

Multi-mission calibrations results at the Permanent Facility for Altimetry Calibration in west Crete, Greece attaining Fiducial Reference Measurement Standards

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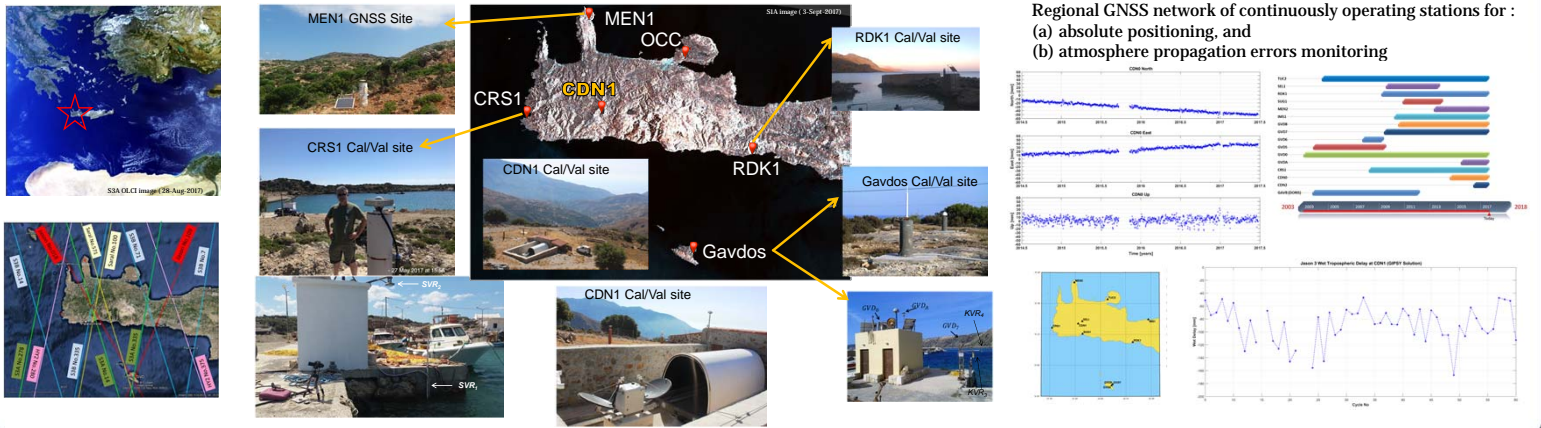
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Abstract

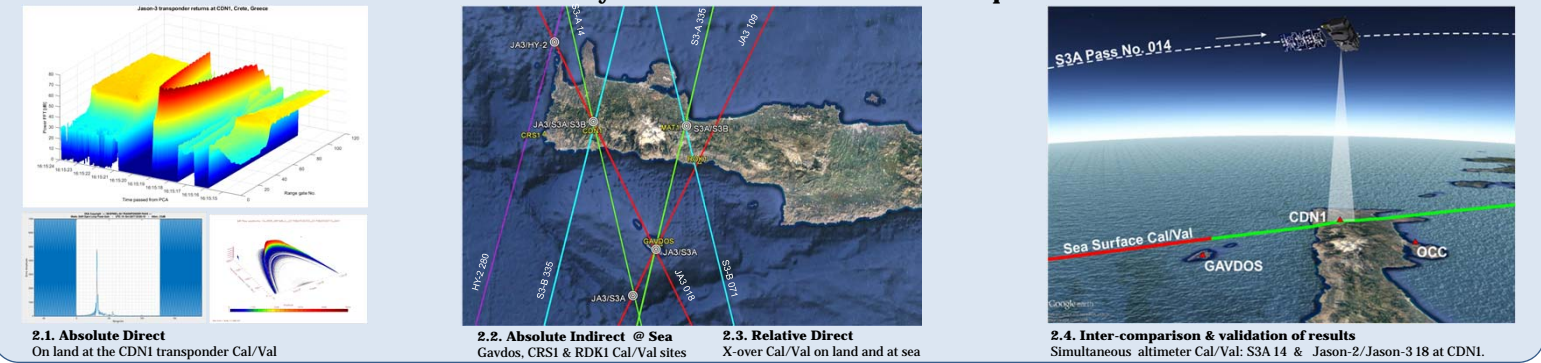
This work presents the updated results for the calibration & validation of several altimeter satellites (Jason-2, Jason-3, Sentinel-3, CryoSat-2, HY-2) determined at the permanent facility for altimetry calibration, west Crete, Greece. These absolute Cal/Val results are obtained using sea-surface and transponder techniques followed by uncertainty budgets at metrology standards. This new concept of Fiducial Reference Measurement for Altimetry is recommended by ESA to start producing Earth observation results for the future in terms of well-characterized SI units, so they are reliable, comparable world-wide and also linked to other areas of science and technology.

