ago made *headlines* for discovering lost cities buried under sand in the Sahara and elsewhere. Satellites are routinely used for measuring *crustal deformation* to understand the earthquake processes that were responsible. Newer satellites can be used to enhance the data obtained by their predecessors. One example is improvements to baseline information (such as the Earth's geoid) that allows correction of 'past' datasets, retroactively making them more accurate. This is being done currently with *ocean altimetry.* In such cases, we are not really monitoring the past, but rather observing the present and relating it to the past through theoretical or empirical relationships. As such relationships can be quite strong (such as the stability of the deformed crust following an earthquake), the distinction can be almost more semantic than real. Should we be proper and

say we are 'inferring' information about the past, or can we claim to be 'sensing' it?

4. Remote Sensing of the Future – Measuring What is to Come

If the past can be observed remotely, what about the future? Analytic and numerical models, routinely used to forecast the future, are often initialized with current remote sensing data. *Weather models* and *climate models* are the best-known examples, but even such things as forecasts of *agricultural economics* use the approach. One might argue the feasibility of remotely sensing the future by going to the small value limit. Is remotely sensed weather at a time T valid only for precisely that time, or can the sensed data also be said to be approximately valid at some time T+delta? For delta small, perhaps a millisecond, it is hard to argue against this (indeed, the act of sensing itself has such a finite time duration). Clearly, with the assistance of our models, current observations allow us to 'know' the future more accurately than if we did not have those observations. The models alone do not get far without the observations. The question of whether this really constitutes 'sensing' of the future is perhaps one for philosophical discussion. For us, it is sufficient to understand that remote sensing does provide useful information relevant to the future.

5. Remote Sensing of Politics, Economics, and Culture – Observing Ourselves

Our common use of the term remote sensing concerns observations of physical phenomena. Yet many applications of environmental knowledge today require related information about economic activity, political situations, and cultural trends. Developing policy responses to Hurricane Katrina is among the most prominent examples. Today, most such information is obtained from polls, surveys, or other direct contact with affected populations. But a surprising amount of information in these areas can be obtained by satellite and other remote sensing. The classic images of *Earth at night*, showing the global distribution of artificial light, have been used to infer population density, industrial capacity distribution, and economic growth. Using remote sensing to understand the trends and tendencies of society is fundamental to many of the applications that are important to the private sector.

6. Remote Sensing of What's Hidden – Interactive Remote Sensing

In some cases, what we would like to sense remotely may be hidden from us or an object may lack attributes that allow it to be sensed directly. Crop diseases, such as those difficult to detect through visual analysis of the plant, represent one example. With today's genetic technologies, it is not difficult to imagine a gene being introduced into a crop that would act like a biological *RFID* tag, changing the crop's solar reflectance at a narrow wavelength in response to the presence of a crop infection. In essence, an object has been actively modified with the sole purpose of enhancing its detection via remote sensing – to reveal what is otherwise hidden. The technique of 'interactive' remote sensing may make it possible to monitor many things that presently seem hidden from us.

7. Company News – to Advertise At No Cost, Please Submit Short Requests to the Editor

Manifold.net announced on 6 May yet another new world record for the number of processors used in a personal computer for Geographic Information Systems (GIS) processing, coming less than 90 days after Manifold's previous world record set in London. At the North American Conference for Manifold GIS Users in Denver, Colorado, Manifold set a new record by demonstrating simultaneous use of over 1,920 processor cores to perform a remote sensing image computation at supercomputer speed with over 5 teraflops of performance. Manifold demonstrated the new software on a desktop 64-bit Windows PC equipped with four NVIDIA-based GTX 295 GPU cards costing less than $500 each. For more information, visit http://www.manifold.net/info/pr_gpu_record2.shtml.

