PROGRAMME OF THE EUROPEAN UNION

Copernicus ROSE-L
Radar Observing System for Europe in L-Band

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EUROPEAN SPACE AGENCY

ESA Advanced Training Course on Land Remote Sensing – 07 September 2026

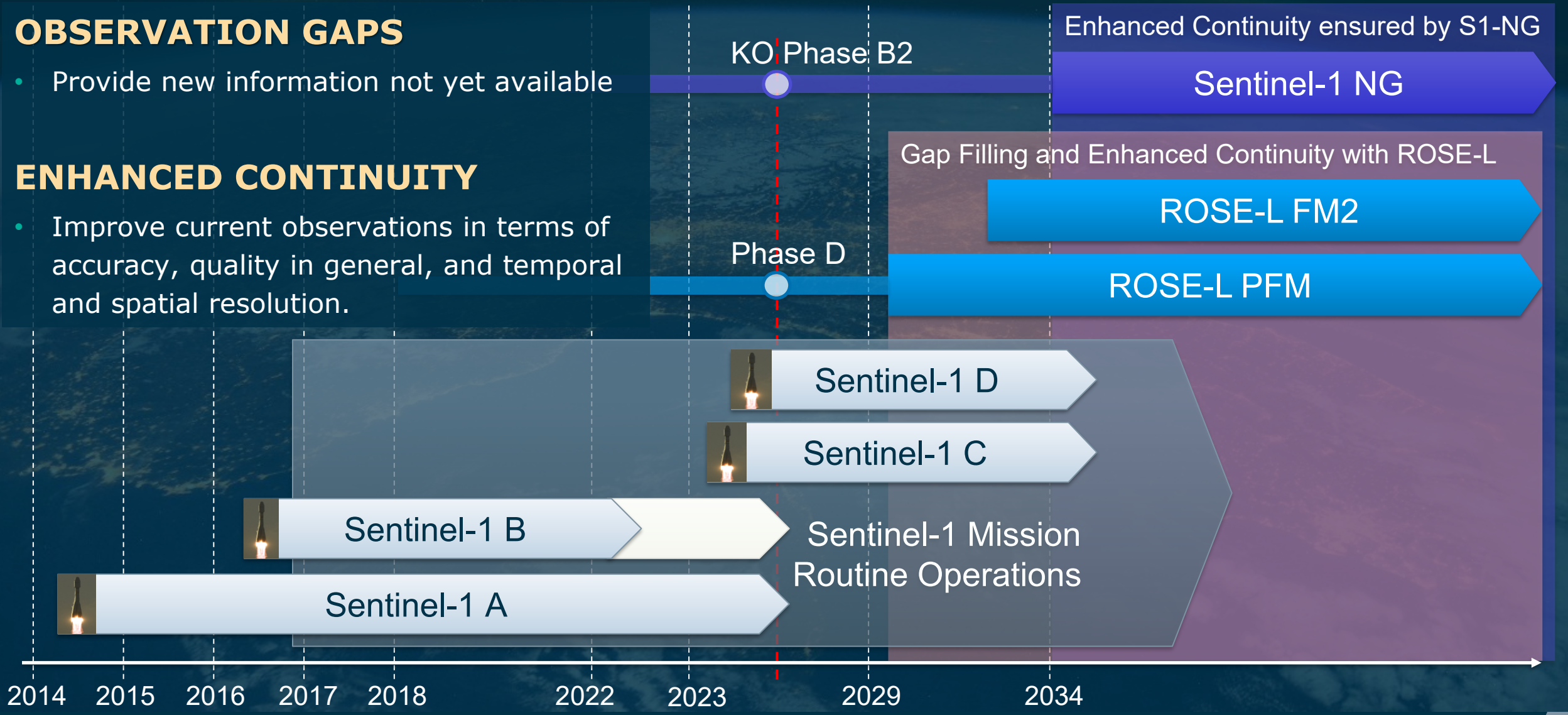
Copernicus SAR Timeline

OBSERVATION GAPS

- Provide new information not yet available

ENHANCED CONTINUITY

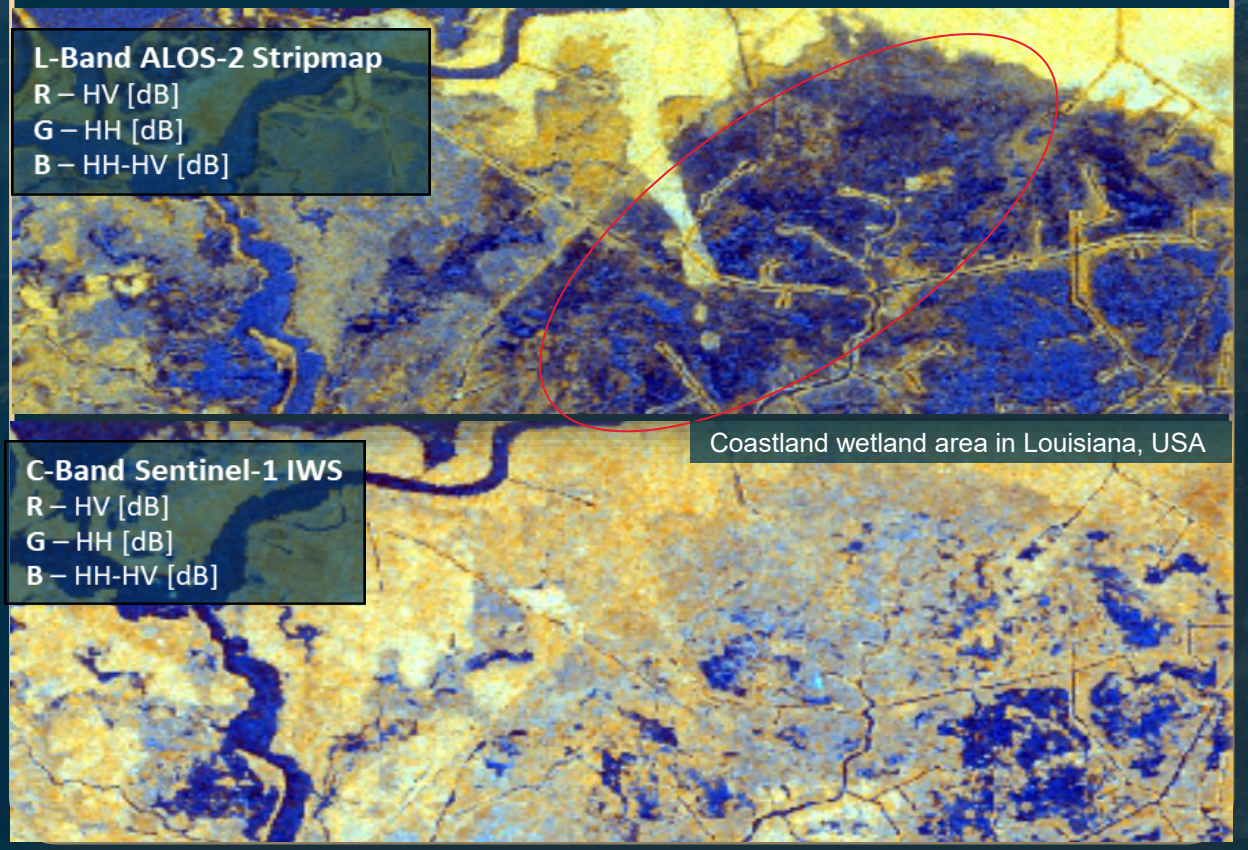
- Improve current observations in terms of accuracy, quality in general, and temporal and spatial resolution.



L-Band for ‘In-Depth’ Scene Visibility

SENSING SOIL AND WATER BELOW CANOPY

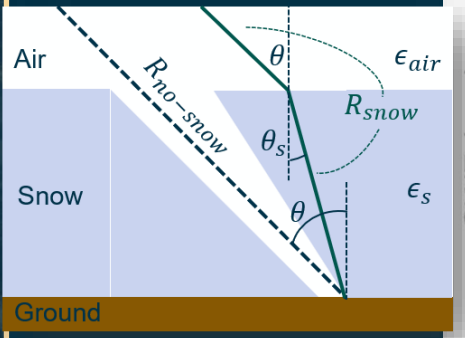
- **High-resolution Soil Moisture information (up to ~5 cm depth)** over crops and vegetated land, due to penetration capability
- **Improved ground motion information in vegetated terrains**
- **Improved Flooding sensitivity in vegetated terrains**

