A new slope correction for ocean SAR altimetry

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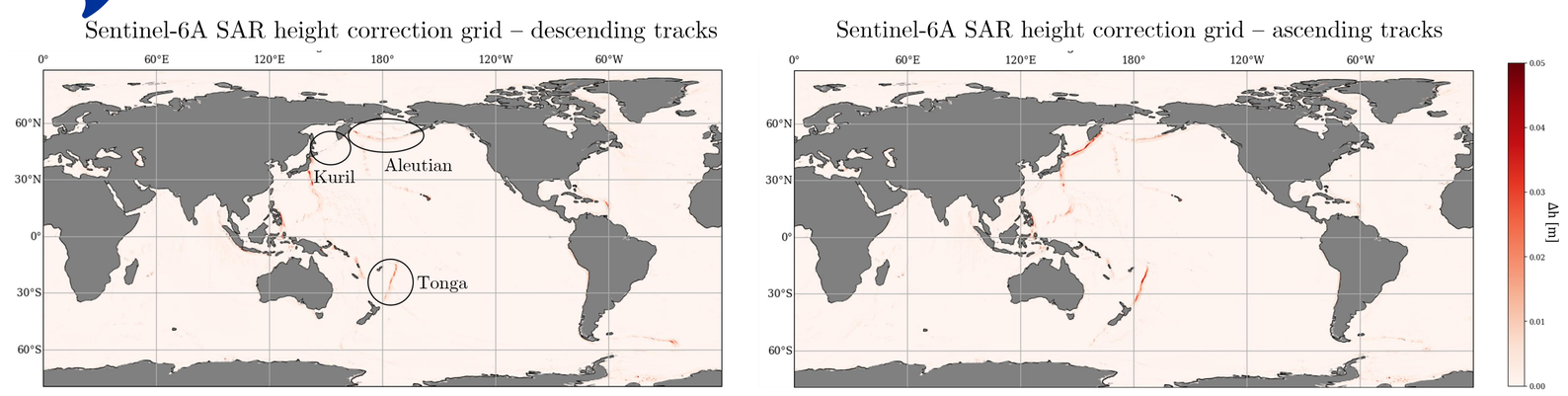
Ref paper

Data access

Introduction & Objectives

- Because SAR altimeters operate differently, corrections developed for LRM altimeters can not be directly applied to them. One key correction accounts for the **effect of sea surface slopes** on height measurements.
- **A slope correction model is provided for SAR altimetry**, derived from the LRM-based approach developed by Sandwell and Smith [1].

Slope correction maps for Sentinel-6A SAR mode



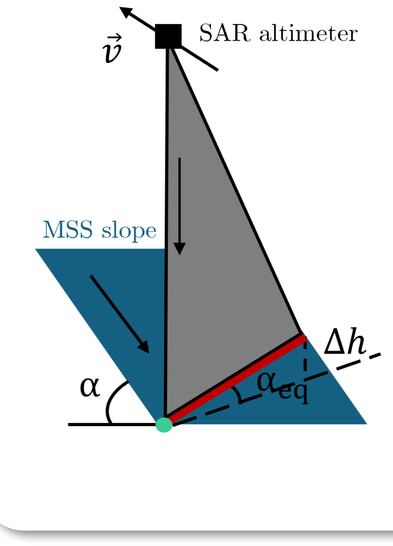
- **Slope corrections maps for Sentinel-6A SAR mode** computed with CNES-CLS Hybrid 23 [2].
- Height correction reaches 7 cm in areas of pronounced MSS slopes.
- **Maps released on Aviso+** [3].

