



“USE OF SAR REMOTE SENSING IN CULTURAL AND NATURAL HERITAGE”

THEORETICAL AND PRACTICAL COURSE

Organized by
Consiglio Nazionale delle Ricerche (CNR), European Space Agency (ESA) and Comisión Nacional de Actividades Espaciales (CONAE),

Supported by **MAE (Ministro degli Affari Esteri e Cooperazione Internazionale)**

25 to November 28, 2014, Buenos Aires, Rome, Potenza

INTRODUCTION

The tremendous availability of remote sensing data available has opened new challenging prospects for the use of Earth Observation (EO) in Archaeology not only for probing the subsurface to unveil sites and artifacts, but also for the management and valorization as well as for the monitoring and preservation of cultural resources. EO technologies are allowing the international scientific community to better understand the global environment and how it is changing. Complemented by aircraft and ground studies, satellite from active and passive sensors are providing, on certain archaeological sites, clearer insights into those environmental changes which are caused by nature and those changes which were induced by human activity.

OBJETIVES

Provide participants with a theoretical and practical training in remote sensing RADAR that facilitates the incorporation of this tool in the scientific and professional work and allow them to develop appropriate operational method to face and solve different problems. Reflecting on the limitations and possibilities offered by this tool in the study of natural and cultural heritage. Provide guidance on the proper selection of the radar data and the use of different digital processing techniques.

PROGRAMME

Tuesday, November 25, 2014

SESSION I INTRODUCTION SAR REMOTE SENSING

09.00-09.45. Fundamentals SAR remote sensing. Basics. Space programs. SAR Sensors. Geometry SAR images - Radiometry SAR images. Speaker: Graciela Salmuni (CONAE-Buenos Aries) and Rosa Lasaponara (CNR-Potenza)

09.45-10.00. Processing of SAR images. Interpretation of SAR images. Speaker: Graciela Salmuni (CONAE-Buenos Aries) and Rosa Lasaponara (CNR-Potenza)

10:00 – 10:30 *coffee break*

SESSION II USE OF SAR REMOTE SENSING IN ARCHEOLOGY (TELECONFERENCE WITH ESA) (02.30 pm to 04.30 Rome time)

10:30-11:30 Introduction to SAR missions (from historical missions to present : missions, including Sentinel-1). Introduction to the catalog for sentinel-1 data access - . Speaker: Francesco Sarti

11.30-12:30 Introduction to the NEST and Sentinel-1 SAR processing toolboxes -. Speakers: Fabiano Costantini, Chris Stewart

12.30-13.00 Acquisition parameters: frequency, polarization, resolution, acquisition angles, date of acquisition etc. Format of data (processing level, metadata, focusing on different type of SAR: COSMO, Terra, selection from catalogues, etc). Data selection according to the specific processing for the archeological applications. Graciela and Rosa (slides from Chris/Fabiano)

13:00 - 14:00 *lunch*

SESSION III PRACTICE I: INSTALL SOFTWARE AND LOAD THE DATA

14:00-15:30 *Install the NEST software. Visit ESA and NEST website. Introduction to the NEST manuals and tutorials (Rosa e Graciela) (Chris/Fabiano: provide link)*

15:30 – 15:45 *coffee break*

15:50-17:00 Introduction to the catalogues of the SAR data: COSMO SkyMed, ENVISAT (slides on EOLI from Chris and Fab), Sentinel-1 (slides on Data hub from Chris/Fabiano) and others

Wednesday, November 26, 2014

SESSION IV: INTRODUCTION TO NEST SOFTWARE

09.00-10:00 This tutorial answers to these questions by presenting a few scenarios of remote processing and visualization of SAR data using NEST.

