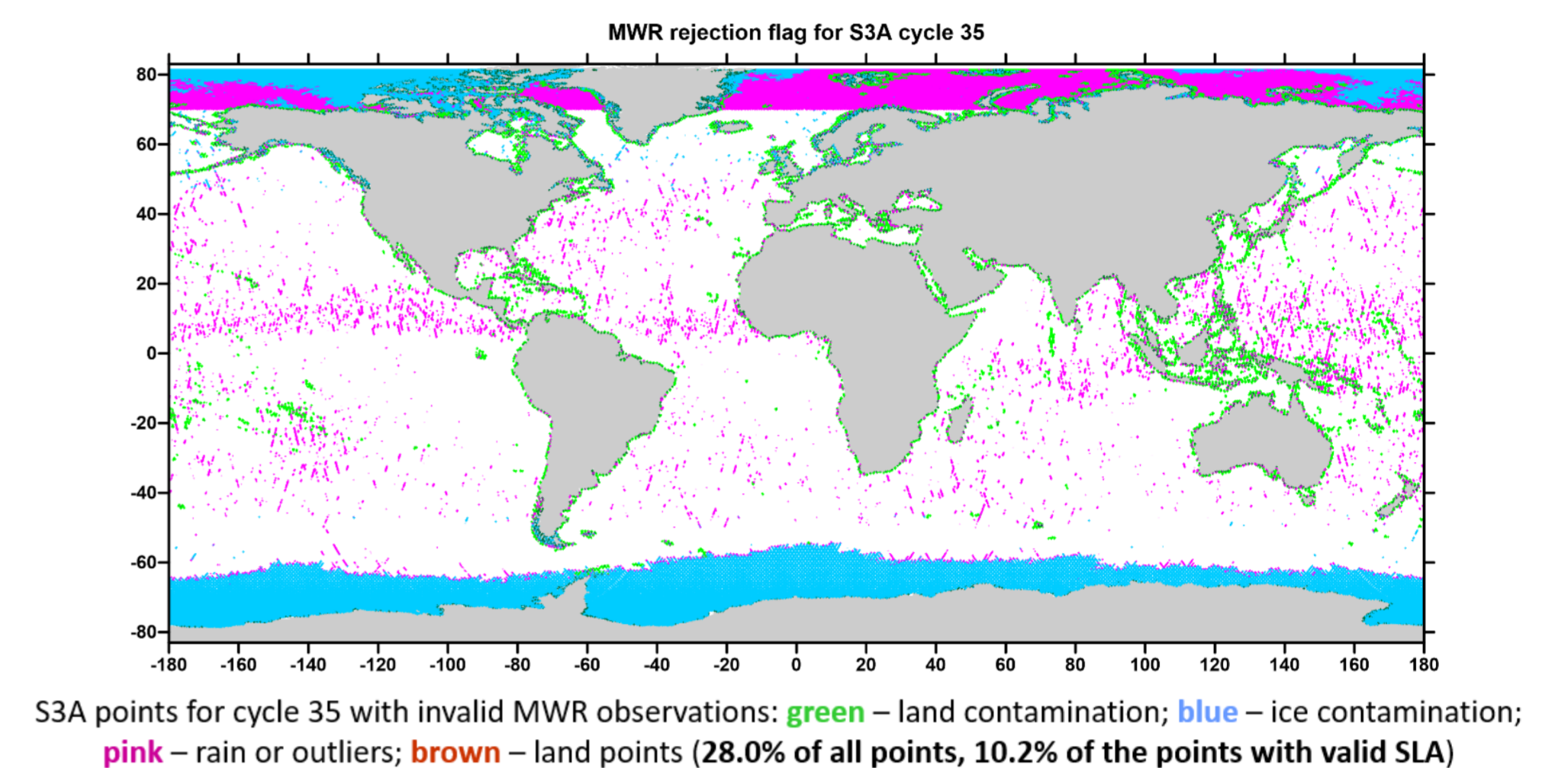


GPD+: a methodology for the computation of the Wet Tropospheric Correction for coastal Satellite Altimetry

C. Lázaro
M. J. Fernandes
T. Vieira
E. Vieira
N. Pires

Background

- More than 26 years of continuous, global, all-weather satellite altimetry measurements are currently available for climate change studies, particularly for the monitoring of sea level change and coastal/inland water regions.
- Accuracy requirement for sea level studies: 1 cm and 0.3 mm/yr (GOOS).
- Satellite-to-surface range, orbits and corrections for instrumental, range and geophysical effects are required.