Methodology Overview & Data

The SAR altimetry slope correction is **specific to each mission or group of missions with the same tracks inclinations**, as it depends on :

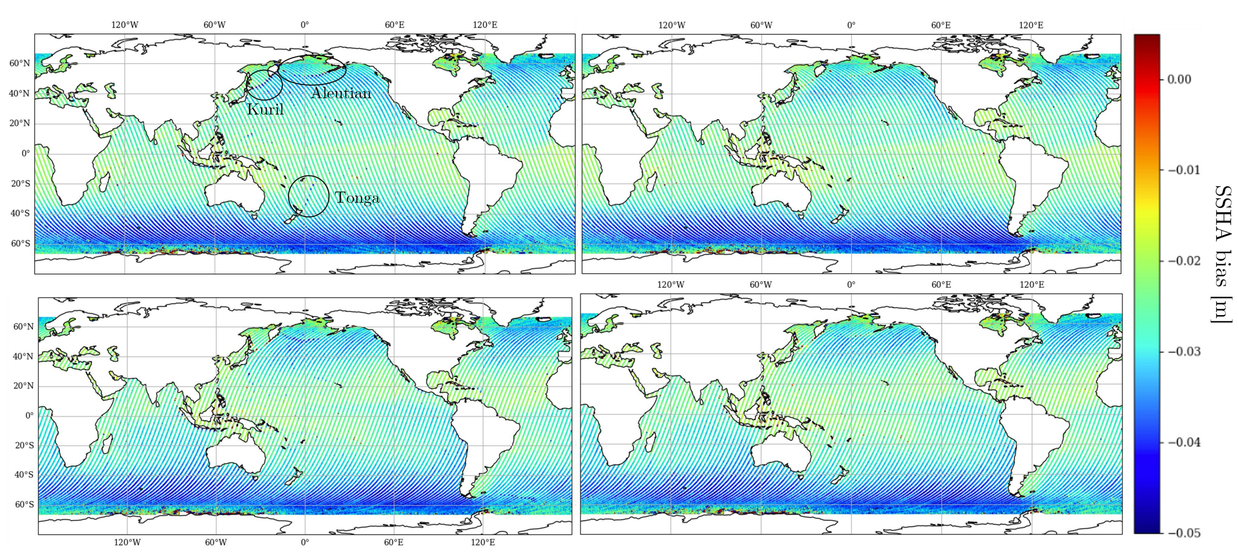
1. The MSS slope angle, α.
2. The angle between the MSS slopes and the satellite tracks, β.
3. The effective altitude of the satellite, H_e.

$$\Delta h = \frac{H_e \alpha_{eq}^2}{2}, \quad \tan(\alpha_{eq}) = \tan(\alpha)\sin(\beta)$$



Application of SAR altimetry slope correction

SSHA data from Sentinel-6A, acquired by LRM and SAR altimeters over 40 cycles, are used to assess the proposed height correction for SAR mode altimeters.



→ In MSS high-slopes zones, the SSHA biases have been almost entirely corrected.

Validation of SAR altimetry slope correction

The slope correction is validated with the three following diagnostics :

- **Comparison of the theoretical and experimental variations of the SAR height correction** → shows a mean difference close to 1 mm (corresponding to residual measurement noise).
- **Consistency with MSS models** → RMSE between SSHA corrected or not from the slope effect and the CNES-CLS MSS Hybrid 23 decreases by up to 1 cm when the slope correction is applied.
- **Accuracy of the slope correction relative to the MSS model used** → calculating the slope correction using independent MSS models result in minimal deviations.

→ **Results under publication in Earth and Space Science AGU journal [4].**

[1] Sandwell, D., & Smith, W. (2014). Slope correction for ocean radar altimetry. Journal of Geodesy, 88 (8), 765-77
[2] Laloue, A., Schaeffer, P., Pujol, M.-I., Veillard, P., Andersen, O., Sandwell, D., . . (2025). Merging recent Mean Sea Surface into a 2023Hybrid model (from Scripps, DTU, CLS and CNES). Earth and Space Science, 12(2), e2024EA003836.
[3] CLS. (2025). Slope correction for sentinel-6a sar altimetry (version 1.0) [dataset]. CNES . doi: https://doi.org/10.24400/527896/A01-2025.007450
[4] Gamot, J., Pujol, M.I., Schaeffer, P., Bignalet-Cazalet, F., Cadier, E., Moreau, T., (2025). Slope correction for ocean SAR altimetry. *Authorea Preprints.*

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