



JASON-2 Transponder Calibration

OSTST meeting – San Diego

October 2011

Jean-Damien DESJONQUERES & François BOY (CNES)



Gavdos Facility and AAS Transponder

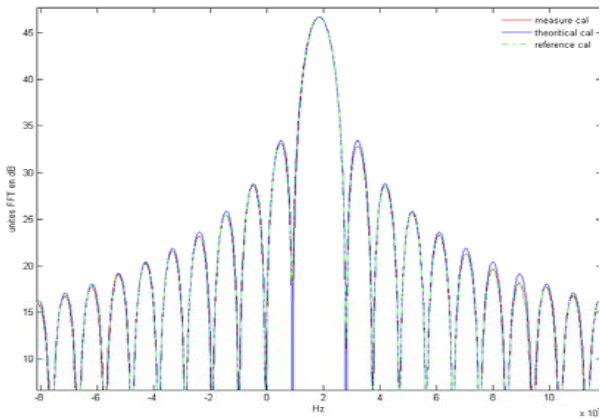
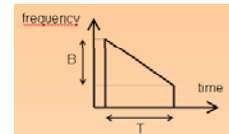
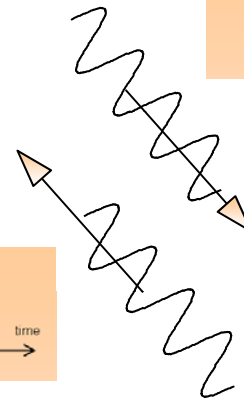
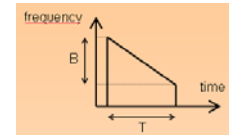
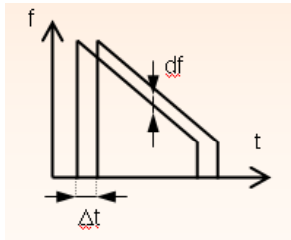


Gavdos (south of Crete, Greece)
Transponder installed for JASON-1 calibration

lat = 34°49'17.2953" / long = 24°05'27.6631"
h = 251.1687 m

Basic 1/2

Full-Deramp



1 Pulse Response

Transponder Calibration:
 equivalent to a « remote » PTR
 calibration
 For range and gain calibration

Calibrations Modes

A little problem: Poseidon altimeters have no mode for Transponder Calibration

-> JASON-1 : No Transponder Signal Acquisition in 5 years

For JASON-2

- 1. CAL2 mode after dedicated operations for configuration change**
 - ◆ Need to predict precisely the satellite altitude
 - ◆ Need of specific telecommands before and after over-flight
 - ◆ Signal averaging over 150ms with ultimate optimization (TM rate + memory)

- 2. Diode/DEM Mode**
 - ◆ DEM locally modified
 - ◆ Simplified operations -> easier and reduced unavailability
 - ◆ Signal averaging over 50ms -> improved accuracy

Bias Computation

$$\text{BIAS} = h\text{SAT} - h\text{TRP} - r\text{TRP} - \text{CorENV/INSTR}$$

Distance Satellite/Transponder : MOE (S-IGDR)

Environment: Last good Model Values over Ocean (S-IGDR) corrected for the altitude (Pistach)

TRP Position: last GPS measurement (by TUC TEAM)

