Absolute Calibration of SARAL/AltiKa in Corsica
Preliminary results

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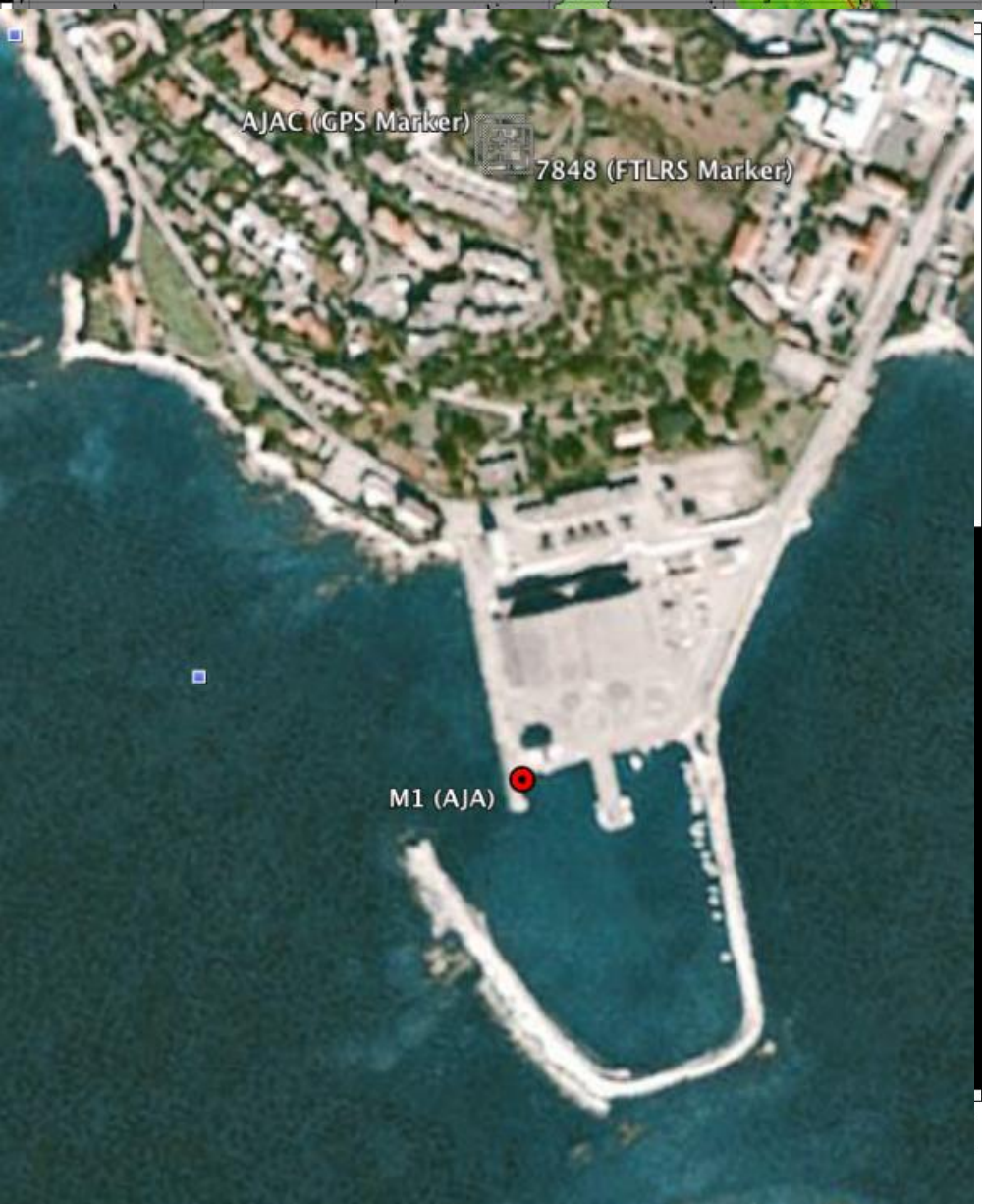
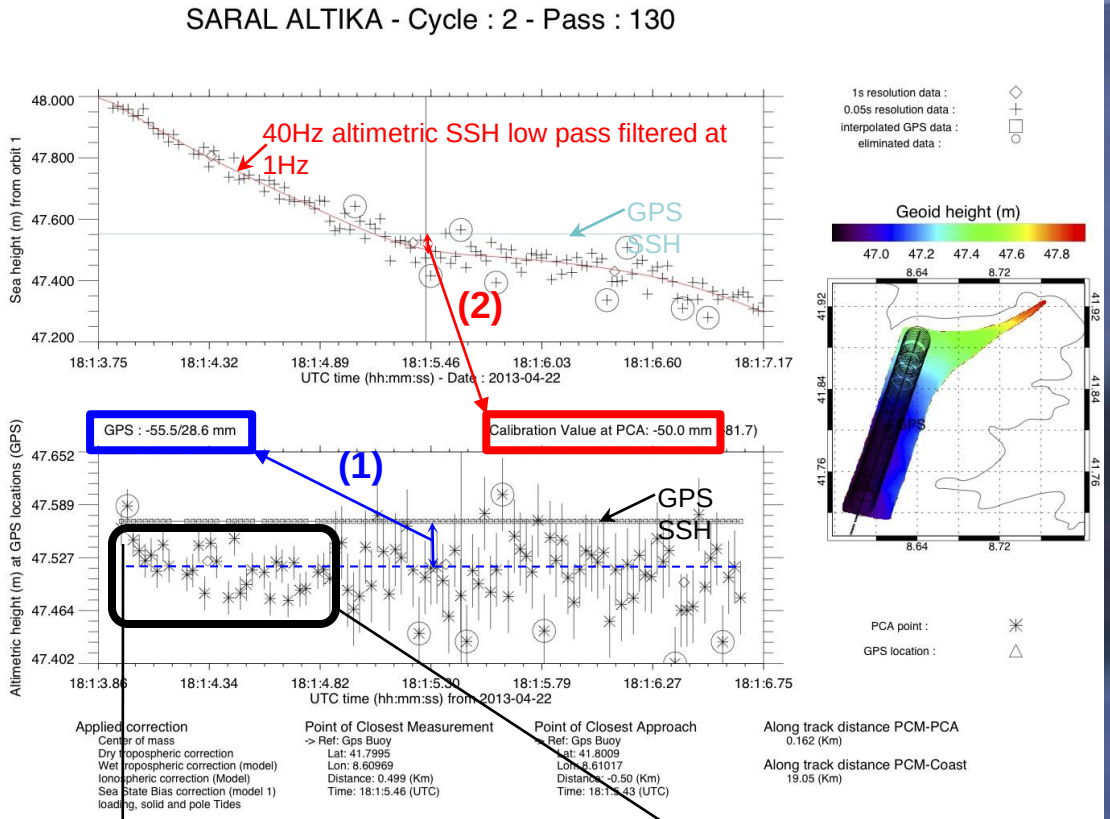
SARAL/AltiKa verification meeting – August 27-29, Toulouse

