

# Equatorial band : Topex was right from the start. An upcoming correction of Jasons and Swot Nadir ground segments.

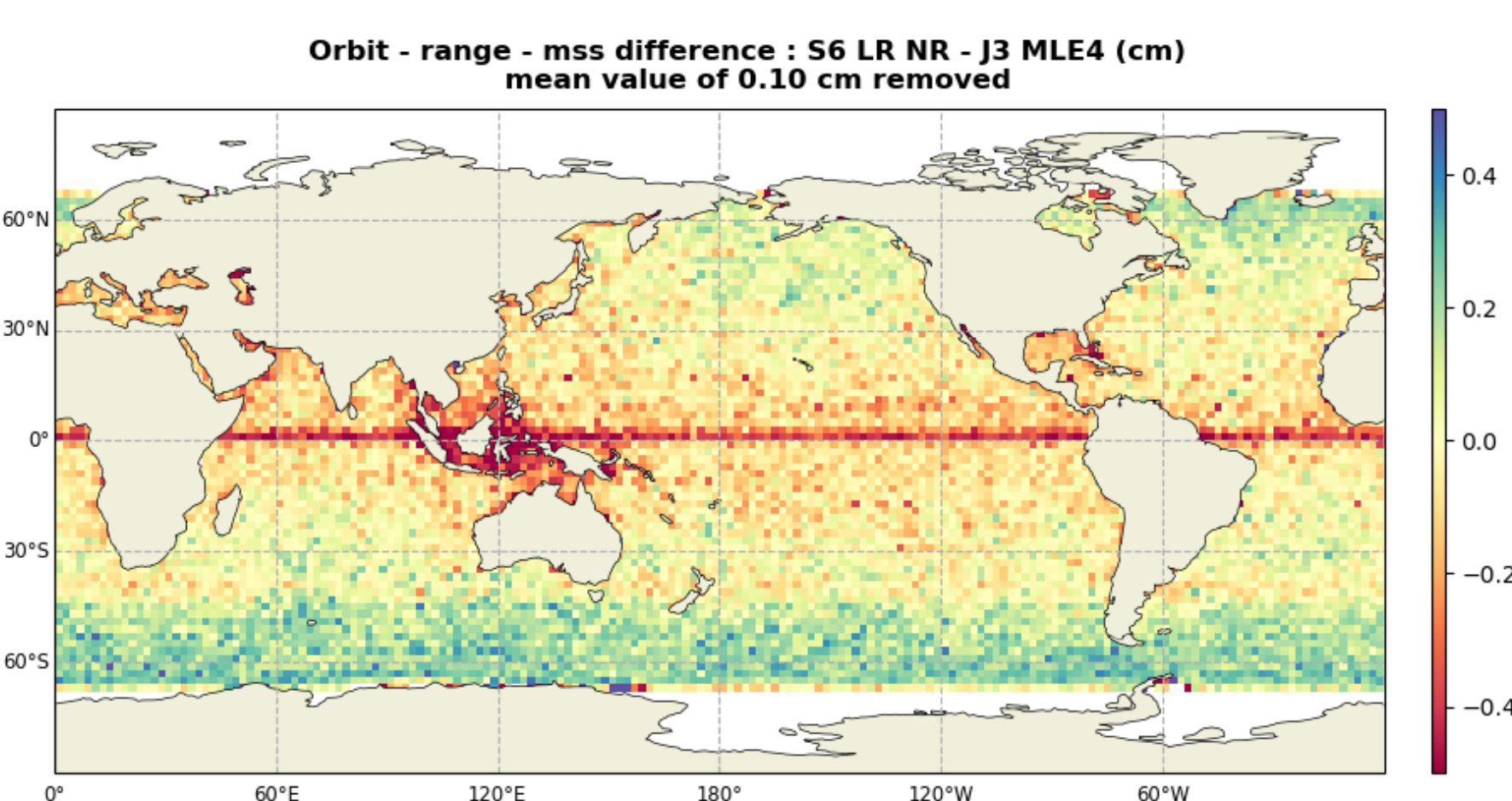
## Comparison of Jason-3 and Sentinel-6MF observations in the equatorial band: was Topex right from the start?

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### Background

- Comparison between S6MF and J3 range over the tandem phase shows :
  - a **4 mm-amplitude band** around the equator (between 1°S and 3.5°N),
  - a second band around 40°S on ascending tracks only.

