CNES ALTIMETRY ORBITS WITH THE LATEST STANDARD GDRG

S. BLONDEL[1], F. MERCIER[1], S.HOURY[1],J. MOYARD[1], A. COUHERT[1,2],L. FOURGEAUD[1]

T. GRAVALON[3,4], E. SAQUET[4], M. CHERRIER[4], G. KATSIGIANNI[4], A. BANOS-GARCIA[4], A. MEZERETTE [4]

(1) CENTRE NATIONAL D'ETUDES SPATIALES, TOULOUSE, FRANCE

(2) GET-UNIVERSITÉ DE TOULOUSE (CNES, CNRS, IRD, UT), TOULOUSE, FRANCE

(3) CELAD

(4) COLLECTE LOCALISATION SATELLITE (CLS)

22/06/2026, OSTST

SUMMARY

RÉPUBLIQUE
FRANÇAISE
Liberté
Égalité
Fraternité

cnes
CENTRE NATIONAL
D'ÉTUDES SPATIALES

MISSION STATUS

STANDARD G DEFINITION

	POE-G/MOE-G
Gravity model	CNES_GRGS.RL05MF_**2026_01** with DORIS+SLR mascons from January 1993 to March 2002
Surface forces	Earth radiation pressure model from ERA5 hourly fluxes (ECMWF climate reanalysis)
Geocenter variations	S1-S2 atmospheric pressure loading correction no more applied (IGS20 feedback) Non-tidal annual and semi-annual geocenter motion model from ITRF2020
ITRF	ITRF2020
Dealiasing	POE : **AOD1B RL07** MOE : None
Oceanic tides	POE : **MIXTE2025** (Following RL07 recommandations) MOE : FES2014

MISSIONS STATUS

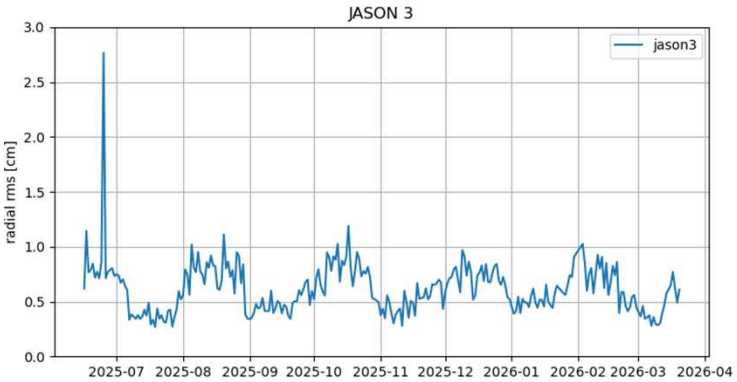
Mission	Launch year	Available in GDRG-G	Reprocessing
Jason 1	2001-2013	/	Planned for october 2026
Jason 2	2008-2019	/	Planned for september 2026
CryoSat-2	2010	Planned in june 2026	Planned for June 2026
SARAL/AltiKa	2013	To be planned	To be planned
Jason 3	**2016**	**Since January 2025**	**Delivered**
Sentinel 3A	**2016**	**Since May 2025**	**Delivered**
Sentinel 3B	**2018**	**Since May 2025**	**Delivered**
HY-2B	**2018**	**Since February 2026**	**Not planned**
HY-2C	**2020**	**Since February 2026**	**Not planned**
Sentinel 6A	**2020**	**Since March 2025**	**Delivered**
HY-2D	**2021**	**Since February 2026**	**Not planned**
SWOT	2022	Planned in July 2026	Year 2025 reprocessed
Sentinel 6B	**2025**	**From beginning of life**	**Mission started in GDR-G**

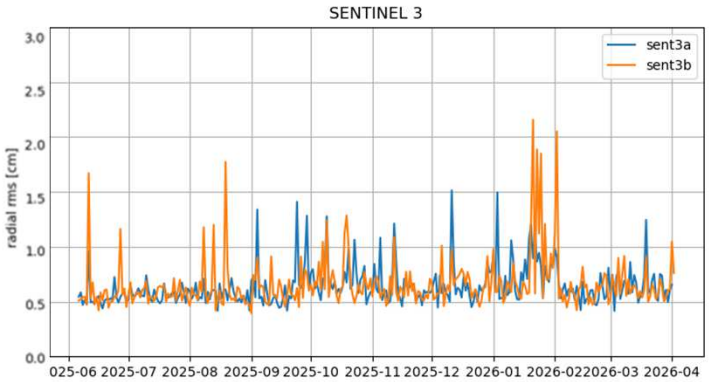
RÉPUBLIQUE FRANÇAISE
Liberté
Égalité
Fraternité