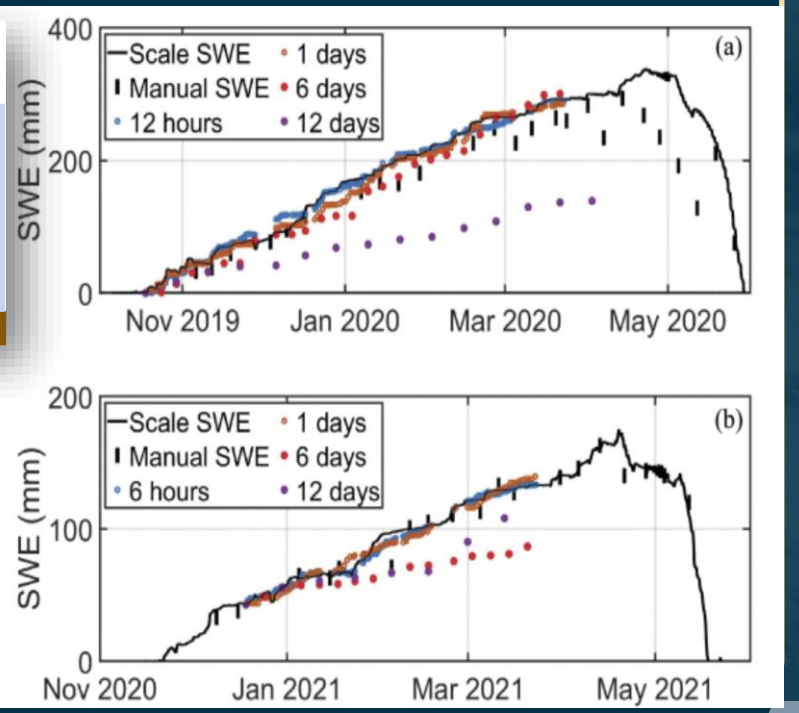


Coastland wetland area in Louisiana, USA

ROBUST SENSING OF DRY SNOW

- **Frequent wet snow maps** provided by C-band, see current SAR Wet Snow (SWS) product by CLMS
- **Information on Snow Water Equivalent (SWE) from InSAR at L-band,** enabled by higher coherence and unambiguous measurement of SWE changes
  - Consolidation of models and algorithms foreseen for tackling topography, melt/rain events and atmosphere noise





SWE accumulation profiles for a non-vegetated area in Sodankylä, Northern Finland, and the L-band SWE estimates from a ground-based radar mounted on a tower for (a) 2019–2020 winter season and 12 h, one day, six days, and 12 days temporal baselines and (b) 2020–2021 winter season and 6 h, one day, and seven days’ temporal baselines. From Ruiz et al. 2022, TGARS

SAR Missions and Copernicus Services

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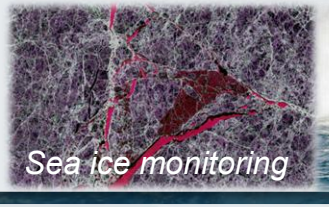
C3S





- Sea ice type, concentration and motion
- Ice sheets & glaciers velocity
- Grounding line
- Snow water
- Ice sheet melt/freeze extent
- Permafrost thawing and extent

CMEMS





- Sea ice type, concentration and motion
- Iceberg location, size and drift
- Ocean surface wind vectors
- Swell properties
- Ocean surface currents

CLMS









- Land use and land use change, including agriculture and forestry
- Soil moisture
- Forest biomass and structure
- Snow water
- Wet snow extent
- Ground movement

EMS





- Flooded area
- Ground movement
- Soil moisture
- Abrupt surface elevation changes

Security

EMSA
FRONTEX



- Iceberg location, size and drift
- Vessel location, size and velocity
- Oil spill location and morphology

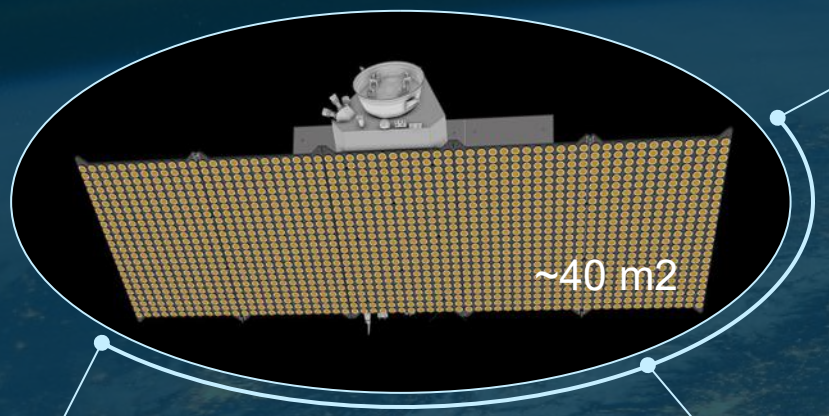


User Needs

- Polar Expert Group
- REDD+
- UNFCCC
- ….