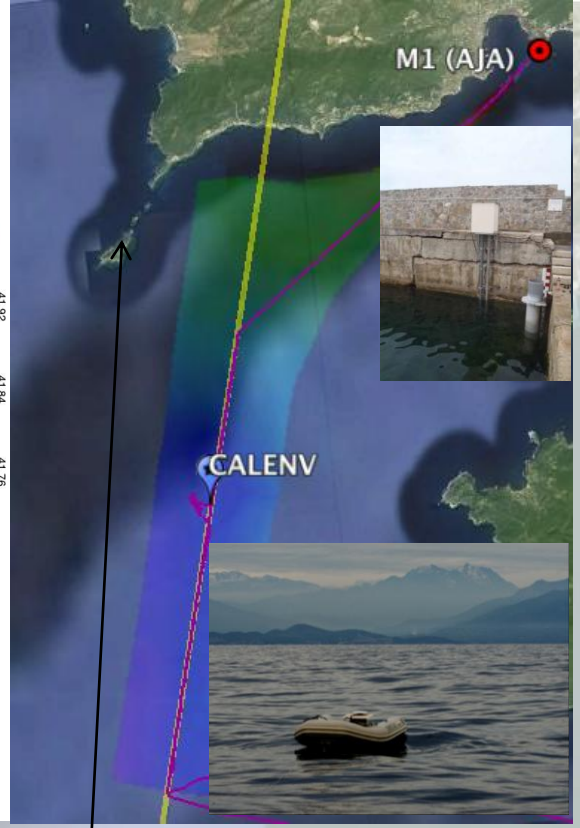


Corsica Calibration Site

- **Senetosa CNES calibration site** established in 1998 (equipped with 4 pressure tide gauges.)
  - Supports continuous monitoring of Jason-1&2 (and formerly T/P)
- Open-ocean altimeter readings connected to tide gauges via detailed **local geoid model**
  - Derived from intensive GPS buoy and catamaran surveys along ground track. **Extension to Ajaccio (2005)** and Capraia (2004)
- **Ajaccio configuration**
  - Supports continuous monitoring of SARAL/ALtiKa (and formerly ERS-2, Envisat)
  - **Open-ocean verification location for GPS zodiac deployments.**
  - **Fiducial point near Ajaccio equipped with GPS/FTLRS/DORIS.**
  - **Ajaccio radar tide gauge (SHOM)**
    New one since 2009/09/16
    (moved on 2012/04/03)

