

Education & Training Activities. IEEE-GRSS Perspectives and Efforts in South America

Synthetic Aperture Radar Literacy and Training Workshop
October 22-24, 2018 Westin Denver International Airport

Carlos López-Martínez

Remote Sensing & Natural Resources Modelling Group
Luxembourg Institute of Science & Technology – LIST

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AND TECHNOLOGY



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Group Leader | Researcher

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Luxembourg Institute of Science and Technology (LIST)
Environmental Research & Innovation (ERIN)
Remote Sensing and Natural Resources Modelling Group

- What do you do related to **SAR** or **big data**?
 - Remote sensing and Synthetic Aperture Radar theory and applications
- Who is your primary **constituency/audience**?
 - Under-graduate, graduate, researchers & professionals
- How were you **introduced to SAR**?
 - My work in Synthetic Aperture Radar started with my PhD in 2000



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IEEE-GRSS Education & Training Activities

- Description of Activities
- Training Material

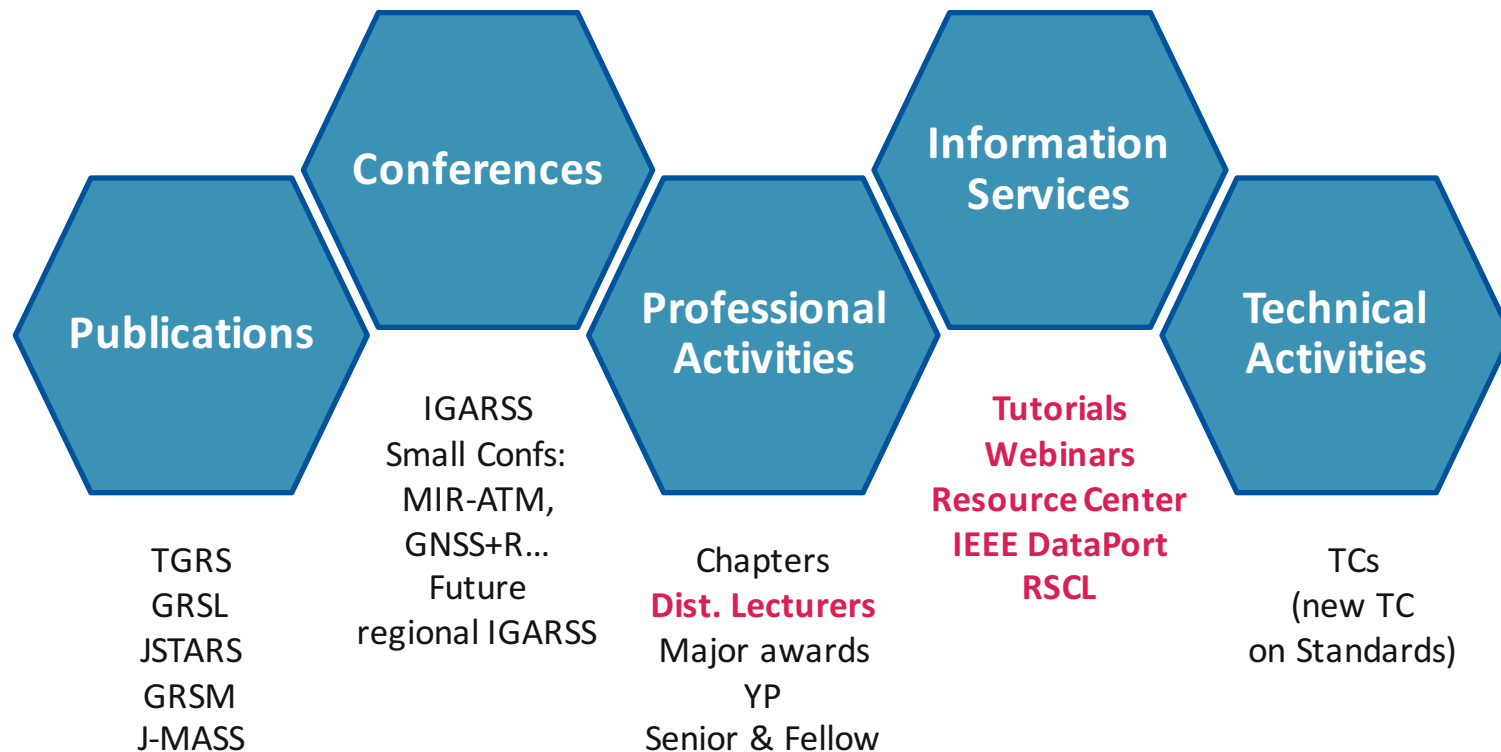
Training Activities in South America

- Description of Activities

Conclusions & Learnt Lessons



Elements of GRSS



Background

- GRSS is a IEEE **technical society** that deals with: **Remote Sensing** and **Geospatial Information**, both Science and **Engineering & Applications** and **Education**, working for societal benefits through remote sensing
- GRSS has more than **3400 Members** in **94 Countries**, and **65 chapters**: that is 3 new chapters and 2 new student branch chapters than last year



