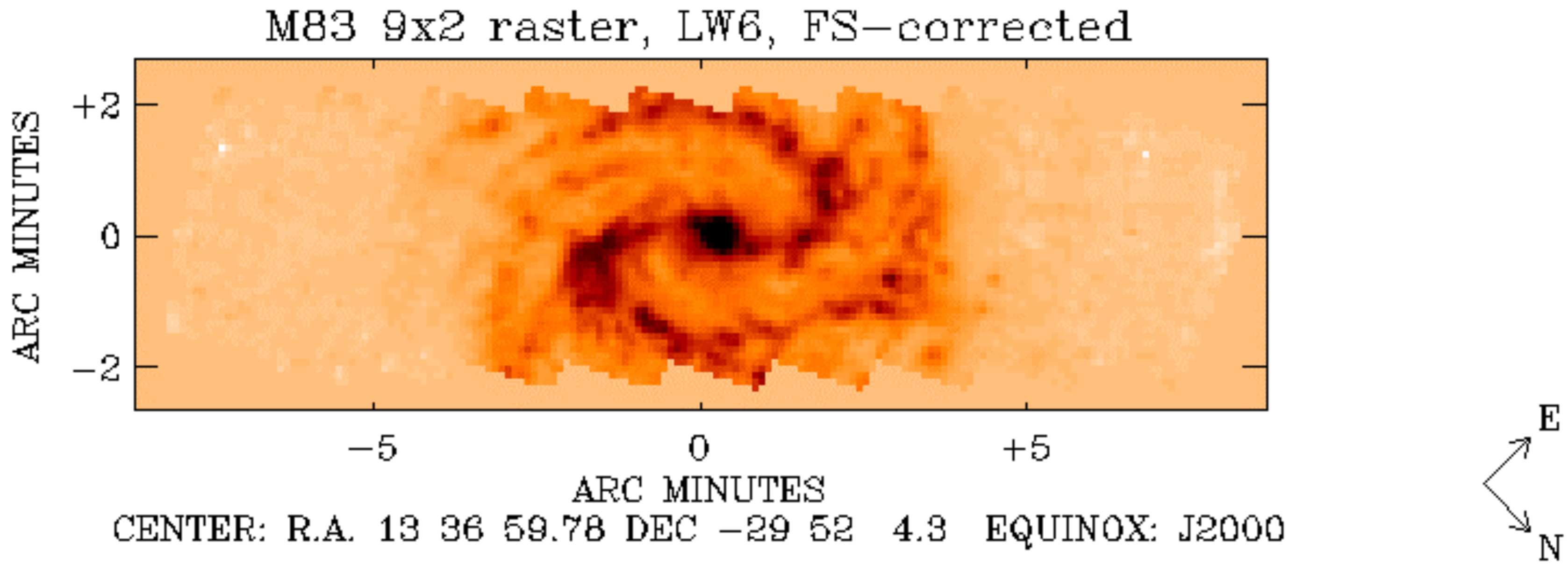
Testing Fouks-Schubert on « real » data: the dataset



The data: 9x2 rasters on M83 performed in LW1, 4, 5, 6, 7, 8, 9

T_{int} = 5.04s N_{exp} = 20

\+
- the object 's dynamics is « similar » in all filters
- the situation is a « typical » one
- the background changes dramatically 1->30 adu/g.s

−
- this is not the uniform illumination case
- strong gradients, point sources

Testing Fouks-Schubert on « real » data: data-reduction

- Darks: always use the model (T_{int} = 5.04s, gain=2)
- Deglitching: always use multiresolution (deglitch_mm /mr1d)
  + manually inspect the nuclear regions and slews on bright arms
- Flat-fields: always constructed from the data (frames 0, 1, 8, 9, 16, 17)

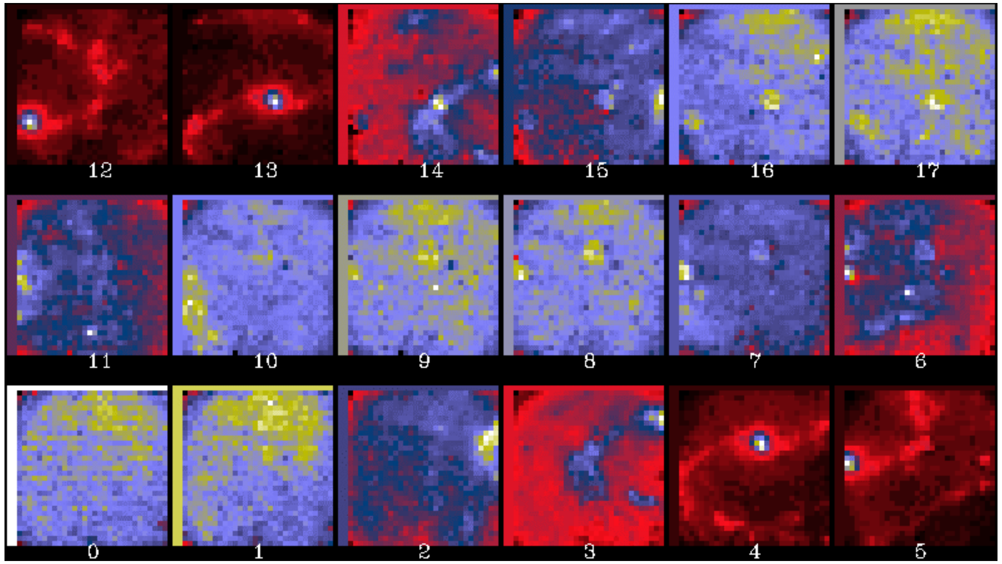
For each filter I create 3 raster images