INTRODUCTION



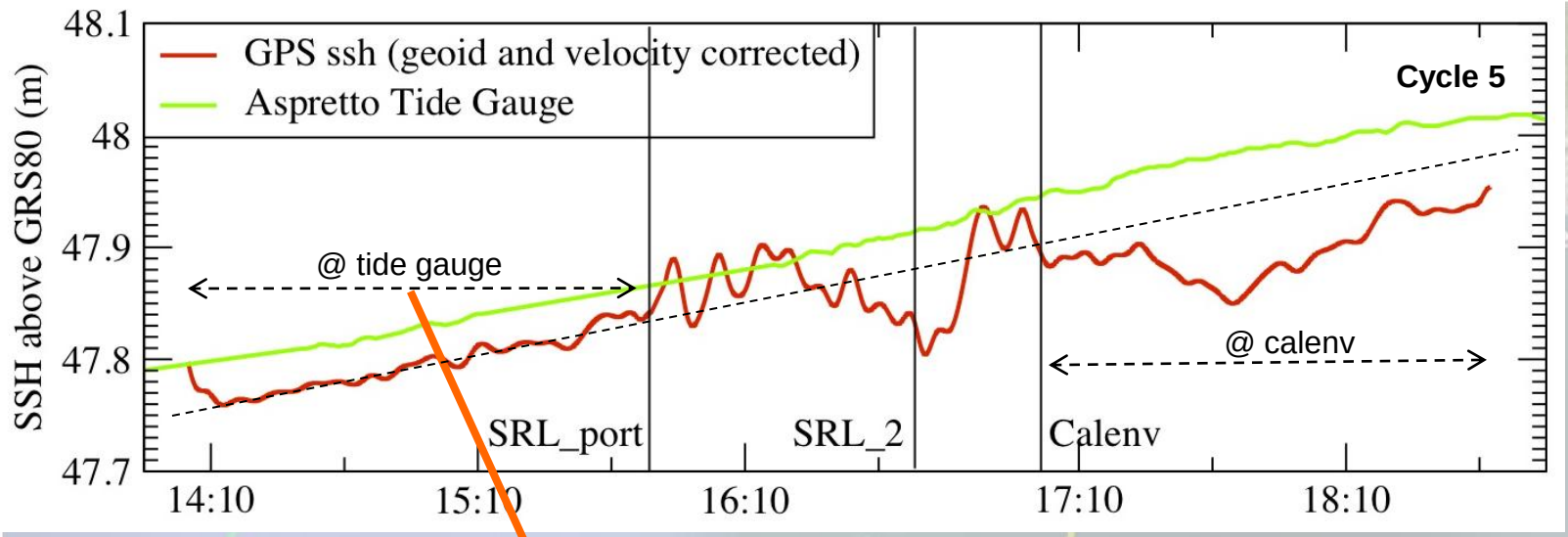


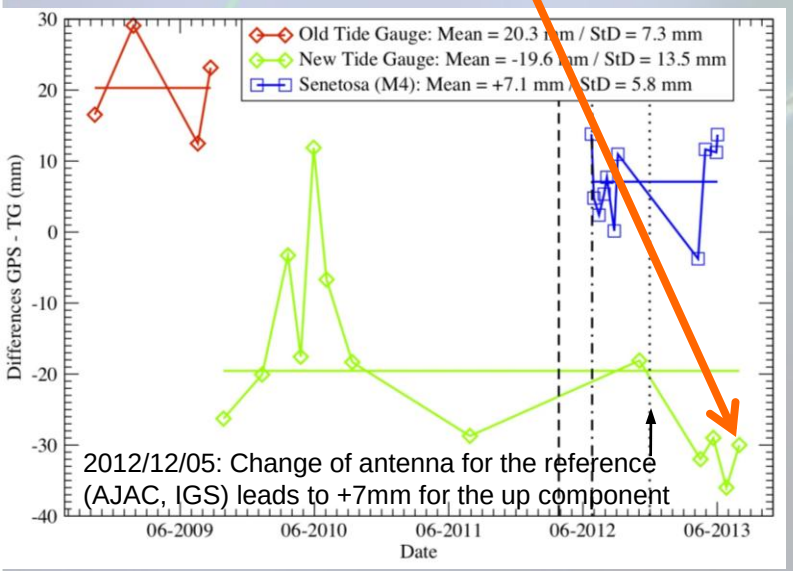
good 40Hz data up to 3km from coast

- First part protected by Sanguinaires islands shows lower standard deviation than in the open area
- Global standard deviation is also very low (28 mm) compared to typical Jason-2 one (~50-60 mm)

2 independent instruments to compute SSH bias:

- From **tide gauge**:
  - **(0) SSH from altimetry needs to be corrected from geoid**
- From **GPS measurement** (GPS aboard a zodiac located under the track, calenv):
  - **(1) Using geoid correction to average all the altimetric SSH** (noted mean in the following)
  - **(2) Computation at PCA = no need to correct from geoid** (noted PCA in the following)