6 Student branches (●)

11 Ambassadors (■)

<http://www.grss-ieee.org/community/chapters/>



IEEE-GRSS EDUCATION AND TRAINING ACTIVITIES

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IEEE-GRSS develops training and education activities:

- At different **levels**: kids, graduate, post-graduate & professional
- At different **scales**: local & international
- With different **thematic**: scientific, technical & societal

Activities:

- **Distinguished Lecturer Program**
- **Tutorials & documents** at national & international conferences
- **Training material repository** (IEEE-GRSS Website)
- **Cool videos for kids**
- **Online tutorials & seminars**
- **IEEE-GRSS Society Resource Center**
 - <http://resourcecenter.grss.ieee.org/>
- **Code Library & IEEE Data Port**
 - Code Library: <http://rscl-grss.org/about.php>
 - IEEE Data Port: <https://ieee-dataport.org/topic-tags/geoscience-and-remote-sensing>
- **Webinars & MOOCs**





IEEE-GRSS EDUCATION AND TRAINING ACTIVITIES

IEEE-GRSS Education Website

<http://www.grss-ieee.org/> > Menu > Education

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IEEE GRSS IEEE

Geoscience and Remote Sensing Society

Interested in using data from satellites to understand the Earth? Our society can help. We deal with the theory, concepts, and techniques of science and engineering as they apply to the remote sensing of the earth, oceans, atmosphere, and space, as well as the processing, interpretation and dissemination of this information.

[Read the President's Message](#)

LEARN MORE Access your Member Directory

Education

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Distinguished Lecturer Program

Tutorials & Documents

Standard Terminology

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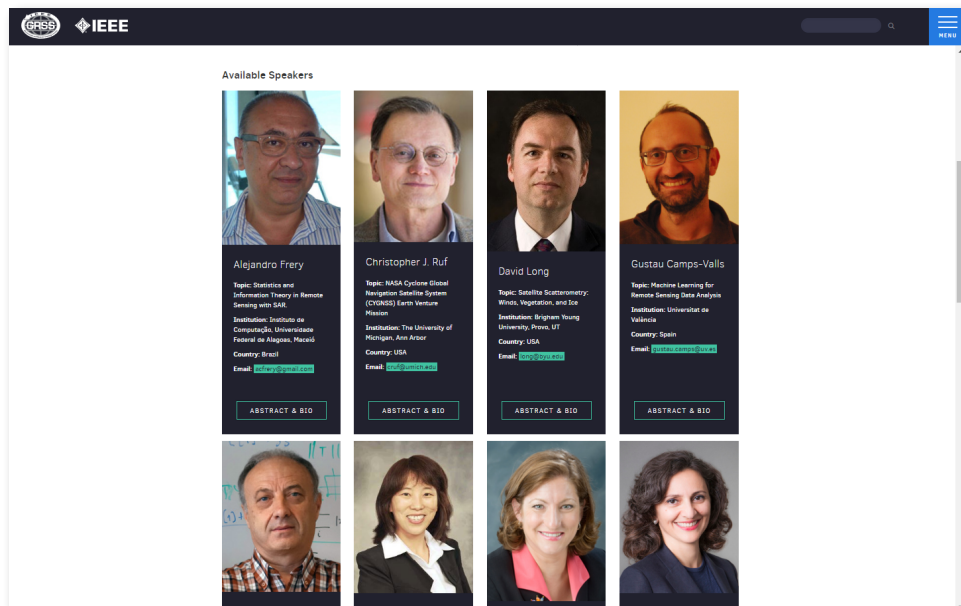
Technical Resources

JAXA Repository

EVENTS OPPORTUNITIES

Distinguished Lecturer Program

The **Distinguished Lecturer program** is a service of the Geoscience and Remote Sensing Society and its members to support our chapter activities. Our goal is provide chapters with access to leading professionals in our discipline



Tutorials & Documents

Diverse collection of education and training material (presentations, videos, etc...). Most of the material is in **English**, but some contributions are also in **Spanish**. Some examples are:

