

RGS CALIBRATION STATUS

XMM-NEWTON USERS' GROUP MEETING #22

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XMM-NEWTON SCIENCE OPERATIONS CENTRE

ON BEHALF OF THE SRON AND ESAC RGS TEAMS

Instrument Status

Operations

System Peak

Charge Transfer Efficiency

Bad Surface

Hot spots and hot columns

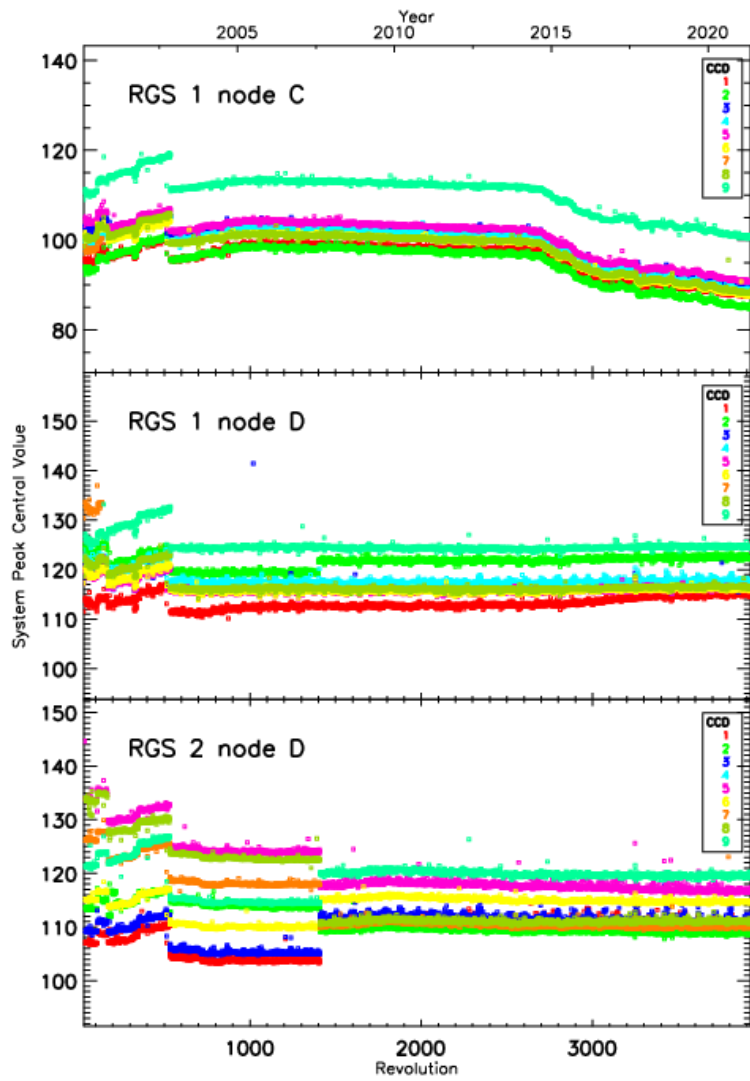
Calibration

Wavelength Scale

Effective Area

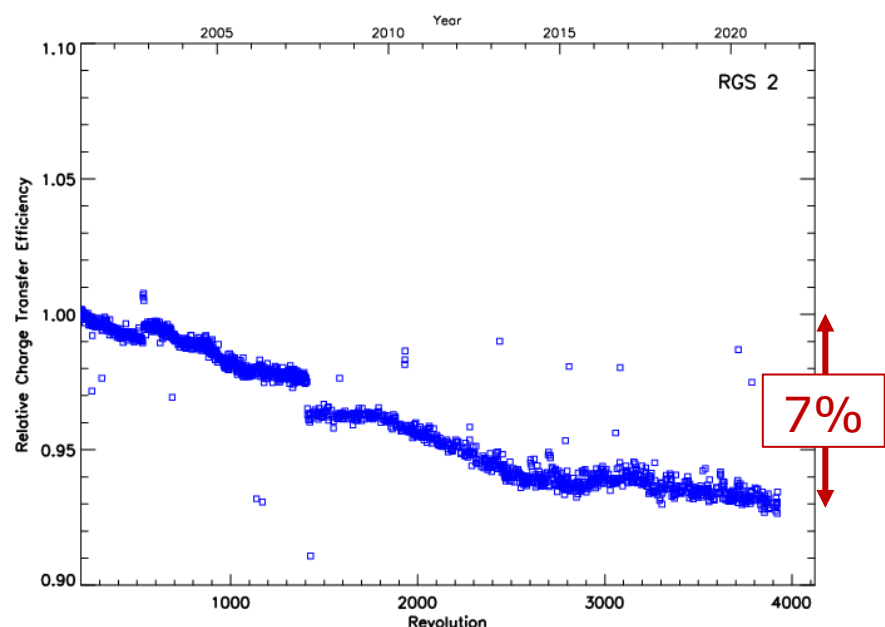
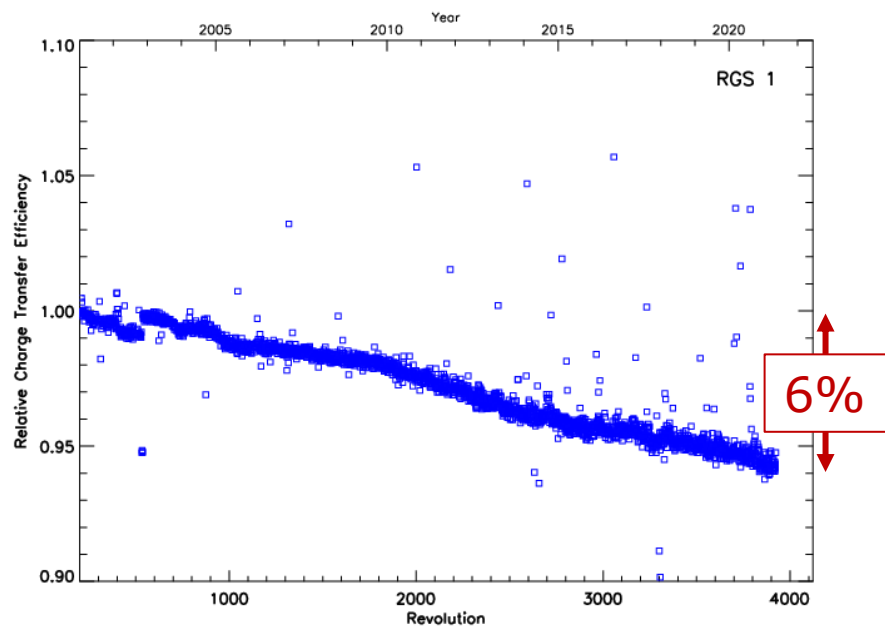
- RGS operations running smoothly
- No instrumental anomalies
- No changes in operational configuration

