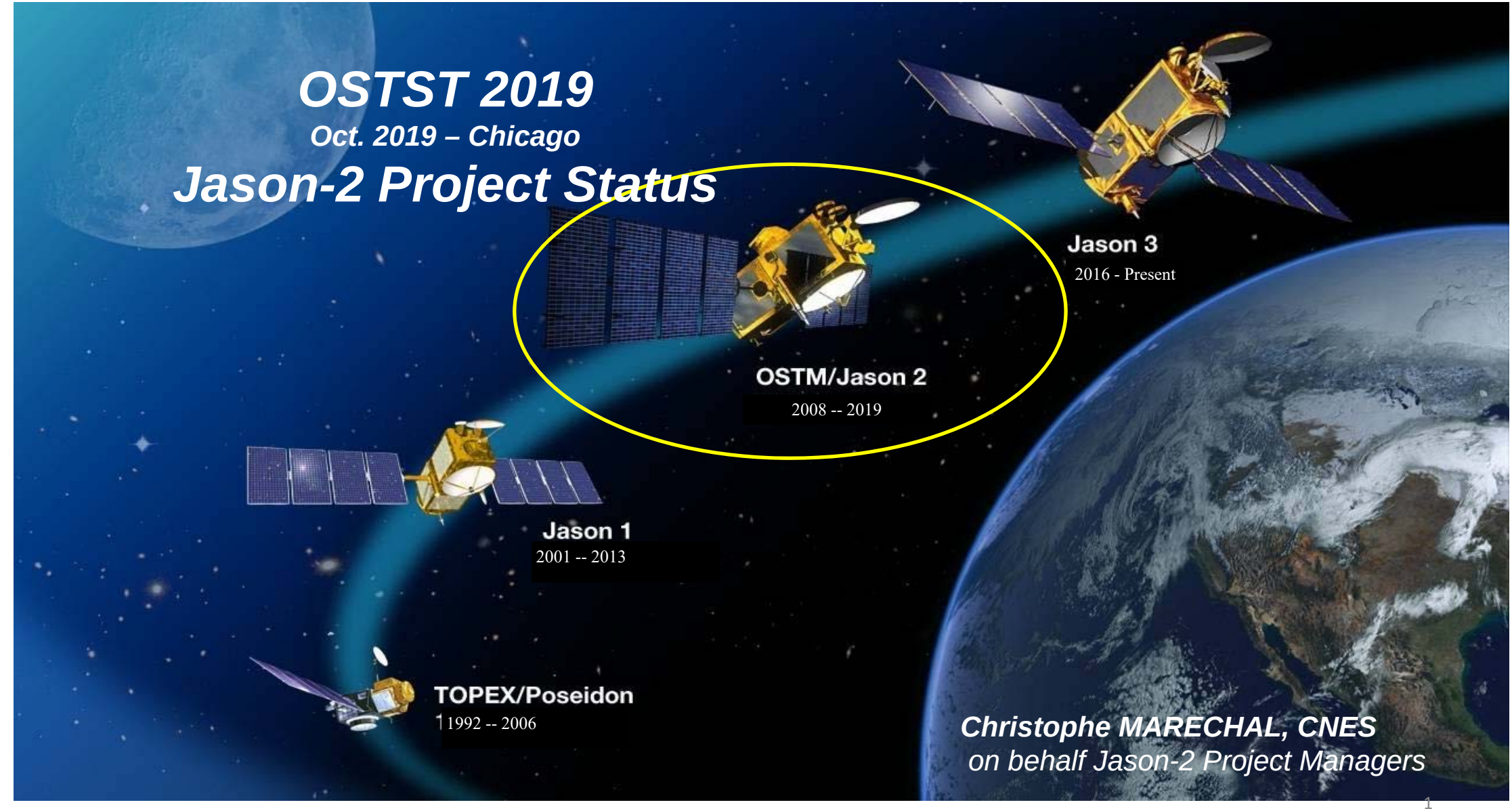
OSTST 2019

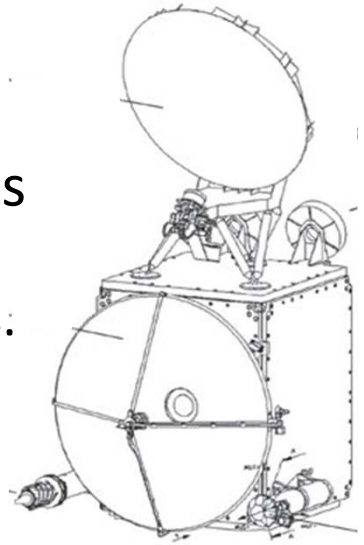
Oct. 2019 – Chicago

Jason-2 Project Status



Christophe MARECHAL, CNES
on behalf Jason-2 Project Managers

General Status



- Due to battery management critical anomalies, Jason-2 decommissionning was requested by the French « Space Operations Act » office, and decided by the 4 partners on Sept. 26th, 2019.
  - Details on the battery management anomaly provided in the next slides.
  - Sept.11th : Start of the fuel depletion process
  - Oct. 1st, 06:48UTC : Official end of the products dissemination
    - Pass 147 for science cycle 644
  - Oct. 4th : End of the fuel depletion
  - Oct. 4th - 8th : Check of redundant instruments
  - October 10th : Final electrical passivation.

June 20th, 2008 -> October 10th, 2019
11 years, 3 months & 20 days in orbit

Approx. 9 years on reference orbit

Nearly 2 geodetic cycles completed

Detailed platform status

Gyro status

- From 2017, regular gyro disjunctions triggered SHMs
- In Feb. 2019, a new workaround was tested :
  - Regular hibernation periods (2-3 months), in order to let gyros rest
  - Rewind on the geodetic cycle if necessay
  - Swap between gyros before disjunctions
    - Thanks to a disjunction prevision software

- Workaround successful
  - Hibernation did enable the gyros healing
  - Rewind successful in May 2019
  - 2 successful gyro swaps, in July and September
  - No new SHMs triggered

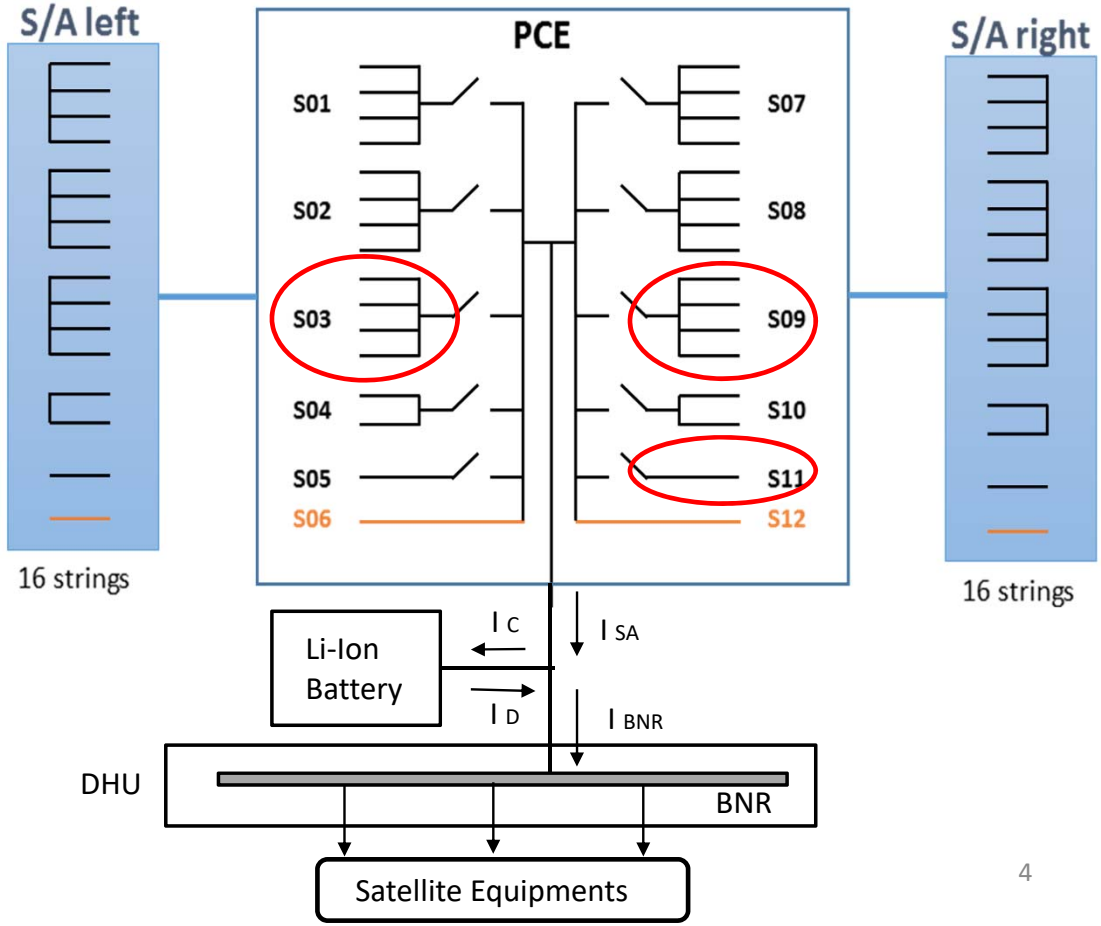
Detailed platform status

Battery management anomaly

- Power Conditioning Equipments are relays that switch ON and OFF depending on the need for electrical power in the platform.
  - Their failure mode is to get stuck CLOSED, i.e. connected.
- When transitionning to SHM, too many PCEs failed creates a critical risk of overcharging the battery.
  - Few equipments are ON
  - The battery needs to absorb the excess power
  - Jason-2 battery is « leak before burst ». However, in case of overcharging, debris generation can not be ruled out.
- PCE#9 failed in Feb. 2018
- Mid Aug. 2019, PCEs#3 & #11 started to fail

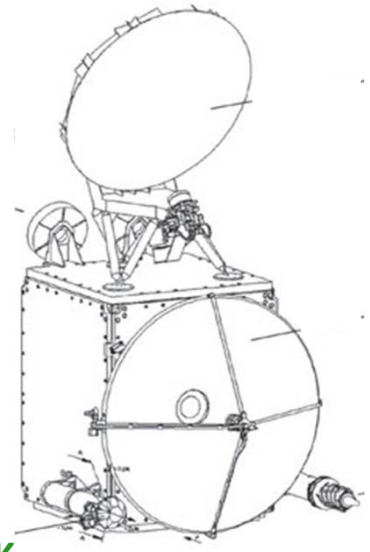
⇒ In order to avoid a catastrophic event, the French « Space Operations Act » office requested the end of the mission on Sept. 20th.