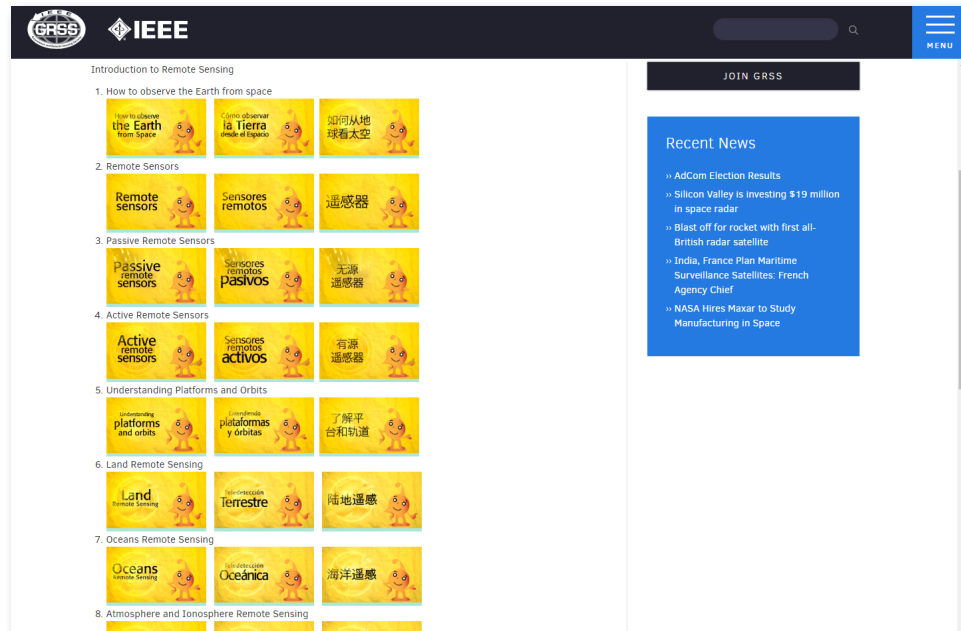
- Introduction to Lidar, Radar, Sonar
- Entire SAR curriculum from DLR
- Canada Center for Remote Sensing: Radar Polarimetry Tutorial
- “SAR Polarimetry: Basics, Processing Techniques and Applications,” Pottier, E., and L. Ferro-Famil (IGARSS 2008)
- “Radar Interferometry,” Paul Rosen (IGARSS 2004)
- ...

Remote Sensing Tutorial In **Spanish**, **French**, **Portuguese**, and **English**, associated to the TELECAN project:

- <http://www.grss-ieee.org/tutorials-documents/remote-sensing-tutorial-in-spanish-french-portuguese-and-english/>

Cool Videos for Kids











10 videos introducing Remote Sensing to kids in **English, Spanish & Chinese**.
At the end of November 2018 also in **French, Italian, German and Portuguese**



Online Remote Sensing Tutorial - Introduction

- Online 10h course recorded in **English & Spanish** (GRSS Mem. necessary)
- http://www.grss-ieee.org/wp-content/uploads/2015/05/jurse2015_tutorials/media/











- Introduction to Remote Sensing (A. Broquetas)
- Earth Observation Tools (J. Cobera)
- Radar and SAR Principles (J. Malloqui)
- Synthetic Aperture Radar: Applications (C. López-Martínez)
- Microwave Radiometers: Principles, Technologies and Sensors (A. Camps)
- Microwave Radiometers: Applications (incl. SMOS-SM, SM @ 1 km, OS) (M. Piles)
- Multi- and Hyperspectral Sensors: Principles, Technologies and Sensors (L. Pipia)
- Multi- and Hyperspectral Sensors: Applications (A. Plaza)
- LIDAR: Principles, Technologies and Sensors (F. Rocadenbosh)
- LIDAR: Applications (M. Sicard)

IEEE Geoscience and Remote Sensing Society					
Remote Sensing Training Materials Materiales de Capacitación de Teledetección					
Lesson Title Título de la lección	Instructor Instructor	Duration Duración	English Inglés	Spanish Español	
1. Introduction to Remote Sensing	Toni Broquetas	1h 19m			
2. Earth Observation Tools (GIS, Classification...)	Jordi Corbera	0h 58m			
3. Radar and SAR Principles	Jordi Malloqui	0h 46m			
4. Synthetic Aperture Radar Applications (INSAR, PolSAR, PolInSAR, Multi-temporal, multi-frequency)	Carlos López-Martínez	0h 45m			
5. Microwave Radiometers: Principles, Technologies and Sensors	Adriano Camps	1h 20m			

