Training Opportunity for Portuguese Trainees

Reference	Title	Duty Station
PT-2020-[EOP-PWM]	**Satellite Synthetic Aperture Radar Interferometry (InSAR): Synergistic combination of C- and L-band data for cross-calibration and geophysical parameter estimation**	**ESA-ESTEC EOP-PWM Tutor: Dr. Dirk Geudtner**

Overview of the unit's mission:

Sentinel-1 is the Synthetic Aperture Radar (SAR) Earth Observation mission of the EU-ESA Copernicus Space Component. Copernicus is the most ambitious Earth observation program to date. It is a cornerstone of Europe's efforts to monitor the planet and its many ecosystems.

The Sentinel-1 mission acquires systematically and provides routinely a large volume of C-band SAR data to the European Copernicus services and to the global scientific and commercial user community. The Sentinel-1 mission is implemented through a pair of identical C-band SAR satellites comprising the current Sentinel-1A&B units, launched in 2014 and 2016, respectively. The near-term continuity is ensured by Sentinel-1 C&D, currently under development.

The systematic SAR data acquisition using the novel Interferometric Wide Swath (IW) mode along with the 6-day repeat orbit cycle of the constellation enables the build-up of long data time series supporting especially SAR interferometry (InSAR)-related geophysical applications. In fact, a major highlight of the Sentinel-1 mission is the cross- (inter-satellite) InSAR mapping capability, which combines data acquired by Sentinel-1A&B from repeat-pass orbits. This enables an instantaneous mapping of wide-area surface deformation, caused, e.g. by tectonic processes or ground subsidence, as well as the monitoring of ice sheet and glacier dynamics.

As part of the ESA Copernicus long-term scenario, the Sentinel-1 Next Generation (NG) will ensure the C-band data continuity beyond the next decade. In addition, as part of preparatory activities for the Copernicus expansion, ESA has initiated the study phase for an L-band SAR mission to provide complementary observations to the C- band data. In particular, an L-band SAR will significantly improve the performance of repeat-pass InSAR-based measurements of land surface deformation and cryosphere dynamics (i.e. ice shelves and glacier flow).

The Sentinel-1 Project team is responsible for the development of the mission concept, the spacecraft and the SAR payload, as well as for the launch and in-orbit commissioning (end-to-end calibration). This also involves the development of prototype SAR and InSAR data processors and the Calibration and Performance Analysis Facility (CPAF).

Interested candidates are encouraged to visit the ESA website: www.esa.int/ESA

https://sentinel.esa.int/web/sentinel/missions/sentinel-1

http://www.un-spider.org/news-and-events/news/sentinel-1-mission-makes-use-insar-track-land-deformation

http://www.esa.int/Our_Activities/Observing_the_Earth/Copernicus/Sentinel-1/Sentinel-1_provides_new_insight_into_Italy_s_earthquake

European Space Agency
Agence spatiale européenne

Overview of the field of activity proposed:

The trainee's activities will focus on researching the feasibility for the synergistic analysis and calibration of Sentinel-1 C-band and L-band data (e.g. from ALOS-2/PALSAR mission) with the objective to evaluate the adequacy of the Sentinel-1 and L-band SAR system performance for deriving geophysical parameters with sufficient accuracy. This will involve the development of tools for SAR interferometry processing and SAR instrument cross-calibration to derive geophysical parameters related to the monitoring of cryosphere dynamics, e.g. glacier flow and sea-ice drift, as well as the mapping of surface deformation, e.g. earthquakes and volcanic activities. The objective is to implement these methods and algorithms in the Calibration and Performance Analysis Facility (CPAF) environment.

In particular, it will involve the following activities:

a) Analyse the performance evolution of the Sentinel-1 C/D SAR instrument, particularly for cross-InSAR implementation,

b) Evaluate the adequacy of the SAR system performance for deriving geophysical parameters with sufficient accuracy considering the instrument calibration concept,

c) Analyse the feasibility for the synergistic combination of C- and L-band InSAR measurements for deriving geophysical parameters with sufficient accuracy considering calibration methods, such as ionospheric correction, and

d) Develop geophysical retrieval algorithms considering novel processing and calibration methods, different radar Line-of-Sight (LOS) imaging geometries to monitor surface motion in the challenging N-S direction.

e) Verify the implementation of these algorithms in the Calibration and Performance Analysis Facility (CPAF) environment.

Required education:

Applicants should have just completed, or be in their final year of a University course at Masters Level (or equivalent) in electromagnetics, geophysics, remote sensing or in a related engineering or scientific discipline.
Previous experience in SAR remote sensing or radar data processing and calibration or development of geophysical retrieval algorithms, and familiarity with the development of software would be an asset.

In addition, applicants should demonstrate good interpersonal skills and the capacity to work both independently and as part of a team. During the interview the candidates' motivation and overall professional perspective/career goals will also be explored.

The working languages of the Agency are English and French. A good knowledge of one of these languages is required. Knowledge of another Member State language would be an asset.