Agenda:

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EPIC BG working group:          6th meeting: 05/11/07 - Mallorca
=================================================================

        Agenda
        ======

Location : http://www.hoteltora.com/                    [Minutes - ME]

14:30 - 18:00 (tea/coffee at ~16:15)
=============

Introduction and action items from last meeting         [AMR]

BG report from the June XMM-Newton UG meeting           [ME]

The status of XMM-ESAS                                  [SS]

The status of the Blank Sky files and software          [JAC]

EPIC PN background spectra for low surface
brightness sources                                      [WNP]

Discussion: Web Pages, BG Components, FWC data,
new scripts/tools, long-term BG trends etc.             [AMR + all]

Summing-up - AOB - Plans for the next period -
Next meeting

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```

Apologies:

None

Actions from last meeting (taken from minutes) 1/3

1.0 Action Items from last meetings (AR)

AI_EPIC_BG_WG_01_01: SS to provide by October 2005 to SOC
- Proton screening tool
- Use of multiple light curves for screening
- Provide list of st. candles for BG analysis comparison with different tools

- By end of December 2005 a SAS task version will be available for DT, aiming release for SAS 7.0 – **OVERDUE** (SAS task by B. Perry for DT; there was a problem with Perl numerical recipes & PGP key for upload) – see new AI_EPIC_BG_WG_03_07
- list of BG candles - **ONGOING**

AI_EPIC_BG_WG_01_04: AR to invite other BG experts to next meetings and to provide possibly scripts/tasks - **ONGOING**

AI_EPIC_BG_WG_01_12: MF: Once any BG or Closed fits files had been obtained, the user can change their CCF_PATH etc. setup so that a new cifbuild would incorporate these extra files. This enables the BG/Closed events files (e.g. the ones used in SS's task) to be used in the SAS, without them having to be included in the CCF files. – **ONGOING, no news from MF** - Interface TBD (MF & RS)

AI_EPIC_BG_WG_02_01: MK to ask RGS if RGS BG light curve could help EPIC screening
OPEN: MK shortly discussed with A. Pollock: **no news from MK,**
A. Pollock should be involved later (invite him for one of the next meeting)

AI_EPIC_BG_WG_02_03: ME to test and transfer WPs script of 01_11 to SOC thread
ONGOING, to be used/tested by SAS-WS participants;
AI is now part of the project of a Young Graduate Trainee (YGT) working with ME at ESAC, see Section 2.5 below.

AI_EPIC_BG_WG_03_02: On all: provide AR with additional links & more papers for BG component table - **ONGOING**

AI_EPIC_BG_WG_03_07: on ME: test soft proton screening s/w SAS tool "espfilt"
OPEN – v0.7 is available in SAS development track now: 1st test on A1795 MOS data looks OK, pn check still TBD

AI_EPIC_BG_WG_03_08: on MF: UHB update section 3.2.4: outside FoV eff. Area (up to 80 arcmin). Update of CCF (currently not supported, calview, 15 arcmin, TBC) **OPEN, no news from MF**

AI_EPIC_BG_WG_03_10: on SM: provide BGWG with script on bkg treatment in spectral analysis (after publication of related paper) – OPEN ⇒ see talk by AL, section 2.4

AI_EPIC_BG_WG_03_11: on AR: check HK parameters for anomalous MOS FWC data – OPEN

AI_EPIC_BG_WG_04_02: on SS/K. Kuntz: try to extend MOS tools such that they also work for EPIC-pn by about June 2007 – ONGOING

AI_EPIC_BG_WG_04_05: on JC/ME: test if location selection tool for blank-sky fields can be installed at ESAC – ONGOING

AI_EPIC_BG_WG_04_06: on JC/AR: check if 'ghosting' script can be made available to all users via the BGWG script page – ONGOING

AI_EPIC_BG_WG_04_07: on AR: trigger the generation of full field-of-view FWC MOS data by K. Kuntz (standard mode), and make them available to ME for an update of the FWC web page and related Newsletter announcement – ONGOING

AI_EPIC_BG_WG_04_08: on AR: trigger the generation of smaller sub-sets of EPIC-pn FWC data (with M. Freyberg) ⇒ update of FWC web page needed - OPEN

AI_EPIC_BG_WG_04_10: on SS: ask K. Kuntz to include a figure on the dependence of the flaring MOS background on the orbital position of XMM-Newton in the planned paper – ONGOING

New Action Items resulting from this meeting:

AI_EPIC_BG_WG_05_01: on ME: continue testing of espfilt task with the goal of a first public release in SASv7.1

AI_EPIC_BG_WG_05_05: on SS: try to extend functionality of ESAS for pn and deliver a progress report for the next BGWG meeting

AI_EPIC_BG_WG_05_06: on AR/SS/ME: formulate request for more FWC calibration data

Possible future AI (on R. Saxton+student)?

Use SciSim to simulate cluster & bkg and test different analysis methods on it (also for Chandra simulator).

Background Analysis

This page gives information on the background analysis of all XMM-Newton instruments (EPIC, RGS, OM) in order that a proper data reduction may be undertaken.

EPIC Background	RGS Background	OM Background	XMM-Newton Background

EPIC

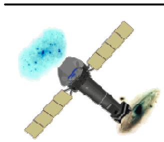
Introduction

The XMM-Newton observatory provides unrivalled capabilities for detecting low surface brightness emission features from extended and diffuse galactic and extragalactic sources, by virtue of the large field of view of the X-ray telescopes and the high throughput yielded by the heavily nested telescope mirrors. In order to exploit the excellent EPIC data from extended objects, the EPIC background, now known to be higher than estimated pre-launch, needs to be understood thoroughly.

There are several different components to the EPIC background:

1. Photons:
   - The astrophysical background, dominated by thermal emission at lower energies (E<1 keV) and a power law at higher energies (primarily from unresolved cosmological sources). This background varies over the sky at lower energies.
   - Solar wind charge exchange.
   - Single reflections from outside the field of view, out-of-time events etc.
2. Particles:
   - Soft proton flares with spectral variations from flare to flare. For weak sources the only option is to select quiet time periods from the data stream for analysis.
   - Internal (cosmic-ray induced) background, created directly by particles penetrating the CCDs and indirectly by the fluorescence of satellite material to which the detectors are exposed.
3. Electronic Noise:
   - Bright pixels, columns etc., readout noise etc.

A table summarizing the temporal, spectral and spatial properties of these EPIC background components is available here.



XMM-Newton EPIC Background Components

Table summarizing the components within the XMM-Newton EPIC Background; temporal, spectral and spatial properties.

Count rate plots, giving an estimate of the to-be-expected EPIC background in 'low background' periods, both in-FOV (~photons+particles) and out-FOV (~particles), are available here.

