# S3 OLCI-A/B status and plans for C/D and Next Generation missions

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### Sentinel-3 Ocean and Colour Instrument (OLCI)



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### OLCI push-broom instrument with five camera modules sharing the field of view



# Sentinel-3A and -3B OLCI Mission Status for 2021

### • Sentinel-3 Constellation

- S3A launched on 16 February 2016, OLCI data from 26 April 2016 (to be soon extended to 4 April 2016)
- S3B launched on 25 April 2018, OLCI data from 15 May 2018 (S3B 140° phase difference to S3A)
- All routine activities in 2021 were performed nominally, with regular schedule
- Two anomalies, one per spacecraft
  - 5 March 2021 S3A OLCI
  - 27 October 2021 S3B OLCI
  - Both reoccurrences of VAM setting corruption anomaly due to a Single Event Upset
  - Processing was able to continue for the 4 unaffected cameras during the latter anomaly due to the update to L1 processor

OLCI-A + OLCI-B, 1-day coverage





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# **Fulfilment of Sentinel-3 Mission Requirements-OLCI L1**

Reference: Mission Requirements Document, EOP-SMO/1151/MD-md Iss.2, online

Performance factor	Requirement Threshold, [goal]	S3 OLCI-A Current status	S3 OLCI-B Current status	Comments
Signal to noise ratio	Band-dependent	Compliant	Compliant	
Absolute radiometric accuracy	<2% [1%] <5% [1%] > 900nm	Non-compliant in most of the bands	Compliant	OLCI-A has ~2% positive bias compared to OLCI-B. Mitigation in L2 OC by SVC gains
Relative radiometric accuracy	<1%* [0.2%]	Partly compliant	Partly compliant	Bright bias of ~4% for band Oa21 (1020nm) compared to the other bands. Mitigation in L2 OC by SVC gains
Geolocation precision	<1 pixel wo/GCP <0.5 pixel w/GCP	Compliant	Compliant	OLCI-B geometric drift has stabilized but still needs regular update
Polarization error	<1%	Compliant	Compliant	

\* Threshold requirement is from Satellite requirements document



# **Sentinel-3 OLCI System Vicarious Calibration**

### **OLCI-A** and **OLCI-B** L2 Rrs time series, applying SVC gains (info online $\frac{1}{2}$ )



Acknowledgements to NASA for MODIS-A products

### OLCI-A, OLCI-B, MODIS-A L2 Rrs time series comparisons at common bands



# OLCI-A/B L1 main updates and activities in 2021

- Detection and processing of OLCI data through VAM camera anomalies
  - Implemented on 28 April 2021
- Reduction of the periodic noise impact on the dark signal
  - Regular dark calibrations are now executed every 3 days on both spacecraft
  - Newest dark data are used in L1 processing
- Extension of OLCI-A mission data back to 4 April 2016
  - Update allows processing of early OLCI-A and SLSTR-A mission data
- Processing Baseline new naming convention in the S3 products
  - OLCI L1 products: OL\_\_L1\_.002.22.00
  - OLCI L2 Ocean Colour products: OL\_L2M.003.01
- Geometric and radiometric updates



# **OLCI Calibration Monitoring using the Moon**

### S3 Moon observations

- S3B on 27 July 2018 (nadir view camera 4, proof of concept)
- S3A on 4 July 2020 (nadir view camera 4, proof of concept)
- S3A on 18 January 2022 (camera 5, part of a series for all OLCI-A and -B cameras)

### • Major goals of lunar observations

- Verification and improvement of straylight correction
- Radiometric monitoring

### OLCI/SYN QWG recommended lunar observations

#### in the Operational phase of missions

- Implement regular lunar observations preferably at 2 month intervals interleaved between S3A and S3B, i.e. one month lunar observation by S3A and the next month by S3B
- Perform lunar observations for additional four OLCI-A and OLCI-B cameras
- Provide draft schedules of lunar observations to Copernicus Services for their review

in the Commissioning phase of S3C/D + future missions

- Perform Moon observations for all five OLCI cameras for straylight analyses
- Perform routine Moon observations at OLCI nadir (camera 4) as