ROSE-L Mission in Brief



MISSION PROFILE

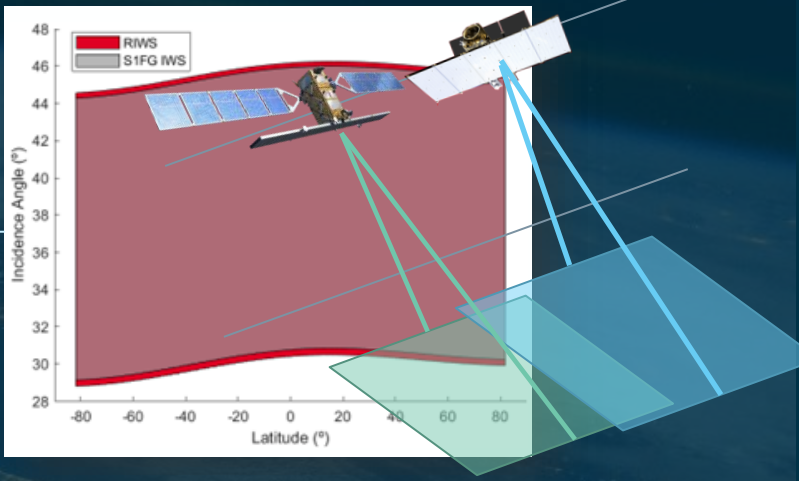
- Constellation of 2 satellites (PFM & FM2)
- Design enhancing synergies with Sentinel-1: same orbit, co-located swaths
- Consortium led by TAS-I, involving 29 companies from 15 countries
- 7.5 years nominal lifetime
- Currently in Phase D (CDR successfully closed in 2025)
- Launch of PFM expected in 2030
- Free, full and open data policy

IMAGING

- L-Band – 85 MHz ITU allocated band (1.215-1.300 GHz)
- Dual-Pol mode: RIWS (ROSE-L Interferometric Wide Swath)
- Support to Quad-Pol mode: QWS (Quad-Pol Wide Swath)
- Wave mode capability
- Resolution < 50 m2 (RIWS mode)
- NESZ < -28 dB
- DTAR < -23 dB
- Swath width > 250 km

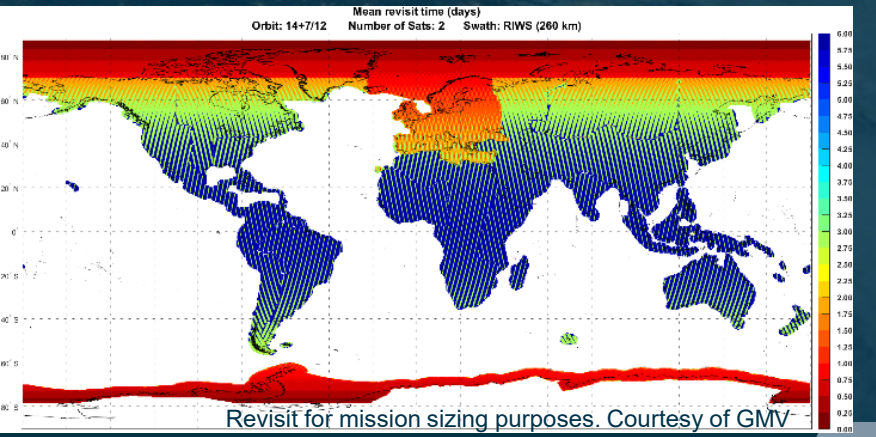
COVERAGE

- Coverage of Global Land (excl. Antarctica) and Arctic
- Revisit with 2 satellites :
  - 6 days Global Land
  - 3 days Europe
  - 1 day Arctic
- Repeat cycle of 6 days over Global Land (2 satellites)



Phasing with S1. Mission design supports options for:

1) orbit phasing for optimized revisit (3 days baseline)
2) convoy with Sentinel-1 (up to a minimum 1min baseline)



Revisit for mission sizing purposes. Courtesy of GMV



Thanks for the attention

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