Instrument Processing:
Propagation, Wind Speed and Sea State Bias

Summary

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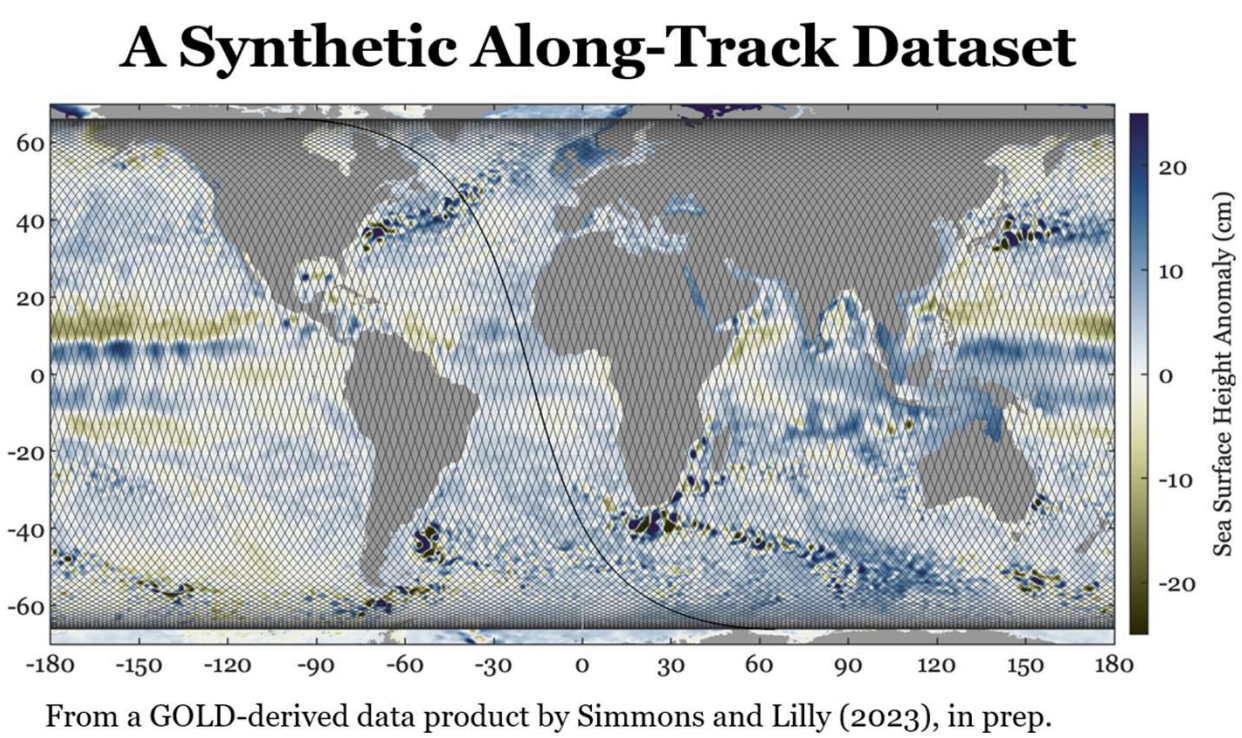
Overview

The splinter 'Instrument Processing: Propagation, Wind Speed and Sea State Bias' took place Wed Nov 08, 15:45

- 7 oral presentations
  - 1 about mapping methods, presented a second time in session Science III
  - 1 about SSB
  - 6 about Wet tropo correction
- No poster

Optimal parameters for mapping alongtrack altimetry by Lilly Jonathan



From a GOLD-derived data product by Simmons and Lilly (2023), in prep.

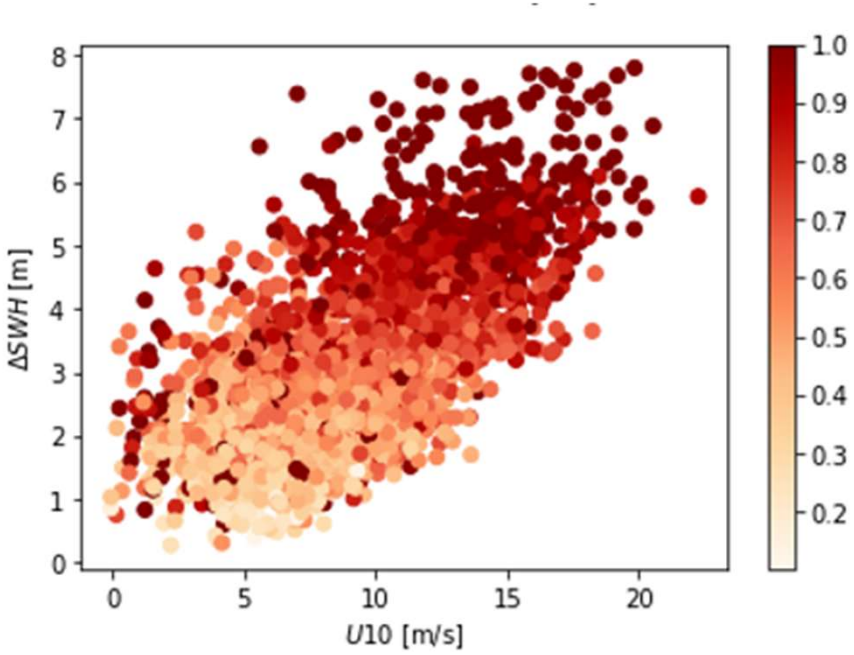
- Local Polynomial Fitting method
- Highly design adaptive, and a promising method for altimetric mapping
- Method particularly promising when dealing with highly heterogenous data, e.g., SWOT + along-track.
- Great potential for an off-the-shelf, user-applied general-purpose mapping algorithm, complementing one-size-fits all black box final products