Instrument Status: System Peak*

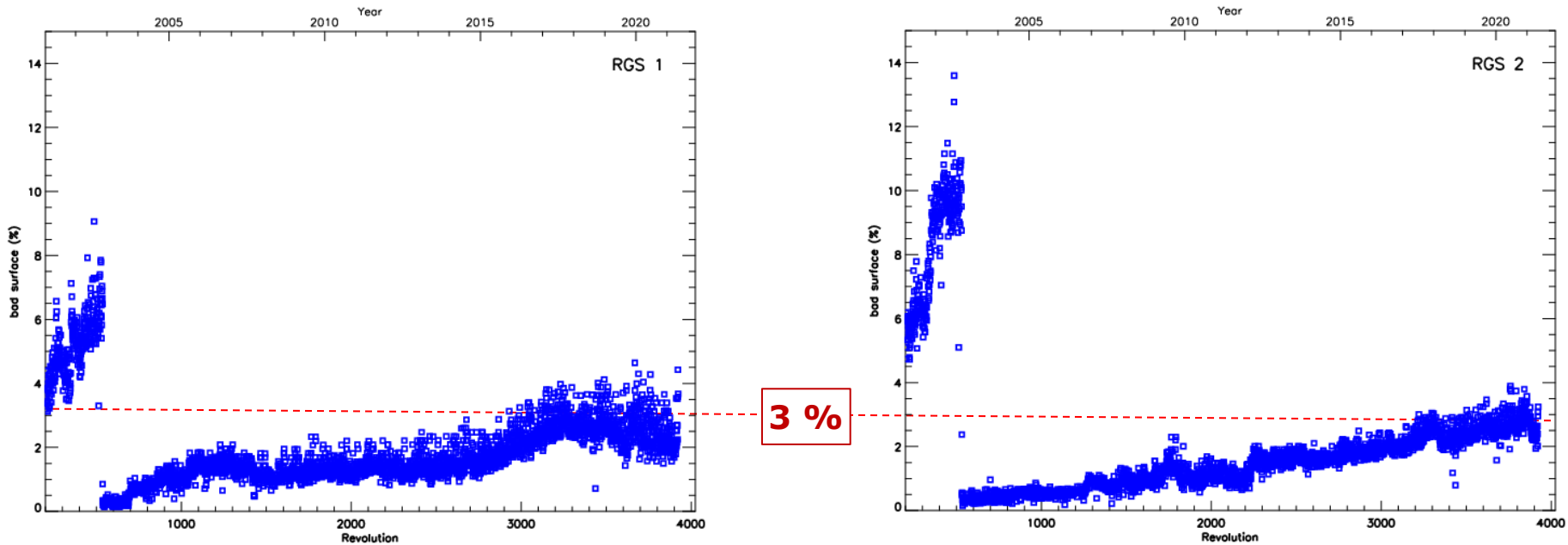


* readout noise + dark current





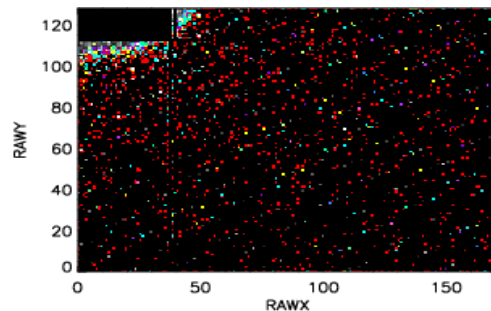
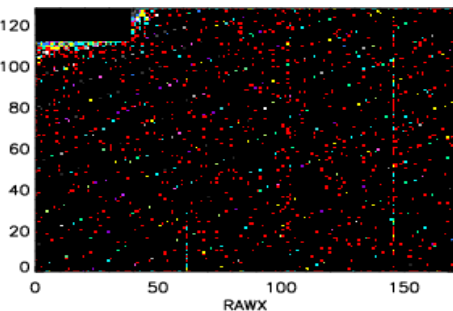
Instrument Status: Bad Surface



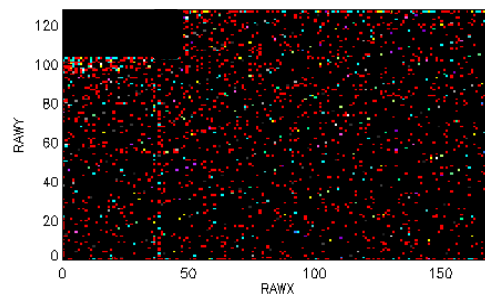
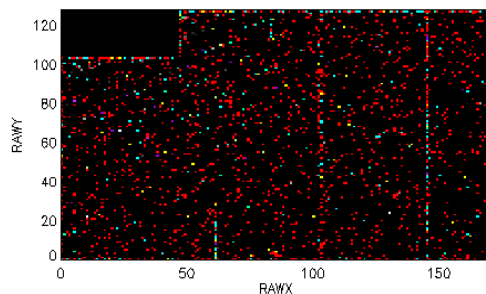
node C

v15

node D



v16



Updated RGS1 CCD 1 Hot Stuff

- Feb 2021

CCF RGS1_BADPIX_0039 issued:

Advisory extended segments

- Mar 2021

Hot Stuff v16 tested on-board

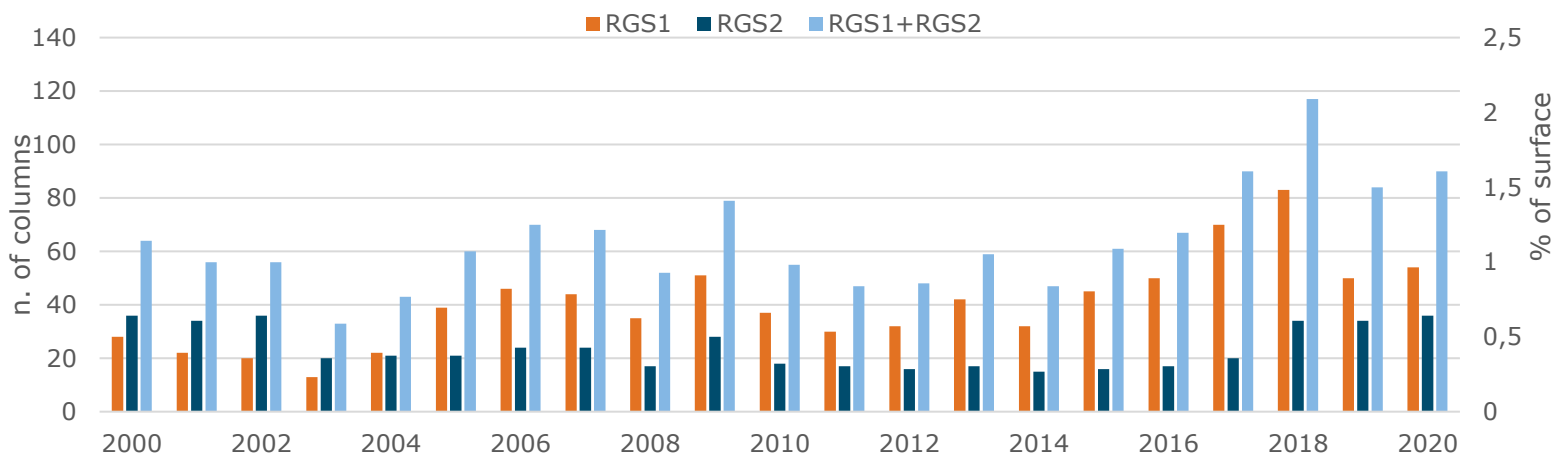
- 1st June 2021

CCF RGS1_BADPIX_0040 issued:

Uploaded extended segments and update of advisory hot columns

Hot Stuff v16 operational

Columns found hot in > 25% of the observations



R. Pérez

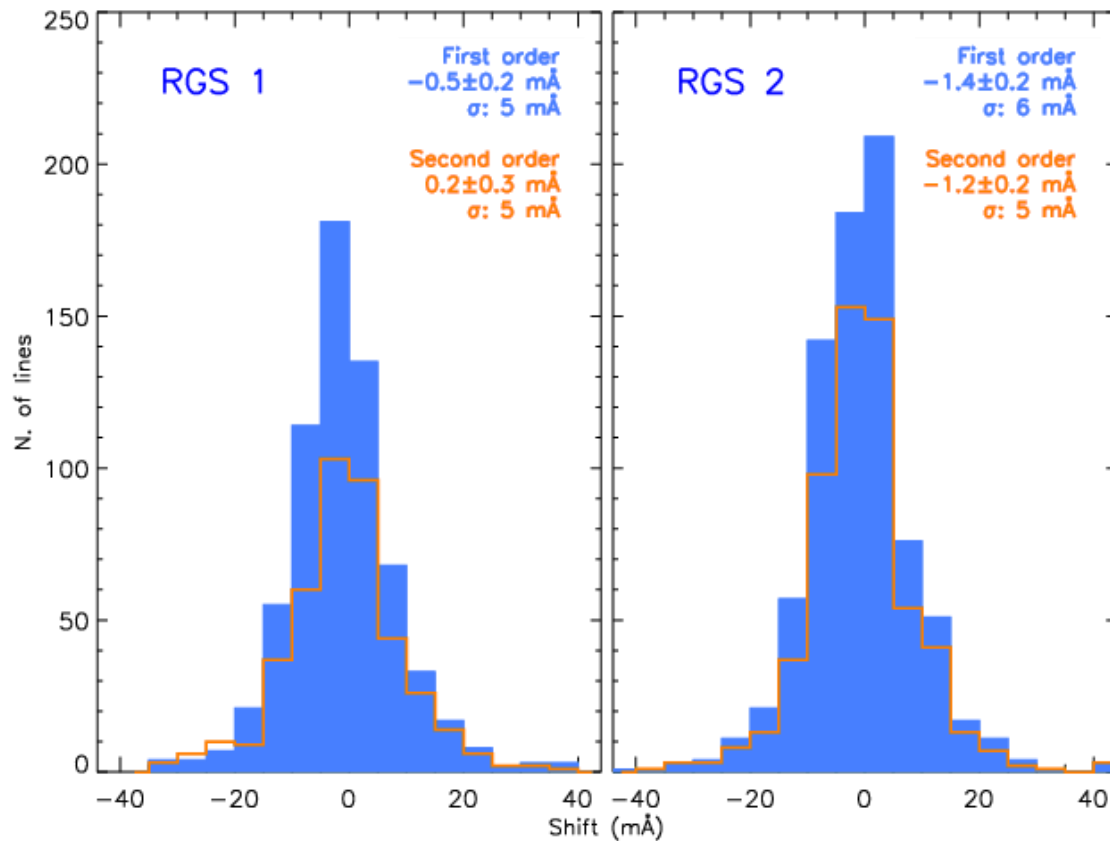
This bar chart displays the number of columns (left y-axis, 0 to 16) and the percentage of surface (right y-axis, 0 to 0,3) for three categories: RGS1 (orange), RGS2 (dark blue), and RGS1+RGS2 (light blue) from the year 2000 to 2020. The x-axis is labeled 'Axis Title'.

Year	RGS1 (n. of columns)	RGS2 (n. of columns)	RGS1+RGS2 (n. of columns)	RGS1 (% of surface)	RGS2 (% of surface)	RGS1+RGS2 (% of surface)
2000	1	5	6	0,02	0,10	0,12
2001	3	6	9	0,05	0,12	0,17
2002	1	4	5	0,02	0,08	0,10
2003	1	3	4	0,02	0,06	0,08
2004	3	3	6	0,05	0,06	0,12
2005	4	4	8	0,07	0,07	0,14
2006	4	6	10	0,07	0,10	0,17
2007	3	6	9	0,05	0,10	0,17
2008	3	4	7	0,05	0,07	0,12
2009	4	6	10	0,07	0,10	0,17
2010	3	4	7	0,05	0,07	0,12
2011	3	4	7	0,05	0,07	0,12
2012	3	4	7	0,05	0,07	0,12
2013	4	4	8	0,07	0,07	0,14
2014	3	4	7	0,05	0,07	0,12
2015	3	4	7	0,05	0,07	0,12
2016	4	4	8	0,07	0,07	0,14
2017	6	6	12	0,10	0,10	0,20
2018	8	6	14	0,13	0,10	0,23
2019	10	5	15	0,17	0,08	0,25
2020	11	4	15	0,19	0,07	0,25