Online Remote Sensing Tutorial - Applications

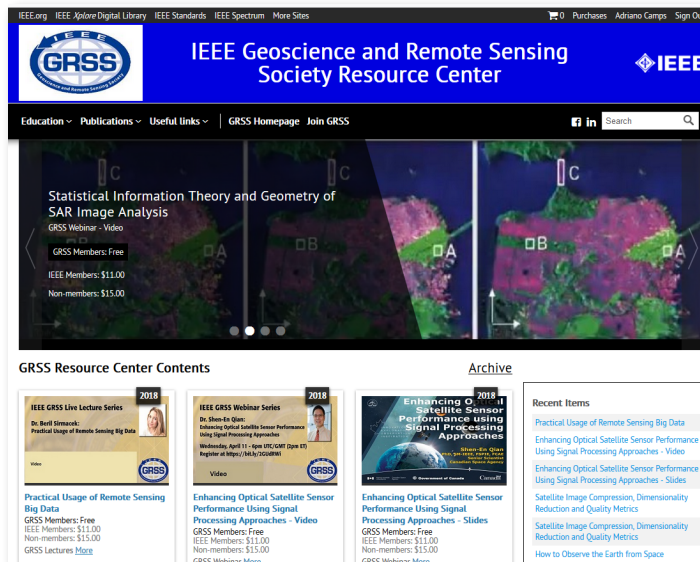
- Online 8h course recorded in **English & Spanish** (GRSS Mem. necessary)
- http://www.grss-ieee.org/wp-content/uploads/2015/05/more_tutorials_2016/media/

- Agriculture Applications of Synthetic Aperture Radar (J. M. López-Sánchez)
- Statistical Modelling, Processing and Analysis of SAR Images (A. Frery, L. Gómez-Deniz, R. Ospina)
- Remote Sensing Using GNSS (reflected) Signals of Opportunity (A. Camps)
- Electromagnetic Scattering in Earth Remote Sensing: the "machine code approach" (J.L. Álvarez-Pérez)
- Thermal Infrared Remote Sensing: Principles and Applications (J.C. Jimenez, J.A. Sobrino, R Niclos, V. Caselles)
- Water Quality Monitoring with Optical Methods (A. Ruiz-Verdú)
- Machine Learning for Remote Sensing Data Analysis (D. Tuia, G. Camps-Valls)
- Real-Time Hyperspectral Imaging (S. López)

IEEE Geoscience and Remote Sensing Society					
Remote Sensing Training Materials Materiales de Capacitación de Teledetección					
Disc 2					
Lesson Title Título de la lección	Instructor Instructor	Duration Duración	English Inglés	Spanish Español	
1. Agriculture Applications of Synthetic Aperture Radar	Juan M. López-Sánchez	0h 48m			
2. Statistical Modeling, Processing and Analysis of SAR Images	Alejandro C. Frery, Luis Gómez-Deniz, Raydonal Ospina	0h 48m			
3. Remote Sensing Using GNSS (reflected) Signals of Opportunity	Adriano Camps	1h 13m			
4. Electromagnetic Scattering in Earth Remote Sensing: the "machine code approach"	José Luis Álvarez-Pérez	0h 55m			
5. Thermal Infrared Remote Sensing: Principles and Applications	Juan C. Jiménez-Muñoz, José Antonio Sobrino, Raquel Niclos, Vicente Caselles	1h 08m			

IEEE-GRSS Society Resource Centre

- **Webinars series started:** Good mix of academia and industry
- **New Resource Centre:** <http://resourcecenter.grss.ieee.org/>
- **MOOCs** under creation in collaboration with UNSW (University of New South Wales)




Reproducible Research

- Publications repositories for **code & data**. They have also **educational value**

Remote Sensing Code Library

<http://rscl-grss.org/about.php>

Remote Sensing Code Library
rscl-grss.org



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About

Forward progress in remote sensing science and technology relies on the free exchange of results and ideas, as well as the dissemination of remotely sensed data acquired by ground-based, airborne, and spaceborne sensors. An important ingredient is the family of computer codes and algorithms used by scientists and engineers to analyze data, model and calibrate sensors, and relate the outputs of sensors to the physical parameters of the observed scenes. Scientific journals and meetings—such as the GRSS Transactions and the IGARSS symposia—play an important role in facilitating the exchange of scientific information, but their domains do not encompass computer codes. For the most part, remote sensing computer codes remain hidden from public view. But, no more!


The Remote Sensing Code Library (RSLC), is an IEEE GRSS initiative aimed at establishing a large family of remote sensing computer codes—contributed by members of the remote sensing community and their host institutions—that can be shared by other members of the community, not only to verify and extend published results, but also to reduce the duplication of time and effort invested in the development of these codes. RSLC invites researchers to submit their codes, which will then be reviewed by an Editorial Team to insure relevance and quality. Accepted codes become citable in the literature, just like journal publications; when an individual uses a code from the RSLC to generate results and then includes them in a journal or symposium publication, that user is expected to cite the code and its authors.

Our Team


RSLC is supported by and Editorial Team and a group of Champions.

The **Editorial Team** manages the review and publication processes, from the code submission stage, through the code evaluation process, and the final decision on whether or not to accept the submitted code for inclusion in the Remote Sensing Code Library.


Editorial Team



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IEEE Data Port: stand alone data or supporting data for journal articles

<https://iee-dataport.org/topic-tags/geoscience-and-remote-sensing>

IEEE DataPort™

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DATASETS

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ABOUT

SEARCH...

