National
Oceanography
Centre

Ongoing Validation and Recent Improvements to CryoSat Ocean Products

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  - Comparison with WW3

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  - SAR bias

  - Ascending/descending biases

- Daily and Monthly

DATA

- Study is additional to routine monthly quality reports

- Geophysical Ocean Product (~30-day latency)

- 12 years of data: January 2011 – December 2022 inclusive
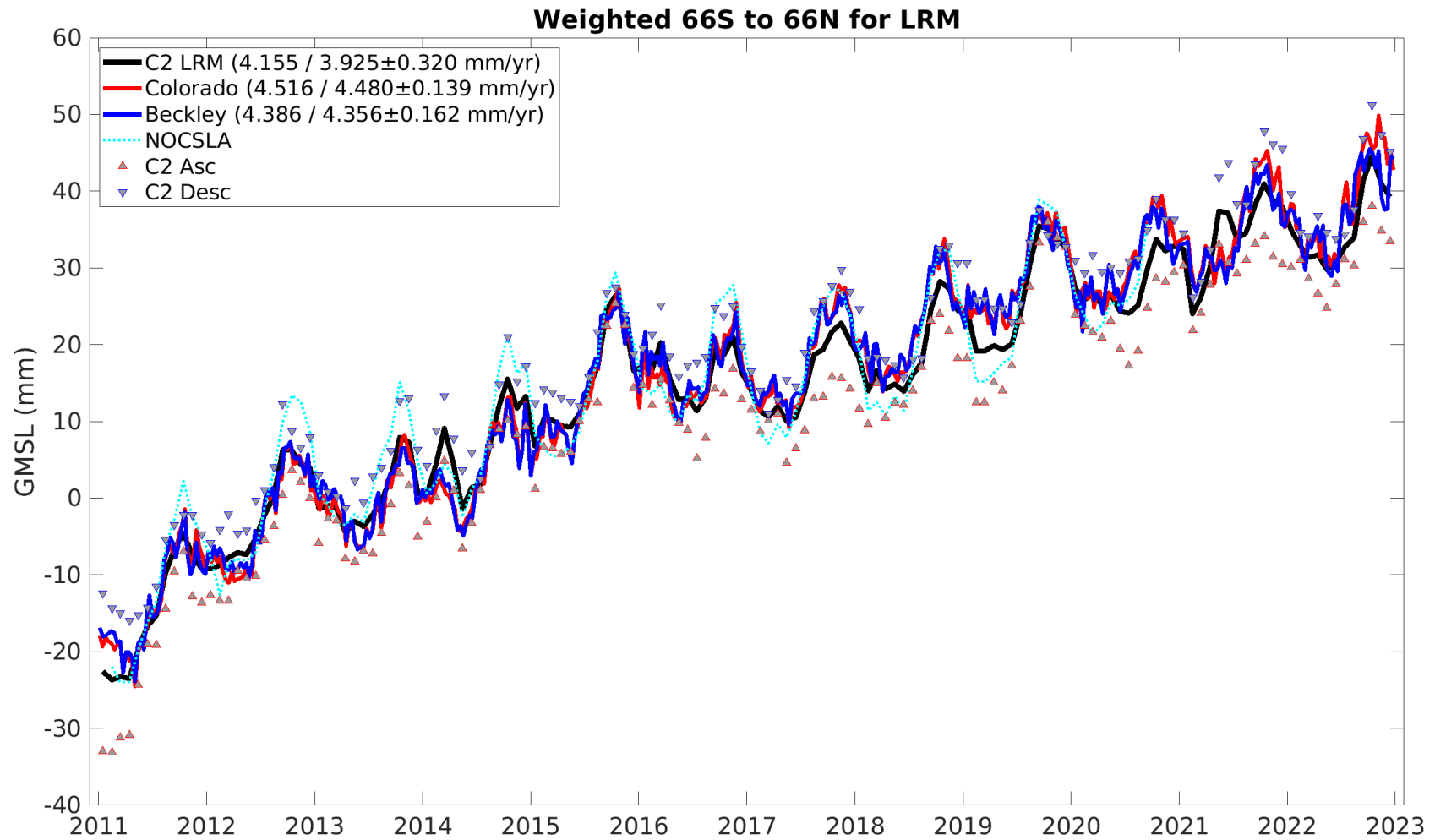
- Only LRM unless stated and data have passed QC