The use of a zodiac instead of the previous buoy allows to record SSH continuously.
When corrected from geoid and zodiac velocity offsets, from GPS location to tide gauge location, the GPS SSH should be equivalent to tide gauge SSH.
The comparisons clearly show that a **different oceanic signal exists between the offshore location (calenv) and the tide gauge location.**

GPS / TIDE GAUGE

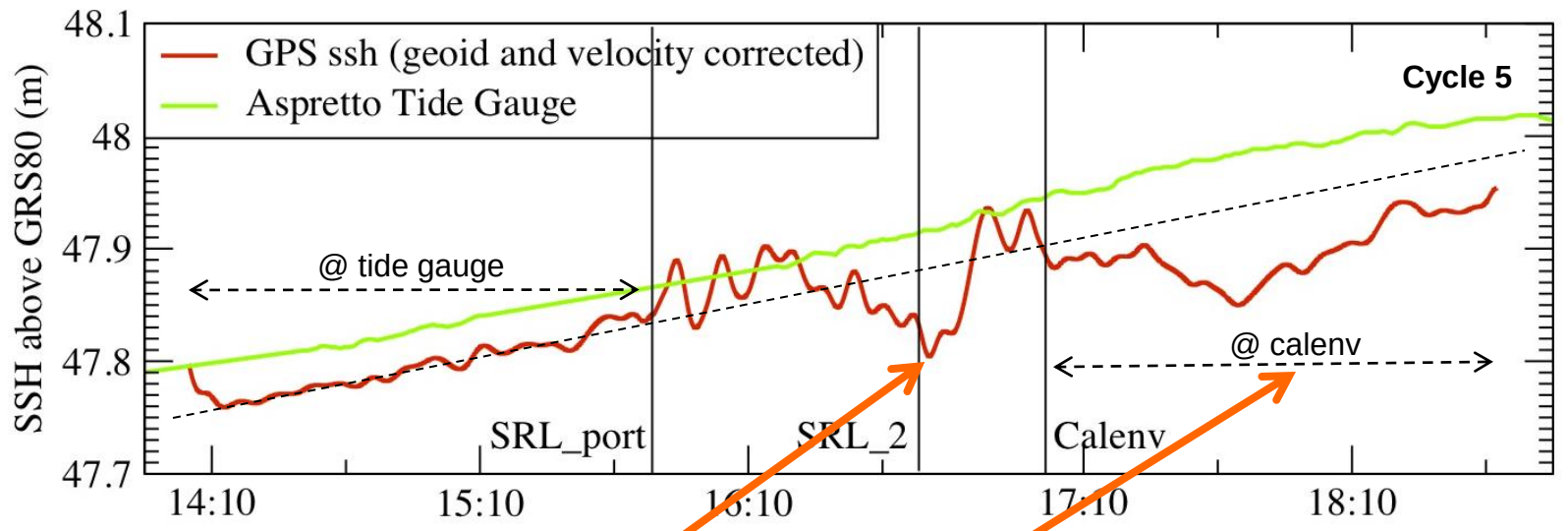
@ Tide gauge location, a clear instrumental bias has been identified from the 2 instruments

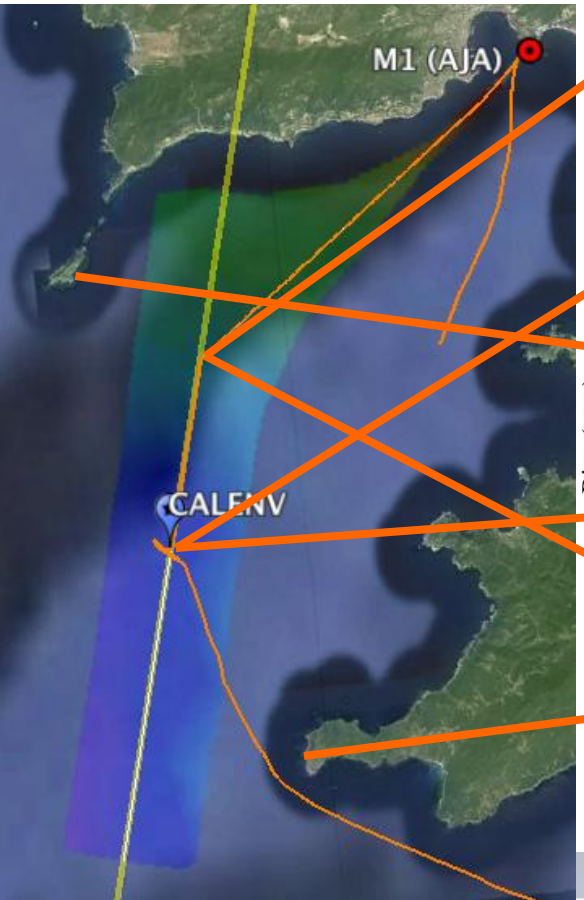
- ✓**Average of differences with GPS shows a bias of -20 mm (**after tide gauge replacement)**.**
- ✓**-32 mm for the 4 SARAL/AltiKa overflights** (cycle 1 not measured by GPS, bad weather).