Reported in [1] and [2]



- Not observed between J2 and J3, nor between J1 and J2.
- But identical signature observed between TOPEX and J1.

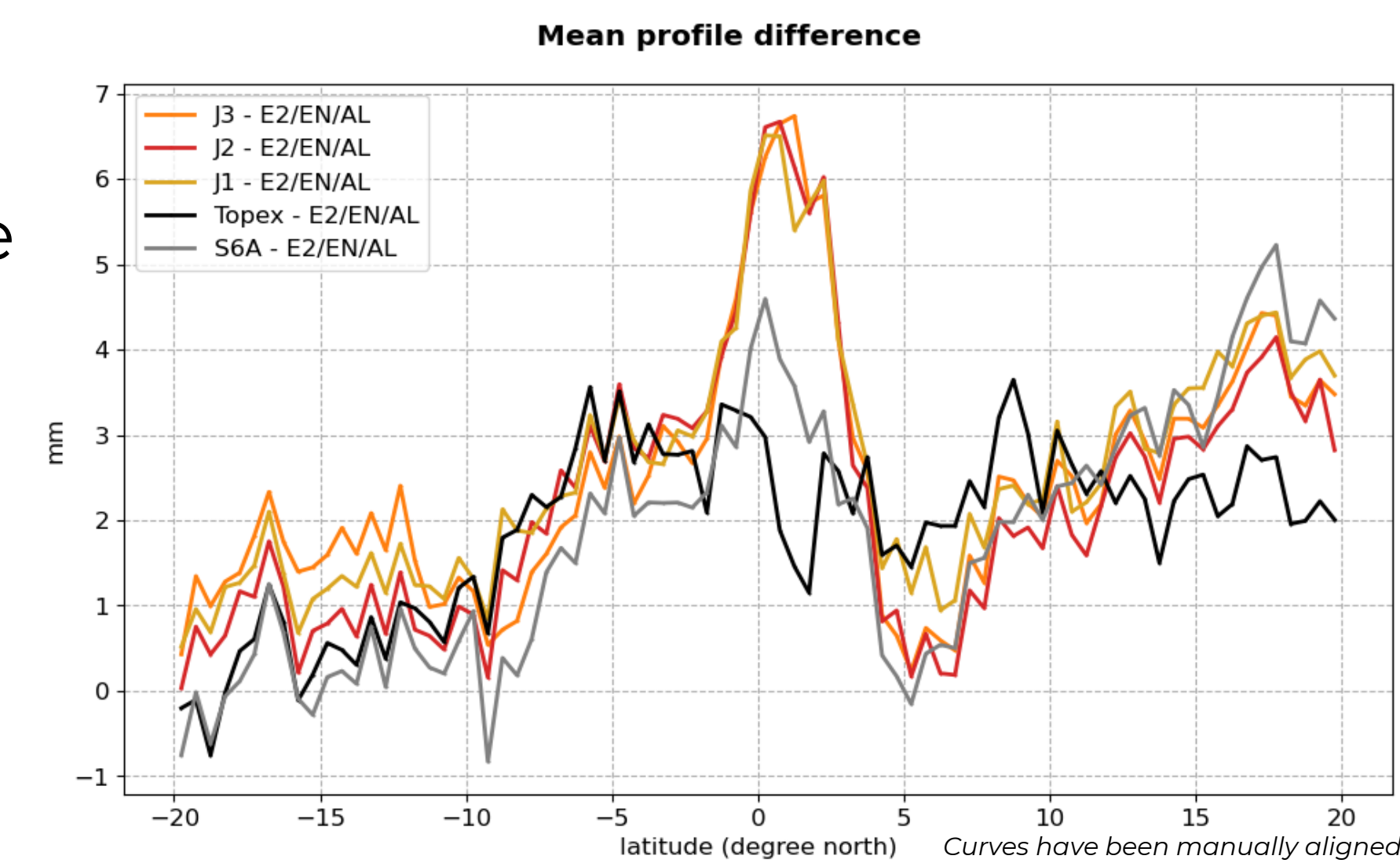
→ As the Jason missions are consistent with one another, the responsibility was naturally put on TOPEX, until the launch of S6MF.

