GIS CALIBRA

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- CDS Software note 54: GIS Instrumen
- CDS Software note 55: GIS Software

Other relevant documentation can be fou

2. Wavelength Calibration

The best fits to the wavelength scale are c
detectors are flat whereas the spectral axi
light is at a high grazing incidence angle;

Another factor which has to be taken into
the way the lines are mapped onto the Ro
RC is not proportional to wavelength, but
which the light leaves the grating. This ha
flatness of the detector, reducing the erro
of the wavelength to pixels is demonstrat
from a straight line crossing the RC at the
designed to do.

The second reason is associated with the
charge cloud with the anode leads to a re
not proportional to radius. When a spiral
with fewer arms than in the anode design
this polar plane only shifts in radius and r

variations in the count rates. No automati
Other errors in the wavelength calibratior
below.

3. Look-up Table corrections

There are two corrections needed for the
patterning, and the other ghosting.

3.1 Fixed patterning

Fixed patterning is an effect caused by th
with the analogue detector read-outs; it is
spectra. Figure 3 shows a subset of data fi

It is necessary to remove the fixed patterr
especially the gain depression calculation
channel plate pore, i.e., before the fixed p

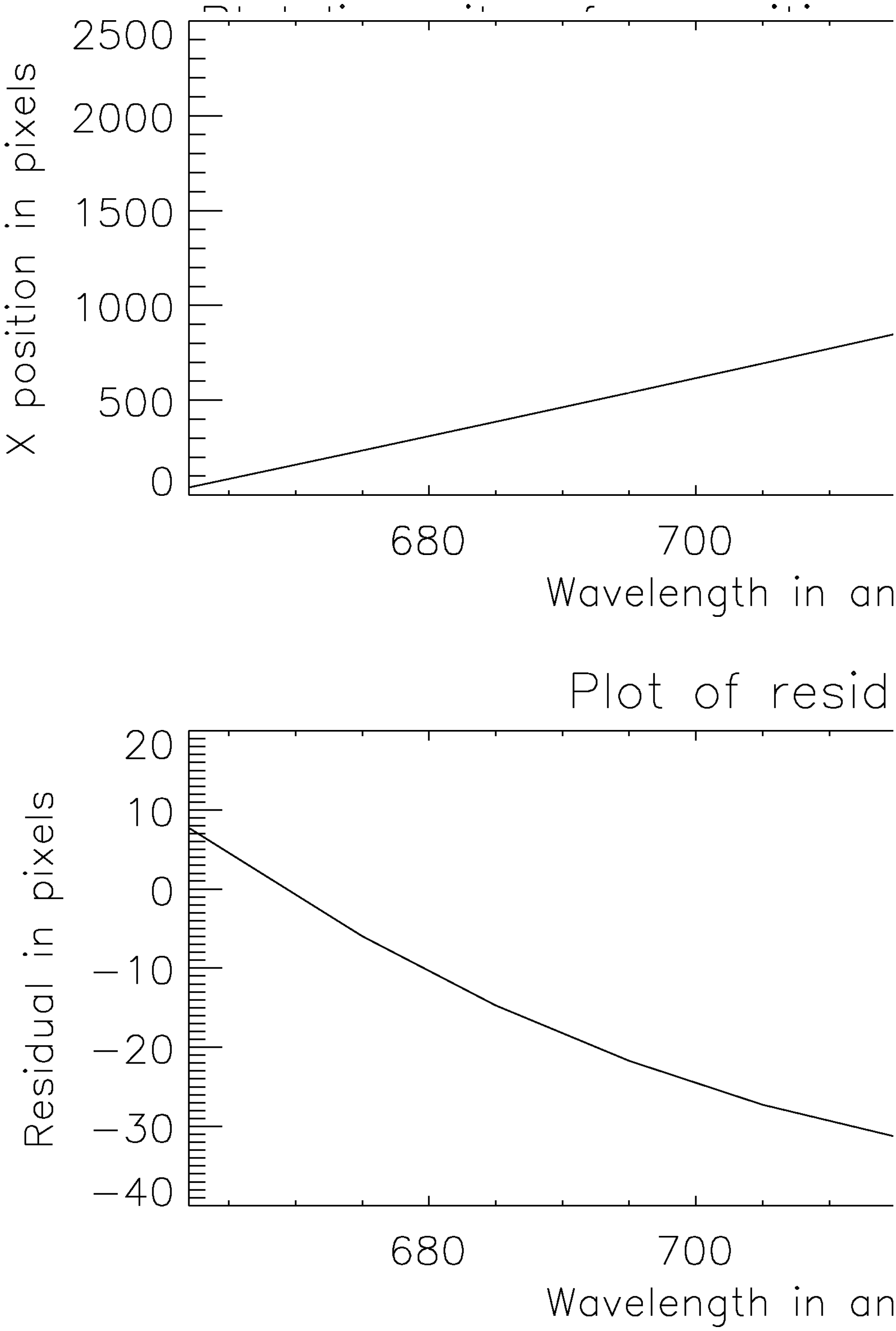


Figure 2. Non linearity in wavelength cali
This result is after combining the effects o

