

The points of caution on the FIS data

ESAC, Madrid, 18–19 September 2007
AKARI Data Reduction Workshop

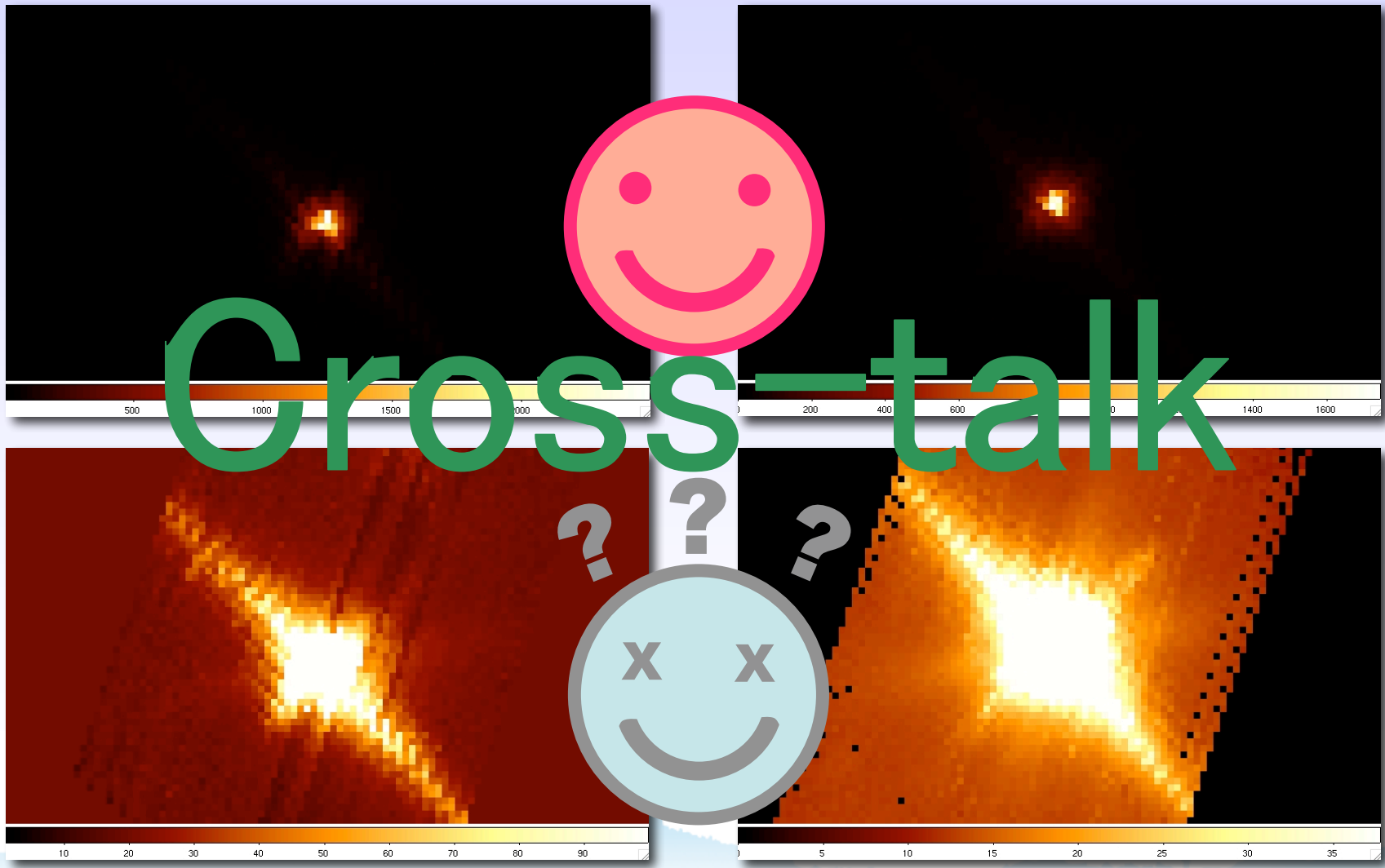
Mai Shirahata (ISAS/JAXA)
Shuji Matsuura (ISAS/JAXA)
Sin' itirou Makiuti (ISAS/JAXA)
Issei Yamamura (ISAS/JAXA)