The latest Cal/Val absolute bias results are given at first for the Jason-2 & Jason-3 based upon the descending Pass No.18 but also on the ascending No.109, with GDR-D data at sea and on land with the transponder at the CDN1 Cal/Val site. Biases are also provided for the Sentinel-3A with the ascending orbit No.14 setting out with the transponder in the mountains of Crete and continuing on the same orbit with the sea-surface infrastructure in the south of Gavdos island. Altimeter bias results over sea surface are also produced for Sentinel-3A based on descending pass No. 335 passing over Gavdos. Using the CRS1 Cal/Val site in west Crete, results for the bias of the Chinese HY-2A satellite altimeter bias is also presented using I-GDR data for its descending Pass No.280 (Cycles 1-101). Relative biases are also presented at crossover locations for several altimeters in the vicinity of the permanent facility for altimeter calibration. Future plans for the upscaling of this infrastructure and for improving the derived results will also be presented.

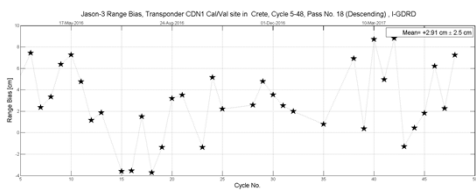
1. The Permanent Altimeter Calibration Facility-PFAC: Location & Infrastructure



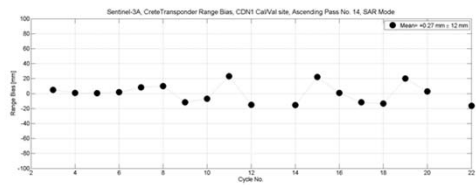
2. Satellite Altimetry Calibration & Validation Techniques



3.1 Absolute Direct (transponder JA3, S3A)

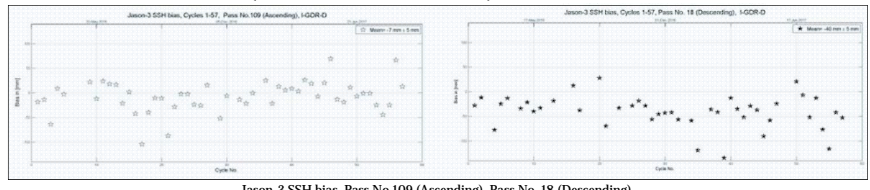


Jason-3 range bias, Cycles 5-48, I-GDR Pass No.18 (Descending)

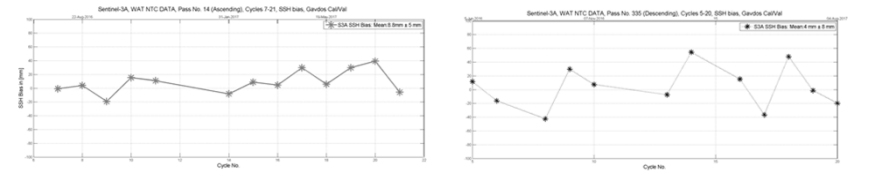


Sentinel-3A range bias, Cycles 3-20, Pass No. 14 (Ascending)

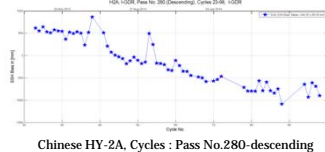
3.2 Absolute Indirect (Sea-Surface Cal/Val)



Jason-3 SSH bias, Pass No.109 (Ascending), Pass No. 18 (Descending)

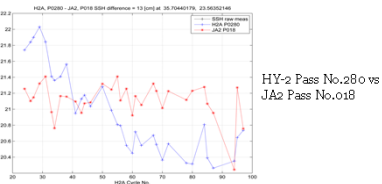


Sentinel-3A SSH bias, Pass No.14 (Ascending), Pass No. 335 (Descending)



Chinese HY-2A, Cycles: Pass No.280-descending

3.3 Relative Direct (X-Over)



HY-2 Pass No.280 vs JA2 Pass No.018

4. Conclusions & future plans

- PFAC continues to provide Cal/Val for Jason, Sentinel-3 & HY-2;
- Absolute direct range bias with a transponder at CDN1 Cal/Val;
- Diverse techniques reduce uncertainty on final bias estimation;
- Uncertainty budget estimated following Fiducial Reference Measurements standards, see Poster **CVL_001**;
- Preparations for S3-B, Jason-CS/Sentinel-6 & SWOT Cal/Val.

Satellite	Transponder	Sea-Surface
JA3, P18	+2.91cm ± 2.5 cm	-4.0cm ± 0.5 cm
JA3, P109	N/A	-0.7cm ± 0.5 cm
S3A, P14	+0.003 cm ± 1.2 cm	+0.8 cm ± 0.5 cm
S3A, P335	N/A	+ 0.4cm ± 0.8 cm
HY-2, P280	N/A	Linear trend