not change the intensities at all (see Table

3.2 Ghosting

An effect in the GIS detectors is the prese
lines, or parts thereof, caused by an ambi

3.2.1 Correcting for Ghosting

The routine ghost_buster is used to rem

When the GIS is in raw data mode, it tran
of co-ordinate pairs from the detectors. W
a spiral (see the 'GIS Instrument Guide')
length of the spiral, and the intensity is th
the spiral. To translate these pairs into spe
used as part of the on-board GIS processi

The ambiguity (or ghosting) in spectral d
range, but where the thin spiral arms broa
is ghosted, it is confined to occur only at
is these facts that are used in ghost_bust
the counts at the original location to prod

Smooth-size	height (counts/pix)	position (Å)	po (p
no	4.45761	188.259	11
4	4.43946	188.276	11
8	4.37399	188.275	11
12	4.26672	188.274	11
16	4.12166	188.273	11
20	3.94973	188.271	11
24	3.76101	188.270	11
28	3.56437	188.270	11
32	3.36759	188.269	11
36	3.17570	188.269	11
error	0.4	0.02	

Table 1. Variation in fitted line paramete
This table was produced by fitting a singl
uncalibrated spectral line at 188Å. For ea
was used in `gis_smooth`. The error quote
by the gaussian fitting. There is no discer
smoothsize.

The GIS line profiles are broader than ex
a peculiar profile. Figure 4 shows the ave
selected lines on each detector. The expe
calculations with perfect optics, the 'stim
lines stimulated by capacitive coupling o

From Figure 3, the profile of detector 1 li
patterning. To remove the fixed patterni
widths, the `smoothsize` keyword in `gis_`
of 7.

It is likely that all detector profiles are do
that it is only noticeable in detector 1. Th
line position as seen in calibration data ta
variation may also be responsible for the
theory as shown in Figure 4.

