The long-term evolution of the XMM-Newton background

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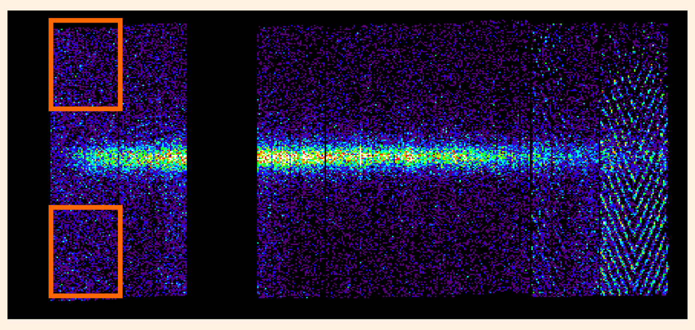
Data Sample:

Data since the beginning of the operational phase until May 2007

Data Filtering:

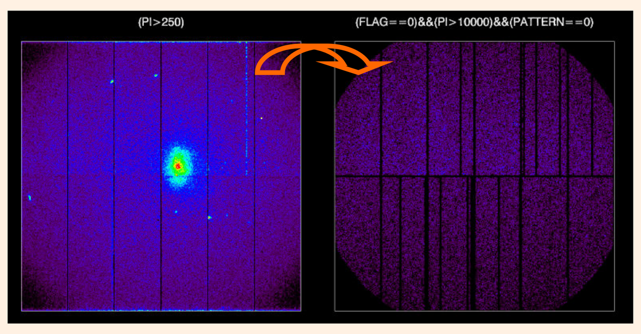
RGS1 in Spectroscopy mode



Background indicator: *Countrate in CCD9 off axis region*

(CCDNR==9 && (XDSP_CORR < -0.0003 || XDSP_CORR > 0.0003))

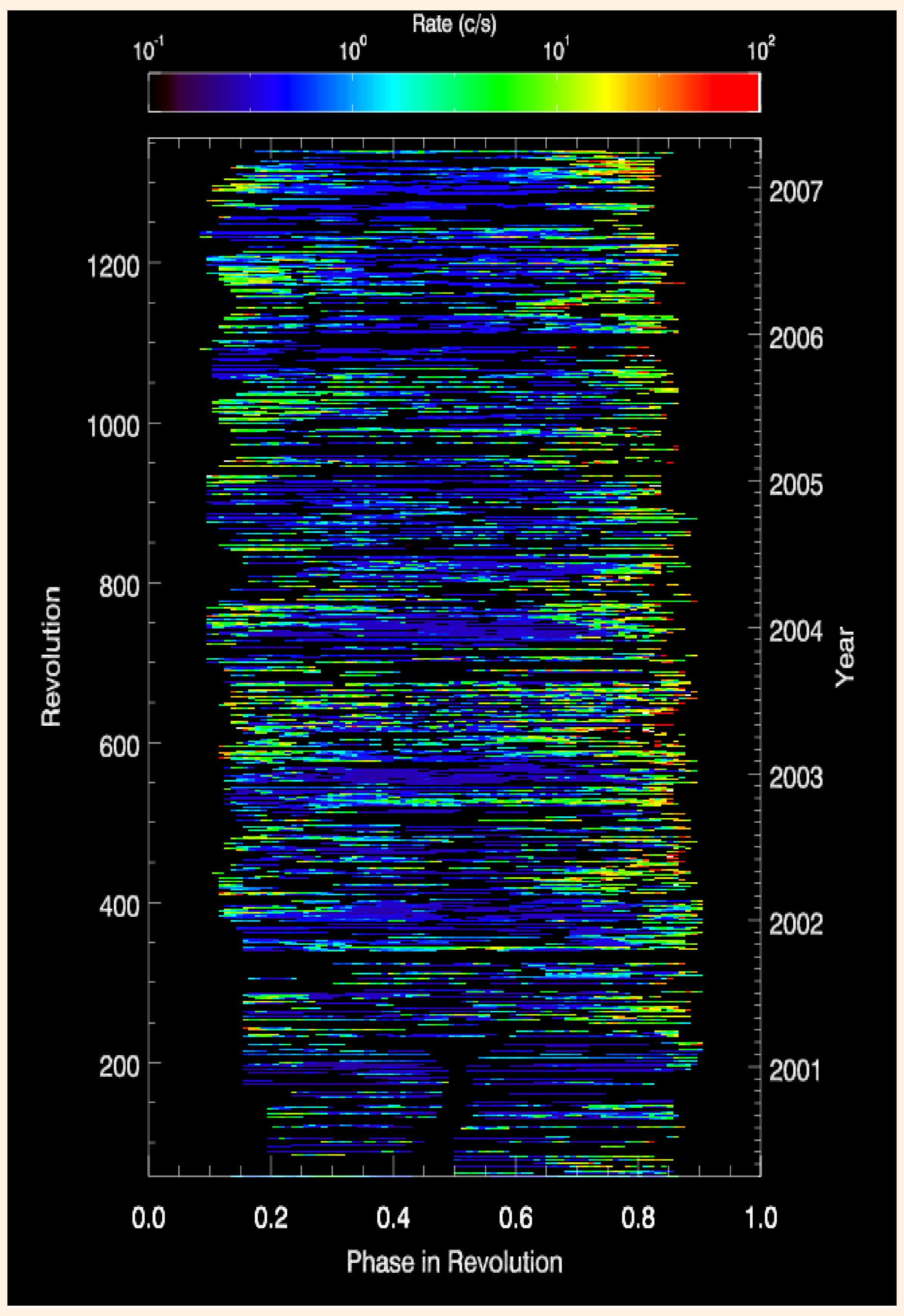
EPIC-pn in Full Frame or Ext Full Frame mode with THIN/MEDIUM filter