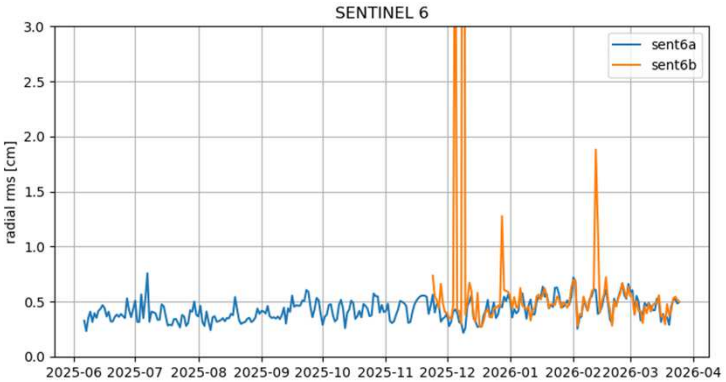
cnes
CENTRE NATIONAL D'ÉTUDES SPATIALES

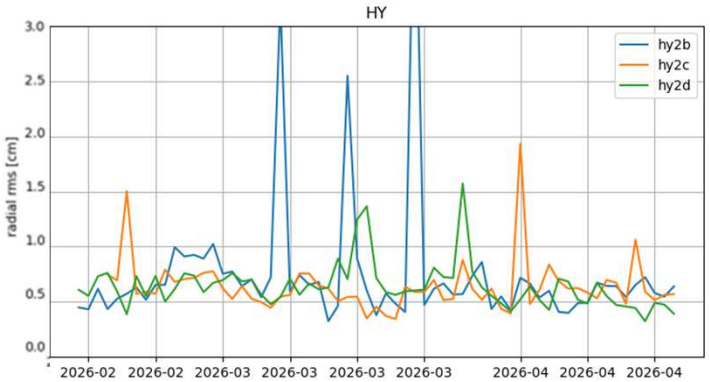
MOE-G AND POE-G ORBIT COMPARISON

RMS RADIAL MOE-G VS POE-G





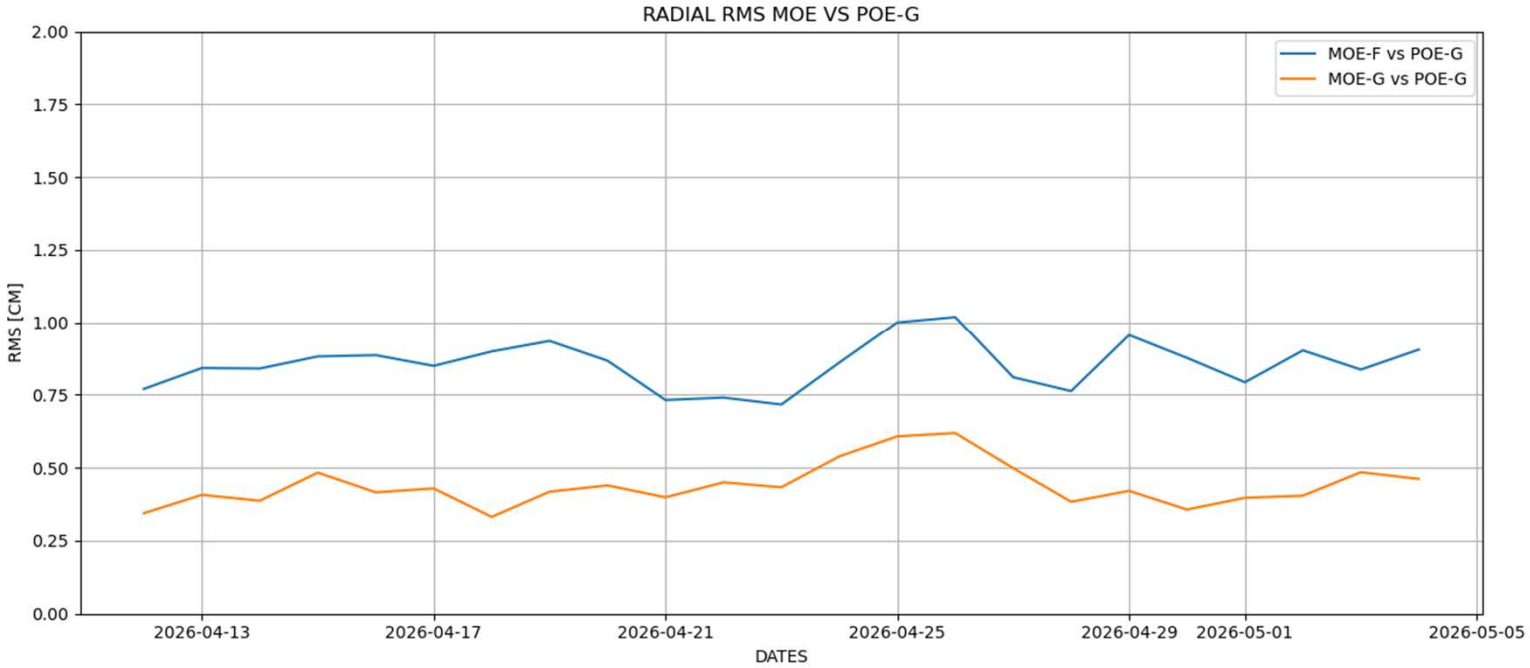




JASON3:
Montly signal to be investigated (attitude law ?)
SENTINEL 3:
MOE impacted by solar activity events and manoeuvers
SENTINEL 6:
S6B anomalies end of december and mid february visible on the MOE
