

RGS INSTRUMENT AND CALIBRATION STATUS

XMM-NEWTON USERS' GROUP MEETING #24

ESAC, MAY 10-11 2023

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XMM-NEWTON SCIENCE OPERATIONS CENTRE

ON BEHALF OF THE SRON AND XMM-SOC RGS TEAMS

Outline

Operations and Instrument Status

- System Peak
- Charge Transfer Efficiency
- Bad Surface
- Hot spots and hot columns

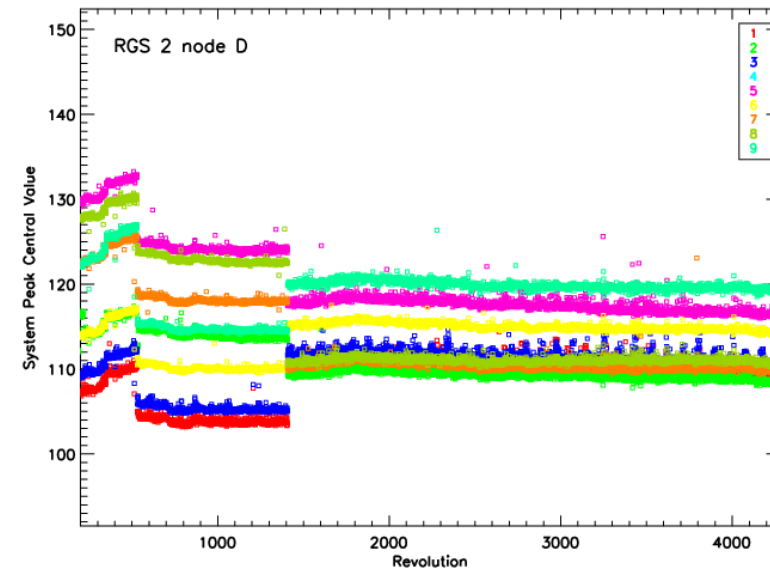
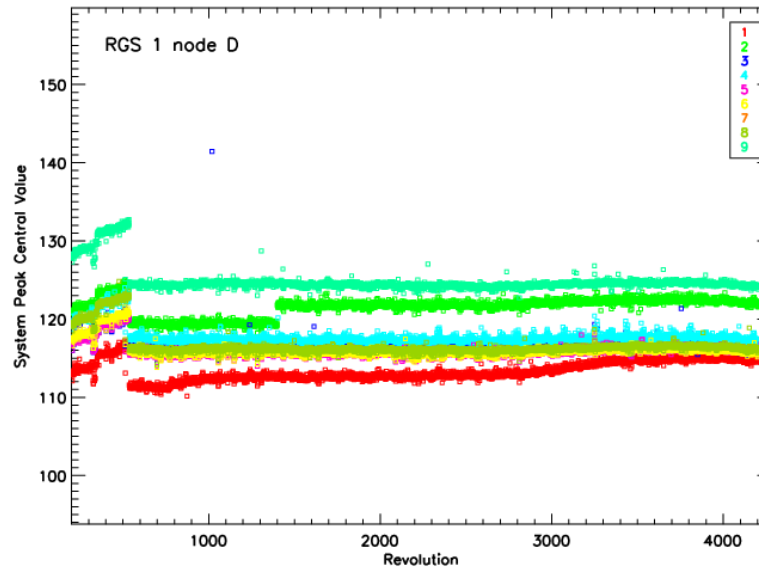
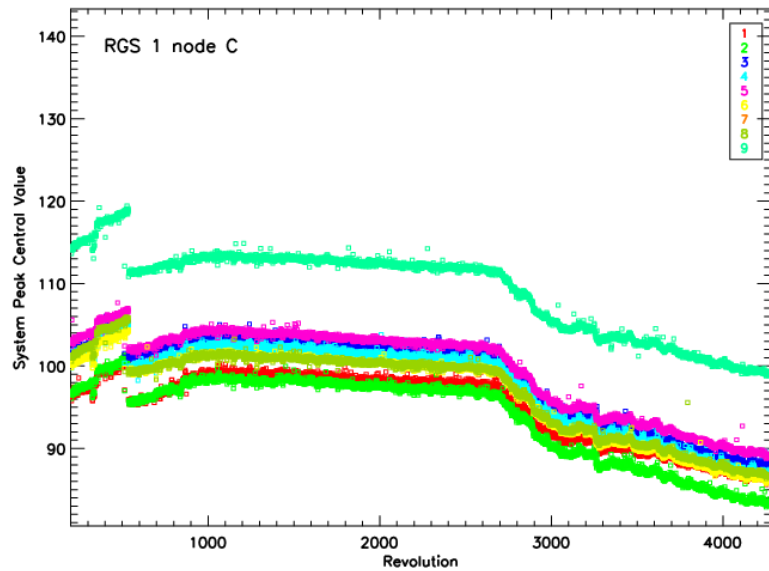
Calibration

- Wavelength Scale
- Effective Area

Operations

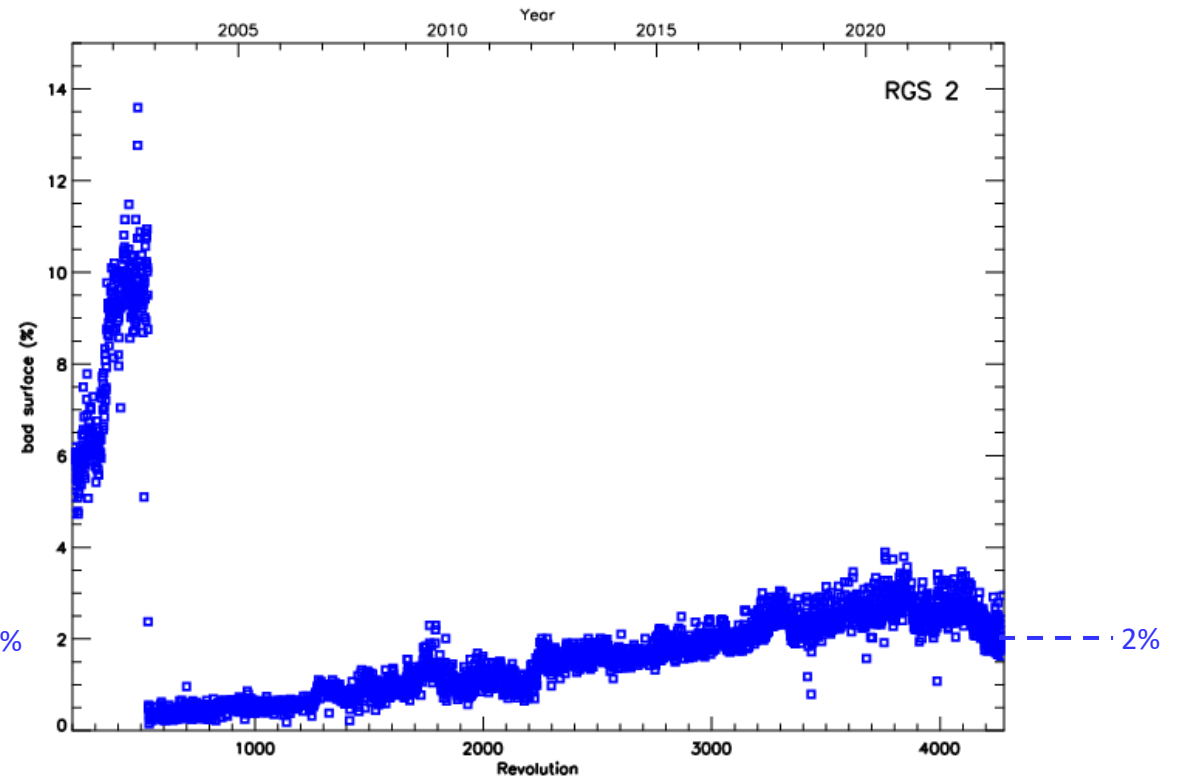
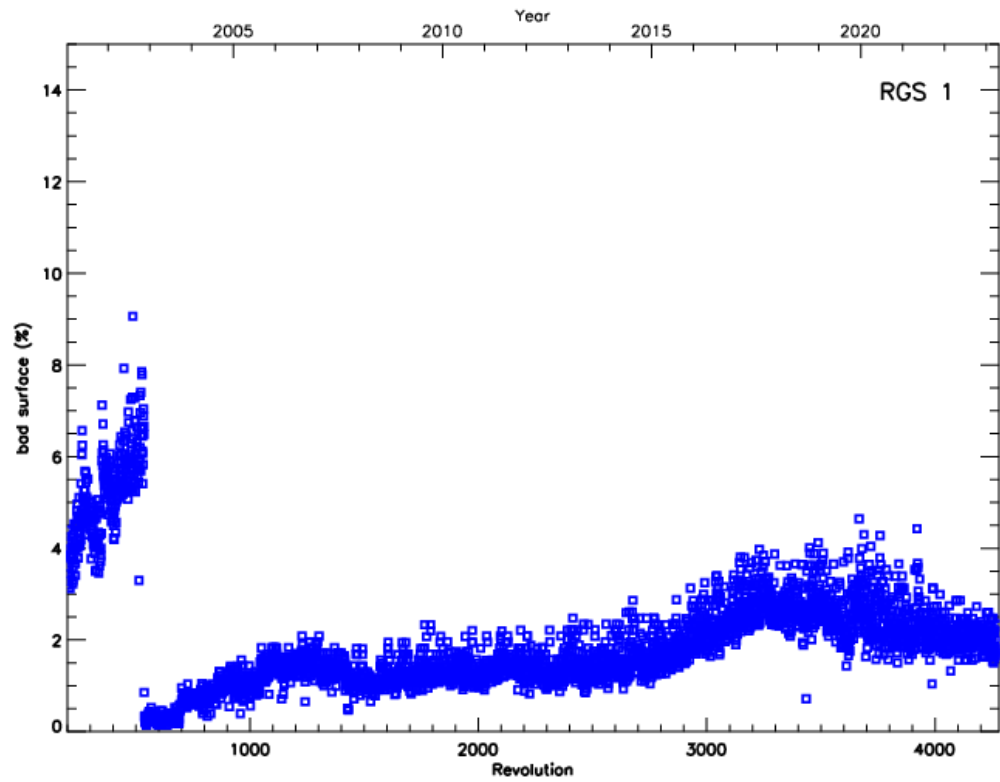
- RGS operations running smoothly
- Same operational configuration
- No instrumental anomalies
- No unexpected degradation of the instrumental parameters