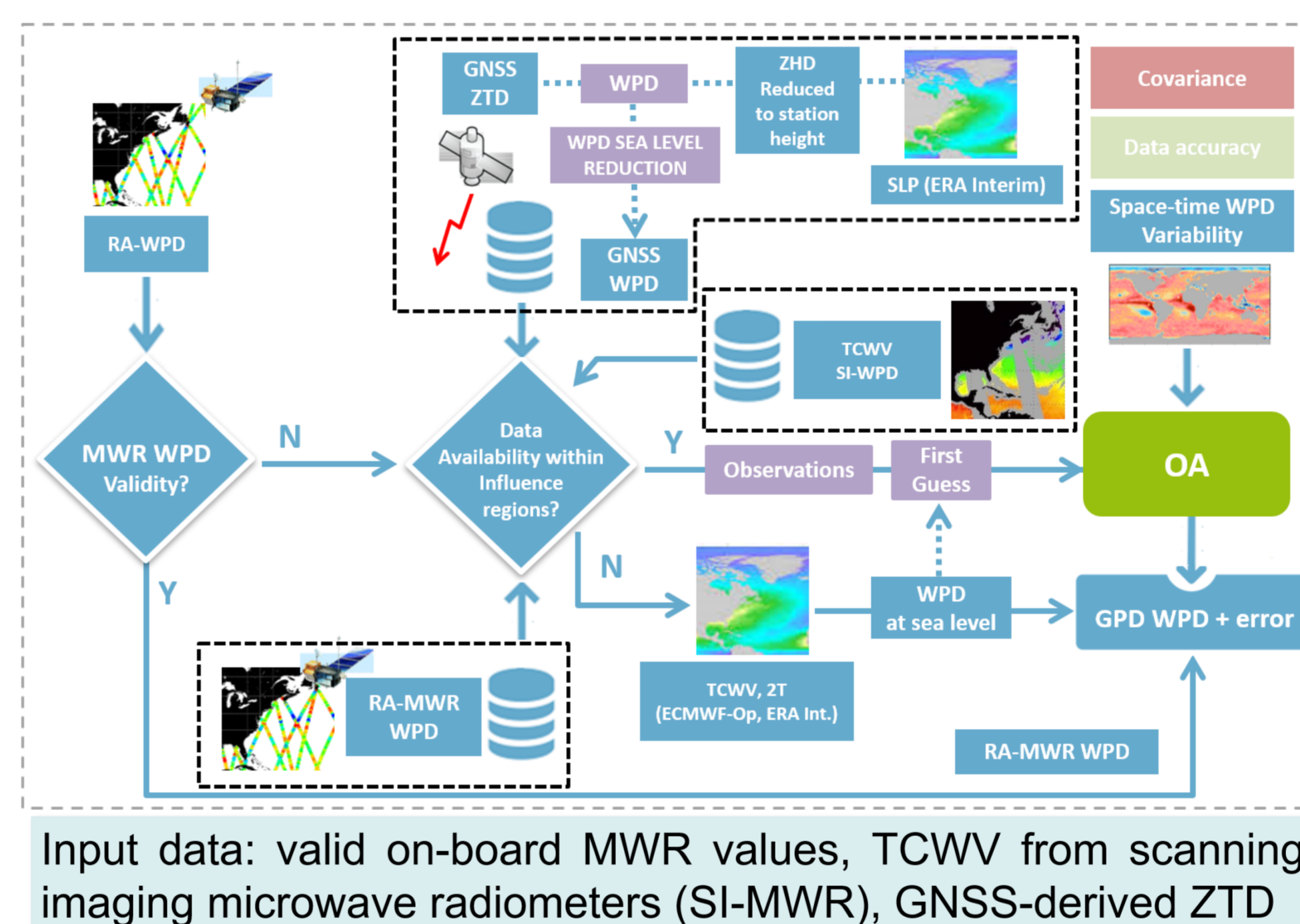
The wet tropospheric correction (WTC) is still one of the major sources of SA data uncertainty over coastal regions, preventing their use in these regions.

- The proposed methodology provides new WTC estimates for measurements with invalid/inexistent WTC, as exemplified above for a Sentinel-3A cycle.

Methodology

GNSS-derived Path Delay Plus (GPD+) algorithm:

- Optimal interpolation of all available WTC observations in the vicinity of the estimation points.
- Valid on-board MWR-derived WTC are preserved.
- Considers the space-time variability of the WTC field and the accuracy of each data type.
- First guess: space-time collocated NWM-derived WTC.