⇒ Decision to end the mission was taken by the 4 partners on Sept. 26th.



Payload Status since last OSTST (September 2018)

- Core Payload
  - POSEIDON3 **OK**
  - DORIS **OK**
  - AMR **OK**
  - GPSP-B **OK**



- Passengers
  - T2L2 **OK**
  - CARMEN2 **Partially OK**
    - MEX module non operational pending instrument restart – will be done after Jason 3 launch. No impact on data (more than 99% still available)
  - LPT **OK**

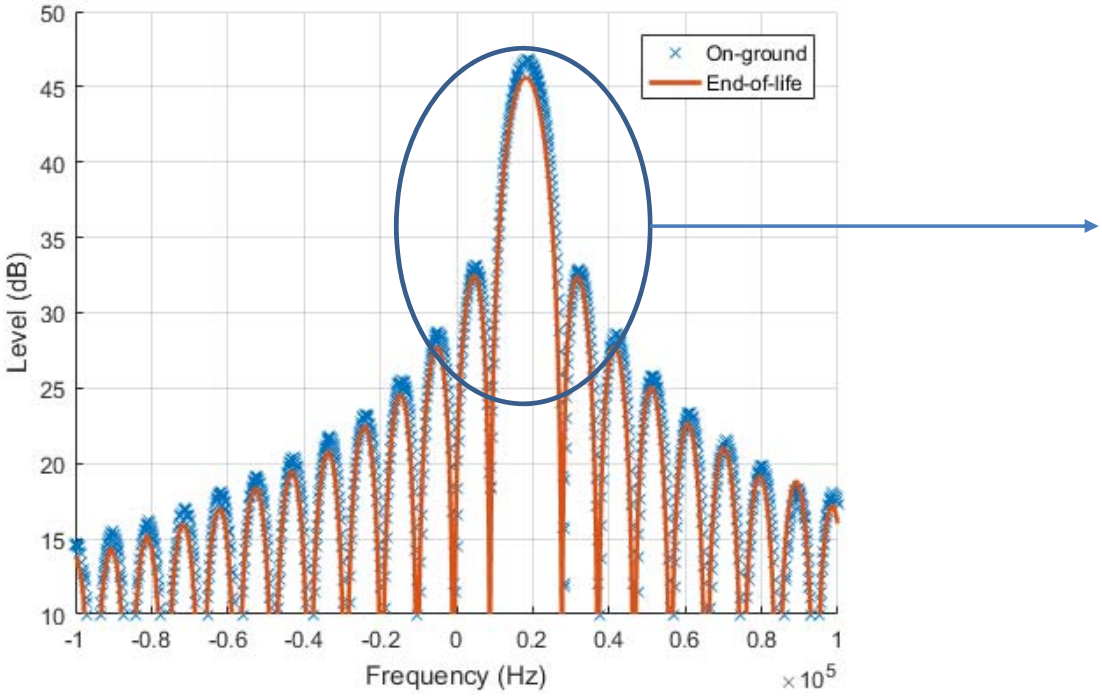
➔ **fully OPERATIONAL with redundancy available for POS-3, DORIS & AMR**

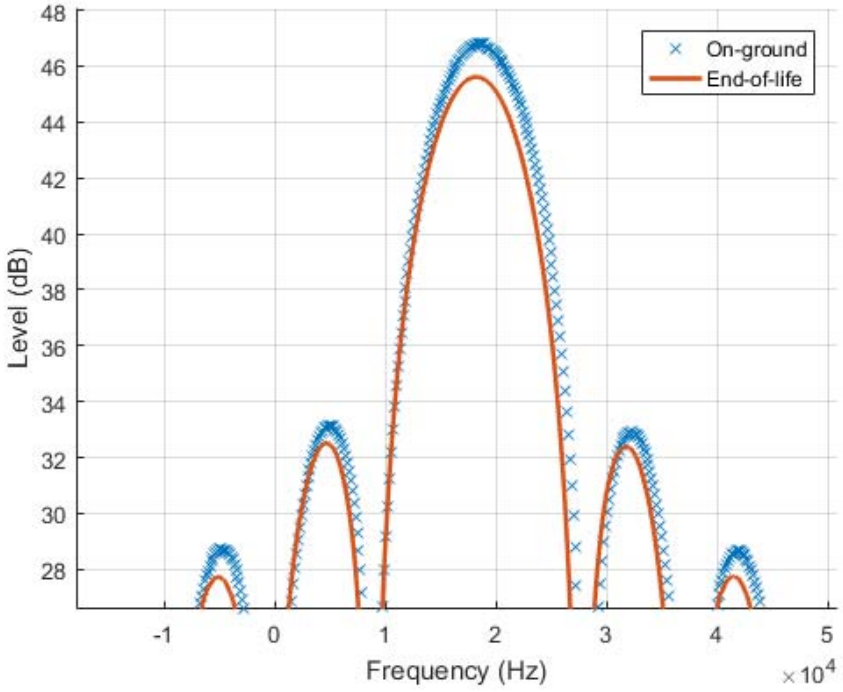
➔ **passengers perform satisfactorily**

Redundant instruments status

POSEIDON-3 / JASON-2

- **POSEIDON-3 redondant chain** has been successfully turned ON October 7, 2019
- **Point Target Response** shows **good stability** wrt. on-ground Integration & Test measurements performed 12 years ago