	PARTICLES			PHOTONS	
	SOFT PROTONS	INTERNAL (cosmic-ray induced)	ELECTRONIC NOISE	HARD X-RAYS	SOFT X-RAYS
Source	Few x 100 keV solar protons, accelerated by magnetospheric reconnection events. Dominate times of high-BG.	Interaction of High Energy particles (cosmic rays) with detector - associated instrumental fluorescence.	(1) Bright pixels & (parts of) columns. (2) CAMEX readout noise (pn). (3) (4) Artificial Low-E enhancements in outer MOS CCDs (Also dark current - thought negligible).	X-ray background (AGN etc), Single Reflections from outside FOV, Out-of-time (OOT) events (pn)	Local Bubble, Galactic Disk, Galactic Halo, Solar Wind Charge Exchange (SWCX), Single Reflections from outside FOV, Out-of-time (OOT) events (pn)
Variable? (per Observation)	Flares (up to >1000%). Unpredictable. Significant quiescent component (long flares) - survive GTI screening. (Also additional possible 'irreducable' component).	+/-10%. MOS: >2keV continuum unchanged, small changes in fluorescence lines. <1.5keV continuum varies - may be be due to Al redistribution. pn: Difference between continuum and lines (some correlation).	(1) +/-10%. (2) Very constant. (3) (4) Believed constant.	Constant.	Constant. Long obs. may see effect of SWCX (e.g. variations at 0.5-1.2 keV [OVIII/MgXI], but not at 2-4 keV).
Variable? (Obs. to Obs.)	Unpredictable. Affect 30%-40% of time. Flaring SP increasing? Quiescent SP not evolving. More SPs far from apogee. More SPs in winter than in summer. Low-E flares turn on before high-E.	Majority @ +/-15%. Can be x10 higher in high radiation periods. No increase after solar flares. Plus above 'per Observation' variations.	(1) >1000% (pixels come and go, also [micro-]meteorite damage). (2) Mode-dependent (lowest eFF, then FF, LW, highest SW) (3) effects 5-20+% of obs. (4) effects 20-50% of obs. (factor [illegible]	Constant. OOT events (pn) mode-dependent (LW:0.16%, FF:6.3%, eFF:2.3%)	Variation with RA/Dec (+/-35%). SWCX may affect observations differently. OOT events (pn) mode-dependent (LW:0.16%, FF:6.3%, eFF:2.3%)
Spectral	Variable. Unpredictable. Continuum spectrum (no lines), fitted by unfolded xspec PL (double-exponential or broken power law [break energy stable ~3.2 keV]) model for E>0.5keV (E<0.5keV, less flux is seen). Variable in intensity + shape (higher the intensity, flatter the slope).	Flat (MOS index~0.2) + fluorescence + detector noise. MOS: 1.5keV Al-K, 1.7keV Si-K. Det.noise <0.5keV. High-E lines (Cr, Mn, Fe-K, Au). PN: 1.5keV Al-K. No Si (self-absorbed). Cu-Ni-Zn-K (~8keV). MIP noise <0.3keV.	(1) low-E (<300eV), tail may reach higher-E. (2) low-E (<300eV). (3) (4) low-E (<500eV) (3) High-rate plus soft excess.	1.4 power law. Below 5keV, dominates over internal component. Above 5keV, internal component component dominates (in times of low-BG).	Thermal with ~<1keV emission lines. Extragalactic @>0.8keV, index=1.4. Galactic - emission/absorption varies. SWCX very soft, with unusual OVIII/OVII line ratios (plus others) - Strong OVIII & MgXI
Spatial - Vignetted?	Yes (scattered) - Vignetting is flatter than for photons - low-E SPs extremely flat, higher-E SPs steeper	No - flat (see below).	(1,2) No. (3) No/unclear (out-FOV) (see below) (4) Yes - evident in vignetting maps (in-FOV). (similar, smaller-magintude vignetting asymmetries seen in pn).	Yes.	Yes.
Spatial - Structure?	Perhaps, in MOS due to the RGA. No structure seen in pn. SP feature seen in MOS1-CCD2 at low-E. SPs observed only inside FOV.	Yes. Detector + construction. MOS: outer CCDs more Al, less Si. CCD edges more Si. Less Si out-FOV. Continuum diff. between out-FOV and in-FOV below Al line (redistribution?). More Au out-FOV. Changes in high-E lines. CCD-to-CCD: line intensity variations, energies/widths stable. PN: Line intensities show large spatial variations from electronic board. Central 'hole' in high-E lines (~8keV). Residual MIP contribution near CAMEX readout (low-E, non-singles, parallel to readout).	Yes. (1) Individual pixels & columns. (Also [pn] sections of columns away from CAMEX, near to FOV centre) (2) Near pn readout (CAMEX), perpendicular to readout. (3) MOS1 CCDs 4 & 5, MOS2 CCDs 2 & 5 - unusual in- & out-FOV differences (esp. MOS1 CCD4) and spatial inhomogeneities. (4) MOS1 CCDs 2 & 5.	No. Single reflections: Diffuse flux from 0.4-1.4 deg (out-FOV) is ~7% of in-FOV signal. Effective area of 1 telescope ~3 sq.cm at 20-80 arcmintes off-axis. OOT events (pn) smeared along readout from bright sources of X-rays. (extra BG in pn LW mode due to frame store area).	No, apart from real astronomical objects. Exgal.>0.8keV spatially uniform. SWCX over whole FOV. Single reflections: Diffuse flux from 0.4-1.4 deg (out-FOV) is ~7% of in-FOV signal. Effective area of 1 telescope ~3 sq.cm at 20-80 arcmintes off-axis. OOT events (pn) smeared along readout from bright sources of X-rays. (extra BG in pn LW mode due to frame store area).
Patterns	Distribution similar to genuine X-rays.	Distribution different from genuine X-rays.	Distribution different from genuine X-rays.	Genuine X-ray distribution.	Genuine X-ray distribution.

Products

- XMM-Newton Extended Source Analysis Software package, XMM-ESAS
Released in March 2006 by the EPIC Background Working Group allowing the user to model the quiescent particle background both spectrally and spatially for the EPIC MOS detectors.

- New XMM-Newton 'blank sky' background events files
Released in May 2006 by the EPIC Background Working Group for the 3 EPIC instruments in each of their different instrument/mode/filter combinations, and constructed using superpositions of pipeline product data from the 2XMM reprocessing of many pointed observations.

- Filter Wheel Closed data
Released in September 2006 by the EPIC Background Working Group the stacked collections of Filter Wheel Closed (FWC) data are available for the MOS and pn cameras.

- Further EPIC Background Scripts

Other Useful Information

The following sources of information (including historical collections of background blank sky fields) are also available:

1. Paper: "The XMM-Newton EPIC background: Production of background maps and event files", A.M. Read & T.J. Ponman, A&A 409, 395 (2003)
   Web site: Related EPIC background event files, maps, software, analysis techniques etc.
2. Paper: "XMM-Newton EPIC background modelling for extended sources", J. Nevalainen, M. Markevitch & D. Lumb, ApJ 629, 172 (2005)
   Web site: Supporting data, background event files etc.
3. Paper: "X-ray background measurements with XMM-Newton EPIC", D. Lumb, R.S. Warwick, M. Page & A. De Luca, A&A 389, 93 (2002)
   Web site: Related background files and explanatory notes.
   [An older version of the background files is still available: Web site: Old background files and old explanatory notes].
4. Paper: "The EPIC/MOS view of the 2-8 keV Cosmic X-ray Background Spectrum", A. De Luca & S. Molendi, A&A 419, 837 (2004)
5. Paper: "XMM-Newton Data Processing for Faint Diffuse Emission: Proton Flares, Exposure Maps and Report on EPIC MOS1 Bright CCDs Contamination", J. Pradas & J. Kerp, A&A 443, 721 (2005)

XMM-Newton Further EPIC Background Scripts

This page contains the following scripts:

- Estimation of the residual Soft Proton flare contamination
- The "images" Script: a tool to create attractive XMM-Newton images

Estimation of the residual Soft Proton flare contamination

A shell script to perform the Fin/Fout ratio calculation developed by Silvano Molendi, Andrea De Luca & Alberto Leccardi (2004, A&A 419, 837) on EPIC event files (MOS1, MOS2 and/or pn), to estimate the amount of residual Soft Proton flare contamination is available.