GLOBAL TRENDS
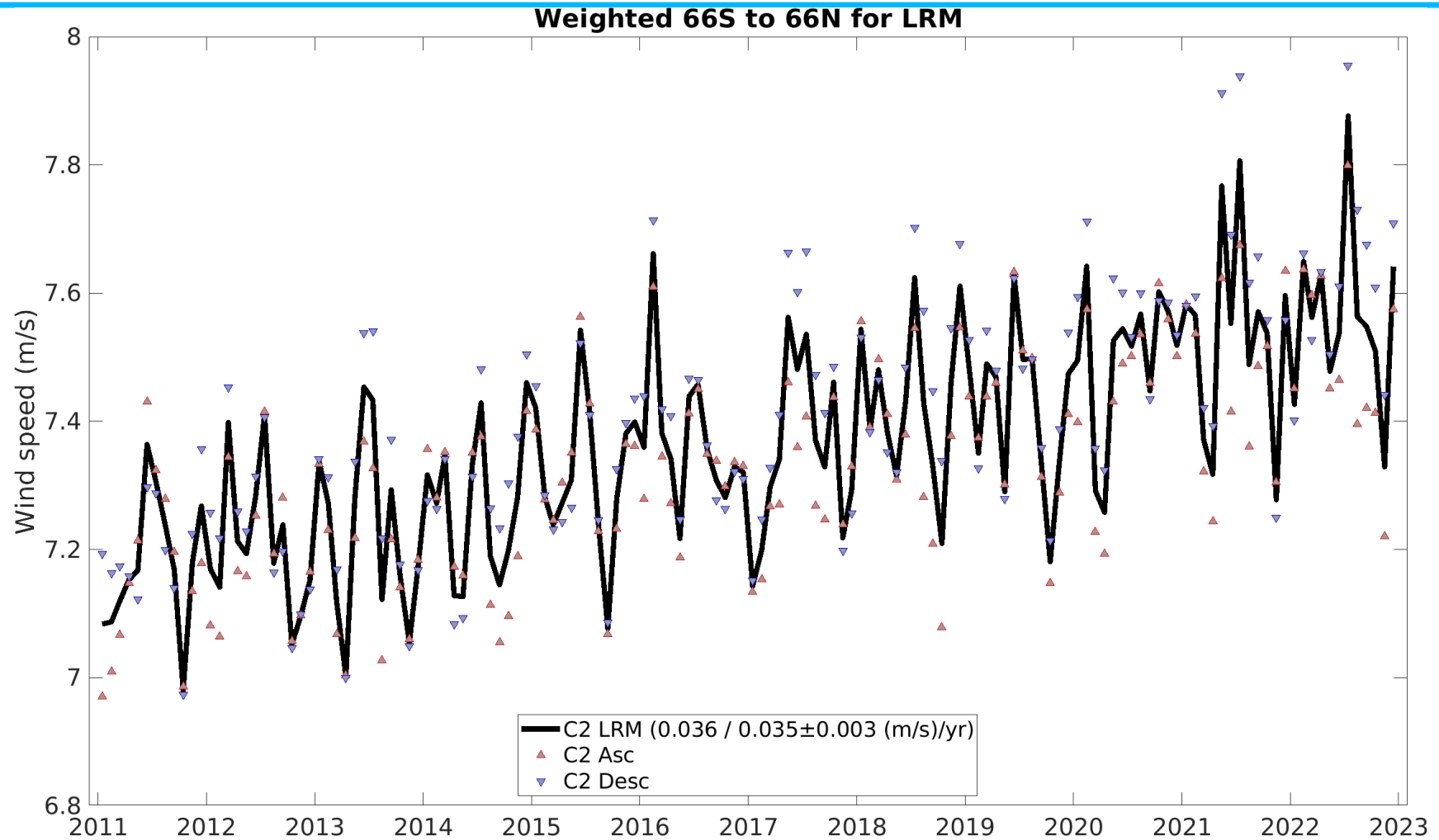
- Weighted mean to take account for latitude (±66˚N)

- Annual and semi-annual signals removed

- Ordinary least squares and Bayesian approach to calculating trends

- Compared with other datasets

  - https://sealevel.colorado.edu/

  - Beckley et al. JGR 2017

  - NOCSLA (gridded L4, daily, ¼˚, CryoSat only)

GLOBAL MEAN SEA LEVEL AND TREND

Weighted 66S to 66N for LRM

Legend:
- C2 LRM (4.155 / 3.925±0.320 mm/yr)
- Colorado (4.516 / 4.480±0.139 mm/yr)
- Beckley (4.386 / 4.356±0.162 mm/yr)
- NOCSLA
- C2 Asc
- C2 Desc

Y-axis: GMSL (mm)

