



PROJECT DESCRIPTION

Remote sensing

The Active Remote Sensing Group belongs to the Remote Sensing Laboratory (RSLab), which is a part of the Signal Theory and Communications Department (TSC). The activities of this group are related with the observation of the Earth surface by means of active remote sensing systems, especially with Synthetic Aperture Radar (SAR) systems, comprising from the conception and construction of real systems up to the final applications, passing through the theoretical analysis and characterization of the data. These research activities are carried out in a context of international collaboration with well reputed institutions and private companies. The Active Remote Sensing group has several research lines where collaboration is offered:

- GBSAR system: The GBSAR developed by the RSLab is a ground-based SAR zero base-line interferometer with polarimetric capabilities designed for field use. Current research is focused on boarding the system on a UAV platform. The interferometric capabilities of the developed systems allow retrieving information related to the ground displacement along the sight-line of the radar system with a very high precision. Data gathered in this imaging mode allows to the GBSAR to be used as a real time Early Warning System for hazards monitoring (landslides, subsidences, etc...).
- Bistatic systems: There is an increasing scientific interest in bistatic SAR (BiSAR) systems, which allow measurements in a wide range of geometries, that allow to investigate new scattering mechanisms. The RSLab is developing a family of fixed-receiver BiSAR systems that use existing orbital SAR systems as transmitters of opportunity. These systems are primarily intended for differential interferometry applications. Possible research activities related to our BiSAR activities range from technological development to the development of advances BiSAR processing algorithms.
- mmW and THz Imaging systems. Active (Radar) and Passive (Radiometer) System architectures and front-end technologies for real-time passenger and luggage scanning for security applications.
- SAR Interferometry (InSAR) and SAR Differential Interferometry (DInSAR): InSAR makes possible to study the terrain topography and remotely generate Digital Elevation Models for large areas. The terrain deformation caused by subsidence phenomena can also be monitored from satellites or airborne platforms with DInSAR techniques, with milimetric precision.
- SAR Polarimetry (PolSAR): PolSAR allows an accurate extraction of bio- and geophysical parameters of the Earth Surface, which can be employed to improve, for instance, terrain classification. The research activities cover from the statistical modelling, filtering, simulation and estimation of data to the definition and assessment of electromagnetic models for the extraction of bio- and geophysical parameters.
- Polarimetric SAR Interferometry (PolInSAR): aims to mix the capabilities of both interferometry and polarimetry. It has opened the door to quantitatively analyze forested areas to extract biophysical parameters and to develop new classification methods for vessel monitoring and improve the performance of DInSAR techniques.
- Time-frequency analysis: Time-frequency analysis tools, as the Wavelet transform, have shown a very good performance in solving different problems present on SAR data understanding and exploitation. These tools have been employed in the group to propose new filtering techniques, to detect vessels in the sea, to perform a fine detection of the coast line and to detect and characterize oil spills.

RESPONSIBLE UPC RESEARCHER

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UPC RESEARCHER CONTACT

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TYPE OF RESEARCH COOPERATION ENVISIONED

Primarily PhD Students, but also open for Post-Doc and Sabbatical stages.

FUNDING AND FACILITIES OFFERES

The group can cover all expenses for doing the PhD thesis in our group. The expenses include registration fees, grant and medical insurance. The group, in the scope of different projects, has access to a large dataset of SAR images from orbital (ERS, ENVISAT, RADARSAT1/2, TerraSAR-X and bistatic SABRINA), airborne sensors (DLR's E-SAR) and ground-based (UPC's GB-SAR).