POSEIDON3
In-Flight Results

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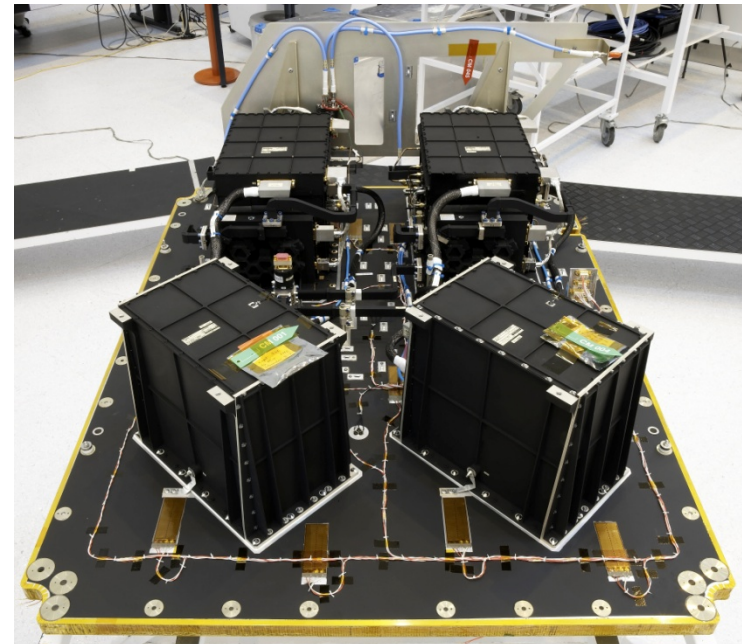# POSEIDON3 Description

Redundant and Bi frequency Altimeter for high reliability and ionosphere delay correction	
Altimeter Measurement Accuracy	<1.5cm (1s/ 2m SWH), Ku Range (ground tests)
Pulse Repetition Frequency	~2060Hz
Ku-Band	
Frequency	13575MHz
Bandwidth	320Mhz
C-Band	
Frequency	5300MHz
Bandwidth	320 MHz or 100MHz
Antenna	
Diameter	1200mm
Beamwidth (3dB)	1.28°