References :  
 [1] Cadier E et al, Assessment of Sentinel-6MF low resolution numerical retracker over ocean: continuity on reference orbit and improvements, under review.  
 [2] Nilsson J et al, Global cross-calibration of the Jason-3 and Sentinel-6 Michael Freilich missions during their tandem period. Poster OSTST 2022. doi:10.24400/527896/a03-2022.3354.  
 [3] Schaeffer P et al. (2012) 'The CNES\_CLS11 Global Mean Sea Surface Computed from 16 Years of Satellite Altimeter Data', Marine Geodesy, doi:10.1080/01490419.2012.718231.  
 [4] Courcol B et al: Impact of POE-G orbits on Sentinel-6 MF and Jason-3 altimetric performances, 30 YPRA (2024), Poster.  
 [5] Kocha C et al: 30 years of sea level multi-mission reprocessed to improve climate and mesoscale satellite data record, 30 YPRA (2024), Oral presentation.

### Track the anomaly down to Jasons

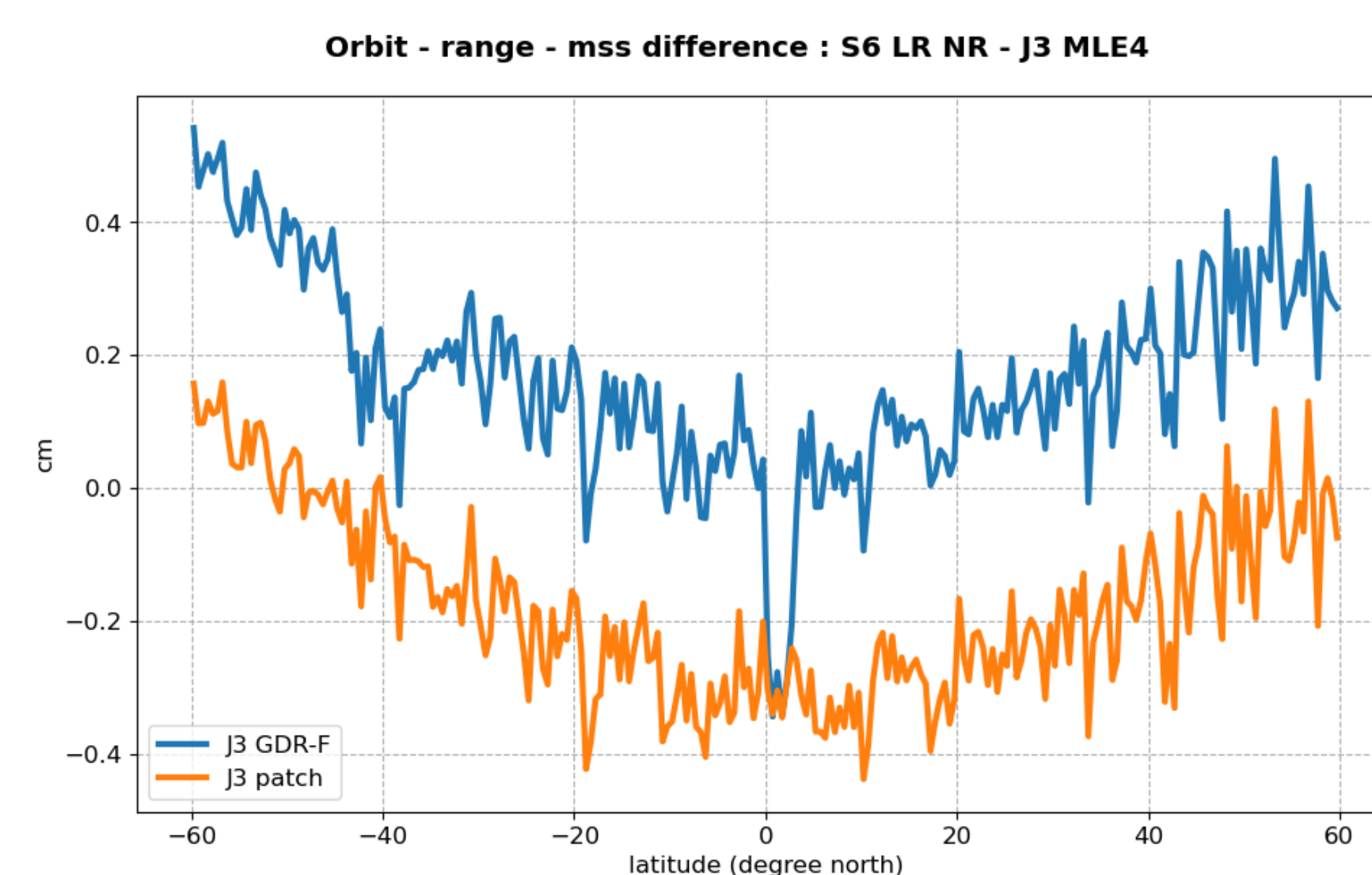
Mean profiles ([3]) comparison between missions on the reference track and independent missions (E2 /EN/AL):