« Raw »	« Inv »	« FS »
No transient correction.	Classical IAS correction	Fouks-Schubert correction Typically « muller » inversion method

In the following I compare photometric informations derived from these 3 images

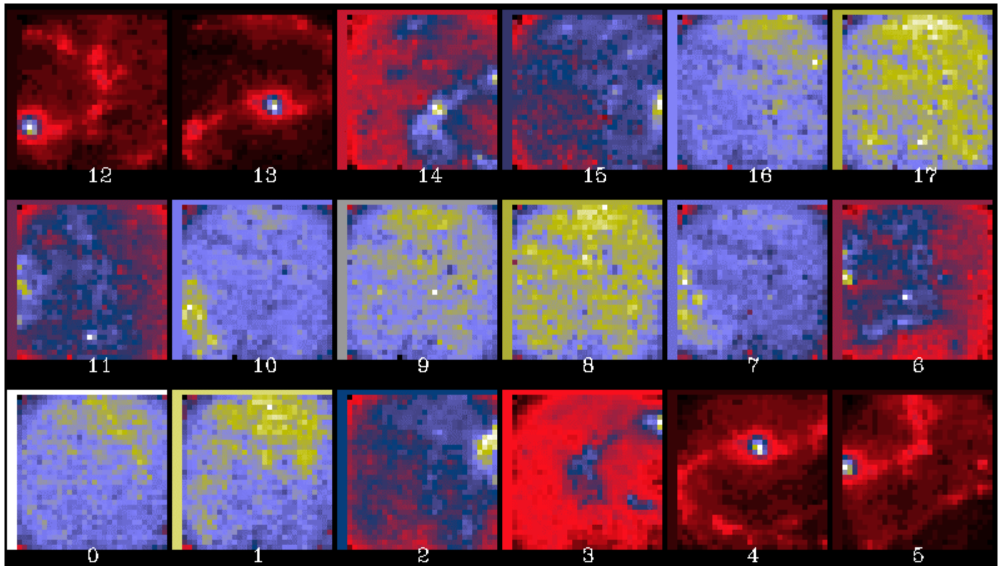
Testing Fouks-Schubert on « real » data: It works!

Here I compare the individual images from the LW5 raster corrected by the old IAS model and the new one



Corrected with the inversion method.
Note the nucleus ghost

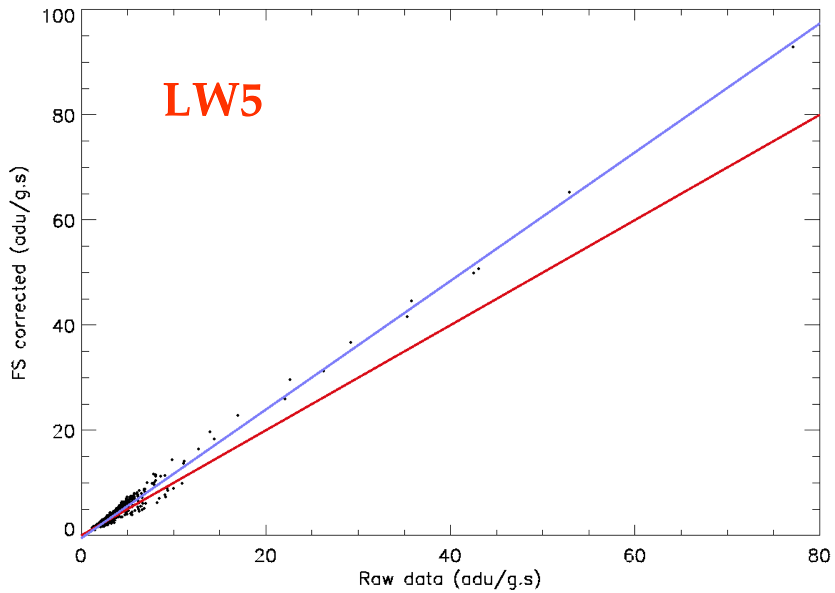
Corrected with Fouks-Schubert and muller solving