Instrument Status: System Peak

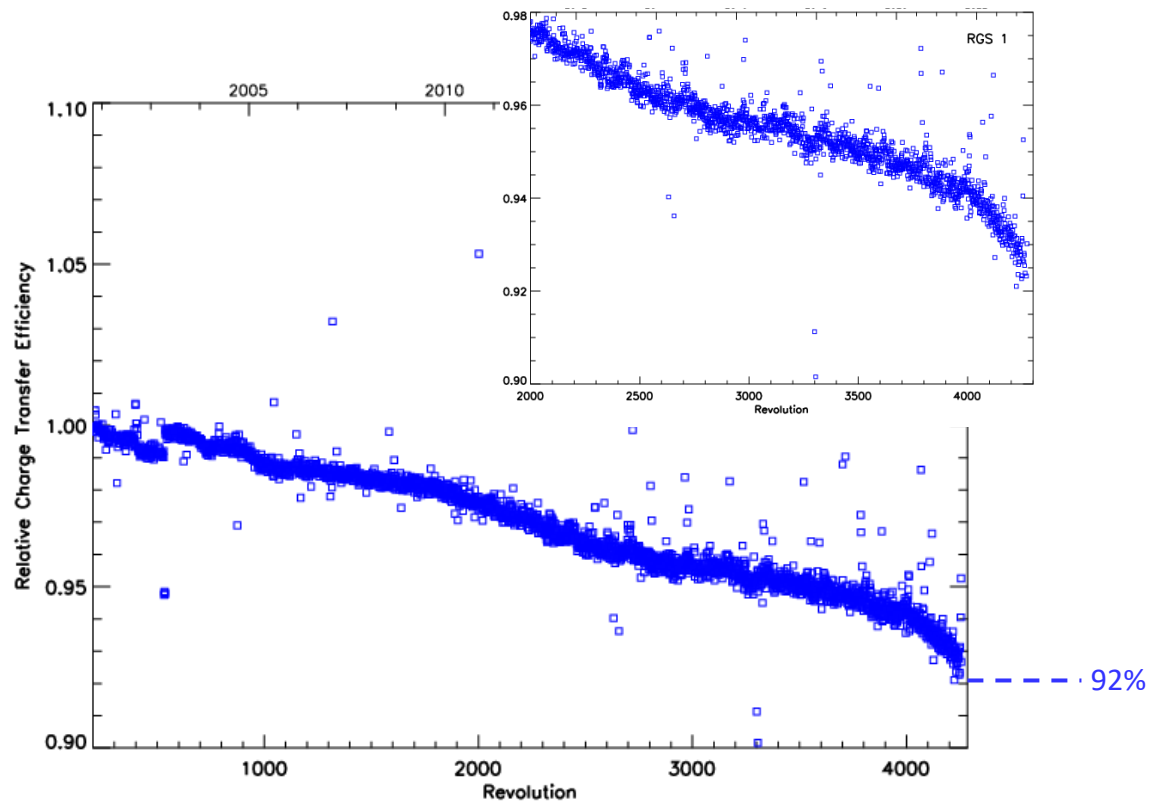


NO NEED FOR CCF UPDATE

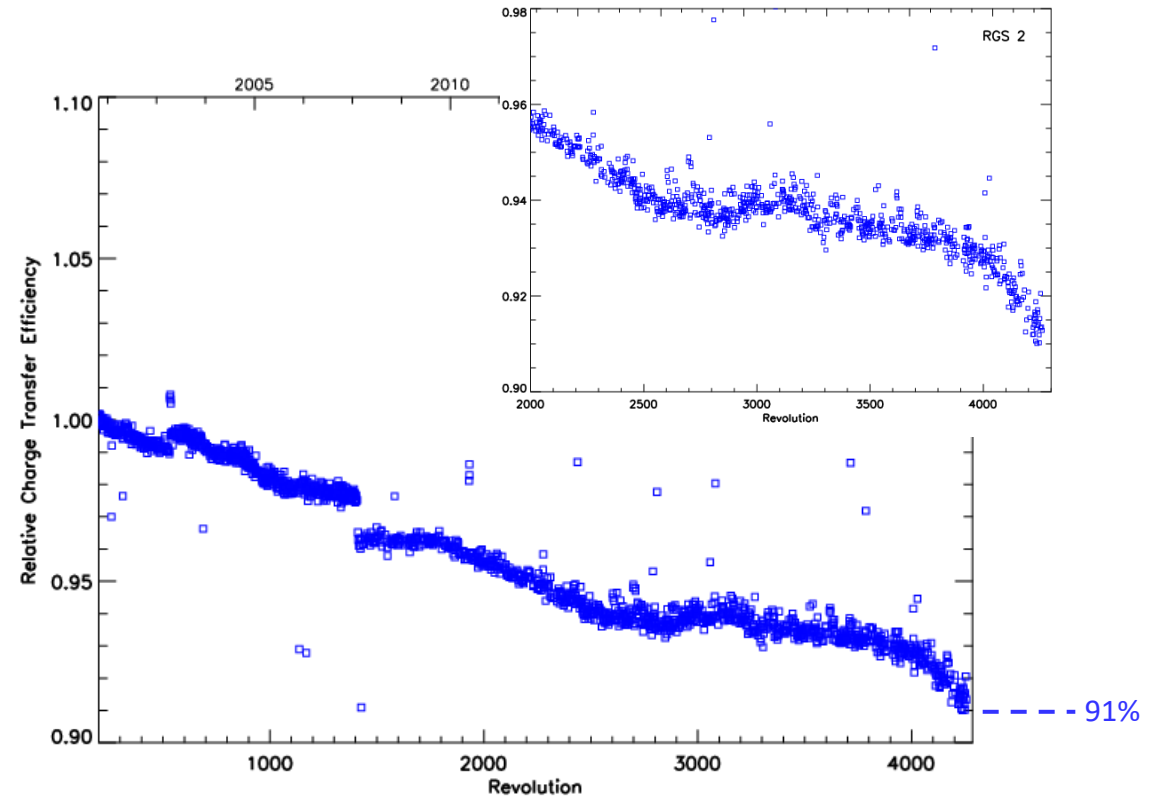
Instrument Status: Bad Surface



Instrument Status: CTE

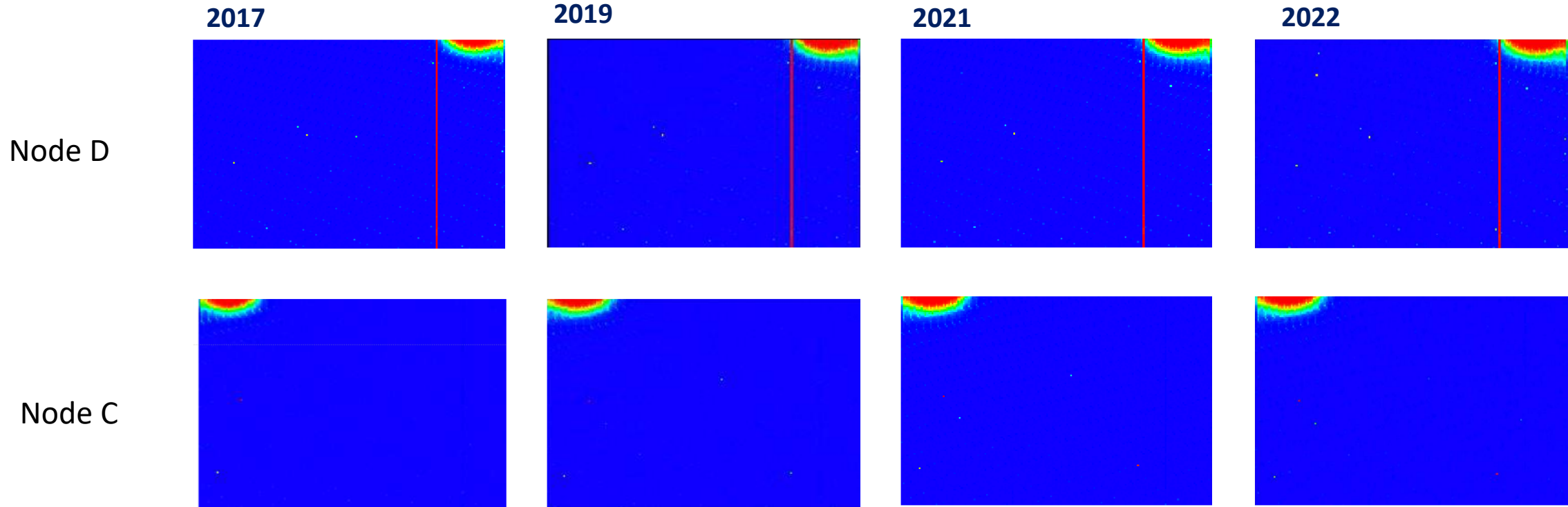


Steeper decrease since rev 4000



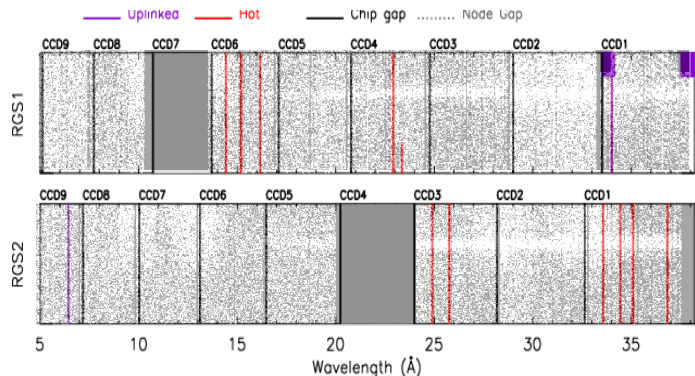
CCF UPDATE IN PROGRESS

Instrument Status: Hot Spots in RGS1 CCD1