The script can be run on any EPIC event files (MOS1, MOS2 and/or pn), to estimate the amount of *residual* Soft Proton (SP) flare contamination, i.e. it should only be used *after* attempts have been made to clean the event files for SPs using GTI filtering.

The script compares area-corrected count rates in the in-FOV (beyond 10 arcminutes) and out-of-FOV regions of the detector. The higher the in-FOV to out-of-FOV ratio, the more the file is contaminated by SPs:

Ratio < 1.15	: File is not contaminated by SPs.
Ratio 1.15-1.3	: File is slightly contaminated by SPs.
Ratio 1.3-1.5	: File is very contaminated by SPs.
Ratio > 1.5	: File is extremely contaminated by SPs.

For point source analysis, and especially for bright point sources, a rigorously correct treatment of the background is not critical, and even extremely SP contaminated files may be analysed safely in the usual manner.

For extended source analysis however, even a moderate amount of residual SP contamination may lead to corrupted science results, especially e.g. in the estimated temperature. Here the user may wish to, depending on what they are trying to do, use another (cleaner) observation (of the same or a different target). Or they may attempt to remove the residual SPs using more complex data screening (some descriptions of various techniques are given in the Other Useful Information section of the main ESAC-XMM Background Analysis page). If the data allow, the user could also attempt to include the SP contamination as an extra model component, when modelling the data (e.g. in spectral fitting).

Note finally that for observations where an extended source fills the entire field of view (FOV), e.g. the Coma cluster, then the Fin_over_Fout script does not yield a reliable measurement of the SP contamination. Care should be taken in such situations.

The script may be downloaded here.

Fin_over_Fout [New – Available]

Warnings put in regarding use of the MOS1 algorithm with post Rev-961 MOS1 CCD6 loss

[have requested input from SM/AL]

```
amr30@epic6 /work/amr30/M101/OBS1/ > ../../Scripts/Fin_over_Fout r1_EvM1_f.fits r1_EvM2_f.fits r1_EvPN_f.fits N N N N

-------- FIN_OVER_FOUT version 1.1 05/10/07 --------

Creating clean event files and spectra...
Using recommended default Energy ranges...
Analysing MOS1 file...
Warning: MOS1 obervation made after the Rev 961 MOS1 CCD6 loss...
         MOS1 result may not be entirely accurate (to ~10% in RATIO) ...
Analysing MOS2 file...
Analysing PN file...
Removing intermediate files...

          COUNTS        EXP TIME     F(IN)/F(OUT)
        IN     OUT     IN    OUT    RATIO    ERR
M1     9417   2423   37.4  37.4   1.719  0.047   File is extremely contaminated by Soft Protons
M2     8908   2687   38.3  38.3   1.584  0.042   File is extremely contaminated by Soft Protons
PN    18267   1822   23.3  23.3   1.331  0.037   File is very contaminated by Soft Protons

amr30@epic6 /work/amr30/M101/OBS1/ > 
```

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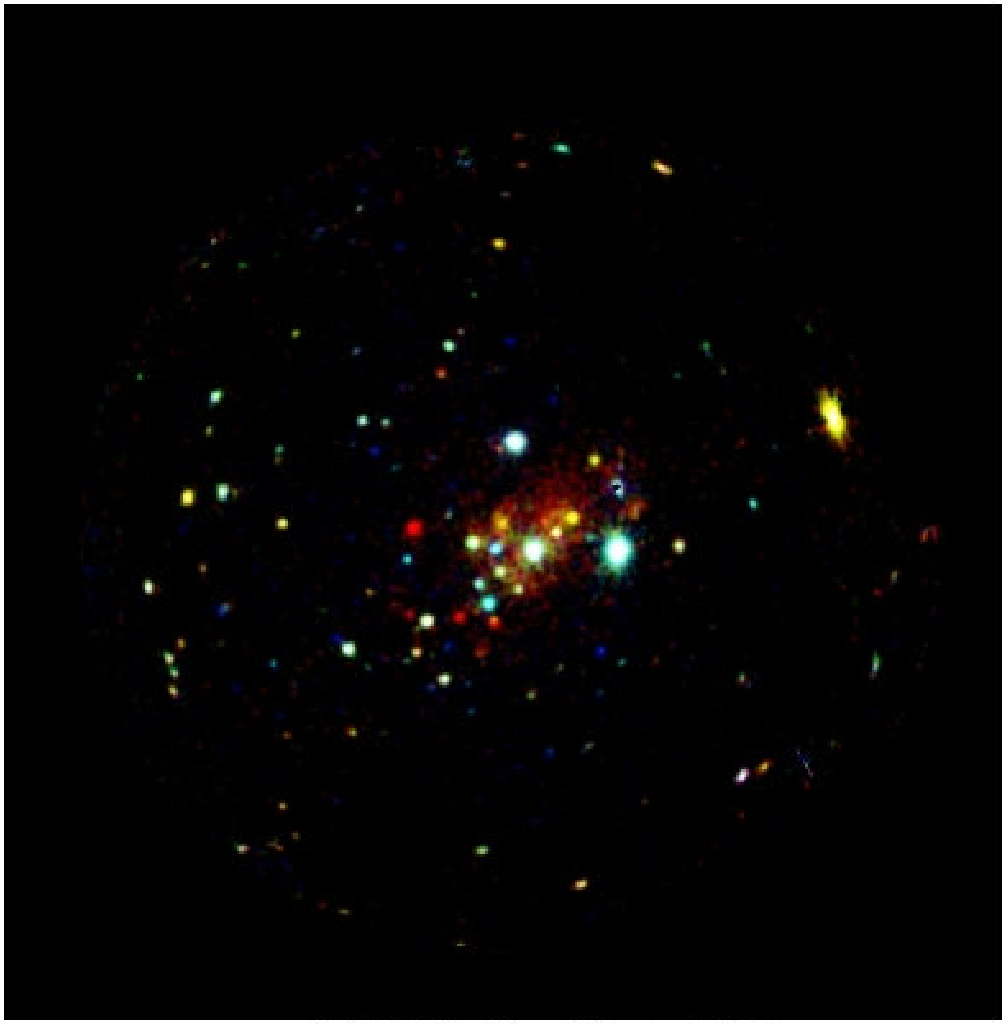
Note finally that for observations where an extended source fills the entire field of view (FOV), e.g. the Coma cluster, then the Fin_over_Fout script does not yield a reliable measurement of the SP contamination. Care should be taken in such situations.

The script may be downloaded here.

Script to perform image creation + cleaning + exposure correcting + smoothing + …

(M. Ehle, R. Willatt, W. Pietsch, M. Bauer)

- Runs cifbuild, odfingest, epchain, emchain, (omichain)
- Performs gti file preparation, gti cleaning, cleans bad pixels and columns, subtracts ooT events (pn)
- Makes images, exposure maps, masks, smoothes images, makes combined exposure map and mask
- Weighs pn against MOS cameras in each band
- Use images, exposure maps, masks and weights to combine images from all cameras



SN2004dj in NGC 2403

BGrebinimage2SKY [New – Available]

Now can rebin and reproject any DETX/DETY image of any binning onto the sky to the spatial scale and sky X/Y position of a user-input image

BGrebinimage2SKY
Projection of Sky maps: A script to rebin and reproject exposure maps (or any DETX/DETY image of any binning) onto the sky to the spatial scale and sky position of a user-input image. This is useful when wanting to work in sky coordinates and to a different spatial scale than e.g. the 4 arcsecond scale used in the production of the exposure maps. This script is a wrapper for a fortran executable and is dependent on the user's operating system.