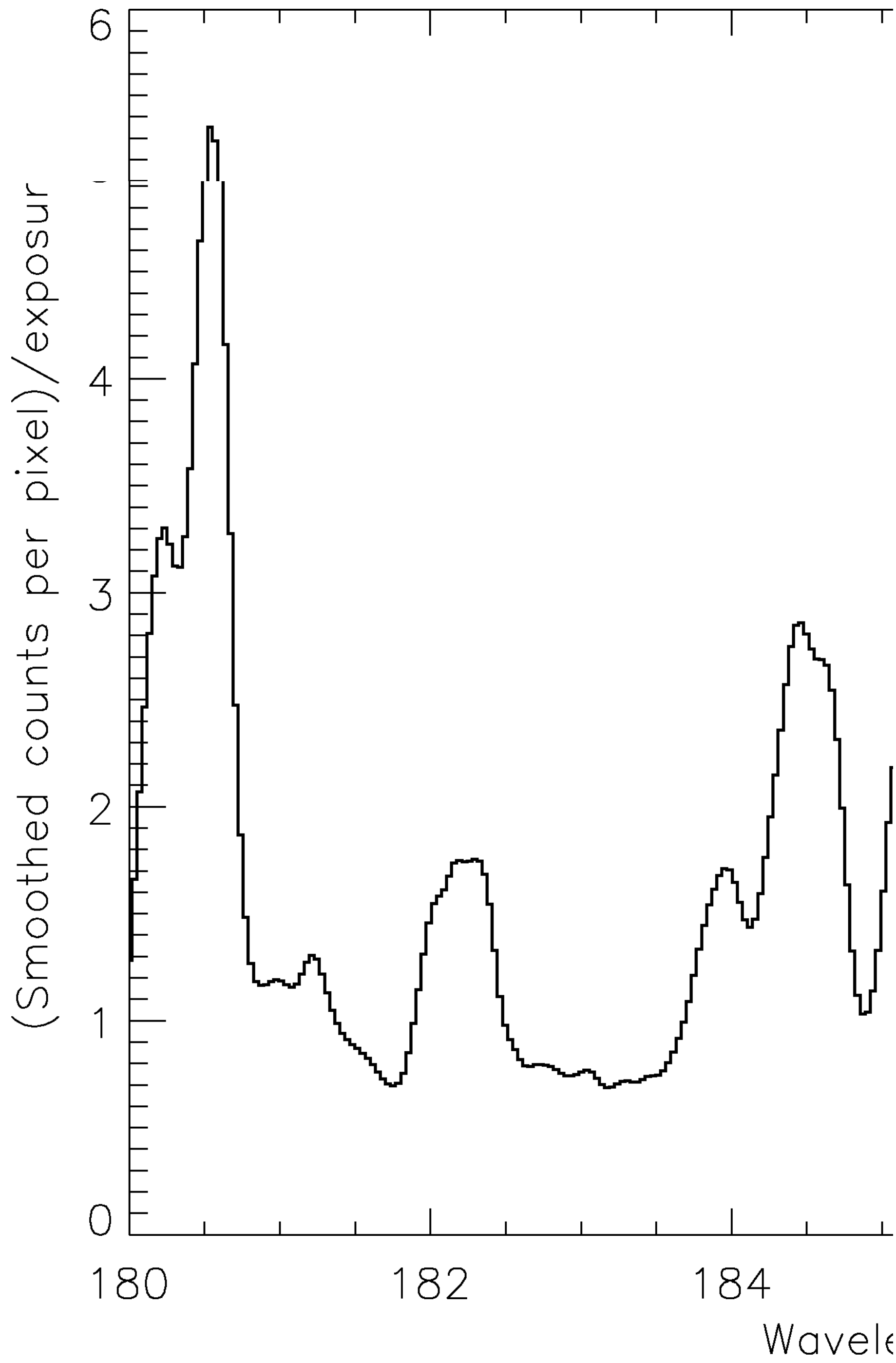