GEOSCIENCE AND REMOTE SENSING

GRSS SAR/PoISAR DATABASE

Remote sensing of environment research has explored the benefits of using synthetic aperture radar imagery systems for a wide range of land and marine applications since these systems are not affected by weather conditions and therefore are operable both daytime and nighttime. The design of image processing techniques for synthetic aperture radar applications requires tests and validation on real and synthetic images. The GRSS benchmark database supports the desing and analysis of algorithms to deal with SAR and PoISar data.

[Login to Submit an Analysis](#)

Beijing taxi trip data_sample

Beijing taxi trip data (sample)

License: [Creative Commons Attribution \(CC\)](#)

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TRAINING ACTIVITIES IN SOUTH AMERICA

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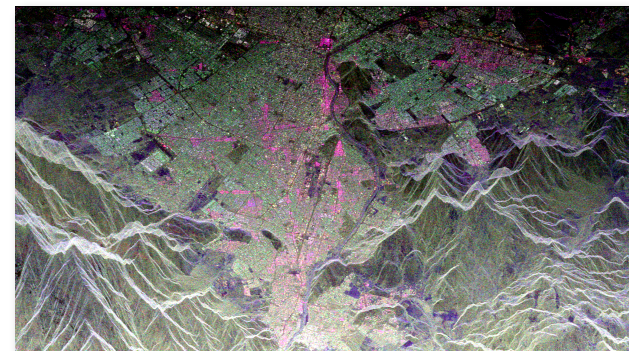
IEEE-GRSS has conducted **training efforts in South America**

- **9/2018**: Spring Remote Sensing School
- **2016/2017/2018**: IEEE-GRSS Young Professionals & ISPRS Summer School
- **11/2016**: Joint GRSS/CIREN Workshop
- **09/2016**: IEEE-GRSS Argentinian Chapter Spring School
- **10/2015**: IEEE-GRSS Young Professionals & ISPRS Summer School
- **10/2015**: Joint GRSS/CIREN Workshop
- **10/2015**: GRSS/CONAE Course and meeting
- **11/2014**: GRSS/CONAE Course and meeting. IEEE GRSS Latin America working group initiative
- **10/2010**: LARS 2010 Latin American Remote Sensing Week. IEEE GRSS Latin America working group initiative



LARS 2010 Latin American Remote Sensing Week. IEEE GRSS Latin America working group initiative

- Title: SAR Polarimetry: Theory and Applications
- 1 week course, Santiago de Chile, Chile
- Lecturer: Carlos López-Martínez
- Tutorial taught in **Spanish**
- About **20** students
- **Contents of the course**
 - Introduction
 - Synthetic Aperture Radar Principles
 - Theory of Radar Polarimetry
 - SAR Data Statistical Description
 - Polarimetric Decompositions
 - Information vs. Frequency
 - Polarimetric SAR Interferometry
 - Applications
 - One complete day of **practice** based on the ESA-SNAP toolbox



PolSAR image of Santiago de Chile

GRSS/CONAE Course and meeting. IEEE GRSS Latin America working group initiative

- Title: Remote Sensing and its Applications
- 1 week course, Buenos Aires, Argentina
- Lecturers: Paolo Gamba, Carlos López-Martínez, Alejandro Frery
- Tutorial taught in **Spanish & English**
- About **40** students
- **Contents of the course**
 - Urban Remote Sensing
 - Hyperspectral Image Analysis
 - SAR Polarimetry
 - Change Detection
 - SAR Interferometry
 - SAR Applications
 - Statistics of Satellite Products



GRSS/CONAE Course and meeting

- Title: Remote Sensing and its Applications
- 1 week course, Buenos Aires, Argentina
- Lecturers: Paolo Gamba, Alejandro Frery, Gianfranco Fomaro
- Tutorial taught in **Spanish & English**
- About **40** students
- **Contents of the course**
 - Machine Learning
 - Differential SAR Interferometry
 - Data Fusion
 - SAR Tomography
 - Digital Elevation Models





TRAINING ACTIVITIES IN SOUTH AMERICA

October 2015

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Joint GRSS/CIREN Workshop

- Title: Remote Sensing and its Applications
- 1 week course, Santiago de Chile, Chile
- Lecturers: Marcelo Scavuzzo, Carlos López-Martínez
- Tutorial taught in **Spanish**
- About **20** students
- **Contents of the course**
 - SAR Basics
 - SAR Polarimetry
 - Remote Sensing in Epidemiology
 - Remote Sensing in Disasters
 - SAR Applications
 - Risk Systems Based in Space Information



IEEE-GRSS Young Professionals & ISPRS Summer School

- 1 week course, Curitiba, Brazil
- Tutorial taught in **English**
- About **70** students
- **Contents of the course**
 - 10 talks
 - Industrial & academic topics and speakers