- 1 in RGS1
- 1 in RGS2

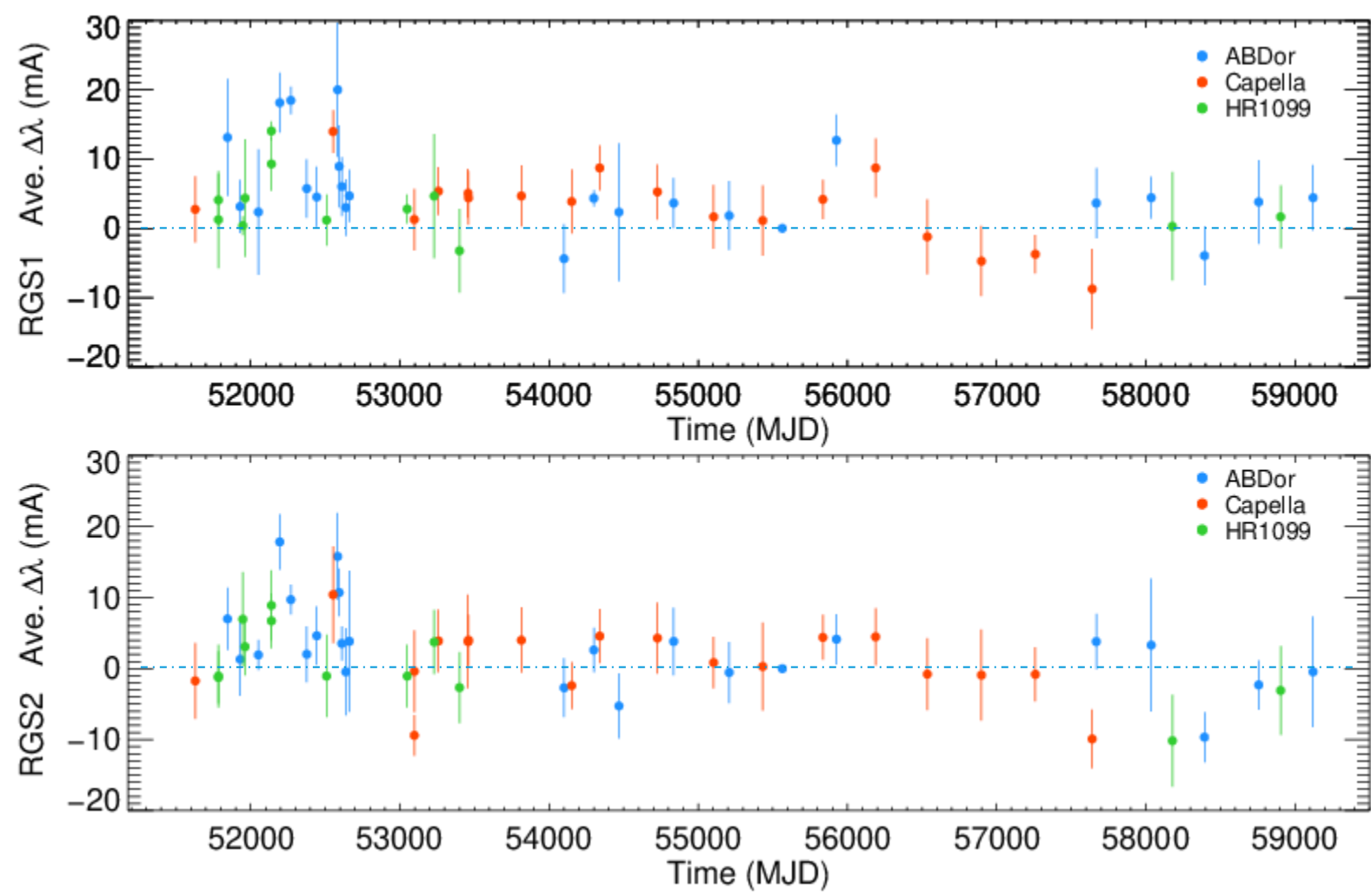
- 6 in RGS1
- 6 in RGS2

European Space Agency



Wavelength scale stable

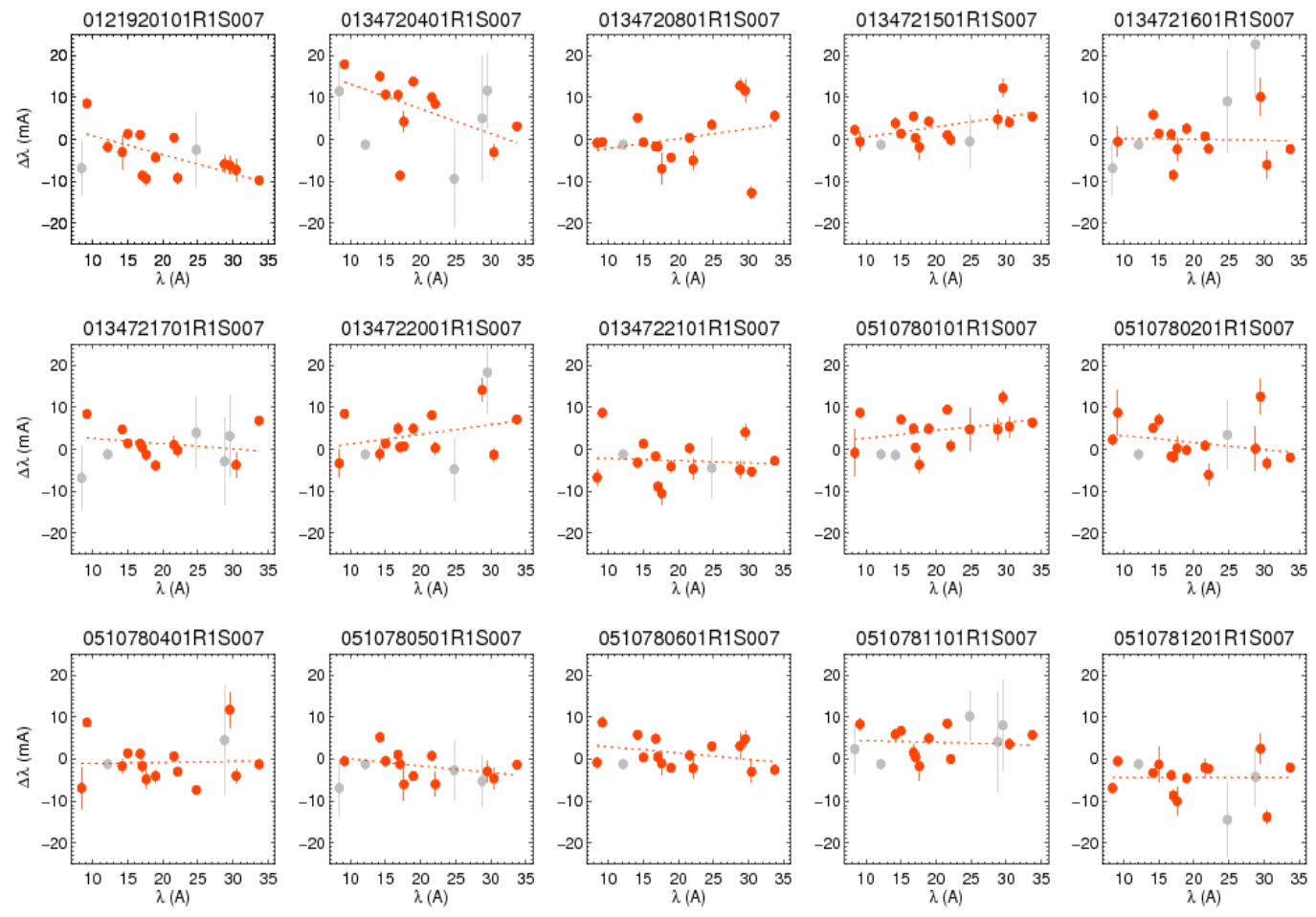
Accuracy $\approx 5 \text{ mÅ}$



C. Sánchez

Calibration: Wavelength Scale

Work on-going: $\Delta\lambda$ vs λ ?