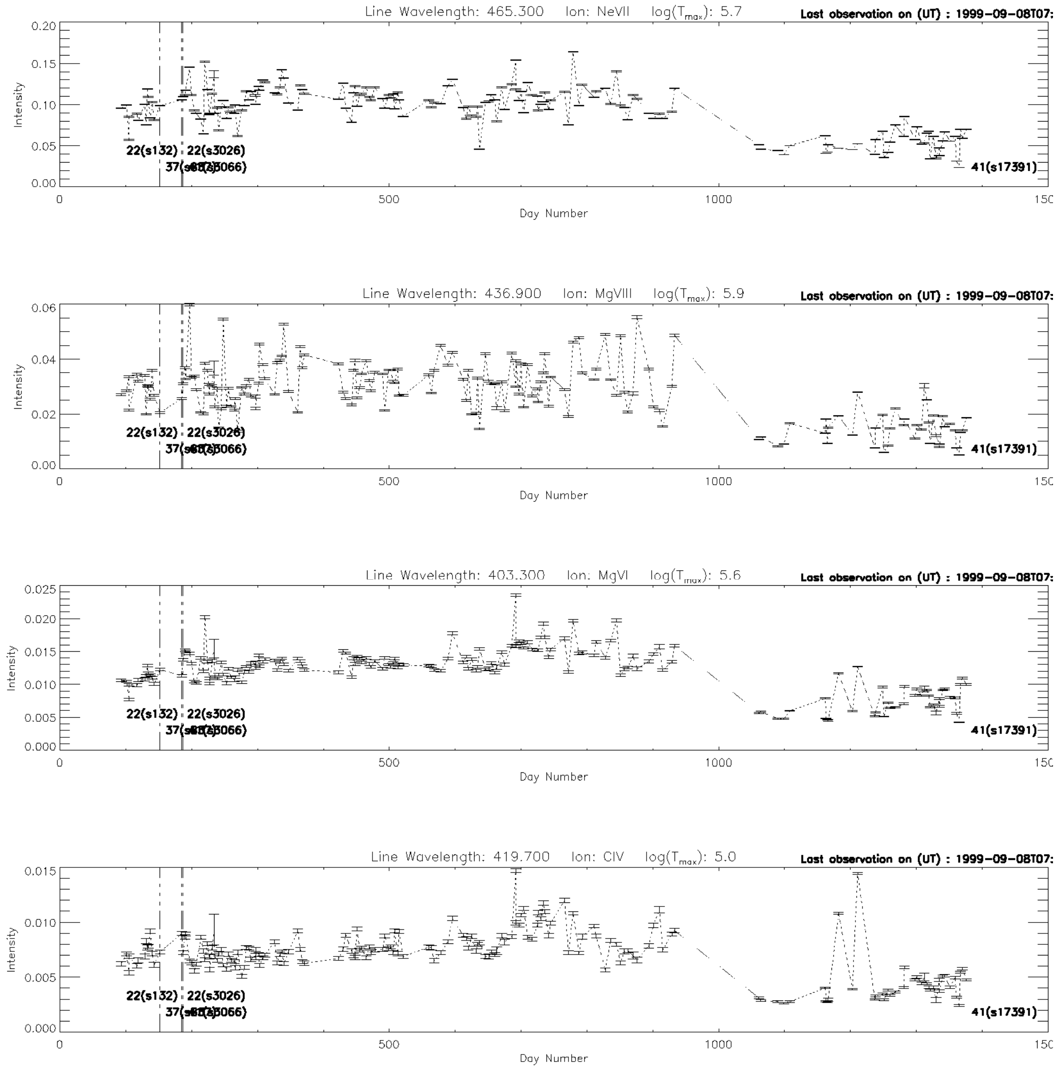