- Equatorial band visible on Jasons curves,
  - Neither on TOPEX nor S6MF.
- Same results with S3A and S3B.  
 → The equatorial band comes from the Jason series.



### Anomaly in Jason's and SWOT Nadir ground segments

Detection of an **anomaly in the range estimation** (inconsistent rounding methods).



Note: The U-shape of these curves will be reduced with S6MF POE-G orbit (see [4]).

Generation of J3 L2 data (3 cycles) with a test version of GDR-F including a patch:

- Difference between patched and original ranges:
  - No bias at the equator, at track extrema and around 40°S for ascending tracks.
  - 3.65 mm bias everywhere else
- Affects all retracker and frequencies,
- Corrects the **two latitudinal bands** on S6MF/J3 range bias.

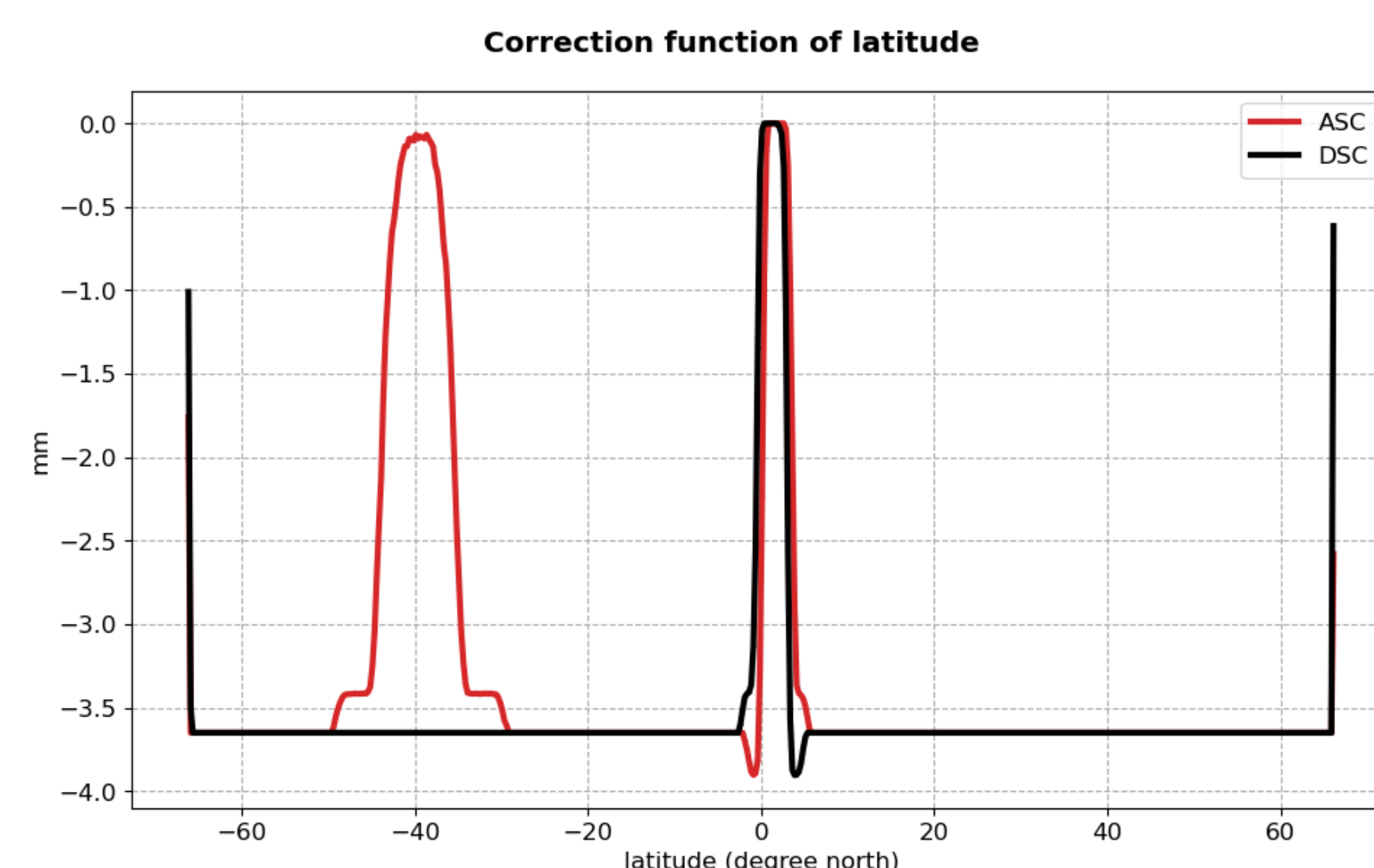
→ This anomaly is the **root cause** of the observed bands.

