



CFOSAT: China France Oceanography SATellite



CFOSAT
Mission status



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(1) CNES, Toulouse, France

(2) LATMOS, CNRS, UVSQ, UPMC, Guyancourt, France

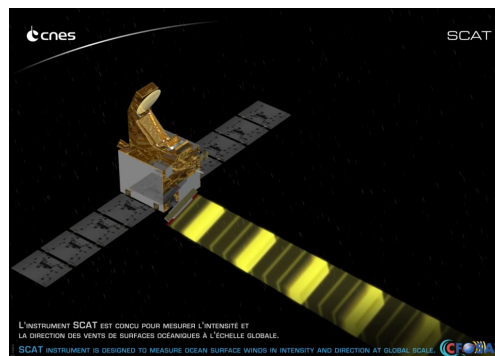
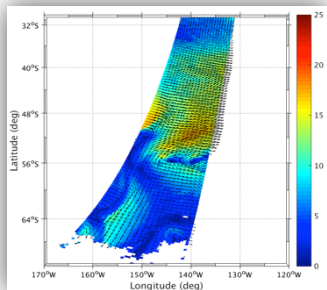
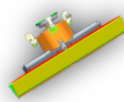
(3) Météo-France, Toulouse, France

Main Objective: Measure at the global scale ocean surface wind and waves spectral properties

SCAT

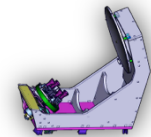
wind scatterometer

- ❖ Fan beam concept
 - Large swath
 - Rotating antenna: 3 rpm
- ❖ Incidences between 26° and ~50°
- ❖ Provides
 - σ_0
 - Ocean wind vector

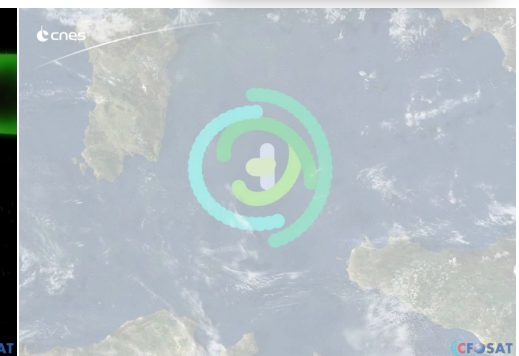
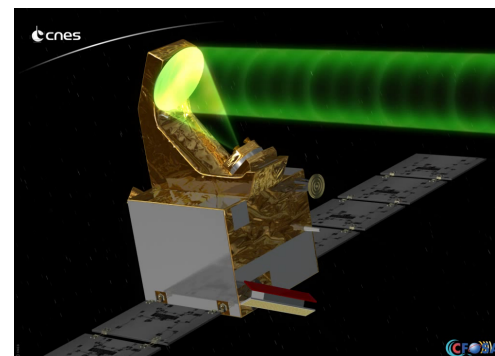
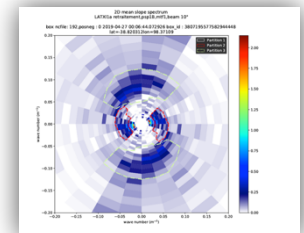


SWIM

Wave scatterometer



- ❖ Ku band real aperture radar
- ❖ Sequential illumination with 6 incidences: 0°, 2°, 4°, 6°, 8°, 10°
- ❖ Rotating antenna (all azimuth direction acquisition): 5,6 rpm
- ❖ Provides:
 - Directional wave spectra
 - Significant Wave Height and wind speed
 - σ_{w0} mean profiles, 0° to 10°





DFH Satellite Co., Ltd



OSTST-2020 Virtual Meeting, October 19-23



Mission main events

2018 October 29th Successful launch

- ❖ Very quick instrument switches ON
 - SCAT: October, 31st
 - SWIM: November, 1st

2019 September 23rd- 26th: 1st International Science Team Meeting in Nanjing

- ❖ 80 international attendees
- ❖ CalVal synthesis for both instrument
- ❖ First scientific team feedbacks
- ❖ Agreement on data quality

