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

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IEEE GRSS

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PRESENTATION

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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 AND TRAINING ACTIVITIES

Elements of GRSS

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IEEE-GRSS EDUCATION AND TRAINING ACTIVITIES

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

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

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IEEE-GRSS EDUCATION AND TRAINING ACTIVITIES

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

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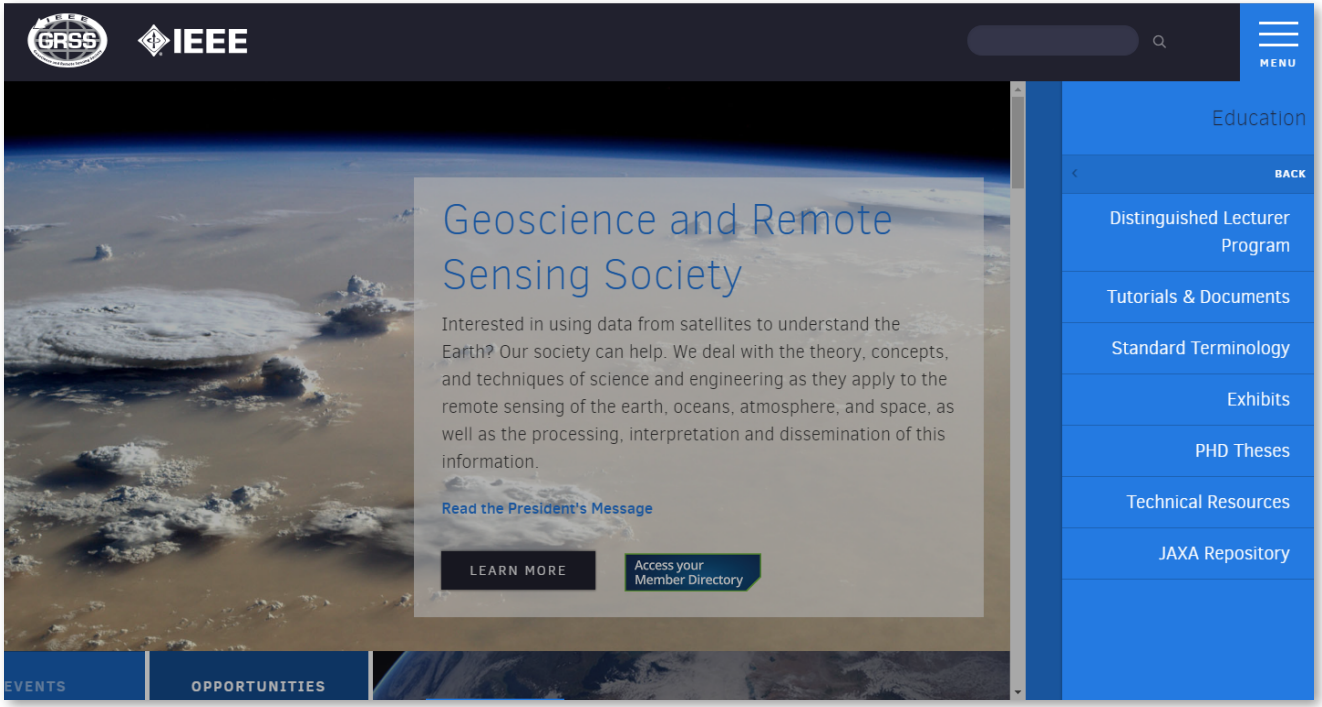
IEEE-GRSS EDUCATION AND TRAINING ACTIVITIES

