Ocean Surface Topography Science Team Meeting

*Precise Orbit Determination Splinter*

# Impact of ITRF2020 on DORIS, GNSS, and SLR observations for the CNES altimeter satellite orbits

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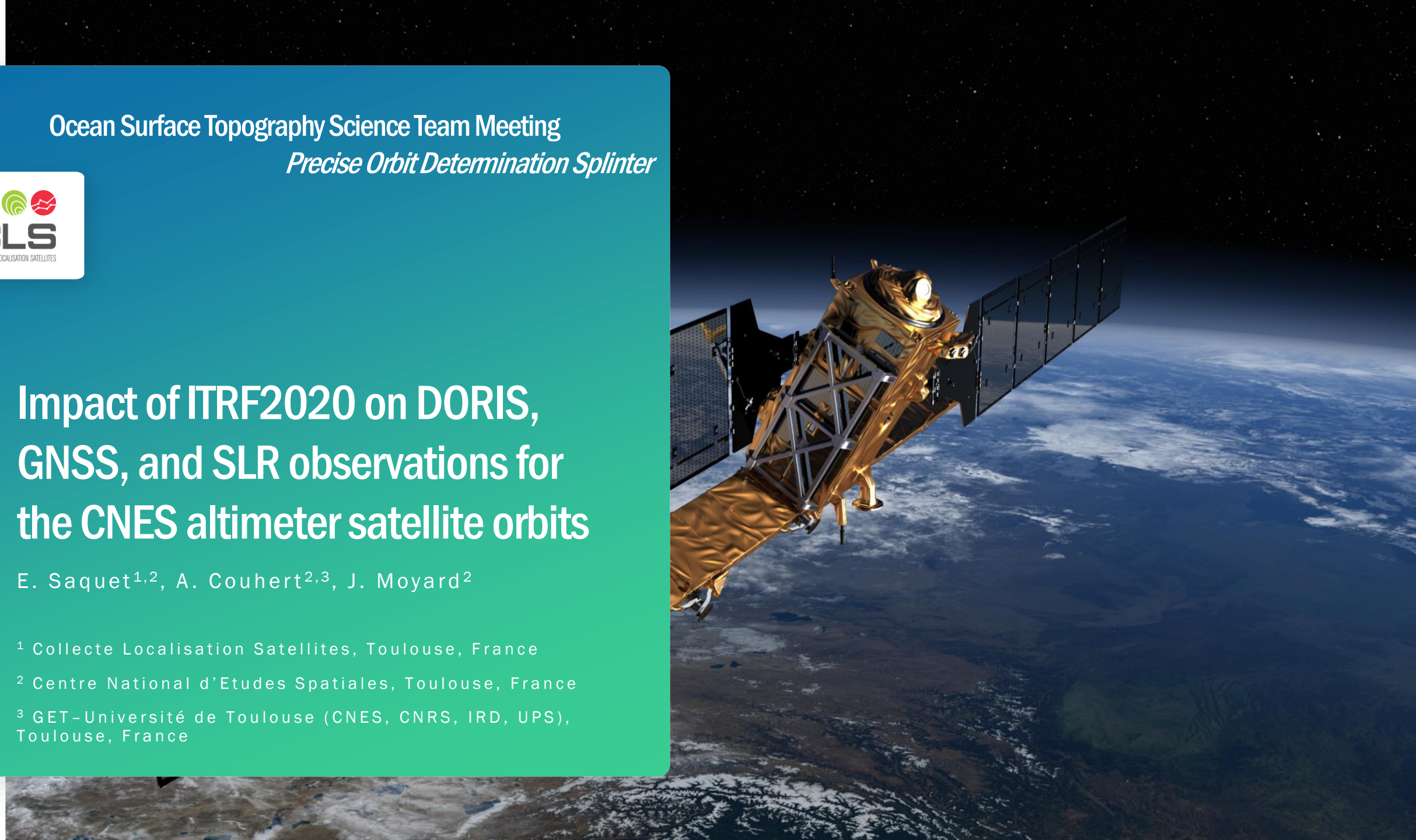