OSTM JASON-2

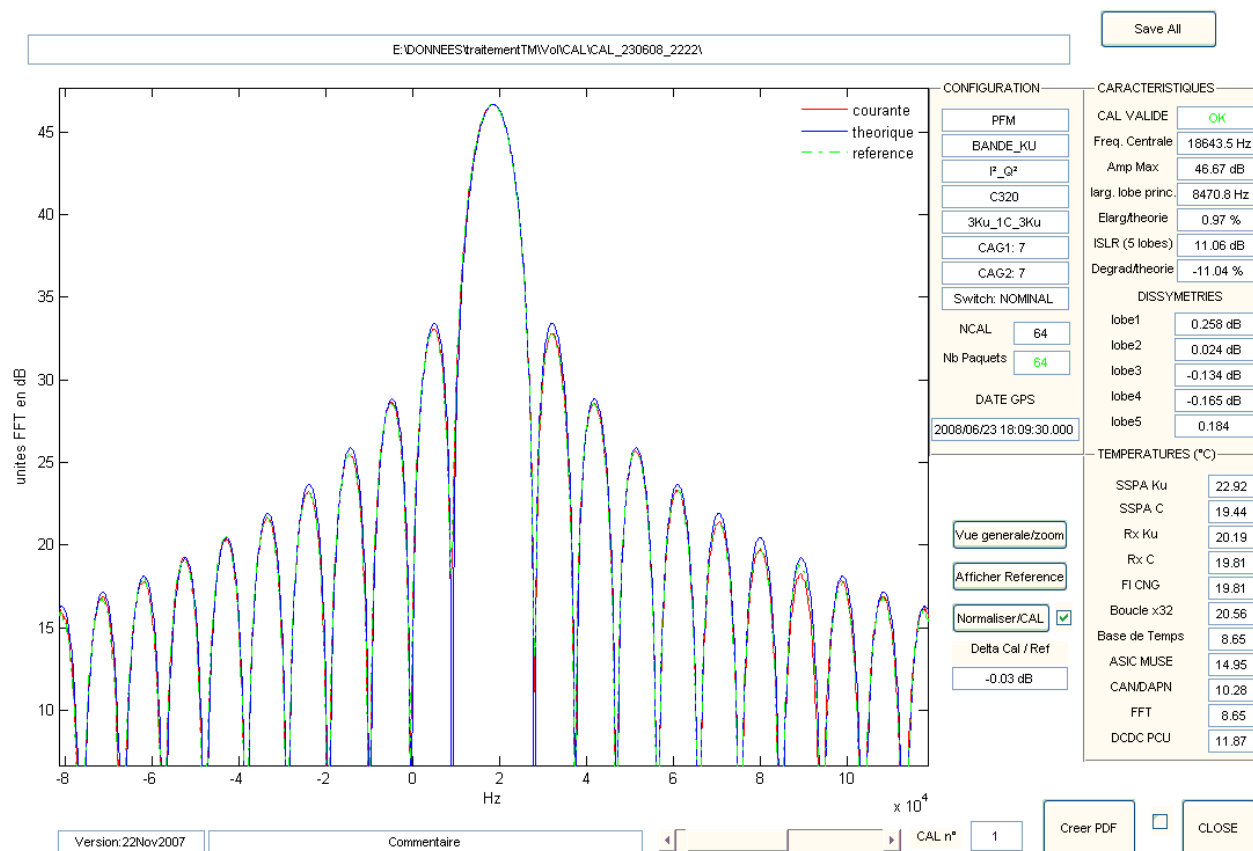# First In-Flight Echoes

22/06/2008 11:16:27
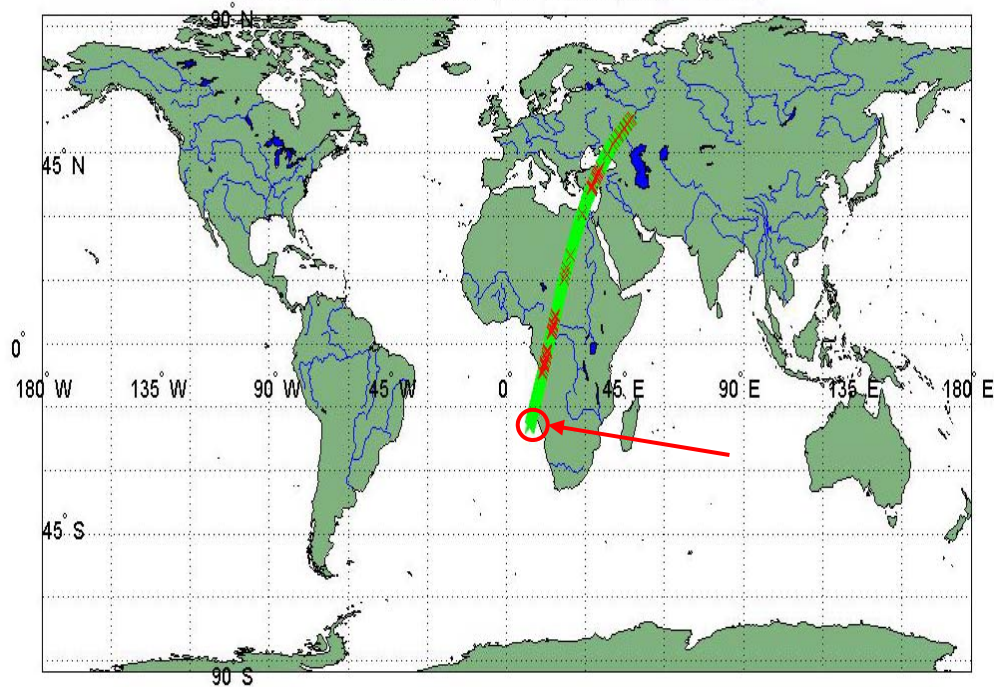