

# Program



## 7<sup>th</sup> European Conference on Synthetic Aperture Radar



June 2 - 5, 2008 • Friedrichshafen, Germany

Organized by

**ITG/VDE**



**FGAN**



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**7<sup>th</sup> European Conference on Synthetic Aperture Radar**

June 2 - 5, 2008 Friedrichshafen, Germany

**EUSAR is jointly organised by:**

**ITG (VDE)** Information Technology Society of VDE

**DLR** German Aerospace Center

**FGAN** Forschungsgesellschaft für Angewandte Naturwissenschaften e.V.

**EADS** European Aeronautic Defence and Space Company

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**Table of Contents**

**Page**

Message from the Conference Chairman ..... 5  
 Message from the Program Chairman ..... 6  
 Conference Board ..... 7  
 Technical Program Committee ..... 8  
 Conference Events Overview ..... 10

**Tutorials**

T1 Tutorial: Bi-/multistatic-SAR ..... 15  
 T2 Tutorial: Advanced SAR Interferometry / MTI ..... 15  
 T3 Tutorial: Advanced Image Exploitation, Polarimetry / PolInSAR ..... 16

**Oral Sessions**

Conference Opening and Plenary Session ..... 17  
 1.1 Advanced SAR Technology ..... 17  
 1.2 TerraSAR-X/TanDEM-X Commercial Exploitation (invited) ..... 18  
 1.3 Polarimetric SAR I ..... 19  
 1.4 Bistatic, Multistatic and Multi-Satellite SAR I ..... 19  
 2.1 SAR Processing, Image Enhancement, Post Processing, Data Fusion ..... 20  
 2.2 TerraSAR-X Commissioning Phase Results (invited) .. 21  
 2.3 Polarimetric SAR II ..... 22  
 2.4 Bistatic, Multistatic and Multi-Satellite SAR II ..... 23  
 3.1 Near-Field Synthetic Apertur Approaches for Security Applications (invited) ..... 24  
 3.2 First Scientific TerraSAR-X Results (invited) ..... 25  
 3.3 Polarimetric SAR III ..... 26  
 3.4 Inverse and Circular SAR; SAR Simulation ..... 27  
 4.1 Low Frequency SAR for Forest Mapping: State of the Art and Challenges in Spaceborne Implementation (invited) 28  
 4.2 Missions: RADARSAT-2, COSMO-Skymed, Cassini ... 29  
 4.3 New Techniques in POLInSAR I (invited) ..... 30  
 4.4 Three-dimensional SAR Techniques I (invited) ..... 31  
 5.1 Sub-Surface Imaging and Sounding I (invited) ..... 32  
 5.2 Next Generation SAR and Future Missions ..... 33  
 5.3 New Techniques in POLInSAR II (invited) ..... 34  
 5.4 Three-dimensional SAR Techniques II (invited) ..... 34  
 6.1 Sub-Surface Imaging and Sounding II (invited) ..... 35  
 6.2 Sentinel-1 I (invited) ..... 36  
 6.3 Urban Remote Sensing (invited) ..... 36  
 6.4 Bistatic SAR I (invited) ..... 37  
 7.1 Calibration and Verification I ..... 38  
 7.2 Sentinel-1 II (invited) ..... 39  
 7.3 Advanced SAR Instruments, Modes and Processing .. 40  
 7.4 Bistatic SAR II (invited) ..... 41  
 8.1 Calibration and Verification II ..... 58

8.2	TanDEM-X I	58
8.3	MTI and Change Detection I (invited)	59
8.4	Innovative Digital Beamforming SAR Systems (invited)	60
9.1	Feature Extraction, Image Classification and Segmentation I	61
9.2	TanDEM-X II	62
9.3	MTI and Change Detection II (invited)	62
9.4	Differential Interferometry, Multi-Pass SAR and SAR Tomography	63
10.1	Feature Extraction, Image Classification and Segmentation II	64
10.2	Airborne and UAV SAR	65
10.3	Along-track Interferometry, MTI, STAP	65
10.4	SAR Interferometry (invited)	66
<b>Poster Session</b>		
P01	Spaceborne, Airborne and UAV SAR	42
P02	SAR Technology	42
P03	Next Generation SAR and Advanced Modes	43
P04	STAP, MTI & Change Detection	43
P05	SAR Calibration and Verification	44
P06	SAR Simulation	45
P07	SAR and Inverse SAR Processing	46
P08	Bistatic, Multistatic and Multi-Satellite SAR	48
P09	Interferometry, Repeat Pass, SAR Tomography, 3D SAR and Applications	49
P10	Polarimetry, Polarimetric Interferometry & Applications	51
P11	Image Enhancement and Post Processing	52
P12	Image Classification and Segmentation	54
P13	Feature Extraction	56
<b>Exhibition</b>		
	General Informations	67
	Registration	67
	Hotel Information	69
	Social Program	71
	Technical Tour	72
	Site Plan on the rear side	