GRSS Young Professionals and ISPRS Summer School

26 a 30 de Outubro de 2015
Sistema Meteorológico do Paraná – SIMEPAR, Curitiba, PR, Brasil

isprs GRSS

GRSS YP & ISPRS SS 2015

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PROGRAMA PRELIMINAR

Young Professionals **Summer School**

YOUNG PROFESSIONALS

Programação	Segunda-Feira
08:00 - 09:30	Registro
09:30 - 10:00	Seção de Abertura
10:00 - 10:45	Indústria / Serviços I Assunto: A tecnologia e mercado do uso de imagens orbitais no Brasil Palestrante: Laurent Martin Soluções em imagens de satélite e softwares (ENGESAT)
10:45 - 11:00	Perguntas e Respostas
11:00 - 11:45	Indústria / Serviços II Assunto: O passado, presente e o futuro do mercado de aerolevantamento no Brasil Palestrante: Renato Asinelli Filho Associação Nacional de Empresas de Aerolevantamento

ORGANIZAÇÃO

UFPR
UNIVERSIDADE FEDERAL DO PARANÁ

UDESC

PUC RIO

IEEE-GRSS Argentinian Chapter Spring School



- Title: Remote Sensing and its Applications
- 1 week course, Córdoba, Argentina
- Lecturers: Paolo Gamba, Claudia Notarnicola, Luis Gómez Chova
- Tutorial taught in **Spanish & English**
- About **20** students
- **Contents of the course**
 - Data Fusion
 - Advanced Classification Techniques in Remote Sensing
 - Spectral-Spatial-Based Classification
 - Retrieval of Biophysical Parameters from Remotely Sensed Imagery
 - Optical Remote Sensing Image Processing
 - Machine Learning in Remote Sensing



Joint GRSS/CIREN Workshop

- Title: Introduction to SAR Systems and their Applications
- 1 week course, Santiago de Chile, Chile
- Lecturers: Pedro Muñoz, Felipe Albornoz, Carlos López-Martínez
- Tutorial taught in **Spanish**
- About **20** students
- **Contents of the course**
 - SAR Systems Introduction
 - Basic Processing of SAR Data
 - SAR Data Applications
 - SAR Interferometry
 - SAR Polarimetry



TRAINING ACTIVITIES IN SOUTH AMERICA

Sept. 2016 – Sept. 2017 – Sept. 2018

IEEE-GRSS Young Professionals & ISPRS Summer School

- Brazil
- Tutorials taught in **English**



**FEDERAL UNIVERSITY OF MATO GROSSO DO SUL
CAMPO GRANDE/MS. BRAZIL**

**GRSS YOUNG
PROFESSIONALS
AND ISPRS SC
SUMMER SCHOOL**

**MULTIUSO AUDITORIUM
OCTOBER 29
TO NOVEMBER 1, 2018**

<https://grss-isprs.ufms.br/en/about/>

Important Dates
Abstract submission: up to July 31 th, 2018 / Result of Abstract evaluation: August 31 th, 2018

Logos: ISPRS, isprs, IEEE youngprofessionals, GRSS, UCDB, UFMS

Spring Remote Sensing School



- Title : The SAR Radar as a Tool for Environment Monitoring and Production
- 2 weeks courses in Córdoba, Argentina
- Tutorial taught in **Spanish & English**
- About **100** students (Scientists & stakeholders)

<https://sites.google.com/ig.edu.ar/3er-escuela-de-primavera/home>



TRAINING ACTIVITIES IN SOUTH AMERICA

September 2018

Course content

- **Theory** lectures
- One complete day of **practice** based on the ESA-SNAP toolbox
- One day for **specific problems** discussion with lecturers/specialists