GLOBAL MEAN WIND SPEED AND TREND

Weighted 66S to 66N for LRM

Legend:
- C2 LRM (0.036 / 0.035±0.003 (m/s)/yr)
- C2 Asc
- C2 Desc

GLOBAL MEAN SWH AND TREND

Weighted 66S to 66N for LRM

REGIONAL TRENDS - SSHA

Gridded mean SSHA using 2.5 deg grid
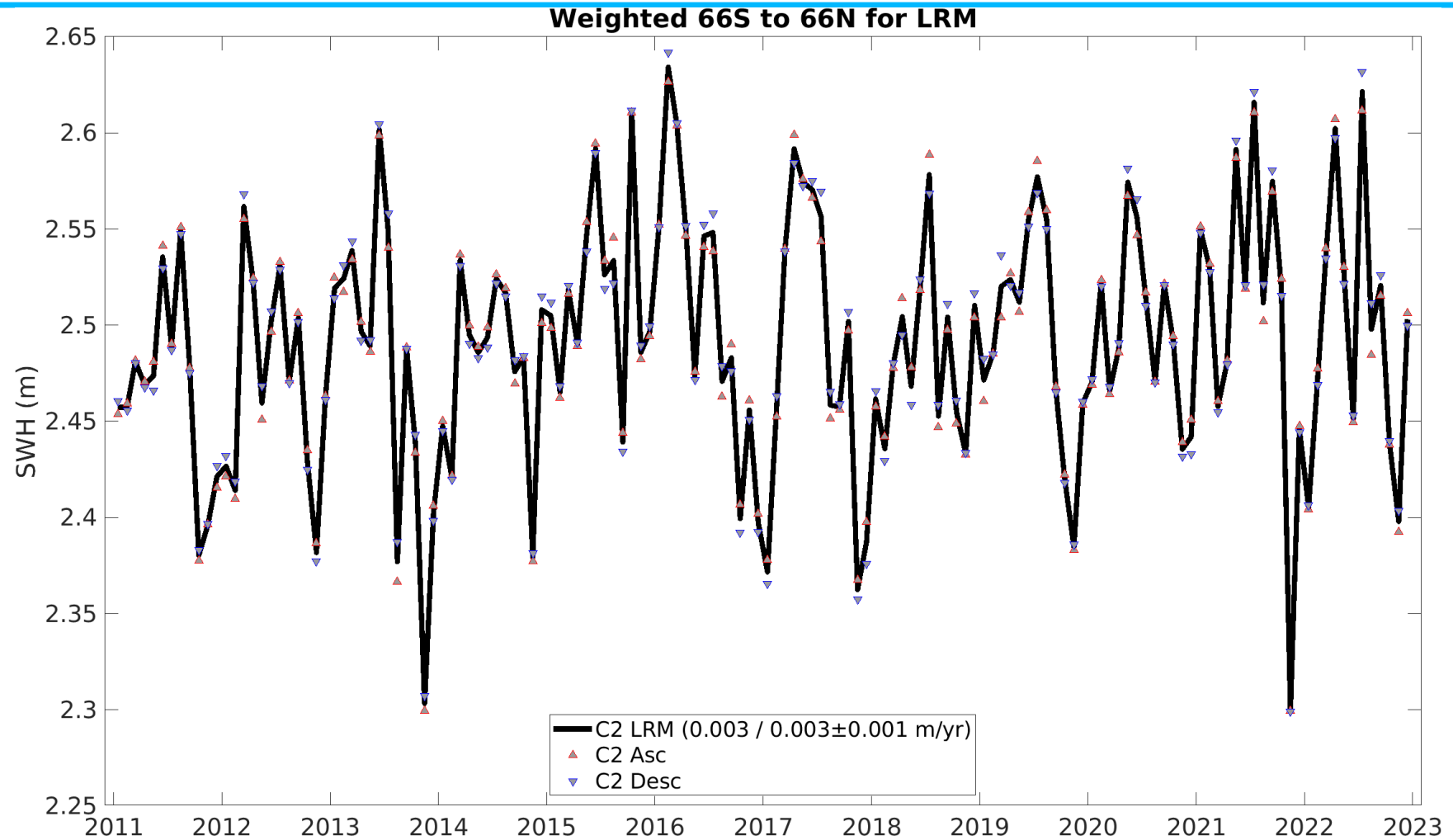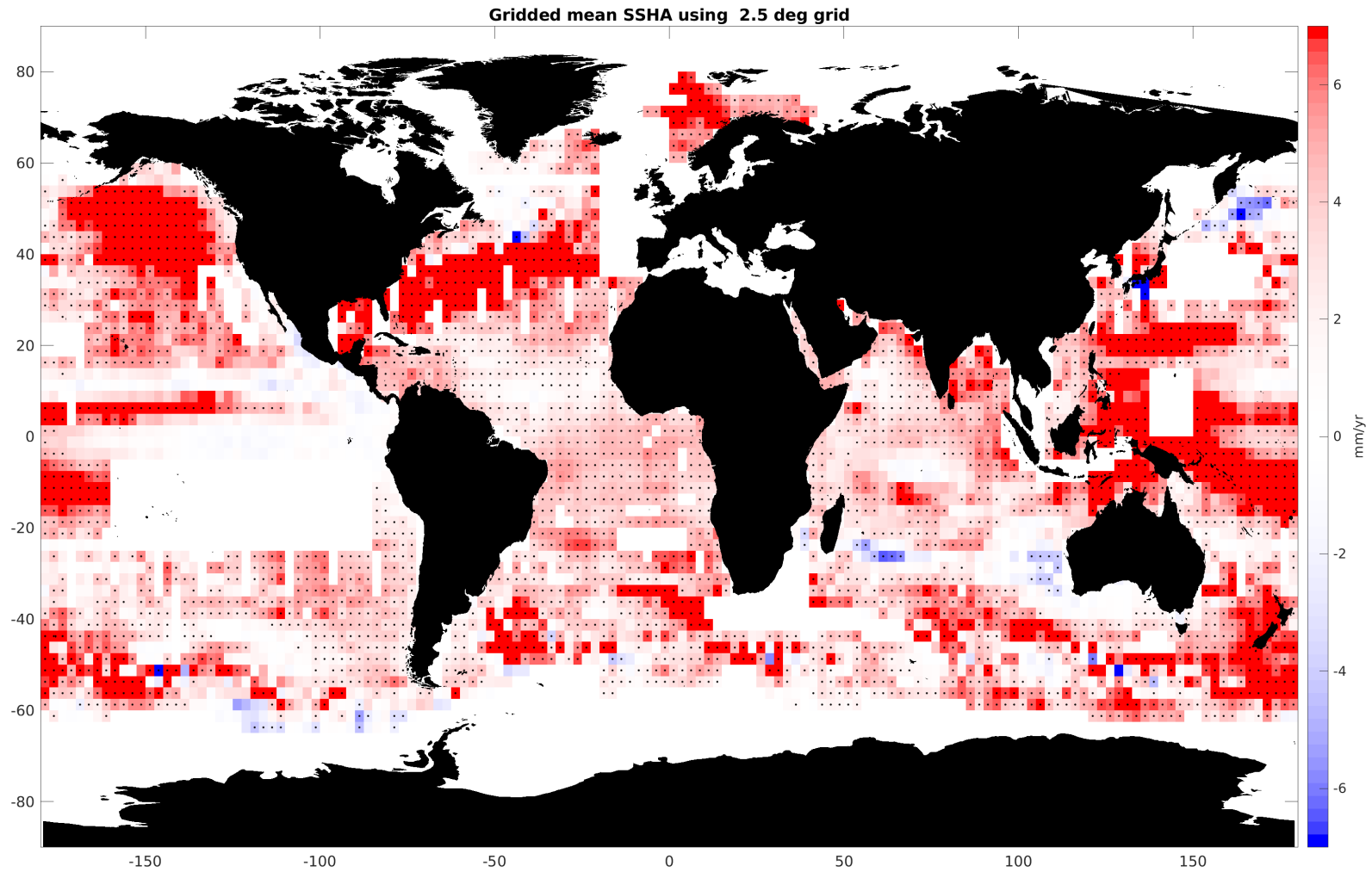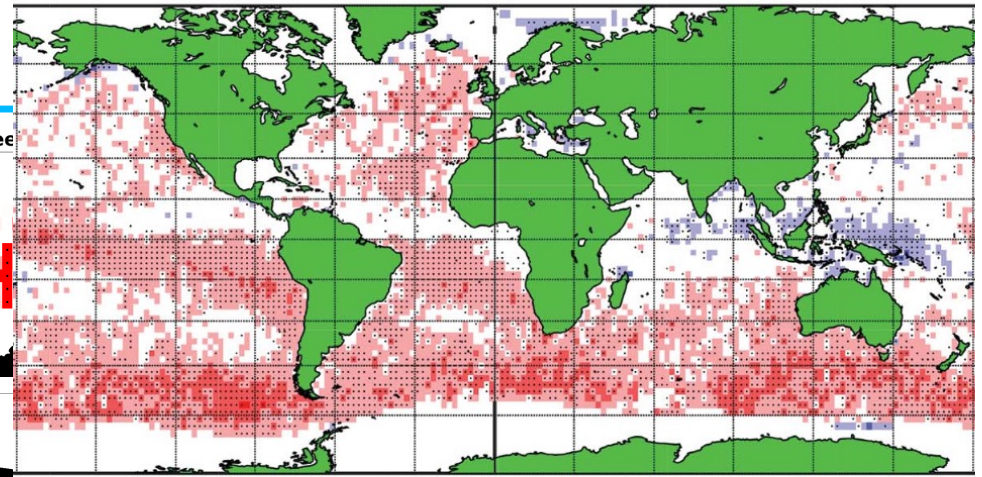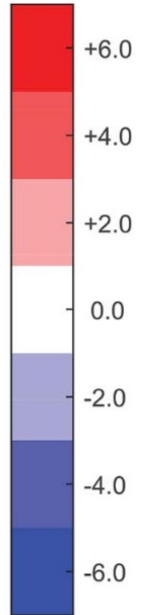
REGIONAL TRENDS – WIND SPEED