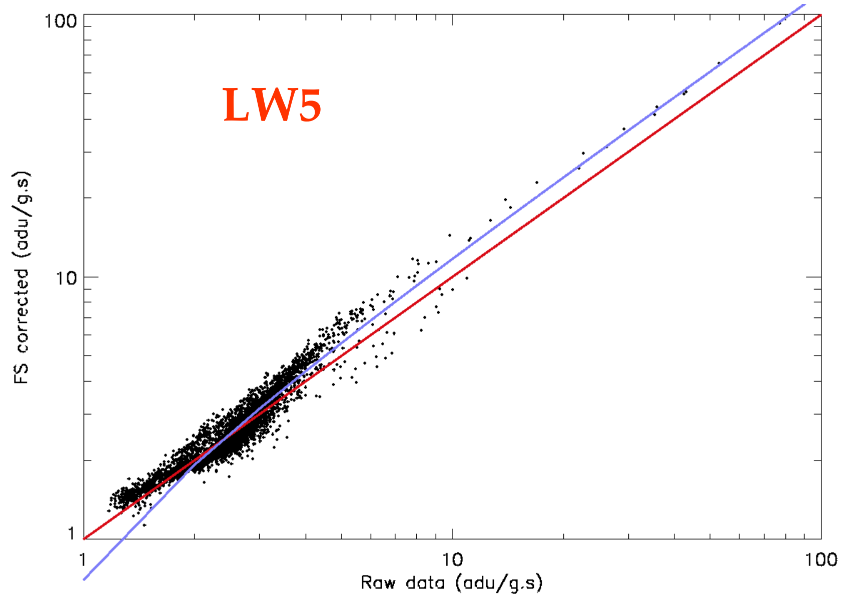
Testing Fouks-Schubert on « real » data: raster-to-raster correlations

A scatter plot is drawn correlating a raster version with another
The slope of the least square fit is measured.

Linear plot



Log-log plot



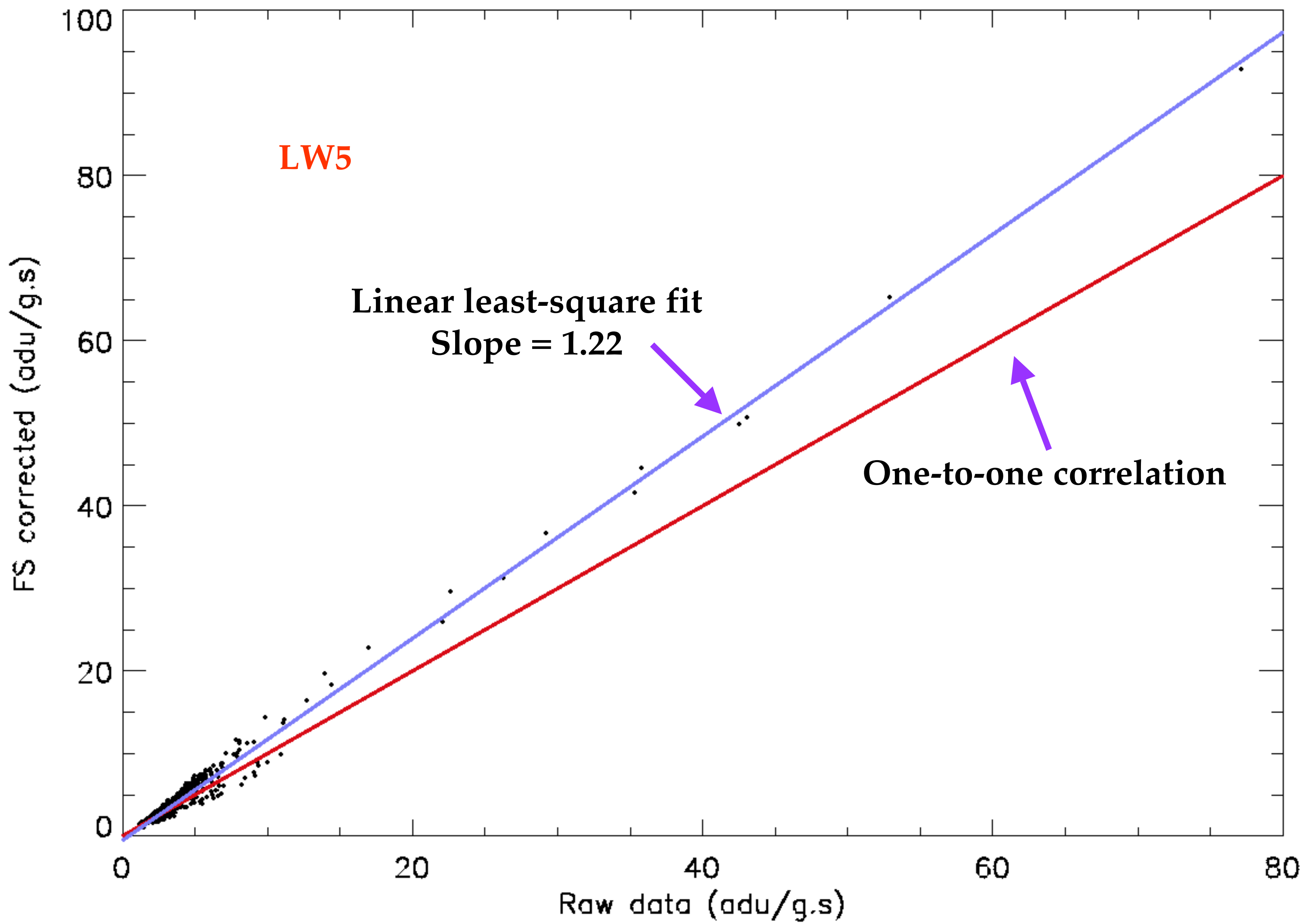
One-to-one proportionality
Linear least-square fit