NO NEED FOR CCF UPDATE

Instrument Status: Hot Columns



Report for 2022 issued in April 2023

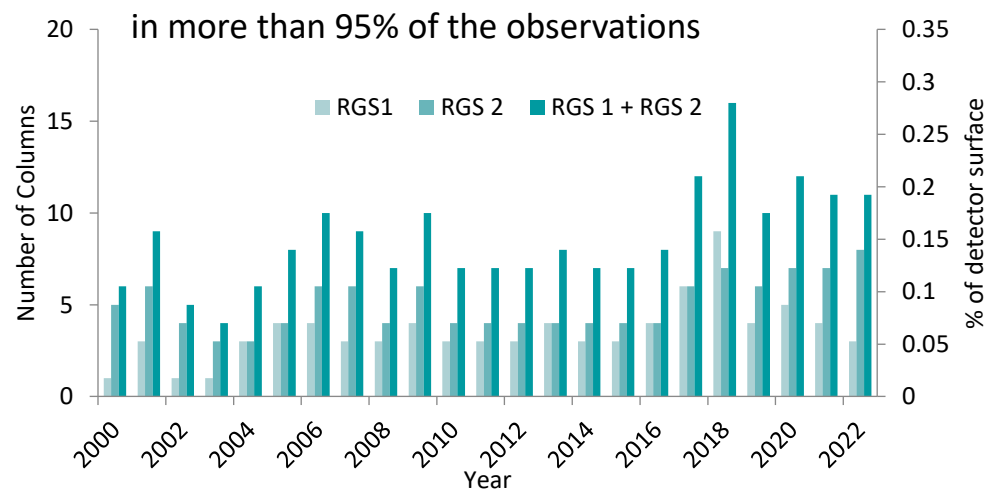
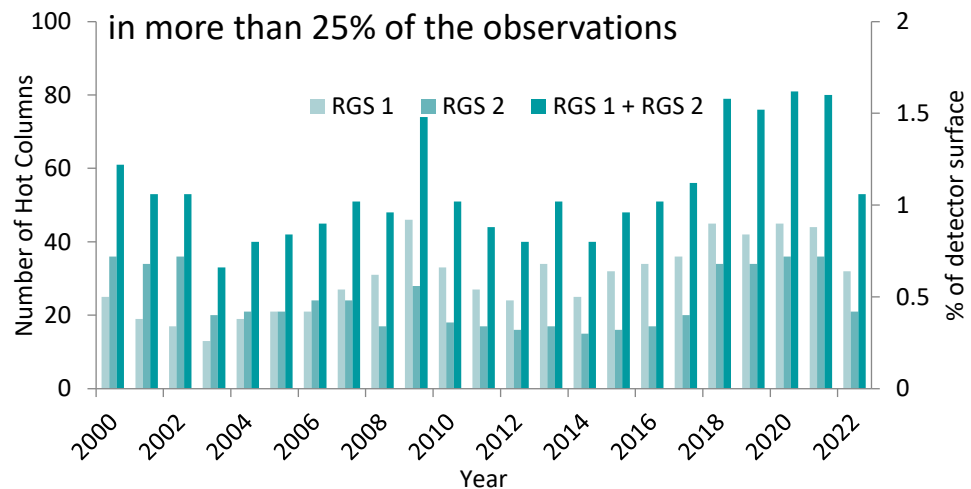
Columns *rejected on-board*

1 in RGS1 CCD 1
1 in RGS2 CCD 9

Columns flagged as *advisory* in CCF

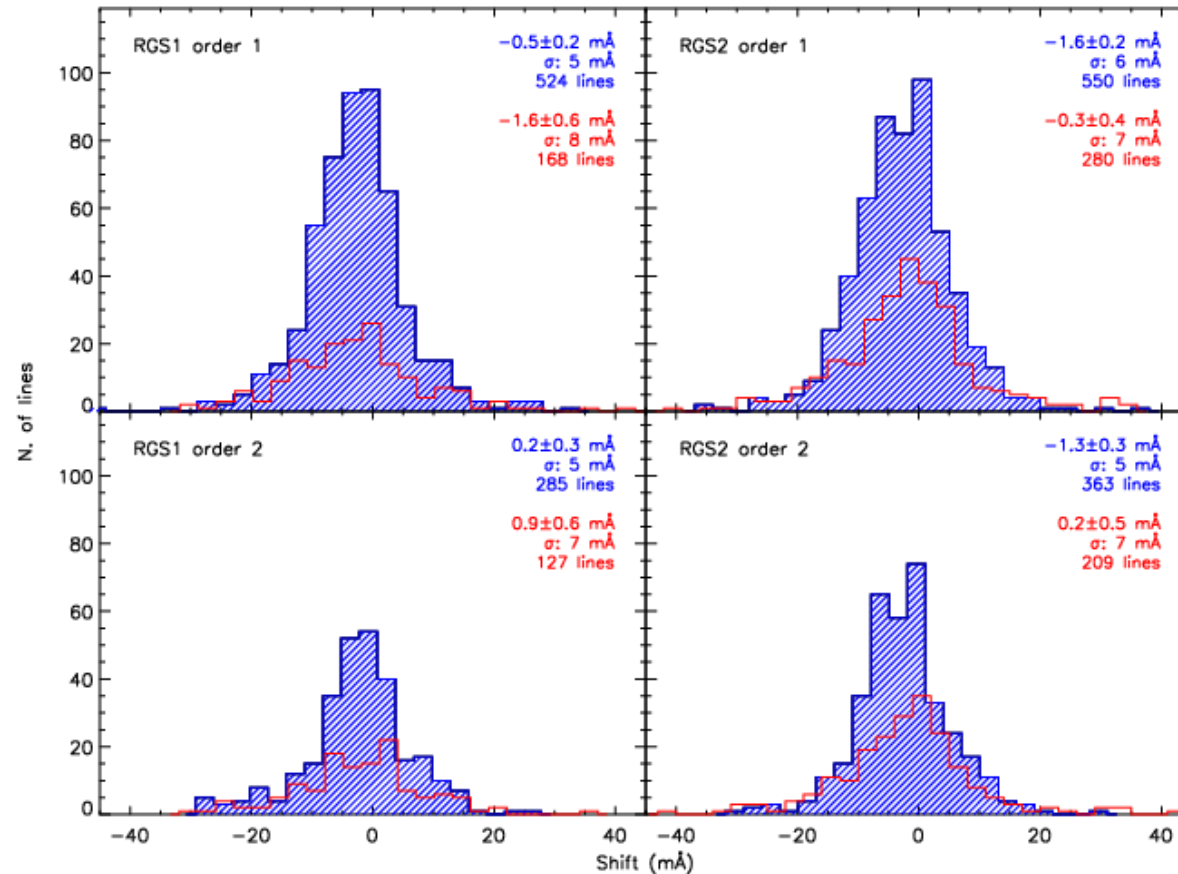
6 in RGS1 (3 in CCD6 + 2 in CCD4 + 1 in CCD1)
6 in RGS2 (2 in CCD3 + 4 in CCD 1)