Altimeter U$_{10}$ mean trend (1985 - 2018) [cm/s/yr]

Gridded mean Wind Speed

Gridded mean Wind Speed using 2.5 deg grid
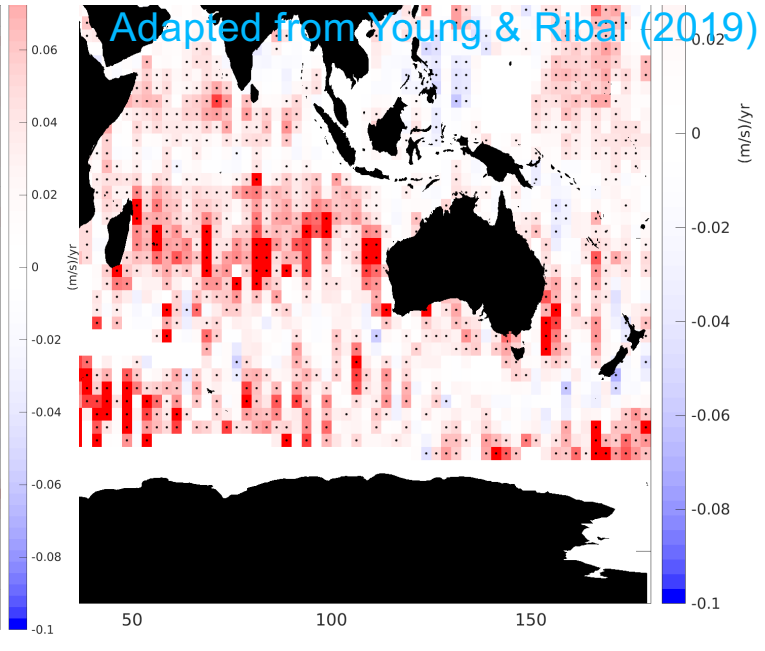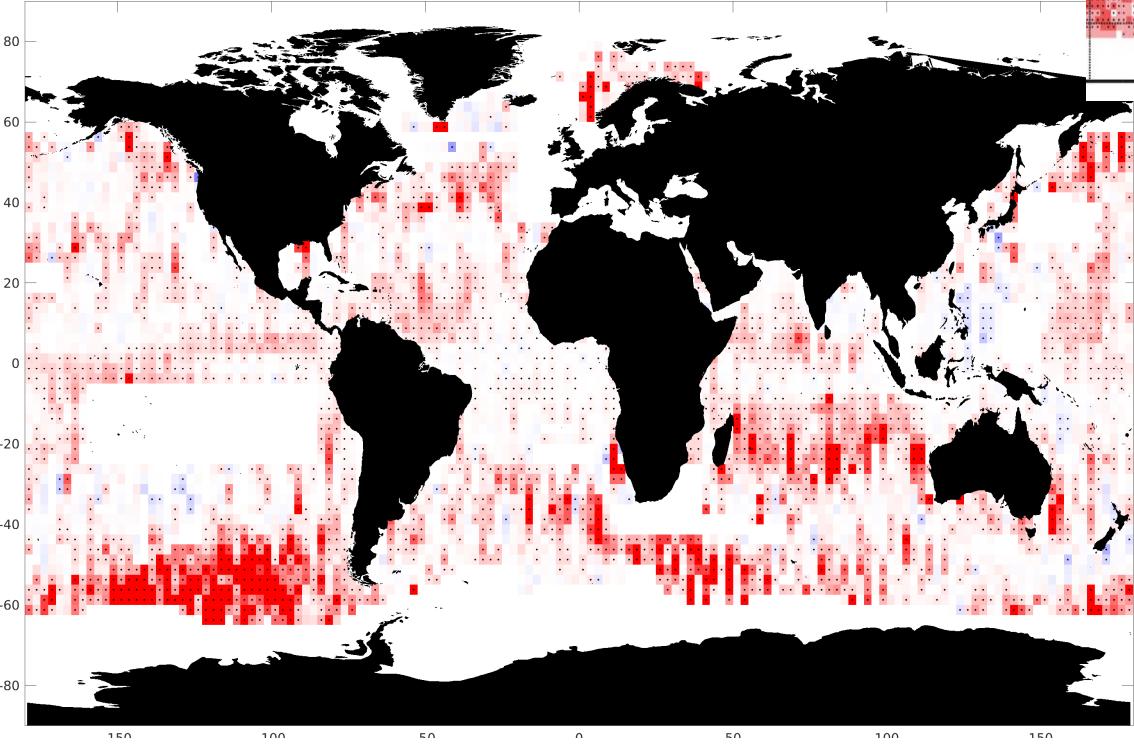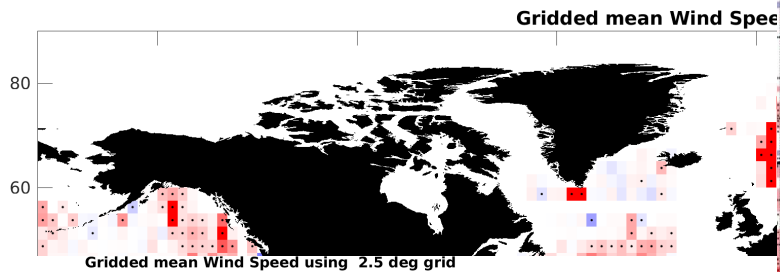
Adapted from Young & Ribal (2019)