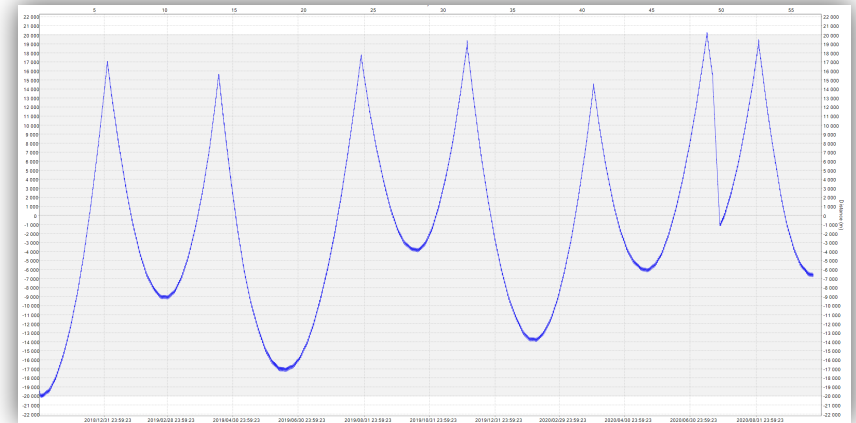
2020 February 19th data release to users

- ❖ SCAT: for operational & scientific usages
- ❖ SWIM: only for scientific usages

Satellite Status

Platform

- ❖ The CFOSAT satellite bus is: **OK**
- ❖ Ground track is maintained in a ± 20 km window



SCAT

- ❖ Switched to the redundant instrument since end of December, 2019
- ❖ The SCAT instrument is: **OK**
- ❖ **Excellent** SCAT Data availability

SWIM

- ❖ The SWIM instrument is: **OK**
- ❖ **Excellent** SWIM Data availability

SWIM Products Quality

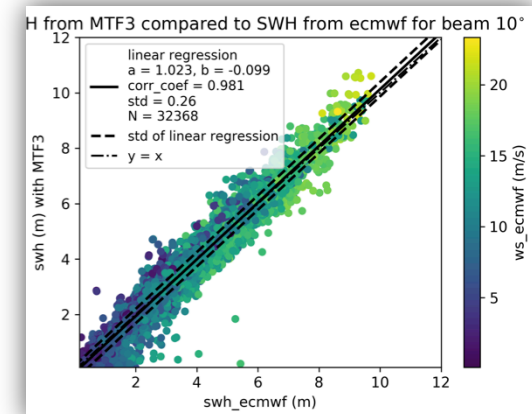
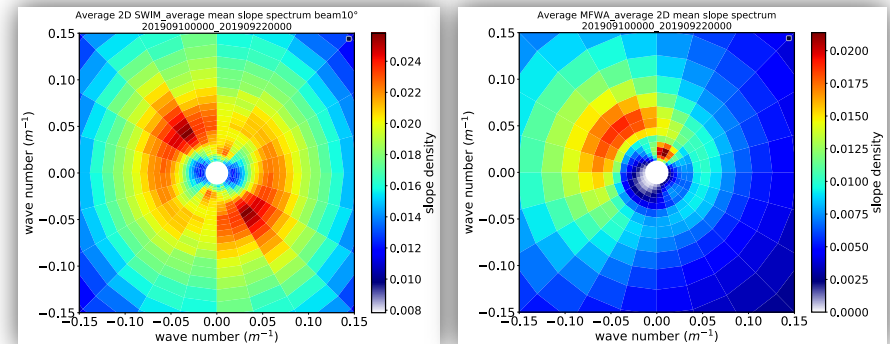
Latest 5.1 version of SWIM processing

- ❖ Along track speckle noise mitigation
- ❖ New Modulation Transfer Function applied (MTF3)