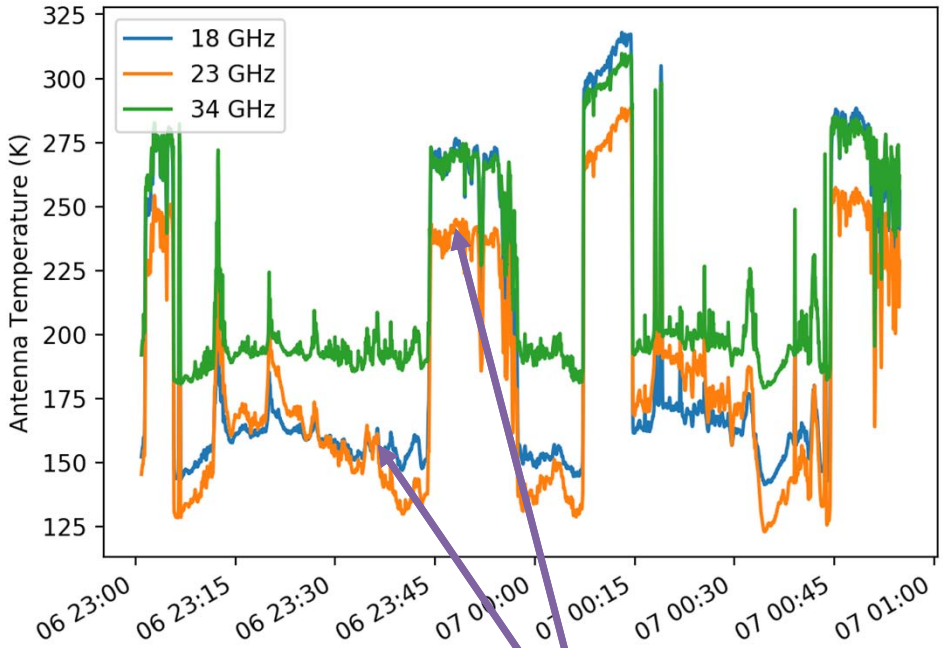




Redundant instruments status

Jason-2 AMR-V End-of-Life Investigation

Antenna Brightness Temperatures



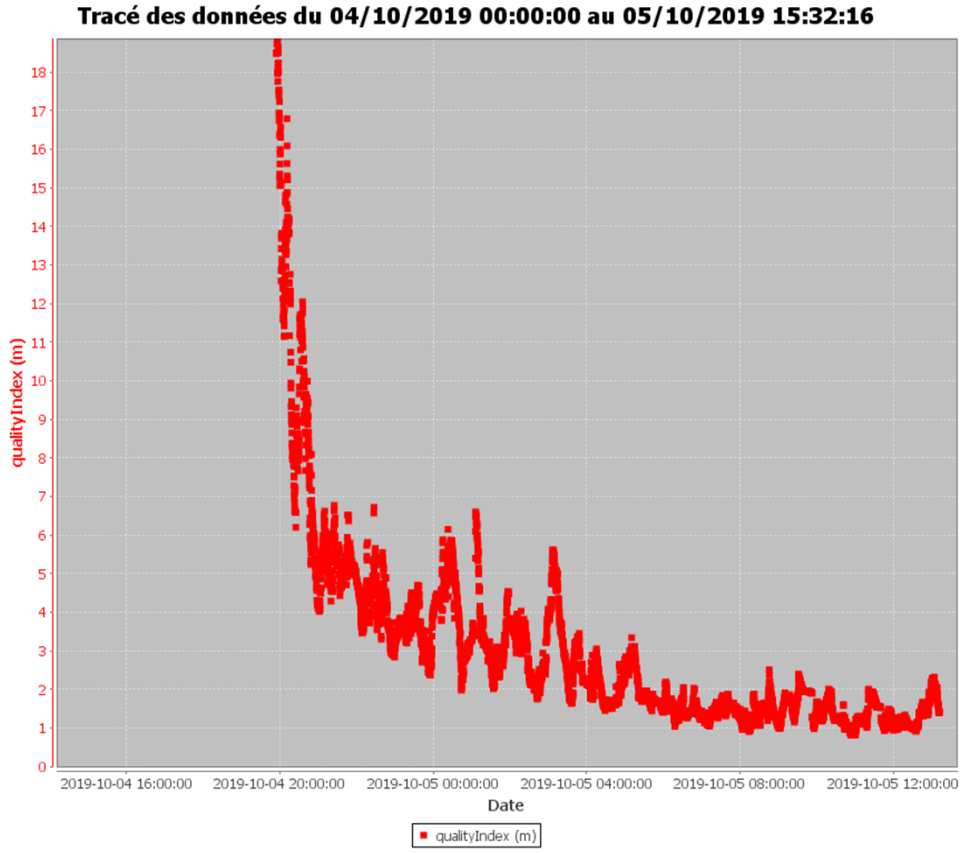
Ocean/land transition

Preliminary assessment:
Jason-2 AMR-V performance was nominal after 11 years of storage in space!

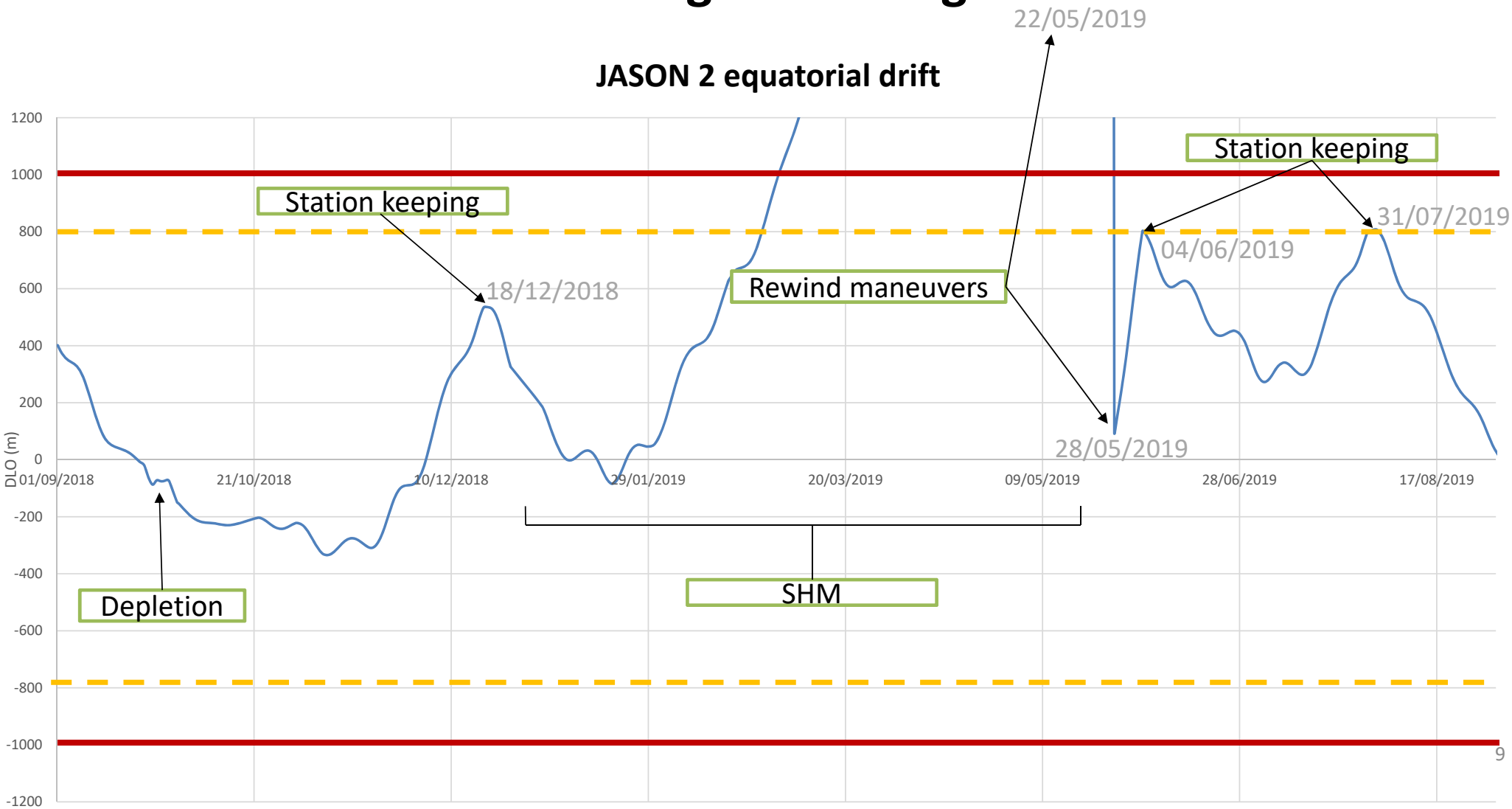
Redundant instruments status

Doris

DORIS 2 convergence in less than 24h



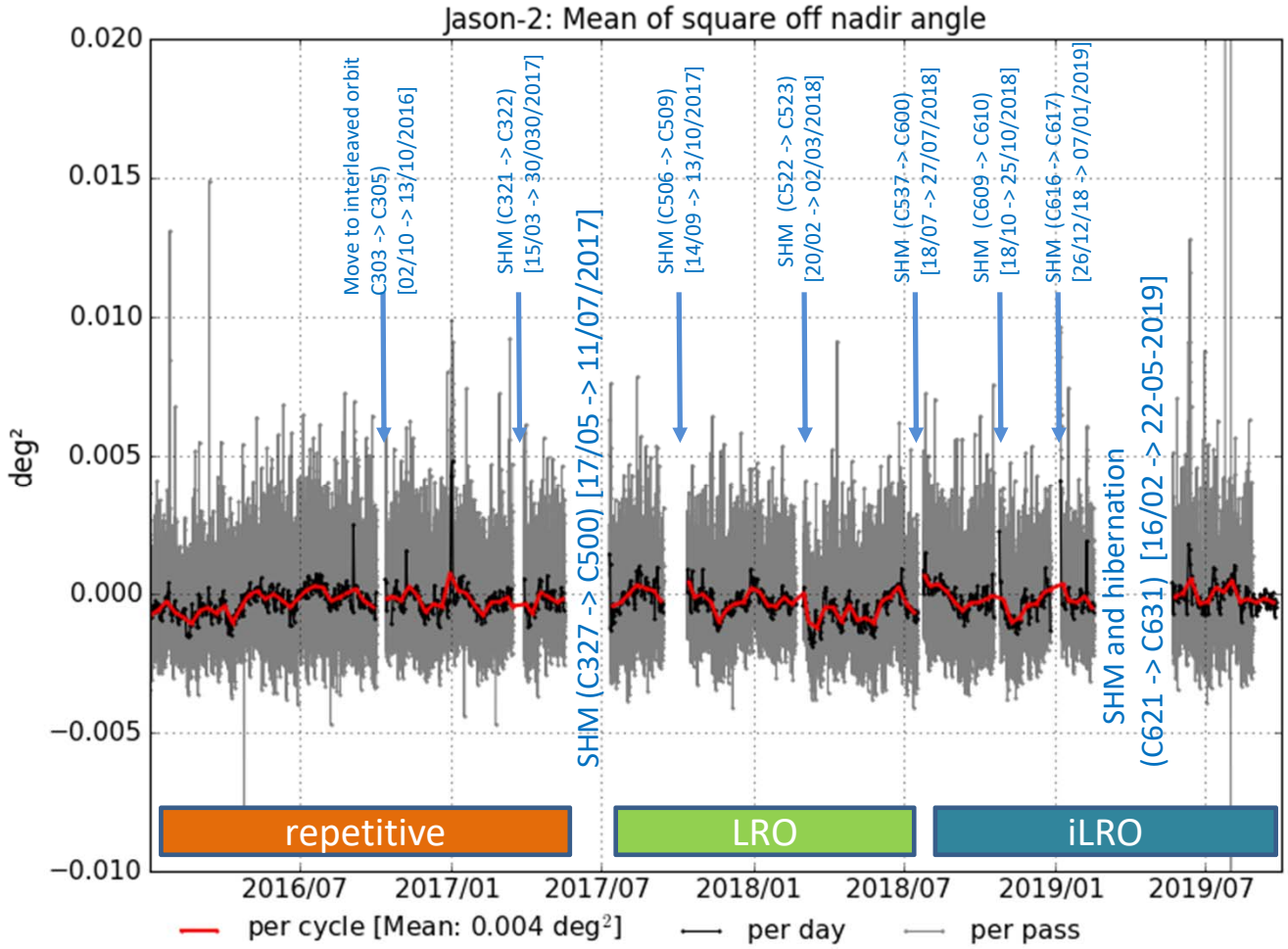
Routine navigation and guidance



System Requirements and Performances

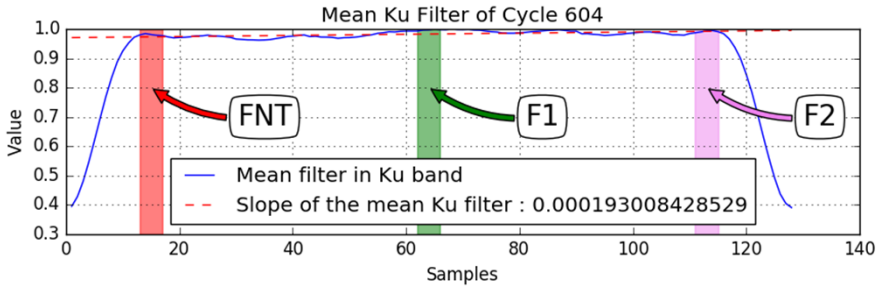
Altimeter Antenna Pointing : **typical value below 0.005°**
(Requirement < 0.2°)