The shell script (BGrebinimage2SKY) and the fortran executable (either BGrebinimage2SKY_interp_solaris or BGrebinimage2SKY_interp_linux, depending on your system - this must be renamed to `BGrebinimage2SKY_interp') can again be obtained from the main download script site.

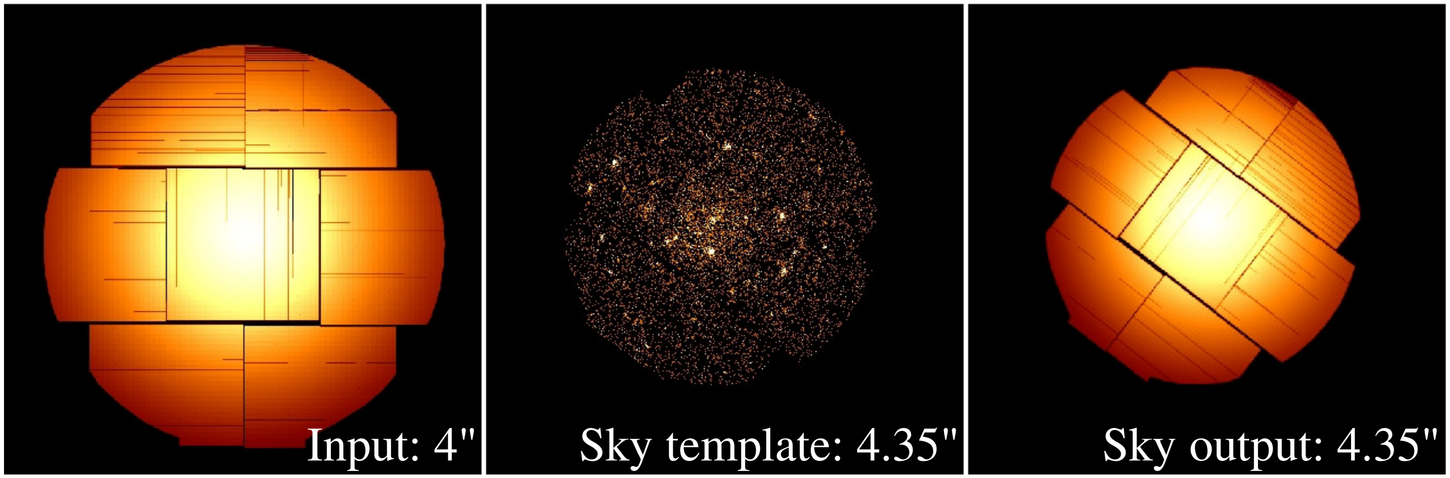
Typing the name of the shell script wrapper BGrebinimage2SKY gives help on usage.

Use:

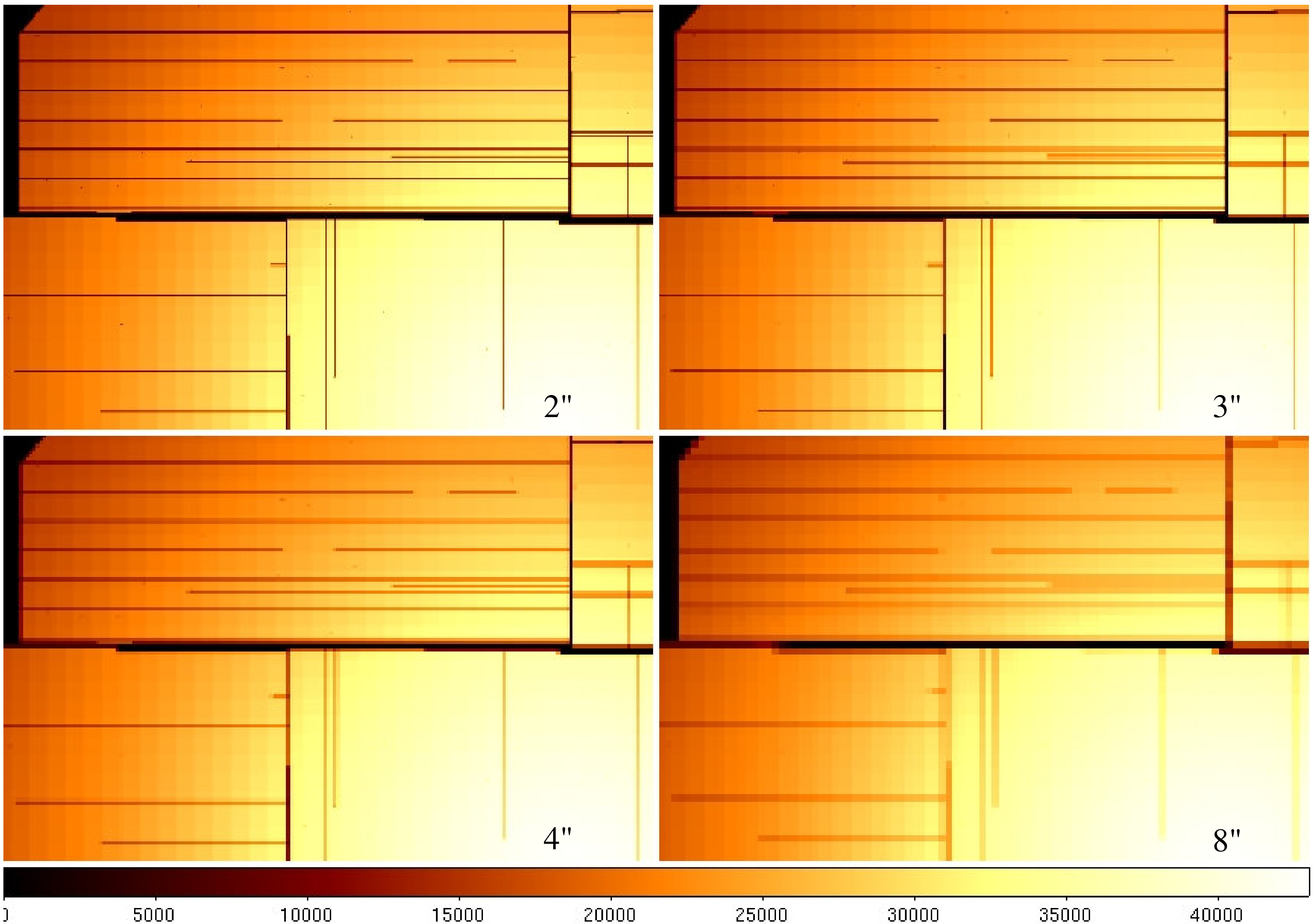
```
BGrebinimage2SKY Input_exposure_map template_image eventfile Interpolation_radius outimage scaling
```

Example call:

```
BGrebinimage2SKY EXPim.fits myimage.fits evfile.fits 0.15 outexp.fits 0
```