## Message from the Conference Chairman



It is with great pleasure that I welcome all the participants to EUSAR 2008, the 7<sup>th</sup> European Conference on Synthetic Aperture Radar, perhaps the most important international conference dedicated to SAR techniques, technology and applications.

The location, Friedrichshafen at Lake Constance, is a beautiful region in Southern Germany well known for its high-tech industries which had their beginnings in the companies started by the airship and aircraft pioneers Zeppelin and Dornier. Over the last 20 years, the activity in SAR has increased making the region a leading centre for space borne Radar.

In 1998, the second EUSAR conference was held in Friedrichshafen. At that time the SAR community could analyse and discuss the results of the successful SAR missions such as ERS-1, ERS-2, SIR-C/XSAR and Radasat-1 while anticipating results from new missions like ENVISAT/ASAR which used a phased array antenna technology and the interferometric mission SRTM on Space Shuttle. As these missions were of a more scientific and experimental nature, the new and emerging technologies and SAR applications indicated the potential of space borne SAR.

Ten years later, EUSAR has returned to the lakeside location and in the meantime space based SAR has evolved strongly and matured by adding commercial applications and creating new markets. Since the last EUSAR event there have been several successful launches of SAR satellites producing SAR images and services of exceptional quality. These include TerraSAR-X, SAR-Lupe, Cosmo Skymed, Radarsat- 2, TEC-SAR, and ALOS/PALSAR. The future will see new SAR based operational services such as ESA's Sentinel-1 for GMES and the PPP based 3D Radar mission TanDEM-X. Various new SAR projects are running or planned on nearly every continent. During EUSAR 2008, we will see new trends leading to the next generation of SAR products like Multi-static SAR, PolInSAR, 3D-SAR and Digital Beamforming SAR. You can expect an exciting and rewarding conference with top level contributions from 37 countries.

I look forward to sharing an exciting conference which should provide a platform for fruitful discussions. I hope you will enjoy you stay at Lake Constance and visit its historic towns and villages and view the alpine scenery.

*Sebastian Riegger, EADS Astrium*  
General Chairman EUSAR 2008

## Message from the Program Chairman



Dear EUSAR Conference Member,  
On behalf of the technical program board I would like to welcome you to the EUSAR 2008 conference.

The overwhelming response to our call for papers indicates the popularity of this conference. The enthusiasm has certainly increased due to the successful launches of the latest SAR Missions and the excellent status of future programs.

For EUSAR 2008, we received 370 Abstracts from 37 countries all over the world. After review by the program committee, 200 papers were selected for oral presentation and 120 papers will be displayed for interactive poster presentations.

Thanks to this response, all important fields of SAR techniques, technology and exploitation are covered by the contributions. EUSAR 2008 starts with a plenary session consisting of two outstanding keynote speeches.

During the three conference days, oral sessions will be divided into four groups, each being held in a separate hall and running concurrently. We have arranged the parallel sessions such that overlap of related research areas is kept to a minimum. We will close the 1st day of the conference on Tuesday evening with the traditional piano recital and the reception. Posters will be displayed throughout the three conference days. Special attention should be given to the interactive poster presentation on Wednesday evening prior to our conference dinner. A Best Paper Award, and three Student Best Paper Awards will be assigned and announced in the closing session on the last day of the conference. Finally, I would like to invite you to join the technical tour of the Astrium premises on Friday which provides you with a close-up view of the radar satellites TanDEM-X, Cryosat and METOP/ASCAT.

