Recent Results for Jason-2 altimeter bias using the Gavdos Cal/Val Facility


(1) Technical University of Crete, Greece,
(2) Technical University of Denmark, Denmark
(3) Aristotle University of Thessaloniki, Greece
(4) University of the Aegean, Greece.

Ocean Surface Topography Science Team Meeting,
19 - 21 October 2011, San Diego, USA
Gavdos/Crete Cal/Val site
Jason, AltiKa and GFO tracks

AltiKa, EnviSat No. 571

EnviSat - 100 deg. asc.
Jason 2 - 100 deg. asc.
GFO - 235 deg. asc.
GFO - 236 deg. asc.

KARAVES
THEOPHILOS
DIAS
PAS 118
PAS 119

JASON 1
JASON 2
JASON 3

MEN1
SEL1
SUG1
CRS1

TUC2
IMS1
RDK1
GV00
GV07
GV18
GV19

Geodesy & Geomatics Engineering Laboratory
Cal/Val Facilities: Gavdos, Crete

GVD0: Central Facility

GVD7&8

RDK1

New RDK1 GPS equipment: Leica GHH 13000 GPS receiver, Leica AT501 antenna

CRS1
Jason-2 calibration regions
Jason-2 bias over pass No. 109
Jason-2 bias over pass No. 18

Jason-2 Altimeter Bias Pass 018 (South of Gavdos) Cycles 1-79

Jason-2 Bias Ku Band: Mean: 171.35 ± 5.13 mm
Ionosphere wrt GPS for Pass No. 018

GPS vs Jason-2 Ionospheric Delay Estimation for Pass 018 Cycles 1-84

- GPS Ionospheric Delay Mean: -21.32 ± 1.15 mm
- Jason-2 Ionospheric Delay Mean: -14.54 ± 1.10 mm

AMF - GPS: Mean: -5.75 ± 0.44 mm

Jason-2 Cycle
Ionosphere wrt GPS for Pass No. 109

GPS vs Jason-2 Ionospheric Delay Estimation for Pass 109 Cycles 1-104

- GPS Ionospheric Delay Mean: -23.25 ± 1.10 mm
- Jason-2 Ionospheric Delay Mean: -17.05 ± 1.00 mm

AMR - GPS: Mean: -6.21 ± 0.43 mm
Wet Tropo wrt GPS for Pass No. 018

GPS vs Jason-2 Ionospheric Delay Estimation for Pass 018 Cycles 1-84

- GPS Ionospheric Delay Mean: -21.32 ± 1.15 mm
- Jason-2 Ionospheric Delay Mean: -14.54 ± 1.10 mm

AMR - GPS: Mean: +6.78 ± 0.44 mm
Wet Tropo wrt GPS for Pass No. 109

GPS vs Jason-2 Ionospheric Delay Estimation for Pass 109 Cycles 1-104

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Kinematic boat campaign on 27-Aug-2010, Along Pass No. 109
Altimeter calibration with boat

27-Sept-2010, Cycle 80, Time=15:14:58 UTC

SSH derived from kinematic GPS (Pass No.109, 7-Sept-2010, Cycle 80)

Overfly time of Pass: 15:14:58
Distance to PCA: 19.396 km
SSH determined: 13.687 m
SSH from GDR: 13.683 m
Bias = +19.6 cm

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Altimeter calibration with kinematic GPS boat campaign

- Satellite passing on 15:14:38 UTC, 7-Sept-2010,
- Simultaneous measurement of sea surface height with boat (GPS & tide gauge),
- 900 samples of GPS data, 2-sec sampling rate,
- Distance from PCA = 19.3 km from PCA,
- Bias = \( \text{SSH}(k) - \text{SSH}(k_0) = +19.6 \text{ cm} \), Pass No. 109.
New transponder

- Central frequency 13.575 GHz, bandwidth = 350 MHz;
- Polarization: Circular;
- Mobile (for new locations) and modular (for other frequencies).
- Capable for record incoming & outgoing signal at the transponder;
- Controlled remotely through control computer using communication links.
- Capable for monitoring internal delays (± 1mm);
New transponder

- Constructed under the ESA specs and supervision;
- Easily transferred to new locations in Crete;
- Will be sent to ESA for calibration in Nov 2011;
- Add modules for new satellites (AltiKa: 35.75 GHz, 500 MHz)
Present transponder signal response

- Jason-2 satellite response in Gavdos in the DEM-mode,
- Measurements over Pass No. 18, on 1-Mar-2011,
- 104 bins (DEM-mode & 128 in CAL2-mode) in each calibration No, and
- Max power return around the bin No. =42.
Summary

- The absolute bias for the Jason-2 altimeter has been determined using sea surface measurements:
  - B = +191 ± 4 mm (Ascending Pass No. 109, Cycle 2-105)
  - B = +171 ± 5 mm (Descending Pass No. 18, Cycle 2-79);
  - B = +196 ± 5 mm (GPS-Boat campaign, Pass No. 109, Cycle 80)
  - Many cycles are missing because of simultaneous transponder calibration

- Atmospheric parameter calibration
  - Wet tropo against GPS -8.56 mm (No.18) & -5.43 mm (No. 109).
  - Ionosphere against GPS +6.78 mm (No. 18) & +6.21 mm (No. 109)

- Field sea-surface campaigns have been performed along satellite ground tracks to validate the used geoid models.

- Transponder data for Jason-2 collected as of July 2009. Results are excellent and consistent.

- A new transponder has been developed to:
  - Calibrate satellite altimeters & determine bias (Sentinel-3, Cryosat-2, Jason)
  - Determine the orientation of the satellite interferometer baseline.
Back up Slides
Steep Bathymetry in calibration regions

16-24 km calibration region, along No. 109
Calculation of bias trend along track
Bias within 150-m window along J2 Pass

Jason-2 Median BIAS with Raw Range for 77 Cycles with 150 meters window
Pass 109 South Leg
Corrections were taken from the South Leg

Pass No. 109