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

carlos.lopez@list.lu
Carlos LÓPEZ-MARTÍNEZ, PhD
Group Leader | Researcher
Carlos.lopez@list.lu
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
IEEE-GRSS Education & Training Activities

• Description of Activities
• Training Material

Training Activities in South America

• Description of Activities

Conclusions & Learnt Lessons
IEEE-GRSS EDUCATION AND TRAINING ACTIVITIES

Elements of GRSS

- Conferences
  - IGARSS
  - Small Confs: MIR-ATM, GNSS+R...
  - Future regional IGARSS

- Professional Activities
  - Chapters
  - Dist. Lecturers
  - Major awards
  - YP
  - Senior & Fellow

- Information Services
  - Tutorials
  - Webinars
  - Resource Center
  - IEEE DataPort
  - RSCL

- Technical Activities
  - TCs (new TC on Standards)

Carlos López-Martínez, carlos.lopez@list.lu, Oct. 2018
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/
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
- Webinars & MOOCs
IEEE-GRSS EDUCATION AND TRAINING ACTIVITIES

IEEE-GRSS Education Website

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

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
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.
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
- ...

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

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)

- **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-GRSS EDUCATION AND TRAINING ACTIVITIES

Online Remote Sensing Tutorial - Applications

- Online 8h course recorded in **English & Spanish** (GRSS Mem. necessary)

- 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)
- Real-Time Hyperspectral Imaging (S. López)
IEEE-GRSS EDUCATION AND TRAINING ACTIVITIES

IEEE-GRSS Society Resource Centre

• **Webinars series started**: Good mix of academia and industry
• **MOOCs** under creation in collaboration with UNSW (University of New South Whales)
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
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

November 2014

Carlos López-Martínez, carlos.lopez@list.lu, Oct. 2018
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
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
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
IEEE-GRSS Young Professionals & ISPRS Summer School

- Brazil
- Tutorials taught in English
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
<table>
<thead>
<tr>
<th>Course content</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Theory lectures</strong></td>
<td></td>
</tr>
<tr>
<td><strong>One complete day of practice based on the ESA-SNAP toolbox</strong></td>
<td></td>
</tr>
<tr>
<td><strong>One day for specific problems discussion with lecturers/specialists</strong></td>
<td></td>
</tr>
</tbody>
</table>

**TRAINING ACTIVITIES IN SOUTH AMERICA**  
September 2018

Carlos López-Martínez, carlos.lopez@list.lu, Oct. 2018
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
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.
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
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 ($\lambda$) & 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 established 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
carlos.lopez@list.lu