HORA / DÍA	LUNES 10/09	MARTES 11/09	MIÉRCOLES 12/09	JUEVES 13/09	VIERNES 14/09	SABADO 15/09	HORA / DÍA	LUNES 17/09	MARTES 18/09	MIÉRCOLES 19/09	JUEVES 20/09	VIERNES 21/09
09:00-10:00	Trámites Administrativos.	Fundamentos de SAR 1: "El radar SAR, adquisición, Geometría, focalización, distorsiones" Dra. C. Notarnicola. (EURAC, Italia)	"Generando información a partir de imágenes SAR" Dra. C. Notarnicola.	"Monitoreo de Humedades a partir de imágenes SAR" Dra. N. Morandeira. (UNSAMCONICET, Argentina)	PRÁCTICO 1: "Descarga y procesamiento de imágenes SAR" Dra. C. Notarnicola. Dra. N. Morandeira. Colaboran: Mgter. R. Solorza. (SAOCOM/CONAE, Argentina) Mgter. A. Brasca. (IG/CONAE, Argentina)	"Aplicaciones de datos SAR Polarimétricos" Dr. López Martínez.	09:00-09:45	"Principles of Operation and Land Applications" Dr. A. Camps (Ple. IEEE-GRSS)	"Aplicaciones de SAR en Argentina" Dr. P. Euláides. (CEDIAC/CONICET, Argentina)	"PolSAR image classification using reaction-diffusion systems" Dr. L. Gómez Deniz (CTIM, España)	"SAR applications in Marine Meteorology" Dr. Xiaofeng Li.	"Taller de elaboración de conclusiones" Dr. L. Gómez Deniz. Dr. A. Frey. Dr. C. Scavuzzo. Dr. A. Bhattacharya. Dr. Xiaofeng Li. Dra. A. Ferral. Mgter. R. Solorza.
10:00-10:30							09:45-10:30	"Characterizing groundwater induced land subsidence and uplift in SAR analysis" Dra. F. Cigna.	"Geometric Methods for analysis of multi-temporal and multi-polarized SAR images" Dr. A. Bhattacharya.			
10:30-11:00							Coffee Break					
11:00-12:30							11:00-12:00	"Statistics for SAR image analysis" Dr. A. Frey. (Univ. Alagoas, Brasil)	"Change detection with SAR images" Dr. A. Frey.			
12:30-13:30							12:00-12:30					
Almuerzo							Almuerzo					
14:00-15:00	ACTO DE APERTURA: Presentación de las actividades y instituciones participantes.	Fundamentos de SAR 2: "La imagen SAR, Ruído, Pre procesamiento, productos" Dra. C. Notarnicola.	Fundamentos de SAR 3: "Aplicaciones SAR en Argentina" Dra. M. Salvia. (IAFE/CONICET, Argentina)	"Conceptos básicos de SAR Polarimétrico" Dr. López Martínez. (LIST, Luxemburgo)	PRÁCTICO 2: "Clasificación de imágenes SAR" Dr. López Martínez. Dra. M. Salvia. Colaboran: Mgter. R. Solorza. Mgter. A. Brasca.	"Mapping and monitoring slow-moving landslides with multitemporal satellite imagery" Dra. F. Cigna. (ASI, Italia)	13:00-14:00	"Polarimetric SAR image analysis" Dr. A. Bhattacharya. (IIT, India)	"How to be lucky publishing" Dr. A. Frey.	"InSAR paso a paso" Dr. L. Euláides.	"Talleres de discusión de problemáticas con participantes" Dr. L. Gómez Deniz. Dr. A. Frey. Dr. C. Scavuzzo. Dr. A. Bhattacharya. Dr. Xiaofeng Li. Dra. A. Ferral. Mgter. R. Solorza.	PUERTA EN COMÚN Y CIERRE. Dr. L. Gómez Deniz. Dr. A. Frey. Dr. C. Scavuzzo. Dr. A. Bhattacharya. Dr. Xiaofeng Li. Dra. A. Ferral. Mgter. R. Solorza.
15:30-16:00							Coffee Break					
15:00-17:00							14:00-17:00	"Talleres de discusión de problemáticas con participantes" Dra. F. Cigna. Dr. López Martínez. Dr. A. Bhattacharya. Dr. Euláides. Dr. C. Scavuzzo.	"Talleres de discusión de problemáticas con participantes" Dra. F. Cigna. Dr. López Martínez. Dr. A. Bhattacharya. Mgter. R. Solorza.	"Talleres de discusión de problemáticas con participantes" Dr. L. Gómez Deniz. Dr. A. Frey. Dr. C. Scavuzzo. Dr. L. Euláides. Dra. A. Ferral.		

TRAINING ACTIVITIES IN SOUTH AMERICA

September 2018

National Lecturers

- Dra. Laura Frulla (CABA) – SAOCOM PI
- Dr. Pablo Eulliades (Mendoza) - CONICET
- Dr. Marc. Thibeaut (CABA) - CONAE
- Dra. Mercedes Salvia (CABA) - CONICET
- Dra. Natalia Morandeira (CABA) - CONICET
- Dr. Pablo Eulliades (Mendoza) - CONICET
- Dr. Jorge Marquez (Mar del Plata) – IEEE-GRSS Chapter President

International Lecturers

- Dr. Alejandro Frery (Brasil)
- Dra. Claudia Notarnicola (Italy)
- Dr. Luis Gómez Déniz (Spain)
- Dr. Xiaofeng Li (China)
- Dr. Avik Bhattacharya (India)
- Carlos López Martínez (Luxembourg)
- Dr. Francesca Cigna (Italy)