IM (*Interactive Mapping*) Rivers is an interactive mapping web portal designed for watershed and river environmental conservation groups. The project was conceived and developed by several environmental organizations with Dr. Wansoo Im. The initial IMRivers project for Alabama was funded by the World Wildlife Fund and River Network and since that time, many grassroots organizations throughout the country have adopted IMRivers to help steward and plan for the conservation of our precious environmental resources. You can see how riverkeepers mapped the recent devastation of the ash spill in Tennessee River (http://www.imrivers.com/tvaash/ve) as well as how San Diego River Park Foundation mapped trash and encampment locations to clean their river (http://www.imrivers.com/sandiego/ve). For more information, contact Dr. Wansoo Im at im@vertices.com

TerraGo Technologies – Geospatial raster imagery can be difficult to easily distribute so that it can be used by those who need it. Many formats require custom viewers and sheer file size makes distribution prohibitive. TerraGo Technologies' Publisher for Raster solution breaks down technology barriers and lets geospatial professionals easily share and view multiple kinds of raster images all through one standard format with no special tools or software. Users are able to quickly and easily convert several Raster formats to a GeoPDF file and from there, incorporate them into maps and share them with users who can take advantage of rich mapping capabilities with or without Internet connections. TerraGo Publisher for Raster leverages the functionality of the source GIS application and readies it for easy collaboration with non-technical users. For more information, please visit www.terragotech.com, email us at customer@terragotech.com or call 866-453-1609.

8. Events

9–12 Sep	*Sixth Intl Symposium on Digital Earth*, Beijing, China
13–17 Sep	*GITA GIS for Oil & Gas Conf*, Houston, TX
14–17 Sep	*AIAA Space*, Pasadena, CA
16–18 Sep	*GIS in the Rockies*, Loveland, CO
22–24 Sep	*Intergeo*, Karlsruhe, Germany
29–2 Sep/Oct	*URISA Annual Conference*, Anaheim, CA
5–7 Oct	*Location Intelligence*, Westminster, CO
12–16 Oct	*Intl Radar Conference*, Bordeaux, France
18–21 Oct	*GEOINT*, San Antonio, TX
26–30 Oct	*AfricaGIS*, Kampala, Uganda
4–5 Nov	*4th Intl Workshop on 3D Geo-Info*, Ghent, Belgium
16–19 Nov	*ASPRS/MAPPS Fall Conference*, San Antonio, TX
14–18 Dec	*American Geophysical Union*, San Francisco, CA
17–21 Jan	*American Meteorological Society*, Atlanta, GA
23–28 Jan	*SPIE Photonics West*, San Francisco, CA
5–9 Apr	*SPIE Defense, Security, and Sensing*, Orlando, FL
12–15 Apr	*National Space Symposium*, Colorado Springs, CO
26–30 Apr	*ASPRS Annual Conference*, San Diego, CA
26–30 Jul	*IGARSS 2010*, Honolulu, HI

9. Professional Organizations – See More Orgs (Public, Private, Academia)

Institute of Electrical and Electronic Engineers (IEEE)
Aerospace Industries Association (AIA)
American Astronautical Society (AAS)
American Geophysical Union (AGU)
American Institute of Aeronautics and Astronautics (AIAA)
American Meteorological Society (AMS)
American Society for Photogrammetry and Remote Sensing (ASPRS)
Geospatial Information and Technology Association (GITA)
International Society for Photogrammetry and Remote Sensing (ISPRS)
International Union of Radio Science (URSI)
The International Society for Optical Engineering (SPIE)
Management Association for Private Photogrammetric Surveyors (MAPPS)
Space Foundation
United States Geospatial Intelligence Foundation (USGIF)
Urban and Regional Information Systems Association (URISA)
Women in Aerospace (WIA)

The IEEE Geoscience and Remote Sensing Society (GRSS) Private Sector Liaison Group was formed in 2002 to increase collaboration between the private sector, academia, and government in the remote sensing field. The readership of this newsletter now exceeds 2000 people from companies associated with remote sensing, as well as government agencies, international space agencies, professional organizations, non-government organizations, OMB, and Congressional staff. We in the private sector want to help keep our colleagues informed of the activities and capabilities of the private sector – and the role that GRSS plays in supporting and promoting these activities. Should you need further information about the Private Sector Group, require that contact information for you or your organization be updated, or request to be removed from the list, please contact Bill Gail (bgail@microsoft.com).