Better performances

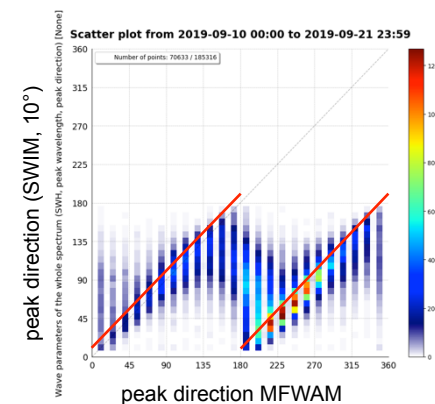
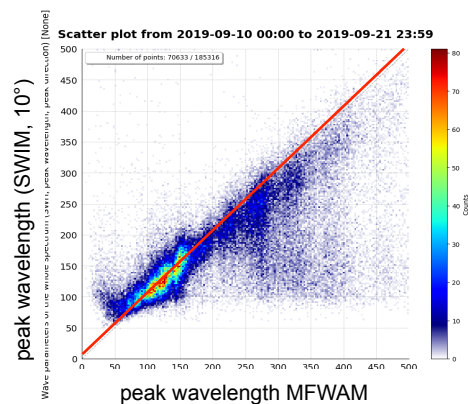
- ❖ Directional spectra
 - Better consistency of the shape in particular at low sea-state (illustrated here for SWH < 2m)
- ❖ SWH in comparison with ECMWF
 - Closer to the model both for low and high wave heights

Mean 2D wave spectra, over 12 days, beam 10°
SWIM MFWAM



SWIM Products Quality

- ❖ Performances for wavelength and wave direction almost unchanged
 - Good agreement with MFWAM, except for waves propagating along-track



- ❖ 2D spectra fully exploitable now
 - No more masking of near along track area
 - Good agreement with models for all wave parameters: Direction, Wavelength, SWH

Read more in “SWIM Products latest evolutions presentation”, CFOSAT Splinter

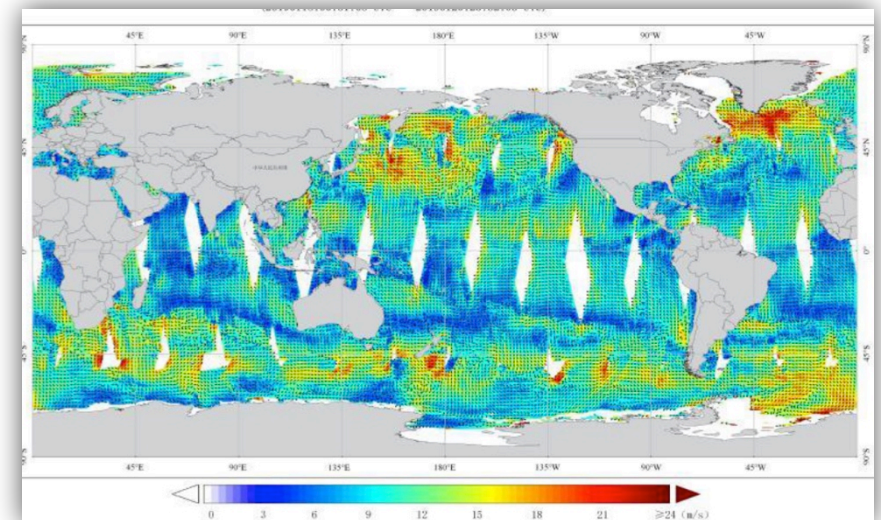
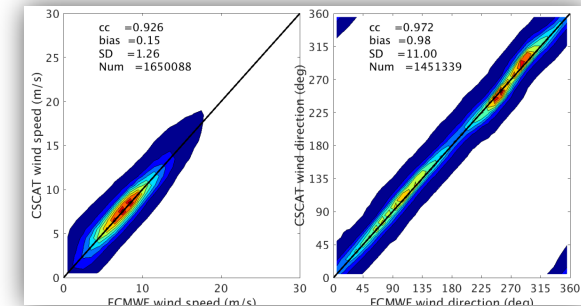
SCAT Products Quality