NO NEED FOR CCF UPDATE



Wavelength Scale

shifts of individual lines
2002 - 2022



Effective Area

Three time-dependent corrections:

- Contamination correction, applied **by default**, with rgsproc/rgsrmfgen parameter *dyneffareacorr=yes*
- Small scale Effective Area correction applied **by default**, with rgsproc/rgsrmfgen parameter *witheffectivaeracorrection=yes*

CCF UPDATED APRIL 2023

- Correction with respect to EPIC-pn (aka Rectification Factors) can be applied with rgsproc/rgsrmfgen non-default option *withrectification=yes*

Currently valid until February 2019

CCF UPDATE IN PROGRESS

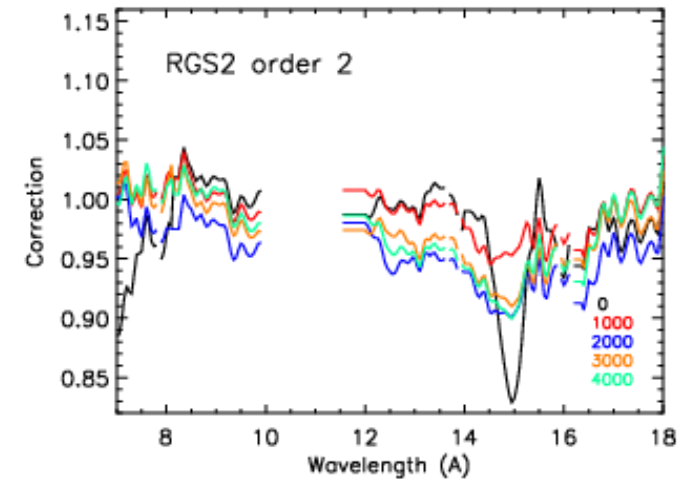
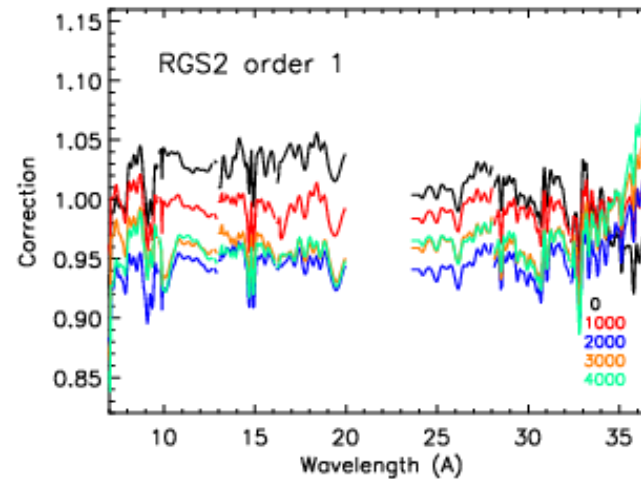
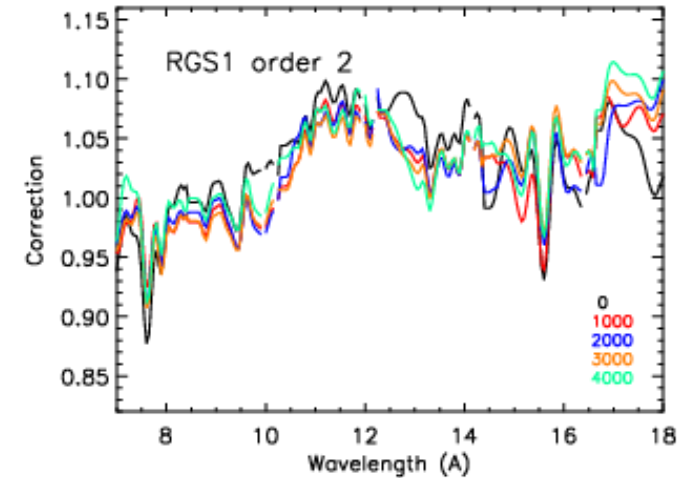
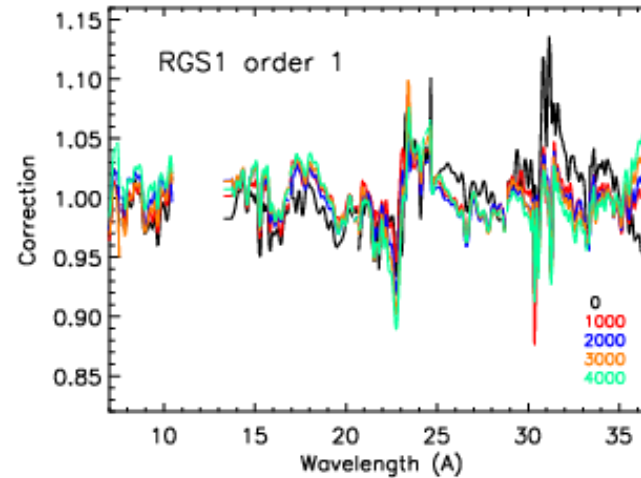
Effective Area Correction

Small scale Effective Area correction applied by default,
with `rgsproc/rgsrmfgen` parameter
witheffectiveareacorrection=yes