Geoinformatics2010:
The 18th International Conference on Geoinformatics
June 18-20, 2010
Beijing, China

Organized by: Peking University,
Capital Normal University, CPGIS

Sponsored by: IEEE GRSS, GSC

Geoinformatics 2010 Co-Chairs:
Liu Yu, Peking University
Aijun Chen, George Mason University

Abstract submission:
Before/on January 30, 2010
Please use conference website to submit

Register:
Before/on April 20, 2010

Registration fees:
Please refer to following conference website

Web Address:
http://cn.geoinformatics2010.org/

2010 IEEE International Geoscience and Remote Sensing Symposium

Hawaii 2010

IGARSS

30th Anniversary

July 25-30, 2010 • Honolulu, Hawaii, USA

Call for Papers

Remote Sensing: Global Vision for Local Action

On behalf of the IEEE Geoscience and Remote Sensing Society, the IGARSS 2010 Organizing Committee, and the remote sensing and earth science communities, we are pleased to welcome you to Honolulu for IGARSS 2010! IGARSS 2010 will mark the 30th anniversary for GRSS and IGARSS and continues the excellent tradition of gathering world-class scientists, engineers and educators engaged in the fields of geoscience and remote sensing to meet and present their latest activities. Truly an international event, we anticipate well over one thousand participants from all over the world to enjoy a week of technical sessions, tutorials, exhibits and social activities.

This is the second time that the event will be held in Honolulu and the first time any previous IGARSS venue has been revisited. A decade has passed since the 20th IGARSS meeting was held in Honolulu and the size and scope of the meeting continues to grow and respond to our rapidly developing fields of interest. IGARSS 2010 will be an exciting celebration of the 30th anniversary and emphasize the emerging field of community remote sensing as part of the conference theme: Global Vision for Local Action. The rapid emergence of 'citizen science' and social networks is a promising new means for augmenting the foundation of knowledge from government sponsored satellites and observing systems. To highlight the importance of these new tools, the emerging field of "community remote sensing" will be spotlighted in a year-long series of projects leading up to the symposium plenary session. More information on these projects, and on technical sessions related to the theme, is available on the IGARSS 2010 website.

Participation in IGARSS is open to all individuals interested in or working in the fields of geoscience and remote sensing. Abstracts must be received by the deadline will be considered for program placement under the standard peer review process. Late abstracts cannot be accepted due to the large number of submissions and short review schedule. The IEEE IGARSS 2010 Technical Program Committee will organize all accepted abstracts into either oral or interactive poster sessions based upon their potential contribution to the symposium and the composition of high-quality sessions. Session Co-chairs will be appointed as early as possible to help TPC setting the highest quality for oral and interactive sessions.

Only accepted papers that are registered and presented at the symposium in Honolulu will be published in the symposium proceedings and be assigned to the IEEE GRSS publication reference. Electronic media containing all accepted IGARSS 2010 abstracts will be distributed to registered attendees at the registration desk.

Abstract Submission Instructions

- Log in to www.igarss2010.org to submit abstracts (only online submissions will be accepted for review).
- Instructions on selecting topics for submissions will be included on the website.
- Abstract deadline is December 11, 2009 for both contributed and invited submissions.
- All abstracts must be written in English.
- The **minimum** page limit for all abstracts is two single sided pages. The **maximum** page limit is 4 pages. Use Times New Roman font, 11 or 12 point, 1.5 line spacing. Please note this is a change from previous years.
- Abstracts should state clearly and concisely the problem, methodology used and central conclusions, and may include figures and graphs.
- Abstracts **must include a bibliography** to help reviewers place the contributions of the work into context. Please note this is a change in policy from previous years.
- A **maximum of two abstracts** may be submitted by each presenting author, including both general and invited sessions. Please note this is a change in policy from previous years.
- Every author is responsible for checking the status of their abstract by visiting the symposium website, www.igarss2010.org after March 26, 2010. Acceptance letters will be sent via email only, and the results posted on the website.
- Authors of accepted papers will have an opportunity to revise their abstracts for inclusion on the electronic media until May 7, 2010.
- The electronic system will enable full proceedings papers to be accepted until July 2, 2010.