# Introduction

1. Context
2. Doris & SLR analysis
3. GNSS & SLR analysis
4. Conclusion

# Context

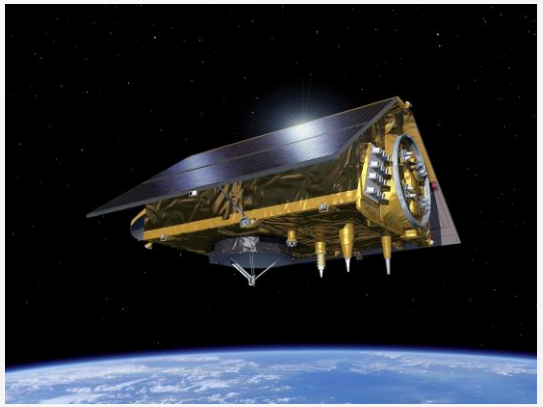
Since April 2022, the new ITRF2020 was released. We present here an evaluation of the ITRF2020 solution and the effect of considering the new seasonal terms (loading and geocenter corrections) through comparison with the current CNES POE-F Standards (ITRF2014) :

- for DORIS POD with Cryosat-2

- for GPS+Galileo POD with Sentinel-6A

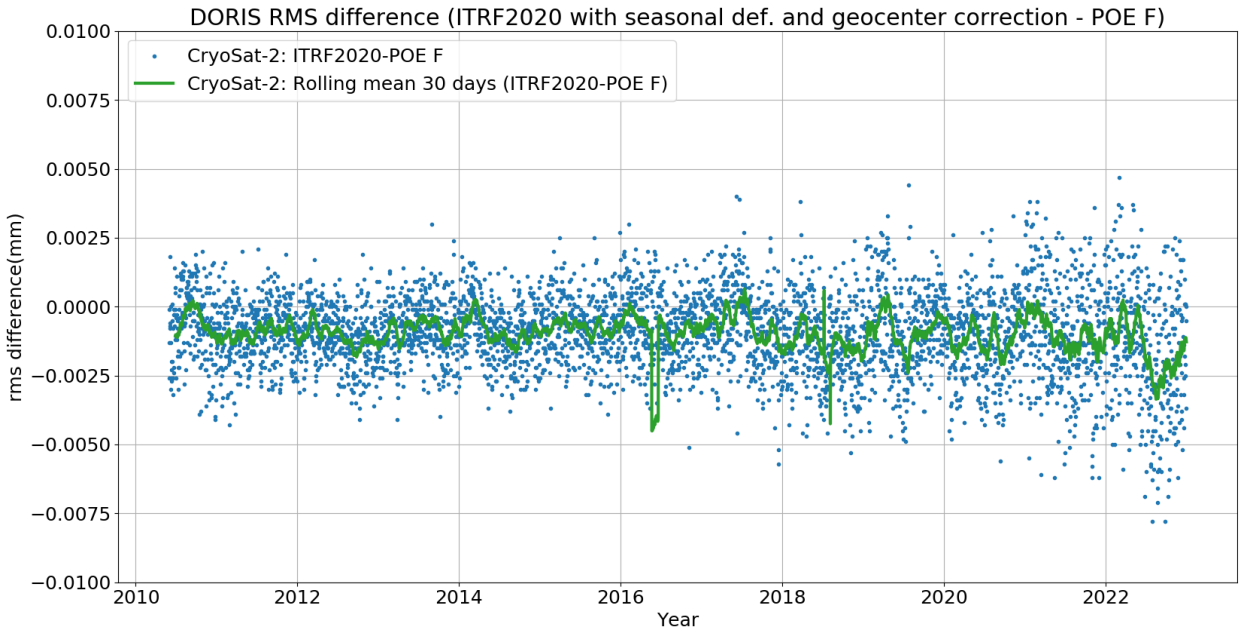
We also used independent SLR observations for their validation.