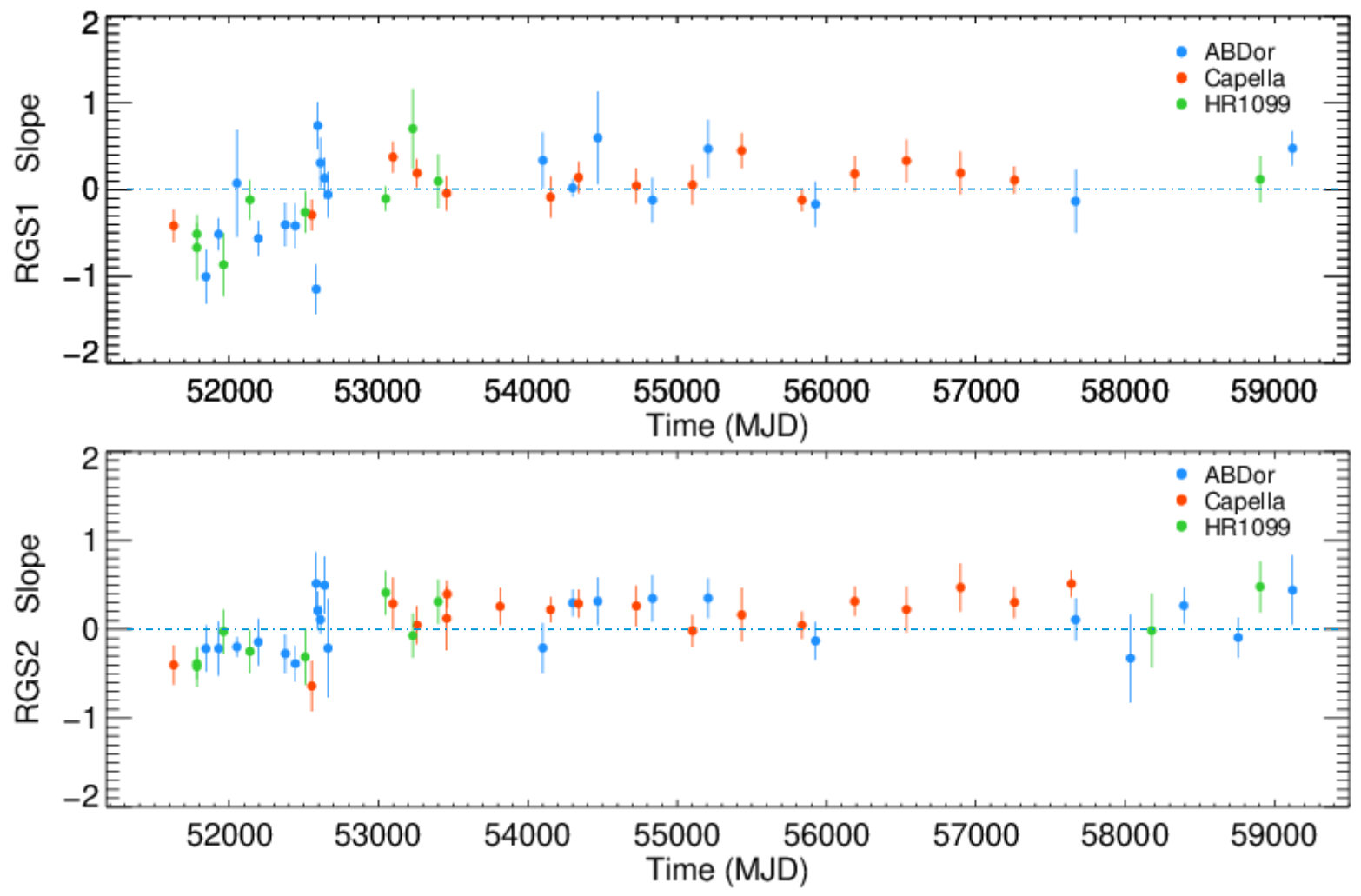
C. Sánchez



Calibration: Wavelength Scale



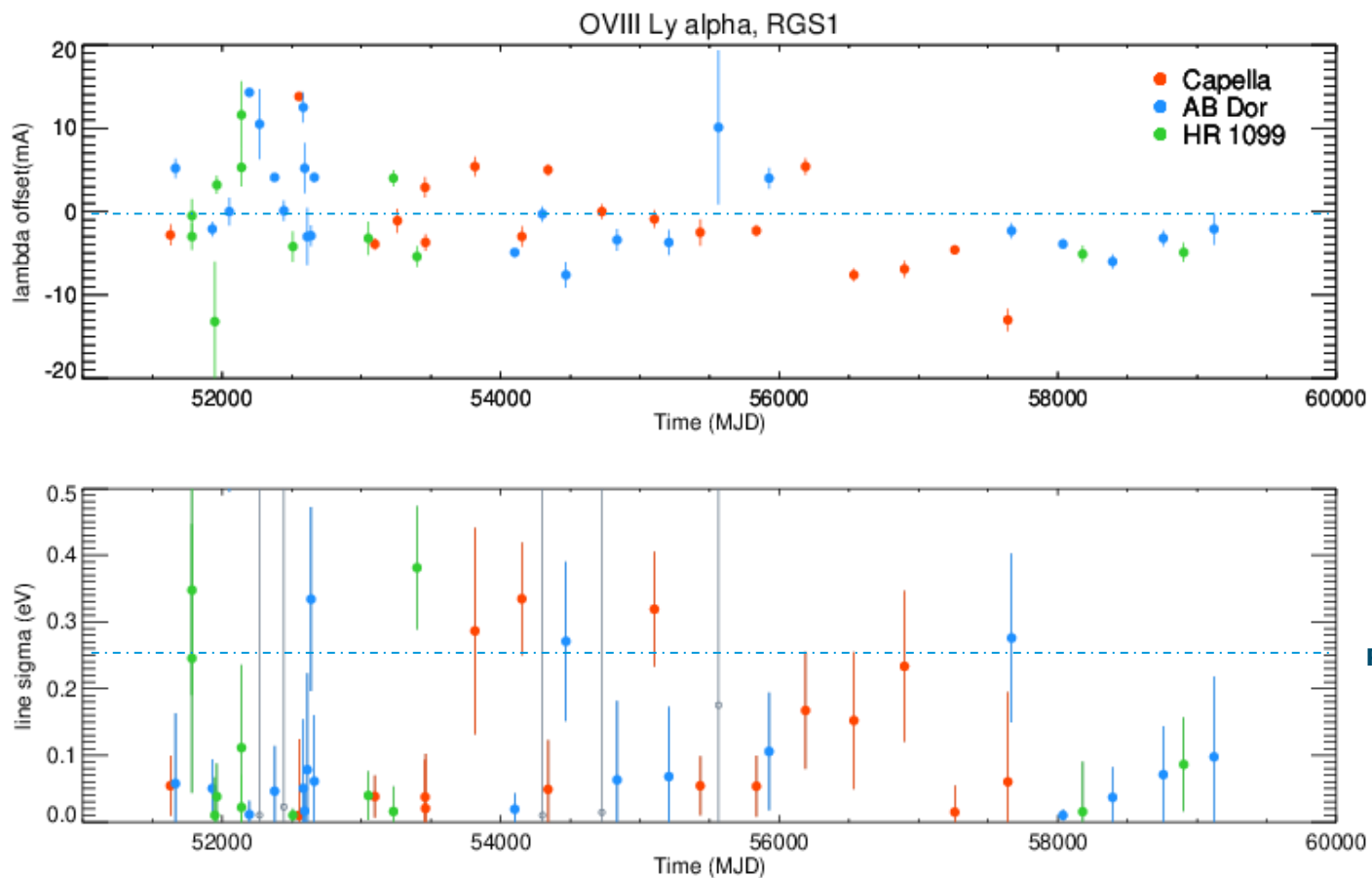
Work on-going: $\Delta\lambda$ vs λ ?



