Absolute Satellite Calibration at Gavdos, Greece

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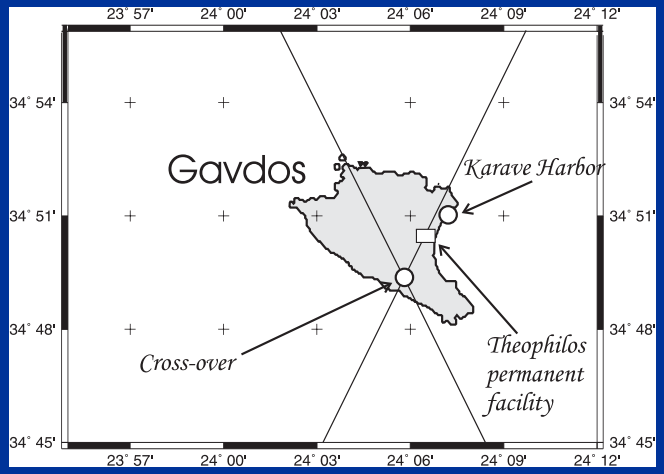
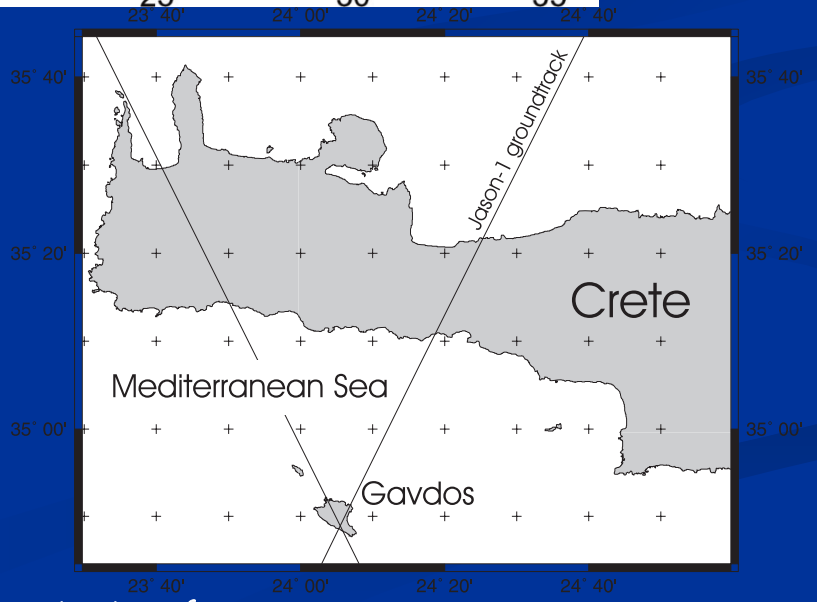
Laboratory of Geodesy and Geomatics Engineering