I would like to thank the conference board for their contribution to the technical program. I would also like to express my appreciation to the program committee for their competent evaluation of the large number of paper submissions, as well as to the invited chairs for their careful preparation of the invited sessions.

*Christoph Heer, EADS Astrium*  
Technical Program Chairman EUSAR 2008

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### Conference Venue

Graf-Zeppelin-Haus

Olgastraße 20

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## Program Committee

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Pierfrancesco Lombardo, Univ. Roma Lasapienza, Italy  
Michael Ludwig, ESA-ESTEC, The Netherlands  
Konstyantyn Lukin, IRE NASU, Ukraine  
Soren Madsen, JPL, USA  
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Kostas Papanthanasios, DLR, Germany  
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Manfred Wahl, CONSENS, Germany  
Chao Wang, China RSSGS, China  
Dan Johan Weydahl, NDRE, Norway  
Kwag Young, Hankuk Aviation Univ., Korea  
Maewan Younis, DLR, Germany  
Minhui Zhu, Chinese Acad. of Sc., China

## Conference Events - Overview

### Monday, June 02, 2008

08:00 - 18:00 Registration  
 08:00 - 17:30 Tutorials  
 10:30 - 11:00 Coffee Break  
 12:30 - 14:00 Lunch Break  
 15:30 - 16:00 Coffee Break

### Tuesday, June 03, 2008

08:00 - 18:00 Registration  
 10:30 - 22:00 Exhibition  
 09:00 - 09:30 Oral Sessions Welcome  
 09:30 - 10:30 Plenary Session  
 10:30 - 11:00 Coffee Break  
 11:00 - 12:20 Oral Sessions  
 12:20 - 13:45 Lunch Break  
 13:45 - 15:25 Oral Sessions  
 15:25 - 15:55 Coffee Break  
 18:00 - 22:00 Get Together (Foyer)

### Wednesday, June 04, 2008

08:00 - 18:00 Registration  
 08:30 - 19:00 Exhibition  
 08:30 - 10:10 Oral Sessions  
 10:10 - 10:40 Coffee Break  
 10:40 - 12:20 Oral Sessions  
 12:20 - 13:45 Lunch Break  
 13:45 - 15:25 Oral Sessions  
 15:25 - 15:55 Coffee Break  
 15:55 - 17:35 Oral Sessions  
 17:35 - 19:00 Poster Presentation  
 19:30 - 22:30 Conference Dinner (Boat Tour on Lake Constance)

### Thursday, June 05, 2008

08:00 - 16:00 Registration  
 08:30 - 16:00 Exhibition  
 08:30 - 10:10 Oral Sessions  
 10:10 - 10:40 Coffee Break  
 10:40 - 12:20 Oral Sessions  
 12:20 - 13:45 Lunch Break  
 13:45 - 15:25 Oral Sessions  
 15:30 - 16:00 Awards Presentation and Closing Remarks (Hugo-Eckener-Hall)

### Friday, June 06, 2008

09:00 - 12:00 Technical Tour: Visit of the ASTRION Satellite Integration Centre

## EUSAR 2008 Program Overview

Monday, June 02, 2008		Kapitän-Flemming-Room	Kapitän-Lehmann-Room	Graf-Soden-Room
08:00 - 17:30	Lobby Registration (Entrance)			
09:00 - 10:30		Bi-/multistatic SAR Introduction into bi-/multistatic SAR	Advanced SAR Interferometry / MTI Introduction into SAR Interferometry	Advanced Image Exploitation Polarimetry / PolinSAR Basics of SAR polarimetry
10:30 - 11:00	Coffee Break			
11:00 - 12:00		Overview of existing bistatic SAR processing	From SAR interferometry to 3D imaging Multidimensional SAR imaging I	Application of SAR polarimetry
12:00 - 12:30				
12:30 - 14:00	Lunch Break			
14:00 - 14:45		Applications, parameter design, and experimental aspects	Multidimensional SAR imaging II.	
14:45 - 15:00				
15:00 - 15:30		Progress in bistatic SAR concepts & algorithms I	Space based MTI techniques	SAR image exploitation
15:30 - 16:00	Coffee Break			
16:00 - 16:30		Progress in bistatic SAR concepts & algorithms II	Airborne SAR/MTI	Advanced image interpretation
16:30 - 16:45		Advanced mono- and bistatic ISAR techniques	Interference suppression with multich. SAR	
16:45 - 17:30				