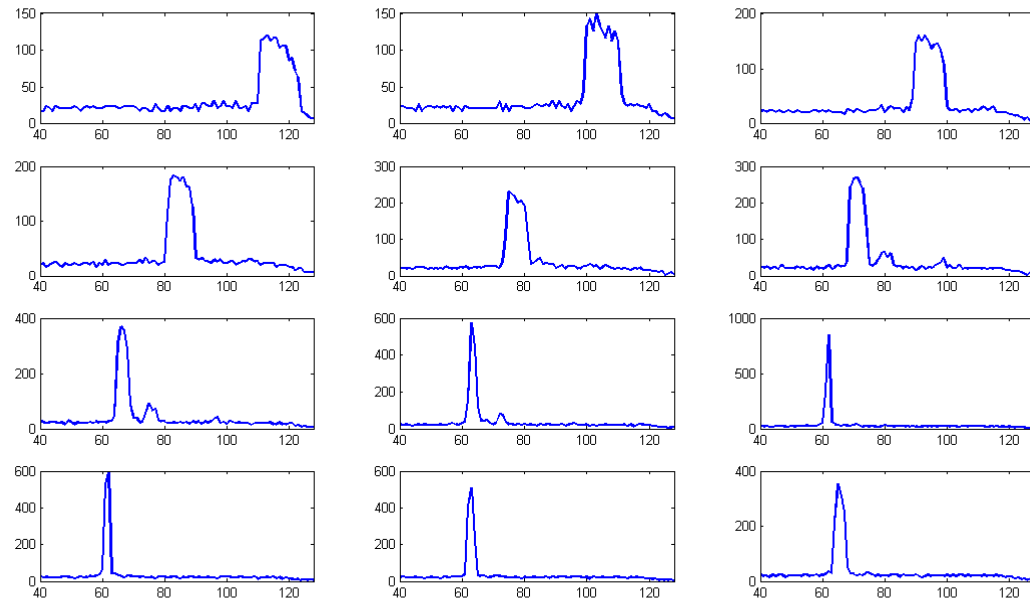
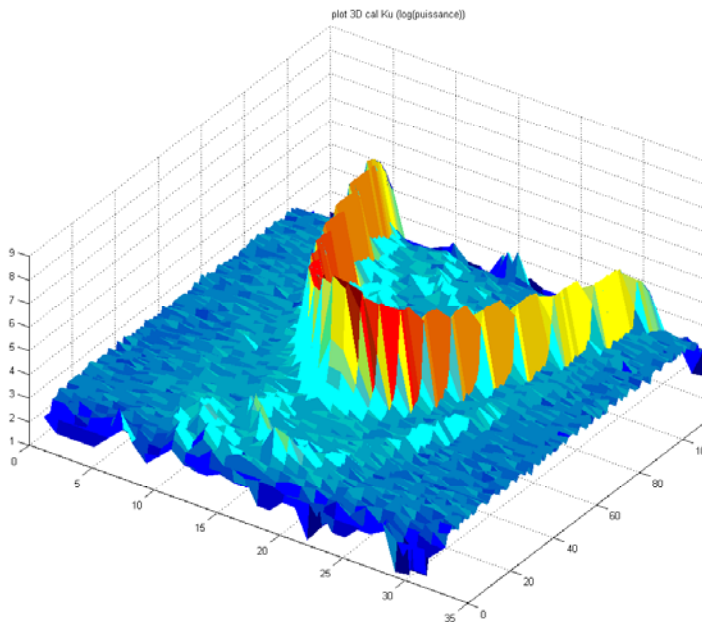
Altimeter Range : “Retracking Value” + instrumental corrections (RAW TM + altimeters characterization)

