Title : GOCE L1b Data Quality Control Report
       December 2010

Author : GOCE Quality Control Team

Distribution : GOCE Users Community
## DOCUMENT CHANGE RECORD

<table>
<thead>
<tr>
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<th>Date</th>
<th>Reason for Change</th>
<th>Changed Pages/Paragraphs</th>
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<tr>
<td>1.0</td>
<td>25/05/2011</td>
<td>First issue</td>
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<td>2.0</td>
<td>20/06/2012</td>
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1. INTRODUCTION

1.1 Purpose and Scope

This document contains the Quality report for GOCE L1b data for December 2010. The latest version of this document is available on the GOCE Data Quality portal at:

http://earth.esa.int/GOCE/→“Level 1b QC”→“Monthly”

The GOCE Data Quality portal is the principal source for any quality-related information on GOCE products.

http://earth.esa.int/GOCE/→“Level 1b QC”.

1.2 Glossary

The following acronyms and abbreviations have been used in this report.

<table>
<thead>
<tr>
<th>ABBREVIATION</th>
<th>MEANING</th>
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</thead>
<tbody>
<tr>
<td>EGG</td>
<td>Electrostatic Gravity Gradiometer</td>
</tr>
<tr>
<td>DFACS</td>
<td>Drag Free and Attitude control system</td>
</tr>
<tr>
<td>SST-I</td>
<td>Satellite-to-satellite tracking instrument</td>
</tr>
<tr>
<td>CTR</td>
<td>Control Voltages</td>
</tr>
<tr>
<td>STR</td>
<td>Star Tracker</td>
</tr>
<tr>
<td>Trace SD</td>
<td>Trace Spectral Density</td>
</tr>
<tr>
<td>ICM</td>
<td>Inverse Calibration Matrix</td>
</tr>
<tr>
<td>GAR</td>
<td>Gradiometer Angular Rates</td>
</tr>
<tr>
<td>FPM</td>
<td>Fine Pointing Mode</td>
</tr>
</tbody>
</table>
2. DATA QUALITY OVERVIEW

2.1 Instruments Quality summary tables

Table 1 December 2010 EGG QC Status

| Dec | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 |
|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|

Table 2 December 2010 SST QC Status

Baseline may be verified by reading out the <Creator_Version> tag in the file header, e.g:

<Creator_Version>05.06</Creator_Version>

(For the latest baseline)

- EGG v5 reprocessed baseline is available through the GOCE Virtual On-line Archive
  
  ➤ http://eo-virtual-archive1.esa.int/Index.html

- EGG v4 is the older baseline. Products are still accessible through the GOCE Virtual On-line Archive

2.2 EGG data – Available baselines

<table>
<thead>
<tr>
<th>Baseline</th>
<th>EGG Processor</th>
<th>SST processor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline D</td>
<td>EGG v5 (&gt; 5.06) installed 31/03/2012</td>
<td>V02.18 Patch B Installed 20/01/2011</td>
</tr>
<tr>
<td>Baseline A</td>
<td>EGG v4 (&lt;4.8) Installed 18/05/2010</td>
<td>V02.18 Patch B Installed 20/01/2011</td>
</tr>
</tbody>
</table>
3. EGG DATA QUALITY: SPACECRAFT AND ENVIRONMENT RELATED EVENTS

3.1 Summary

For the reference period, the following events are highlighted:

- Instrument Calibration operations were performed on December 7th. EGG data are not produced during Calibration Operations. Dec 7 and 8 data are affected by these operations.
- Anomalous oscillation found in L1 and L0 data in CTR components at UTC 08/12 with impacts on performance.
- BeamOut at Utc time 12:51:48 on 10th of December and Kalman reinit. At UTC 10/12 due to wrong OUTC from 8/12/2010 (Kiruna) pass at 17:40 UTC to 9/12/2010 17:40 UTC.
- Anomalous oscillation found in L1 and L0 CTR datasets and in Uyy with impacts on trace at UTC 21/12 17:40.
- BeamOut at Utc time 12:49:59 and oscillations at 09:56:40 without impacts on performance at UTC 29/12.