$F_{zodi} = 3.5$ adu/g.s

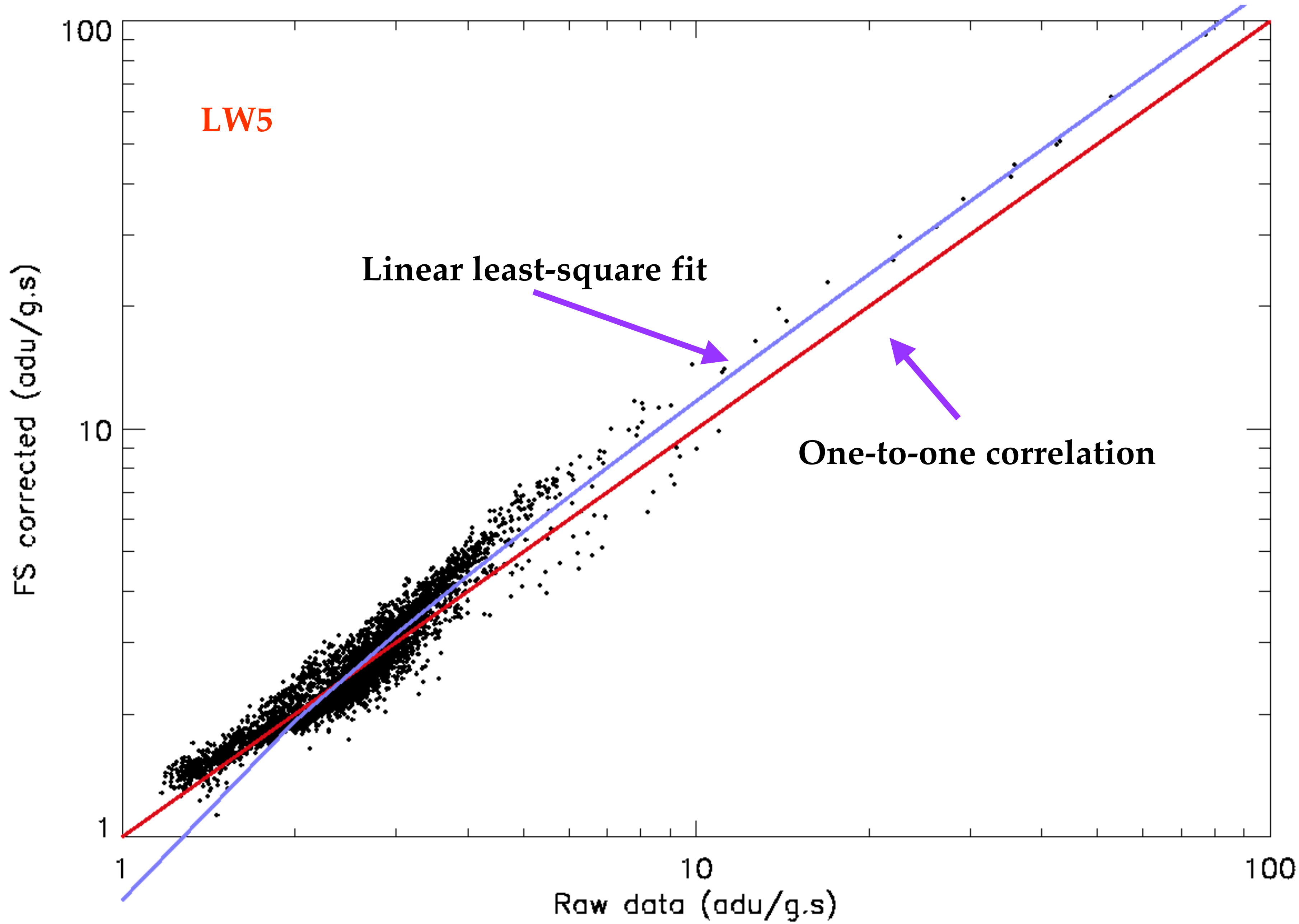
Note:

Significant increase in measured flux
Significant non linearities in the correlation
Muller solving fails for mysterious reasons