GeoMatLab

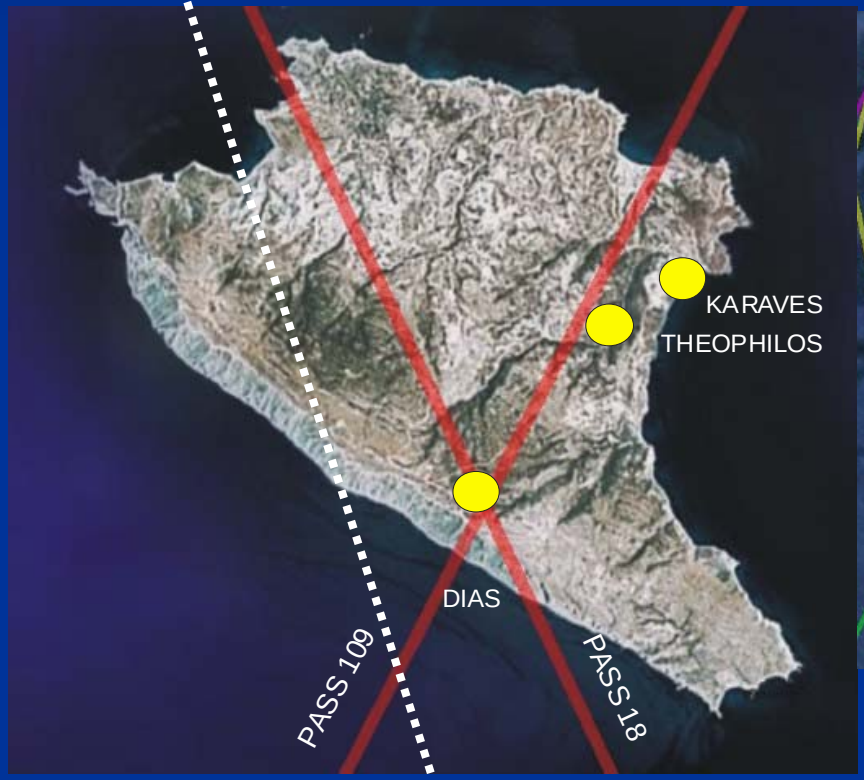
Gavdos/Crete Cal/Val site

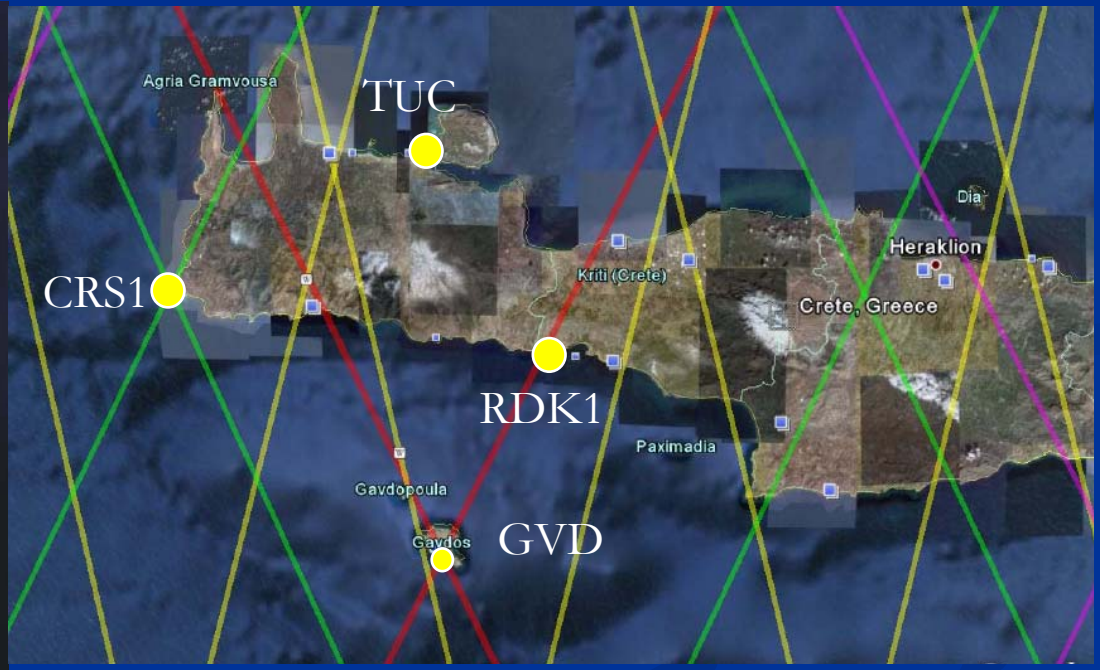




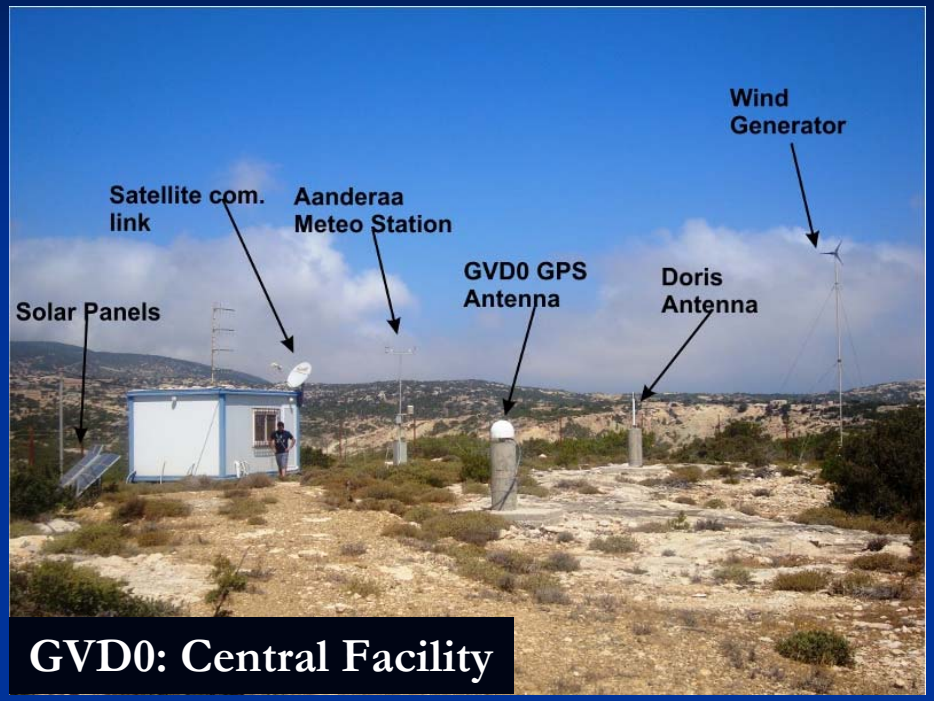
Jason, AltiKa and GFO tracks

AltiKa, EnviSat No. 571





Cal/Val Facilities: Gavdos, Crete



GVD0: Central Facility

GVD7&8

RDK1

CRS1

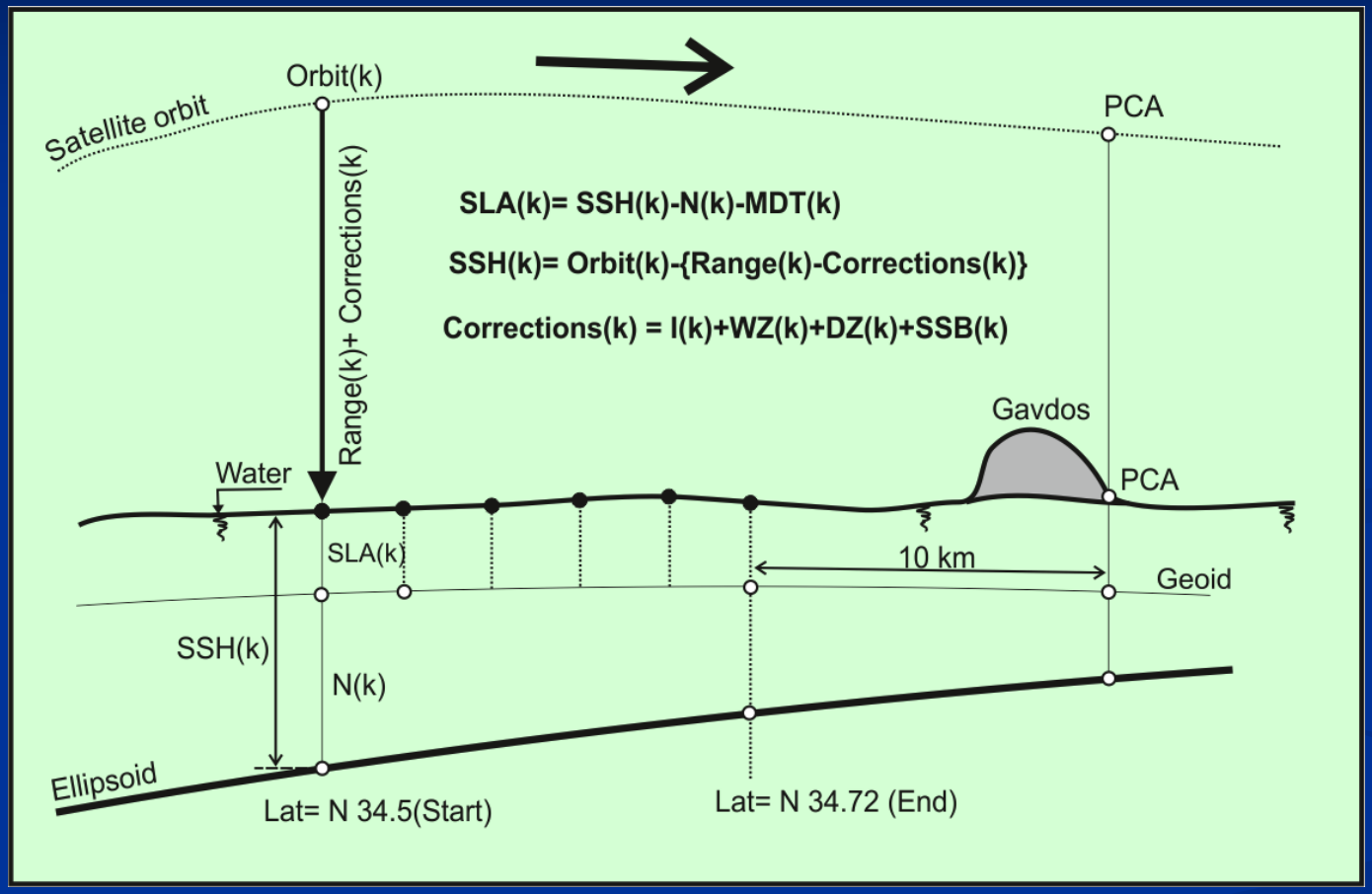
Geodesy & Geomatics Engineering Laboratory