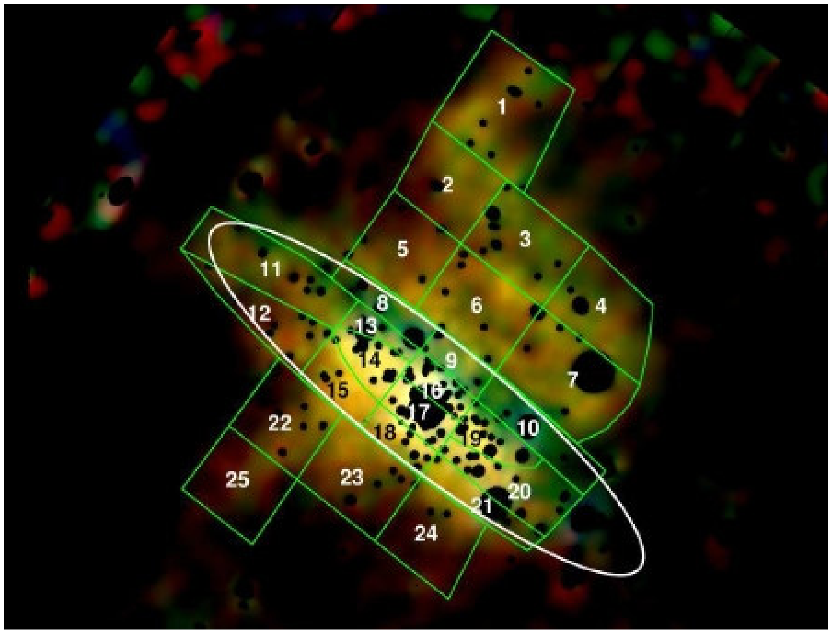
BGrebinimage2SKY


2"
3"
4"
8"
5000
10000
15000
20000
25000
30000
35000
40000

M. Bauer et al.: The diffuse X-ray emission in the starburst galaxy NGC 253

$$B(E) = \underbrace{S_{\rm obs}^{\rm OOT}(E) \times f}_{\text{Out-of-Time events}} + \underbrace{S_{\rm det}(E)\frac{R_{\rm obs}}{R_{\rm det}}\frac{t_{\rm obs}}{t_{\rm det}}}_{\text{detector background}} - \underbrace{S_{\rm det}^{\rm OOT}(E)\frac{R_{\rm obs}}{R_{\rm det}}\frac{t_{\rm obs}}{t_{\rm det}} \times f}_{\text{detector Out-of-Time events}} +$$

$$\underbrace{+ \frac{V(E,\theta_S)}{V(E,\theta_B)}\frac{A_S}{A_B} \times \left(B_{\rm obs}(E) - \underbrace{B_{\rm obs}^{\rm OOT}(E) \times f}_{\text{Out-of-Time events}} - \underbrace{B_{\rm det}(E)\frac{R_{\rm obs}}{R_{\rm det}}\frac{t_{\rm obs}}{t_{\rm det}}}_{\text{detector background}} + \underbrace{B_{\rm det}^{\rm OOT}(E)\frac{R_{\rm obs}}{R_{\rm det}}\frac{t_{\rm obs}}{t_{\rm det}} \times f}_{\text{detector Out-of-time events}} \right)}_{\text{sky background}}$$



XMM-Newton EPIC

at the University of Leicester

XMM-Newton has orbited the Earth ***1438*** *times*

Space Research Centre

University *of* Leicester

User Resources

This page contains details on the XMM-Newton EPIC cameras, including health monitoring, and presentations from calibration meetings and background meetings.

Attendees' presentations from past meetings are available in the following formats: postscript (ps), powerpoint (ppt), or acroread (pdf). Presentations that comprise of several files are tape-archieved (tarred), and often compressed (using gzip). All the health monitoring plots are in PostScript format, unless otherwise stated.

Instrument Monitoring

Plots showing the health of the EPIC MOS instrument can be found on our Instrument Health Monitoring page.

Calibration Meeting Presentations

- Expand all meetings (allowing searching)
- Palermo, April 2007
- Mallorca, October 2006
- Iceland, June 2006
- MPE, May 2006
- ESAC, October 2005
- Mallorca, February 2005
- Vilspa, March 2004
- Saclay, September 2003
- Tuebingen, February 2003
- Vilspa, July 2002
- Ringberg, April 2002
- Milan, November 2001
- Leicester, June 2001
- Paris, February 2001
- Leicester, July 2000
- Paris, June 2000

Background WG Meeting Presentations

- Palermo, April 2007
- Mallorca, October 2006
- MPE, May 2006
- MPE, November 2005
- ESAC, June 2005

Background talks are also included in the Calibration Meetings above.

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The Behaviour of the XMM–Newton Background: From the beginning of the mission until August 2006