Testing Fouks-Schubert on « real » data: raster-to-raster correlations



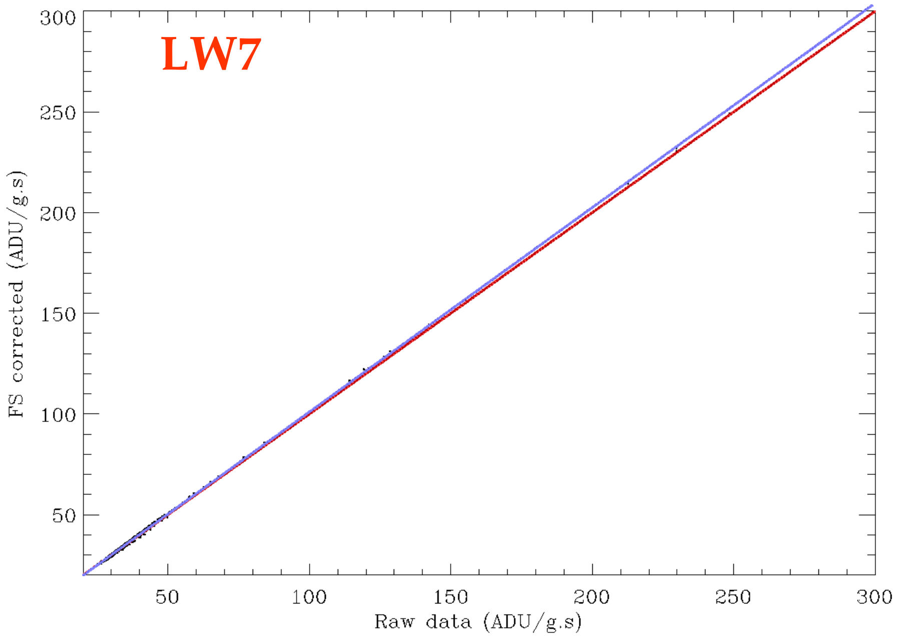
Testing Fouks-Schubert on « real » data: raster-to-raster correlations



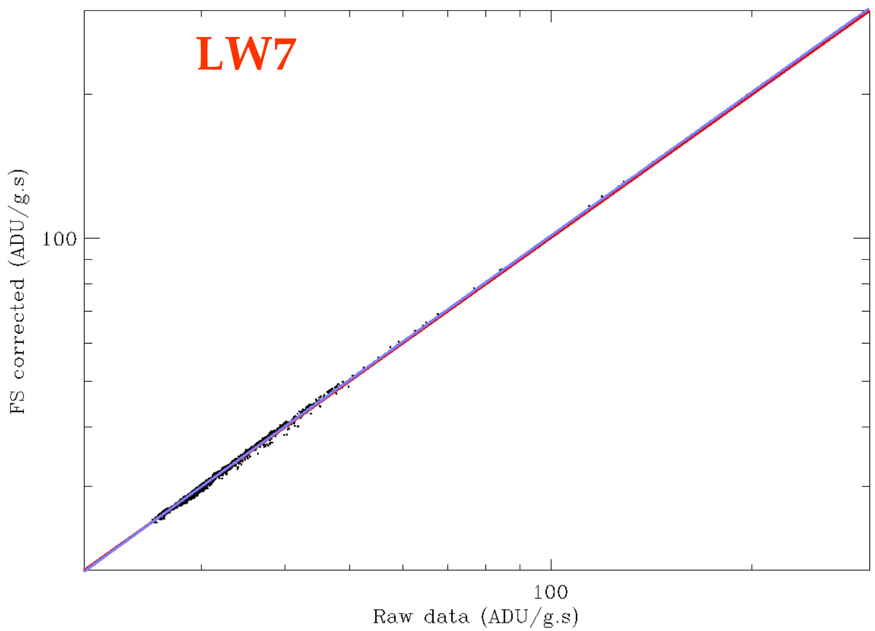
Testing Fouks-Schubert on « real » data: raster-to-raster correlations

The difference is much less pronounced at high background levels

Linear plot



Log-log plot



One-to-one proportionality

Linear least-square fit

F_{zodi} = 27.3 adu/g.s

Testing Fouks-Schubert on « real » data: raster-to-raster correlations

Results on all filters

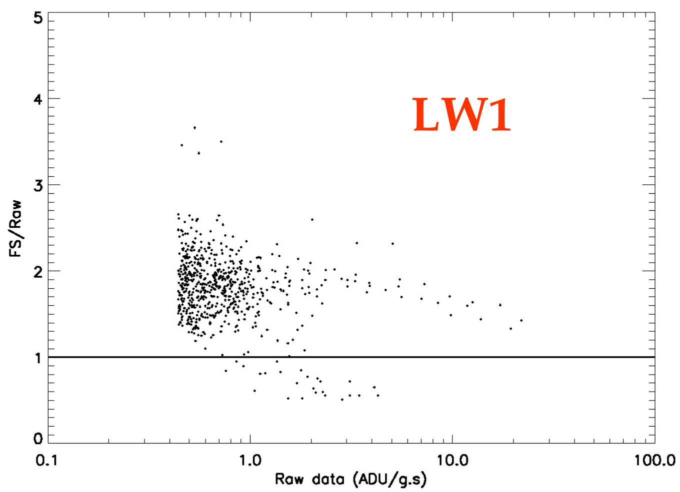
Filter	slope FS vs Raw	Slope FS vs Inv	F_{zodi}
LW1	1.51	1.27	0.86
LW5	1.22	1.13	2.28
LW4	1.17	1.05	3.51
LW6	1.04	1.02	10.97
LW8	1.02	1.005	23.0
LW9	1.02	0.996	24.0
LW7	1.01	0.999	27.3