Wind products

- ❖ Wind vectors globally consistent with ECMWF model
 - Wind speed: 1.3 – 1.4m/s RMS discrepancies
 - Wind direction: 15 - 17 ° RMS discrepancies

- ❖ Good wind field consistency with NDBC buoy
 - Wind speed about 1.0m/s
 - Wind direction about 16°

- ❖ Work on-going to make products available operationally



Ground Segment Status

Earth Terminals

- ❖ Chinese S-Band and X-band stations: **Ok**
- ❖ French X-Band (Kiruna, Inuvik): **Ok**

Control Center

- ❖ Chinese CLTC: **Ok**

Mission and processing Centers

- ❖ NSOAS CFMC (Beijing): **Ok**
- ❖ CNES CWWIC NRT processing (Toulouse): **Ok**
- ❖ Ifremer IWWOC DT processing (Brest): **ready for operation next month**



Data production: availability

CFOSAT Satellite availability

- ❖ Requirement:
 - The availability of the Satellite for generating Observation data (Measurement and Calibration) shall be greater than 95 %
- ❖ From the beginning of life (2019/10/29) till now (2020/10/19): 720 days
 - House Keeping manoeuvres (including 1 collision avoidance): 4 days
 - On-board X-band interruption: 5 days
 - SCAT switch to redundant: 9 days

Global CFOSAT Satellite availability performance:

SCAT: 97.5%

SWIM: 98.75%

Very good operational cooperation between Chinese and French teams

Data production: NRT Latency

CFOSAT Near Real Time production and distribution

❖ Requirement:

- NRT data shall be made available at meteorological or oceanographic operational centers within 3 hours from acquisition time, with an availability of 75% %

❖ SWIM

- From the beginning of life (2019/10/29) till now (2020/10/19): 720 days
- 90.4 % of SWIM NRT products under 3 hours

❖ SCAT

- From 2019/11/18 till now (2020/10/19): 335 days
- 97 % of SCAT NRT products under 3 hours



Data access & distribution

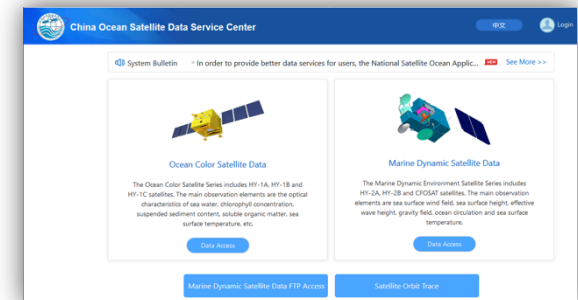
CFOSAT products are available



❖ On Aviso+ Website: <https://www.aviso.altimetry.fr/en/missions/current-missions/cfosat.html>