REGIONAL TRENDS - SWH

Gridded mean SWH using 2.5 deg grid
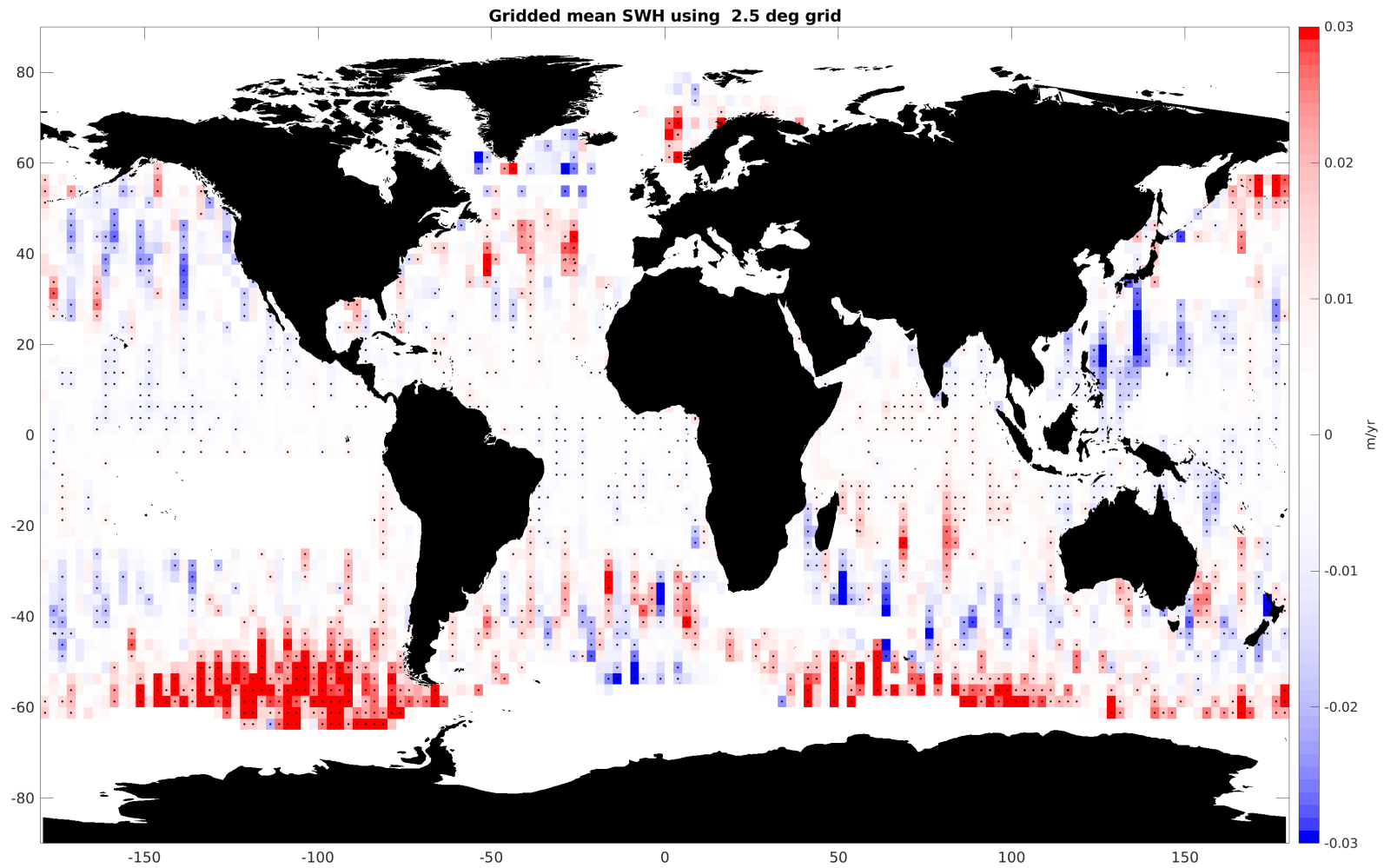
CRYOSAT SWH COMPARISON WITH WW3