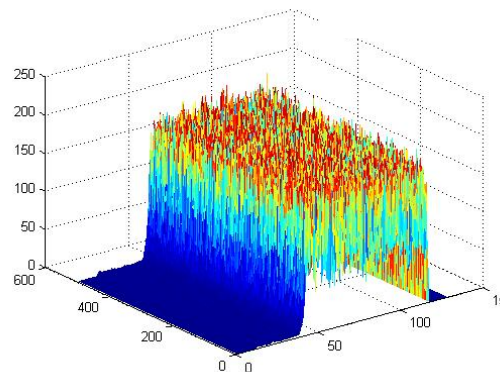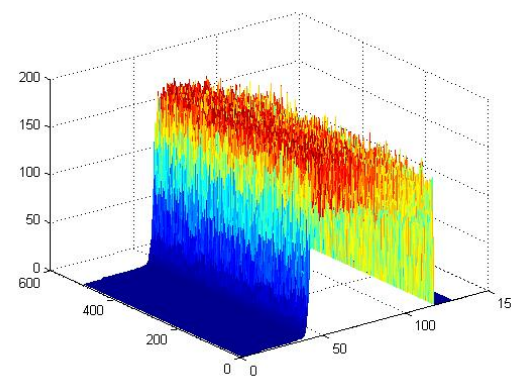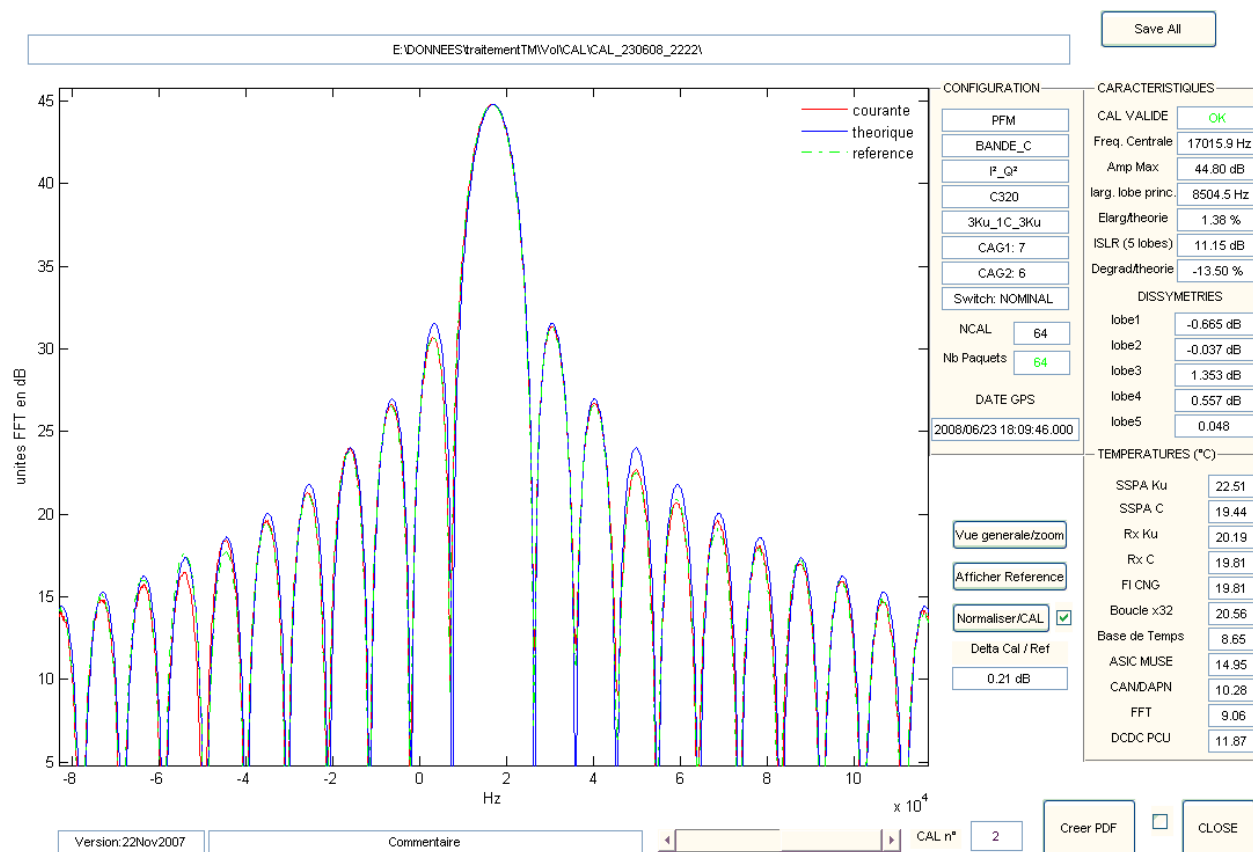