HY:
Performances not investigated

SWOT – POE-G PREPARATION

SWOT POE-G reprocessing available for 2025.
Comparison to MOE-F product and to MOE-G preliminary product over 30 days of data



For more, see poster: SWOT orbit: parameters, standard and modelling updates during POD poster session

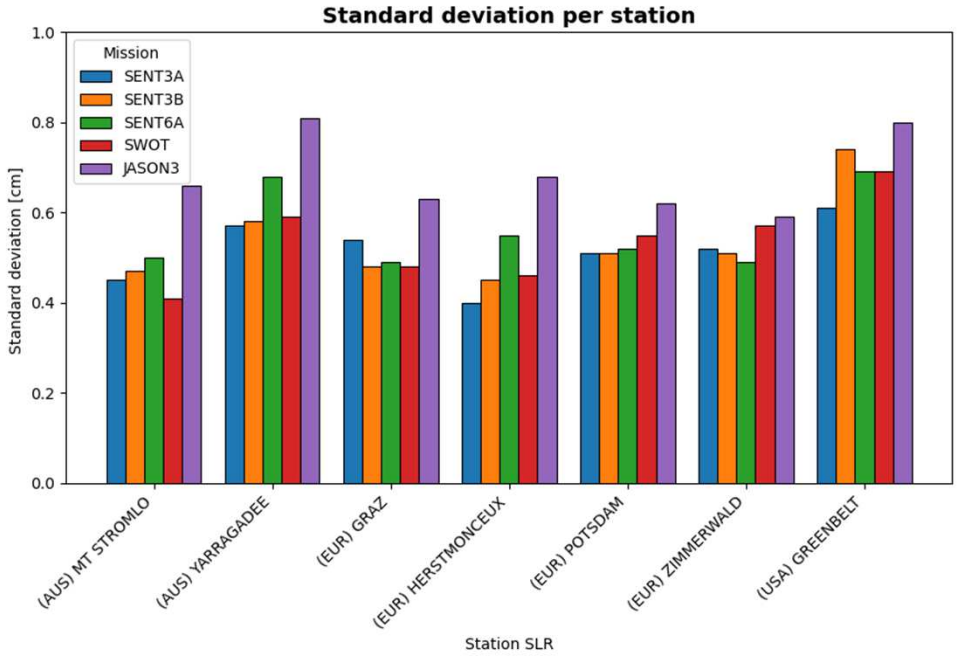
RÉPUBLIQUE
FRANÇAISE
Liberté
Égalité
Fraternité