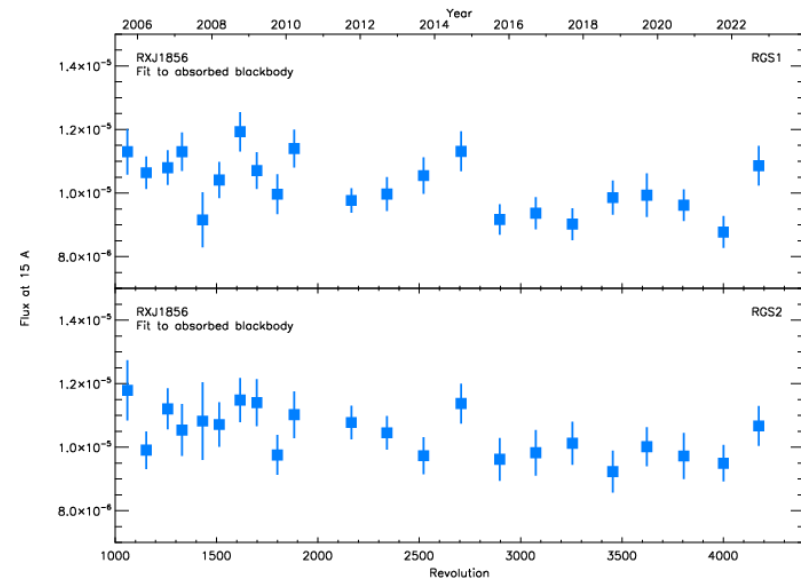
Updated with data taken until end 2022

RGS[12]_EFFAREACORR_0015.CCF

See Release Note: CAL-SRN-395

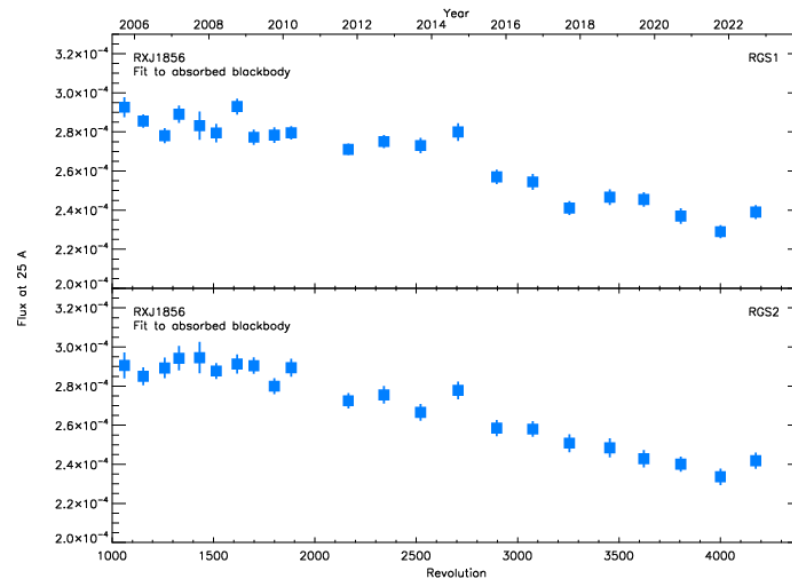


Effective Area Monitoring: RXJ1856



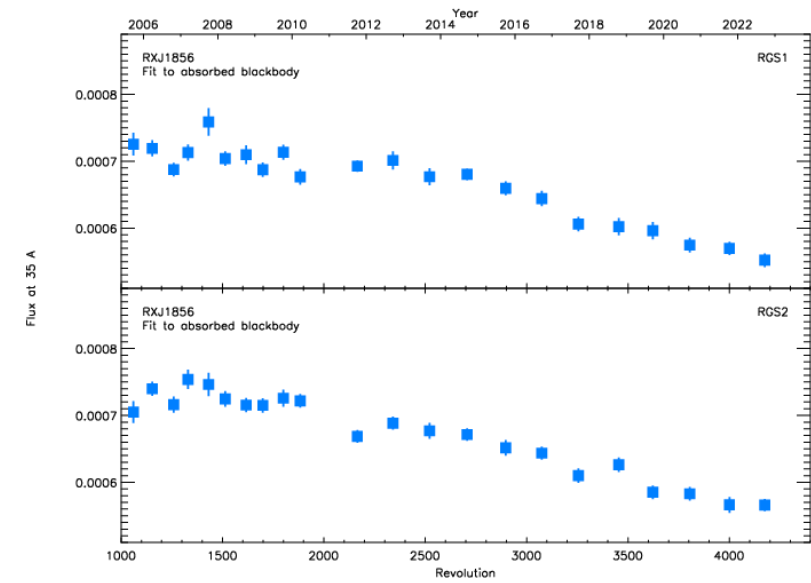
RGS1 1.0 +/- 0.1

RGS2 1.0 +/- 0.1



RGS1 2.7 +/- 0.2

RGS2 2.7 +/- 0.2

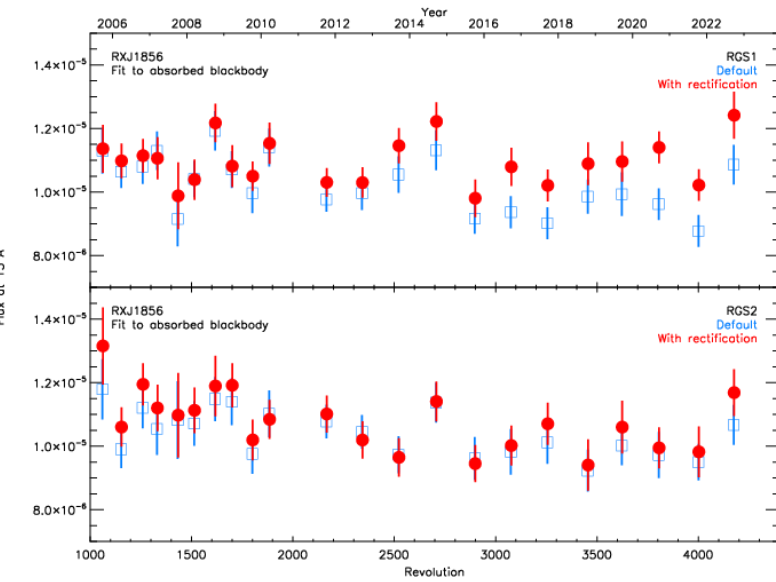


RGS1 6.7 +/- 0.6

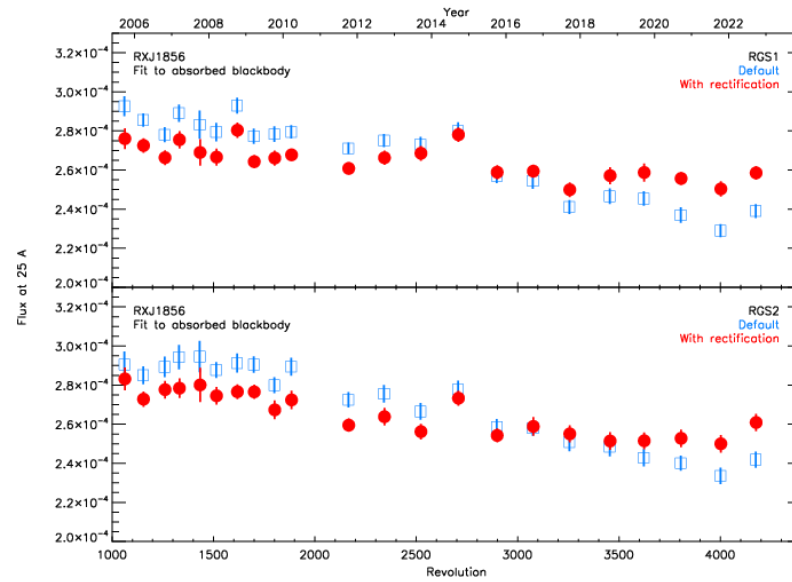
RGS2 6.7 +/- 0.6

Effective Area Monitoring: RXJ1856

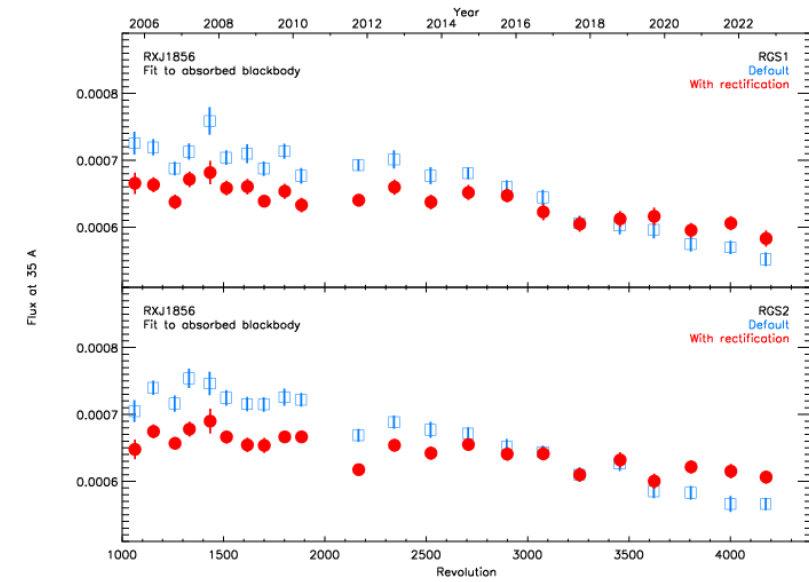
- With rectification correction



| | | |
|------|-------------|-------------|
| RGS1 | 1.0 +/- 0.1 | 1.1 +/- 0.1 |
| RGS2 | 1.0 +/- 0.1 | 1.1 +/- 0.1 |

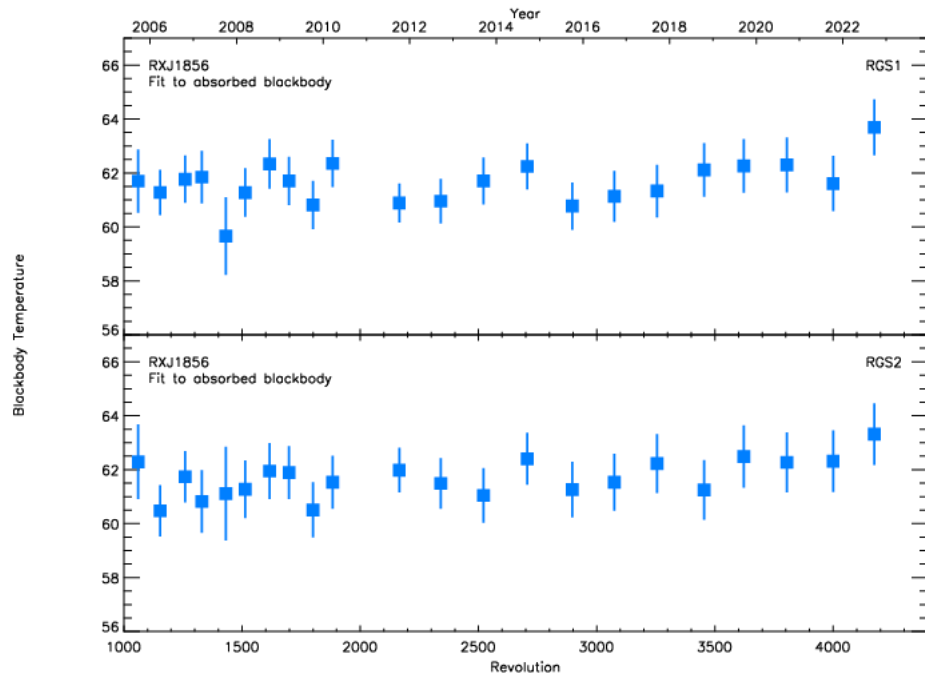