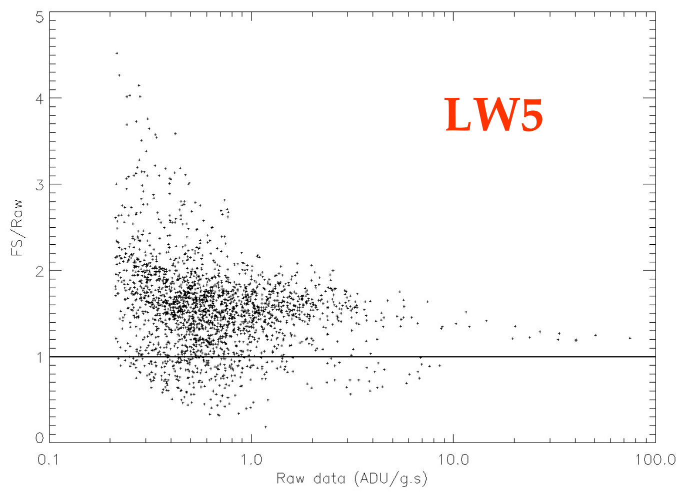
Questions

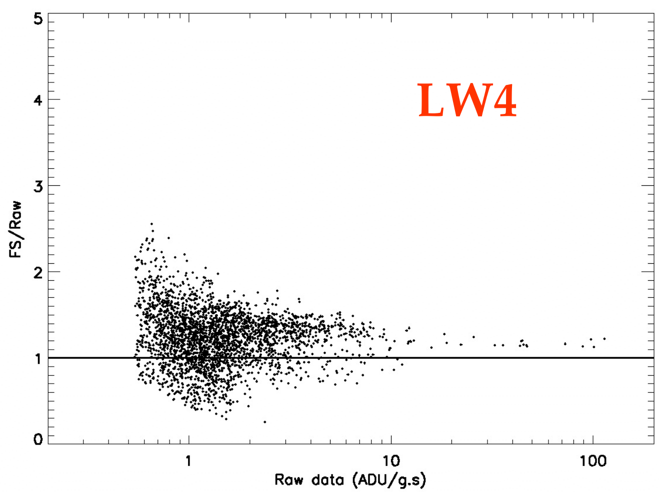
- Is the correction (any one) not working above 10 adu/g.s?
- Is 10 adu/g.s a limit after which no transient correction is required? (when a sufficient N_{exp} has been used)

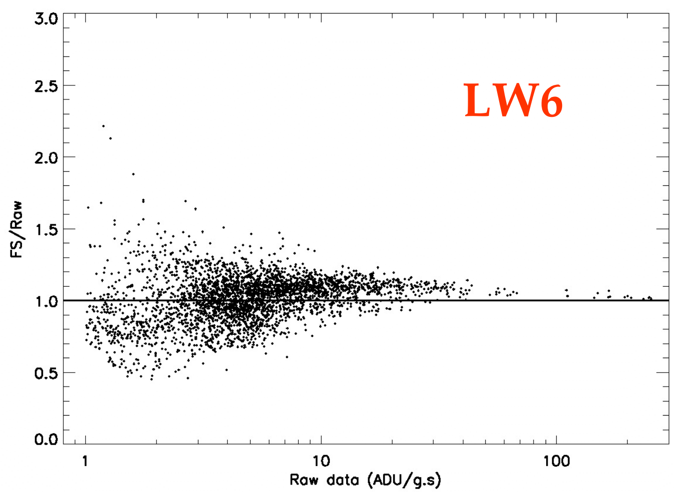
Testing Fouks-Schubert on « real » data: pixel by pixel corrections

Here the idea is to inspect, for each pixel in the raster image, the value before and after transient correction and see how this ratio varies with the intensity