C. Sánchez



Work on-going: Assessment of the LSF

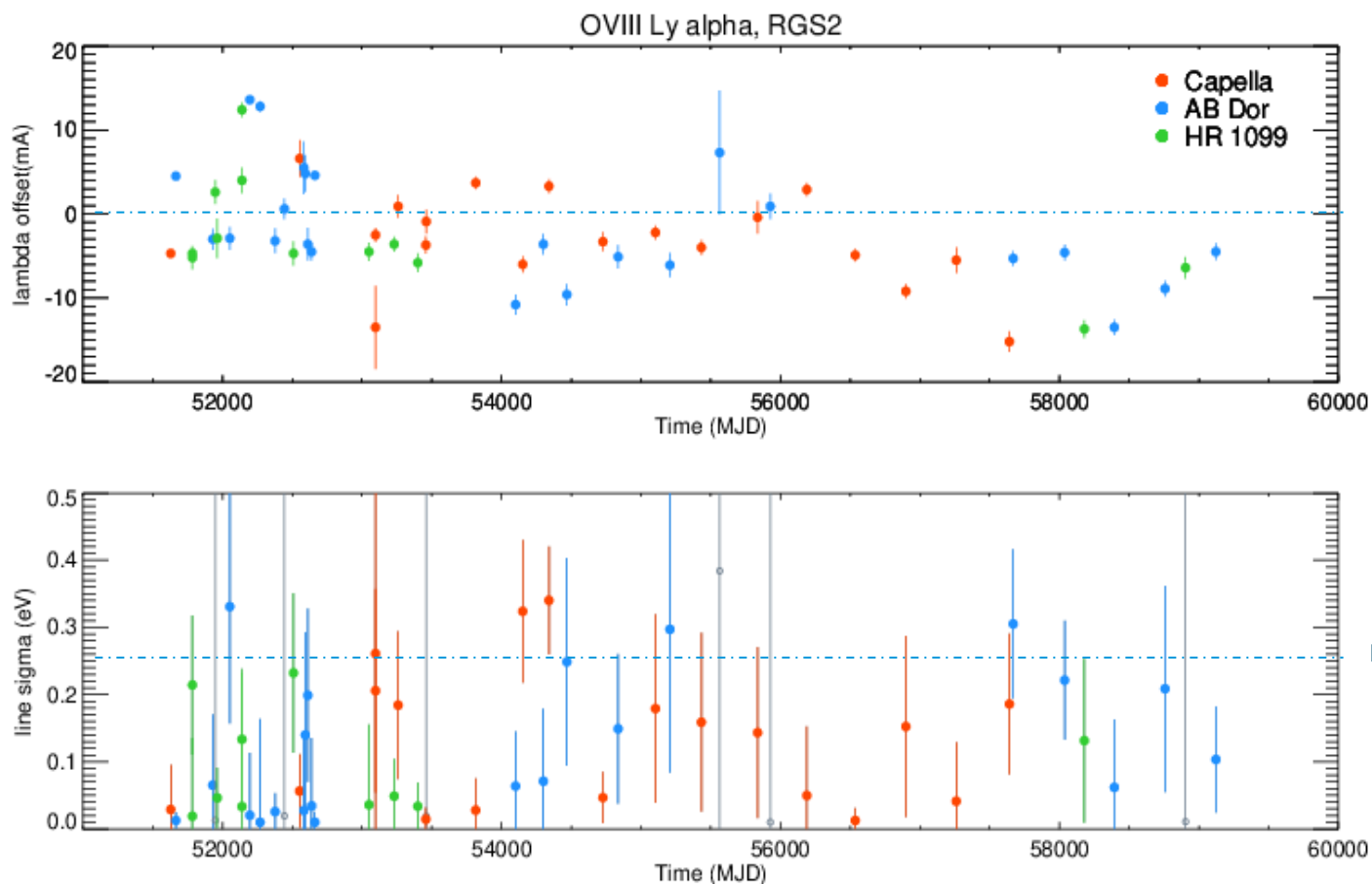


C. Sánchez

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Rosario Gonzalez-Riestra | ESAC | 09/06/2021 | Slide 16

Work on-going: Assessment of the LSF



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Three time-dependent corrections:

- Contamination correction, applied by default
- Effective Area correction now applied in SAS by default, with `rgsproc/rgsrmfgen` parameter