pointing performance stable since launch

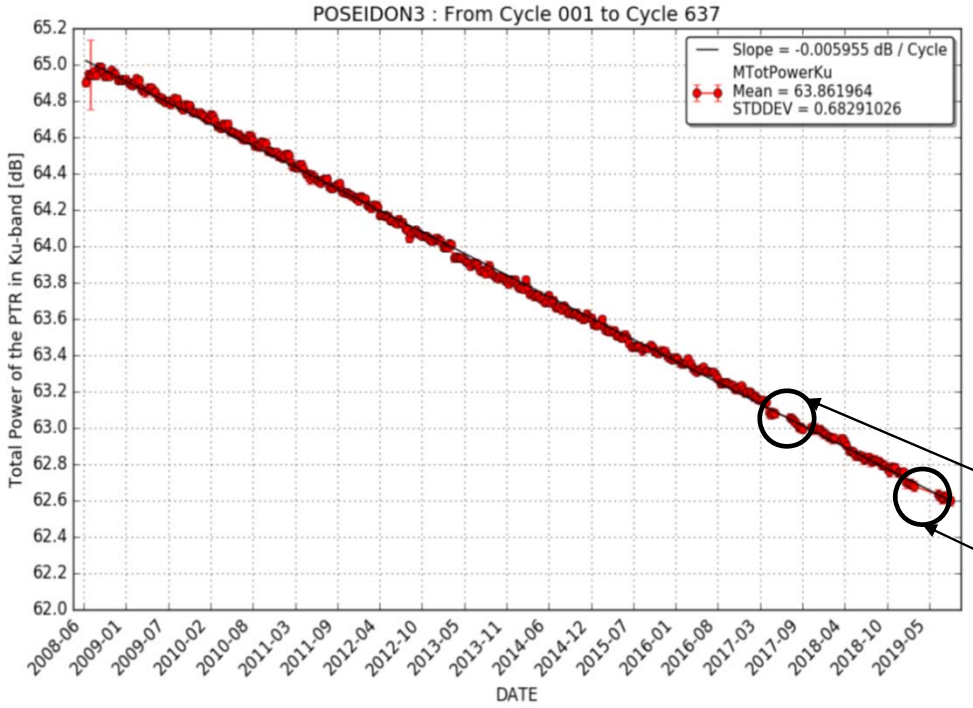


POSEIDON-3 / JASON-2

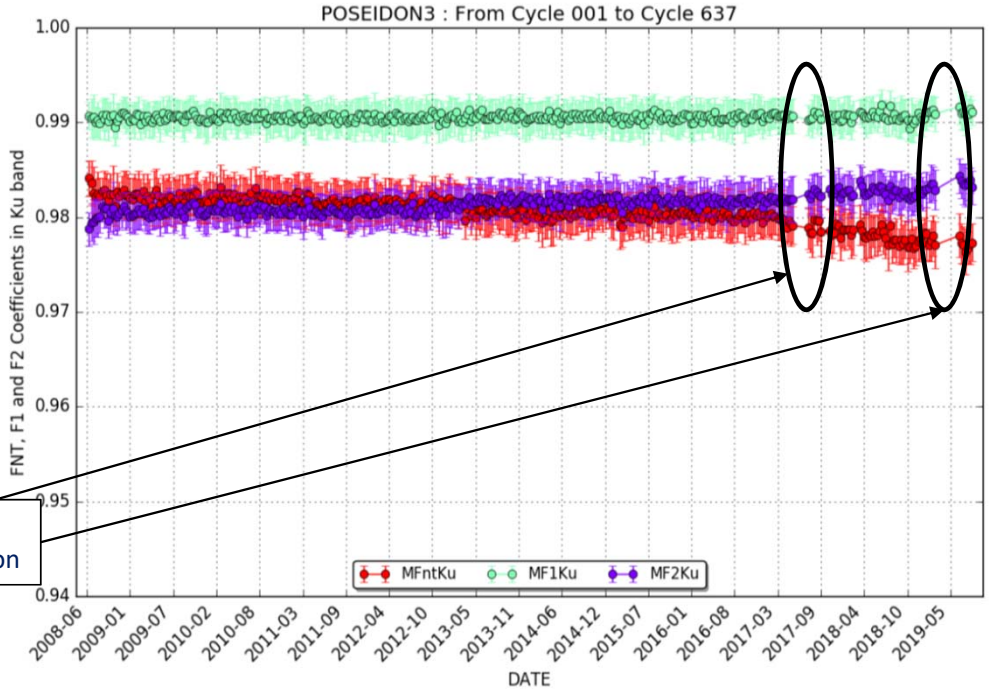
- Routine/Exceptional calibrations are OK
- Good stability even after SHM



– CAL1 Ku-band PTR power



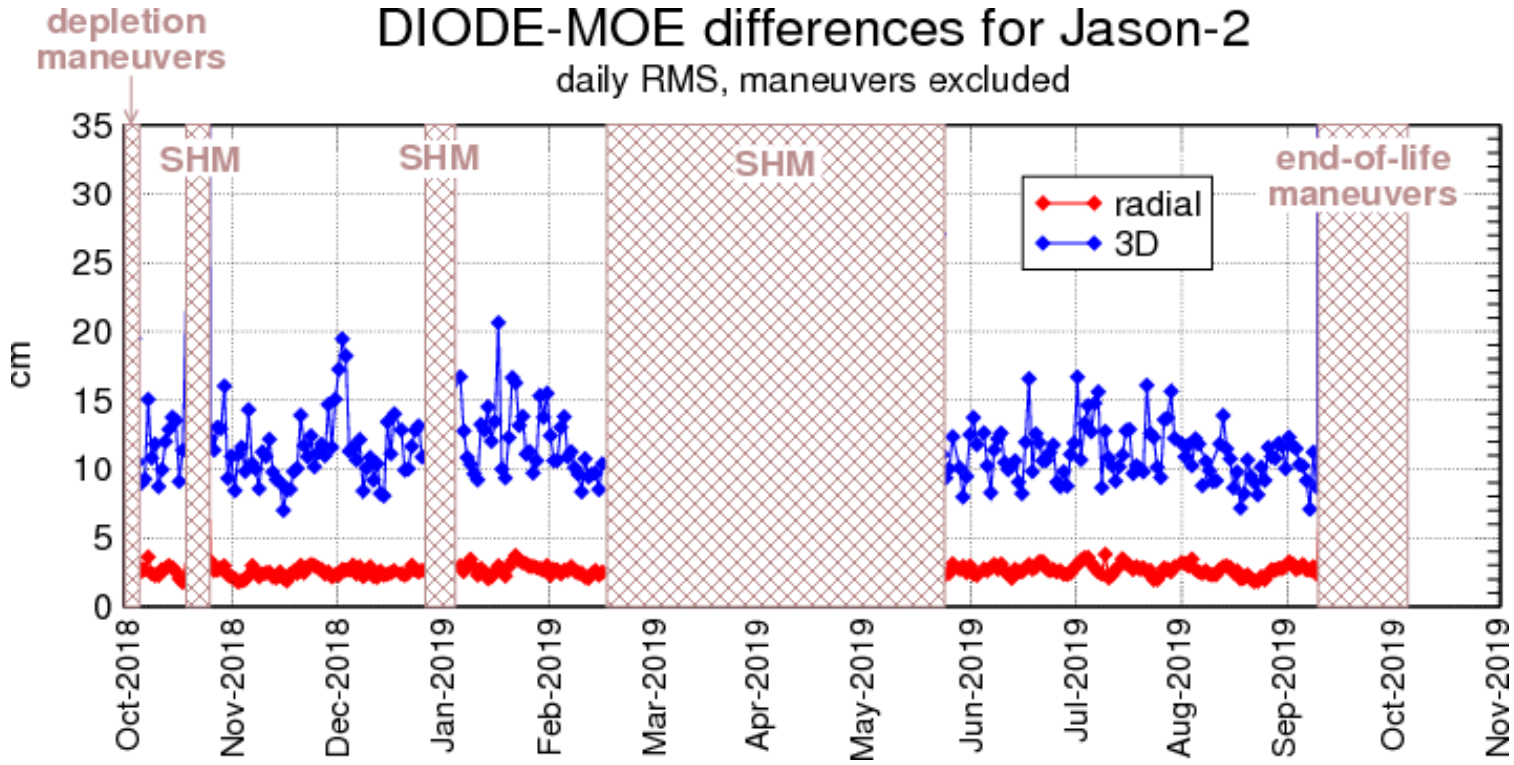
– CAL2 Ku-band LPF



SHMs/ hibernation

DORIS

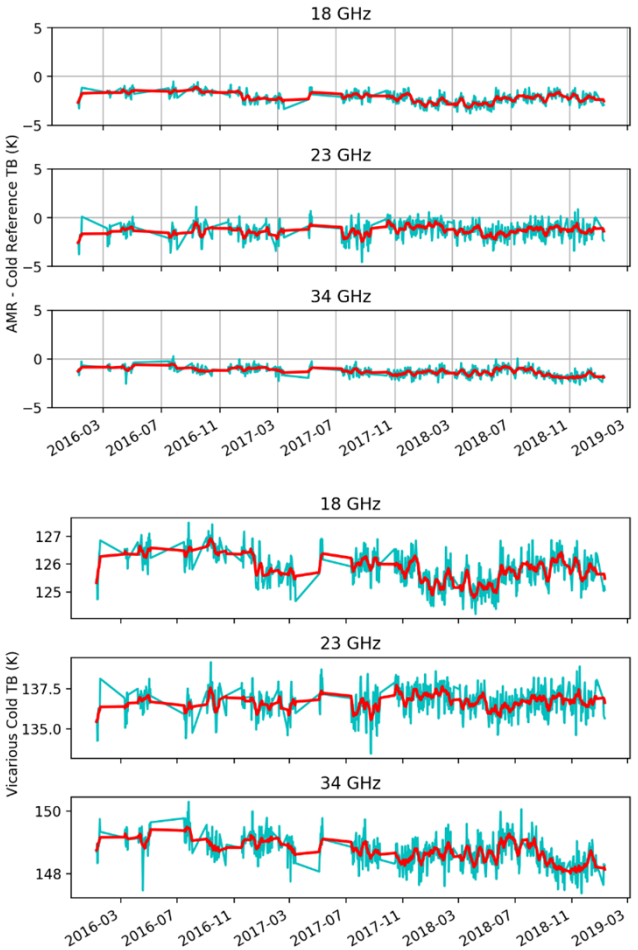
Availability = **100% over the period (special events excluded)**