cnes
CENTRE NATIONAL
D'ÉTUDES SPATIALES

SLR PERFORMANCES

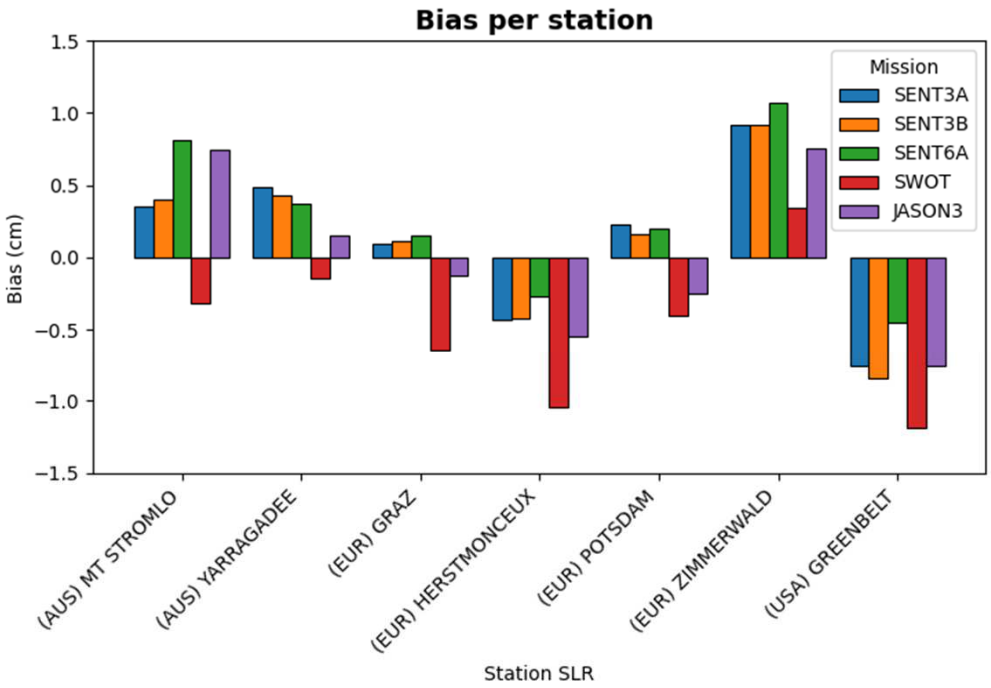
SLR RESIDUALS STANDARD DEVIATION
PER MISSIONS AND PER STATIONS

Standard deviation per stations for different missions, over the same time span (july-december 2025)
Residuals > 3cm removed. Stations with data available for all missions tested and nb passages > 60

