

## Towards FRM observations for hydrology and cryosphere Sentinel-3 Cal/Val activities: the St3TART project

Elodie Da Silva (NOVELTIS, )

**Nicolas Picot** (CNES, France); **Henriette Skourup** (DTU Space, Denmark); **Geir Moholdt** (Norwegian Polar Institute, Norway); **Jean-Christophe Poisson** (VORTEX.io, France); **Ole Andersen** (DTU Space, Denmark); **Laurent Arnaud** (IGE, France); **Jérémy Aublanc** (CLS, France); **Sajedah Behnia** (NPL, Germany); **Etienne Berthier** (LEGOS/OMP/CNRS, France); **Mathis Bertin** (NOVELTIS, France); **Denis Blumstein** (CNES, France); **Pascal Bonnefond** (SYRTE/OBSPM, France); **François Boy** (CNES, France); **Stéphane Calmant** (LEGOS/IRD, France); **Michel Calzas** (DT-INSU/CNRS, France); **Stefania Camici** (CNR-IRPI, Italy); **Mathilde Cancet** (NOVELTIS, France); **Jean-François Cretaux** (LEGOS/OMP/CNRS, France); **Jacob Fahy** (NPL, United Kingdom); **Vincent Favier** (IGE, France); **Roger Fjortoft** (CNES, France); **Sara Fleury** (LEGOS/OMP/CNRS, France); **Renée Fredensborg Hansen** (DTU Space, Denmark); **Benoit Laignel** (M2C/University of Rouen, France); **Emmanuel Le Meur** (IGE, France); **Antonio Lourenco** (LOCEAN/IPSL/CNRS, France); **Jérôme Maxant** (SERTIT/Connectus/University of Strasbourg, France); **Ashley Morris** (Norwegian Polar Institute, Norway); **Eric Munesa** (NOVELTIS, France); **Karina Nielsen** (DTU Space, Denmark); **Adrien Paris** (Ocean Next, France); **Ghislain Picard** (IGE, France); **Antoine Rabatel** (IGE, France); **Nico Sneeuw** (GIS/University of Stuttgart, Germany); **Nicolas Taburet** (CLS, France); **Angelica Tarpanelli** (CNR-IRPI, Italy); **Mohammad Tourian** (GIS/University of Stuttgart, Germany); **Guillaume Valladeau** (VORTEX.io, France); **Maxime Vayre** (CLS, France); **Frédéric Vivier** (LOCEAN/IPSL/CNRS, France); **Emma Woolliams** (NPL, United Kingdom); **Hervé Yésou** (SERTIT/Connectus/University of Strasbourg, France); **Lionel Zawadzki** (CNES, France); **Pierre Féménias** (ESA/ESRIN, Italy)

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The Copernicus Sentinel-3 Surface Topography Mission (STM), based on a constellation of two satellites, provides extremely valuable surface elevation information over inland waters, sea ice and land ice, thanks to its SAR altimeter which retrieves high-resolution along-track elevation measurements, and to its orbit that covers high-latitude polar regions. To ensure that these measurements can be used with confidence, and to maximize the return on investment of the Copernicus Sentinel-3 STM, adequate validation of the geophysical retrieval methods, processing algorithms and corrections must be performed, considering independent observations as Reference Measurements.

St3TART is an EU and ESA funded project led by NOVELTIS with a consortium of 17 European partners (CNES, DTU, NPI, vortex.io, LEGOS, Hydro Matters, CLS, LOCEAN, IGE, SERTIT, GIS, CNR-IRPI, NPL, DT/INSU, IRD, M2C, SYRTE). It aims to generalize the concept of Fiducial Reference Measurements (FRM) for the Copernicus Sentinel-3 STM and to collect and distribute FRM data for the validation of the satellite mission over inland waters, sea ice and land ice. The provision of FRM will serve the validation activities of the ESA S3 Land Altimetry products, currently performed by the Sentinel-3 Mission Performance Centre, with the support of the Sentinel-3 Validation Team, for the sake of performance assessment and fitness-for-purpose of the Sentinel-3 STM Land core products. Those products cover inland waters, land-ice and sea-ice areas.

The objective of the St3TART project is not only to collect existing data or measure new observations during field campaigns, but to ensure that these observations meet the criteria of FRM standards and can be used in an operational way for the validation of the Sentinel-3 Land topography mission. Within the project, field campaigns are means to provide operational observations for the validation of the Sentinel-3 data.

In addition of the definition and consolidation of methods and protocols for the validation of the Sentinel-3 Altimetry Land products with FRM measurements, a roadmap will be drawn for the operational provision of FRM for the Sentinel-3 validation, considering the most relevant and cost-effective methods to be maintained, supported as far as possible or implemented. This will include guidelines for SI traceability, definition of the FRM measurement procedures, processing methods, and uncertainty budgets estimation. Several FRM campaigns have already been executed in sea ice covered region (Greenland) and on hydrological sites (on Garonne, Rhine and Po rivers), based on the first recommendations gathered in this roadmap.

A platform is under development to publicly disseminate the FRM data and measurements gathered within the St3TART project in order to facilitate the validation of the Sentinel-3 STM Land data products, with fully characterized and documented FRM processing and measurements. The St3TART project also supports the community with the development of SCAISIT, a tool intended to help identifying in-situ Cal/Val sites over Inland Water Surfaces.

We will present the main objectives, tools and outcomes of the project.

**Corresponding author:**

**Elodie Da Silva**

NOVELTIS

elodie.dasilva@noveltis.fr