XMM-SOC-USR-TN-0014
issue 1.0

P.M. Rodríguez–Pascual and R. González–Riestra

XMM–SOC User Support Group

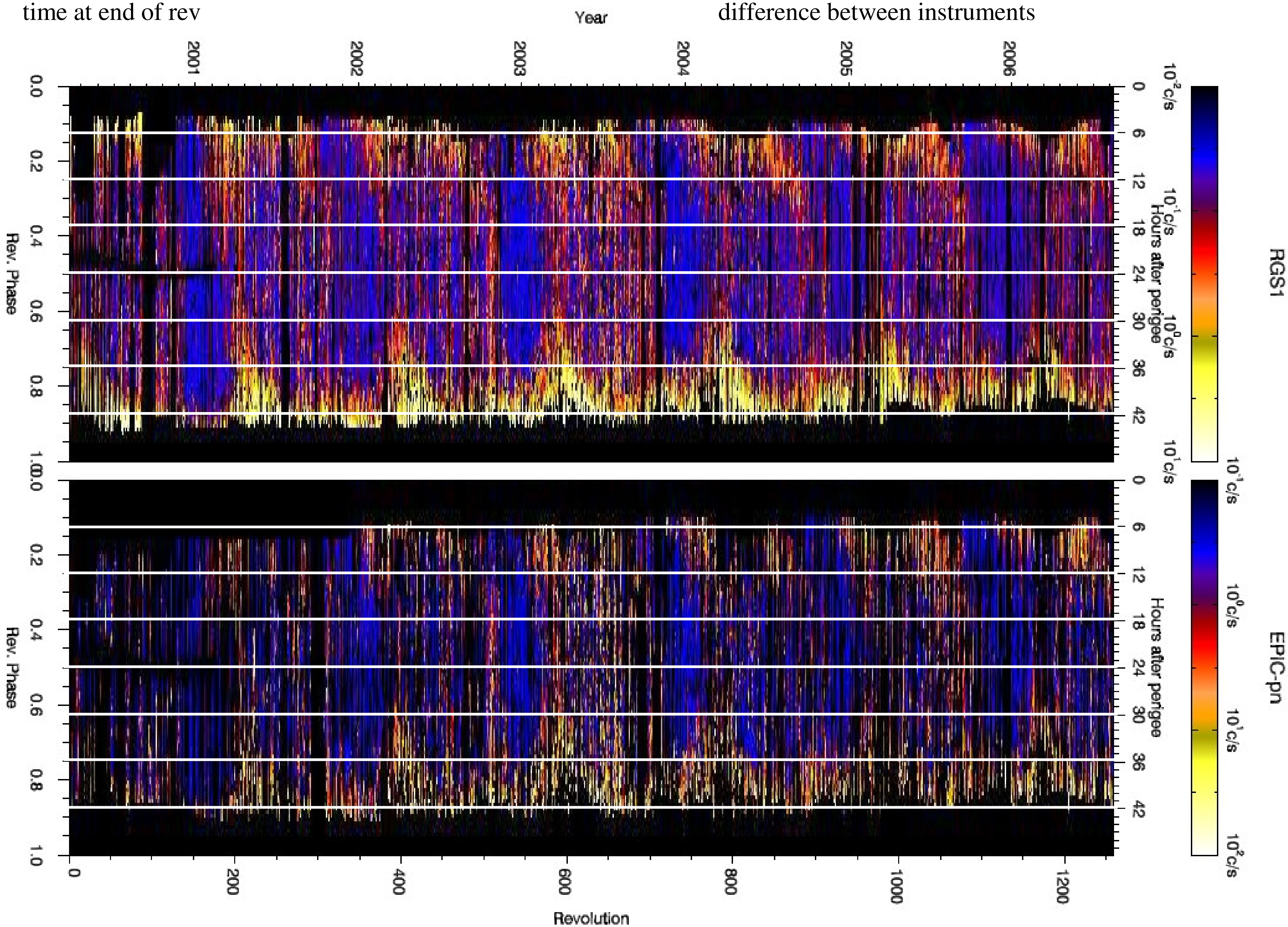
January 22, 2007

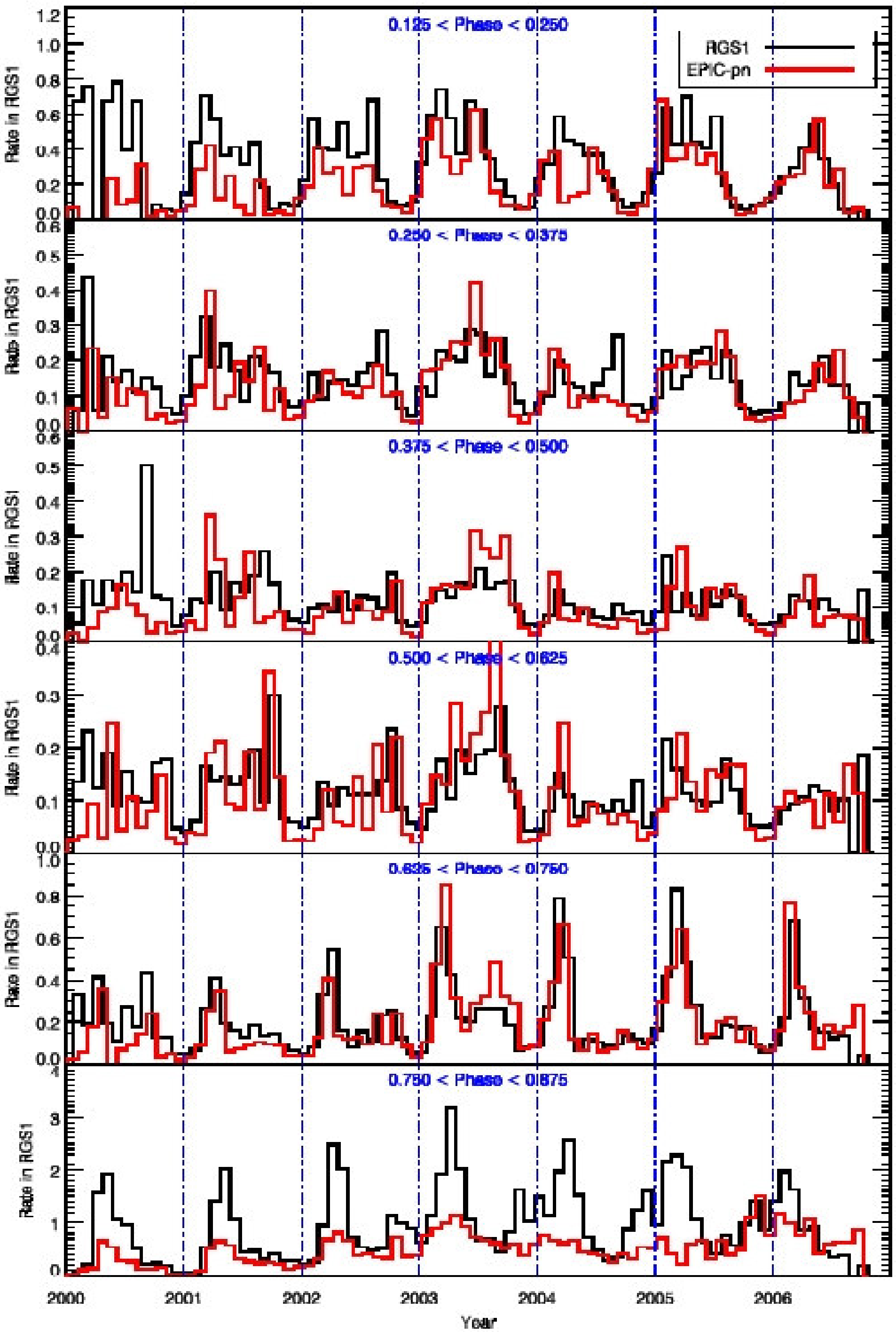
1 Introduction

In their Meeting of May 2006, the XMM–Newton Users Group recommended *"to reassess the EPIC background loading for a 1 year sample in order to investigate a seasonal dependence"* (*rec. 2006-05-19/34*). There was a second recommendation *"to study the possibility to define a new type of proposal whose scientific objectives can be achieved with short observations performed in high background conditions at the last science time of the revolution"* (*rec. 2006-05-19/35*). The present report is aimed to study the two above points. For this purpose we have examined the background in RGS1 and EPIC–pn science observations taken until the end of July 2006.

• EPIC-pn data more scarce & RGS on longer time at end of rev

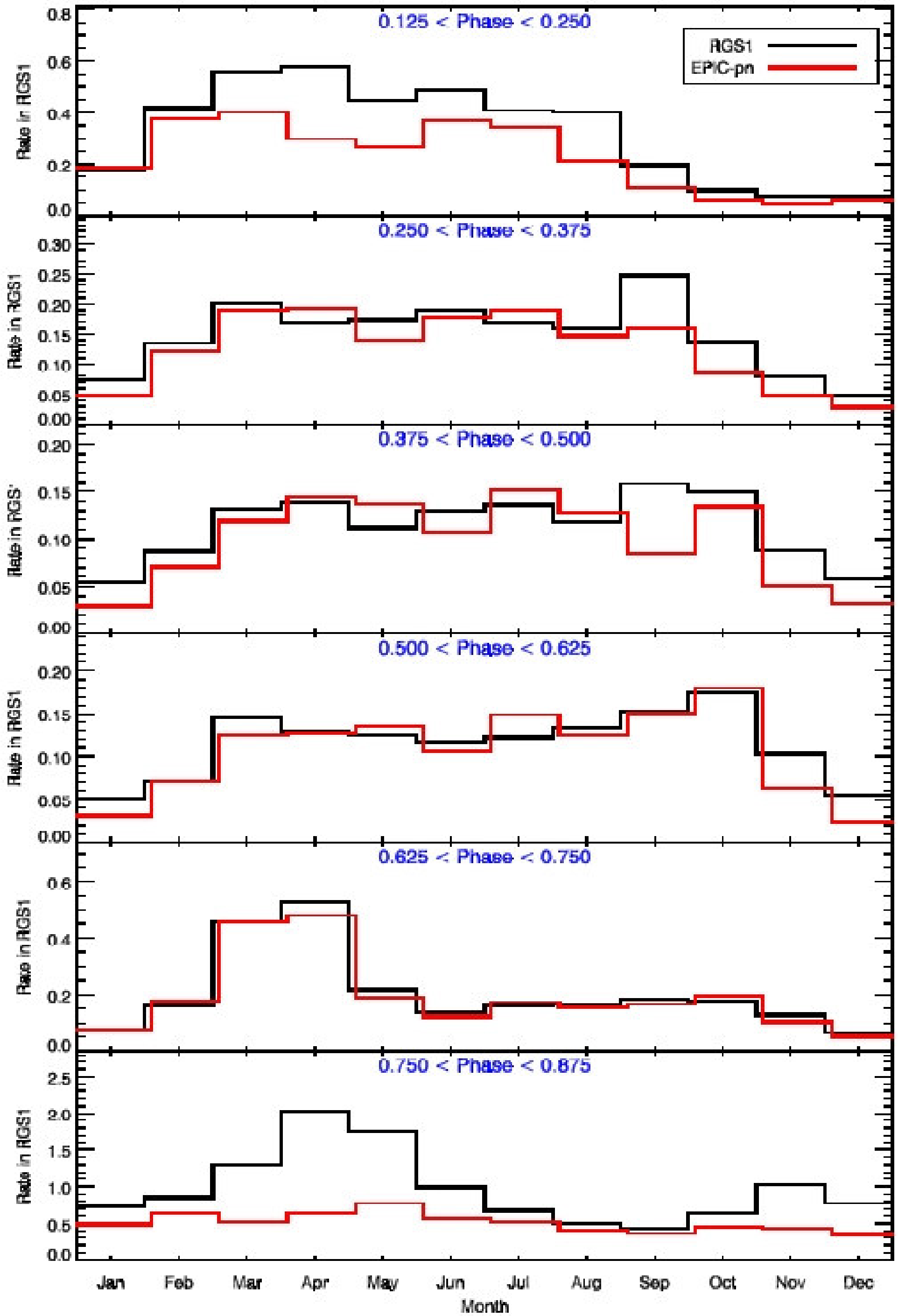
• Conclsions based mainly on RGS – within scatter, no difference between instruments