Figure 5. Data from the same observatio
'smoothsize' (10).

5.1 Long Term Gain Depressior

There are two problems here: One is the g detector-caused by outgassing, plate ageii differential decay caused by the fact that t parts of the detector.

The cause of this is simply usage of the d charge is removed from the MCP channel effect of reducing the apparent intensity c to compensate. For GIS, the parts of the c suffer first. Because of the wide range of possible to compensate for the LTGD in a voltage. A particularly intense line may c up to a distance of 1 mm (2% of spectrun



Current Date: 13–Sep–1999. GIS3 SPECT Normalised Data

Figure 7. Variation of line strengths in de

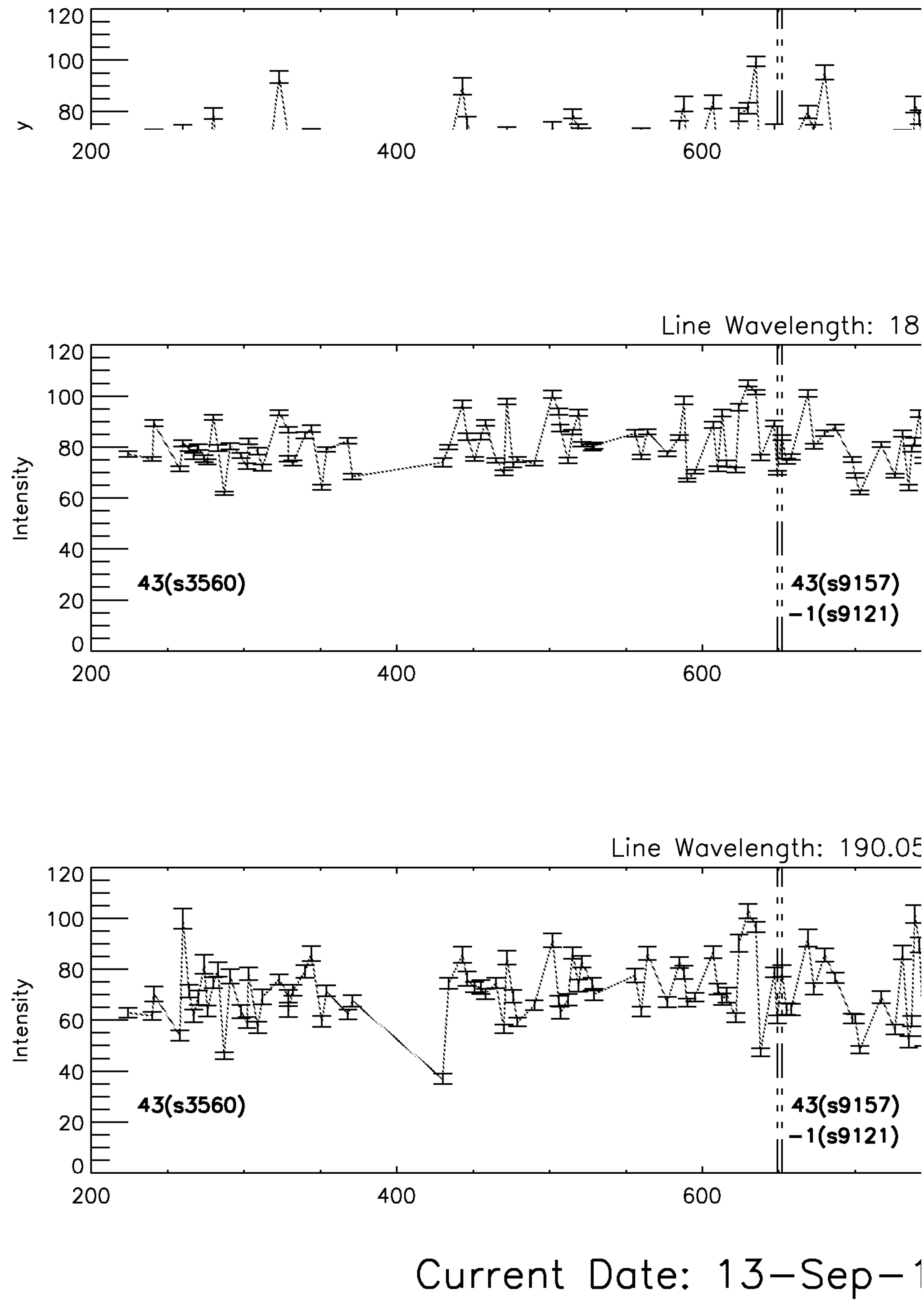
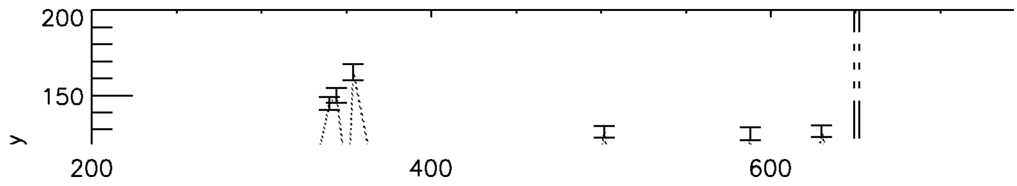
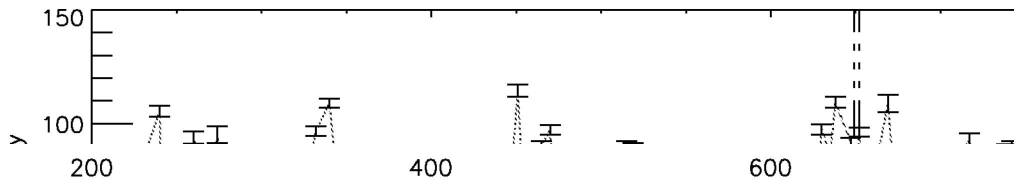