Dear Colleague,

The IEEE-GRSS Technically-Co-Sponsored Workshop CASI'2009 invites you to contribute with your presentation and participate in our event:

Computational Advances in Intelligent Processing of Remote Sensing Imagery
(CASI'2009) A workshop of the **2009 14th CIARP Congress**

(November 15, 16, 2009, Guadalajara, Mexico)

2009 CIARP Website: **http://www.gdl.cinvestav.mx/ciarp2009/**

Topics of Interest: The CASI'2009 organizers invite to submit contributions in the following remote sensing (RS) advanced signal and image processing-related areas:

* Adaptive High Performance Techniques for RS Array Data & Image Processing
* Intelligent Experiment Design Concepts for High Performance RS Applications
* Parallel and Distributed Algorithm Design and Implementation in RS Imagery
* Adaptive Data Fusion and Imaging Techniques for High Performance RS Applications
* Feature Extraction, Signature Fields Mapping and RS Image Understanding
* Environmental Monitoring and Resource Management with RS Imagery
* Hardware/Software Co-Design for (Near) Real Time Intelligent RS Data Processing

Important Dates:	Full paper submission (**through the CIARP 2009 Paper Submission System http://www.gdl.cinvestav.mx/ciarp2009/**		**June 7,** 2009
	Review notification		August 1, 2009
	Final revised manuscript		August 21, 2009
Workshop Co-Chairs:	Yuriy Shkvarko (Mexico)	shkvarko@gdl.cinvestav.mx	
	Sonia Gallegos (USA)	gallegos@nrlssc.navy.mil	
Program coordinator:	Alejandro Castillo (Mexico)	acastillo@gdl.cinvestav.mx	

Welcome to Guadalajara, Mexico!

ICMARS-2009
International Conference on Microwaves, Antenna, Propagation & Remote Sensing
Dedicated to 150th Birth Anniversary of Sir J C Bose
19th–21st December 2009
Jodhpur, Rajasthan (India)
Sponsored by
Department of Govt. of India and Rajasthan
International Union of Radio Science (URSI)
IEEE MTTS-India, IEEE AES/COM/LEO-India
IEEE ED-India, ATMS-India, IEEE GRSS, USA
Regional Facility on Radio Science (RFRS) India

Organised by:
International Centre for Radio Science(ICRS)

Workshop/Tutorial on : 8.12.2008
(1) Polarimetric Radar by Dr. W. M. Boerner (USA)
(2) Microwave through CAD by Prof. M Chandra (Germany)
Chairman Conference: Prof. O.P.N.Calla
Secretary: Mr. Rajesh Vyas
Submission of Summary(500 words): August 1, 2009
Acceptance of Summary: September 1, 2009
Submission of Full Paper: October 1, 2009
Tel No.: 91-0291-2613123, 2640063, **Fax No**.: 91-0291-2626166
Email id: opncalla@yahoo.co.in , info@radioscience.org

Web Address: www.radioscience.org

*Registration before November 11,2009 will get 10% discount

GPR2010 - XIII International Conference on Ground Penetrating Radar

June 21-25 2010, Lecce (Italy)
www.ibam.cnr.it/gpr2010

100 words abstract :	**before October 15, 2009**
Full paper :	**before January 15, 2010**
Notification of acceptance:	**February 28, 2010**