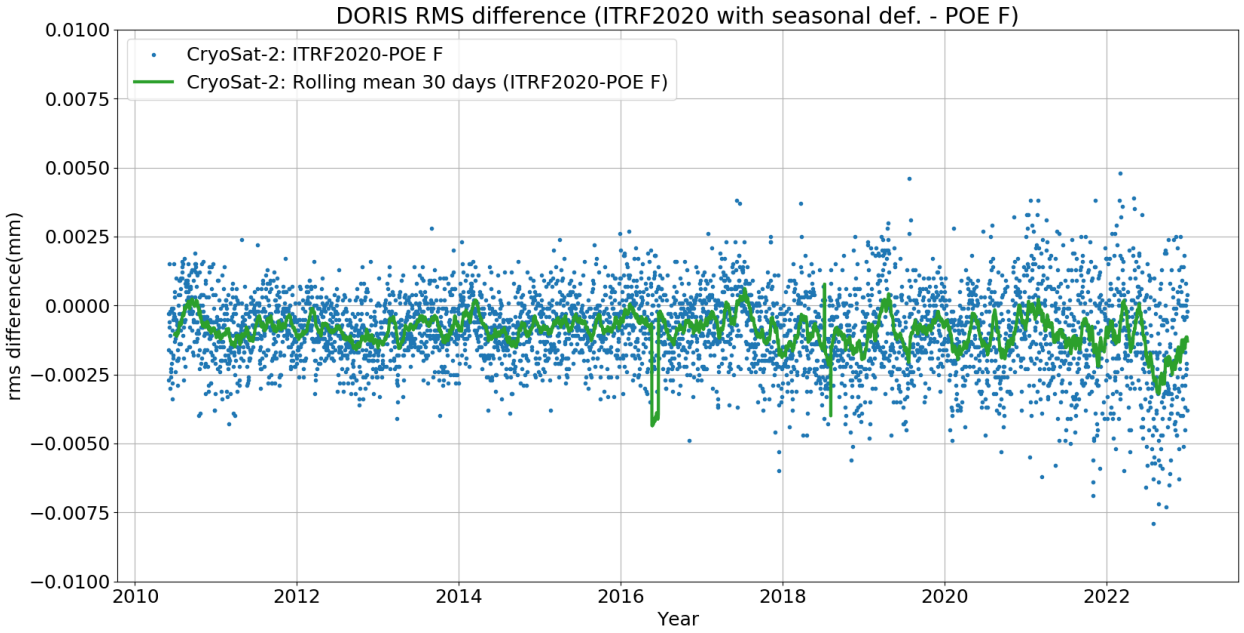
Cryosat-2. Credits: ESA



Sentinel-6A. Credits: ESA

# Doris & SLR analysis

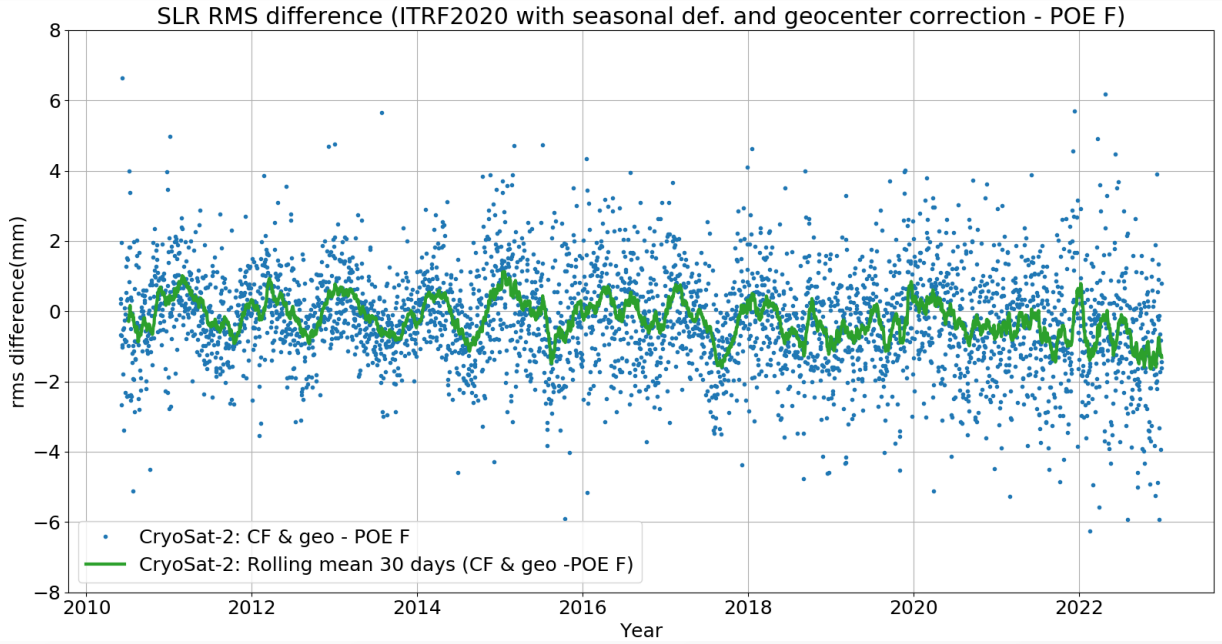


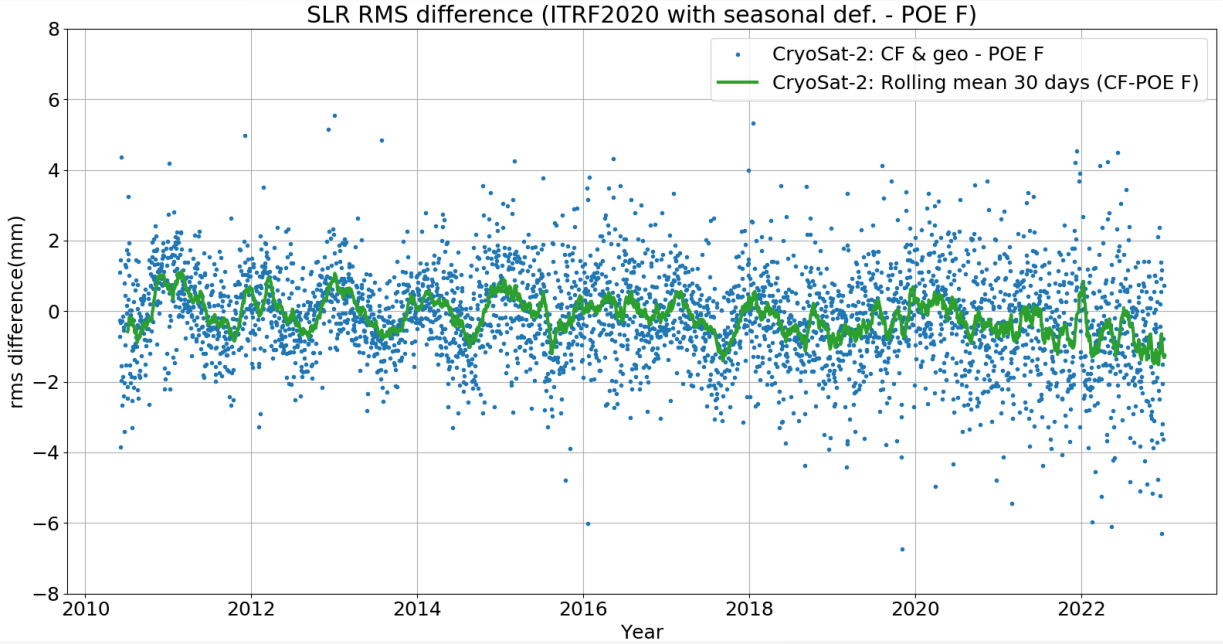




Comparison between reduced dynamic DORIS orbits in ITRF2020 with ITRF2020 seasonal loads with (left figure) and without (right figure) seasonal ITRF2020 geocentre and POE-F (without geocenter model).

The negative rolling mean (30 days) rms shows an **improvement using the ITRF2020 solution.**