Figure 8. Ratio of slit 3 to slit 1 intensitie
mission.



Current Date: 13-Sep-1

Figure 9. Ratio of slit 3 to slit 1 intensitie
mission.



Current Date: 13-Sep-1

Figure 10. Ratio of slit 3 to slit 1 intensit
mission.

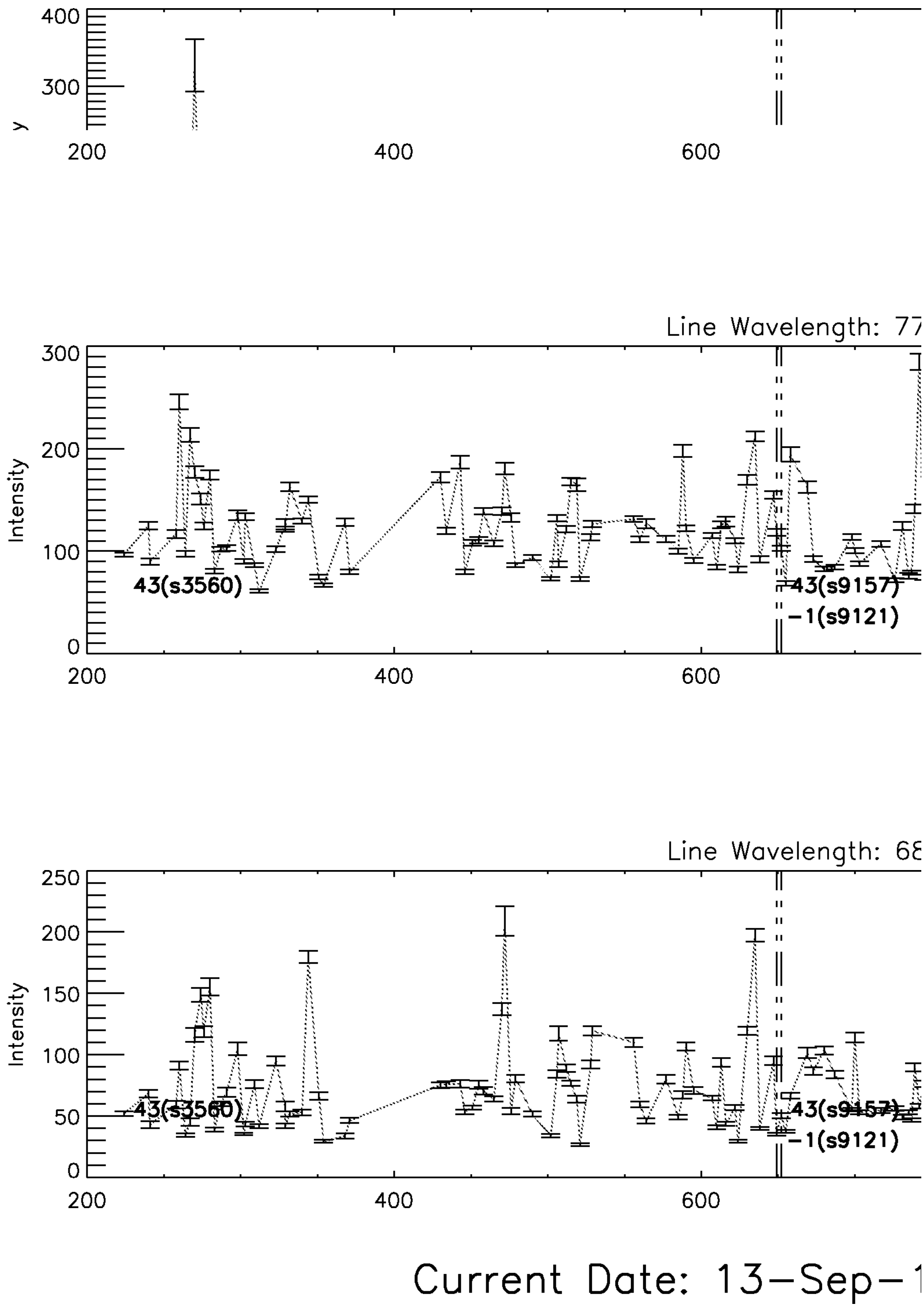


Figure 11. Ratio of slit 3 to slit 1 intensit
mission.

made at the start of the mission in order t

The problem with using filaments to mon constant in time. We currently set up the rate over the whole detector. Then dividi pixel basis, will give values equal to 1 in where there has been loss of sensitivity.

5.1.2 LTGD Correction

Long term gain depression and flat field gain depression. These data can also be u detector response over the illuminated are routine `gis_calib_ff_ltgd` which is cal stamped, and the file nearest in date to th

Currently, no regions of LTGD have bee exception of the region around the excess Here the count rates have dropped by a fa SOHO, and are considered uncalibratable called from `gis_calib`, will mark the reg