GeoMatLab

Transponder site @ cross-over

Calibration regions

Principle of operation (South of Gavdos)



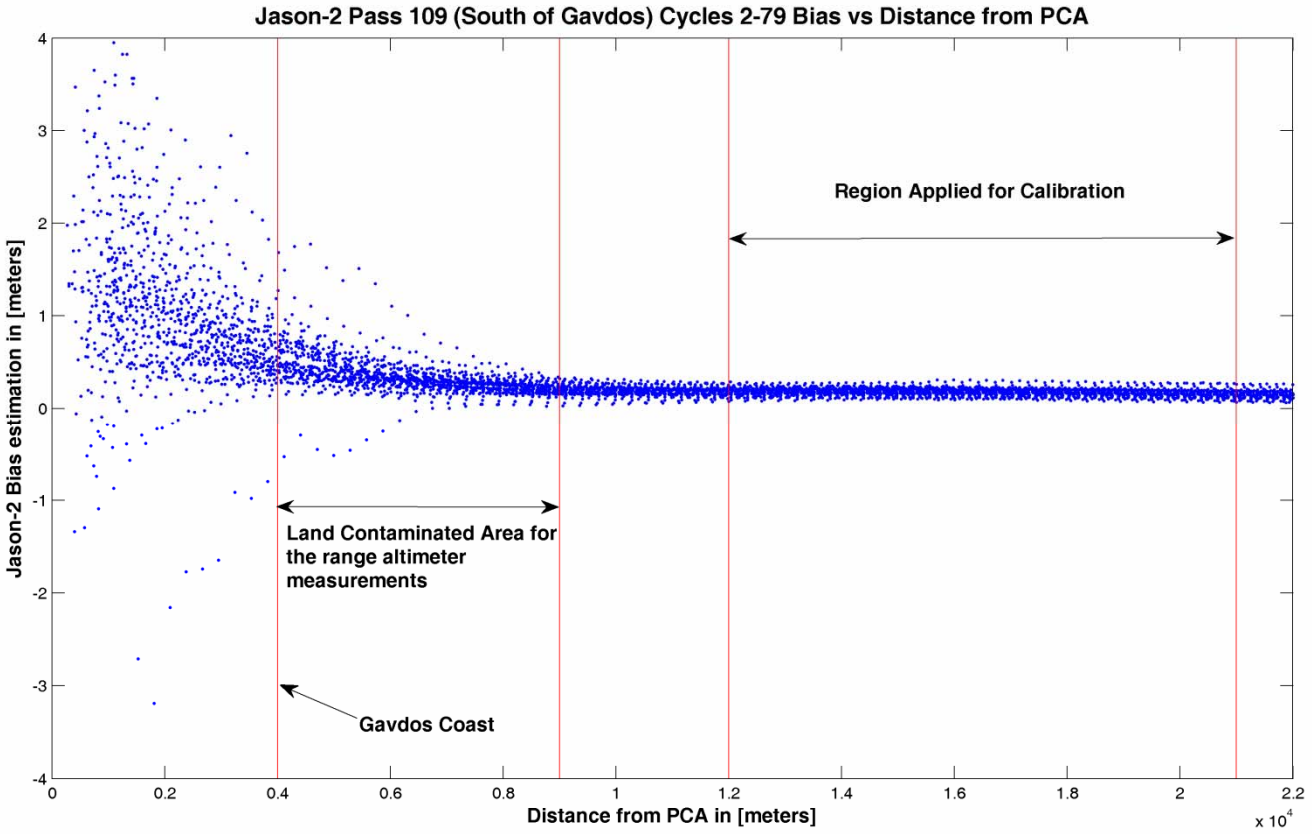
Ascending Pass:
12 to 21 km South of Gavdos

Descending Pass:
8 to 18 km South of Gavdos

Geophysical Correction Models

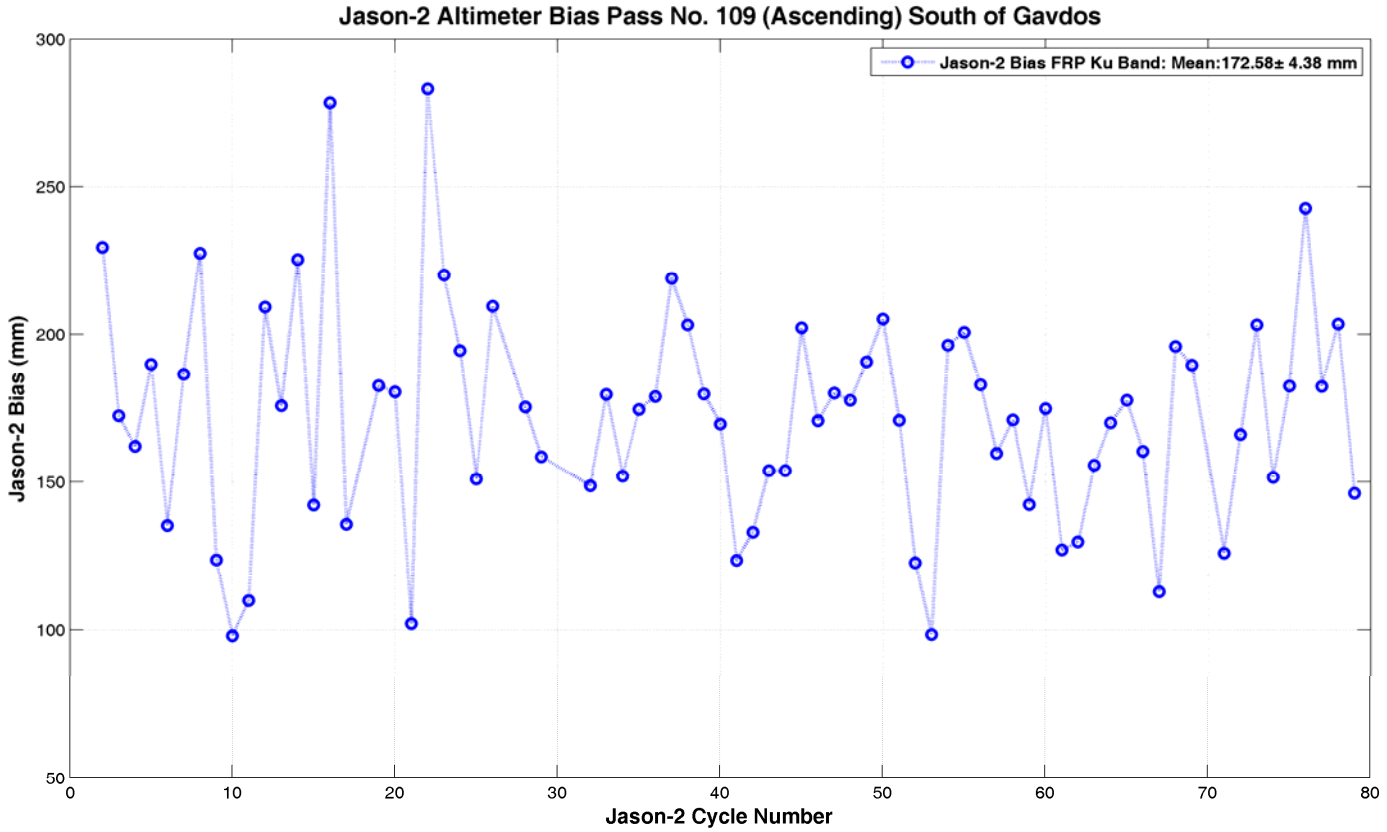
	Pass No 109 (Ascending)	Pass No 018 (Descending)	Models Employed
PCA	Satellite's Point of Closest Approach to the tide gauge		
Calibration Area	**South Leg (12-21 Km)**	**South Leg (8-18 Km)**	
Iono	[-21 to -1] sec from PCA	[+1 to +21] sec from PCA	Average
Dry	[-10 to +2] sec from PCA	[-2 to +10] sec from PCA	Linear fit
Wet	[-15 to -5] sec from PCA	[+5 to +15] sec from PCA	Linear fit
SSB	[-10 to +1] sec from PCA	[+1 to +10] sec from PCA	Cubic polynomial Fit
MDT			RioMed MDT model
N (Geoid)			Local geoid campaigns
MSS			MSS_CNES_CLS_10
GNSS Coordinates			ITRF2006