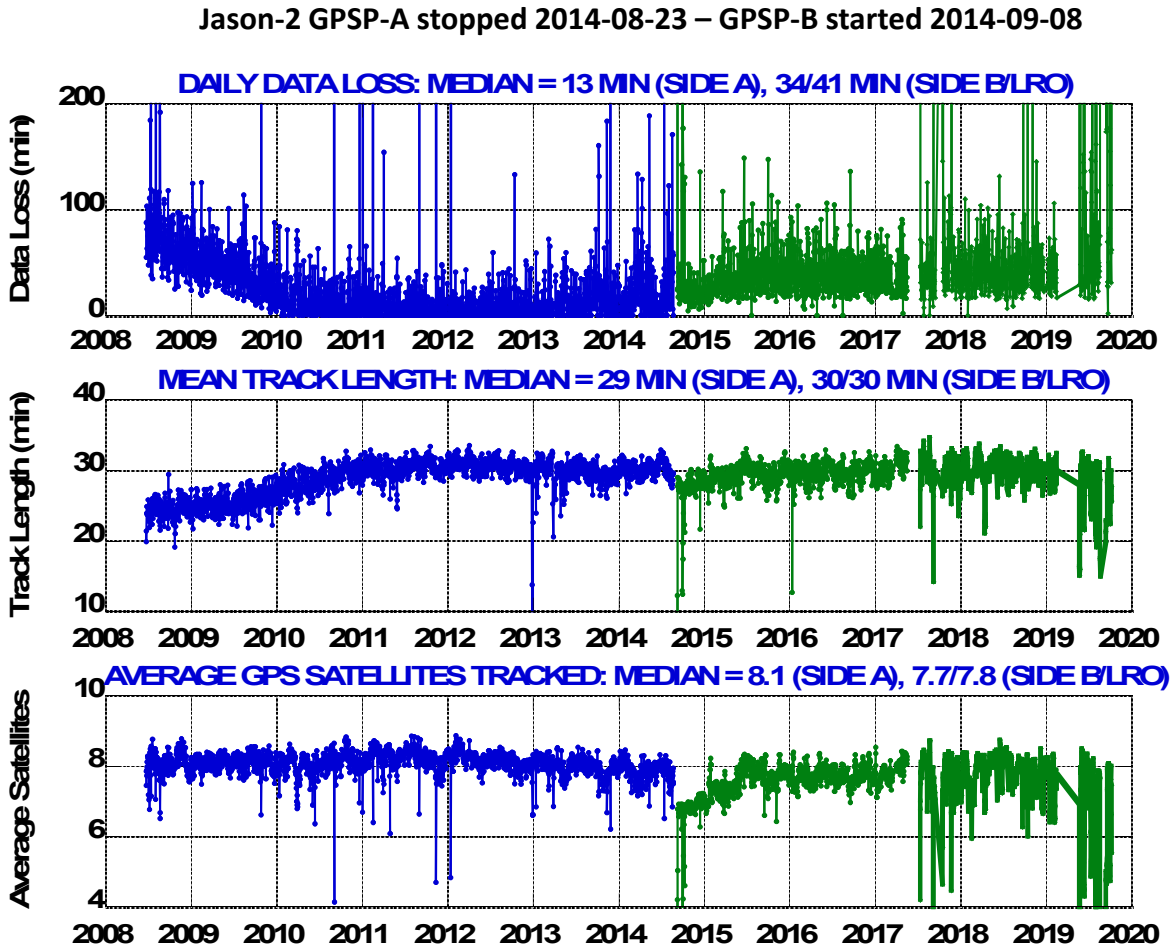
AMR

- **Jason-2 AMR-H performance was nominal**
  - Jason-2 AMR performance remains nominal in maintaining stable long-term path delay estimates
  - New calibration coefficients with the help of cold-sky and on-Earth references have stabilized the performance
  - Both Jason-2 and Jason-3 are in good agreement

Jason-2 AMR Ocean Brightness Temperatures Stability

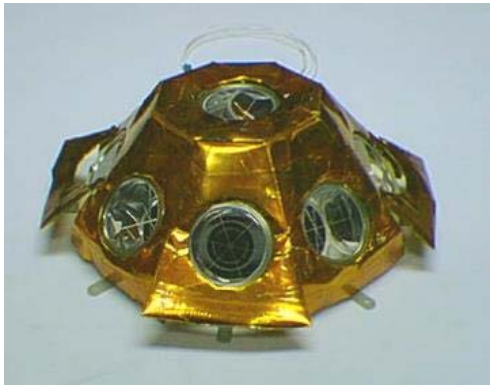


GPSP

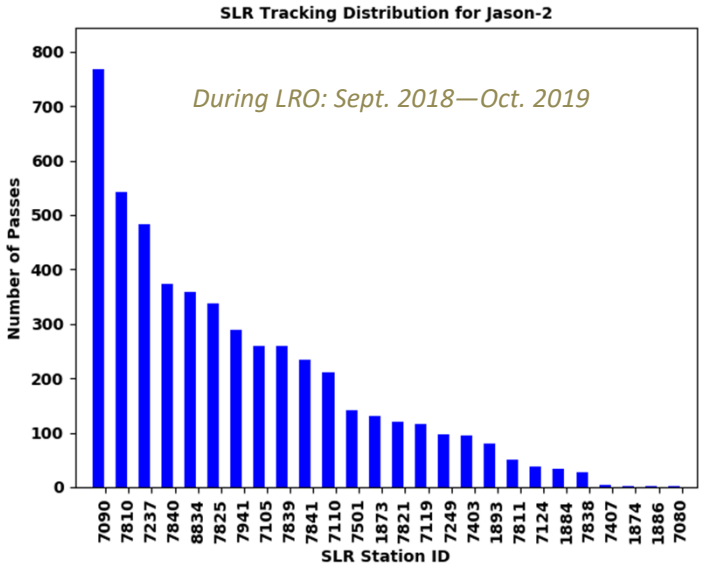


- GPSP-B performance was stable over the last year, including in both LROs.

SLR/LRA



- Laser ranging array (LRA) is passive (No electronics or software)
- Copy of Jason-1 LRA system, supporting cm-level ranging
- Tracking of Jason-3 and Jason-2 high priority for International Laser Ranging Service (ILRS)
- Performance of Jason-2 LRA has been nominal



Cumulative Passes Per Station for Jason-2

- **Top 5 stations by pass volume during Long Repeat Orbit (LRO):**
  - ***Yaragadee, Zimmerwald, Changchun, Herstmonceux, Wetzell***

OGDR products Status and performances

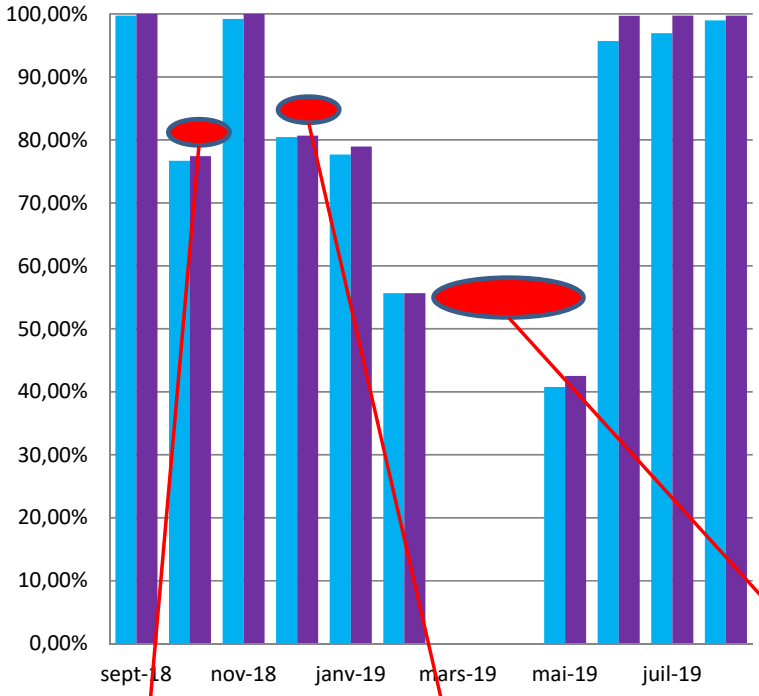
- NRT products made by **EUMETSAT** and **NOAA/ESPC** Mission Center