IEEE-GRSS Education Website

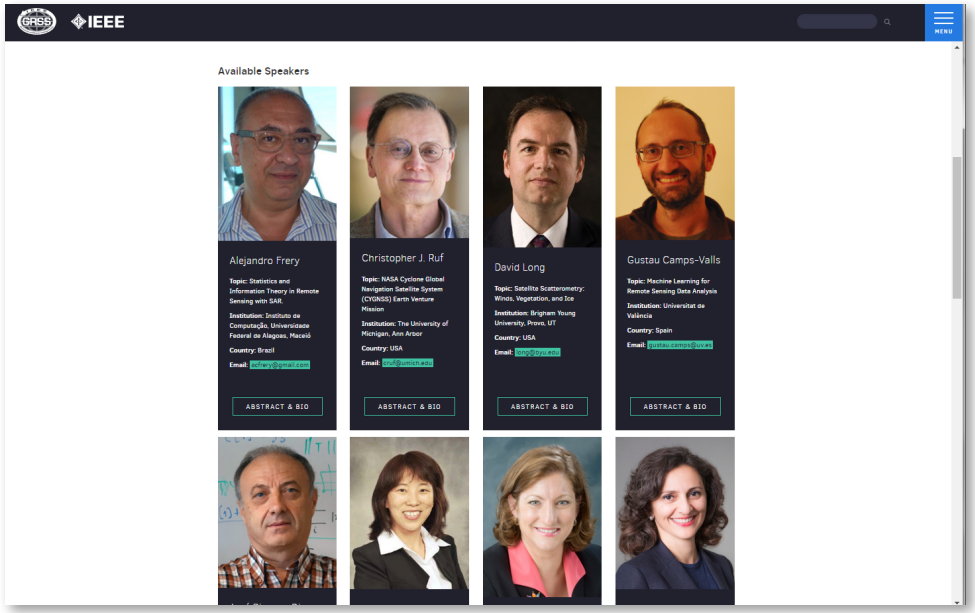
http://www.grss-ieee.org/ > Menu > Education



IEEE-GRSS EDUCATION AND TRAINING ACTIVITIES

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



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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/

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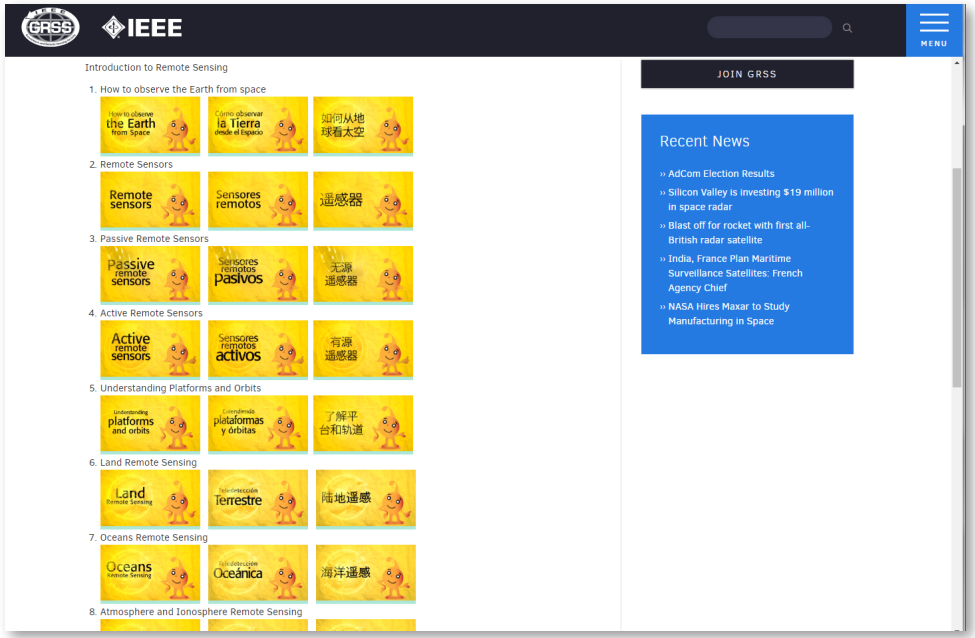
Cool Videos for Kids

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



Video

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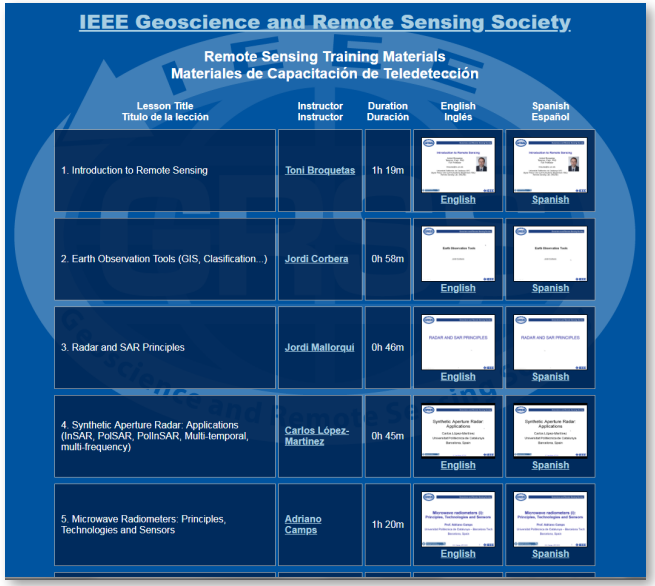
Online Remote Sensing Tutorial - Introduction