| | | |
|------|-------------|-------------|
| RGS1 | 2.7 +/- 0.2 | 2.7 +/- 0.1 |
| RGS2 | 2.7 +/- 0.2 | 2.7 +/- 0.1 |



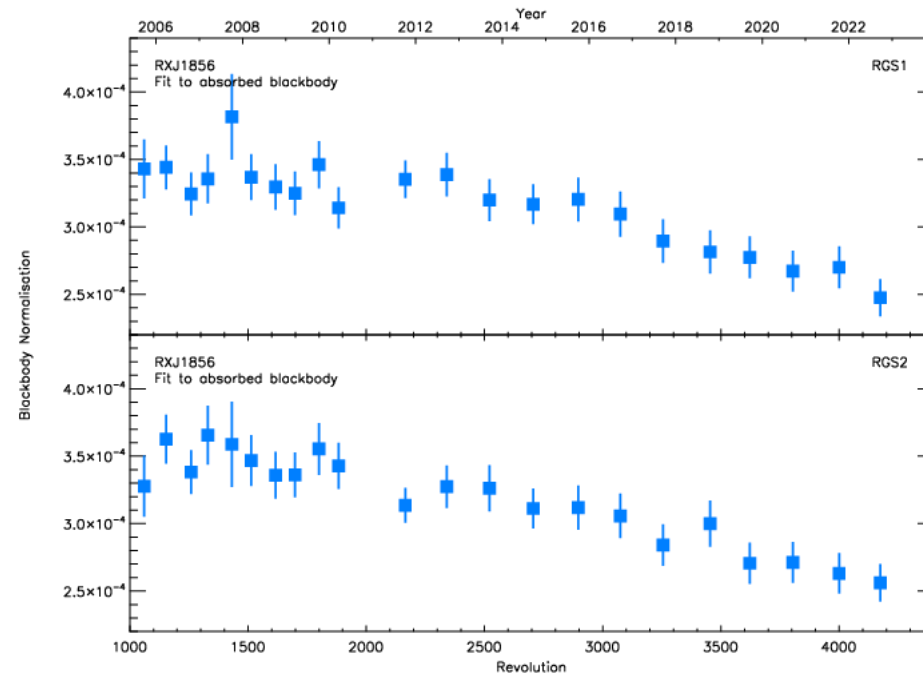
| | | |
|------|-------------|-------------|
| RGS1 | 6.7 +/- 0.6 | 6.4 +/- 0.3 |
| RGS2 | 6.7 +/- 0.6 | 6.5 +/- 0.3 |

Effective Area Monitoring: RXJ1856



RGS1 61.6 ± 0.8

RGS2 61.7 ± 0.7

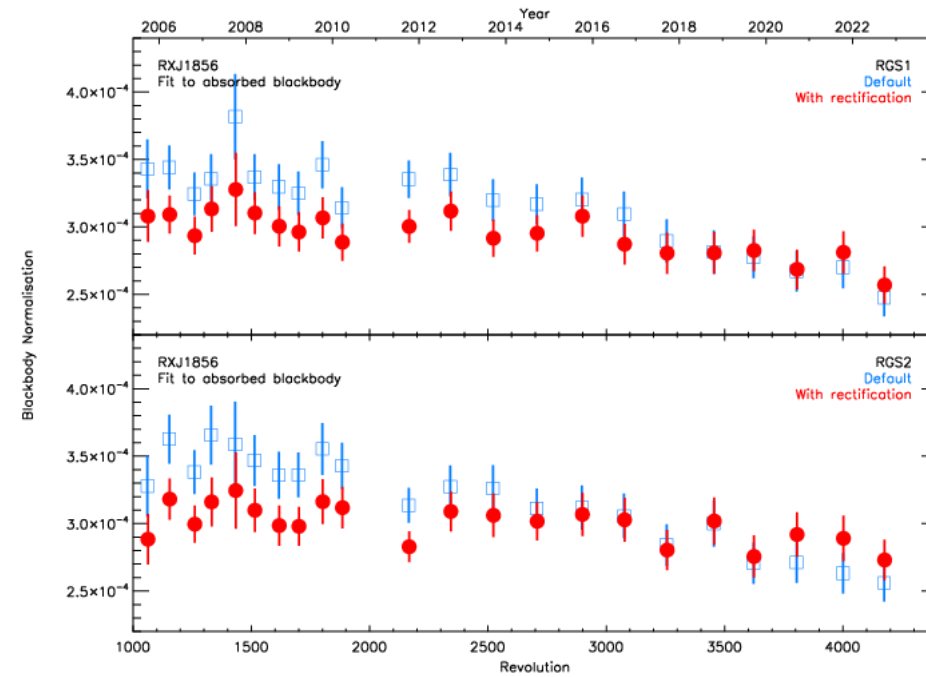
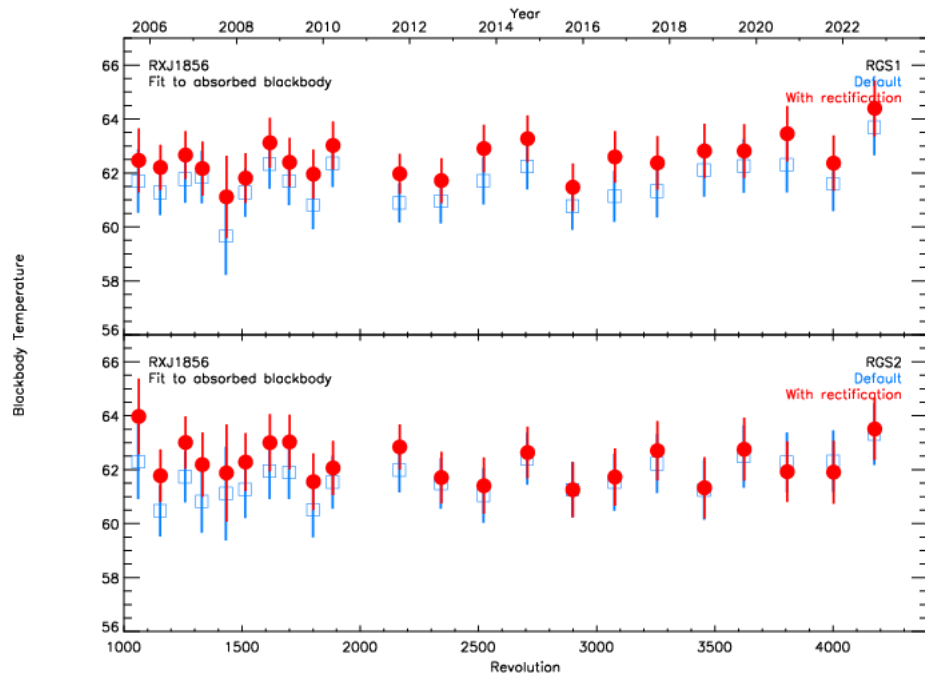


RGS1 3.2 ± 0.3

RGS2 3.2 ± 0.3

Effective Area Monitoring: RXJ1856

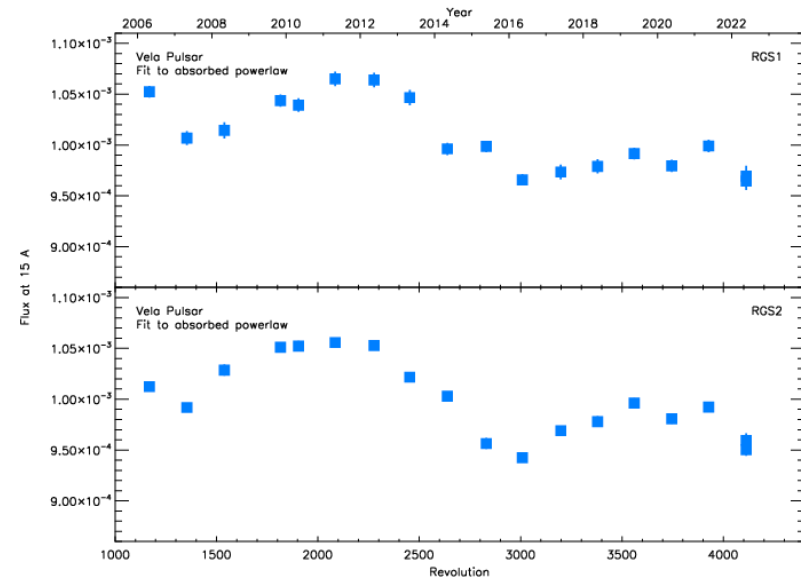
- With rectification correction



| | | |
|------|--------------|--------------|
| RGS1 | 61.6 +/- 0.8 | 62.5 +/- 0.7 |
| RGS2 | 61.7 +/- 0.7 | 62.3 +/- 0.7 |