Ku Band

C Band

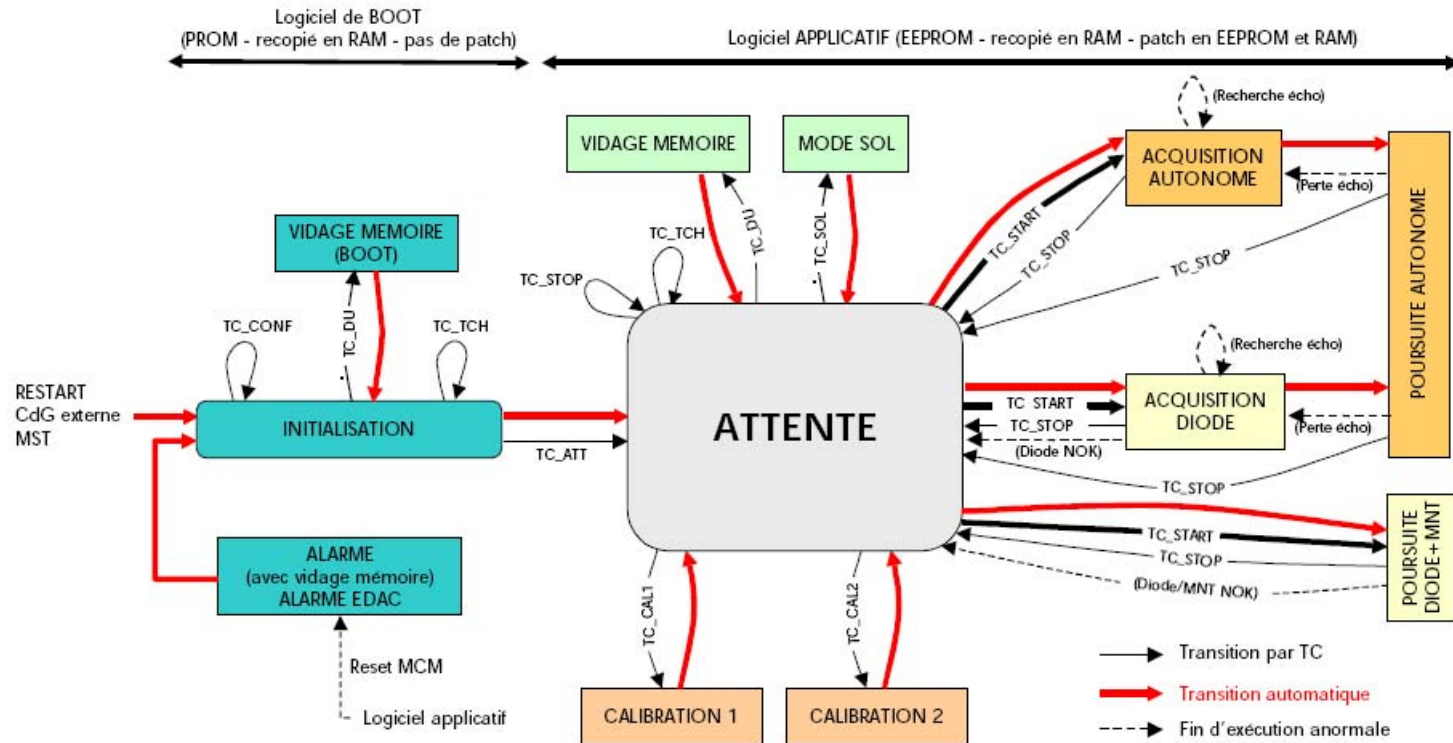# In-Flight Calibrations

Ku Band PTR

In-Flight Calibrations

C Band PTR

POSEIDON3 Modes

Autonomous Acquisition / Autonomous Tracking Mode

■ **Mode similar to Poséidon2**

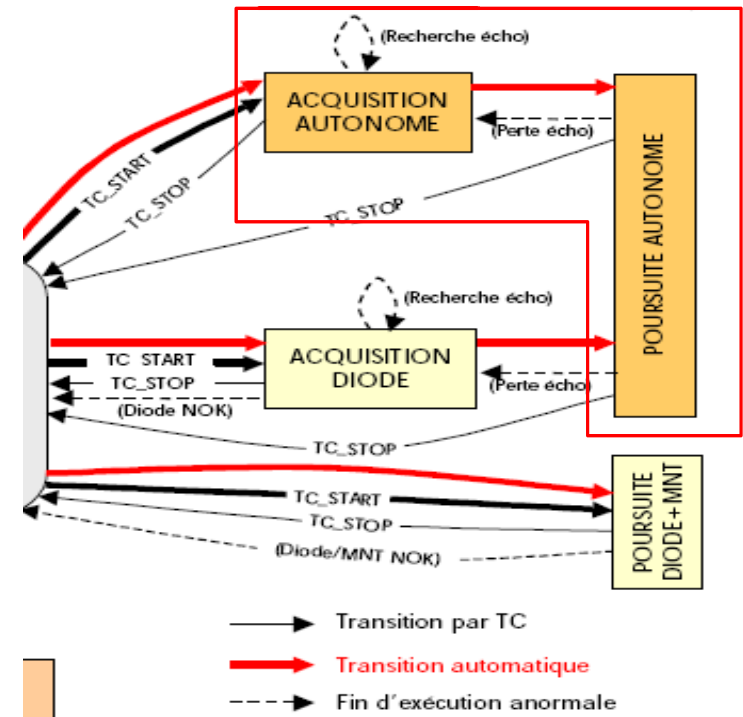■ **2 Selectable Tracking Algorithms**

♦ **Split Gate Tracker = POS2 algorithm**

- Good Results over oceans for Brown Echoes
- Sensitive to Land Backscatter (Loss of Tracking)

♦ **MEDIAN Algorithm: new algorithm**
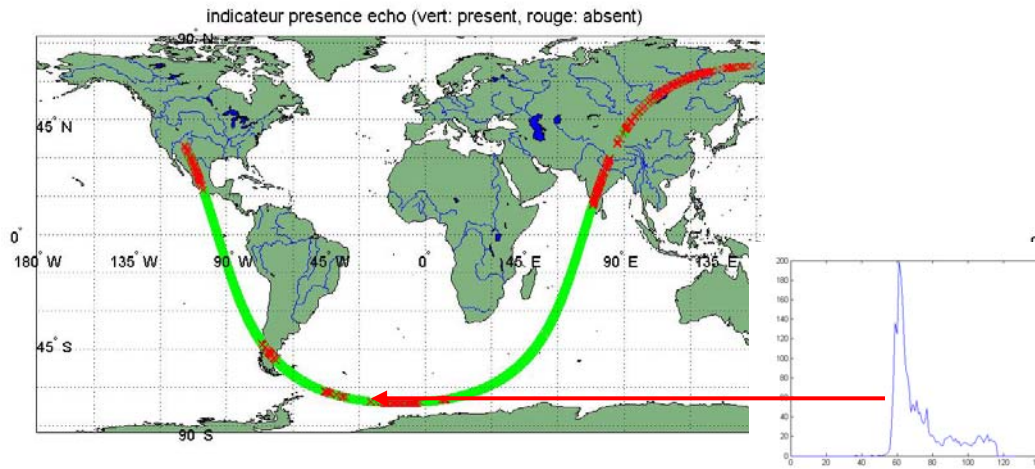
- Good Results over oceans for Brown and non Brown Echoes (ice…)
- Better Immunity to Land Backscatter (good results over Coastal Zones)
- Capability over Land Surfaces

Tracking Algorithms Performances Illustration

Autonomous Mode

SGT
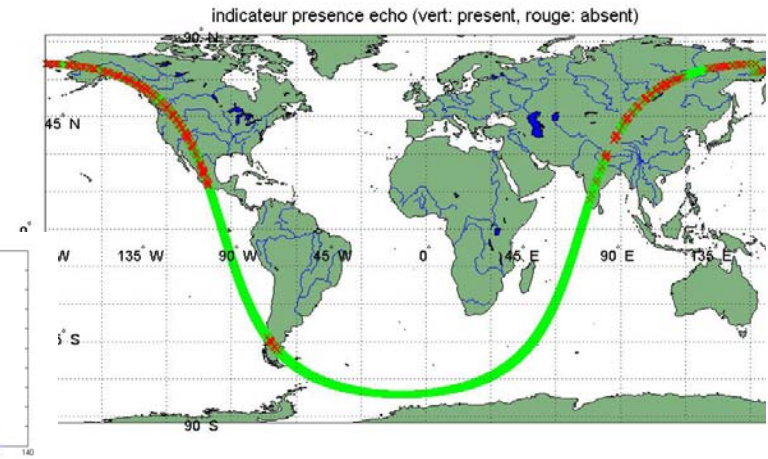
Data Availability Comparison

Autonomous Mode

Median

-> The Median Algorithm gives better results -> default algorithm for JASON2

Tracking Algorithms Performances Illustration

■ JASON2
Median Tracker

■ JASON1
SGT Tracker

data availability over ocean (CLS)