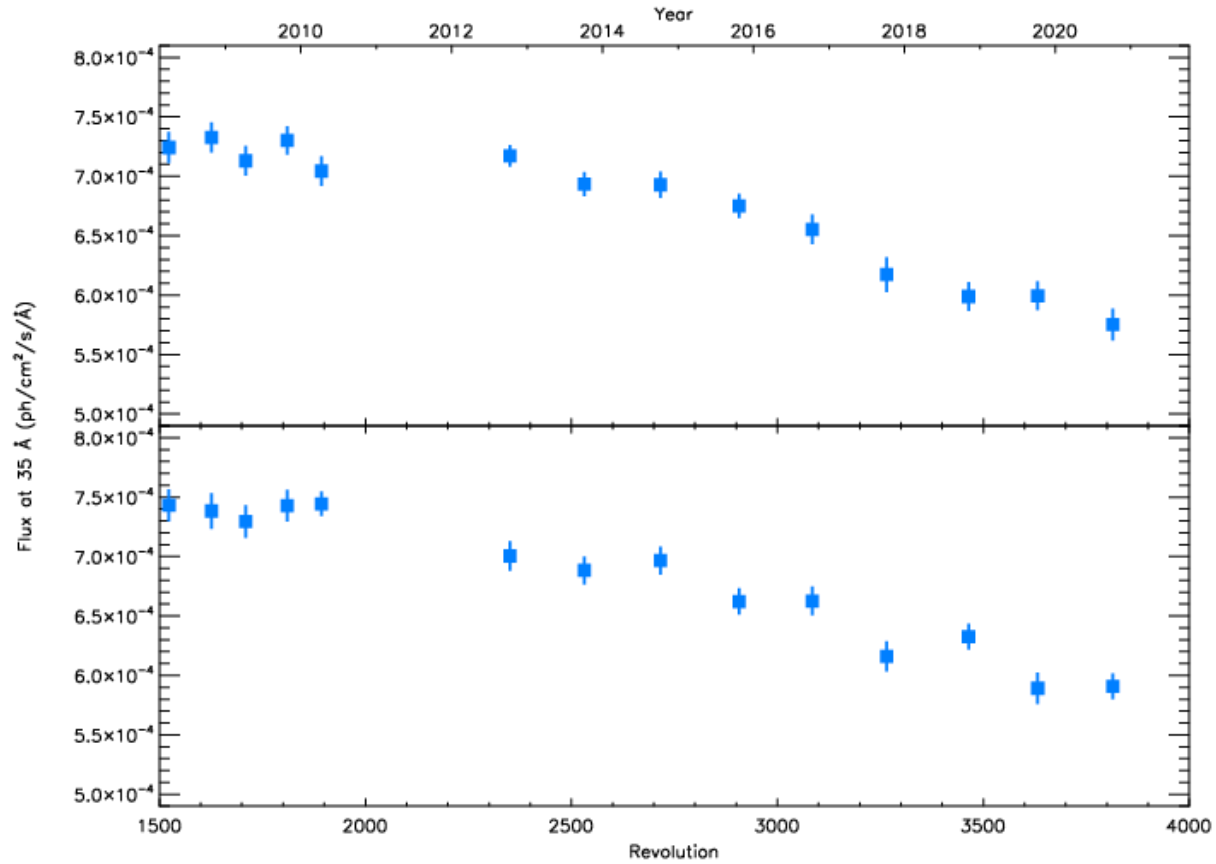
`witheffectivaeracorrection=yes`

- Correction with respect to EPIC-pn (aka Rectification Factors) can be applied with the non-default option