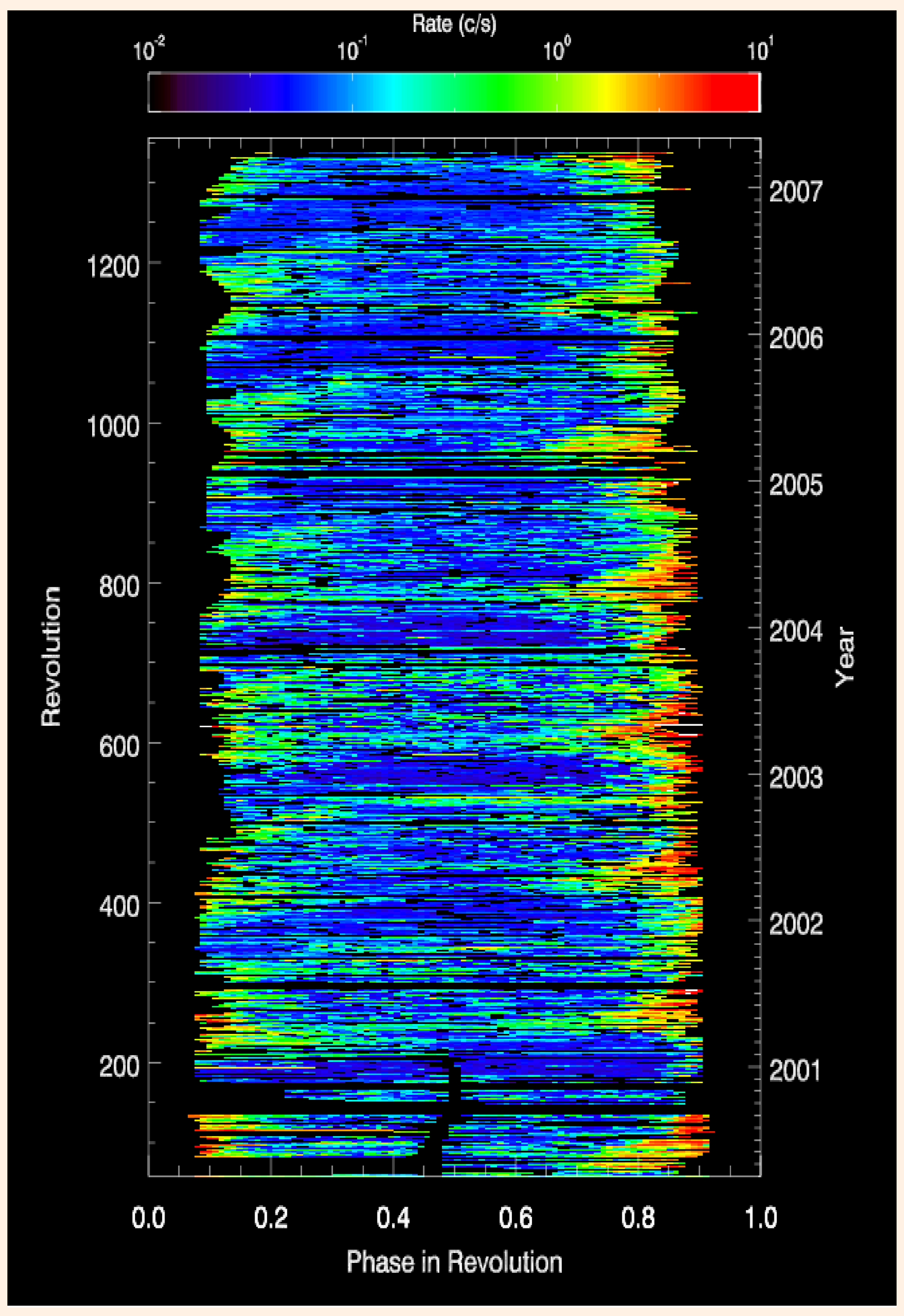
Background indicator: *High energy events*