Evolution of the BG (years)

- Instruments generally agree
- No clear trend in evolution of BG
- Largest changes seen at end of rev – peaks of BG increase from 2000 to 2003-2005 and then decline

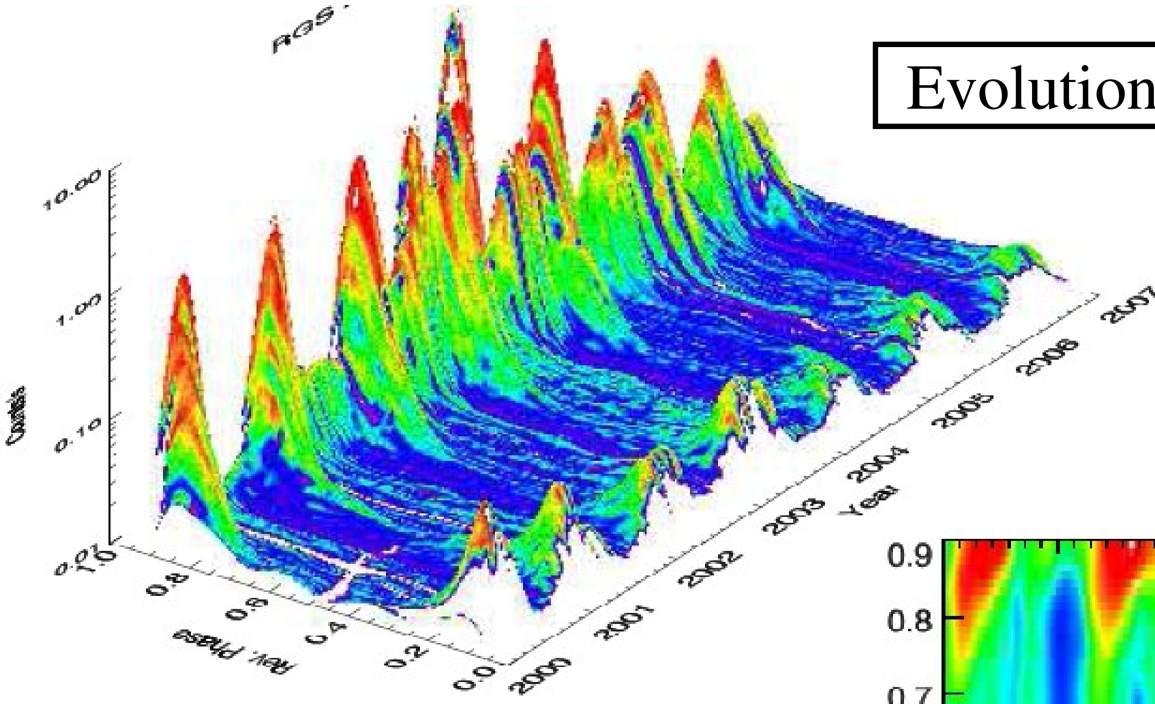


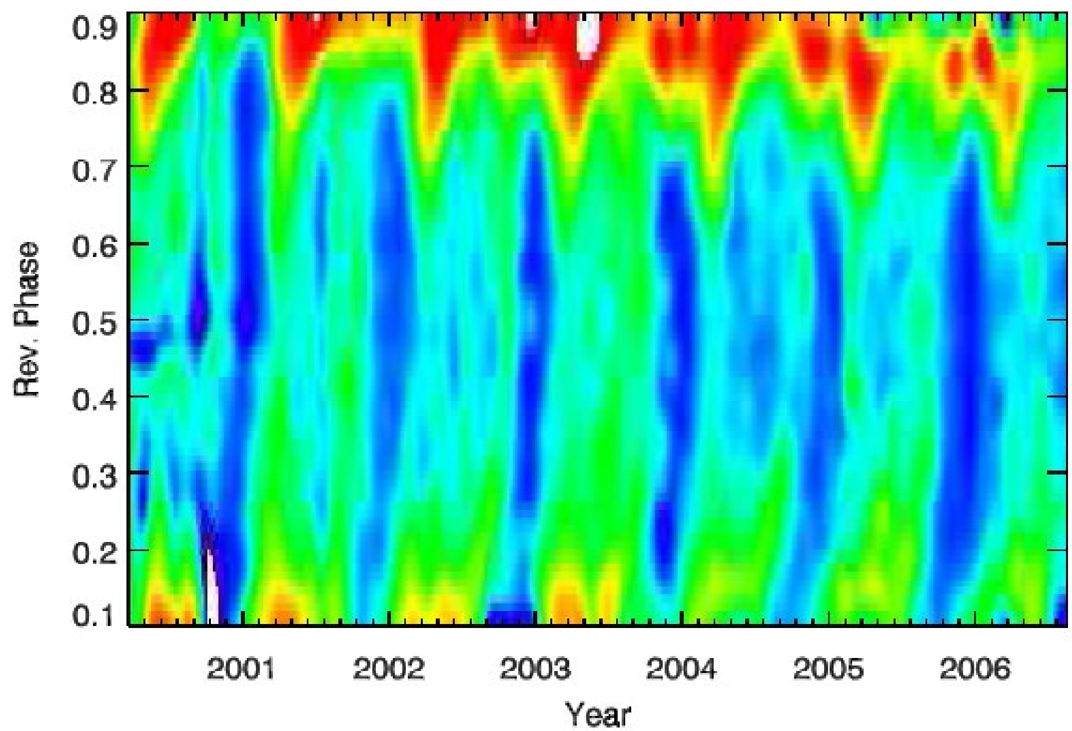
Evolution of the BG (months)

- Seasonal dependence due to asymmetry of the Earth's magnetic field along the sun-antisun line.

