Jason-2 instrumental and processing status

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Seattle, USA
June 2009
Introduction

In Nice OSTST, very good results about Jason-2 performances were presented by various speakers. Since then, we have got confirmation of these very good results.

However, some studies were decided to investigate (and close) some specific points:

- J2 colored spectra and impact of Wfs compression
- Mispointing and antenna beamwidth
- Retracking diagram for C band
- Skewness coefficient
- Rain flag
- Impact of filter variability on altimetric parameters
Conclusion:

- No impact of WF compression on noise coloration
- Noise coloration was due to an editing problem in our processing chains
Mispointing angle

The Jason-2 pointing angle is slightly biased $\Rightarrow +0.1$ deg

The antenna beamwidth value (which was determined on ground) can be adjusted to reduce this bias (verifications have been done with platform pointing values during cross-manoeuvres).

$\theta_0 = 1.30$ deg
$\theta_0 = 1.28$ deg
$\theta_0 = 1.26$ deg

Median values: $-0.068$ deg for $\theta_0 = 1.30^\circ$
$+0.068$ deg for $\theta_0 = 1.28^\circ$
$+0.115$ deg pour $\theta_0 = 1.26^\circ$

$\Rightarrow$ Conclusion: $\theta_0 = 1.28^\circ$ recommended
J1/J2 Waveforms Retracking diagram

- same retracking diagram for Jason1 and Jason2
- same LUT correction principle

BUT
- what was correct (and necessary) for J1, has to be modified for J2 because J2 is well pointed

MLE-4 retracking solving for range, SWH, $\sigma_0$ and $\xi^2$ angle at 20 Hz

LUT correction (1Hz) on
  - Range
  - SWH
  - Sigma0

Corrected range, SWH, $\sigma_0$, $\xi^2$

MLE-3 retracking solving for range, SWH and $\sigma_0$ at 20Hz

LUT correction (1Hz) on
  - Range
  - SWH
  - Sigma0

Corrected range, SWH, $\sigma_0$
Jason-2 waveform retracking in C band

**Sig0 Spectrum**

Sig0 20 Hz in C–Band – Cycle 19 Jason–2

![Graph showing Sig0 Spectrum data]

**C–Band SLA Spectrum**

Orbit–Range–MSS 20 Hz – Cycle 19 Jason–2

![Graph showing C–Band SLA Spectrum data]

→ **Conclusion**: no $\xi^2_{Ku}$ injection recommended
Determination of the skewness coefficient

Jason-1 Skewness
(SGT Tracker,
MLE4 on 1Hz avg WFs)

\[ \lambda_s = -0.1 \]

Jason-2 Skewness
(Median Tracker,
MLE4 x2 + MLE4 ls
on 20Hz WFs)

\[ \lambda_s = -0.08 \]

Conclusion: the same skewness value can be used for Jason-1 and Jason-2
### Jason-2 rain flag

- On Jason-1, the rain flag is unsatisfactory because it has been done from instrumental Ku/C AGC relationship and not from geophysical signals ($\sigma_0$ Ku and C).

- Moreover, Jason-2 AGCs vary from Jason-1 AGCs $\Rightarrow$ rain flag no more valid.

- The Ku/C $\sigma_0$ relationship cannot be used as for J1 GDR A (MLE3).

- Graham Quartly tried to fit a new flag with empirical corrections (poster presented during the last OSTST).

- We performed:
  
  - a MLE3 on Ku band WFs to estimate $\sigma_0$ (not possible on Jason-1 because of deteriorated platform pointing).
  
  - a MLE3 on C band WFs without injection of Ku mispointing angle (evolution wrt Jason-2 ground segment).
Lower dispersion for MLE3 than for MLE4

G. Quartly

OSTST Meeting - Seattle - USA - June 2009 - P. Thibaut et al, CLS
Jason-2 Sigma0 (N.tran, J.Tournadre)

→ Comparison (for different missions) of the $\sigma_0$ (Ku-C) differences

→ Comparison (for different missions) of the $\sigma_0$ (Ku-C) rms relationship

Sigma0 C (dB)

J2 / J1 GDRa / TP

J2 MLE3 very homogeneous with J1 MLE3

Sigma0 C (dB)

J2 / J1 GDRa / TP
Conclusions:

We recommend:

• to perform an MLE3 on Ku band and a MLE3 on C band (without any injection)

• to compute the corrected values of Ku and C $\sigma_0$ (one year of data needed)

• to compute a new rain flag based on the Ku/C sigma0 MLE3 relationship

• to update new coefficients for the wind speed algorithm (we recall that on Jason-2, it was fitted on Jason-1 MLE3 values $\Rightarrow$ Collard algorithm)

• to update a SSB solution accounting for the updated wind speed
**Instrumental monitoring**

- Very good coherence between on-ground and in-orbit Poseidon-3 PTR and Filters

![Graph showing coherence between on-ground and in-orbit data](image)

- Very good stability of Poseidon-3 PTR and Filters

![Graph showing stability of Poseidon-3 PTR and Filters](image)

**Conclusion:** negligible impact on LUT

- Internal path delay
  - Slope $< -0.02$ mm/cycle

![Graph showing internal path delay](image)

- Cycle 1 vs Cycle 30

![Graph comparing Cycle 1 and Cycle 30](image)
Impact of the J2 filters variability (1 LTM filter per day – 10 days)

- **Range variability** = 2 mm

- **SWH variability** = 1.5 cm

- **Sig0 variability** < 3 E-2 dB

**Conclusion** : correction by a stable filter would improve the precision of the estimations
Update of the Flight Software: position of the WFs in the analysis window ➔ OK
Conclusions

- Jason-2 in very good agreement with Jason-1
- Very good instrumental stability of Poseidon-3

- Some improvements recommended
  - Antenna beamwidth
  - C band processing
  - LUT and Skewness are OK
  - Rain Flag with MLE3 + Wind_Speed + SSB
  - Filter correction could be improved
Thank you!
Differences between Jason-1 and Jason-2 waveforms

- Due to telemetry rate, Jason-1 waveforms are compressed

Ku band waveforms

Jason-1

C band waveforms

Jason-2

- SGT tracker on Jason-1 = echos are centred on gate 44
- Median and DIODE/DEM on Jason-2 = Lateral motion of the echos in the window
  - for median: depends on the waveheight (as for Envisat)
  - for DIODE: depends on the local value of the DEM
  - AGC tracking loop: small differences in C band loop coefs

Differences between median and DDEM trackers

Bias=0.6m
Std=1.3m