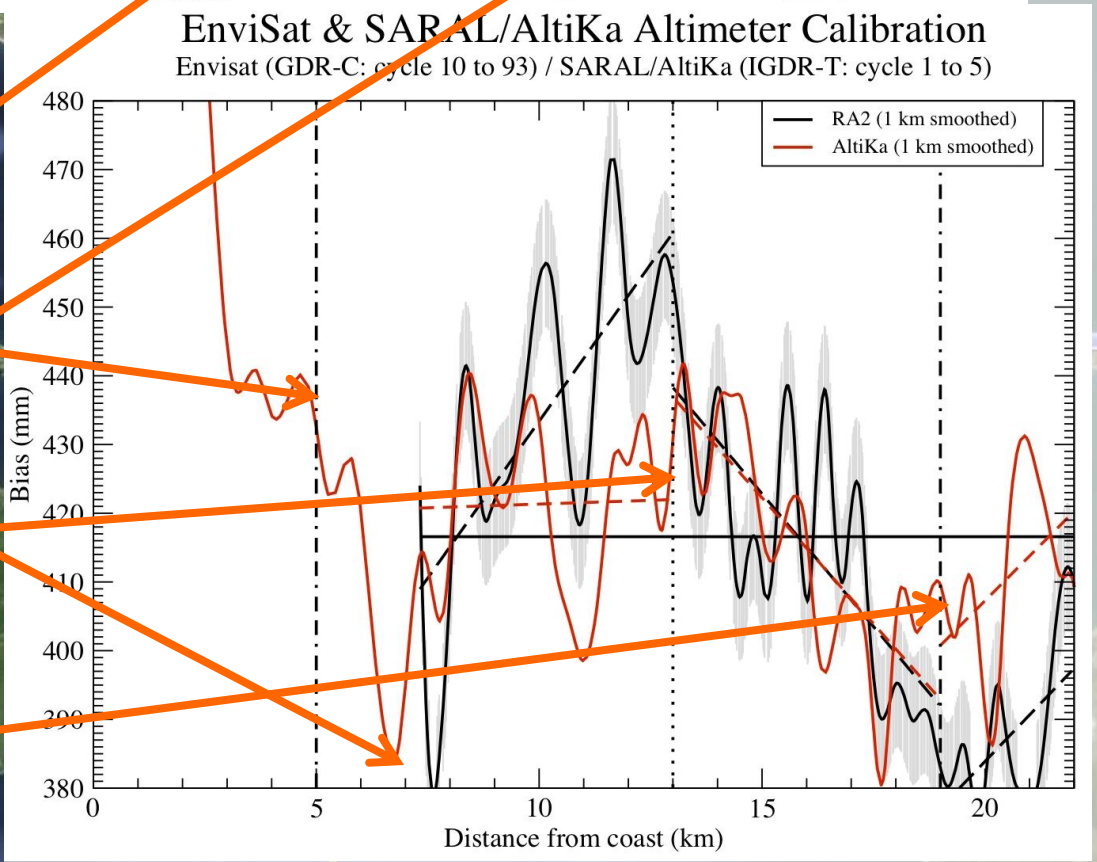
=> This bias comes probably from 2 effects:

✓ - 7 mm due to the AJAC antenna change

✓ - 13 mm from SHOM calibration applied to raw data

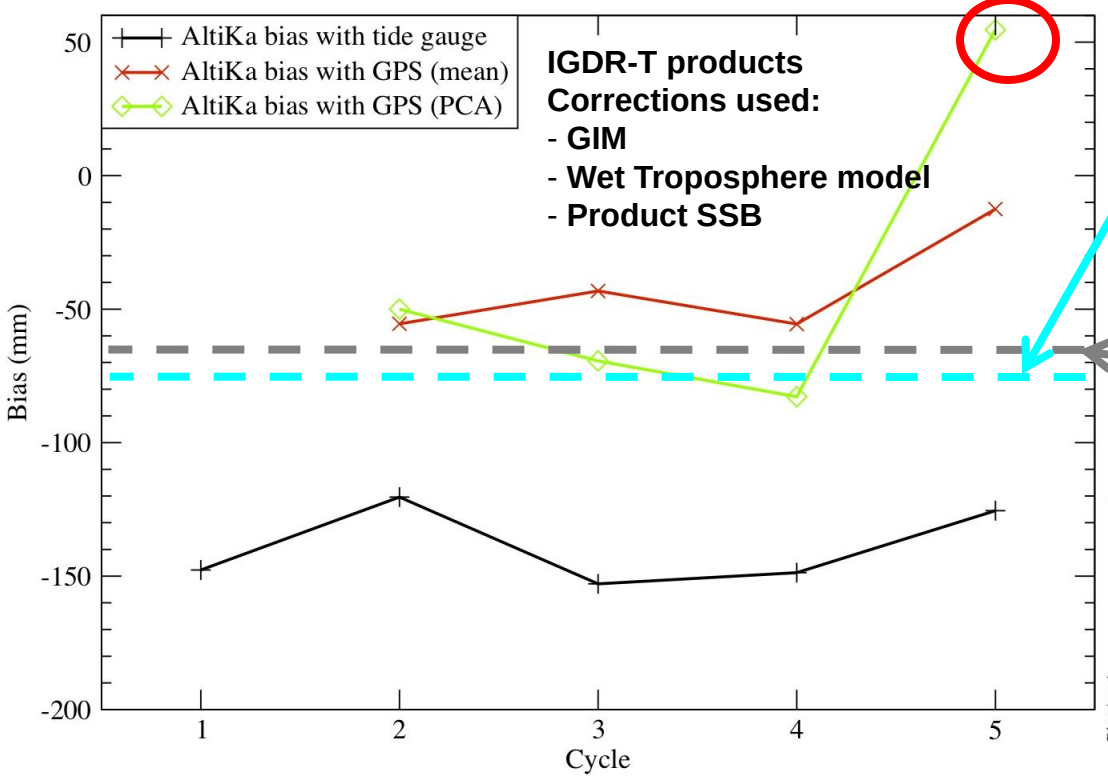


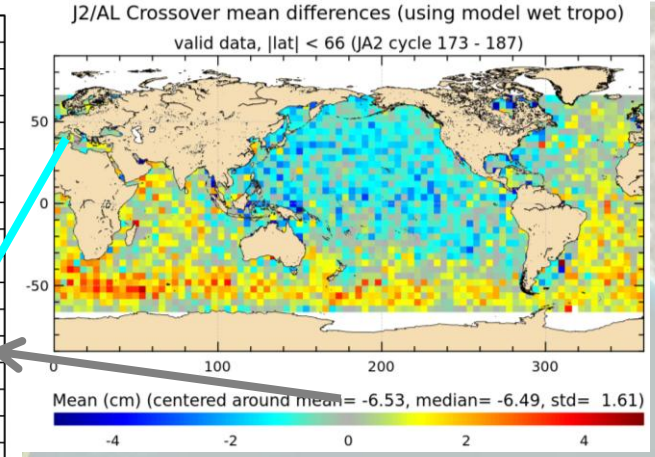


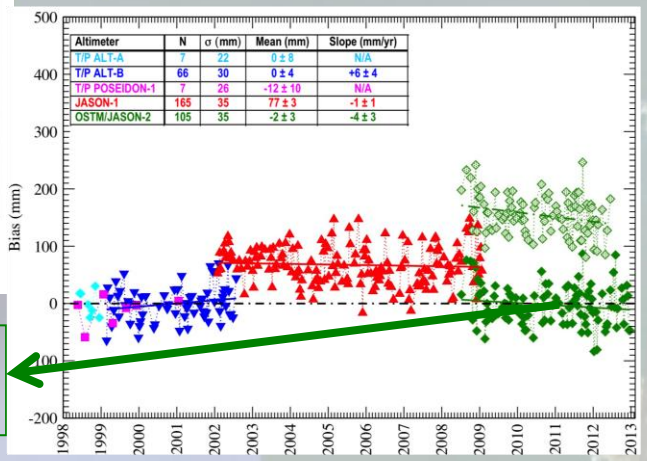


Corsica Absolute Altimeters Calibration

ALTIMETER CONTAMINATION







Corsica Absolute Altimeters Calibration

AltiKa SSH Bias

Jason-2 bias absolute bias computed from Senetosa site is close to zero (-2 ±3 mm)