Transponder Signal Retracking

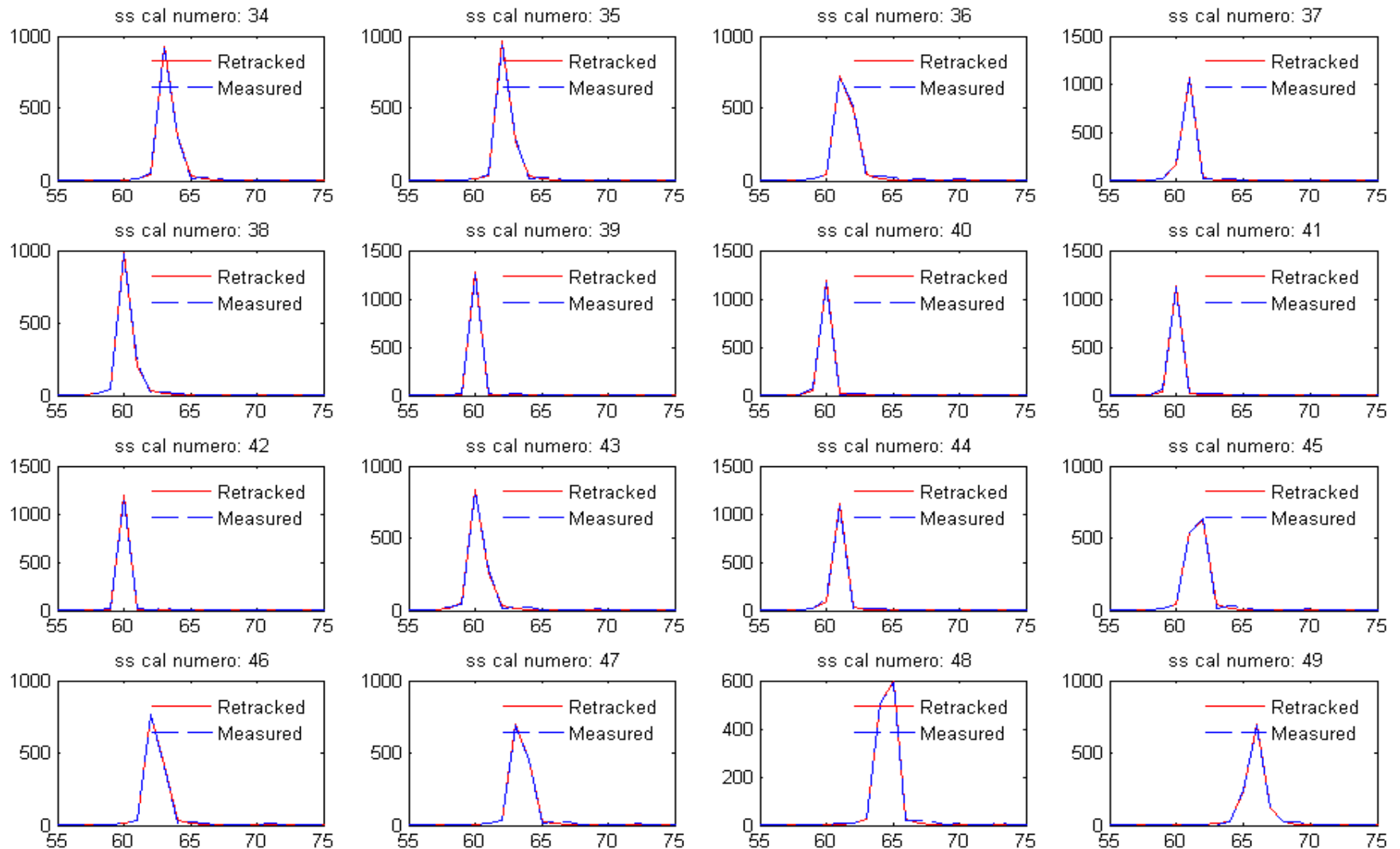
Classic Method: Fit of a Sinc Function

But: Echoes are NOT at all SINC Function (LRM echoes -> averaged)