GPR 2010 Executive Committee

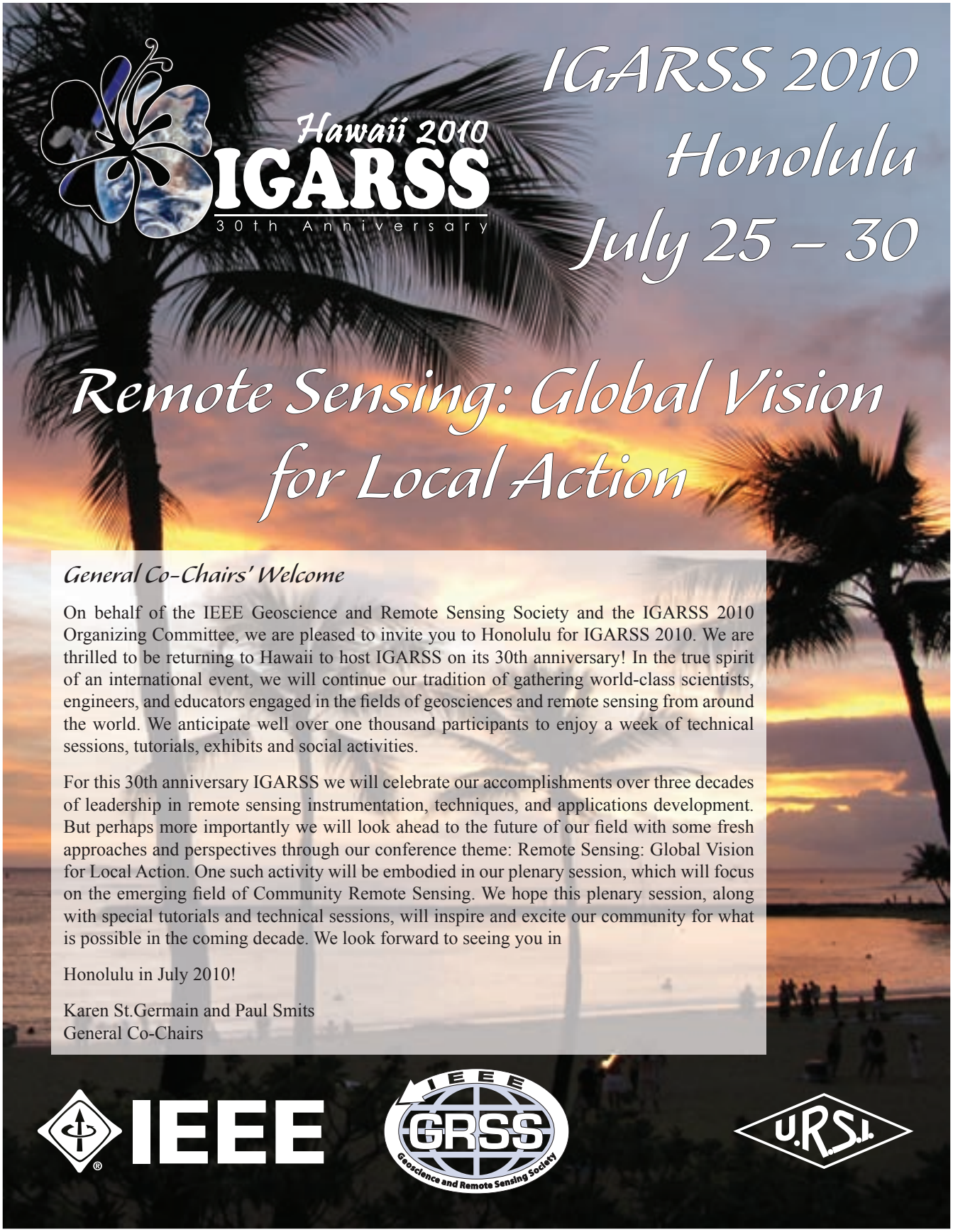
General Chair: **Raffaele Persico**, IBAM-CNR

