Global Statistical Jason-2 assessment and cross-calibration with Jason-1
Parameter Analysis

S.Philipps, M. Ablain, P. Thibaut, N.Picot
Introduction

- General
  - OSTM/Jason-2 successfully launched on 20th of June 2008
  - In tandem configuration with Jason-1 (55 seconds apart) since 4th of July 2008

- Objective:
  - Assess Jason-2 data quality

- Method:
  - Analysis of missing and edited measurements
  - Parameter analysis using cross-calibration of Jason-2 with Jason-1

- Used Data:
  - 1 Hz Igdr Jason-2 and Jason-1 data
  - From 4th of July to 19th of October 2008: Jason-2 cycles 0 to 10 (Jason-1 cycles 239 to 249)
Missing and edited data

- **Missing measurements**
  - Only few missing measurements over ocean, mostly due to:
    - Acquisition station problems
    - Ground processing anomalies
  - Over coastal and hydrological zones, Jason-2 better than Jason-1, thanks to new tracker algorithms

Parameter Analysis:
- Sigma0
- Number and Rms of 20 Hz range measurements
- SWH
- Mispointing
- Altimeter ionospheric correction
- Wet tropospheric correction

Conclusion
Missing and edited data

• Edited measurements
  – Over open ocean: same editing criteria used for Jason-1 and Jason-2
  – Percentage of edited measurements similar for both satellites (approx. 16% of edited measurements over ocean)
  – In Median mode, small portions might be edited due to AGC, mispointing, SWH out of threshold
Parameter Analysis

- Monitoring of altimetric parameters is very important to verify stability of measurements

- **Tools:**
  - Maps of Jason-1 – Jason-2 differences to observe possible geographically correlated bias
  - Daily monitoring of global Jason-1 – Jason-2 differences to observe possible drifts or jumps

- **Analyzed parameters:**
  - Backscattering coefficient
  - Number and Rms of 20 Hz range measurements
  - Significant wave height
  - Mispointing from waveforms
  - Altimeter ionospheric correction
  - Radiometer wet troposphere correction
Backscattering coefficient

- Jason-2 backscattering coefficient shows good agreement with Jason-1

Map of JA1 – JA2 Sigma0 difference (Ku-band), cycles 0 to 10 [dB]

Mean: 0.09 dB
Backscattering coefficient

- Jason-2 backscattering coefficient shows good agreement with Jason-1
- Global bias of 0.1 dB in Ku-band and 0.2 dB in C-band
- Bias between T/P and JA1 was 2.4 dB
Number and Rms of 20 Hz range

- JA1-JA2 difference of number of 20 Hz range measurements is stable
- RMS of 20 Hz range measurements equivalent for both satellites

Conclusion

- JA1-JA2 difference of number of 20 Hz range measurements is stable
- RMS of 20 Hz range measurements equivalent for both satellites
Number and Rms of 20 Hz range

- MQE (Mean Quadratic Error between measured waveform and best fitted Brown model) not yet used during 20 Hz to 1 Hz compression

- Number of elementary valid 20 Hz measurements (per second) higher for JA2 than for JA1 especially visible for high MQE
Significant Wave Height

- Good agreement between JA2 and JA1
- Weak regional differences

Map of JA1 – JA2 SWH difference (Ku-band), cycles 0 to 10 [cm]

Mean: -1.0 cm
Significant Wave Height

- Daily monitoring: no drift between JA2 and JA1, neither in Ku- nor in C-band
- Global bias between T/P and Jason-1 was 8.9 cm

<table>
<thead>
<tr>
<th></th>
<th>Ku-band</th>
<th>C-band</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean (JA1-JA2)</td>
<td>-1.0 cm</td>
<td>-0.2 cm</td>
</tr>
<tr>
<td>Std (JA1-JA2)</td>
<td>17.5 cm</td>
<td>43.6 cm</td>
</tr>
</tbody>
</table>

Mean Ku (J1-J2) = -1.058
Mean C (J1-J2) = -0.2024
Std Ku (J1-J2) = 17.49
Std C (J1-J2) = 43.6
Mispointing from waveforms

- Daily monitoring of JA2 mispointing from waveforms much more stable than JA1
- JA1: reduced star tracker availability → poorer pointing
- JA2: no real mispointing, but mean of 0.012 deg2
Dual-frequency Ionospheric Correction

- Good agreement between JA2 and JA1
- Weak regional differences (linked to MQE)

Map of JA1 – JA2 Dual-frequency Ionosphere difference, cycles 0 to 10 [cm]

Mean: -0.87 cm
Dual-frequency Ionospheric Correction

- Good agreement between JA2 and JA1
- Daily monitoring: no drift between JA2 and JA1
- Global bias: -0.87 cm with small (2mm) day to day variations

![Graph showing mean and standard deviation over time]
Wet tropospheric correction

- Daily monitoring: JA1 – JA2 radiometer wet troposphere correction not stable

Signals up to 7 mm amplitude
Wet tropospheric correction

- Daily monitoring: JA1 – JA2 radiometer wet troposphere correction not stable
- Comparison with ECMWF model reveals strange behavior of JMR, since JA1 safehold

Introduction
- Missing and edited data

Parameter Analysis:
- Sigma0
- Number and Rms of 20 Hz range measurements
- SWH
- Mispointing
- Altimeter ionospheric correction
- Wet tropospheric correction

Conclusion
- Daily monitoring: JA1 – JA2 radiometer wet troposphere correction not stable
- Comparison with ECMWF model reveals strange behavior of JMR, since JA1 safehold
Wet tropospheric correction

- Radiometer – ECMWF model difference vs coast distance
  - Similar behavior of AMR and JMR far from coasts
  - AMR stays longer stable when approaching coast (different antenna properties)

![Graph showing differences in wet tropospheric correction](image)

Image Description:
- JMR (Jason-1) - ECMWF
  - Mean = 0.4241
- AMR (Jason-2) - ECMWF
  - Mean = 0.04298
- MWR (Envisat) - ECMWF
  - Mean = 0.7949

Conclusion
- Radiometer – ECMWF model difference vs coast distance
  - Similar behavior of AMR and JMR far from coasts
  - AMR stays longer stable when approaching coast (different antenna properties)
Conclusion

• Use of 11 Jason-2 cycles in tandem configuration with Jason-1

• Very good consistency between altimetric parameters of Jason-2 and Jason-1

• Improvement observed thanks to new JA2 radiometer (AMR) more stable than JMR

• Parameter analysis reveal no particular behavior linked to use of different tracking modes (Median, Diode/DEM)

• Small differences observed (principally in C-band) likely linked to MQE editing criteria
  – Do not impact SSH computation (talk M. Ablain)