Selection of the Calibration area for the ascending Pass 109 (South of Gavdos)



Bias vs Distance from PCA for Pass 109 (South Leg). Figure depicts the region applied for calibration (12 to 21 km from PCA) along with the land contaminated area (4 to 9 km from PCA)

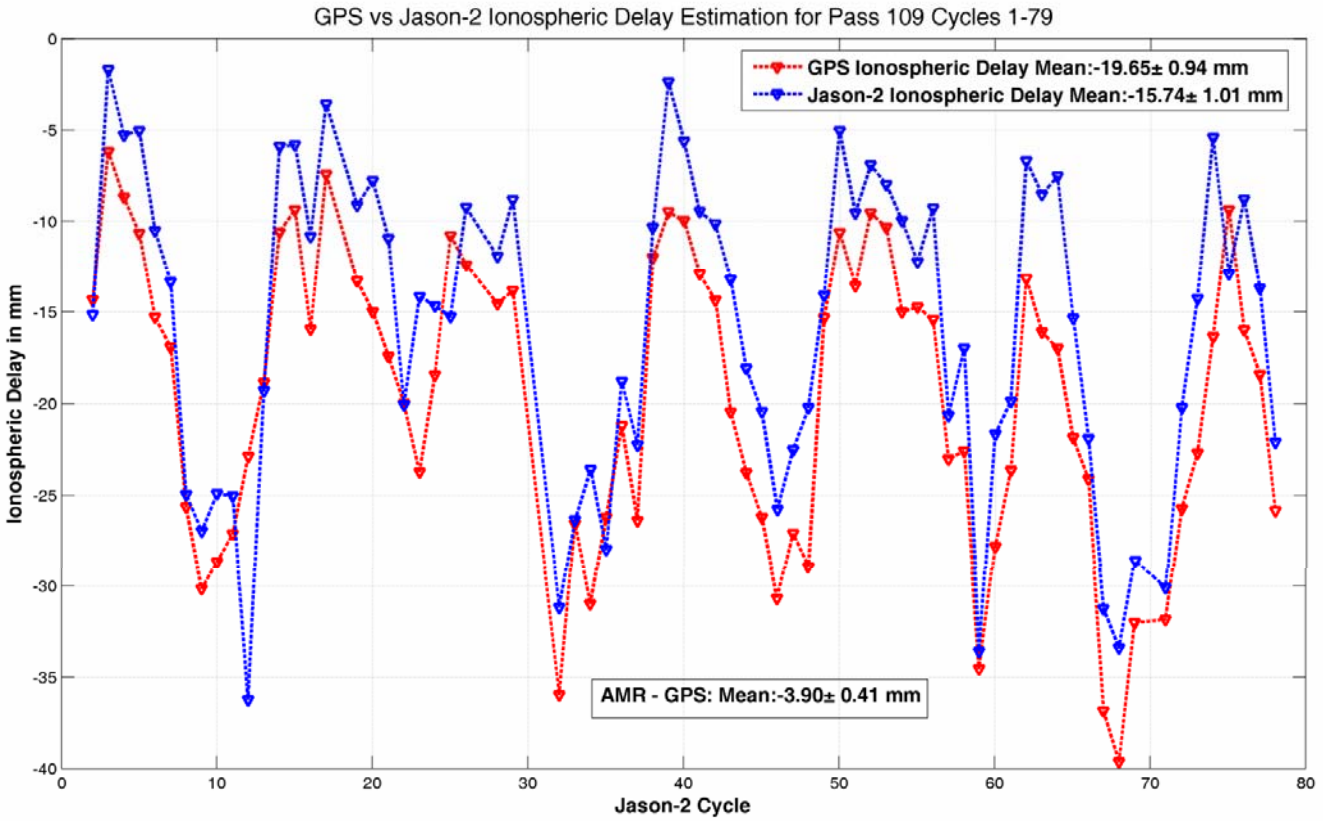
Bias: Ascending Pass No.109



Cycles 30, 31 excluded, because no tide-gauge data were available.