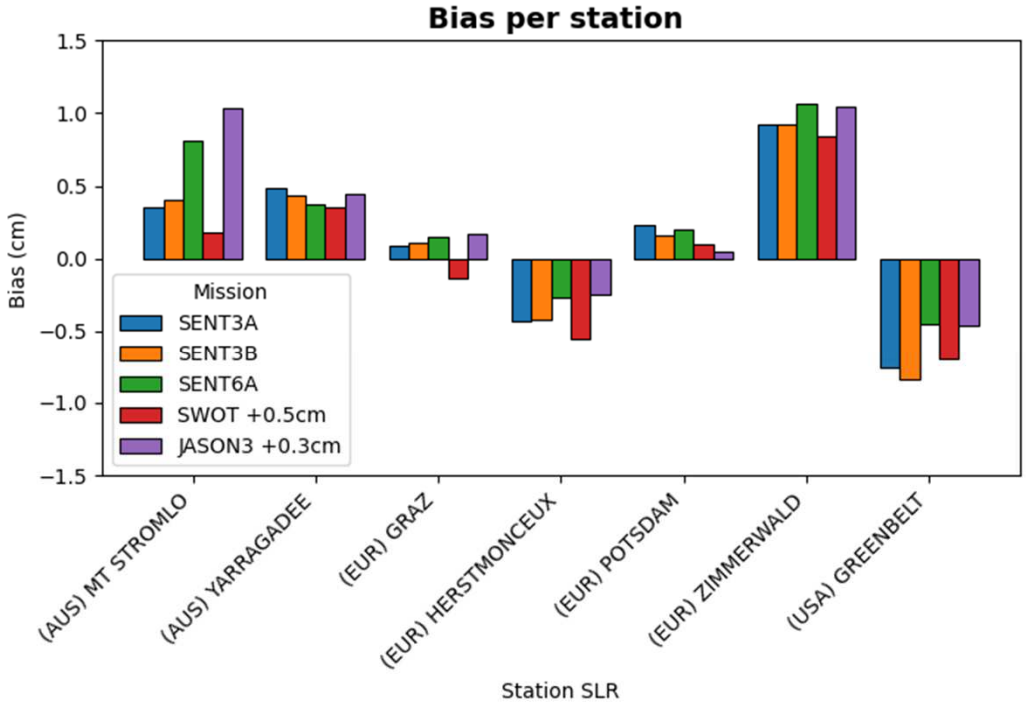


JASON3 standard deviation is slighly higher on all stations – should be investigated

SLR RESIDUALS BIAS
PER MISSIONS AND PER STATIONS

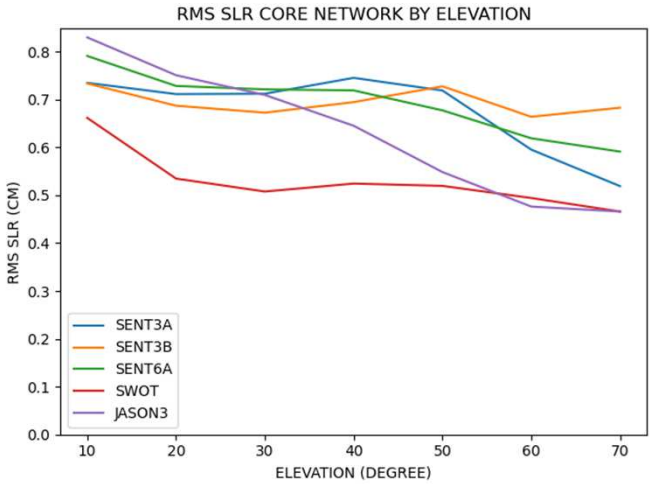


Same bias for S3A/S3B. Close with S6A
SWOT is ~5mm below S3 values on all stations
J3 is ~3mm below S3 values on all stations

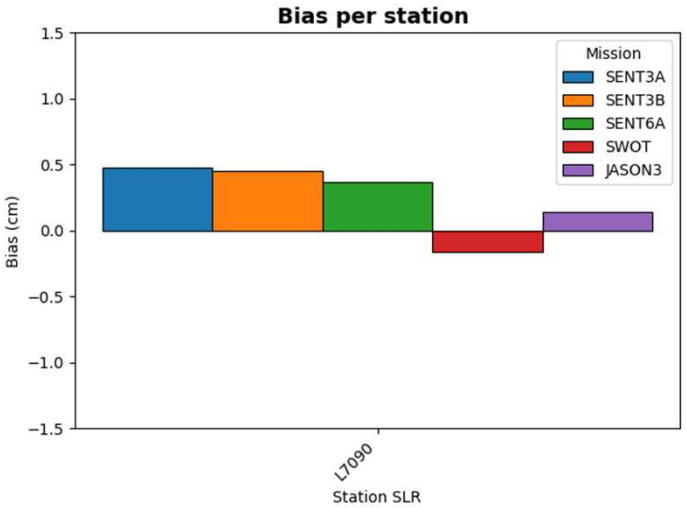


Add +5mm for SWOT and +3mm for JASON3.

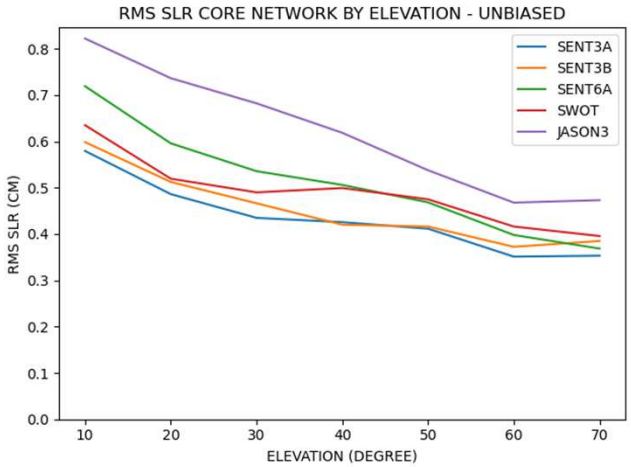
SLR RESIDUALS PER MISSIONS/ YARRAGADEE,



RMS residuals w.r.t. elevation.
Bias not removed.
Radial performances (read at elev=70deg) dispersion between 0,5cm and 0,7cm