(FLAG==0) && (PI>10000) && (PATTERN==0)

EPIC-pn
2769 exposures: **60.8 Msec**



RGS 1
4707 exposures: **125 Msec**

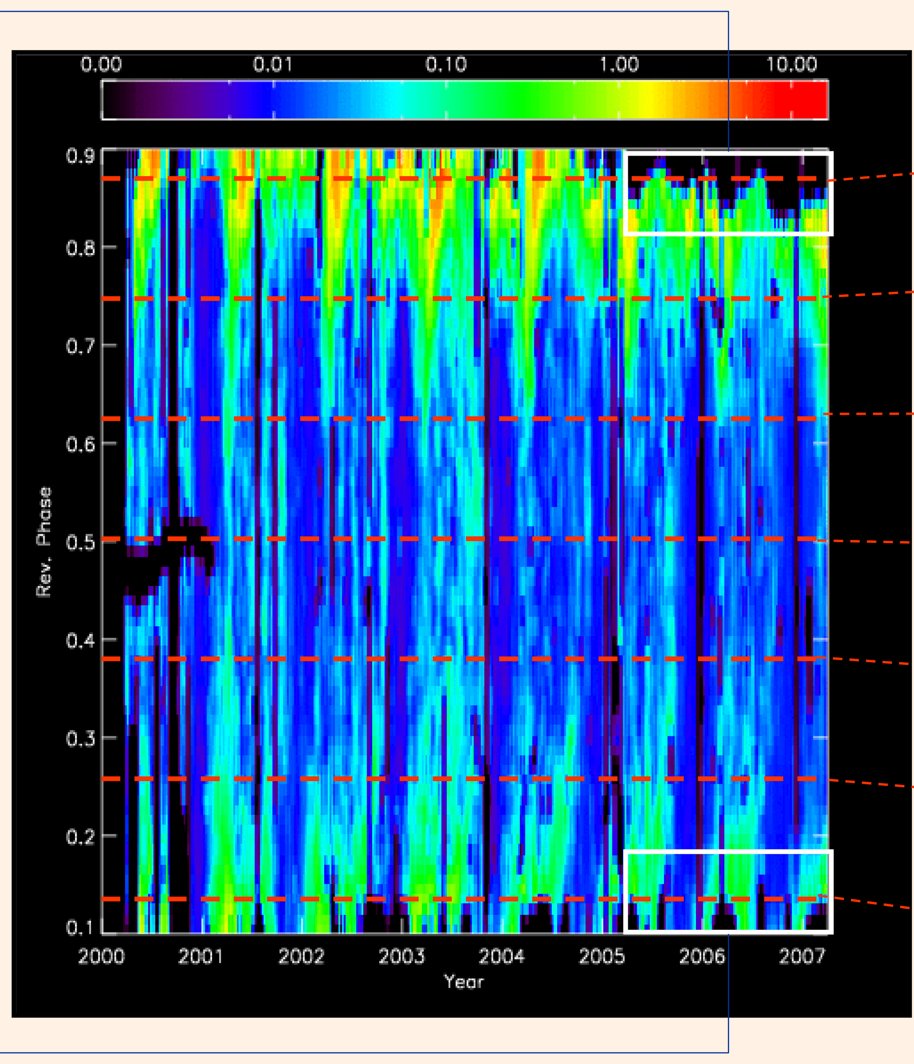


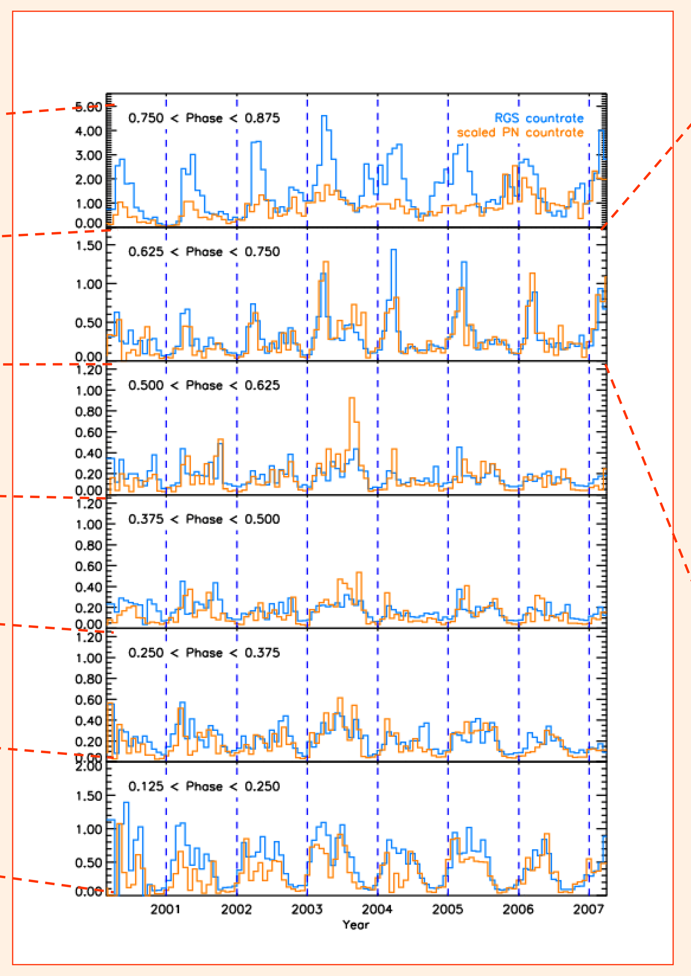
EPIC-pn data are more scarce, first because of the mode/filter selection and second, because the criterion for closure in high radiation conditions