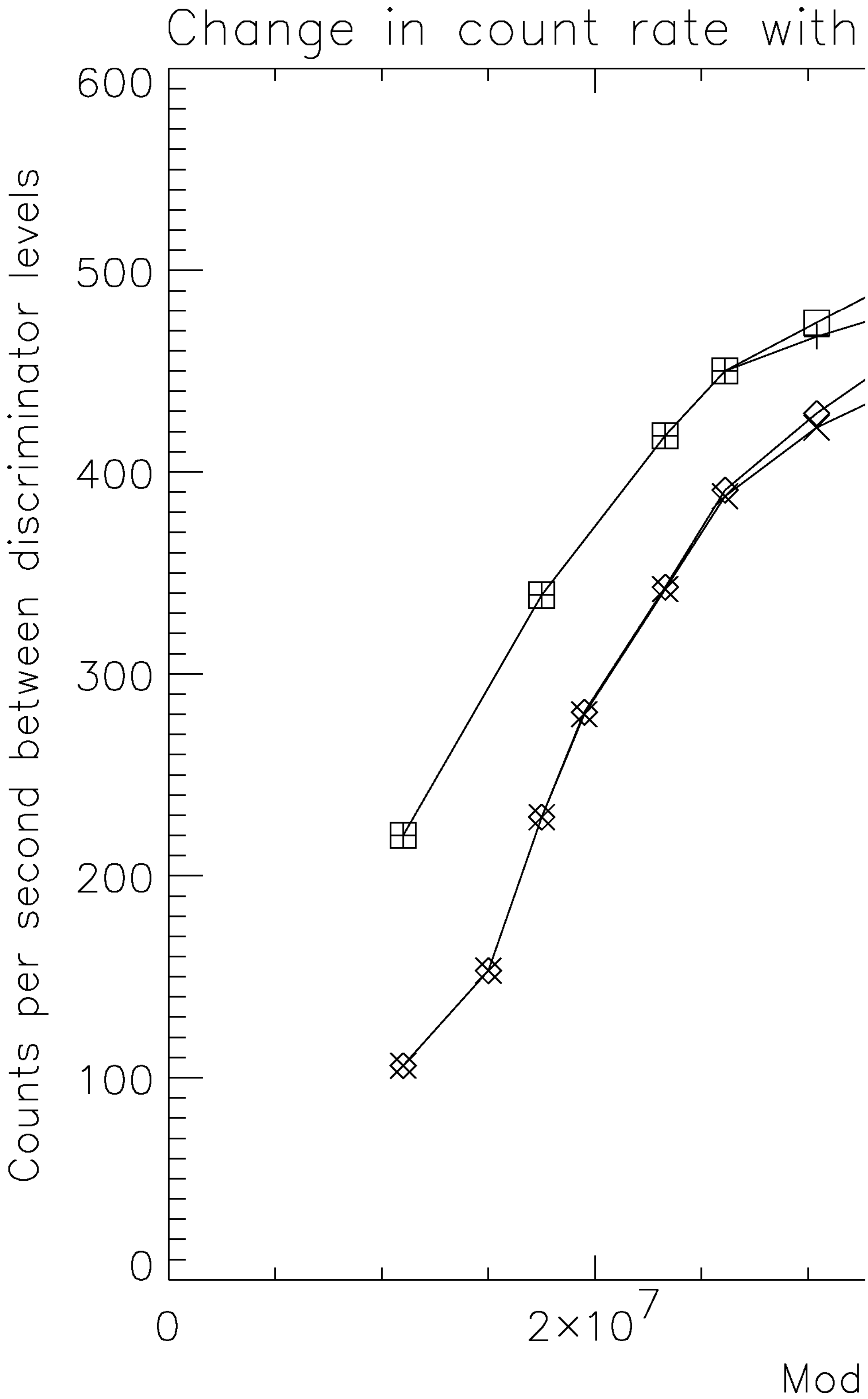


Figure 13. Stability of output count rate v
From A. A. Breeveld (1996)[3].

rate per MCP pore. This is combined witl
count rate as a function of gain. The relev

Finally, the number of pores illuminated 1
(1999) pages 41*ff*. For this to work, a vali
positional resolution from the electronic r
the spectral line width.

5.2.2 Errors in Intensity

As mentioned, the errors involved in calc
large, thus a 4% limit is set on the correct
standard (1/e) error of around ±2% in the
correcting for CDGD. Lines that are too b

5.3 Edge effects

Most detectors show edge effects, both as
background. There are many causes for th
wavelength scale, causing an increase in t
microchannel plates, where the strong ele
detectors; changes in the solar backgroun
some very bright (solar) lines, seen espec
calibrating the non-solar effects.