- Major changes in the period
  - **None on the products**
  - No products during SHMs :
    - Oct. 18th to Oct. 25th, 2018
    - Dec. 26th 2018 to Jan. 7th 2019
    - Feb. 24th to May 22nd 2019

- **EUMPC : ~100% OGDR successful for PLTM1 acquired at USG**
- **NOAA ESPC : ~100% OGDR successful for PLTM1 acquired at CDAs**
- **100 % OGDR products archived, all disseminated via EUMETCast and via NOAA dissemination services**

Operational Geophysical Data Record data latency

OGDR Latency at End User's EUMETCast Reception Station



3 Safe Hold Modes:
19 Oct – 25 Oct
26 Dec – 7 Jan
16 Fen – 22 May

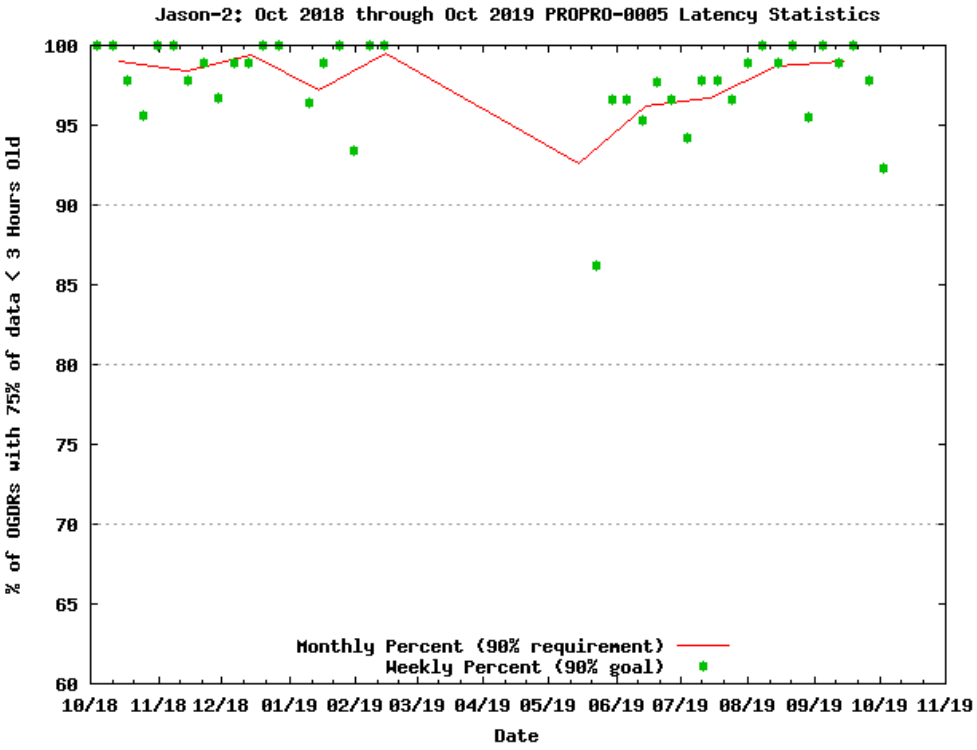
< 3 hours: 71%
< 5 hours: 72%

Anomaly with Gyro 2 triggered a satellite SHM (Safe Hold Mode). No OGDRs produced for subsequent passes.

SHM triggered by Gyro 1. No OGDRs produced for subsequent passes.

SHM triggered by Gyro 2 FDIR on 16 February 2019 and a secondary SHM during recovery on Gyro 1 FDIR on 19 February. Jason-2 remained in SHM due to endorsed hibernation period until 22 May 2019 followed by gyros swap.

NOAA

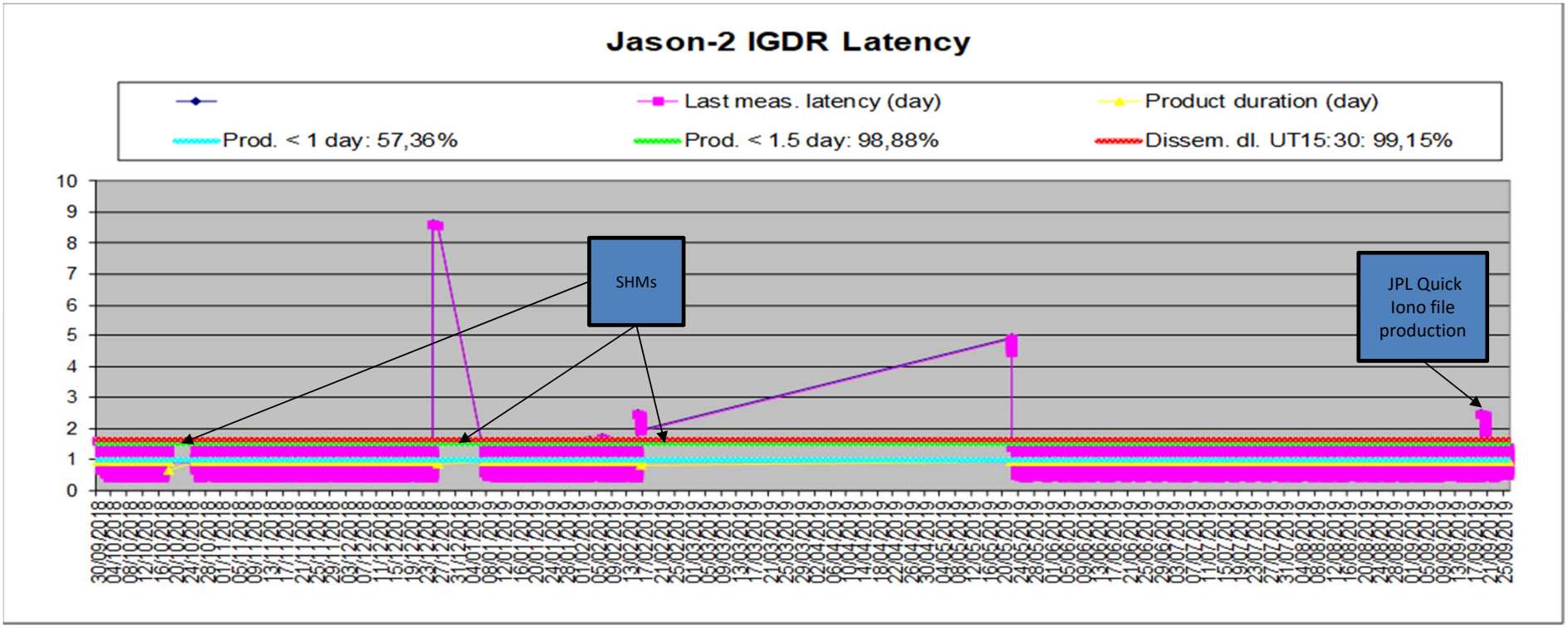


IGDR - status and performances

- Jason-2 IGDR processing is OK (CNES : 100% of possible IGDR successful)
- 100% IGDR products archived
- All disseminated via CNES AVISO+ and NOAA dissemination services

- Lifetime statistics :

Prod. < 1 day: 45,24%
Prod. < 1.5 day: 85,07%
Dissem. dl. UT15:30: 87,84%

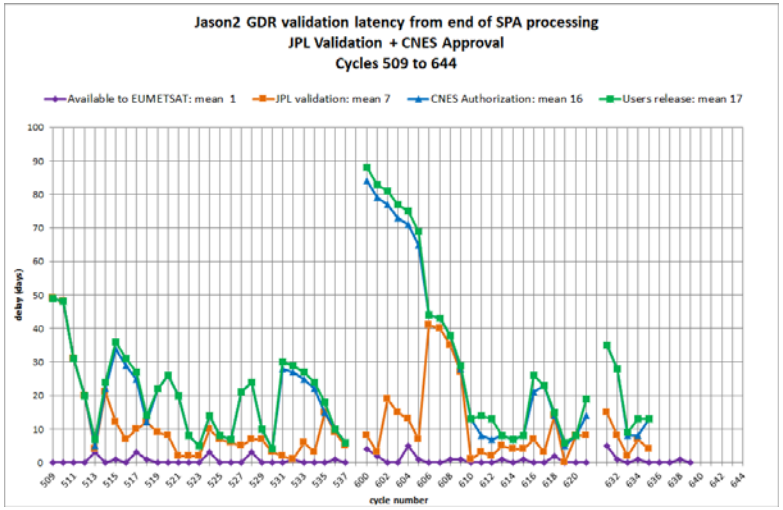


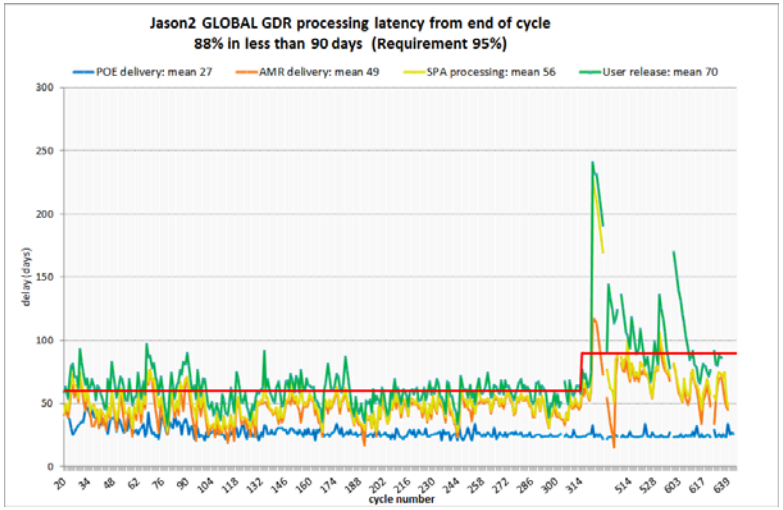
GDR - status and performances

- GDR produced by CNES/SSALTO
- Jason-2 GDR processing is OK
  - Data availability & latency OK
  - Systematic validation by JPL
  - Yearly validation reports until end of 2017 available on AVISO+ http://www.aviso.altimetry.fr/en/data/calval/systematic-calval.html