is more strict than for RGS. It is clear however that the behaviour of the background in both instruments (EPIC-pn and RGS1) is very similar

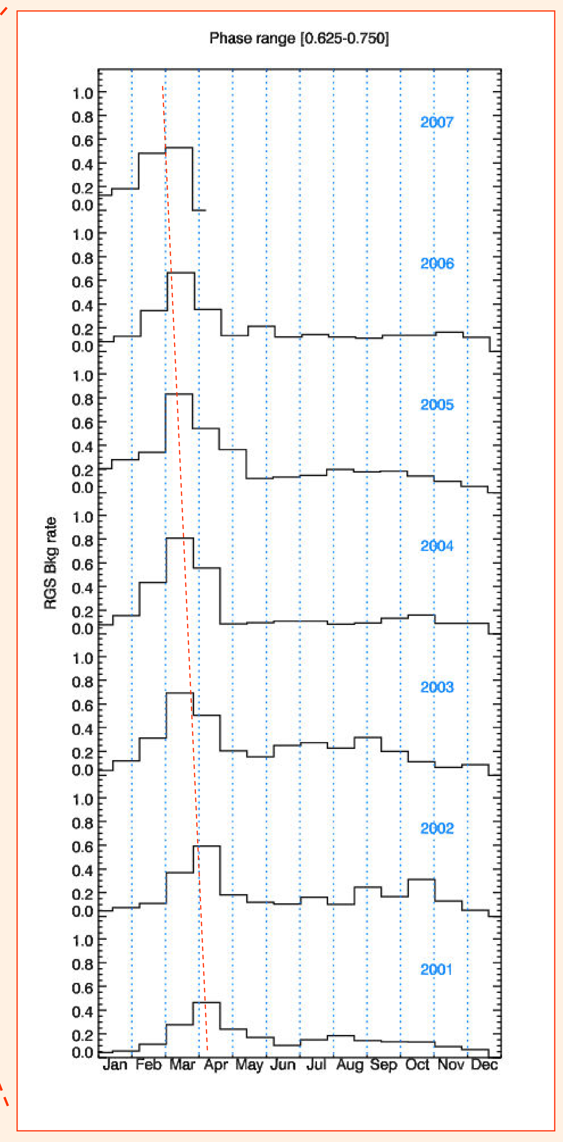
Starting in April 2005, science observations are scheduled only within a window defined by the Radiation Model of Casale and Fauste (XMM-SOC-OPS-TN0004, 2004).