data availability over land (CLS)
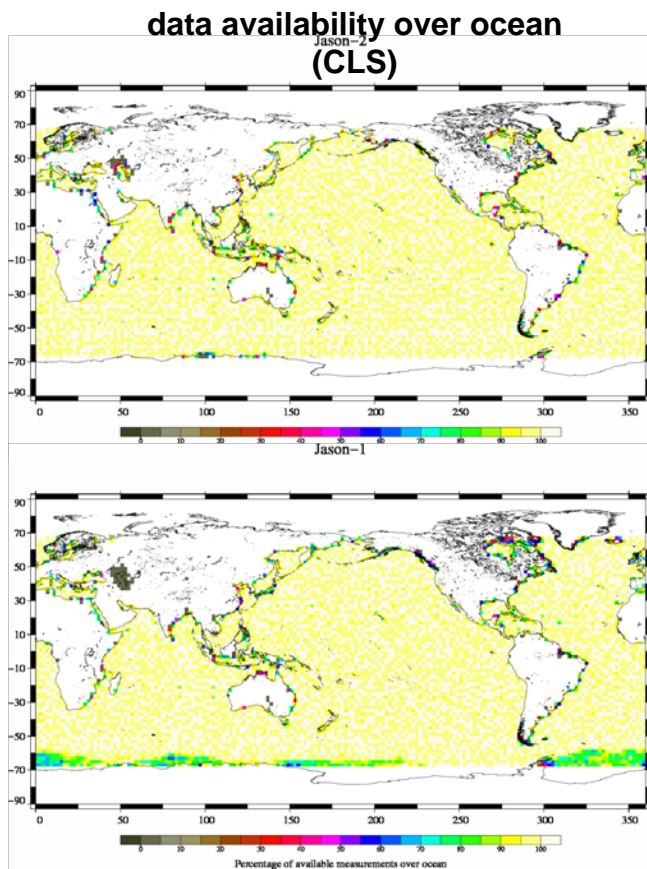
-> The Median Algorithm gives better results
-> Default algorithm for JASON2

New Modes

■ **Goal: to acquire mode data over Coastal Zones and Inland Waters**

■ **2 new modes**

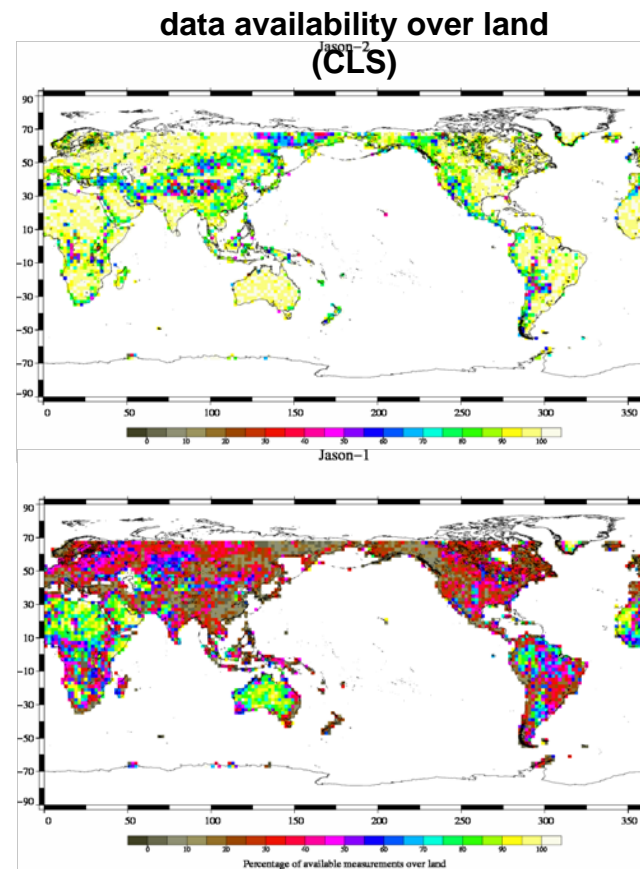 ◆ **Diode Acquisition Mode: to reduce the acquisition time using the satellite altitude information provided by Diode**

  ◆ **Diode/ MNT coupling Mode: Open Loop Mode using the satellite position information provided by Diode and the surface altitude provided by a pseudo DEM stored in POS3**

Diode Acquisition Mode
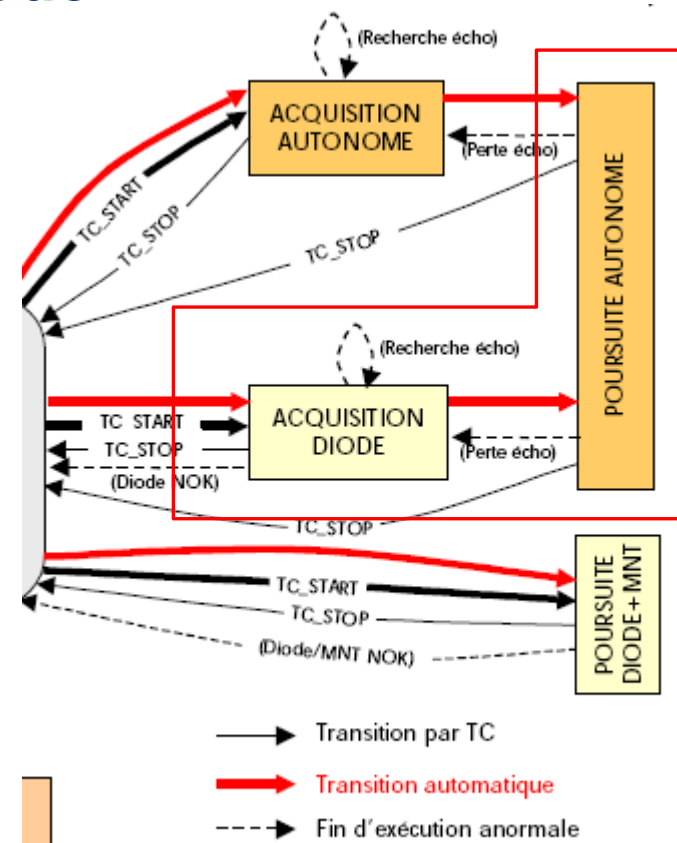
■ **Quiet similar to the autonomous mode**