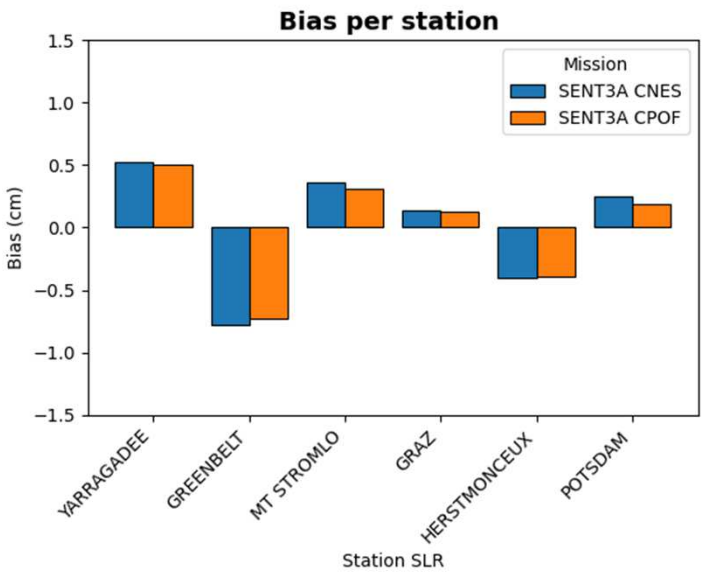


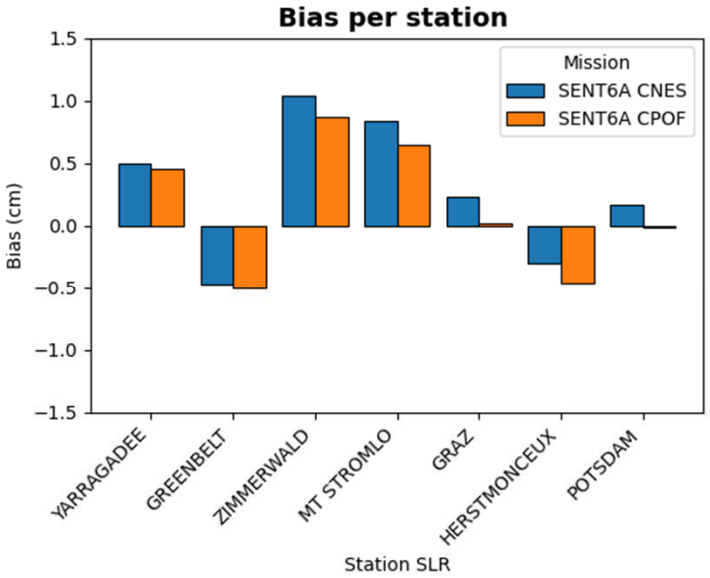
Bias computed for each mission.

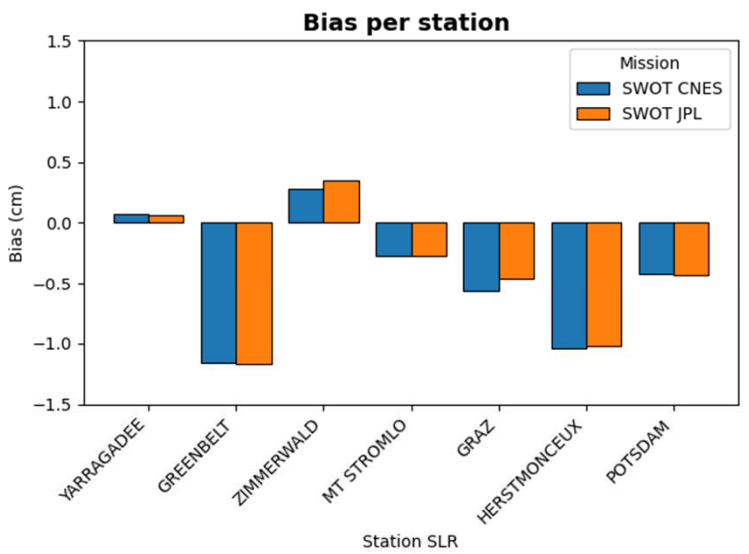


RMS residuals w.r.t. elevation.
Bias removed.
Radial performances dispersion between 0,4cm and 0,5cm