## Tuesday, June 03, 2008

	Lobby	Alfred-Colsman	Hugo-Eckener	Ludwig-Dürr	Theodor-Kober
09:00 - 09:30	Welcome (Hugo Eckener)				
09:30 - 10:30	Plenary (Hugo Eckener)				
10:30 - 11:00	Coffee Break Coffee will be served in exhibition area				
11:00 - 12:20	Exhibition	1.1 Advanced SAR Technology	1.2 TerraSAR-X / TanDEM-X Commercial Exploitation (invited)	1.3 Polarimetric SAR I	1.4 Bistatic, Multistatic and Multi-Satellite SAR I
12:20 - 13:45	Lunch Break Lunch will be served in exhibition area				
13:45 - 15:25	Exhibition	2.1 SAR Processing, Image Enhancement, Post Processing, Data Fusion	2.2 TerraSAR-X Commissioning Phase Results (invited)	2.3 Polarimetric SAR II	2.4 Bistatic, Multistatic and Multi-Satellite SAR II
15:25 - 15:55	Coffee Break Coffee will be served in exhibition area				
15:55 - 17:35	Exhibition	3.1 Near-Field Synthetic Apertur Approaches for Security Applications (invited)	3.2 First Scientific TerraSAR-X Results (invited)	3.3 Polarimetric SAR III	3.4 Inverse and Circular SAR; SAR Simulation
18:00 - 22:00	Get Together (Foyer)				

## Wednesday, June 04, 2008

	Lobby	Alfred-Colsman	Hugo-Eckener	Ludwig-Dürr	Theodor-Kober
08:30 - 10:10	Exhibition	4.1 Low Frequency SAR for Forest Mapping: State of the Art and Challenges in Spaceborne Implementation (invited)	4.2 Missions: RADARSAT-2, COSMO-Skyrmed, Cassini (invited)	4.3 New Techniques in POLInSAR I (invited)	4.4 Three-dimensional SAR Techniques I (invited)
10:10 - 10:40	Coffee Break Coffee will be served in exhibition area				
10:40 - 12:20	Exhibition	5.1 Sub-Surface Imaging and Sounding I (invited)	5.2 Next Generation SAR and Future Missions	5.3 New Techniques in POLInSAR II (invited)	5.4 Three-dimensional SAR Techniques II (invited)
12:20 - 13:45	Lunch Break Lunch will be served in exhibition area				
13:45 - 15:25	Exhibition	6.1 Sub-Surface Imaging and Sounding II (invited)	6.2 Sentinel-1 I (invited)	6.3 Urban Remote Sensing (invited)	6.4 Bistatic SAR I (invited)
15:25 - 15:55	Coffee Break Coffee will be served in exhibition area				
15:55 - 17:35	Exhibition	7.1 Calibration and Verification I	7.2 Sentinel-1 II (invited)	7.3 Advanced SAR Instruments, Modes and Processing	7.4 Bistatic SAR II (invited)
17:35 - 19:00	Poster Presentation (drinks + snacks)				
19:30 - 22:30	Conference Dinner (Boat Tour on Lake Constance)				

	Lobby	Alfred-Colsman	Hugo-Eckener	Ludwig-Dürr	Theodor-Kober
08:30 - 10:10	Exhibition	8.1 Calibration and Verification II	8.2 TanDEM-X I	8.3 MTI and Change Detection I (invited)	8.4 Innovative Digital Beamforming SAR Systems (invited)
10:10 - 10:40	<b>Coffee Break</b>	Coffee will be served in exhibition area			
10:40 - 12:20	Exhibition	9.1 Feature Extraction, Image Classification and Segmentation I	9.2 TanDEM-X II	9.3 MTI and Change Detection II (invited)	9.4 Differential Interferometry, Multi-Pass SAR and SAR Tomography
12:20 - 13:45	<b>Lunch Break</b>	Lunch will be served in exhibition area			
13:45 - 15:25	Exhibition	10.1 Feature Extraction, Image Classification and Segmentation II	10.2 Airborne and UAV SAR	10.3 Along-track Interferometry, MTI, STAP	10.4 SAR Interferometry (invited)
15:30 - 16:00	<b>Awards Presentation and Closing Remarks (Hugo-Eckener-Hall)</b>				