TRAINING ACTIVITIES IN SOUTH-AMERICA

September 2018

Students background

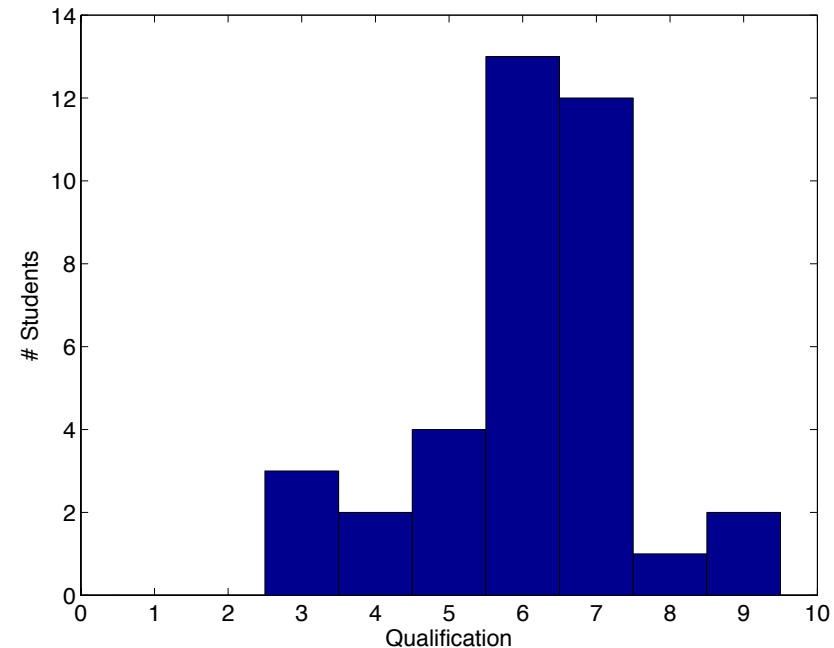
- Forest fires and degradation
- Agricultural and forestry production
- Meteorology
- Wetlands
- Bioindicators
- Biomass
- Satellite phenology
- Disaster risk
- Hydrographic basins
- Cryosphere
- Hydrocarbon monitoring
- Interferometry
- SAR product validation

Students Origin

- Paraguay
- Cuba
- Brazil
- Mexico
- Venezuela
- Ecuador
- Argentina
- Chile
- Colombia Guatemala
- Uruguay
- Peru
- Bolivia
- Nigeria

September 2018

- **Feedback** is important, but **evaluation** may give a different picture
- Evaluation on student bases on a questionnaire of **27 single-answer** questions
- Each responsible/lecturer provided **3 questions**
- **Qualifications** (0 to 10) based on 37 answers





TRAINING ACTIVITIES IN SOUTH AMERICA

LUXEMBOURG
INSTITUTE OF SCIENCE
AND TECHNOLOGY



September 2018 - Feedback

- The format & planning adopted for the workshop has opened a space for **exchange and discussion of specific interests related to main topics**. New problems that can be approached with SAR technology were found
- The participants of the School emphasized that they acquired a new vision that allows them to **improve their practices in**:
 - Education – teaching
 - Research
 - Development & Innovation





TRAINING ACTIVITIES IN SOUTH AMERICA

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September 2018 - Feedback

- To **continue** these types of events throughout the region
- To **generate documents** and **online content** with material about the courses (texts, slides, data, code), as well as articles from participants' presentations
- To create a **web page** and a data repository with the memory of the Schools, containing audiovisual material, participant's opinion and their contacts
- To produce **webinars** and to be able to transmit them on YouTube
- To **share information** for the continuity of the research, training and development of applications generated in the Schools
- To **keep updated** this **information**
- To create a **network of participants** and **institutions**, such as the Cyted Network - Ibero-American Program of Science and Technology for Development
- To explore **funding opportunities**
- To **increase lab hours** and **practical activities** in upcoming events
- To structure **presentations by specialists** as poster sessions



Conclusions & Learnt Lessons

- Despite proficiency in **English**, **Spanish** is largely preferred
- **Cost** is an issue for registration, material & software. Participants in all the courses have indicated they only use **free-access material**
- **Basics of remote sensing** are **present**, specially in the **optical domain**. Knowledge about microwave and **Synthetic Aperture Radar** systems is **largely missing**. Nevertheless, there is a clear interest in this technology
 - Need of introduction to **electromagnetism** (λ) & **basic maths** (complex number)
- **Training must be adapted to their needs** respect to:
 - **Training level**
 - **Applications**. They have different types of applications and needs
- Courses/Tutorial should be **organized jointly with local entities**
- There are **emerging** or **stablished research groups** in Basil, Argentina and in a lower extend Chile
- South American countries have **different cultures** and “**ways of doing things**”

| QUESTIONS?

— **Carlos Lopez-Martinez**

**Remote Sensing & Natural Resources Modelling Group
Luxembourg Institute of Science & Technology – LIST**

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