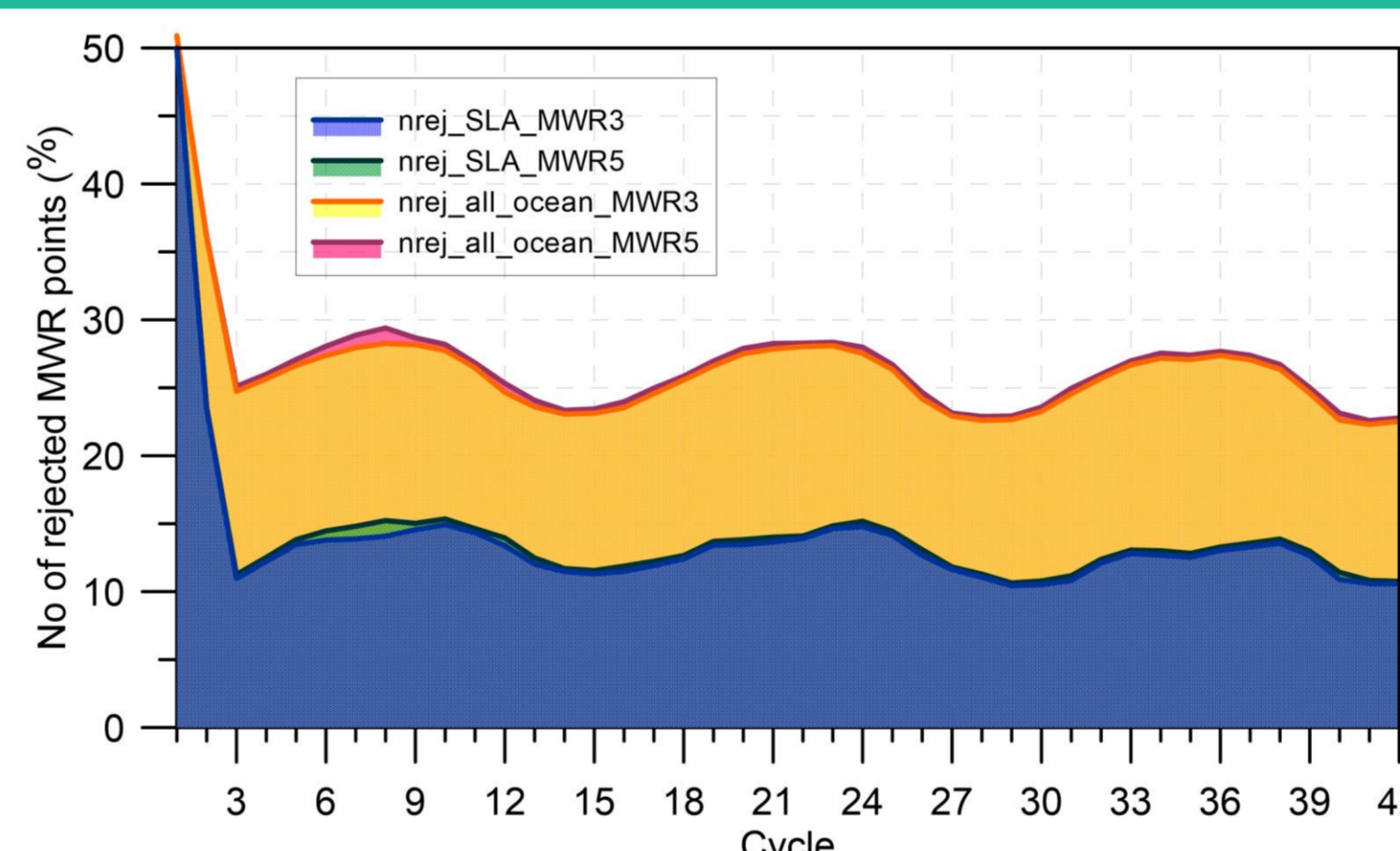