❖ On NSOAS Website: <https://osdds.nsoas.org.cn/#/>

❖ On Ifremer Website for value-added products: coming soon

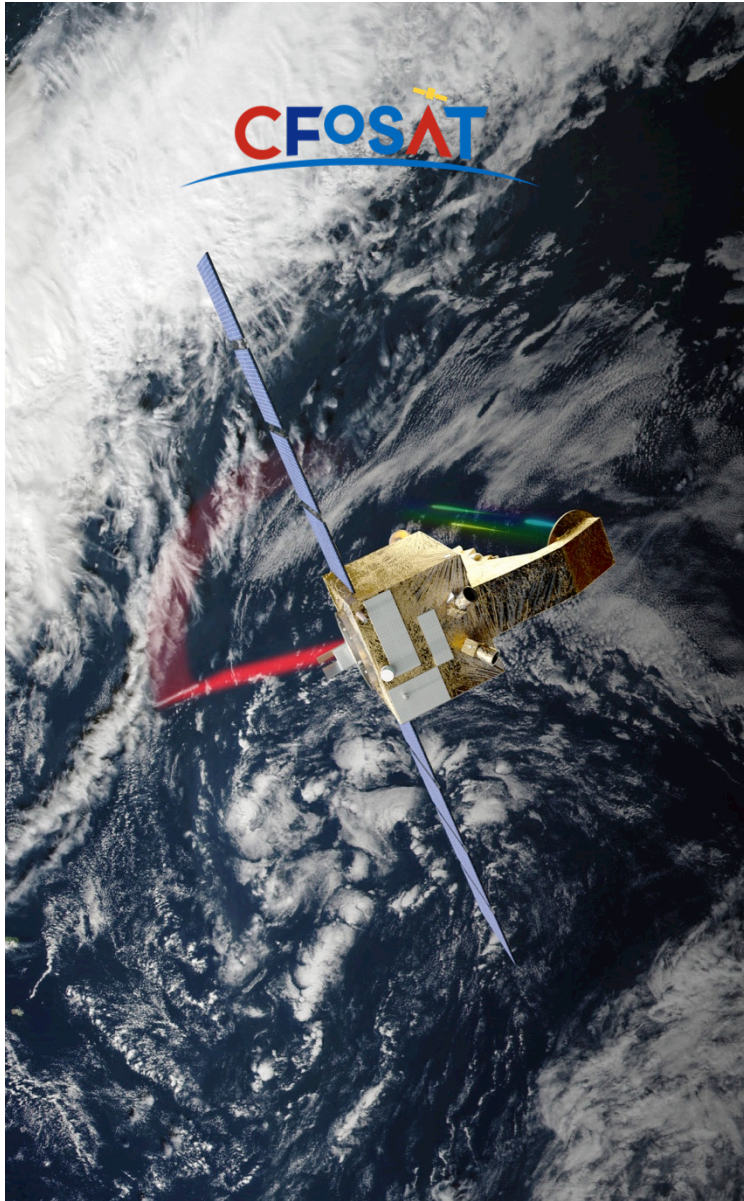


CFOSAT products are distributed

❖ By EUMETSAT via EUMETCast: only for SWIM-NRT at the time being

❖ To CMEMS Waves-TAC:

➤ SWIM-L2P-SWH-Nadir-1Hz products (also available on Aviso+ website)



Conclusions

CFOSAT Mission is performing well after 2 years in orbit

Products now mature to be widely used

To come

- ❖ SWIM full reprocessing by the end of the year
 - 5.1.1 Version
 - Available on Aviso+ website
- ❖ Second CFOSAT International Science Team meeting
 - France (Saint-Malo)
 - 2021, 16-18 March



**Thank you for your attention and
to all the contributors!**

CFOSAT



The CFOSAT mission

CFOSAT: A China/France world premiere for oceanography

Joint measurements of oceanic **wind** and **waves**

- **SWIM**: a wave scatterometer (new instrument)
- **SCAT**: a wind scatterometer (fan beam concept)

Main Objective : Measure at the global scale ocean surface wind and waves spectral properties

Applications :

- atmospheric, oceanic and wave forecast systems
- wind and wave climatology
- characterization of processes affecting surface waves
- characterization and modeling of ocean/atmosphere coupling

Secondary objective : Land and sea ice characterization (Sun synchronous polar orbit)

- Sea ice and ice cover
- Land surface (variations of humidity and roughness)

Data production: versions

SWIM processing chain

- ❖ 2019/07/29 **4.3.2** Version:
 - First release of SWIM products (2020/02/19) for scientific usages
- ❖ 2020/06/24 **5.0.1** Version: Along track speckle noise impact mitigation
 - SWIM-L2 products ready for all usages: scientific and operational
- ❖ 2020/10/12 **5.1.1** Version: choice of MTF3 solution
 - Considered as the first consolidated release of SWIM-L2 products (including SWIM-NRT products)
 - Products are identified with the **OP05** code in the name
 - Version that will be used for the first full reprocessing campaign to come and available by the end of 2020