SLR STATIONS BIAS
BETWEEN ANALYSIS CENTER







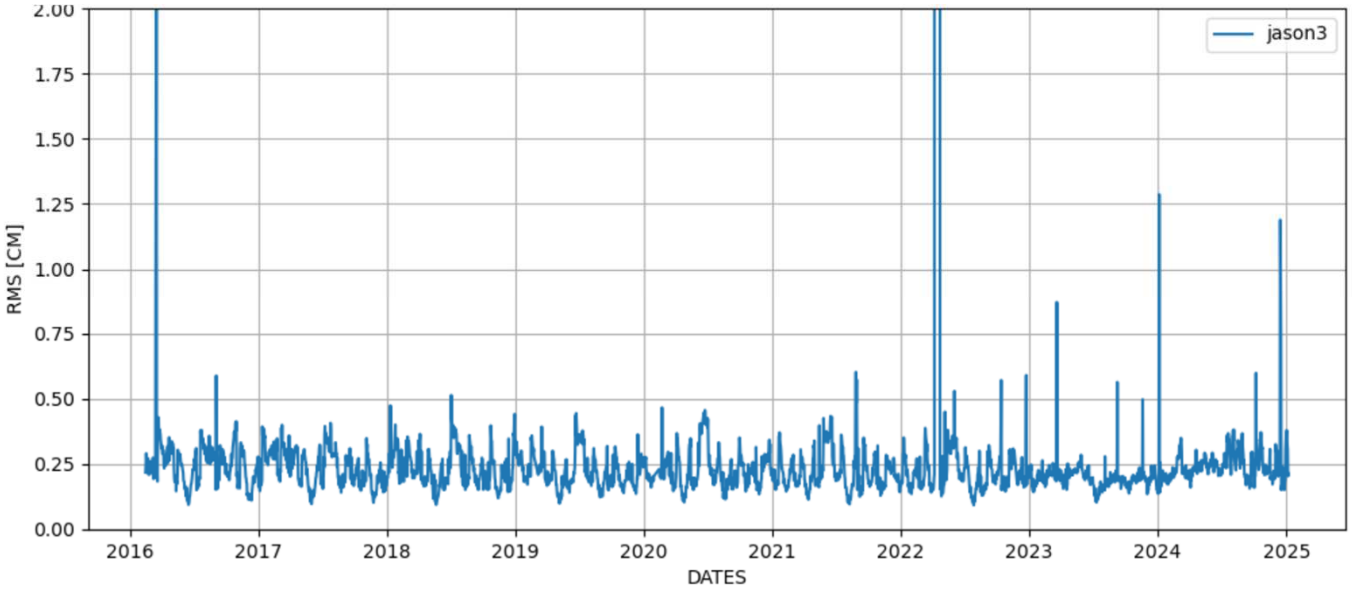
Consistent bias computed between different analysis center.