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Lunar reference

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- Comparison of the observed lunar irradiance with GIRO simulations (GSICS Implementation of the ROLO model)
- Accounting for oversampling + solid angle variability



# **OLCI-A/B** planned L1 updates and activities

### • Planning of OLCI L1B future changes

- L1B uncertainty products per pixel
- Geometric correction temporal frame-offset evolution along the orbit
- Flagging of partial saturation anomaly online
- High Energy Particle flagging in EO data
- Improved straylight correction (requirement OL-DE-510: residual straylight <2% (Oa02), 6% (Oa19))</li>
- OLCI-A/B L1B full mission reprocessing
  - Fall 2022 (QWG R7.4, R6.11)
- OLCI-A/B spectral evolution model
  - Spectral evolution developed and made available to users <u>online 1/2</u>
  - Model planned for implementation in L2 pre-processing
- Extension of OLCI observation coverage at Northern and Southern latitudes requested by CMEMS Sea-Ice TAC
  - Tests of orbit extension from 80° SOLZ to 103° SOLZ performed on 3 consecutive orbits on 17, 20 and 24 February 2020
  - Permanent extension of observation coverage up to ~94° SOLZ currently on hold, planned during or after the S3C commissioning phase (~ 2024 / 2025)
    CMEMS: Copernicus Marine Environment Monitoring



CMEMS: Copernicus Marine Environment Monitoring Service TAC: Thematic Assembly Centre

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### Sentinel-3 C and D Satellite Status



S3C – system testing after ENV image courtesy of TAS-F

### Sentinel-3C

- Satellite fully integrated
- Environmental Campaign complete
- Final System testing after ENV on-going
- Storage preparations in progress



- Platform integrated with Topo (SRAL & MWR) and POD (DORIS, GNSS, LSS)
- System testing up to this build level complete

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- OLCI: complete
- SLSTR: final integration on-going
- ENV testing and radiometric cal in 2022
- Storage preparations in progress



S3D – PF/Topo/POD testing complete image courtesy of TAS-F

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# Sentinel-3 C and D Satellite Major Milestones

#### Current milestone dates

- S3C Satellite Flight Acceptance Review (FAR): Dec 2021 Feb 2022
- S3D Satellite Pre-Storage Reviews (PSR):
  - PF/Topo/POD: Oct 2021 Nov 2021
  - OLCI: Jan 2022
  - SLSTR: Q3 2022
- Storage for S3C and S3D satellites/instruments starts after the respective PSRs
- Launch dates are to be defined by the European Commission, but foreseen in the range
  - S3C: 2024 2025
  - S3D: 2026 2028
- During S3C commissioning, S3C will be put into tandem orbit with S3A or S3B (TBC), similarly to S3B commissioning tandem phase with S3A
- After S3C commissioning, either S3A or S3B will be put into in-orbit storage as a "back-up". Default is S3A, but the exact configuration is TBC.
  - Phase position of the in-orbit spare is TBD, but A/C (or B/C, TBC) will retain the current A/B phasing of 140° (TBC).

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### **Sentinel-3 Next Generation Developments**

- Activities towards Copernicus Next Generation missions have been initiated
- Activities are separate for Optical and Topography missions
- Phase 0 study has started with TAS-F and OHB having been selected with the goal of deriving System Requirements Document and Mission Requirements Document for Phase A
- A group of experts, AHEG (Ad-Hoc Expert Group), has been formed and first meetings have been held
- Mission Assumptions and Preliminary Technical Requirements (MATER) document is being developed with feedback from AHEG and OLCI/SYN Quality Working Group
- Initial timeframe for Sentinel-3 NG first launch is about 2033



### **Sentinel-3 OLCI Summary**

- Both S3 OLCI instruments are performing well
- Activities are ongoing to improve instrument calibration / characterization and to respond to user requirements
- OLCI-C and -D launches planned for S3C: 2024 2025 and S3D: 2026 2028
- Development of Copernicus Next Generation missions has been initiated

