



IEEE Distinguished Lecture Series

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Future Perspectives of SAR Polarimetry with Applications to Multi-parameter Fully Polarimetric POLSAR Remote Sensing

Co-Organized by
IEEE GRSS Malaysia Chapter &
Universiti Tunku Abdul Rahman



Speaker: Professor Wolfgang-Martin Boerner

Department of Electrical and Computer Engineering,
University of Illinois at Chicago

Time/Date: 2.30pm, Friday, 28 Nov 2014

**Venue: EDK3, Ground Floor, Faculty of Engineering and Green Technology,
Universiti Tunku Abdul Rahman, Kampar**

About the Lecture:

With the un-abating global population increase our natural resources are stressed as never before, and the global day/night monitoring of the terrestrial covers from the mesosphere to the litho-sphere becomes all the more urgent. Microwave radar sensors are ideally suited for space imaging because those are almost weather independent, and microwaves propagate through the atmosphere with little deteriorating effects due to clouds, storms, rain, fog aerosol and haze. Globally humidity, haze and aerosols next to cloudiness are increasing at a rather rapid pace, whereas only 20 years ago all of those covered 48% of the globe, today those have increased to about 62% and within another 20 years may exceed 80% for irreversible reasons. Thus, optical remote sensing from space especially in the tropical and sub-tropical vegetated belts is already and will become ever more ineffective, and microwave remote sensing technology must now be advanced strongly and most rapidly hand in hand with digital communications technology because operationally it is more rapidly available especially for disaster mitigation assistance.

The basic radar technologies to do the job at day and night are the multimodal Synthetic Aperture Radar (SAR) sensors, first developed for air-borne sensing implemented as for example in 1978 with the first space-borne digital Sea-Sat L-Band SAR which had severe limitations in that it was of fixed wide swath-width at a single arbitrary polarization (HH) and of

rather poor 25m resolution. In the meantime, fully polarimetric multi-modal high resolution SAR systems at multiple frequencies and incidence angles were introduced first with the multi-band AIRSAR of NASA-JPL culminating in the once-only pair of SIR-C/X-SAR shuttle missions of 1994 April and October, which laid the ground work for true day/night space remote sensing of the terrestrial barren and vegetated land and ocean covers using multi-band polarimetric SAR. Thereafter, the Canadian CCRS, the German DLR and the Japanese NASDA & CRL {now JAXA & NICT} took over introducing and steadily advancing the Convair- 580, the E-SAR (now F-SAR) and Pi-SAR airborne highly advanced fully polarimetric sensors platforms, respectively.

These separate international multi-modal fully polarimetric and also interferometric airborne SAR developmental efforts culminated in a well coordinated group effort of three independent teams eventually launching and operating Fully Polarimetric Satellite SAR Sensors at L-Band (ALOS-PALSAR launched by JAXA/Japan in 2006 January - and to be followed by ALOS-PALSAR-2 &3); at C-Band (RADARSAT-2 launched by CSA-MDA in 2007 December - to be followed by independent RADARSAT-3&4) and at X-Band (TerraSAR-X launched by DLR- Astrium in 2007 July with the follow-on tandem mission TanDEM-X launched in June 2010) . Thus, international collaboration on advancing day & night global monitoring of the terrestrial covers was demonstrated with the launch of the three fully polarimetric multi-modal SAR Satellites at L-, C-, X-Band and its first tandem satellite-pair update of the DLR TanDEM-X. Recently NASA-JPL is joining these global efforts again, and all of these efforts will be topped by the near-future joint DLR-JPL DESDynI/Tandem-L wide-swath, high-resolution fully polarimetric sensor implementation.

In this lecture, Prof. Wolfgang-Martin Boerner will give an overview of SAR technologies and the future perspectives of SAR polarimetry with applications to multi-parameter fully polarimetric POLSAR remote sensing.

About the Speaker:



Wolfgang-Martin Boerner (IEEE SM'75-F'84, LF'92) received the B.S. (Abitur) degree from the August von Platen Gymnasium, Ansbach, Germany, the M.S. (Dipl.-Ing.) degree from the Technical University of Munich, Munich, Germany, and the Ph.D. degree from the Moore School of Electrical Engineering, University of Pennsylvania, Philadelphia.

From 1967 to 1968, he was a Research Assistant Engineer at the Department of Electrical and Computer Engineering, Radiation Laboratory, University of Michigan, Ann Arbor. From 1968 to 1978, he was with the Electrical Engineering Department, University of Manitoba, Winnipeg, MB, Canada. In 1978, he joined the Department of Electrical Engineering and Computer Science, University of Illinois, Chicago as Professor and Director of its Communications, Sensing & Imaging and Navigation Laboratory, where he serves now a

Professor Emeritus and Distinguished Research Scientist. He is currently involved actively in international outreach programs in Europe, Oceania and Pacific Asia. For his contributions toward linking international research centers of Oceania & East/Austral-Asia via the Americas with Eurasia & Europe, Prof. W-M. Boerner was honored most recently with the distinguished IEEE-GRSS Outstanding Services Award for 2005 and that of IECE-SANE for 2007.

Dr. Boerner is a Life Fellow of IEEE and Fellow of the OSA, SPIE, AAAS and of IEICE. He has been awarded the Alexander von Humboldt U.S. Senior Scientist, the Japan Society for the Promotion of Science Senior U.S. Scientist, and the U.S. Navy Distinguished Senior Professor awards, respectively. He is the University of Illinois Senior Scholar, member of the Sächsische Akademie der Wissenschaften zu Leipzig, the Akademie-Forum (Academy) of Science and Technology of Germany, and he was awarded the Doctor Honoris Causa of the Tomsk State University Cluster in Tomsk (2000); an Honorary Doctorate, Dr. h.c., from the University of Rennes 1 in Rennes, Brittany, France (2003); and another Honorary Doctorate of Engineering, Dr.-Ing. E-h., from the Friedrich-Alexander University of Erlangen-Nürnberg in Erlangen, Frankonia, Germany (2003). Professor Boerner was elected a member of the IUCN SSC/WI Crane Specialist Group 2005-2008, and he is an active member of various nature and migratory bird conservation groups including NABU, BUND, ICF, WBI, WBSJ, WBST, and so on, and specializes on the conservation of wetland and desert habitats for cranes - worldwide.

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