Inclusion of the ocean's vertical velocity variance into the sea-state-bias correction by Marcel Schlembach

- Including velocity variance has limited impact on SSB:
  - The Auto Correlation Method is not robust enough.
  - The model data is not accurate enough.
- For swath altimeters:
  - Model data might help to reduce the SSB uncertainty.
  - ACF method on S3-NGT spectra probably yields better results.
- Looking forward:
  - Use machine-learning approaches on SAR spectra and waveform parameters.

	Est. Unc. [cm]
SSB3	2.0
SSB4	2.0
SSB4 + velocity variance	1.9-2.0
SSB-VV - (no SWH)	2.5-2.7

Very limited improvement!



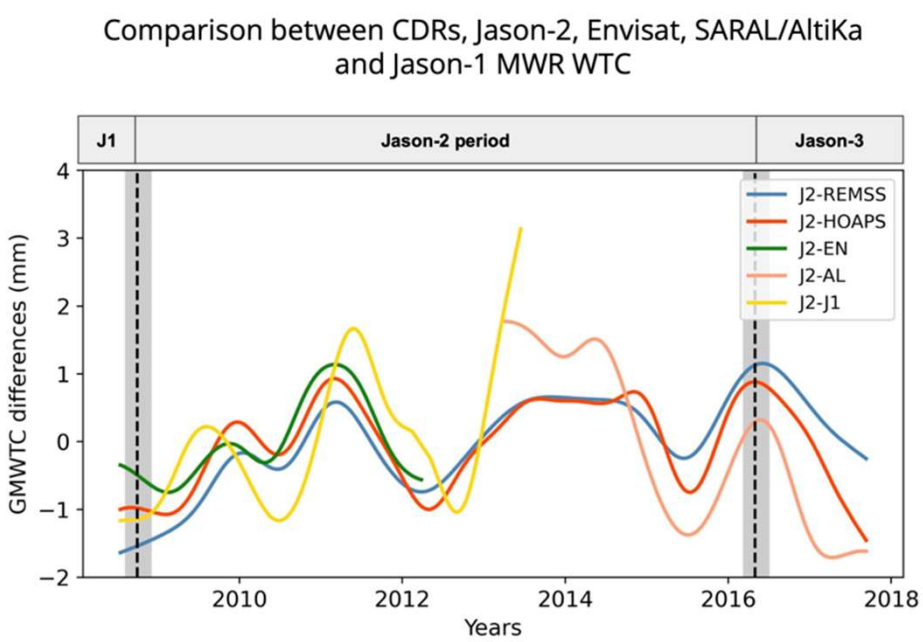
Improved algorithms for the wet tropospheric correction over coastal regions: application to the Sentinel-3 mission by Pedro Aguiar