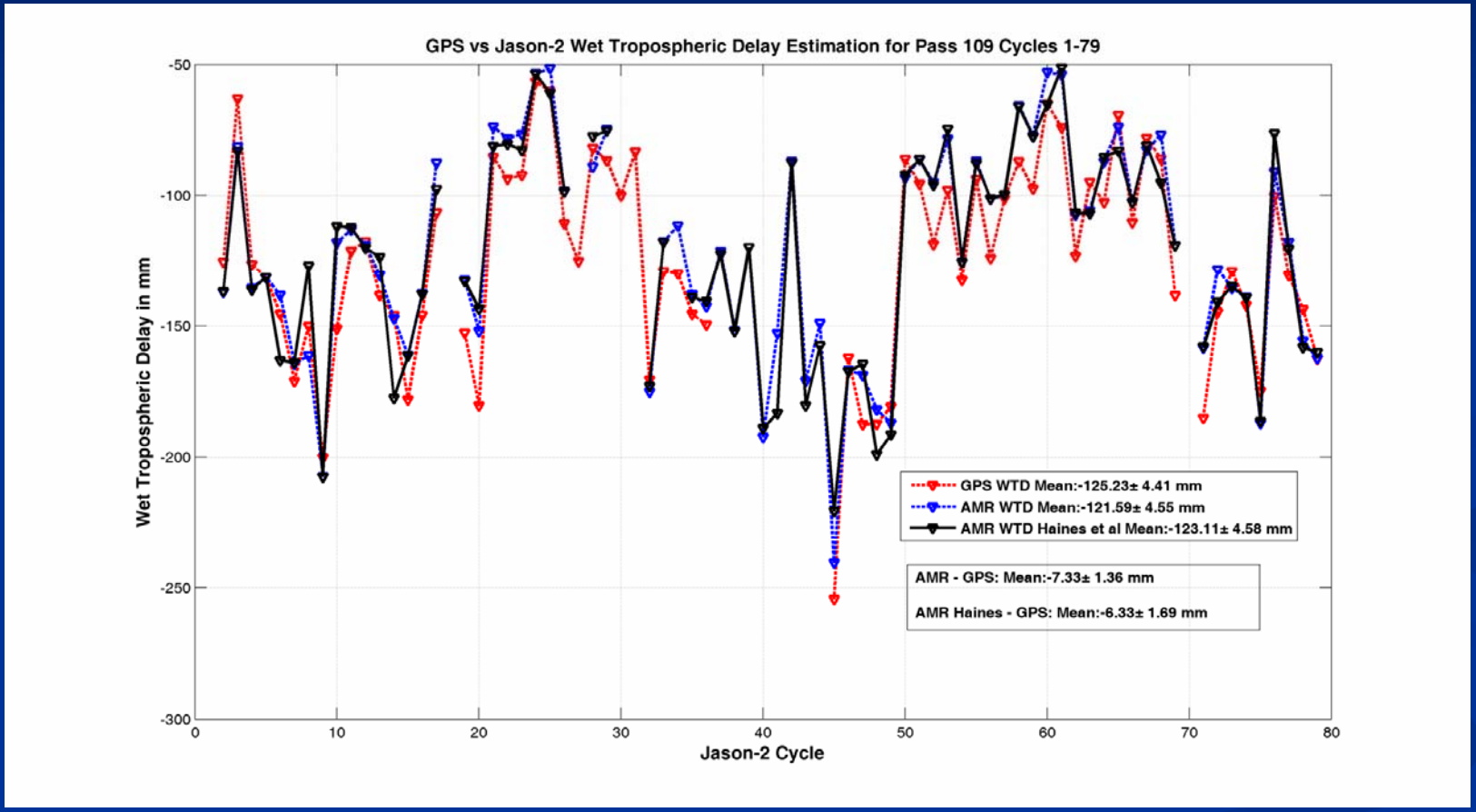
Cycle 18, 27 excluded because of sigma bloom.

Ionosphere wrt GPS for Pass No. 109



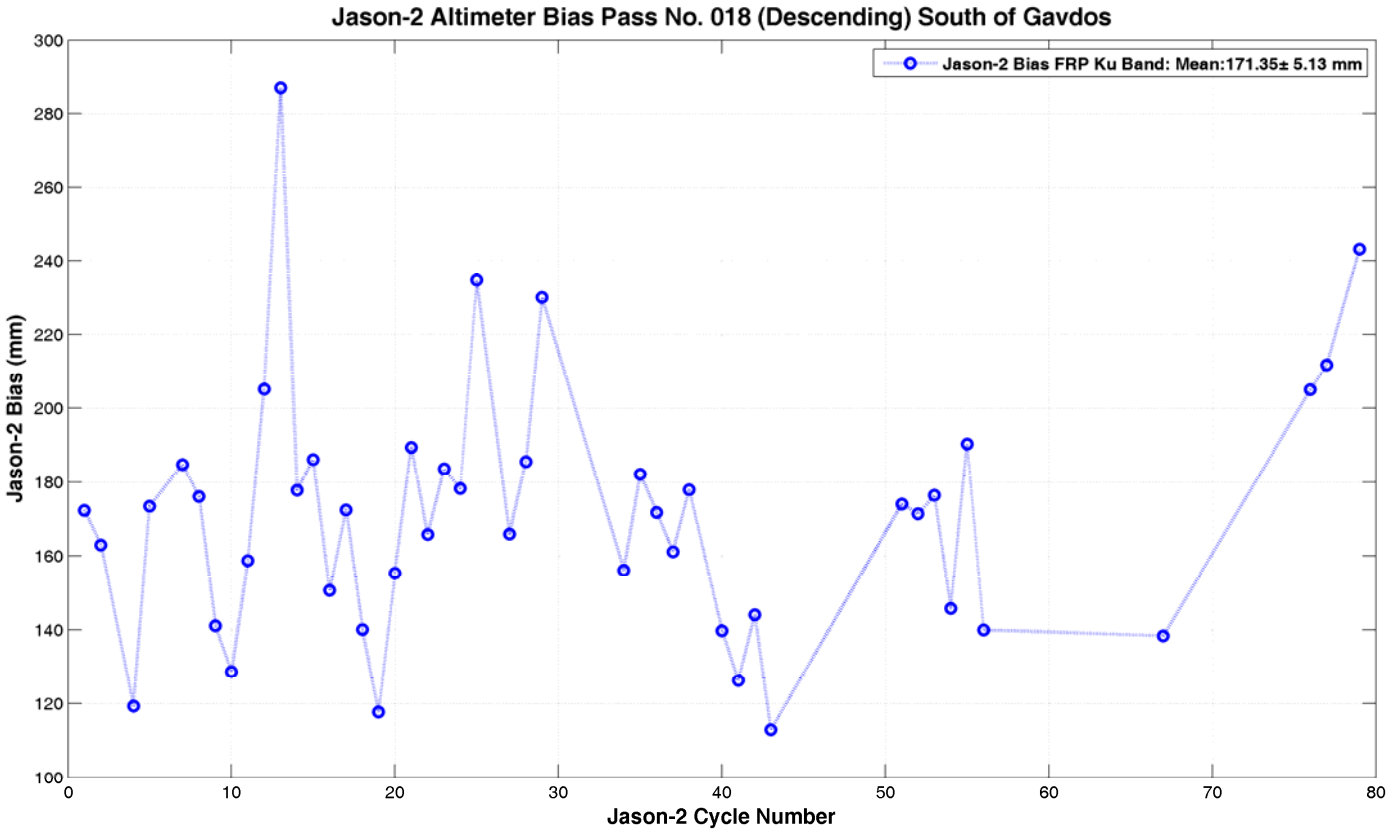
Modeling of ionospheric values (average model) in the region [-1 to -21 sec] from PCA. The ionospheric value as obtained from extrapolating the model to the PCA is compared against the one obtained through GNSS analysis.