# Doris & SLR analysis

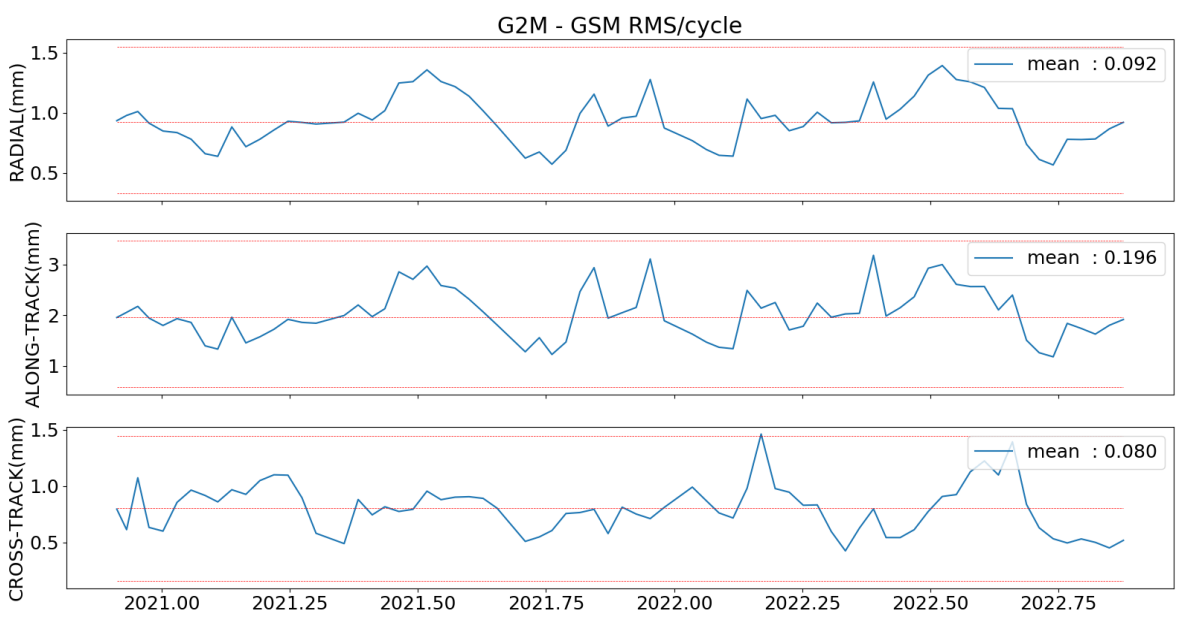


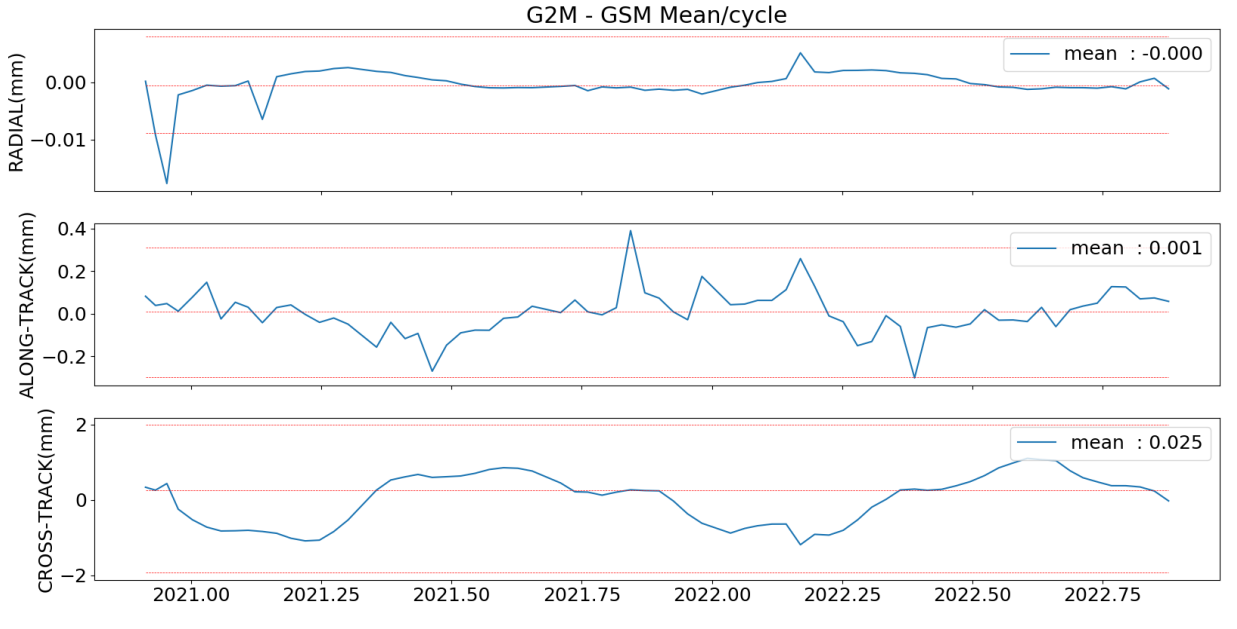




SLR treatments in both cases (consistent with previous DORIS orbits).