 ◆ **The Tracking is the same with selectable Tracking Algorithm**

 ◆ **The Acquisition is faster**

  • Satellite Altitude Information -> reduce the search altitude range

  • Limiting the range from 30km to 5km -> 1s gain -> 6km of extra surfaces measured

■ **This mode is particularly useful to get elevation data over small water area and for land/ocean transitions**

■ **This mode is the current POS3 mode (with Median Algorithm)**

(Recherche écho)

ACQUISITION AUTONOME

(Perte écho)

POURSUITE AUTONOME

TC_START
TC_STOP
TC_STOP

(Recherche écho)

TC START
TC_STOP
(Diode NOK)

ACQUISITION DIODE

(Perte écho)

TC_STOP

TC_START
TC_STOP
(Diode/MNT NOK)

POURSUITE DIODE+MNT

→ Transition par TC

→ Transition automatique

--→ Fin d'exécution anormale

OSTM JASON-2

Diode/MNT coupling Mode

- **This mode is the much more innovative mode.**
- **There is no more acquisition phase**
- **The tracking loop is an open loop using a pseudo Digital Elevation Model**

 - **->NOT SENSITIVE TO THE ECHO SHAPE AND LAND BACKSCATTER CONTAMINATION**
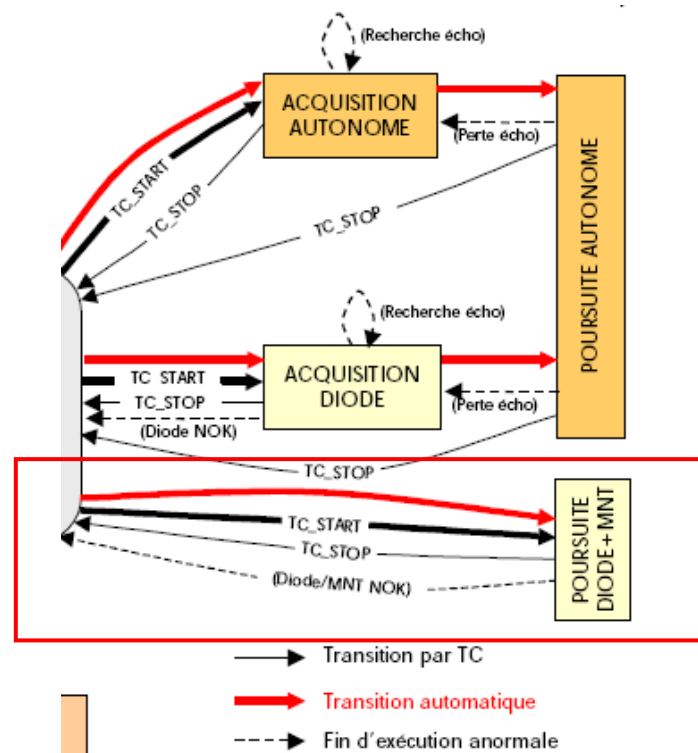
Diode/MNT coupling Mode

Diode provides the position of the satellite on the orbit

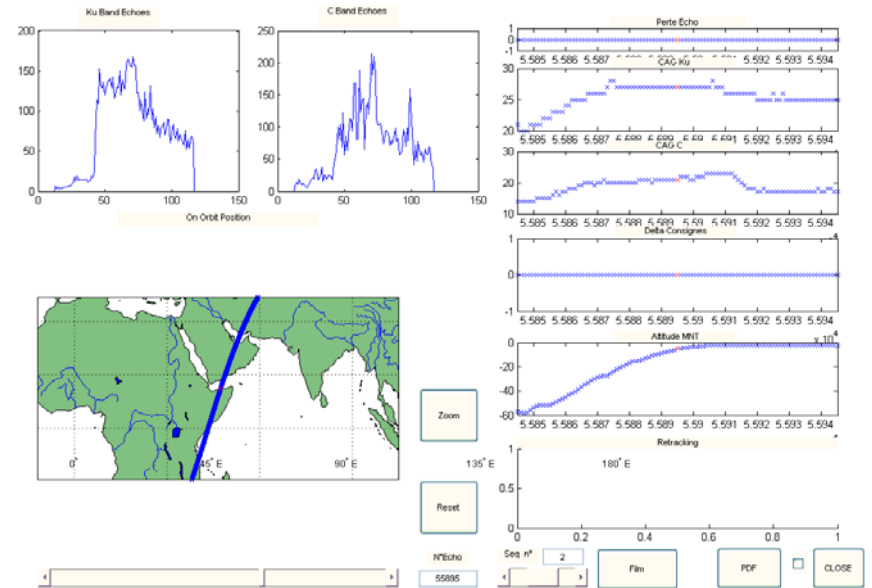The sea surface height is given by the pseudo DEM (DEM=MNT) stored in POS3
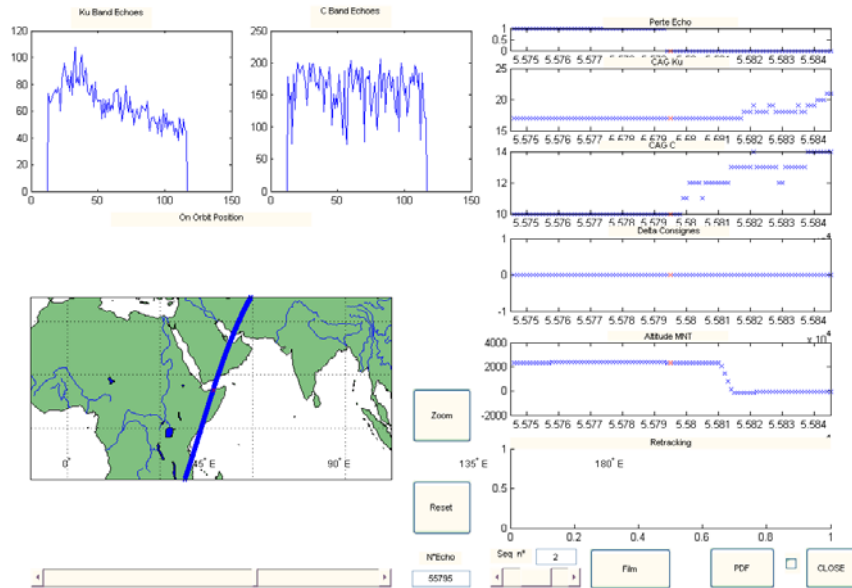
This pseudo DEM is not a model of the surface height but a model of the surface height "as seen by the altimeter"

