Contamination on the EPIC MOS detectors
Black (MOS1) Red (MOS2)

April 2000

Nov 2013

Only mild evolution in spectra
Use IACHEC standard model of 1E0102 as calibrator. Model based on input from several missions but dominated by RGS.
Choose low and high energy bands which are relatively insensitive to shape of RMF
Real change in softness ratio counts in MOS2

\[ \frac{\text{CR}(0.1-0.75)}{\text{CR}(0.98-3.0)} \]
Multiply standard IACEHC model by varab model and find nH Carbon value that makes overall model ratio (folded through response) equal to observed ratio.
Current carbon contamination model:
looks linear but are exponential functions
RGS C model (expressed as depth in nm)

MOS2 is 
~ 20% of RGS
Lack of contamination on pn probably due to cold finger (~20-30° colder than CCDs) which is not a feature of the MOS cameras.
SAS 13.5.0 responses: new arf with contamination and new rmf

Fitted parameters with reduced trends

Global
OVII
OVIII
NeIX
NeX
MOS v PN: fit model to pn then fold through MOS response

sas12.0.0 v sas13.5.0

Improves cross-cal with pn in continuum sources
Recalculation of contaminant with sas13.5.0 rmf: plus latest observation

Contamination model is still sensitive to RMF solution
MOS2 outer region RMFs, epoch-2151-2450

But little change with re-calculated RMF after applying updated (greater) level of contamination. Implies Convergence in global solution.
Summary:

SAS13.5.0 contains carbon contamination plus new set of rmfs.

Helps detrend MOS2 1E0102 fits

Improves MOS2 v MOS1 & MOS2 v pn XCAL

“global iterative solution” vis-à-vis rmf solution shows convergence … true contamination level ~30% higher than SAS13.5.0 solution.