10:00 -10:30 *coffee break*

(TELECONFERENCE WITH ESA) (02.30 pm to 05.30 pm Rome time)

- 10:30-11:00 Questions and live discussion on NEST SAR processing toolboxes
11:00-13:00 Practical exercises with NEST and/or Sentinel-1 SAR processing toolboxes (basic functions) - Speaker: Fabiano Costantini

The participants will learn the concepts and principles of SAR pre-processing functions (such as calibration, co-registration, de-speckling, multilooking) and will follow step by step practical exercises using a SAR processing SW package

- 13:00-13.30 Examples of SAR Remote Sensing applications to Archaeology (theory) - Speaker: Chris Stewart

13:30 - 14:30 *Almuerzo*

SESSION V: PRÁCTICA II: SAR IMAGES VISUALISATION AND COMPARATION WITH OPTICAL IMAGES

- 14:30-15:30 Opening and viewing SAR images with different characteristics - Analysis of property
Speakers: Graciela Salmuni (CONAE-Buenos Aries) and Rosa Lasaponara (CNR-Potenza)
15:30 – 15:45 *coffee break*
15:50-17:00: Observation and Interpretation of SAR images of different environments - Comparison with optical data. Speakers: Graciela Salmuni (CONAE-Buenos Aries) and Rosa Lasaponara (CNR-Potenza)

Thursday, November 27, 2014

SESSION VI: SAR CONCEPTS AND TOOLS

- 09.00-10.00. Theory: Construct arithmetic expressions using conditional, comparison, and arithmetic operators as well as mathematical functions, average after speckle filtering, ROI analysis, evaluating how the sigma 0 varies during the time Speaker: Graciela Salmuni (CONAE-Buenos Aries) and Rosa Lasaponara (CNR-Potenza)

10:00 – 10:30 *coffee break*

TELECONFERENCE WITH ESA (2.30 pm to 5.30 pm Rome time)

- 10:30-12:00. Polarimetric results for Archaeology
12:00 – 13:30 Practical exercises with POLSARPRO Speakers: Jolanda Patruno and Nicole Doré

13:30 - 14:30 *lunch*

SESIÓN VII: PRACTICE III: CALIBRATION, COREGISTRATION, SPECKLE FILTERS AND MULTILOOKING

14:30-15:30. Using NEST software calibration, co-registration, apply speckle filters and multi-looking

Speakers: Graciela Salmuni (CONAE-Buenos Aries) and Rosa Lasaponara (CNR-Potenza)

15:30 – 15:45 *coffee break*

15:50-17:00: Continuation of exercises for SAR data processing. Speakers: Graciela Salmuni (CONAE-Buenos Aries) and Rosa Lasaponara (CNR-Potenza)

Friday, November 28, 2014

SESSION VIII: ADVANCED SAR CONCEPTS AND TOOLS

09.00-10:00. Theory: Terrain corrections, Radiometric Normalization, Mosaicking.

Speakers: Graciela Salmuni (CONAE-Buenos Aries) and Rosa Lasaponara (CNR-Potenza)

10:00 – 10:30 *coffee break*

(TELECONFERENCE WITH ESA) (02.30 pm to 05.30 pm Rome time)

10:30-12:45 Practical exercises with NEST and QGIS on Terrain corrections, Radiometric Normalization, Mosaicking. Speakers: Chris Stewart, Fabiano Costantini

12:45-13:30. Interferometric results for Archaeology, Speaker: J. M. Delgado Blasco

13:30 - 14:30 *lunch*

SESSION IX: PRACTICE IV: ADVANCED SAR PROCESSING

13:00-15:30. Using NEST software (Apply Terrain corrections, Radiometric Normalization, Mosaicking). Speakers: Graciela Salmuni (CONAE-Buenos Aries) and Rosa Lasaponara (CNR-Potenza)

15:30 – 15:45 *coffee break*

15:50-17:00: Continuation of exercises for SAR data processing. Speakers: Graciela Salmuni (CONAE-Buenos Aries) and Rosa Lasaponara (CNR-Potenza)

SOFTWARE: Nest

Data SET: will provide by CNR, CONAE and ESA

Number of experts: 2 CONAE: Graciela Salmuni and Daniela Marchionne; 2 CNR: Rosa Lasaponara and ;
6 selected by the European Space Agency : Francesco Sarti, Chris Stewart, Fabiano Costantini, Jolanda
Patruno, Nicole Doré and J. M. Delgado Blasco

Number of participants: **20**.

Level of the participants: **University level, partially with remote sensing experience.**

Location:

- Conference Room in CONAE location in the Ciudad Autónoma de Buenos Aires, Paseo Colón 751
CABA, Bs As
- CNR C.DA S. LOYA - ZONA INDUSTRIALE – 85050 TITO SCALO - POTENZA (ITALY)

Duration: **4 days**

Date: **25-28 November 2014, from 9am to 5pm**

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