It includes the ionospheric and tropospheric delays.

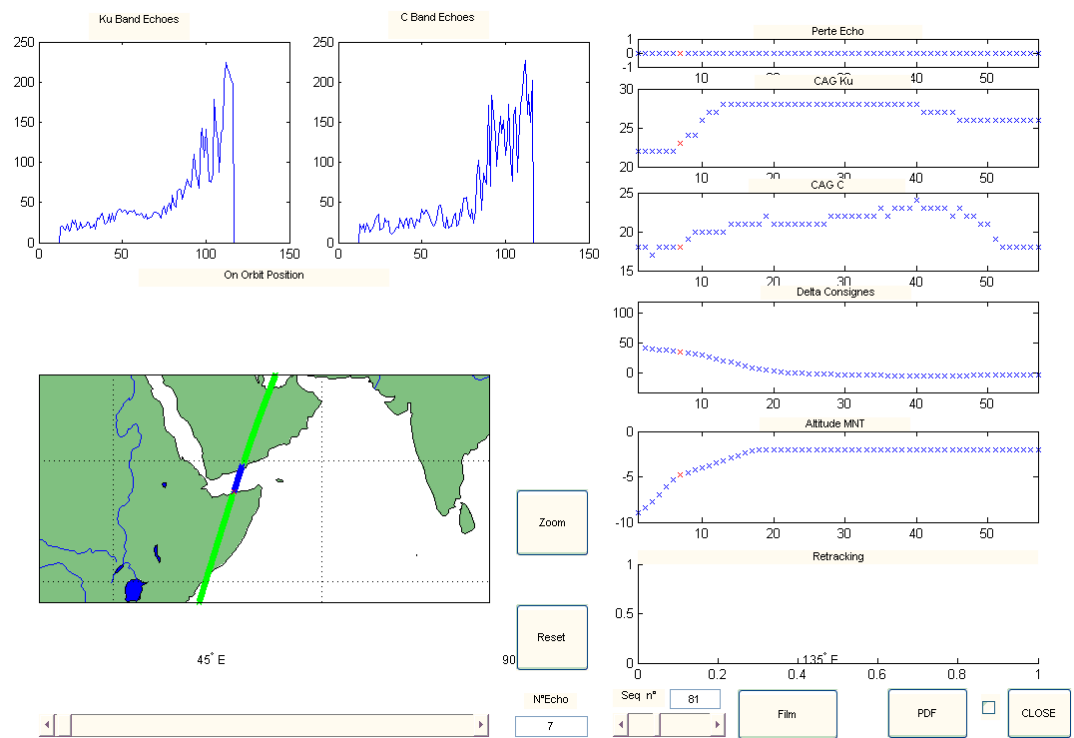The DEM is optimized to track water.
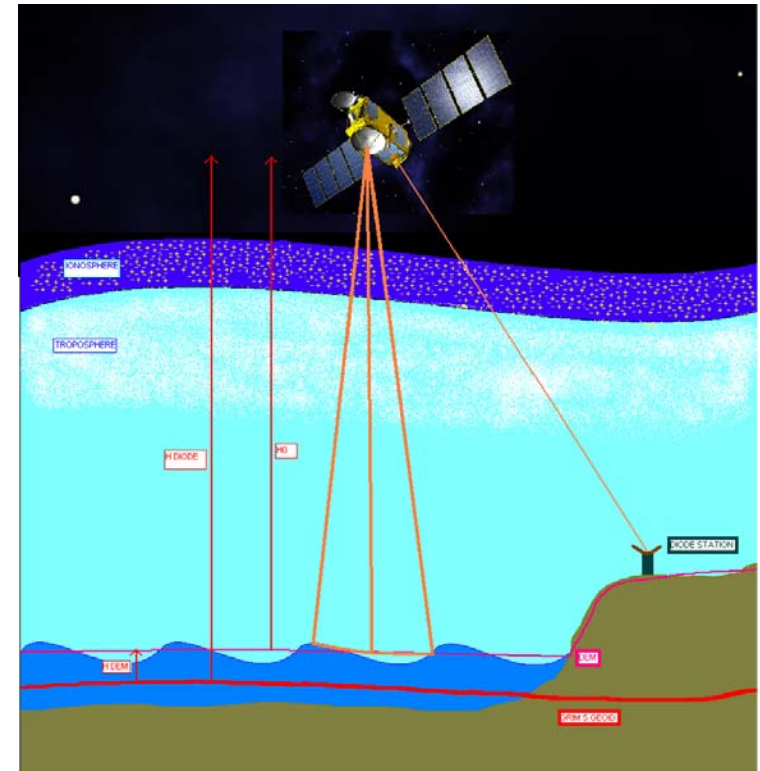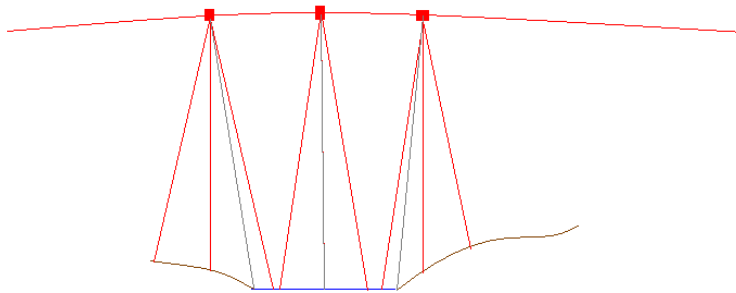
Diode/MNT coupling Mode