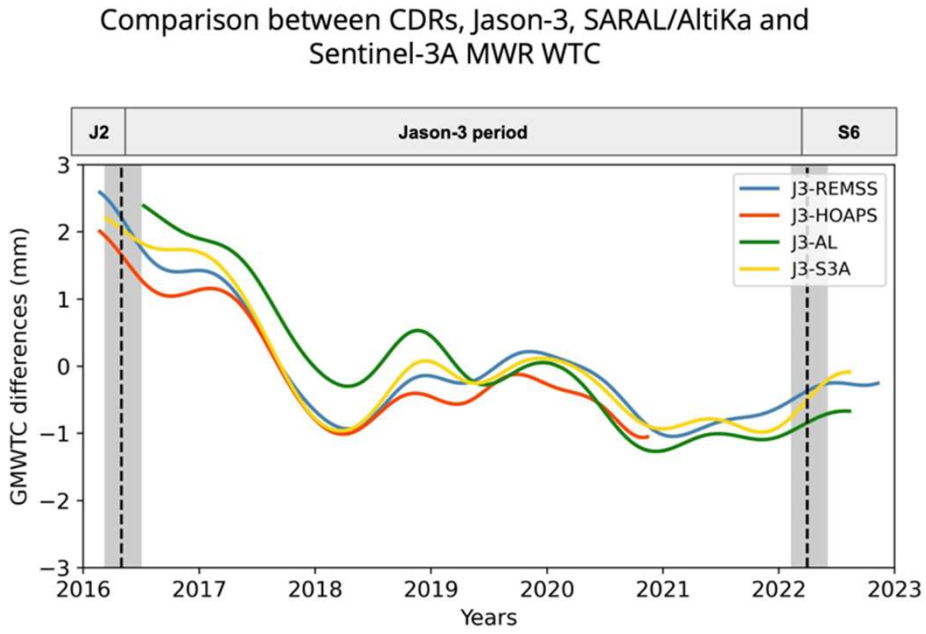
- The WTC retrieval over coastal regions is still a challenging process.
- The use of the open-ocean UP3S0 algorithm with modified inputs significantly improved the retrieval errors in the WTC.
- Moreover, the developed coastal algorithms, with the same modified inputs, further improved the WTC retrieval errors, from ~16 cm to 3.3 cm close to the coast.
- All the results shown are in line of agreement with the comparison against the ERA5 model (not shown).
- More work needs to be done to further improve the retrieval errors and meet the requirements for coastal altimetry applications (e.g., technological improvements on the radiometer and altimeter sensors).

Mean and rms of the differences $WPD_{GNSS} - WPD_{MWR}$, in cm, for the first class of distance from coast.

Algorithm	Algorithm Description	0-5 km		
		Mean	RMS	RMS improv.
Op. 3I	Open-ocean Sentinel-3A operational algorithm, MWR TBs and SRAL σ_0	-14.1	16.2	-
O2C UP3S03	Open-ocean UP3S0 algorithm, MWR TBs modified by LF and WPD classes, and SRAL σ_0 modified by DistCoast classes	-1.2	4.4	11.8
C2C UP2	Coastal algorithm, MWR TBs modified by LF and WPD classes, and SRAL σ_0 modified by DistCoast classes	-0.7	3.6	0.8
C2C UP4	Coastal algorithm, MWR TBs modified by LF and WPD classes, SRAL σ_0 modified by DistCoast classes, and SST_{skin} and γ_{800} from the ERA5 model	-0.5	3.3	0.3

Wet troposphere correction derived from water vapor climate data records by Anne Barnoud