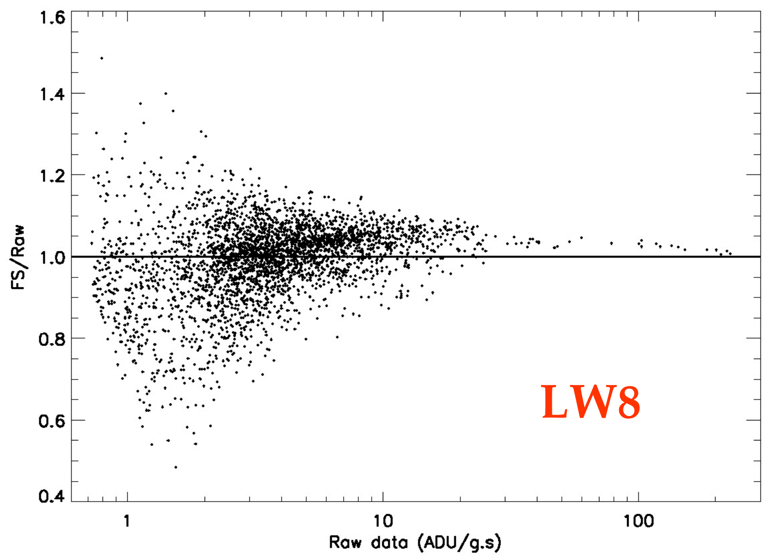


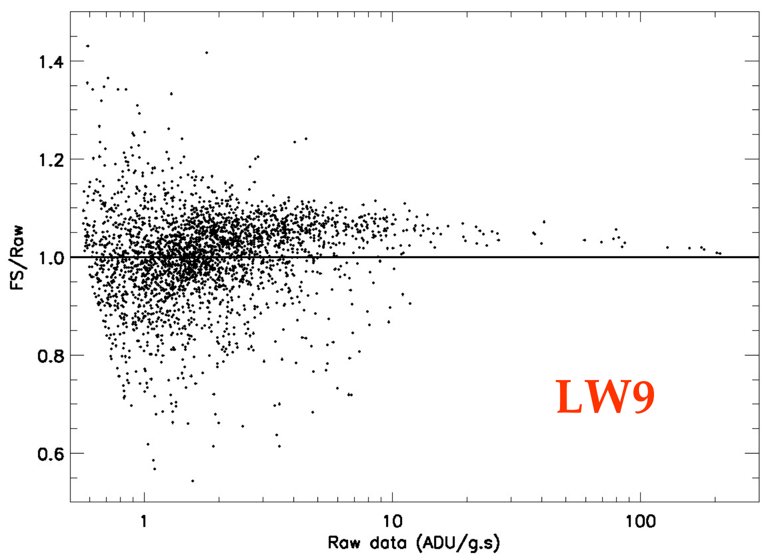


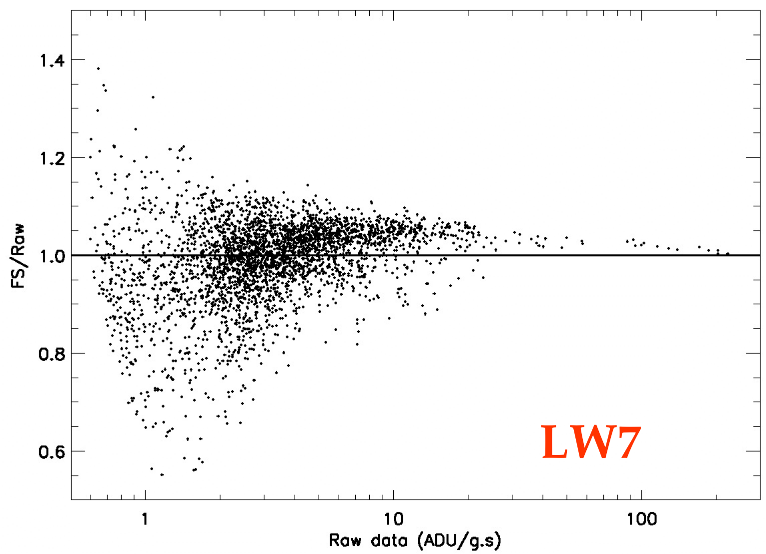


All images are background subtracted, and only significant (3s) pixels are shown

Testing Fouks-Schubert on « real » data: pixel by pixel corrections







Even at high background level, a photometric correction is applied by FS.
However its mean/median/maximum amplitude clearly decreases with increasing background flux