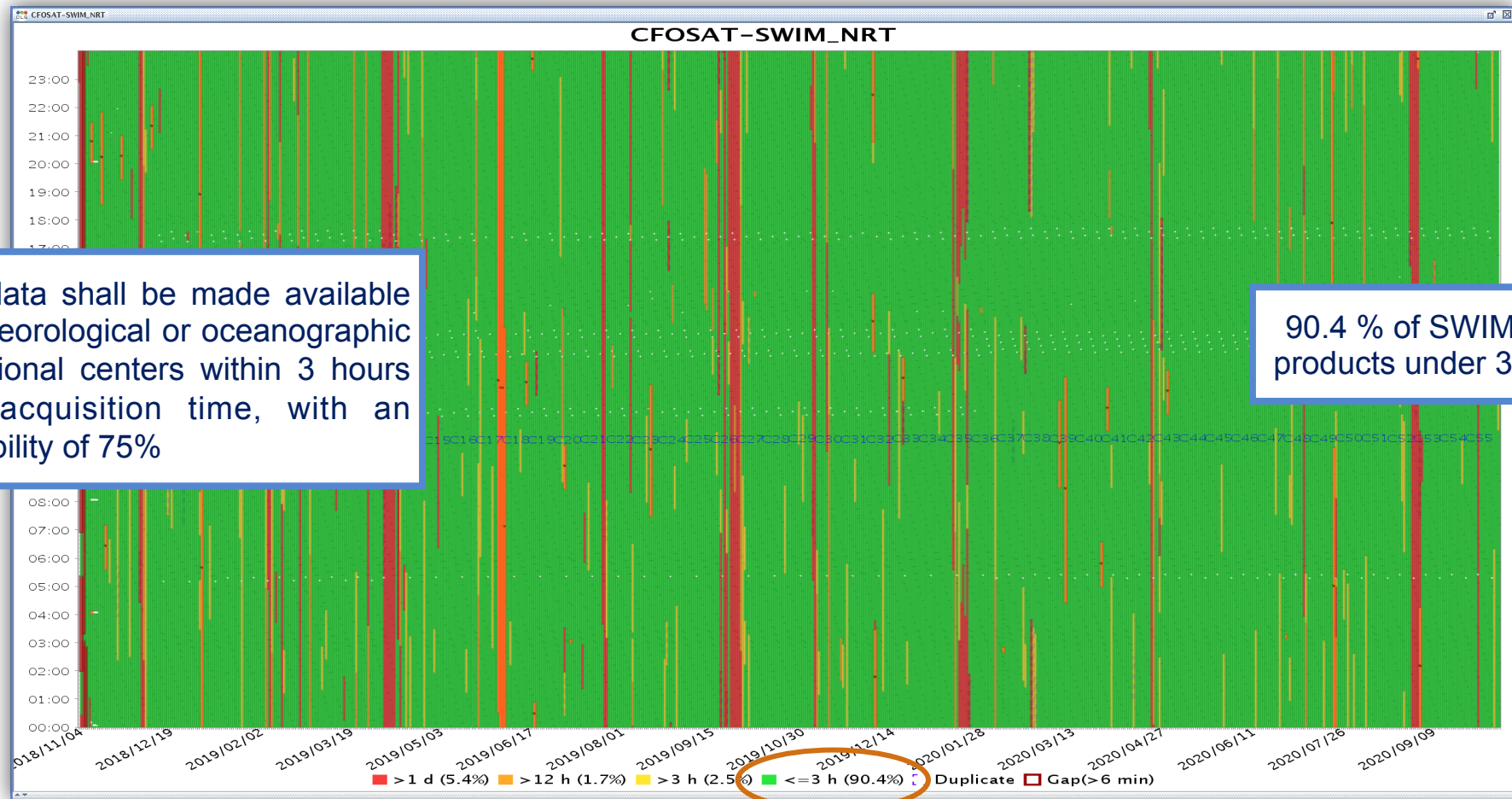
SCAT processing chain

- ❖ 2019/11/18 **2.0** Version:
 - First release of SCAT products (2020/02/19) for scientific and operational usages
- ❖ 2020/05/28 **3.0** Version:
 - Update taking into account the instrumental switch for nominal to redundant and other improvements (2019/12/29)