The rolling mean (30 days) rms is also negative -> **residuals improvement with ITRF2020 solution.**

# GNSS & SLR analysis



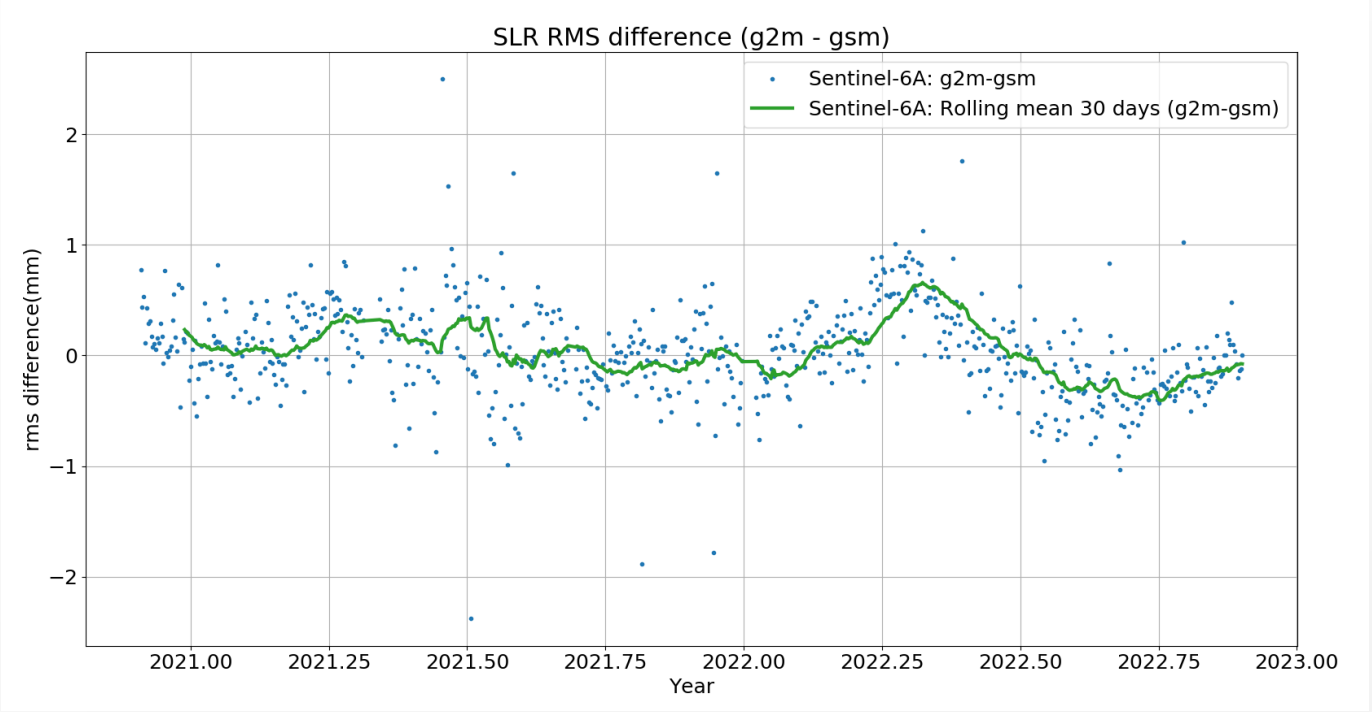

These figures show Sentinel-6A GPS+Galileo ephemeris comparisons between GNSS GSM (ITRF2020 alignment + annual and semi-annual loading/geocenter terms) and G2M (ITRF2020 alignment only <=> classical IGS20 processing) products.

In the cross-track direction we can observe the geocenter systematic effect in the mean orbit differences whereas in the radial and along-track directions the inconsistency reflects in the standard deviation.

# GNSS & SLR analysis

SLR treatments for the previous case (G2M-GSM).

RMS difference is up to 1mm: importance of taking into account the annual and semi annual loading/geocenter terms.



# Conclusion

- Evaluation of the ITRF2020 solution realised on DORIS and SLR measurements (Cryosat-2) and GNSS and SLR measurements (Sentinel-6a)
- Improvement of the residuals using the new ITRF2020 solution with the new seasonal terms.
- Up to 1mm RMS with taking into account the annual and semi annual loading/geocenter terms.