- 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. Malloquí)
  - 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)

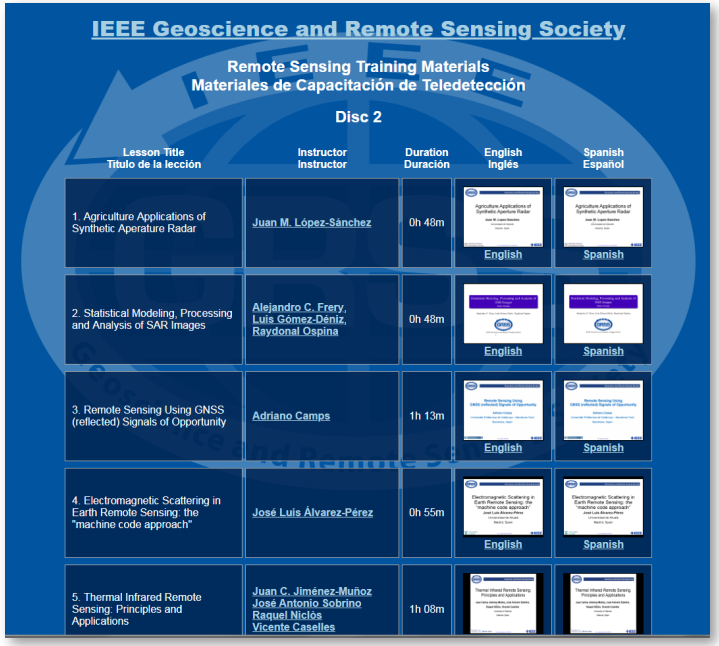


IEEE-GRSS EDUCATION AND TRAINING ACTIVITIES

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)



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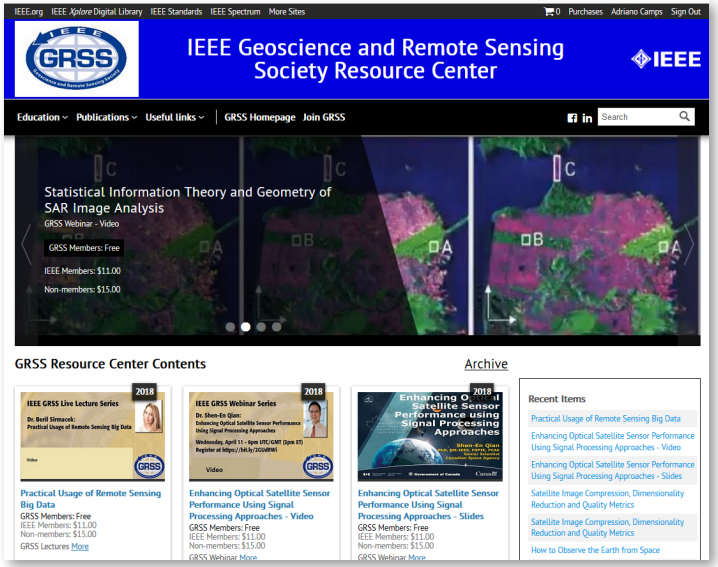
IEEE-GRSS EDUCATION AND TRAINING ACTIVITIES

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 Whales)



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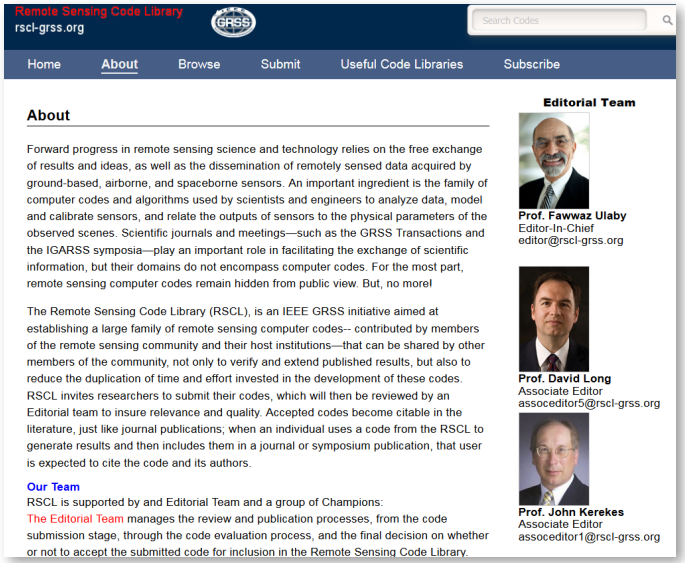
IEEE-GRSS EDUCATION AND TRAINING ACTIVITIES