Wet Tropo wrt GPS for Pass No. 109



Modeling of WTD values (linear model) in the region [-15 to -5 sec] from PCA. The WTD value as obtained from extrapolating the model to the PCA is compared against the one obtained through GNSS analysis. These values are also compared against the last valid WTD model values (as it is propagated to the PCA)

Bias: Descending Pass No.18

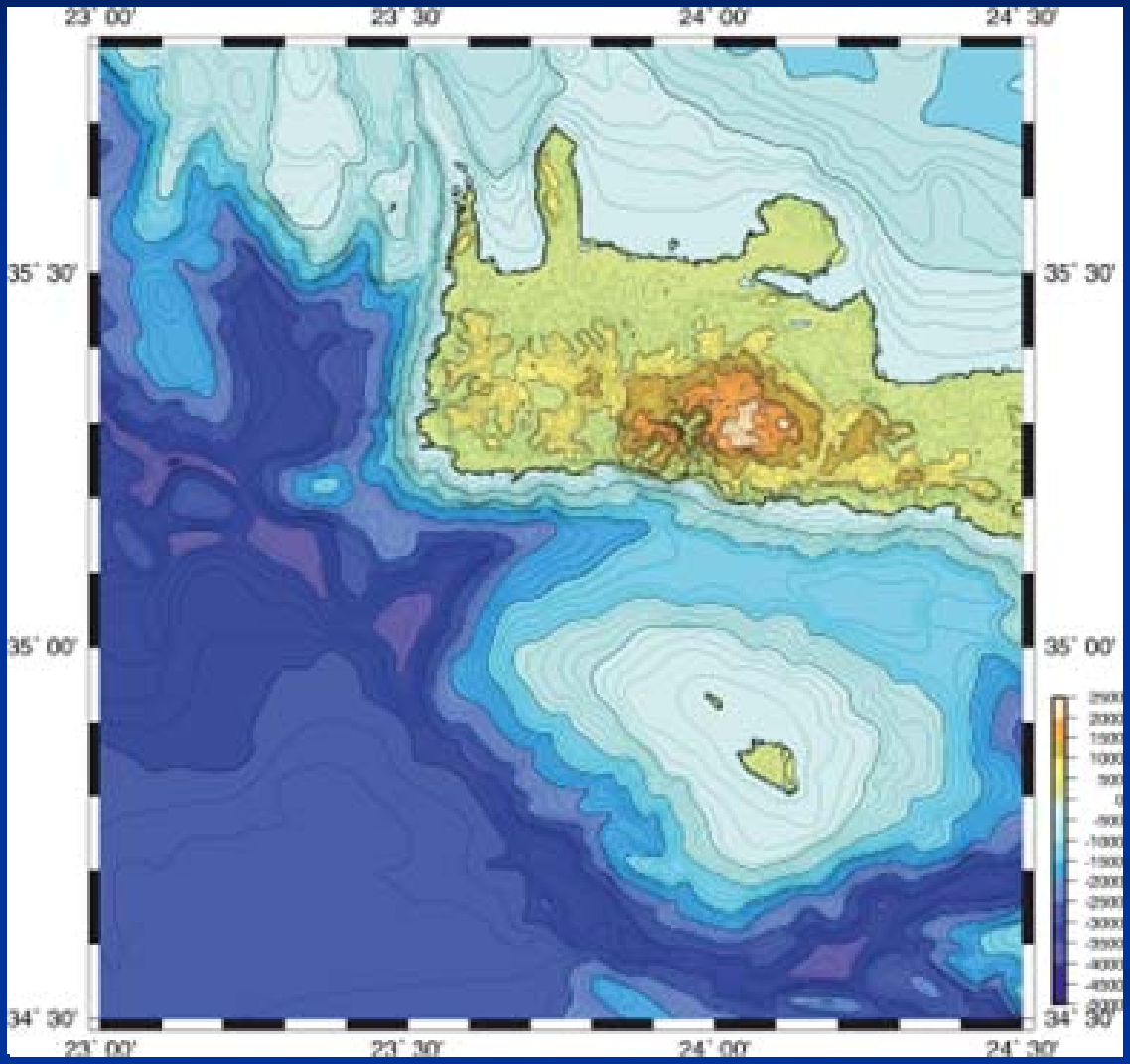


Cycles 30, 31 excluded, because no tide-gauge data were available.

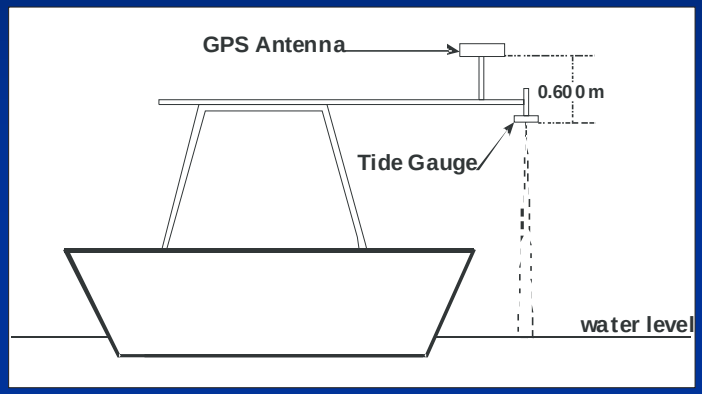
Cycle 3, 6, 26, 32 excluded because of sigma bloom.

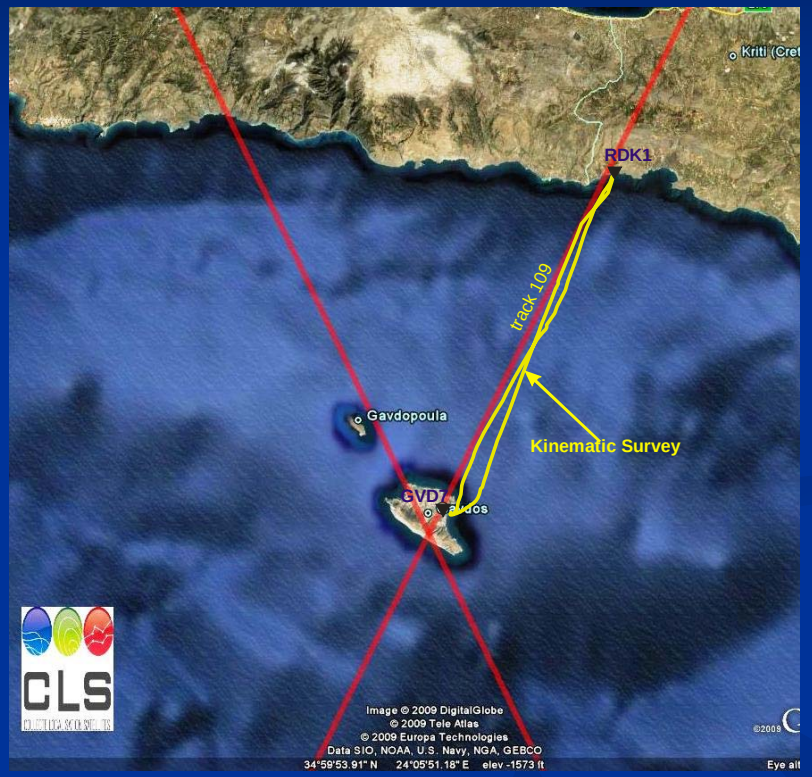
No GDR data available at the calibration area after Cycle 40 due to transponder experiment