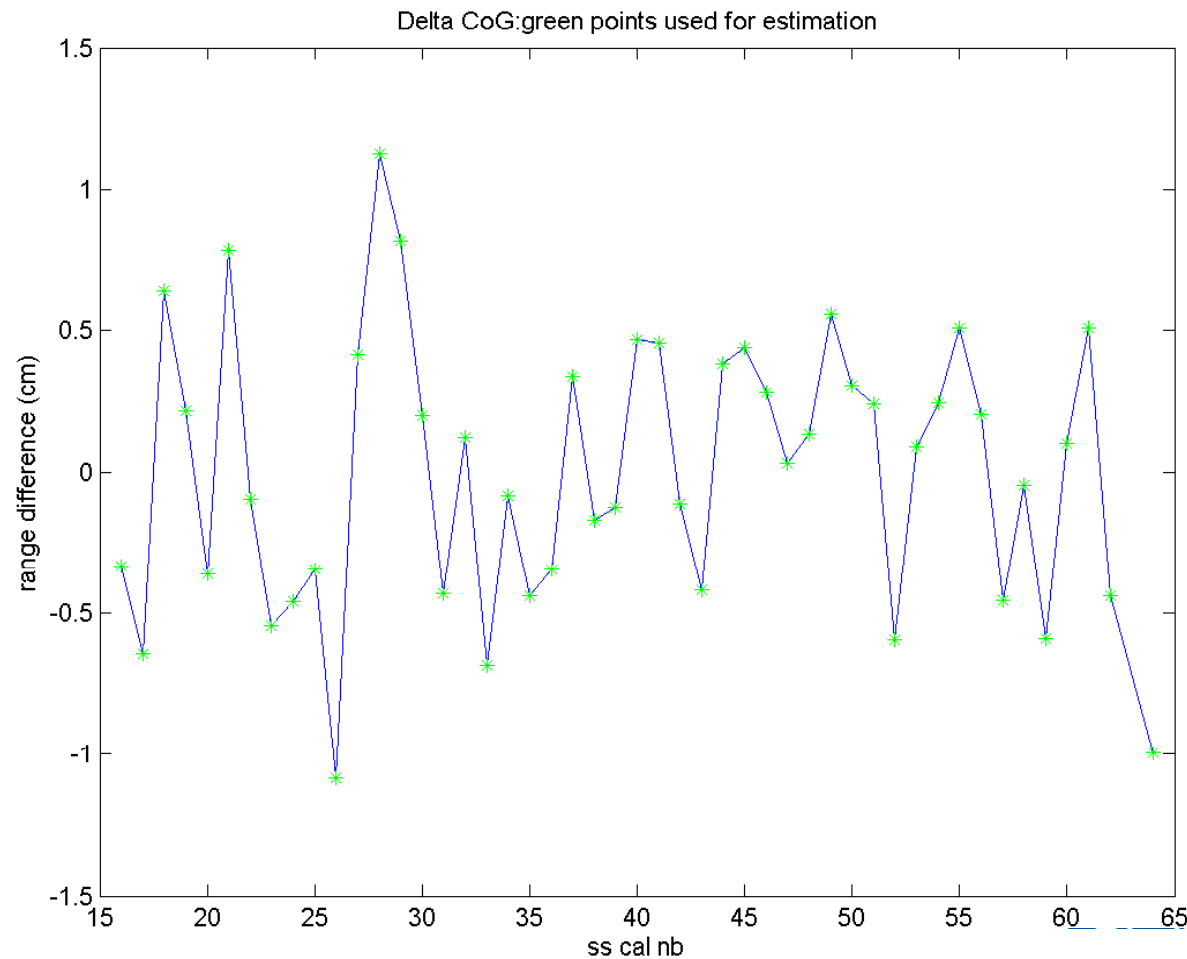
-> design of dedicated Tracking = numerical method



Transponder Signal Retracking Performance 1/2



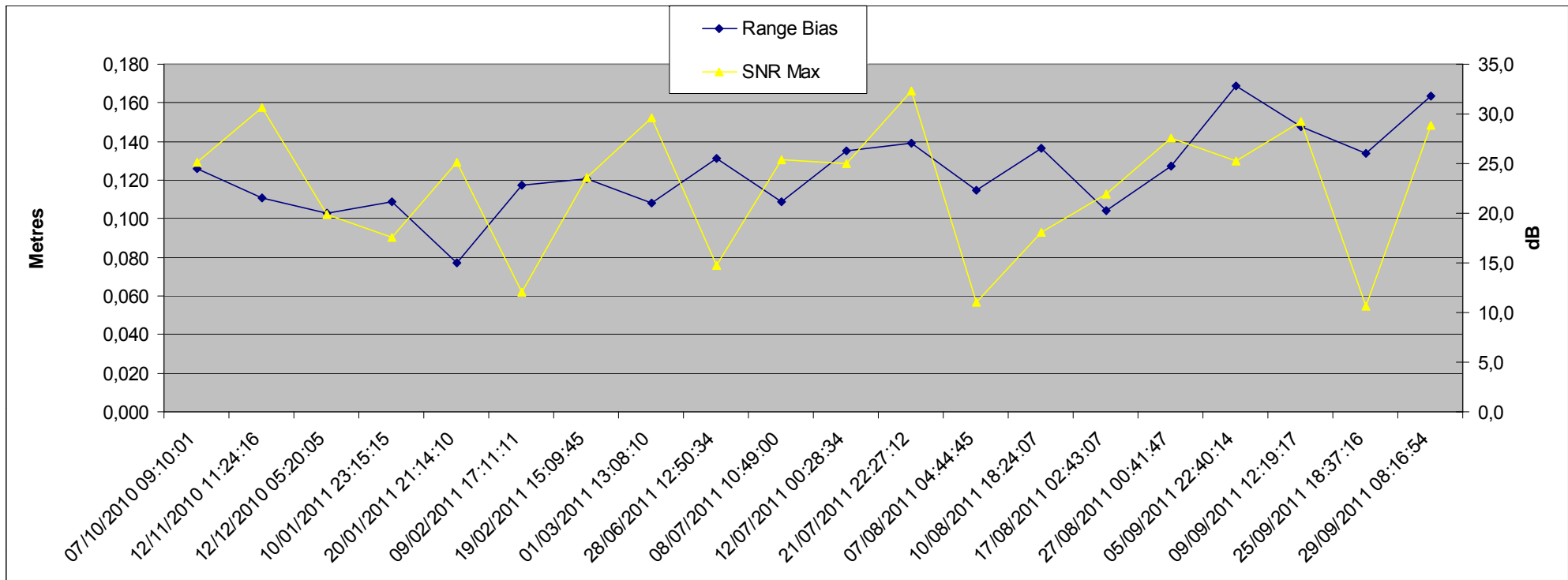
Transponder Signal Retracking Performance 2/2