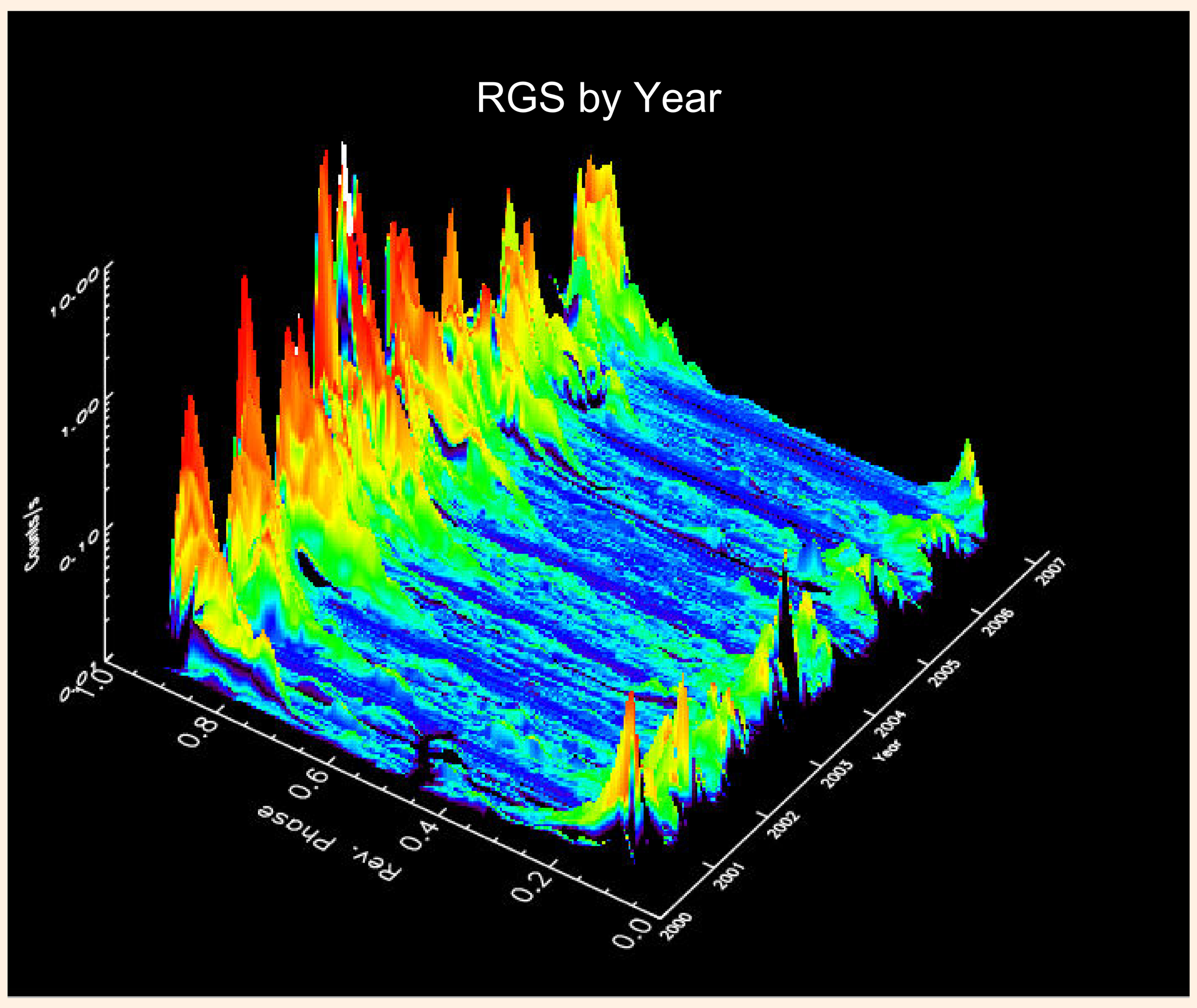
The model is based on data from the Radiation Monitor on board XMM-Newton, which is sensitive to particles with energies between 50keV and 5MeV.

The aim of the model is to predict the start/end times of the period around perigee passage when the background radiation level might be hazardous for the science instruments if they are in operation.









Conclusions:

- The distance to the Earth is the dominant parameter. As expected, the background is lower close to apogee, but …
- There is a marked asymmetry in the behaviour of the background when moving away from perigee and when approaching it
- Generally speaking, the background level is higher at the end of the revolution than at the beginning
- The high background time does not extend usually beyond 12 hours (phase < 0.25) after perigee
- In some epochs of the year the background starts to rise shortly after apogee (phase 0.65)
- The behaviour of the background presents a pronounced seasonal effect
- Near apogee, seasonal variations are not larger than a factor three
- Near perigee, seasonal variations are as large as a factor eight
- The seasonal variations are not exactly annual; the post-apogee radiation peak near Spring is occurring earlier every year.