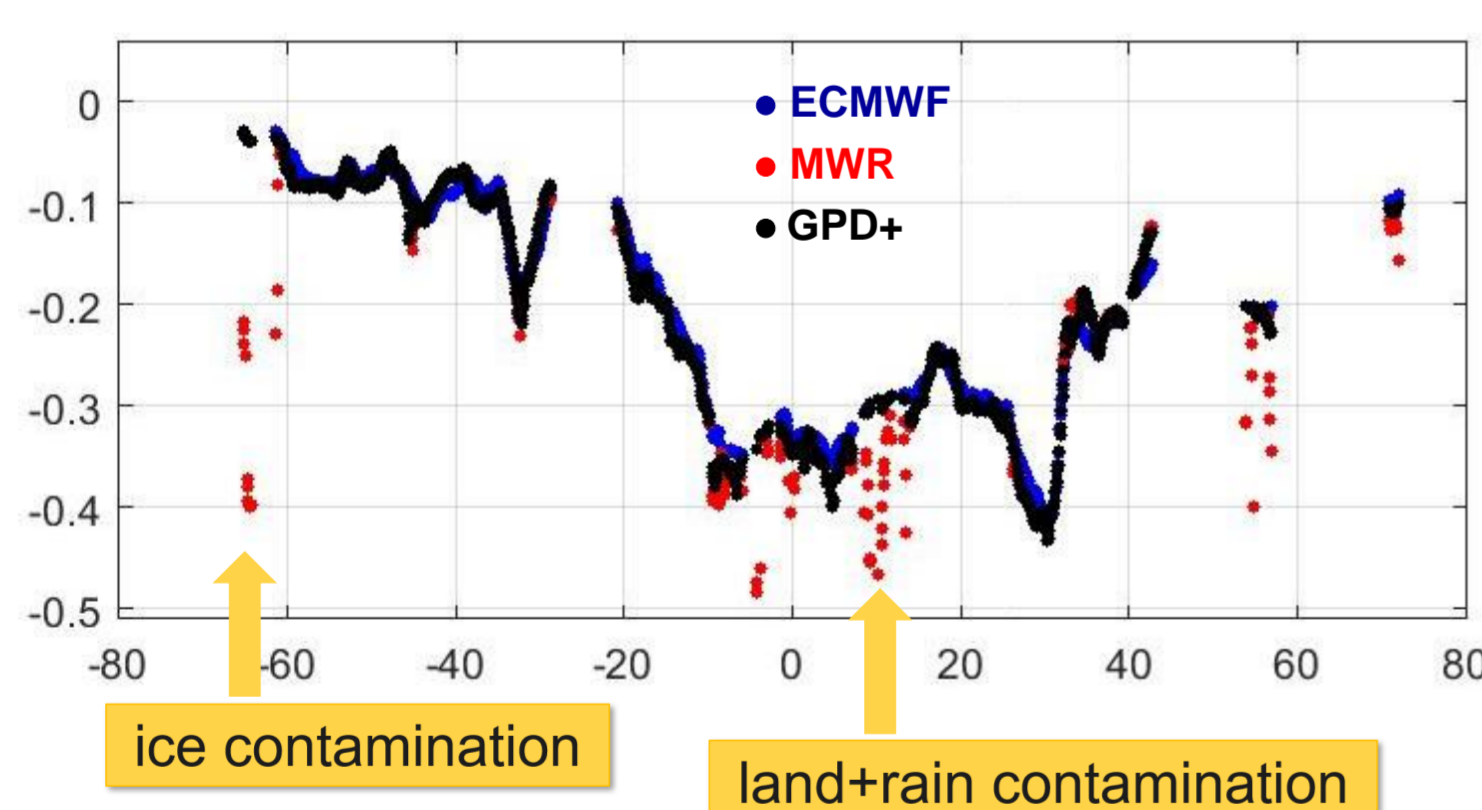