Weighted mean differnce with 5.0 deg resolution

C2 - WW3 for January 2011 resolution 5.0 deg
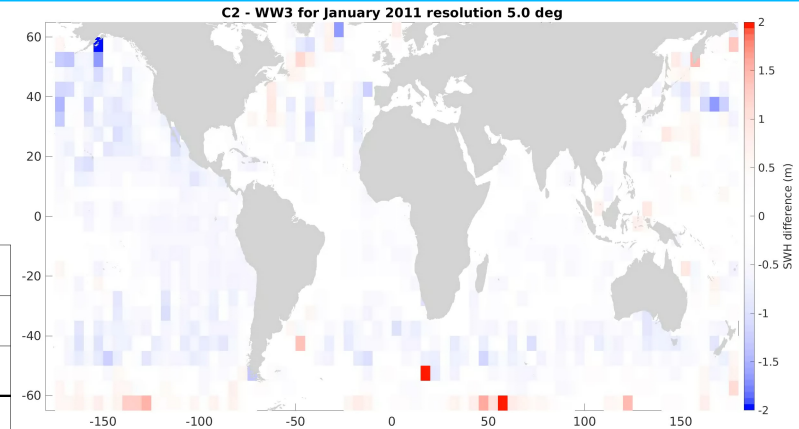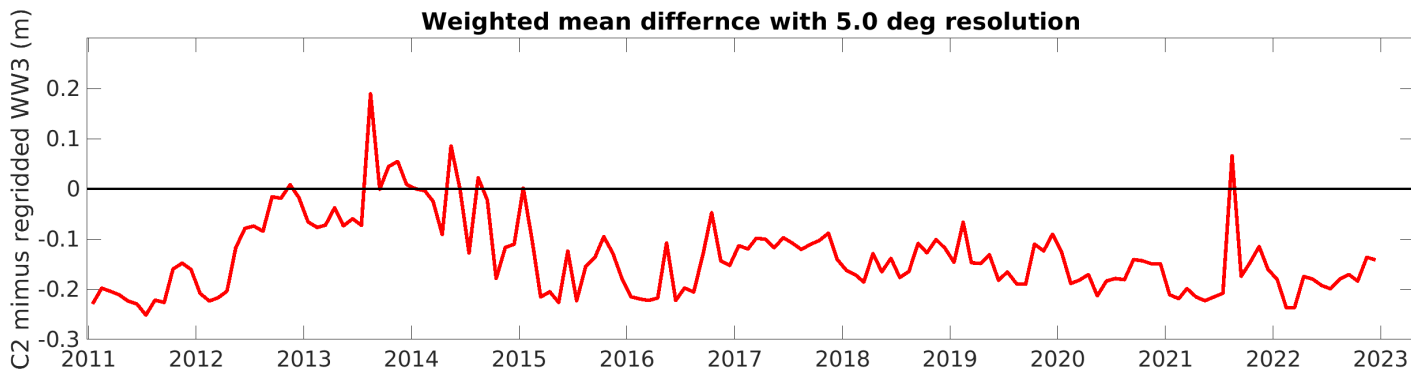
Slight bias with CryoSat ~10 cm lower globally
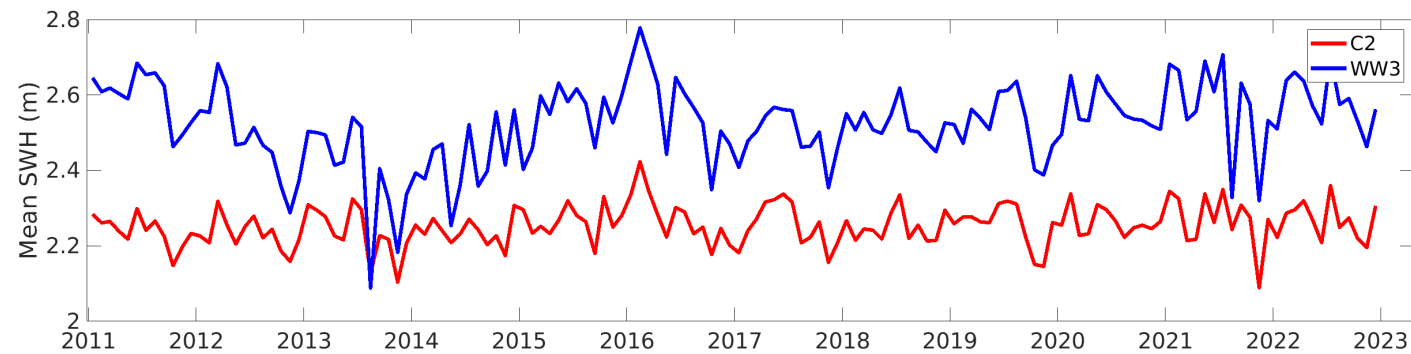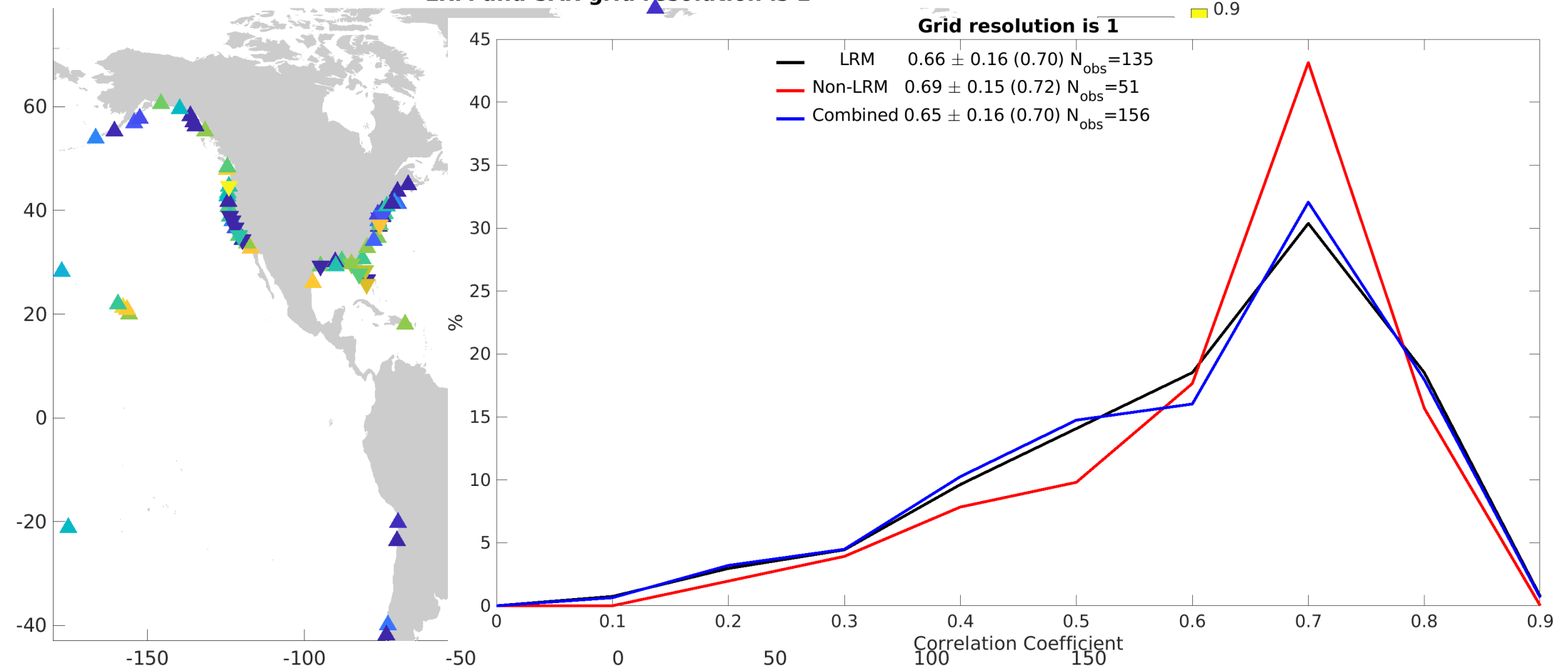
SEA LEVEL COMPARISON WITH PSMSL TIDE GAUGES