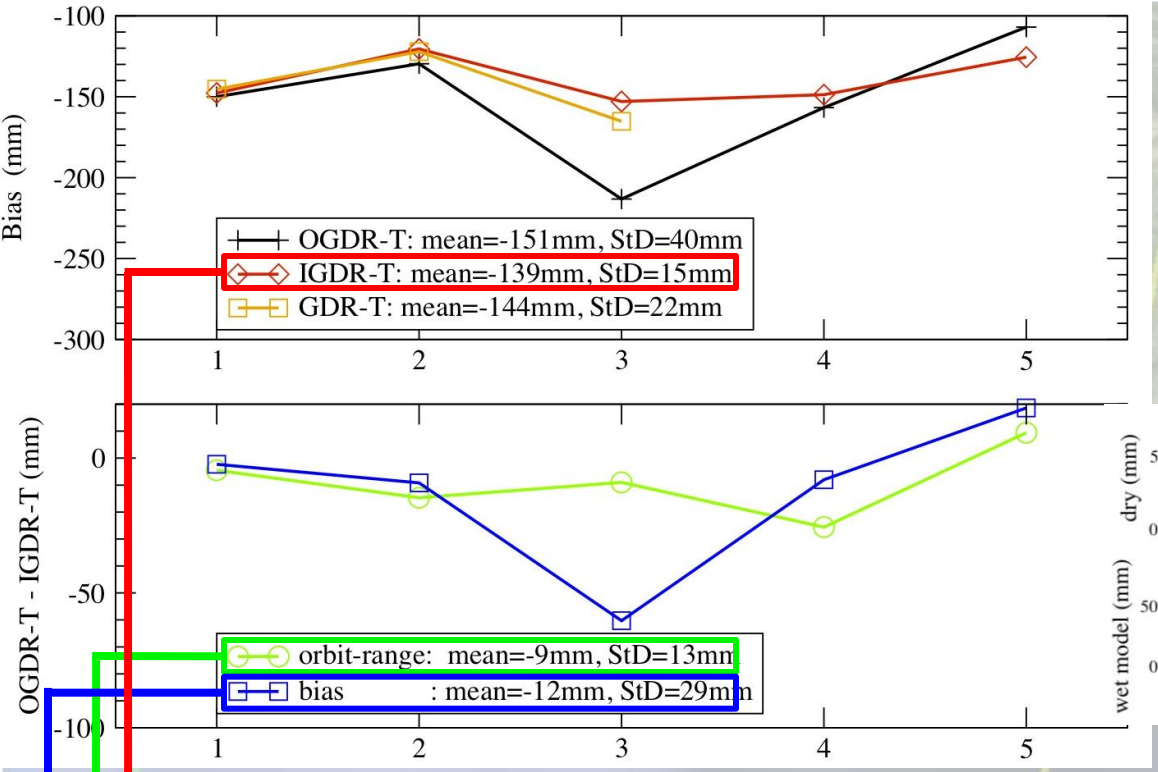
AltiKa absolute SSH bias should be close to the relative bias to Jason-2

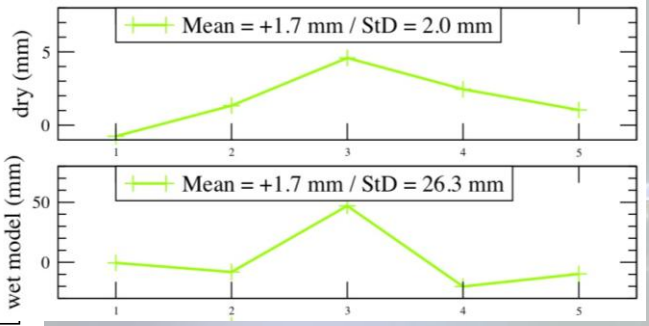
Averaged SSH bias (common cycles: cycle 2 to 4)

Tide gauge	GPS (mean)	GPS (PCA)	Xover
-141 mm (σ=18 mm)	-51 mm (σ=7 mm)	-67 mm (σ=16 mm)	~-75 mm

~-70 mm differences:

- **tide gauge and/or GPS instrumental bias (~-30 mm)**
- **oceanic signal from tide gauge to offshore (~-40 mm)**