Bathymetry



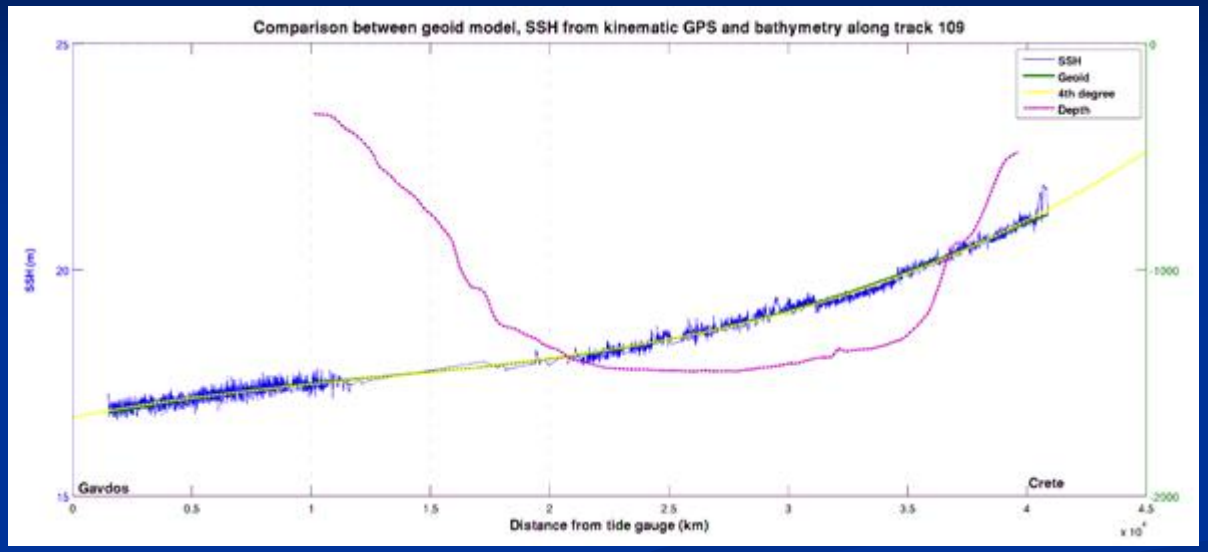
GPS Kinematic Surveys



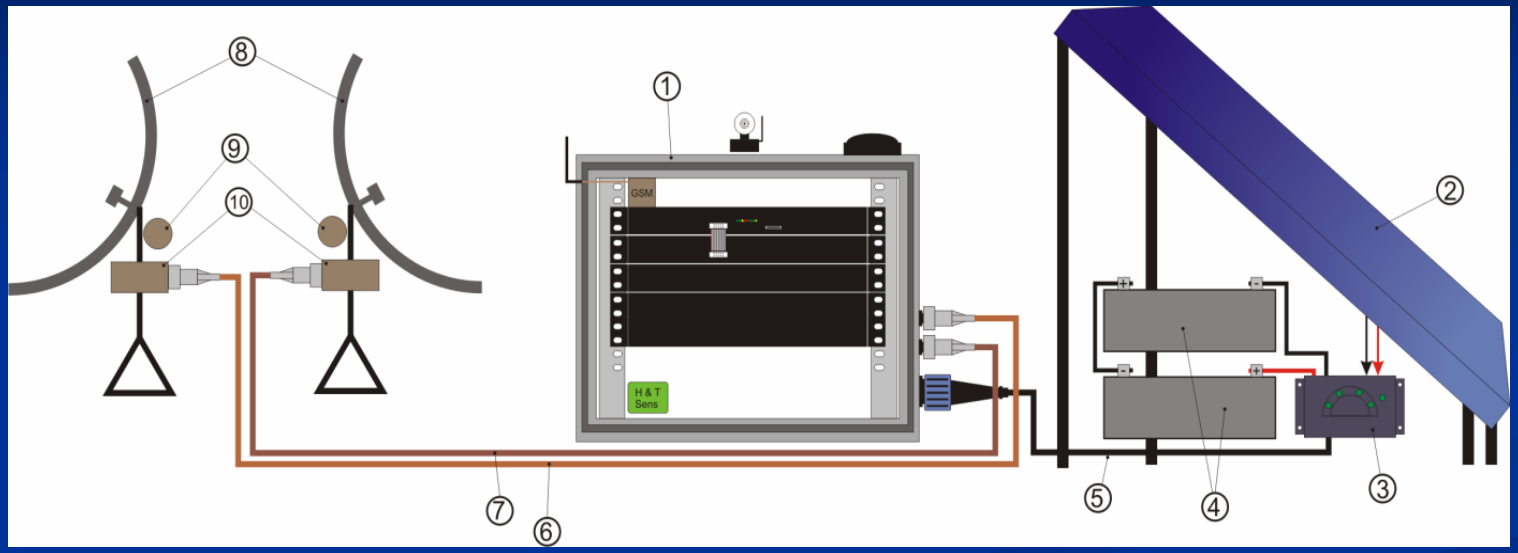


- Calibrate satellite with GPS buoys;
- Two GPS buoys;
- Vessel for field campaigns;
- Kinematic surveys carried out in Aug and September 2010 along passes No. 18 and No. 109;