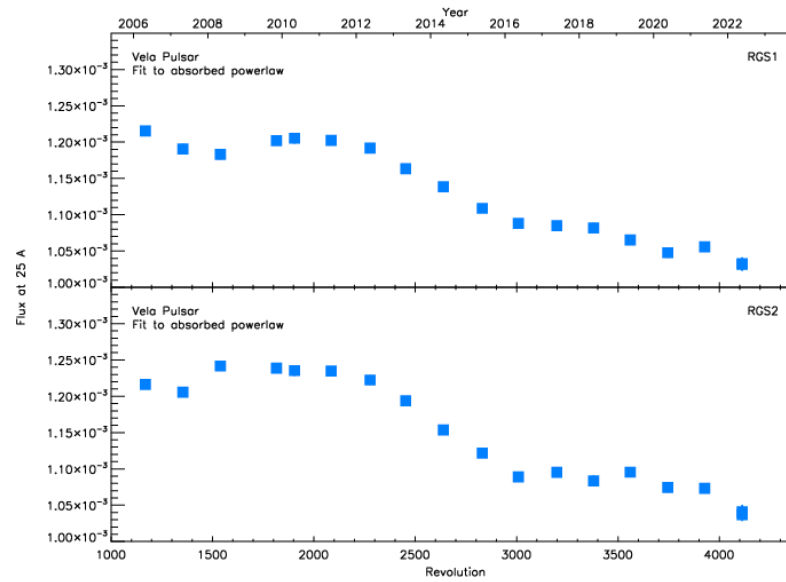
| | | |
|------|-------------|-------------|
| RGS1 | 3.2 +/- 0.3 | 3.0 +/- 0.2 |
| RGS2 | 3.2 +/- 0.3 | 3.0 +/- 0.1 |