- 100% GDR products archived

- All disseminated via CNES AVISO+ and NOAA dissemination services

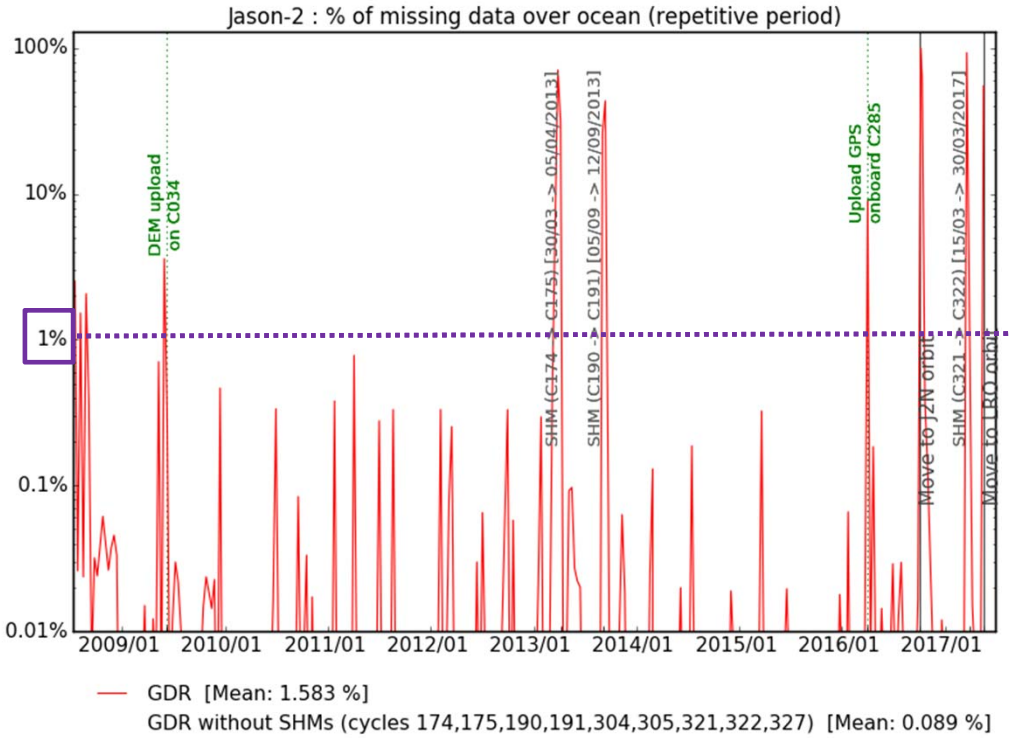


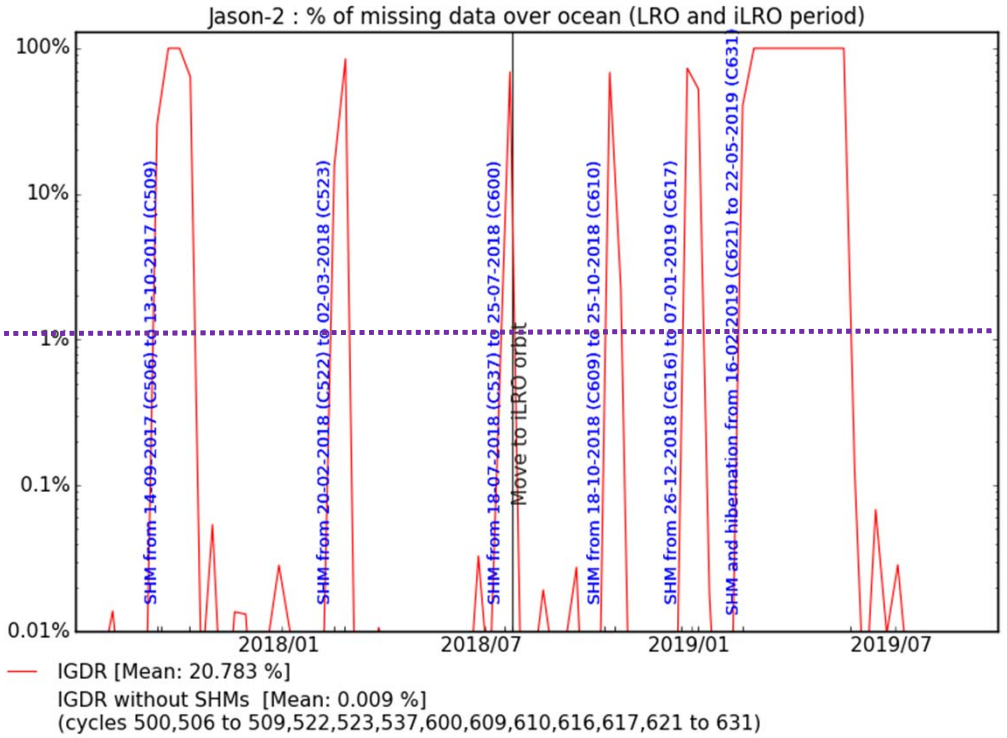


Performances – missing measurements

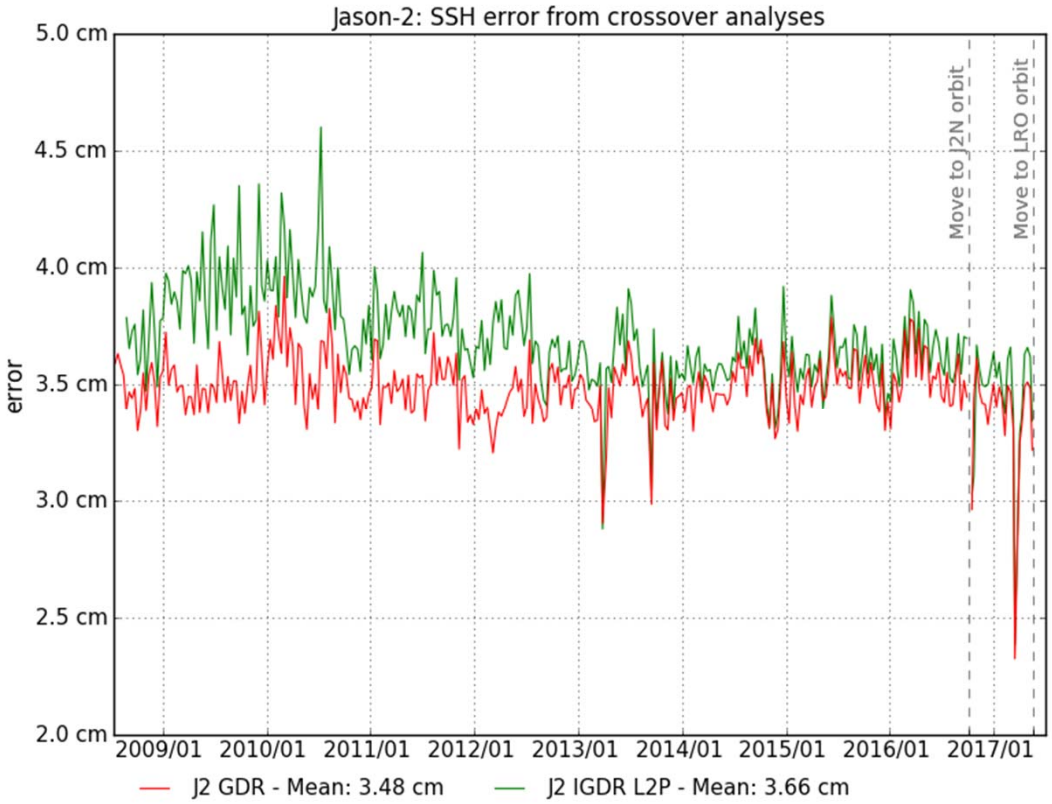
Very good data availability over ocean : 98.25 % over repetitive phase, calibrations and incidents included