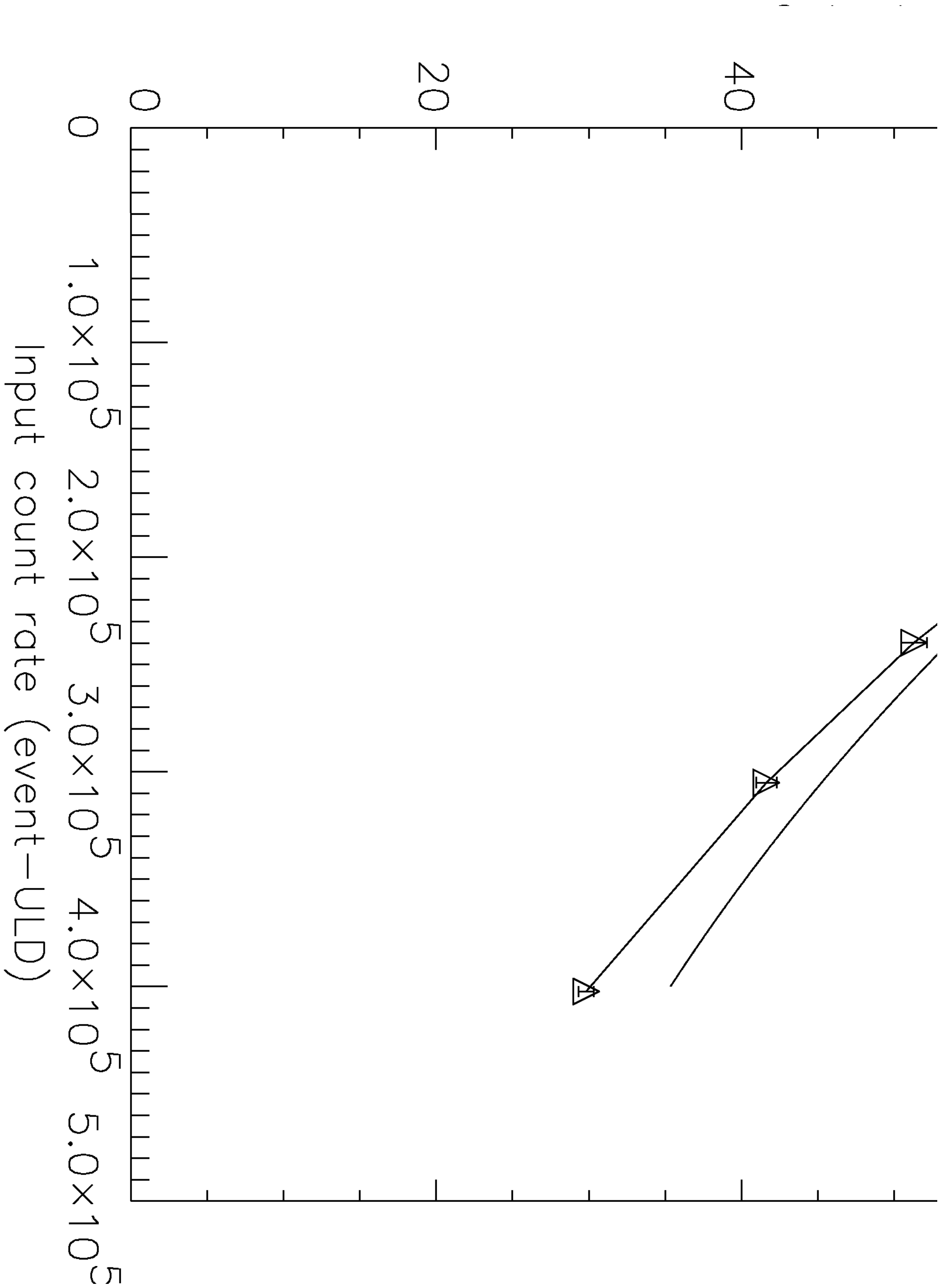


Figure 14. Plot of relationship between th
rates.

The dead time used in the fit is 2.6 μs.
leading to a reduction in output count rate

In fact the count rate is ultimately limited
to the CDHS from the GIS box, which is
deep, is used to store bursts of events clos
at a higher count rate. At total (sum of all
it may be possible to reduce the number c
just one detector is still too high, the inter
calibration software marks such data as u

6.2.1 Errors in Intensity

Count rates in excess of the limits impose
uncalibratable by the calibration software

6.3 Analogue dead time

This involves an extending dead time of a
used to correct for this were measured be
plotted in Figure 14. The routine `gis_cal`
the data file `$CDS_GIS_CAL_INT/deadtin`

The dead time used in the fit is 2.6 μs. Th
leading to a reduction in output count rate
arrival and detection of a photon there fol
detected, within which any new events w
discrimination. This limits the rate at whi
non-linear relationship between the input

processing facility at Goddard, there is a
signified in the GIS and NIS data as a neg
exist (e.g., `cds_fill_missing`) to guess
taken with the results. Much lost data is '
CDROMs processed at Goddard within a

6.4.1 Errors in Intensity

Missing data introduces obvious errors in
negative values and should not be used fo
the value '65535', and should not be used

7. Effective Area and Detector

After all the above corrections have been
known absolute calibration data, using gi
`/arcsec2_cm2` switches. Detailed use of
GIS Software User Manual[2].

The GIS calibration coefficients used are
tests[4], the coefficients can be viewed grap

```
IDL> .run gis_write_calib
```

and are shown in Table 2.

Wavelength dependence of the efficiencies	**x^0**	
G1 polynomial	-2.31180E+01	3.8
G2 polynomial	1.10400E+02	-1.
G3 polynomial	1.43580E+00	-1.
G4 polynomial	1.22100E-01	1.1

Effective area (cm^2)	
Average area:	2.51667E+01

Vignetting against mirror position (cm^2)	**x^0**	
Polynomial	2.34380E+01	3.3

Table 2. Calibration coefficients used in

Date Observed: 1998-05-01

Table 3. Variation of NIS and GIS data r
The above observations were selected to
NIS and GIS data. The two observations
the calibrated intensities show large absol
1998. The lines observed were Mg VIII 3
($\log_{10}(\max(T_e))=6.2$).