Effective Area Monitoring: Vela Pulsar



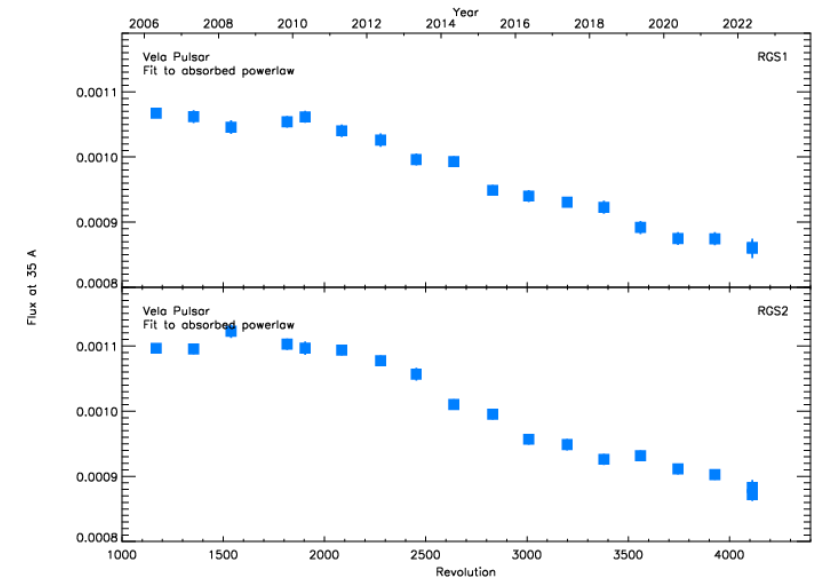
RGS1 1.01 +/- 0.04

RGS2 1.00 +/- 0.04



RGS1 1.1 +/- 0.1

RGS2 1.2 +/- 0.1

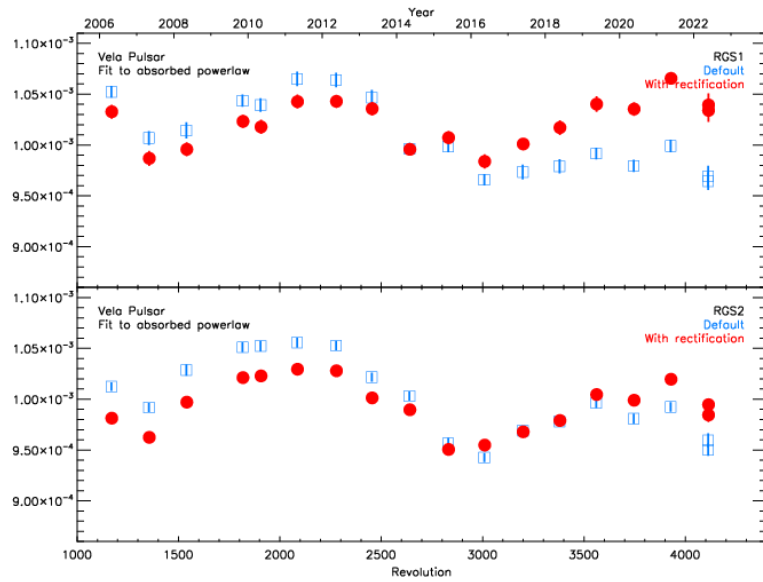


RGS1 1.0 +/- 0.1

RGS2 1.0 +/- 0.1

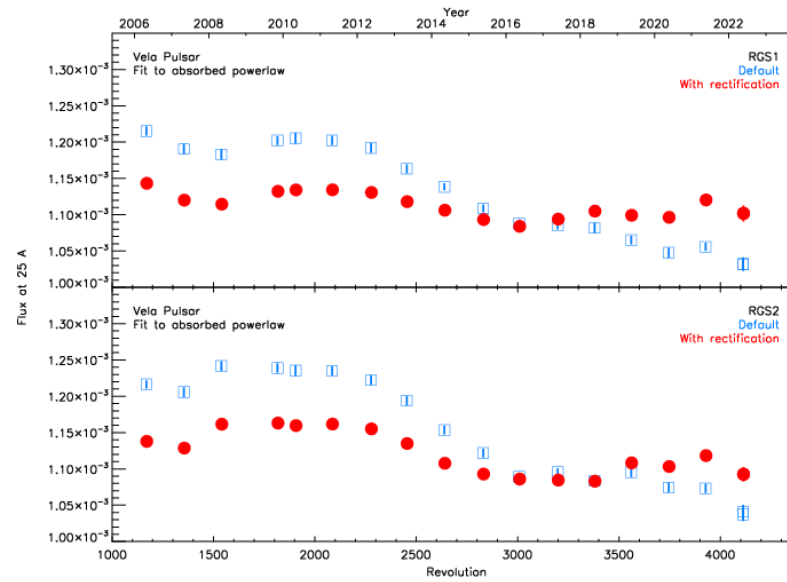
Effective Area Monitoring: Vela Pulsar

- With rectification correction



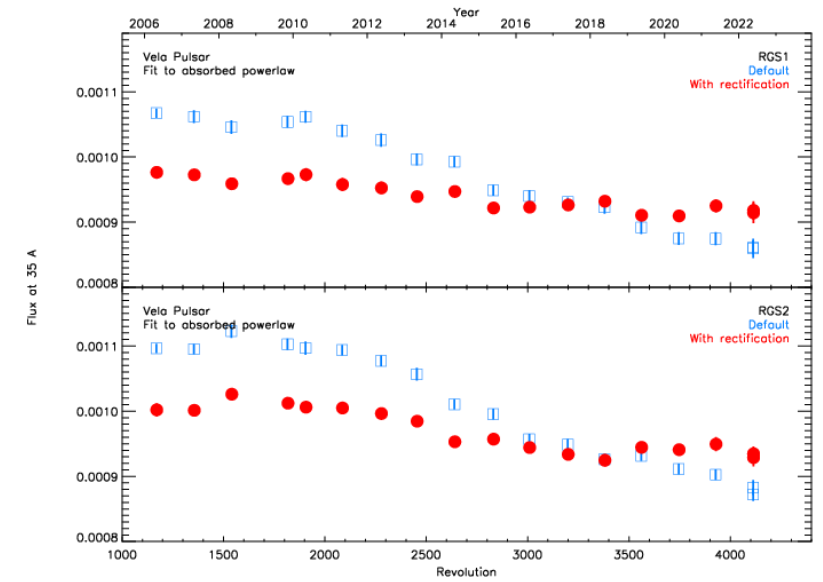
RGS1 1.01 +/- 0.04 **1.02 +/- 0.02**

RGS2 1.00 +/- 0.04 **0.99 +/- 0.03**



RGS1 1.1 +/- 0.1 **1.11 +/- 0.02**

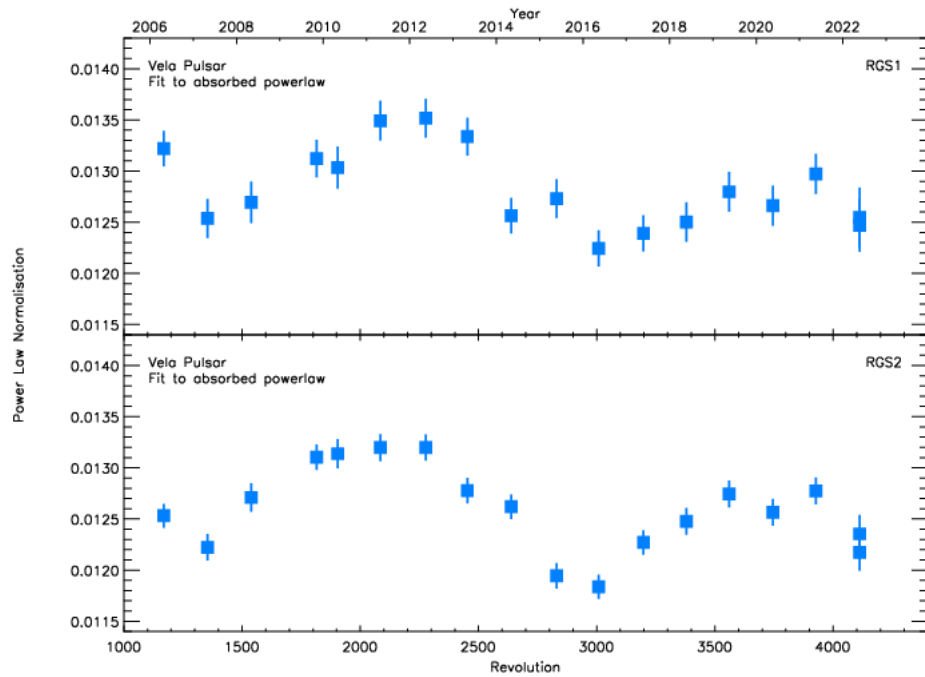
RGS2 1.2 +/- 0.1 **1.12 +/- 0.03**



RGS1 1.0 +/- 0.1 **0.94 +/- 0.02**

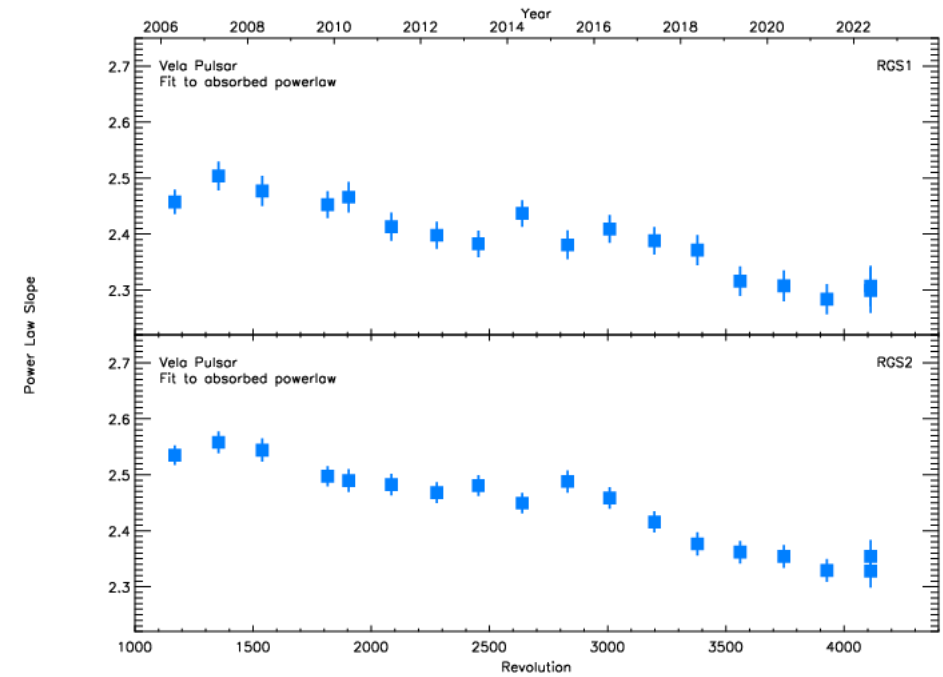
RGS2 1.0 +/- 0.1 **0.97 +/- 0.03**

Effective Area Monitoring: Vela Pulsar



RGS1 1.28 +/- 0.04

RGS2 1.26 +/- 0.04

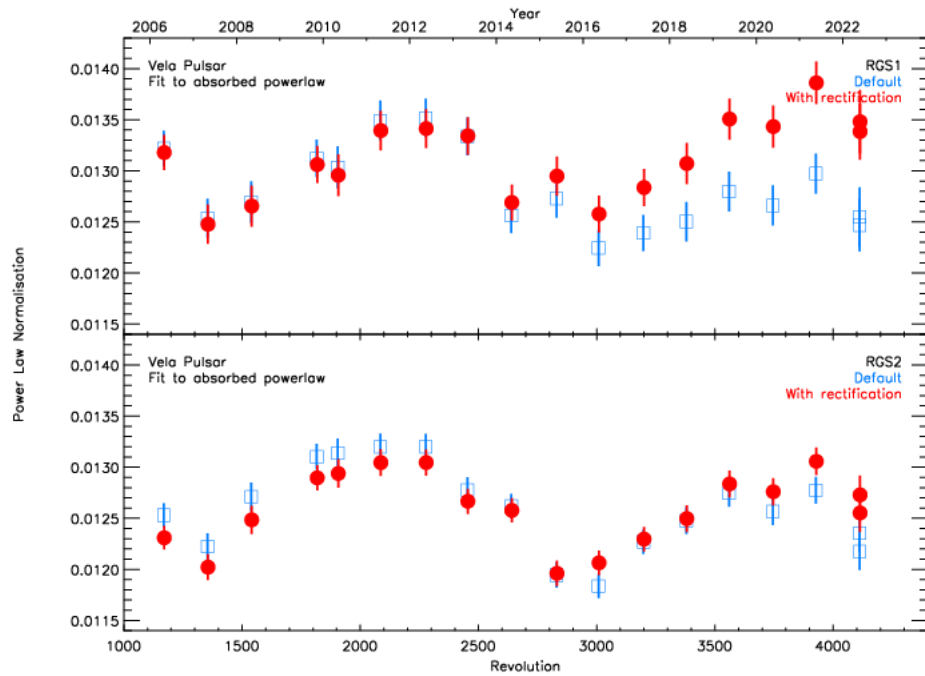


RGS1 2.4 +/- 0.1

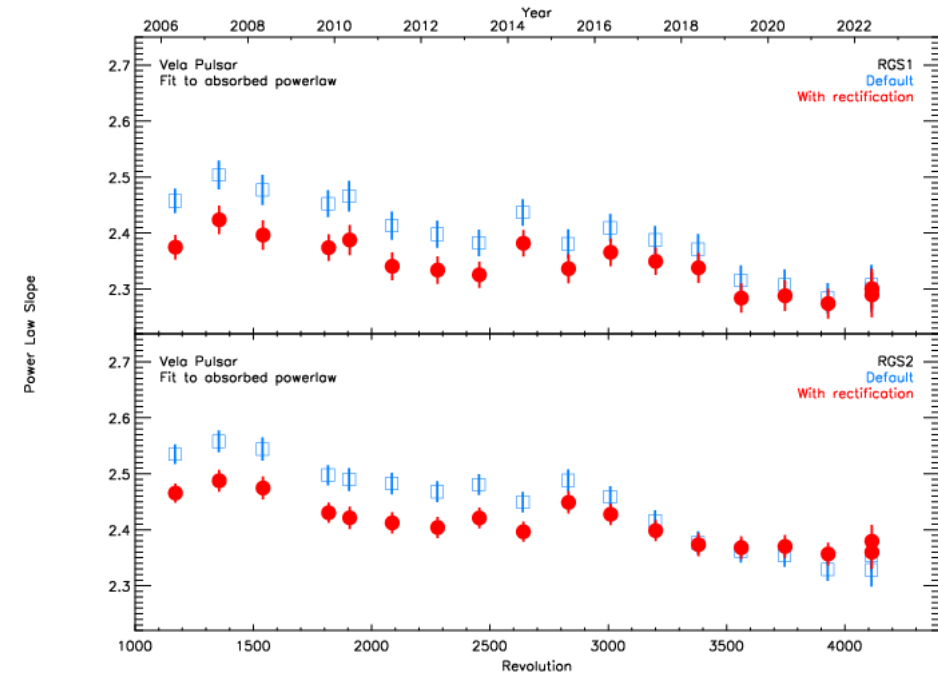
RGS2 2.4 +/- 0.1

Effective Area Monitoring: Vela Pulsar

- With rectification correction



| | | |
|------|---------------|---------------|
| RGS1 | 1.28 +/- 0.04 | 1.31 +/- 0.04 |
| RGS2 | 1.26 +/- 0.04 | 1.26 +/- 0.04 |



| | | |
|------|-------------|---------------|
| RGS1 | 2.4 +/- 0.1 | 2.34 +/- 0.04 |
| RGS2 | 2.4 +/- 0.1 | 2.41 +/- 0.04 |

Summary

- Operations and Instrument Status
 - Operations running without problems
 - No unexpected behaviour in the instrumental performance, except for a slightly steeper decrease in CTE -> **CCF update in progress**
 - No changes in hot columns / hot spots -> **no CCF update needed**
- Wavelength scale
 - Wavelength scale stable
 - No significant trend with time
- Effective Area
 - Variations in Effective Area continuously monitored
 - Empirical corrections to take into account the observed change in Effective Area in place
 - Effective area correction updated -> **CCF updated**
 - Update of rectification correction in progress -> **CCF update in progress**