Range Estimation Noise at 20Hz : **RMS ~5-10mm**
for 7-8cm in conventional altimetry



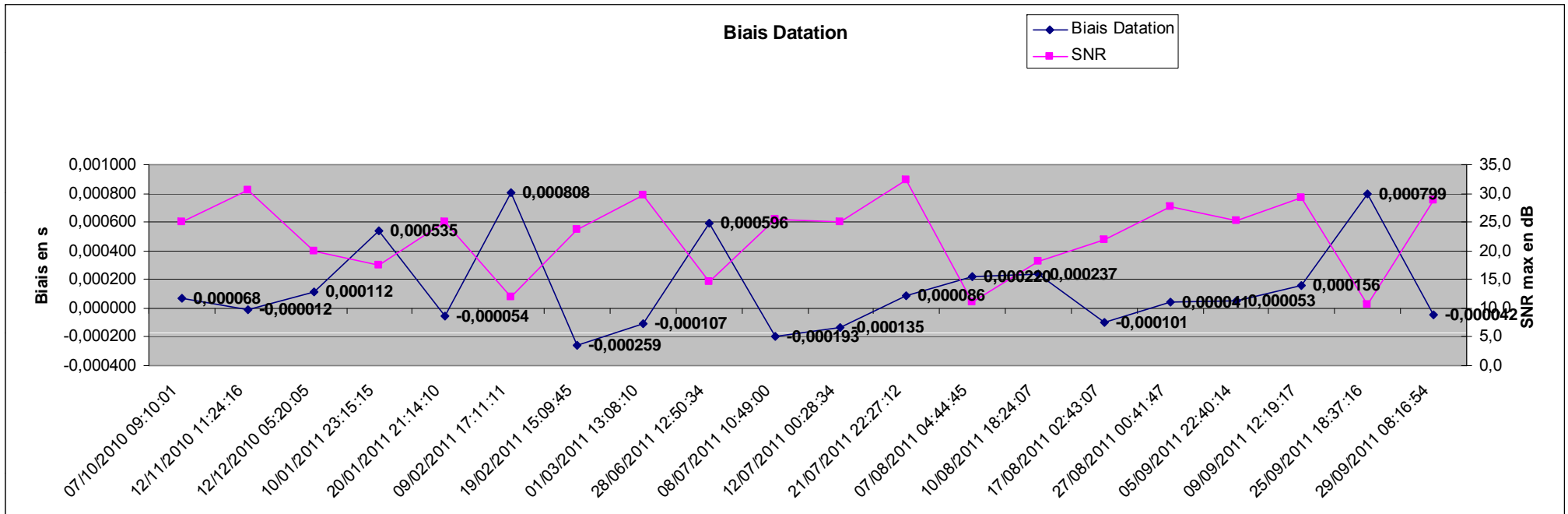
Range Bias Estimation



Noise: 0,020m



Datation Bias



Mean Datation Bias = 40µs
(without low SNR calibration)



Future Activities

- Reprocessing with POE orbite (better RMS)
- Use of Gavdos GPS measurements for environmental corrections
- Correction of range with satellite attitude
- Transponder calibration in CNES antennas measurement facility
(POS-3 bias is not 12 cm)

Conclusion

- **A very promising method for altimeters calibration**
 - ◆ ->RMS: 2cm with MOE orbit

- **A very good method to check the altimeter algo and processing**
 - ◆ **Stable and Independent from the surface characteristics**

- > **A dedicated transponder will be developed for AltiKa mission (range and gain calibration)**