- Permanent Service for Mean Sea Level – see Poster CVL2023_012

- Revised Local Reference (RLR) for same period

- Filter PSMSL flags and limited gaps

- 249 remaining tide gauges averaged into [0.5° 1° 2.5° 5° 10°] boxes same as CryoSat (split by LRM/non-LRM)
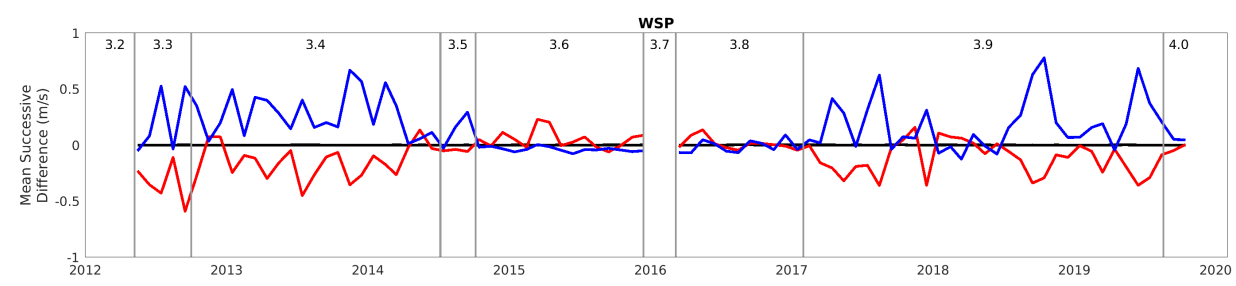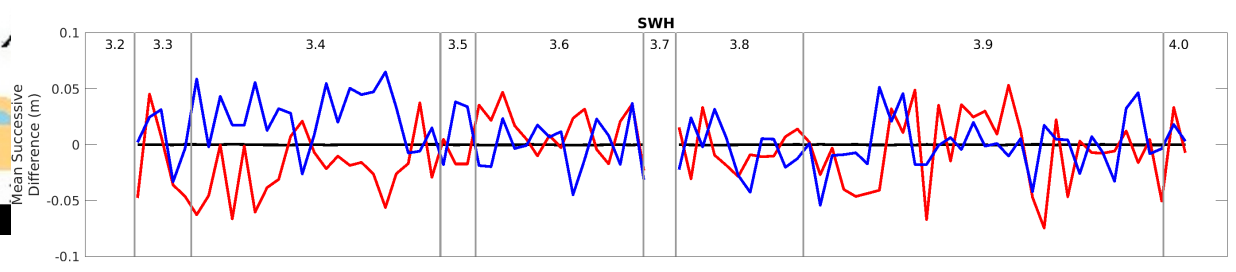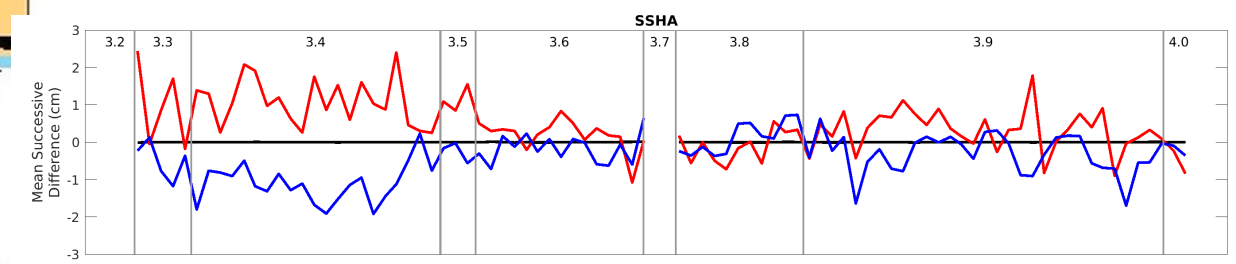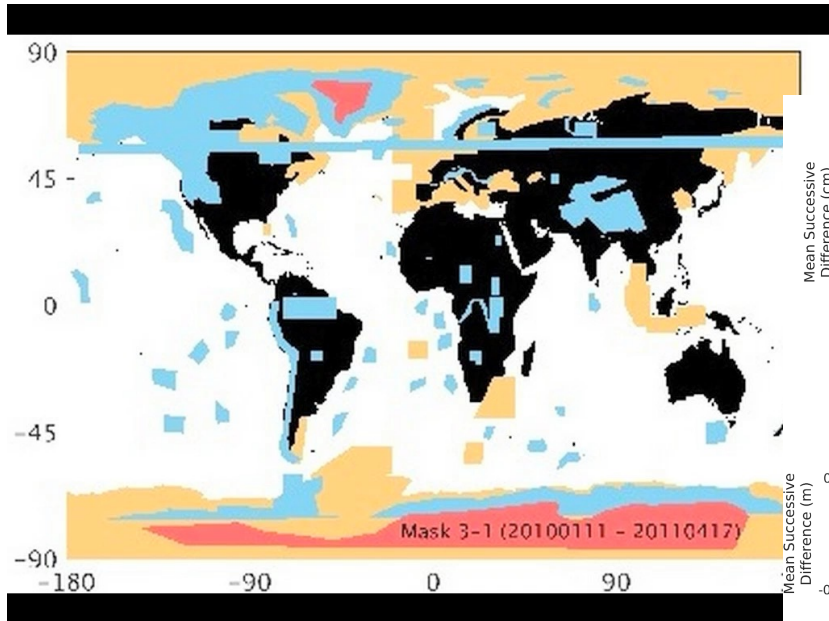
SEA LEVEL COMPARISON WITH PSMSL TIDE GAUGES