- For each mission, improved criteria for the detection of corrupted WTC have been implemented.
- All radiometer data are calibrated w.r.t. SSM/I and SSM/IS imaging MWR, known for their stability.

Results

GPD+ results for Sentinel-3A (2-band MWR)

- Example for cycle 06, pass 462:

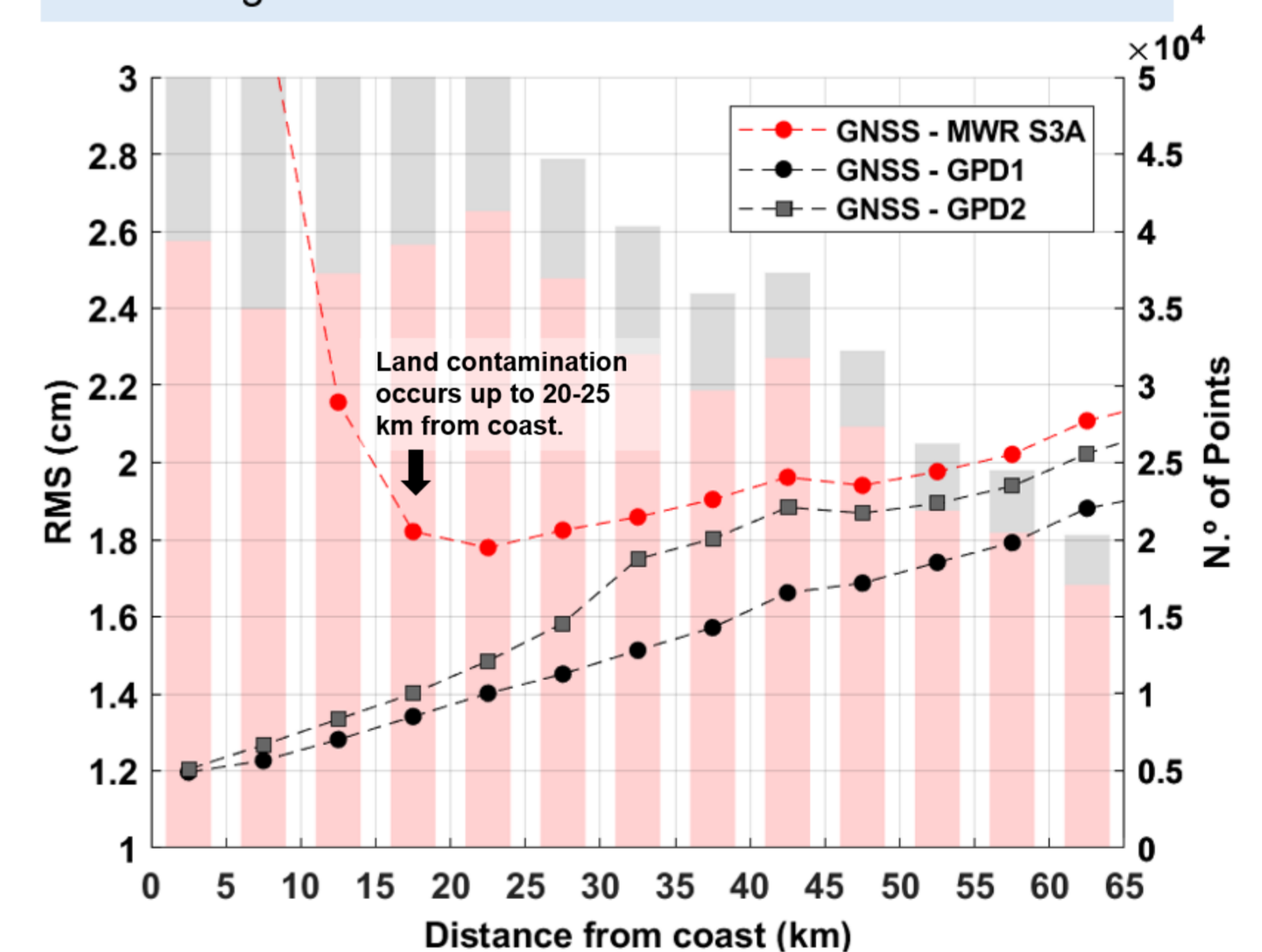


Percentage of recovered points:

- MWR (3 parameters) all ocean points
- MWR (3 parameters) points with SLA valid
- MWR (5 parameters) points with SLA valid

- ~30% of all points and 10-16% of the points with valid SLA are recovered

- **GPD1** – GPD+ version where all points are estimated using only external data sources (SI-MWR and GNSS); allows an independent assessment of the S3A on-board MWR.
- **GPD2** – Normal GPD solution, using all data types, including the S3A on-board MWR.



Conclusions

GPD+ WTC are:

- Based on the state-of-the-art on-board MWR-derived WTC of each mission and preserve the valid MWR observations.
- A significant improvement over the ECMWF model for satellites such as CryoSat-2, with no on-board MWR; this result is also valid for all other missions, particularly those with 2-band MWR.
- Global, continuous and consistent corrections, valid over all surface types, increasing data coverage.
- Adopted for the generation of SL-CCI products and included in the official L2 products of CryoSat-2 and Envisat.

Future work:

- Improve the modelling of the 4D variability of the WTC field.
- Extend the corrections to large lakes and rivers where valid MWR and GNSS can be exploited.
- Improve the WTC retrieval algorithms currently in use.

GPD+ WTC can be downloaded from:
http://www.fc.up.pt/Satellite_Altimetry/index_data.html