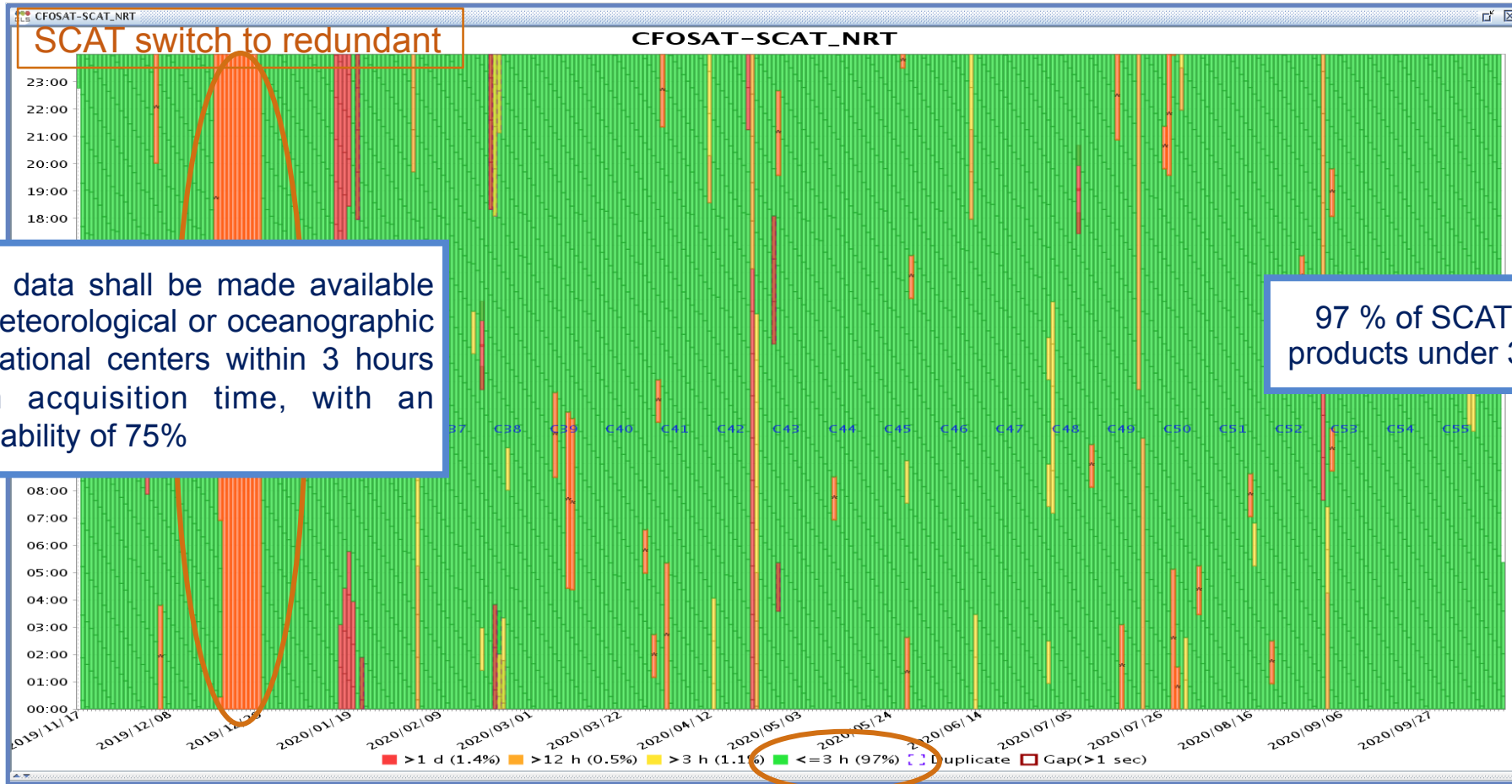
Data production: SWIM-NRT Latency

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