SAR BIAS

Ascending-descending biases
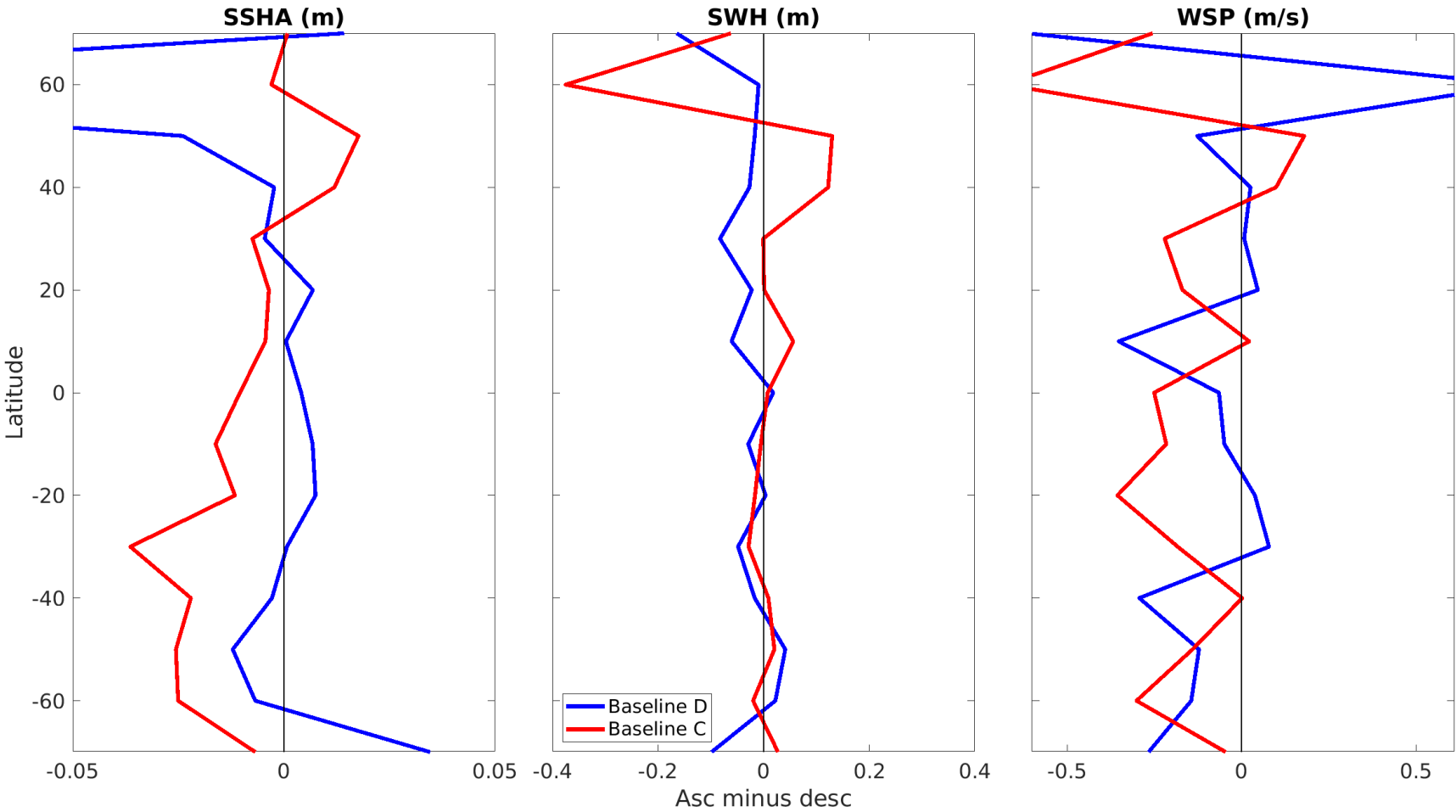
- Monthly averages of all data in 10°x10° boxes (similar, if noisier, results at lower spatial resolutions)

- Mean ascending minus descending in each box

- For operational Baseline C and preliminary Baseline D
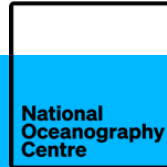
Ascending-descending biases

CONCLUSIONS

- CryoSat-2 continues to provide high quality ocean data –SSHA, SWH and wind speed

- Unique orbit provides complementary coverage to other altimetry missions

- Long timeseries (now >13 years)

- Baseline D will represent further improvements

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Thank you

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