Testing Fouks-Schubert on « real » data: raster-to-raster correlations

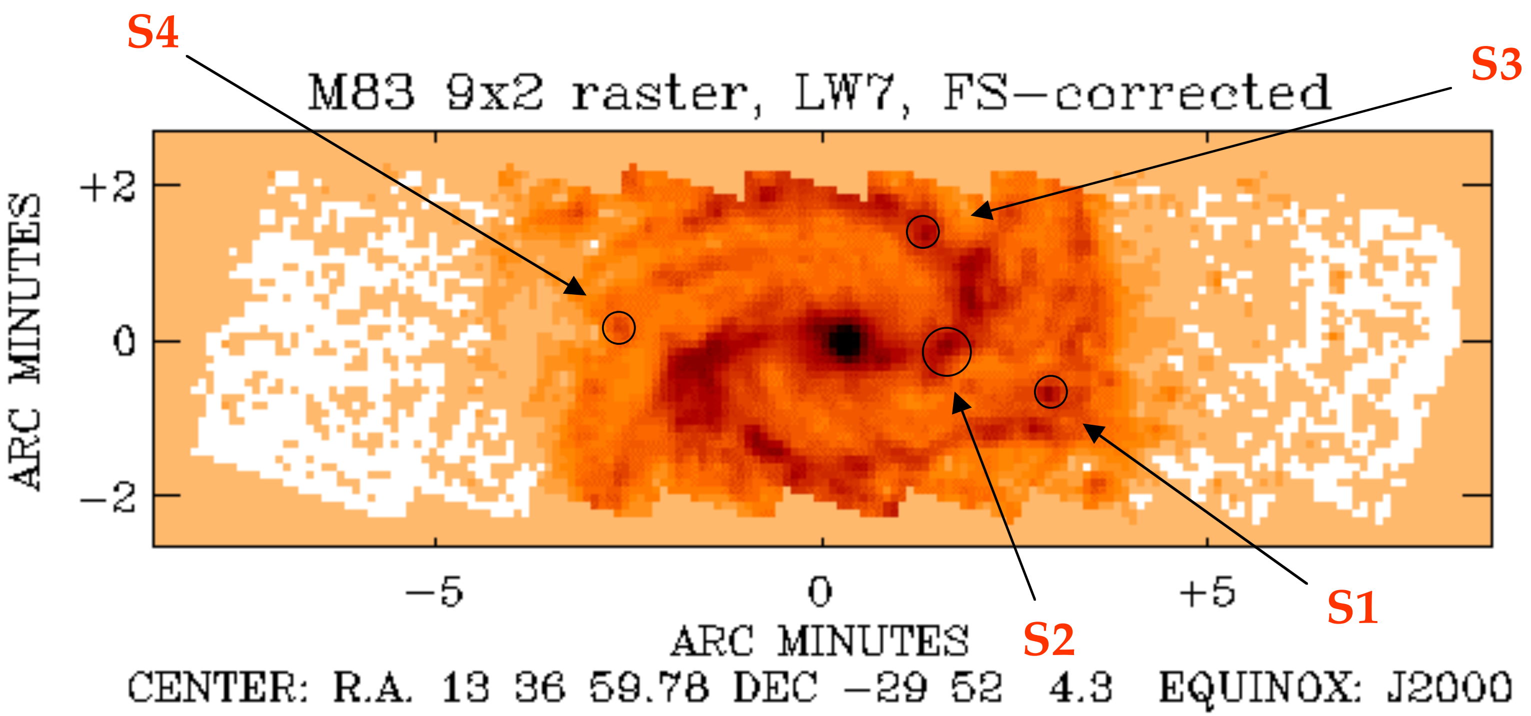
Results on all filters

Filter	<corr> all pix	<corr> FS/Raw>1	F_{zodi}
LW1	1.8±0.4	1.8±0.3	0.86
LW5	1.6±0.5	1.7±0.4	2.28
LW4	1.3±0.3	1.4±0.2	3.51
LW6	1.0±0.2	1.1±0.1	10.97
LW8	1.0±0.1	1.05±0.05	23.0
LW9	1.0±0.09	1.05±0.05	24.0
LW7	1.0±0.09	1.04±0.04	27.3

Median of the ratio FS/Raw for all significant pixels of the rasters

Median of the ratio FS/Raw for only those points where the ratio is greater than 1 (i.e. where flux was lost due to the transient)

Testing Fouks-Schubert on « real » data: aperture photometry



Aperture photometry is performed for 4 HII regions in the galaxy in the three raster images (no aperture corrections applied)

No photometry is performed on LW1 as HII regions are not detected

Testing Fouks-Schubert on « real » data: aperture photometry

All integrations are performed in a 3pix radius aperture

LW7	Raw	Inv	FS	Δ(%)
S1	178	181	189	+6
S2	300	290	288	-4
S3	219	223	230	+5
S4	80	80	81	+1

LW6	Raw	Inv	FS	Δ(%)
S1	287	306	326	+12
S2	485	456	477	-2
S3	340	354	374	+9
S4	131	126	131	0

LW9	Raw	Inv	FS	Δ(%)
S1	100	104	109	+8
S2	147	131	131	-12
S3	95	97	101	-6
S4	31	32	31	0

LW4	Raw	Inv	FS	Δ(%)
S1	66	83	86	+23
S2	132	117	120	-10
S3	74	106	102	+27
S4	34	37	37	+8

LW8	Raw	Inv	FS	Δ(%)
S1	195	201	208	+6
S2	330	313	316	-4
S3	240	244	250	+4
S4	91	91	89	-2

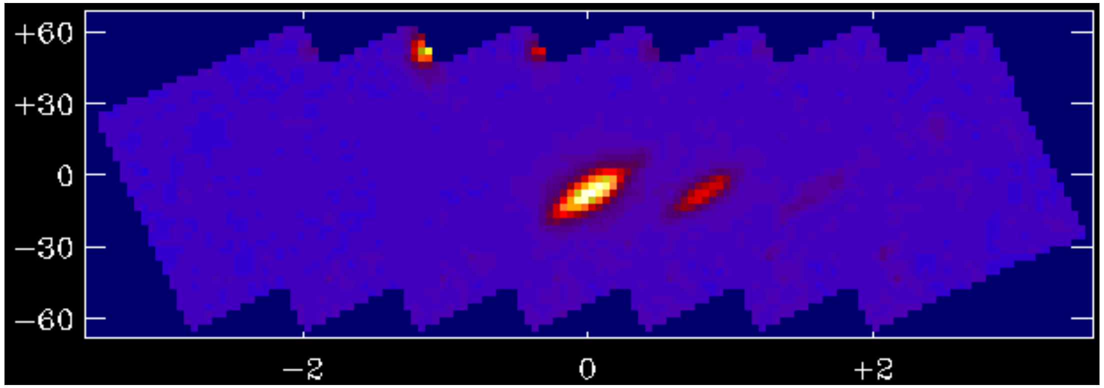
LW5	Raw	Inv	FS	Δ(%)
S1	26	43	42	+38
S2	65	66	73	+11
S3	37	53	55	+33
S4	13	13	16	+19

Once again, corrections become significant at low median flux

Testing Fouks-Schubert on « real » data: future work

Clearly more work is needed to understand the photometric impact of FS and state when it is effective. For this purpose the M83 data used here are probably not ideal

→ Use the TFPR field:



− Again a rather compact source (but small pfovs can be used after dark model)

\+
- Many observations (7x7, 7x1) exist
- Very long observations were performed so intrinsic photometry can be constrained
- transients are simple (off-on-off)