### Correction

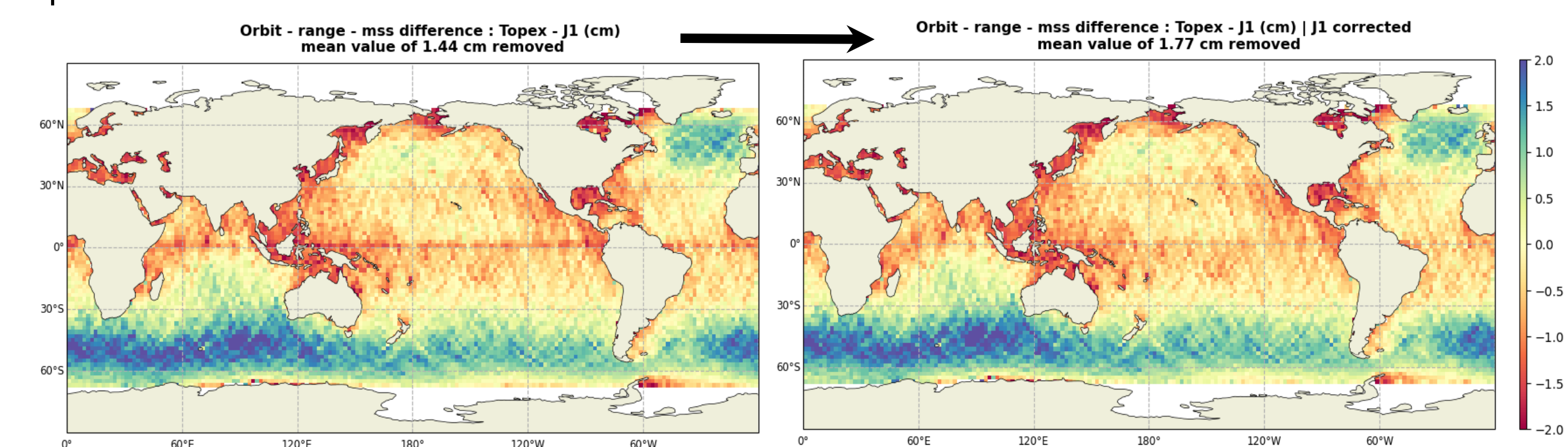
In operational ground segments: **SWOT Nadir GDR-S2** (Fall 2024) and **GDR-G for Jasons** (2025).

In the meantime, users can apply an **approximate correction available for download** below :

- based on J3 patched dataset,
- function of latitude, with a distinction between ascending and descending tracks,
- valid for Jason missions flying on the reference track only.



This correction shows great results on J1 data over its tandem phase with TOPEX:



### What about L2P DT2024 ?

- Implemented before the ground segment anomaly detection
- Jasons' datasets corrected at first order through regional biases using **S6MF as reference** [5].

### Conclusions

- The equatorial band error **detected more than 20 years ago** and attributed to TOPEX at the time is now proven to be due to an artifact in Jasons' ground segments.
- This anomaly also causes for the 2<sup>nd</sup> band at 40°S.
- It is a great example of the **importance of tandem flights**.

Take a picture to download the correction