Reproducible Research

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

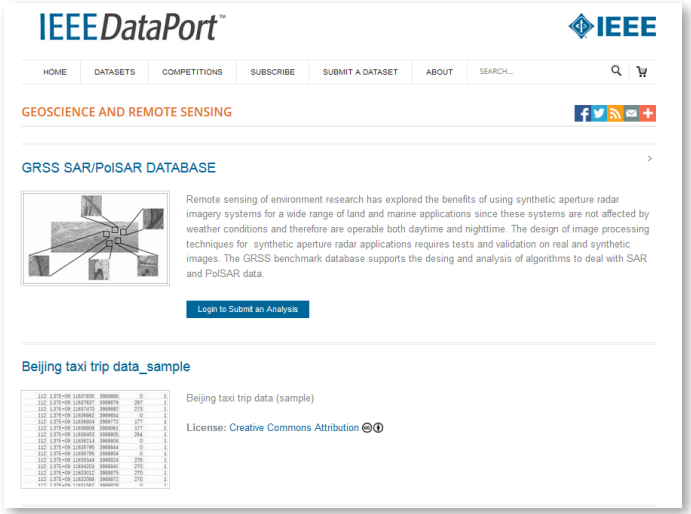
Remote Sensing Code Library

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



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

https://ieee-dataport.org/topic-tags/geoscience-and-remote-sensing



TRAINING ACTIVITIES IN SOUTH AMERICA

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

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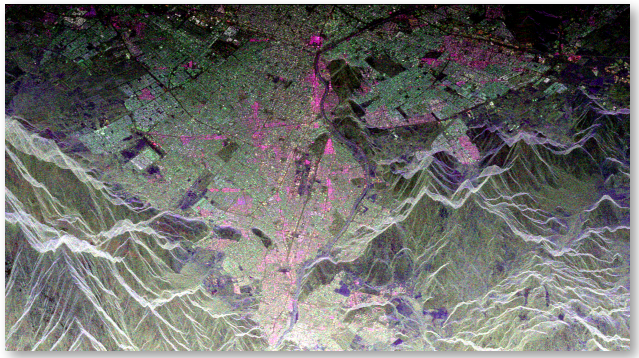
TRAINING ACTIVITIES IN SOUTH AMERICA

October 2010

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

TRAINING ACTIVITIES IN SOUTH AMERICA

November 2014

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

TRAINING ACTIVITIES IN SOUTH AMERICA

October 2015

GRSS/CONAE Course and meeting

- Title: Remote Sensing and its Applications
- 1 week course, Buenos Aires, Argentina
- Lecturers: Paolo Gamba, Alejandro Frery, Gianfranco Fornaro
- 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

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

TRAINING ACTIVITIES IN SOUTH AMERICA

October 2015

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

TRAINING ACTIVITIES IN SOUTH AMERICA

September 2016

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

TRAINING ACTIVITIES IN SOUTH AMERICA

November 2016

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

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TRAINING ACTIVITIES IN SOUTH AMERICA

September 2018

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	SÁBADO 15/09
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. (UNSAM/CONICET, Argentina)	**PRÁCTICO 1:** "Descarga y procesamientos 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.
10:00-10:30						
10:30-11:00 Cofee Break						"Alcances y aplicaciones de Radares Metereológicos" Dr. A. Rodríguez. (FCEFyN/UNC, Argentina) Dr. G. Caranti. (FAMAF/UNC, Argentina)
11:00-12:30						
12:30-13:30 Almuerzo						
14:00-15:00	ACTO DE APERTURA: Presentación de las actividades y instituciones participantes.	Fundamentos de SAR 2: "La imagen SAR. Ruido. 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)
15:30-16:00 Cofee Break						
15:00-17:00	"Misión SAOCOM y el proyecto SIASGE II" Dra. L. Frulla. (Inv. Principal de la Misión SAOCOM, Argentina)					