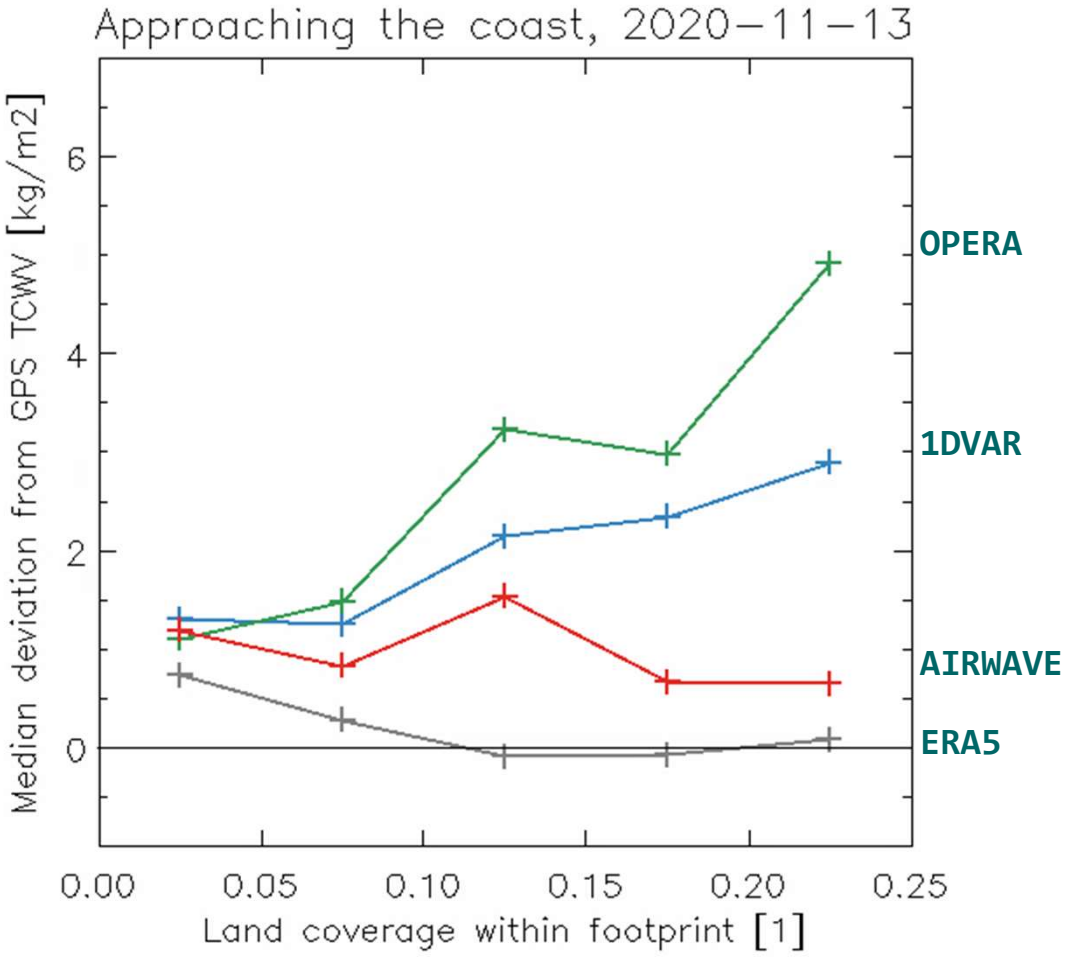


- HOAPS Vinterim and REMSS V7R2 water vapour climate data records show, in agreement with inter-mission comparisons:
  - a drift of **Jason-2** MWR WTC over 2009-2010 (~2 mm in 2 years),
  - a drift of **Jason-3** MWR WTC over 2016-2018 (~3 mm in less than 2 years).

The CDR-derived WTC is available on the AVISO+/ODATIS portal for independent assessment:
https://doi.org/10.24400/527896/a01-2022.018

Performances and benefits of a 1D-variational approach to retrieve the wet tropospheric correction: recent achievements for Sentinel-6 and Sentinel-3A and -3B topography missions by Ralf Bennartz

- Development of a 1Dvar method for WTC retrieval
- Proof of concept for Sentinel-6: 3-TBs and 6-TBs configurations
- Benefit of Synergetic use of Sentinel-3 MWR and SLSTR observations

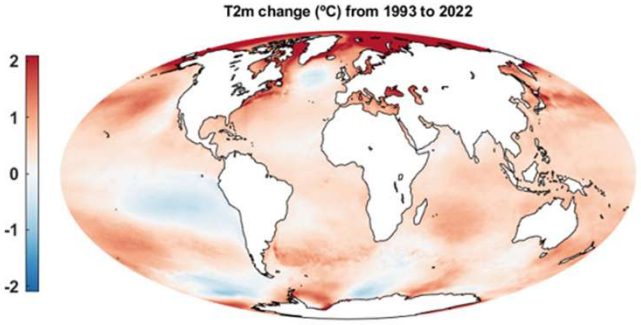


How has global warming impacted the altimeter wet path delay over the altimetry record? by Telmo Vieira

- Over 1993-2022, WPD has increased at an average rate of 0.26 mm/year over the global ocean
- Due to the global warming over these 30 years, this is a physical signal that should not be misled with any kind of drift.

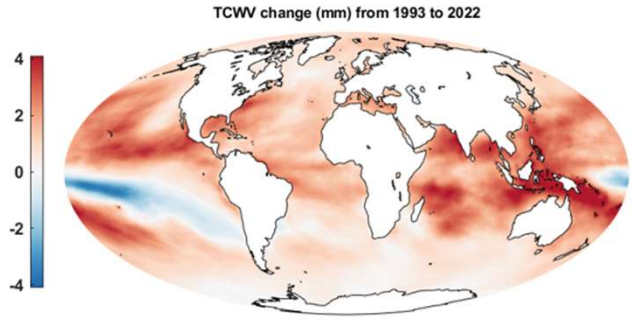
↓ Global map of T2m change, in °C, from 1993 to 2022

Global mean: +0.53 °C
(0.18 °C/decade × 3)



↓ Global map of TCWV change, in mm, from 1993 to 2022

Global mean: +1.28 mm
(0.43 mm/decade × 3)



Progress on the Wet Path Delay Correction: Historical, Current and Future by Shannon Brown

- Sentinel-6A exhibiting climate quality calibration on NTC product due to new supplemental calibration system
  - No trends observed with uncertainty < 0.08mm/yr over mission to date
- Jason-3 long-term calibration updated and PD correction product available, appears to improve non-closure of sea level budget
- Jason-2 GDR-F long-term calibration improved over GDR-D after 2017 (un-changed before)
- HRMR working well, shows promise for new applications for cryosphere altimeter missions, including CRISTAL