## TUTORIALS

### Monday, June 2, 2008

*Kapitän-Flemming-Room*

#### **T1 Tutorial: Bi-/multistatic-SAR**

- 09:00     **Introduction into bi-/multistatic SAR**  
*Chris Baker, UCL, London, UK*
- 10:30-11:00     Coffee break
- 11:00     **Overview of existing bistatic SAR processing**  
*Mehrdad Soumekh, Univ. of New York, USA*
- 12:30-14:00     Lunch break
- 14:00     **Applications, parameter design, and experimental aspects**  
*Joachim Ender, FGAN, Wachtberg, Germany*
- 15:00     **Progress in bistatic SAR concepts & algorithms I**  
*Otmar Loffeld, Univ. of Siegen, Germany*
- 15:30-16:00     Coffee break
- 16:00     **Progress in bistatic SAR concepts & algorithms II**  
*Otmar Loffeld, Univ. of Siegen, Germany*
- 16:30     **Advanced mono- and bistatic ISAR techniques**  
*Jens Rosebrock, FGAN, Wachtberg, Germany*
- 17:30     Discussion / End of Tutorial 1

*Kapitän-Lehmann-Room*

#### **T2 Tutorial: Advanced SAR Interferometry / MTI**

- 09:00     **Introduction into SAR Interferometry**  
*Michael Eineder, DLR, Oberpfaffenhofen, Germany*
- 10:30-11:00     Coffee break
- 11:00     **From SAR interferometry to 3D imaging**  
*Gianfranco Fornaro, CNR-IREA, Italy*
- 12:00     **Multidimensional SAR imaging I**  
*Fabrizio Lombardini, Univ. of Pisa, Italy*
- 12:30-14:00     Lunch break



- 14:00 **Multidimensional SAR imaging II**  
*Fabrizio Lombardini, Univ. of Pisa, Italy*
- 14:45 **Space based MTI techniques**  
*Chuck Livingstone, DRDC, Ottawa, Canada*
- 15:30-16:00 Coffee break
- 16:00 **Airborne SAR/MTI**  
*Joachim Ender, FGAN, Wachtberg, Germany*
- 16:45 **Interference suppression with multich. SAR**  
*Luke Rosenberg, DSTO, Edinburgh, AU*
- 17:30 **Discussion / End of Tutorial 2**

*Graf-Soden-Room*

**T3 Tutorial: Advanced Image Exploitation,  
Polarimetry / PolInSAR**

- 09:00 **Basics of SAR polarimetry**  
*Wolfgang Boerner, Univ. of Illinois, Chicago, USA*
- 10:30-11:00 Coffee break
- 11:00 **Application of SAR polarimetry**  
*Andreas Reigber, DLR, Oberpfaffenhofen, Germany*
- 12:30-14:00 Lunch break
- 14:00 **SAR image exploitation**  
*Uwe Stilla, TU Munich, Germany*
- 15:30-16:00 Coffee break
- 16:00 **Advanced image interpretation**  
*Stefan Hinz, TU Munich, Germany*
- 17:30 **Discussion / End of Tutorial 3**

**Tuesday, June 3, 2008**

*Hugo Eckener*

**Opening of the Conference and Welcome**

- 9:00 *Conference Chairman: S. Riegger, EADS Astrium, Germany*  
*Program Chairman: C. Heer, EADS Astrium, Germany*  
*Awards Chairman: W. Wiesbeck, University of Karlsruhe, Germany*

*Hugo Eckener*


**Plenary Session**

- 9:30 **The German SAR Roadmap - Strategic and Programmatic Remarks**  
*Ludwig Baumgarten, Member of the Executive Board, German Aerospace Center, Germany*
- 10:00 **The European Space Agency's Synthetic Aperture Radar Programme: "From Experiment to Service Provision"**  
*E. Attema, Directorate of Earth Observation Programme, European Space Agency ESTEC, The Netherlands*
- 10:30-11:00 Coffee break

*Alfred-Colsman*

**Session 1.1: Advanced SAR Technology**

*Chairmen: Christoph Heer, EADS Astrium GmbH; Michael Ludwig, ESA ESTEC, Germany*