`withrectification=yes`

- Corrections to be updated adding recent data

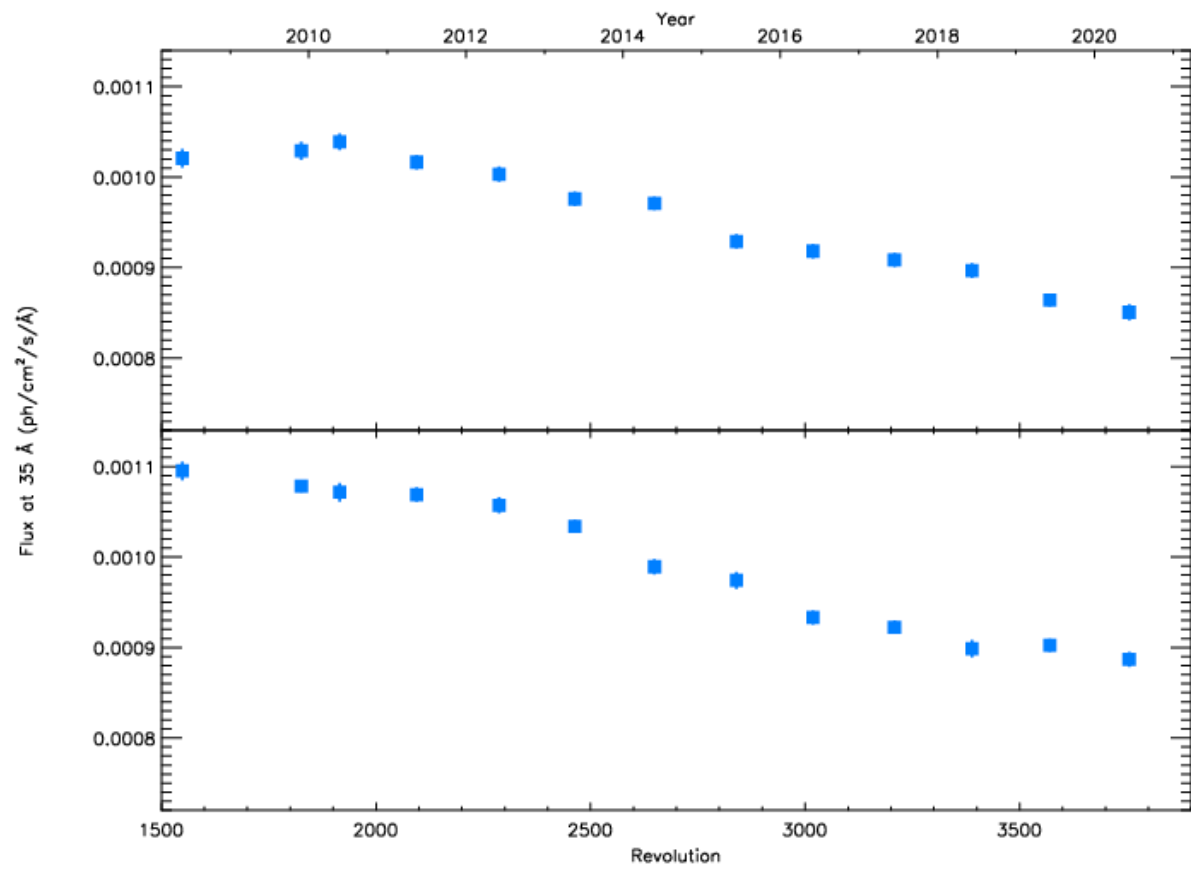
RXJ1856-3754



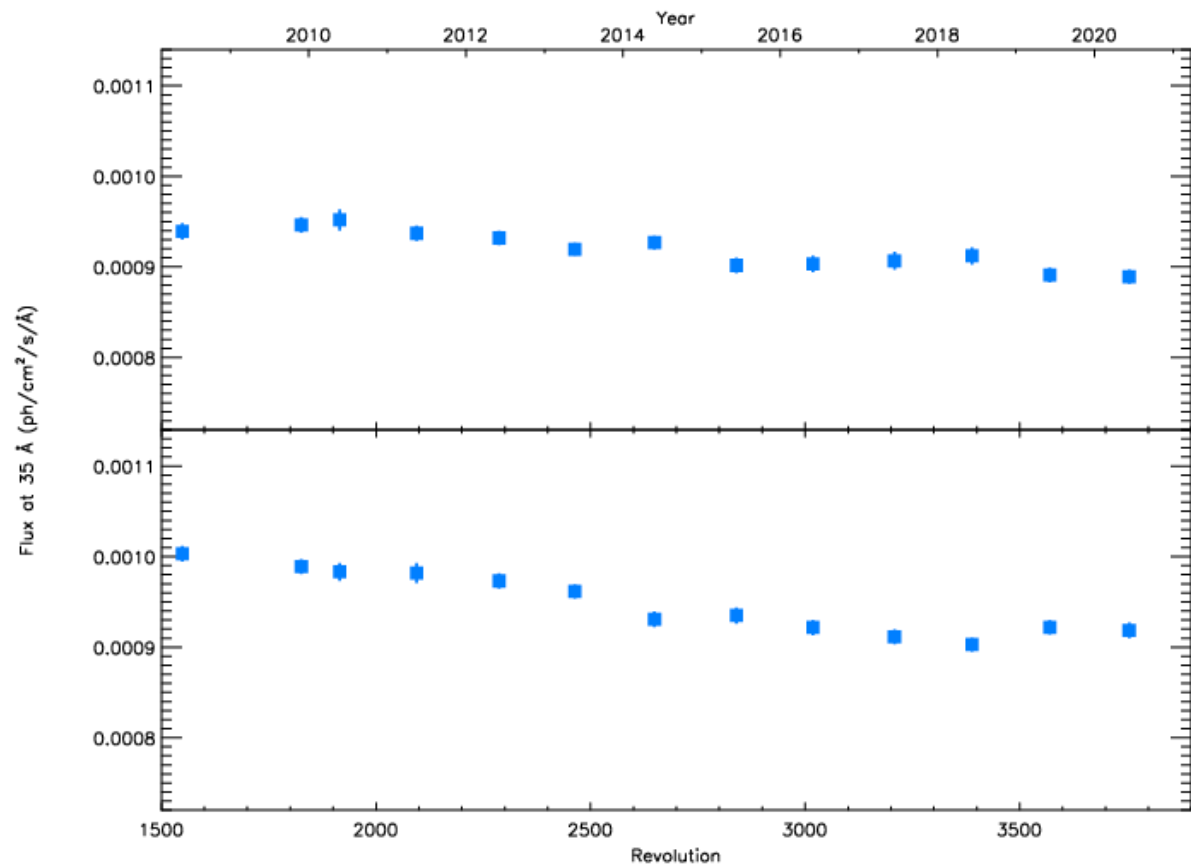
With correction



Vela Pulsar



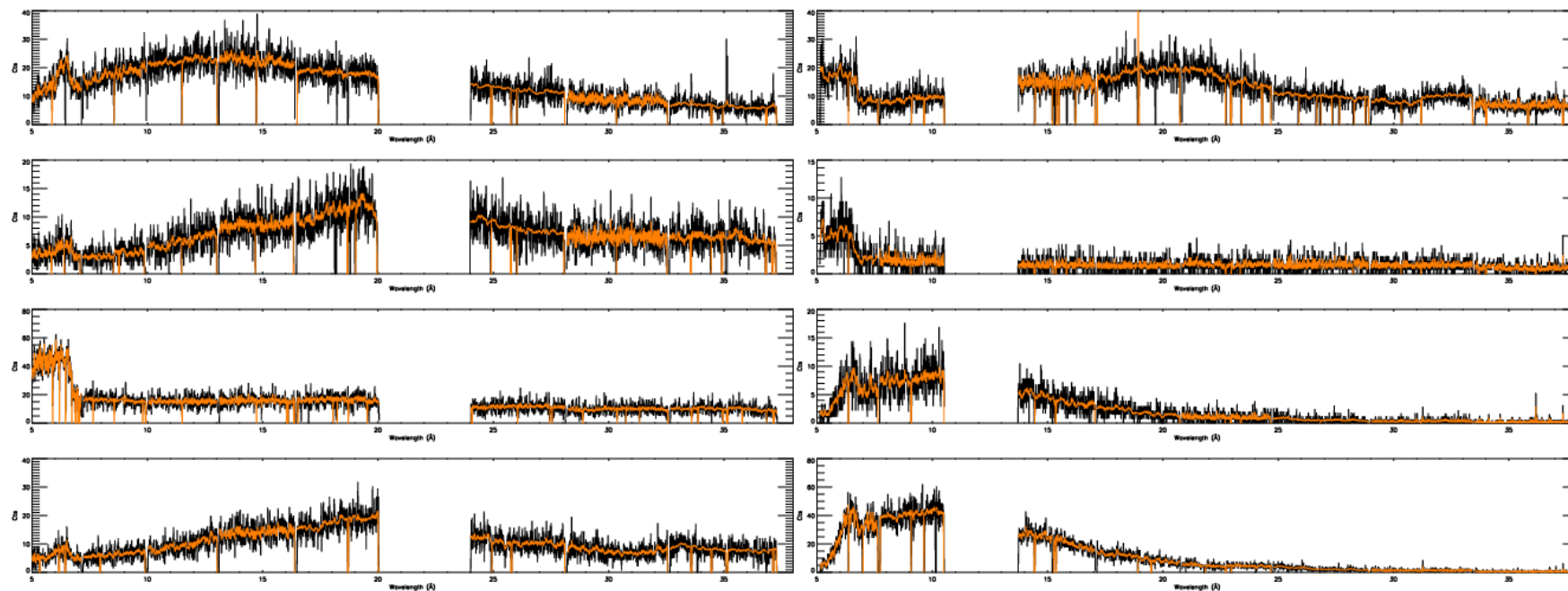
Vela Pulsar



With correction

New SAS task rgsbkgsmoothing (method by J. Kaastra)

- Wiener filtering:
 - Make FFT of background spectrum
 - Determine noise level N^2 at high frequency
 - Make model for “true” signal S^2
 - $Filter = S^2 / (S^2 + N^2)$
 - Multiply FFT by filter and transform back
- SAS implementation in Phyton
- Undergoing testing and validation



- Operations and Instrument Status
 - Operations are running smoothly
 - No degradation in the instrumental parameters
 - RGS1 CCD1 Hot Spots masked area updated on-board
- Wavelength scale
 - Wavelength scale stable
 - Systematic effects under study
 - Re-evaluation of the LSF
- Effective Area
 - Variations in Effective Area continuously monitored.
 - Corrections to take into account the observed change in Effective Area implemented, to be updated with recent data
- Evaluation of new methods for background subtraction on-going

Thanks!

SRON and ESAC RGS Teams