HORA / DÍA	LUNES 17/09	MARTES 18/09	MIÉRCOLES 19/09	JUEVES 20/09	VIERNES 21/09
09:00-09:45	"Principles of Operation and Land Applications" Dr. A. Camps (Pte. IEEE-GRSS)	"Aplicaciones InSAR en Argentina" Dr. P. Euillades. (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. Frery. Dr. C. Scavuzzo. Dr. A. Bhattachayra. Dr. Xiaofeng Li. Dra. A. Ferral. Mgter. R. Solorza.
09:45-10:30	"Characterizing groundwater induced land subsidence and uplift InSAR analysis" Dra. F. Cigna.	"Geometric Methods for analysis of multi-temporal anda multi-polarized SAR images" Dr. A. Bhattachayra.			
10:30-11:00 Cofee Break					
11:00-12:00	"Statistics for SAR image analysis" Dr. A. Frery. (Univ. Alagoas, Brasil)	"Change detection with SAR images" Dr. A. Frery.	"SAR applications in Oceanography" Dr. Xiaofeng Li. (NOOA, USA)	"Objective Evaluation of SAR despeckled data" Dr. L. Gómez Deniz.	
12:00-12:30 Almuerzo					
13:00-14:00	"Polarimetric SAR image analysis" Dr. A. Bhattachayra. (IIT, India)	"How to be lucky publishing" Dr. A. Frery.	"InSAR paso a paso" Dr. L. Euillades.	"Talleres de discusión de problemáticas con participantes" Dr. L. Gómez Deniz. Dr. A. Frery. Dr. C. Scavuzzo. Dr. A. Bhattachayra. Dr. Xiaofeng Li. Dra. A. Ferral. Mgter. R. Solorza.	PUESTA EN COMÚN Y CIERRE. Dr. L. Gómez Deniz. Dr. A. Frery. Dr. C. Scavuzzo. Dr. A. Bhattachayra. Dr. Xiaofeng Li. Dra. A. Ferral. Mgter. R. Solorza.
15:30-16:00 Cofee Break					
14:00-17:00	"Talleres de discusión de problemáticas con participantes" Dra. F. Cigna. Dr. López Martínez. Dra. C. Notarnicola. Dr. C. Scavuzzo.	"Talleres de discusión de problemáticas con participantes" Dra. F. Cigna. Dr. López Martínez. Dr. A. Bhattachayra. Dr. Euillades. Mgter. R. Solorza.	"Talleres de discusión de problemáticas con participantes" Dr. L. Gómez Deniz. Dr. A. Frery. Dr. C. Scavuzzo. Dr. L. Euillades. Dra. A. Ferral.		

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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

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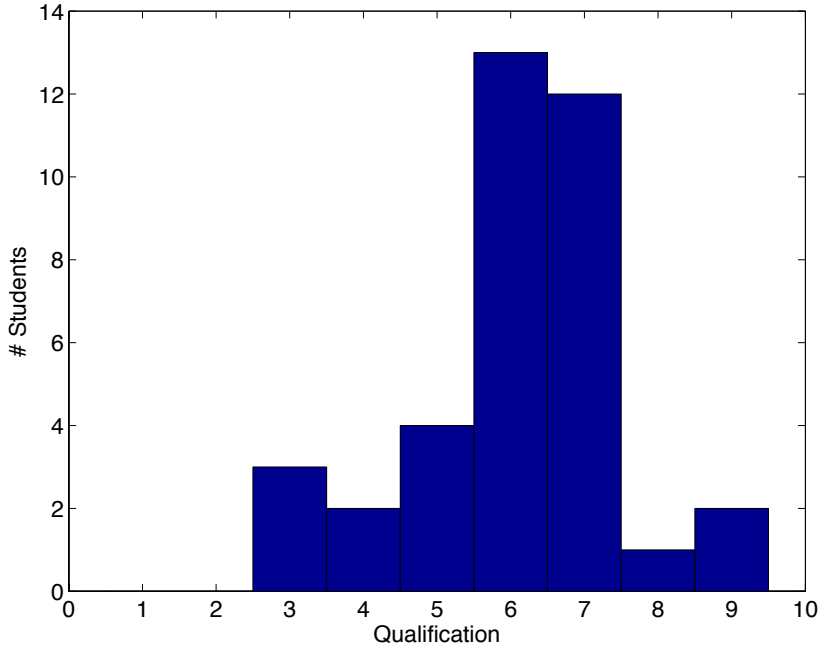
TRAINING ACTIVITIES IN SOUTH AMERICA

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

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

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

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TRAINING ACTIVITIES IN SOUTH AMERICA

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"

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QUESTIONS?

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