Example on Coastal Area Diode/MNT

Diode/MNT coupling Mode

Example on Coastal Area Median

Diode/MNT coupling Mode

In-Flight Results

Oceans: **Good performances. No impacts on the products wrt autonomous mode (Median)
->Compliant with system objective**

Coastal Zones : **Good Performances. Better than median tracker**

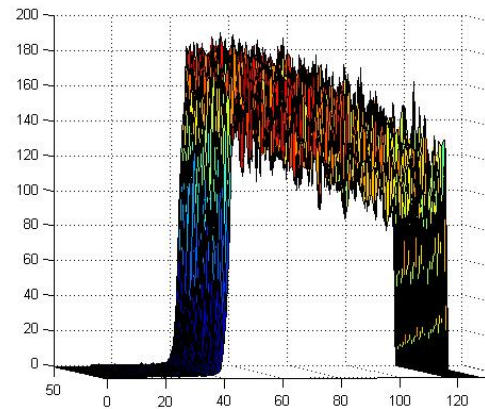**Inland Water Areas: Mitigated Results**
The range command is correct when the area is in the BD LEGOS (Hydroweb DataBase)

The DEM is still in investigation and it would be uploaded taking advantage of JASON2 measurements
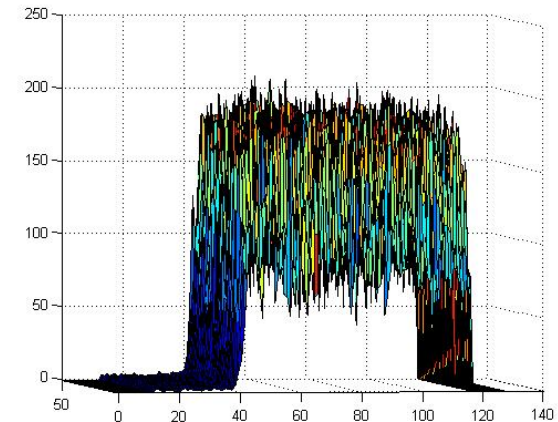**(use of POS3 Data with Median Tracker to complete the BD LEGOS over Inland Waters)**

Automatic Gain Loop

■ **The level of the echoes is stable and in the specified range**

Ku Band Echoes

C Band Echoes

■ **The AGC Loop is very similar to the POS2 AGC Loop with a few differences for new modes**

Automatic Gain Loop

■ **Autonomous Tracking**

◆ **SGT Algorithm: POS3 AGC = POS2 AGC**

◆ **Median Algorithm: Correction of the quantification error**

-> makes the AGC command more stable

Diode/MNT

◆ **Correction of the quantification error**

◆ **Special C Band Coefficient**

-> makes the AGC command more stable in C Band

◆ **Protections (Anti-Glare)**

->No impact on Data

Low Signal Tracking Anomaly

■ **Observation**

   ◆ **Tracking of low signal echoes with « Brown like » but « distorted » shape.**

   ◆ **Range too Short (~-50m of fixed offset)**

   ◆ **Data Loss <1% for ocean measurements**

   ◆ **Pb would appeared over hydrological areas but more difficult to detect**

Ku Band Echo (anomaly)

C Band Echo (anomaly)
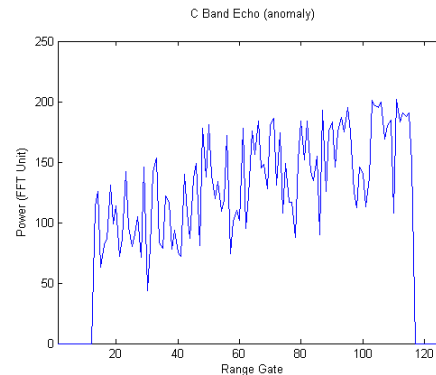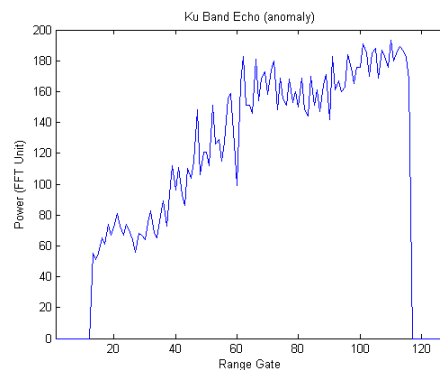
Low Signal Tracking Anomaly

■ **Analysis**

  ◆ **Detection Threshold to Sensitive, Makes Possible the Acquisition on Attenuated Replica of the Echo**

■ **->Simulations have been performed to confirm the problem and select a new parameters set for Detection Threshold**

■ **->Correction would be uploaded soon**

Conclusion

- Poseidon3 Range Accuracy is very good (=POS2, very close from Theory)

- The stability is excellent (Internal Calibrations)

- New modes provide better capacity over non oceanic zones and more measurement over coastal zones

    -> Global behavior consistent with Pos2 on Jason1 with better data availability (CALVAL)