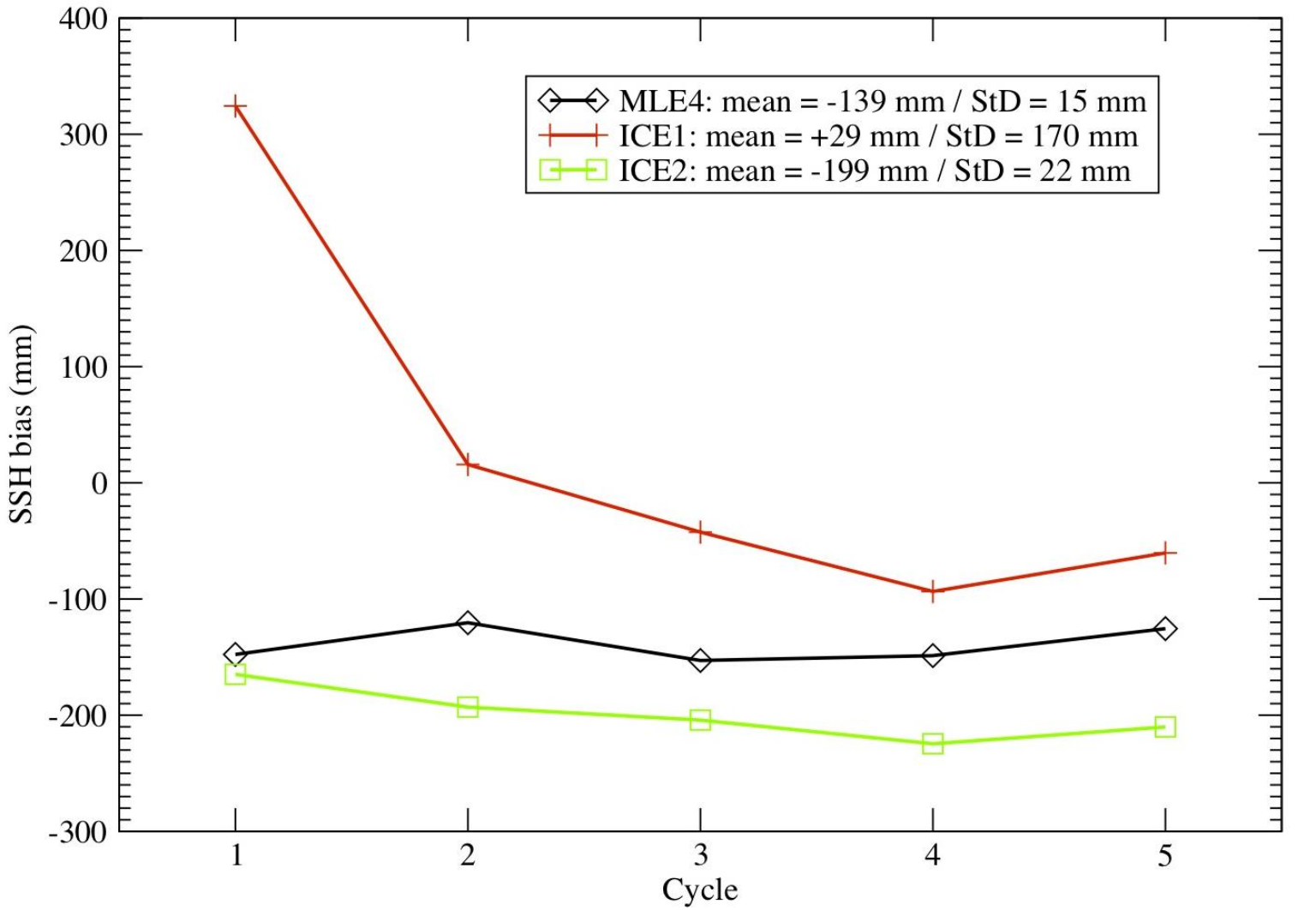


OGDRT / IGDRT

Very low standard deviation (15 mm) compared to typical Jason-2 one (~35 mm)

Mean radial orbit differences between DIODE and MOE (-9 mm) in agreement with short-arc analysis over Europe (-16 mm). Stable over the 5 cycles (13 mm)

Differences between OGDR-T and IGDR-T SSH bias are due to dry and wet tropo and linked to differences between predicted and computed ECMWF model



Corsica Absolute Altimeters Calibration

ICE1&2 RETRACKING

Averaged SSH bias (excluding cycle 1)

MLE4	ICE1	ICE2
-137 mm (σ=16 mm)	**-45 mm** (σ=46 mm)	**-208 mm** (σ=13 mm)
Differences / MLE4:	-92 mm	+71 mm

Calibration from Corsica

Corsica Absolute Altimeters Calibration

Absolute biases over the first 5 cycles (IGDR-T):

Tide gauge: -139 mm (cycle 1 to 5)
GPS (mean): -42 mm (cycle 2 to 5)
GPS (PCA): -67 mm (cycle 2 to 4)

Relative biases between GPS and tide gauge:

@ tide gauge: - 30 mm (instrumental bias)
@ calenv (offshore): add ~-40 mm (differential oceanic signal?)

OGDR-T versus IGDR-T:

- ✓ MOE and DIODE very close (-9 mm bias and 13 mm stability)
- ✓ Very stable bias with IGDR-T (standard deviation of 15 mm)
- ✓ Wet and dry tropo accuracy affected by predicted ECMWF model in OGDR-T

Radiometer monitoring using GPS:

- ✓ Coherent results with the model
- ✓ Radiometer biased (wetter) by ~10mm with variability from one cycle to the other

CONCLUSION

SWH monitoring using GPS: -2 cm bias (12 cm standard deviation)
±5min at overflight time using sea level measured by GPS-zodiac

Cycle	GPS	Product	Difference
2	86 cm	83 cm	+3 cm
3	60 cm	54 cm	+6 cm
4	41 cm	57 cm	-16 cm
5	37 cm	32 cm	+5 cm

Encouraging results from the Indian absolute calibration site at Kavaratti