

Training Opportunity for Luxembourgish Trainees

| Reference | Title | Duty Station |
|-----------------|-------------------|--------------|
| LU-2022-EOP-SDS | Coastal Altimetry | ESRIN |

Overview of the mission

The Data Applications Division in the Department of Science, Applications and Climate based at ESA/ESRIN in Frascati, Italy, is in charge of engaging scientific, public and commercial sector user communities, identifying their needs, implementing EO data exploitation projects, tools and platforms to address these needs, and progressively transferring validated results and applications from research to operations. The Division builds up new scientific and end-user communities and works with them in targeted R&D and demonstration activities, that range from science up to pre-commercial applications development, to advance Earth system knowledge, maximise ESA missions impact in society and underpin the definition of future EO systems. The Division is responsible for coordinating ESA's EO training and education activities.

Overview of the field of activity proposed

As part of the R&D Section, the candidate will be involved in ESA Radar Altimetry research mainly in the areas of SAR and SARin altimetry for **Oceanic Coastal Zones, extendible to Inland Waters and Estuaries**. Research will be dedicated to develop and validate innovative Delay-Doppler processing algorithms and consolidate the algorithms and methods for the use of SAR and SARin of **CryoSat** data and SAR of **Sentinel-3** and **Sentinel-6** data for Coastal Altimetry (Sea Level Rise and Coastal Hazards) and Inland Waters (Coastal Flooding due to River Discharge). Adding other imaging sensors to support **Coastal Hazards Monitoring** will be considered, as well as Investigating methods of Artificial Intelligence, Deep Learning and Big Data for very near shore altimetry.

Tasks: Process CryoSat, Sentinel-3 and Sentinel-6 data to derive Sea Level in the Coastal Zone

- Get up-to-date with the state of the art in deriving Sea Level in the Coastal Zone from space (Radar Altimetry, Gravity, Imaging Sensors both optical and microwave).
- Analyse the limitations of the existing pilot demonstration processors. Propose evolutions towards a reliable and sustainable processing system.
- Develop (or adapt from existing precursors) a Coastal Sea Level estimator starting from the Level 1A data from CryoSat in SAR and SARin mode and Sentinel-3A, -3B and -3C, using the GPOD service SARvatore (<http://wiki.services.eoportal.org/tiki-index.php?page=GPOD+SENTINEL-3+SARvatore+Software+Prototype+User+Manual>). Process CryoSat and Sentinel-3 data over a selected area.
- Develop (or adapt from existing precursors) a Coastal Sea Level estimator over a selected area (involving other sensors or auxiliary data).
- Validate the methods using in situ data.
- Study how to enhance the estimation of Coastal Sea Level as close as possible to the coast, using data from an imaging instrument. Prototype the method and apply on a selected area.
- Participate in an experiment to apply Fully-Focused SAR Altimetry processing on a small area very near shore.
- Investigate methods of Artificial Intelligence, Deep Learning and Big Data for very near shore altimetry.
- Eventually explore SWOT simulated or real data (depending on launch date) to explore synergies with SAR Altimetry for improvements in very near shore altimetry.

- Write a report. Publish in ESA workshops and at EGU. Eventually submit a manuscript to the journal Advances in Space Research for peer-reviewed publication.

Required background

- Master's degree in a technical or scientific discipline
- Good interpersonal and communication skills
- Ability to work in a multi-cultural environment, both independently and as part of a team
- Fluency in English and/or French, the working languages of the Agency