RÉPUBLIQUE
FRANÇAISE
Liberté
Égalité
Fraternité

cnes
CENTRE NATIONAL
D'ÉTUDES SPATIALES

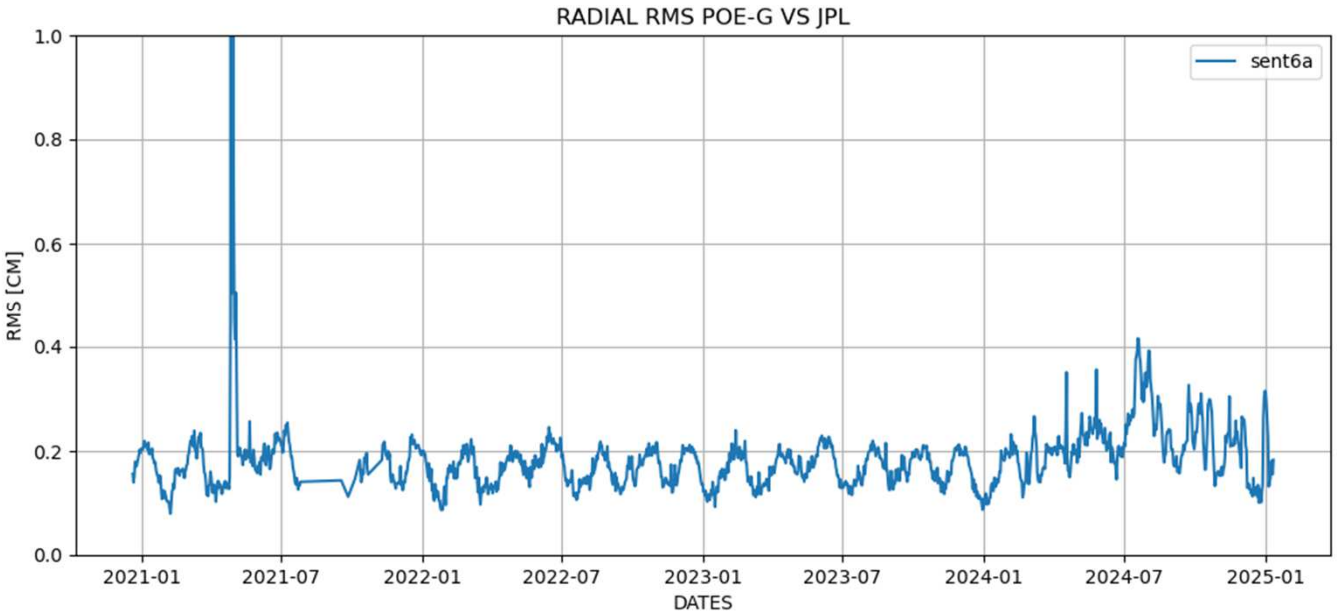
REPROCESSINGS

JASON3 REPROCESSING
RMS RADIAL JPL VS CNES G



Average difference around 0,25cm
Change of behaviour from 2023, to be discussed

SENTINEL-6A REPROCESSING
RMS RADIAL JPL VS CNES G



Average difference around 0,18cm
60 days signal in radial RMS ?
Higher differences during 2024, difference in processing during high solar activity events ?
Other differences in modelling ?

RÉPUBLIQUE FRANÇAISE
Liberté
Égalité
Fraternité

cnes
CENTRE NATIONAL D'ÉTUDES SPATIALES

CORNER REFLECTOR STUDY

CORNER REFLECTOR STUDY

On going internship at CNES to process corner reflector measurements

- Colocalised with an SLR station at Grasse (below S3 track)
- Single CR in the Pyrennees, France (below S6 track)

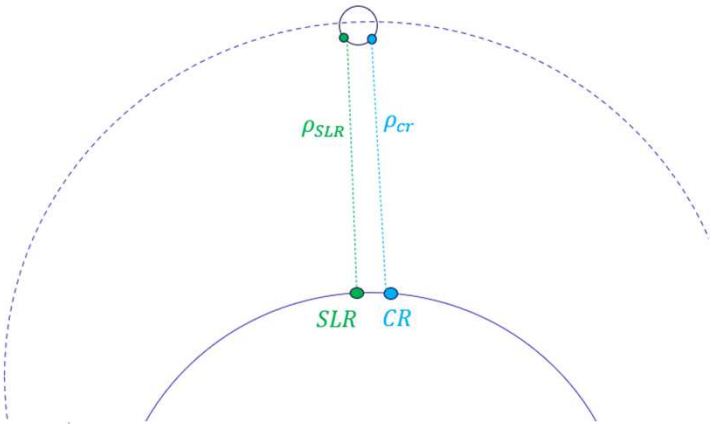


Photo du coin réflecteur et de son antenne de positionnement par satellite derrière la palissade de protection.
©CNES / Maxime Brient, 2024

Goals:

- Analyse corner reflector measurements for orbit validation
- Assess the altimeter bias using colocated SLR data
- Implement a new measurement function for corner reflector data

Challenges:

- One measurement per cycle for one corner reflector (when the satellite is at 90deg elevation, every 30 days for S3)
- Standard altimeter processing uses the orbit

RÉPUBLIQUE FRANÇAISE
Liberté
Égalité
Fraternité

cnes
CENTRE NATIONAL D'ÉTUDES SPATIALES

THANK YOU !

ANY QUESTIONS ?