3.2 Anomalous oscillation on 8 December

An anomalous oscillation has been found in 8 December gradients time series at UTC 07:23:53 with impacts on trace, as reported in figure 1:

![Figure 1 Anomalous oscillation in gradients time series (left) and their impacts on trace PSD (right)](image)

The same anomaly has been found in L0 data as well in the following CTR components:

- A1: X3, X4, Y1, Y2
- A2: X2, X3, X4
- A3: Z1, Z2, X3, X4
- A4: X1, X2, X3, X4, Y1, Y2
- A5: X2, X3, X4
- A6: Z1, Z2, X3, X4
3.3 Instrument calibration on 07/12/2010

Special Spacecraft Operations for Instrument Calibration were performed on 07th December 2010, from
- 20101207T043336 to 20101208T052859

EGG_NOM_1b data are unavailable during this period, i.e. between products:
- GO_CONS_EGG_NOM_1b_20101207T023352_20101207T040336
and
- GO_CONS_EGG_NOM_1b_20101208T052859_20101208T065843

Due to the new processor logic, the following products before and after the calibration, have incomplete GGT and IAQ datasets:

GO_CONS_EGG_NOM_1b_20101206T233425_20101207T010408
GO_CONS_EGG_NOM_1b_20101207T010408_20101207T023352
GO_CONS_EGG_NOM_1b_20101207T023352_20101207T040336 Calibration
GO_CONS_EGG_NOM_1b_20101208T052859_20101208T065843
GO_CONS_EGG_NOM_1b_20101208T065843_20101208T082826
GO_CONS_EGG_NOM_1b_20101208T082826_20101208T095810

3.4 Unexpected Kalman filter reinitialization on 10/12/2010

3.4.1 EGG V4

An unexpected Kalman filter reinitialization is found at UTC 10/12 20:16 affecting the following products:

GO_CONS_EGG_NOM_1b_20101210T184751_20101210T201735_0001
GO_CONS_EGG_NOM_1b_20101210T201735_20101210T214718_0001
GO_CONS_EGG_NOM_1b_20101210T214718_20101210T231702_0001
GO_CONS_EGG_NOM_1b_20101210T231702_20101211T004646_0001
GO_CONS_EGG_NOM_1b_20101211T004646_20101211T021630_0001

The computed trace PSD after the transient due to Kalman filter reinitialization is reported below:
This reinitialization is due to wrong OUTC from 8/12/2010 (Kiruna) pass at 17:40 UTC to 9/12/2010 17:40 UTC received.

3.4.2 EGG V5
The Kalman filter reinitialization is no more preset in the new data delivery.

3.5 Anomalous oscillation on 21 December
On 21st of December at UTC 17:40 an anomalous oscillation occurred in CTR and gradients data with impacts on performance, as reported below:

Figure 3 CTR anomaly on 21st of December component A2_X1 (left) and the impacts on gradients Uyy (right)
The same oscillation is present in the L0 data as well in the following components:

- A1: X1, X2, X3, X4
- A2: X1, X2, X3, X4, Z1, Z2
- A3: X1, X2, X3, X4
- A4: X1, X2, X3, X4
- A5: X1, X2, X3, X4, Z1, Z2
- A6: X1, X2, X3, X4

### 3.6 Oscillation on 29/12

The oscillation found in gradients Uyy and Uzz components at UTC 09:56:40 has no impacts on performance, as reported below:

![Figure 4 Uyy and Uzz oscillation (left) and their impacts on trace PSD (right)](image)

### 3.7 Beam Out events

Two Beam Out events occurred at the following UTC time during December 2010 reference frame:

<table>
<thead>
<tr>
<th>EVENT NUMBER</th>
<th>UTC TIME</th>
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<tbody>
<tr>
<td>1</td>
<td>2010-12-10T12:51:48</td>
</tr>
<tr>
<td>2</td>
<td>2010-12-29T12:49:59</td>
</tr>
</tbody>
</table>

Table 3 Beam out event

Below, the effects of the Beam Out in the common mode acceleration, component 14_x, are displayed, for the two events.
This oscillation enters the gradients time series notably in the $U_{xx}$ component.

This effect may be seen in the Gradients PSD graphs below:

$U_{xx}$ (red in the plots) has a higher value in the PSD above, when the beam-out is included (only the trace and gradients PSD for 10th of December are reported, plots for 29th of December show similar behavior).

No relevant differences in terms of trace PSD are recognized, as reported in figure 7:
Figure 7 Trace PSD considering the Beam out event (left), trace PSD not considering the Beam out event (right)