- 11:00 **(1.1.1) The Modified BFPQ algorithm**  
 *Ury Naftaly, Elta, Israel*  
*(Former paper P03.05)*
- 11:20 **(1.1.2) On Space-based Synthetic Aperture Radar Antennas**  
*Cornelis van't Klooster, European Space Agency Estec, The Netherlands*

Hugo-Eckener

**Session 6.2: Sentinel-1 I (invited)**

Chairmen: Evert Attema, ESA; Malcolm Davidson, ESA/ESTEC, The Netherlands

- 13:45 **(6.2.1) Sentinel-1 ESA's New European Radar Observatory**  
Evert Attema, Malcolm Davidson, Nicolas Flourey, Guido Levrini, ESA/ESTEC, The Netherlands; Betlem Rosich, ESA/ESRIN, Italy; Bjorn Rommen, ESTEC/EOP-FTC; Paul Snoeij, ESA, The Netherlands
- 14:05 **(6.2.2) Sentinel-1 Radar Interferometry Applications**  
Francesco De Zan, Andrea Monti Guarnieri, Fabio Rocca, Stefano Tebaldini, Politecnico di Milano, Italy
- 14:25 **(6.2.3) Sentinel-1 Land Applications based on Multi-temporal Data Acquisitions**  
Christiana Schmallius, Friedrich-Schiller-University Jena, Germany
- 14:45 **(6.2.4) Sentinel-1 Ship Monitoring Applications Harm Greidanus, European Commission Joint Research Centre, Italy; Evert Attema, ESA, The Netherlands**
- 15:05 **(6.2.5) Sentinel-1 Mission Analysis**  
Andrea Pietropaolo, Michelangelo L'Abbate, Claudio Bruno, Thales Alenia Space S.p.A., Italy
- 15:25-15:55 Coffee break

Ludwig-Dürr

**Session 6.3: Urban Remote Sensing (invited)**

Chairmen: Fabio Dell'Acqua, University of Pavia, Italy; Uwe Stilla, Technische Universität München (TUM), Germany

- 13:45 **(6.3.1) Registration of metric resolution SAR and Optical images in urban areas**  
Gabrielle Leheureau, Florence Tupin, GET/Telecom Paris; Céline Tison, CNES; Guillaume Oller, Magellium; David Petit, Magellium, France

- 14:05 **(6.3.2) Simulation of Radar Reflection at Man-Made Objects and its Benefits for Persistent Scatterer Interferometry**  
Stefan Auer, Stefan Gernhardt, Stefan Hinz, Remote Sensing Technology, Technische Universität München; Nico Adam, Richard Bamler, German Aerospace Center (DLR), Germany
- 14:25 **(6.3.3) Circular SAR imagery for urban remote sensing**  
Helene Oriot, Hubert Cantalloube, ONERA, France
- 14:45 **(6.3.4) Modelling and Analysing InSAR Phase Profiles at Building Locations in Multi-Aspect and Multi-Resolution Data**  
Antje Thiele, Ulrich Thoennessen, Uwe Soergel, Karsten Schulz, FGAN-FOM, Germany
- 15:05 **(6.3.5) Analysis of building dimension estimation accuracy from SAR shadow information**  
David Blacknel, Cranfield University; Robert Hill, Christopher Moate, QinetiQ, United Kingdom
- 15:25-15:55 Coffee break

Theodor-Kober

**Session 6.4: Bistatic SAR I (invited)**

Chairmen: Otmar Loffeld, Center for Sensorsystems (ZESS), University of Siegen; Joachim Ender, FGAN e. V., Germany

- 13:45 **(6.4.1) Progress of Hybrid Bistatic SAR: Synchronization Experiments and First Imaging Results**  
Thomas Espeter, Ingo Walterscheid, Andreas Brenner, FGAN-FHR; Jens Klare, FGAN; Christoph Gierull, DRDC Ottawa, c/o FGAN-FHR; Joachim Ender, FGAN e. V.; Otmar Loffeld, Center for Sensorsystems (ZESS), University of Siegen, Germany
- 14:05 **(6.4.2) Spaceborne Bistatic Radargrammetry: a robust method for DEM generation**  
Antonio Moccia, Alfredo Renga, Università di Napoli "Federico II", Italy