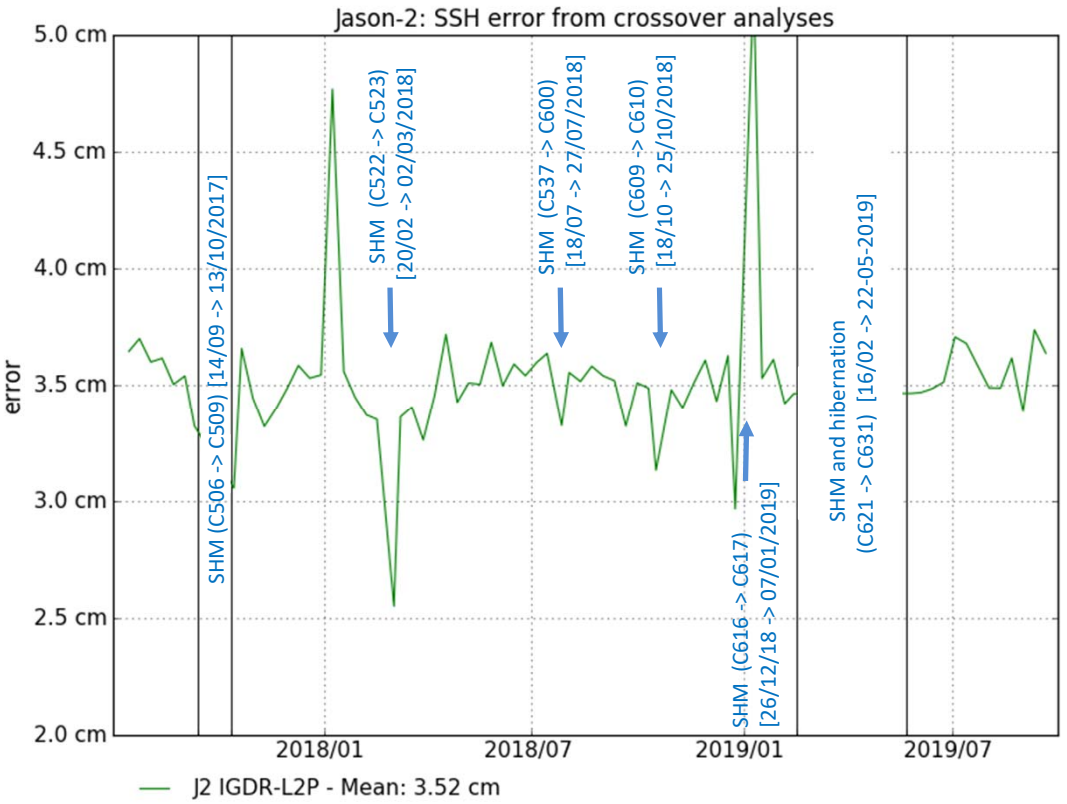
After removing calibrations and incidents: >99.9 % data are available over ocean over both repetitive, and LRO phases



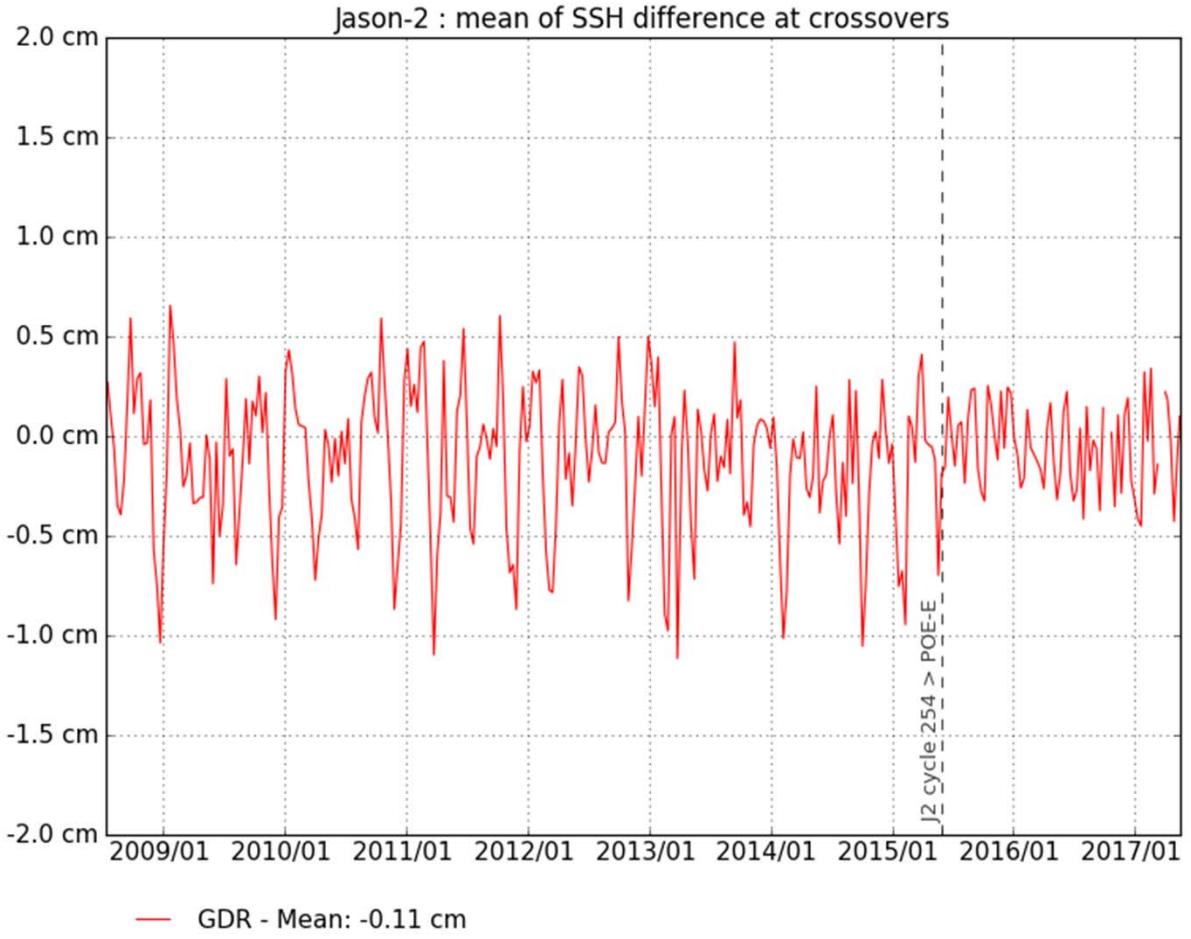


Performances – error at Xover

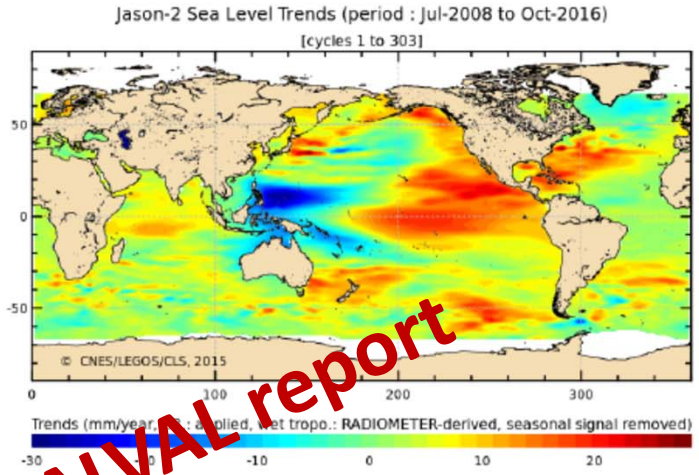




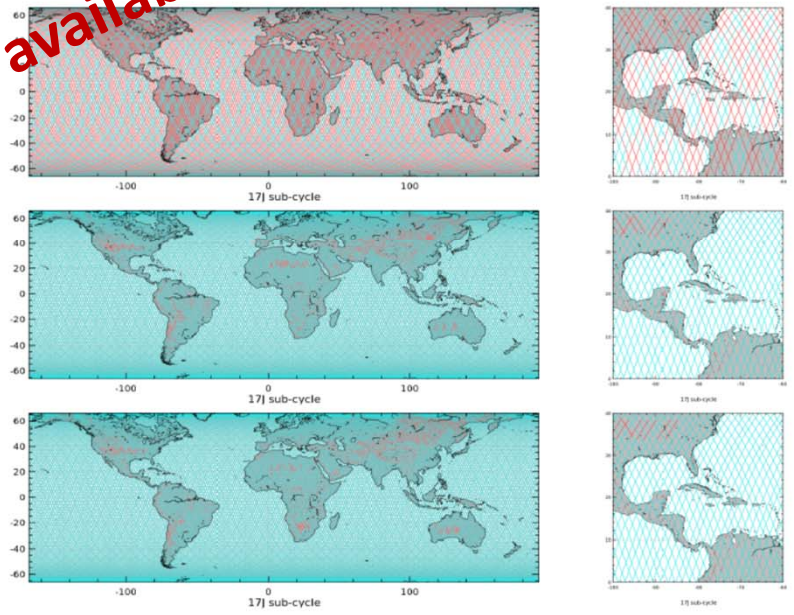
Performances – mean of SSH differences at Xover



CalVal Jason-2



Jason-2 validation and cross calibration activities (Annual report 2017)



Available in the annual CALVAL report

Executive summary also available

System Requirements and Performances

- Data availability :
  - Requirement : The GDR shall contain 95% of all possible over-ocean data (acquisition and archive) during any 12 month period, with no systematic gaps.
- from Jan. 2018 until Oct.2019

⇒ **satellite unavailability**		**~19.7 %**	**> 4% req**
– bus : 19.7%	altimeter : 0.009%	Doris : 0%	AMR : 0.07%
with planned activities		***~0.00 %***	***< 4% req***
⇒ **ground unavailability**		**~0.00 %**	**< 1% req**

➔ **Global Jason-2 system availability : ~ 79.2 %**

Conclusion

- 11th Jason-2 Exploitation Review (REVEX) : successful in May 2019

- S/C passivated on October 10th, 2019

- Excellent measurements quality during more than 11 years in orbit, with an average overall availability of 92.8%

Thank you to all the teams from CNES, NOAA, EUMETSAT & NASA/JPL

- *CNES*
  - ***Th Guinle***
  - ***J. Caron***
  - ***F. Bailly-Poirot***
  - ***N. Picot***
  - ***A. Gerrin***
  - ***A. Guerry***
  - ***S. LeGac***
  - ***Christian Jayles***
  - ***JP. Chauveau***
  - ***T. Médina***
  - ***E. Coulaud***
- *NOAA*
  - ***D. Donahue***
  - ***J. Lillibridge***
- *JPL*
  - ***G. Shirtliffe***
  - ***S. Brown***
  - ***S. Desai***
  - ***B. Haines***
  - ***A. Dorsey***
  - ***W. Bertiger***
  - ***Jean-Damien Desjonquères***
- *EUMETSAT*
  - ***M. Tahtadjiev***
  - ***G. Sinatra***
  - ***A. Richardson***

Thank you for your attention and ... also to the contributors !!