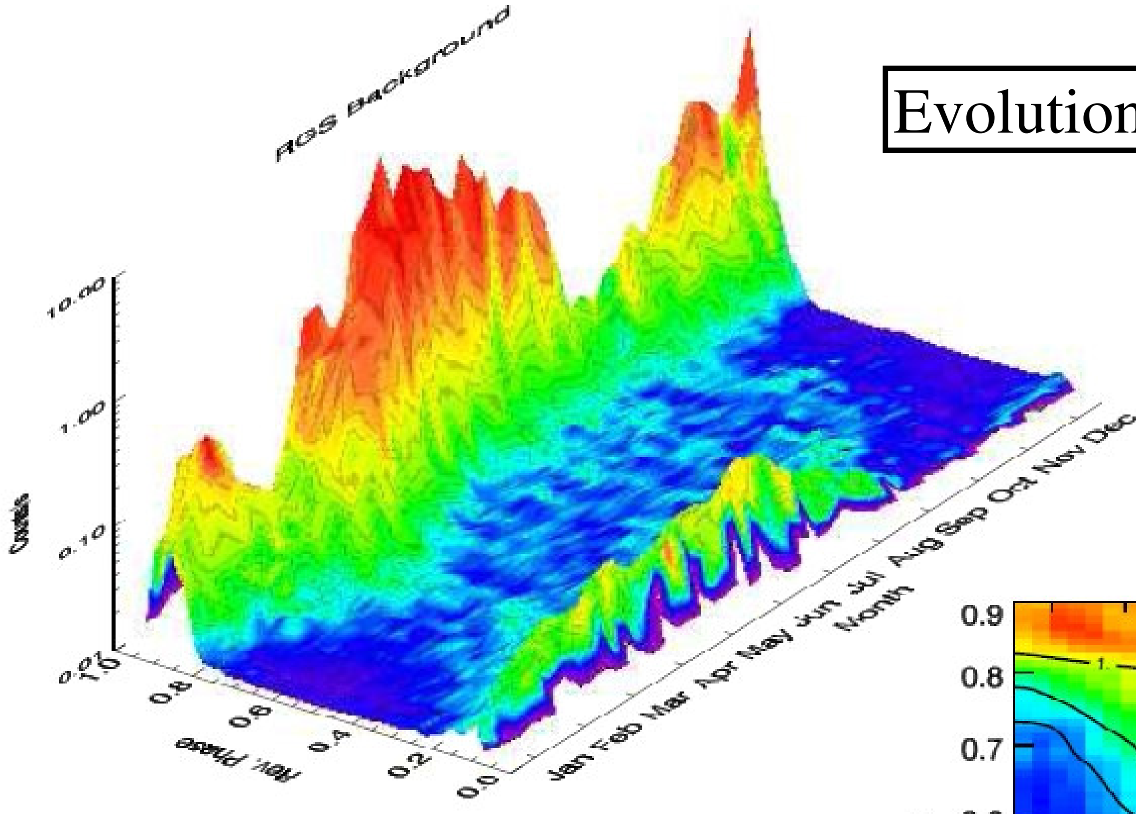
- Beginning: Strong seasonal effect – high Feb-Aug – lower for rest of year – min in Dec & Jan – variation factor can be ~8
- Apogee: Similar – marked minimum in Dec & Jan – variation only <3 (only <1.5 in Mar-Oct)
- End: Highest levels and strongest variations – Max in Apr (~8x Aug-Sep) – plus yearly effect

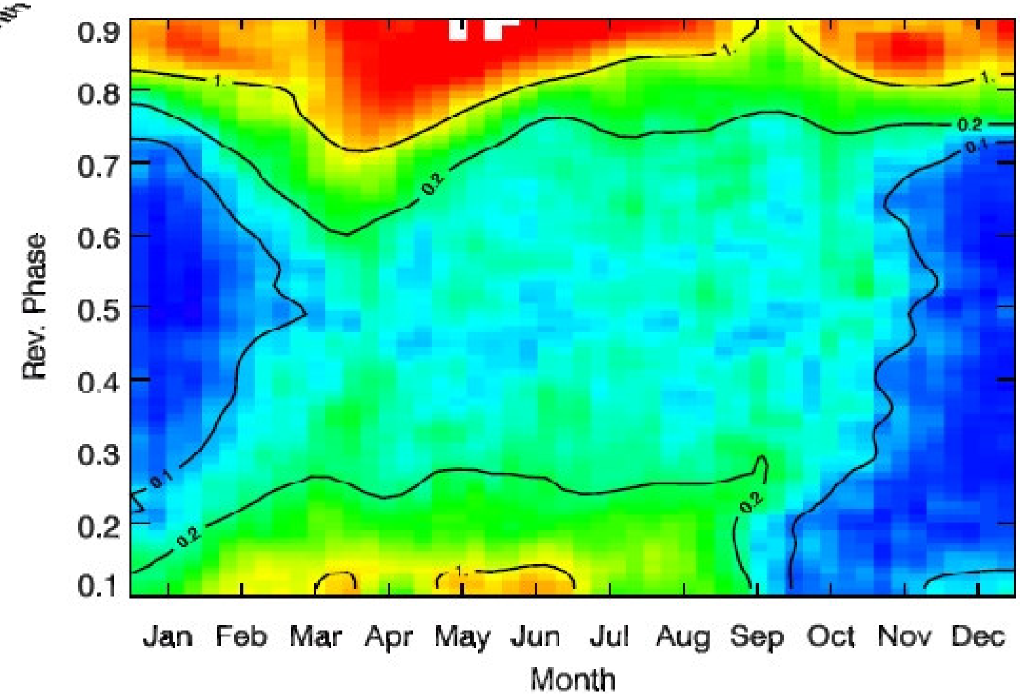
Evolution of the XMM BG (Years)





Evolution of the XMM BG (Months)





XMM
EPIC
MOS

Andy Read (amr30@star.le.ac.uk)

6th EPIC BG WG Meeting
Mallorca, Spain 05/11/07

University of Leicester

Some Other Open Issues

• espfilt?

• Any new tools, files?

• MJF – new pn CLOSED stacked sets – SAS 7.1

• Scripts? Link from Other scripts page to ‘other scripts’ – e.g. ghostholes, BGrebinimage2SKY

• Plans for future versions of the ESAS s/w package?

• Convert ESAS into pn tool?

• Papers – KK/SS – MOS BG paper (astro-ph?) (BGWG-link?)

• What to present to CAL tomorrow?

OOT events – removal on an event-by-event basis?

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AMR - 020206
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To remove OOT events on a statistical basis from pn event files.
================================================================

- shell-script? SAS-task?

- Takes (clean) pn event file as input, obtains mode, hence knows
  fraction of events that are OOT events (e.g. 6.3% for FF mode [2.3%
  for eFF]).

- Per CCD

  - Per RAWX (if stats allow - can be checked first - if not [low
    stats] can go to groups of columns e.g. 2/4/8/16 RAWX...)

    - Analyse events in particular RAWX column - Select 6.3(FF)% of
    the events such that:
    1) They are uniformly distributed (flat) in RAWY
    2) Anything else? e.g. spectral considerations...

    - Remove these events to a separate (OOT) file

  - Next RAWX

- Next CCD

- Updates header values - e.g. such that one is unable to do the same
  procedure again (only want to do this once to a file).

==================================================================
```