GPS Buoy & field campaigns

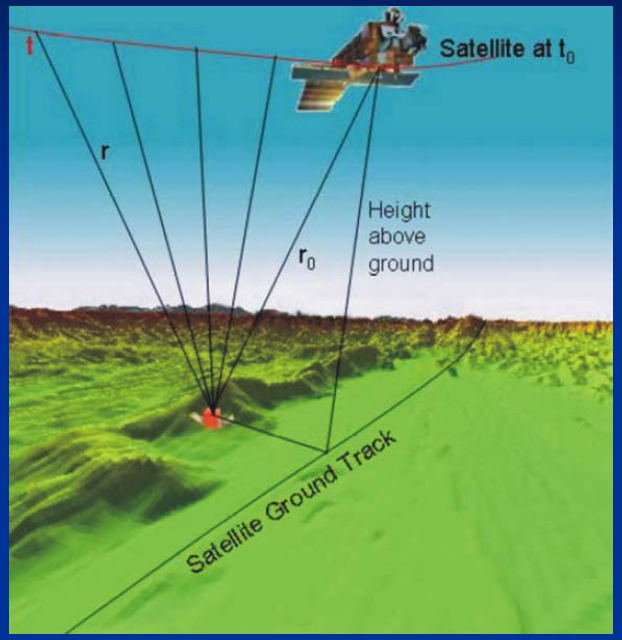


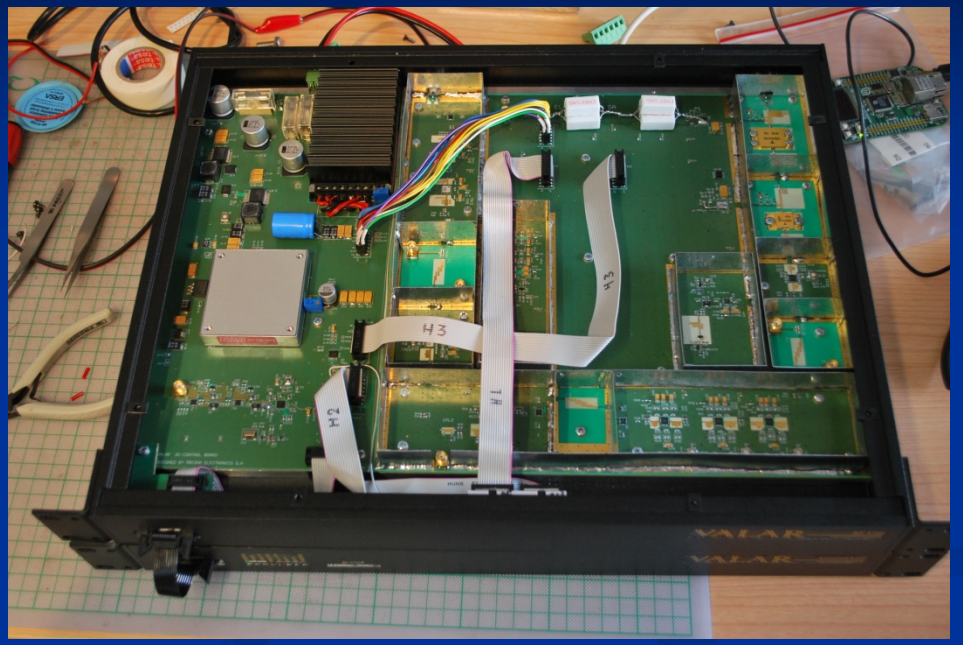
New transponder



- 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);

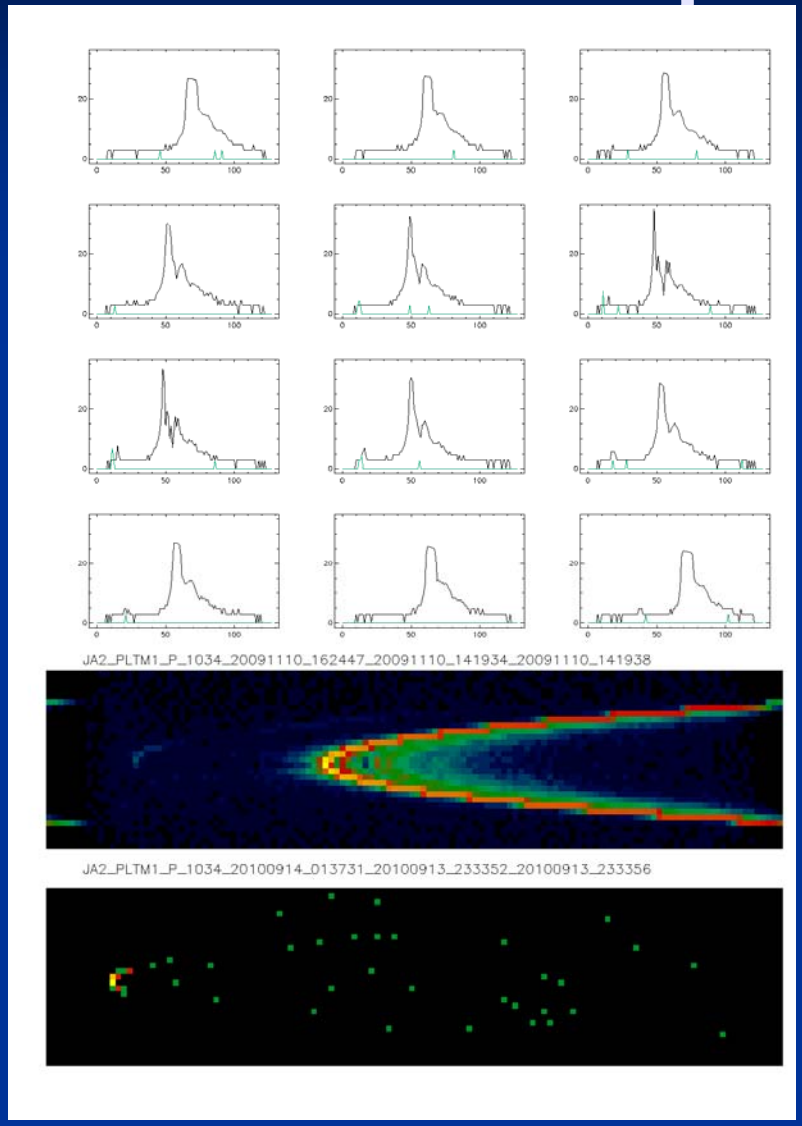
New transponder





- Constructed under the ESA specs and supervision;
- Ready be delivered in April 2011;
- Easily transferred to new locations in Crete;
- Add module for new satellites (AltiKa: 35.75 GHz, 500 MHz)

Transponder calibration



- Altimeter calibration with transponder after 1-Jan-2010 over pass No.18;
- Collaboration with CNES (France) to set the altimeter to calibration mode;

- Experiment Date: 2010/09/13 23:33:53, Pass No. 18;
- X-axis: Range window with 128 bins of time (bin= 3.125 ns);
- Y-axis: Power return;
- Bin No. 46 preset to closet approach to the distance between satellite-transponder;

Summary

- The absolute bias for the Jason-2 altimeter has been determined as
  - B= +173 ± 4 mm (Ascending Pass No.109, Cycle 2-79)
  - B= +171 ± 5 mm (Descending Pass No. 18, Cycle 2-79);
  - 20-Hz, in the Ku-Band;
- Tandem mission for Jason-1 &-2: difference 72 mm (cycles: 1-79)
- GPS buoys deployed as the satellite flies over. Processing on-going.
- Field sea-surface campaigns have been performed along satellite ground tracks to validate the used geoid models.
- Currently, analyzing transponder data collected as of July 2009.
- A new transponder is being developed to:
  - Calibrate satellite altimeters and determine bias, and;
  - Determine the orientation of the satellite interferometer baseline.