Co-chairs:
Maria Teresa Carrozzo, University of Salento,
Francesco Soldovieri, IREA-CNR,
Luciano Tarricone, University of Salento

Technical Chairs:
Lorenzo Crocco, IREA-CNR
Luciana Orlando, University of Rome La Sapienza
Massimiliano Pieraccini, University of Florence

Young Scientist Award to the best paper presented by a young researcher

The Conference proceedings will be included in the IEEE*Xplore*® library



General Co-Chairs' Welcome

On behalf of the IEEE Geoscience and Remote Sensing Society and the IGARSS 2010 Organizing Committee, we are pleased to invite you to Honolulu for IGARSS 2010. We are thrilled to be returning to Hawaii to host IGARSS on its 30th anniversary! In the true spirit of an international event, we will continue our tradition of gathering world-class scientists, engineers, and educators engaged in the fields of geosciences and remote sensing from around the world. We anticipate well over one thousand participants to enjoy a week of technical sessions, tutorials, exhibits and social activities.

For this 30th anniversary IGARSS we will celebrate our accomplishments over three decades of leadership in remote sensing instrumentation, techniques, and applications development. But perhaps more importantly we will look ahead to the future of our field with some fresh approaches and perspectives through our conference theme: Remote Sensing: Global Vision for Local Action. One such activity will be embodied in our plenary session, which will focus on the emerging field of Community Remote Sensing. We hope this plenary session, along with special tutorials and technical sessions, will inspire and excite our community for what is possible in the coming decade. We look forward to seeing you in

Honolulu in July 2010!

Karen St.Germain and Paul Smits
General Co-Chairs

The Institute of Electrical and Electronic Engineers, Inc.
445 Hoes Lane, Piscataway, NJ 08854

UPCOMING CONFERENCES

See also http://www.techexpo.com/events or http://www.papersinvited.com

Name: 6th International Symposium on Digital Earth
Location: Beijing, China
Dates: September 9–12, 2009
URL: http://www.isde6.org/

Name: International Radar Conference
Location: Bordeaux, France
Dates: October 12–16, 2009
URL: http://www.radar2009.org/

Name: AfricaGIS
Location: Kampala, Uganda
Dates: October 26–30, 2009
URL: http://www.africagis2009.org/

Name: Computational Advances in Intelligent Processing of Remote Sensing Imagery (CASI'2009)
Dates: November 15–16, 2009
Location: Guadalajara, Mexico
URL: http://www.gdl.cinvestav.mx/ciarp2009/

Name: ASPRS/MAPPS Fall Conference
Location: San Antonio, TX
Dates: November 16–19, 2009
URL: http://www.asprs.org/sanantonio09/index.html

Name: Middle East Spatial Technology Conference & Exhibition
Dates: December 7–9, 2009
Location: Bahrain Conference Centre, Crowne Plaza Hotel, Kingdom of Bahrain
URL : http://www.mest.bh

Name: American Geophysical Union 2009 Fall Meeting
Dates: December 14–18, 2009
Location: San Francisco, CA
URL: http://www.agu.org/meetings/fm09/

Name: International Conference on Microwaves, Antenna, Propagation & Remote Sensing (ICMARS-2009)
Dates: December 19–21, 2009
Location: Jodhpur, Rajasthan, India
E-mail: opncalla@yahoo.co.in, info@radioscience.org
URL: http://www.radioscience.org

Name: American Meteorological Society Annual Meeting
Dates: January 17–21, 2010
Location: Atlanta, GA
URL: http://www.ametsoc.org/MEET/annual/index.html

Name: 11th Specialist Meeting on Microwave Radiometry and Remote Sensing of the Environment (μRad 2010)
Dates: March 1–4, 2010
Location: Washington, DC
URL: http://www.MicroRad2010.org

Name: ASPRS Annual Conference
Dates: April 26–30, 2010
Location: San Diego, CA
URL: http://www.asprs.org/SanDiego2010/index.html