Output Image : N60 / Wide-S

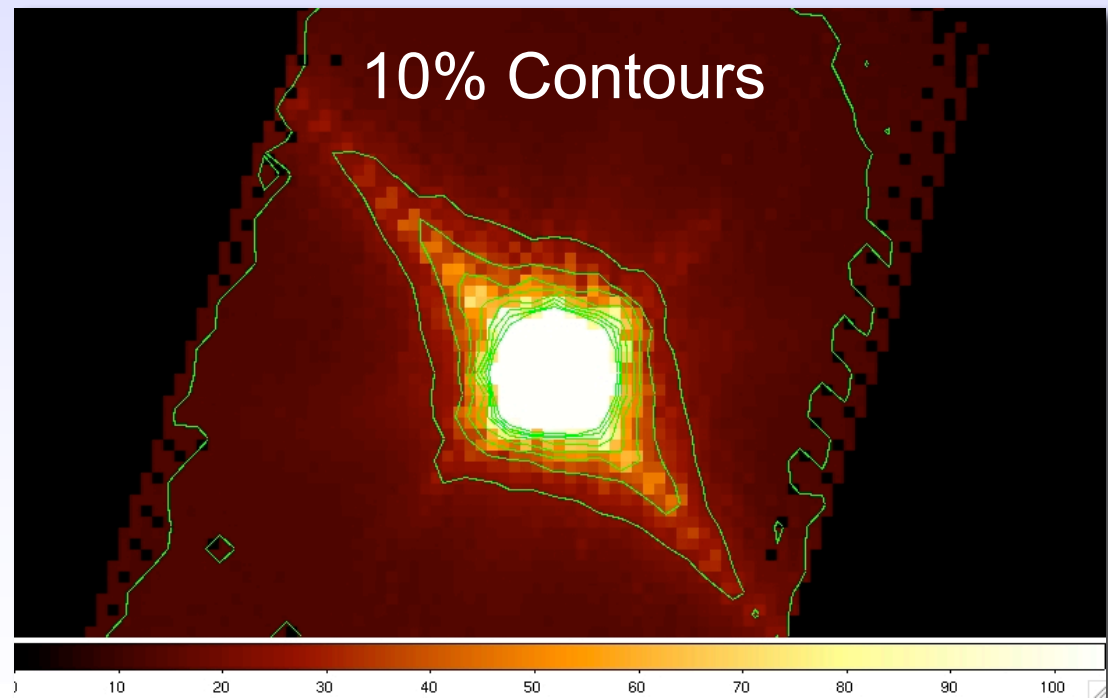
N60

Wide-S



Cross-talk

- Cross-talk between the array pixels appears only in the **SW** detector.
 - **Cause:** Photons diffuse into the monolithic Ge:Ga substrate.
 - The strength of the cross-talk is about 10%.

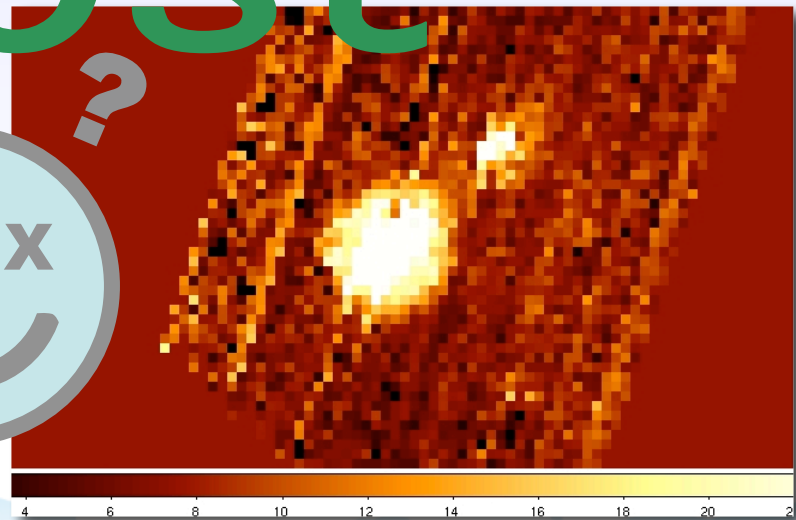
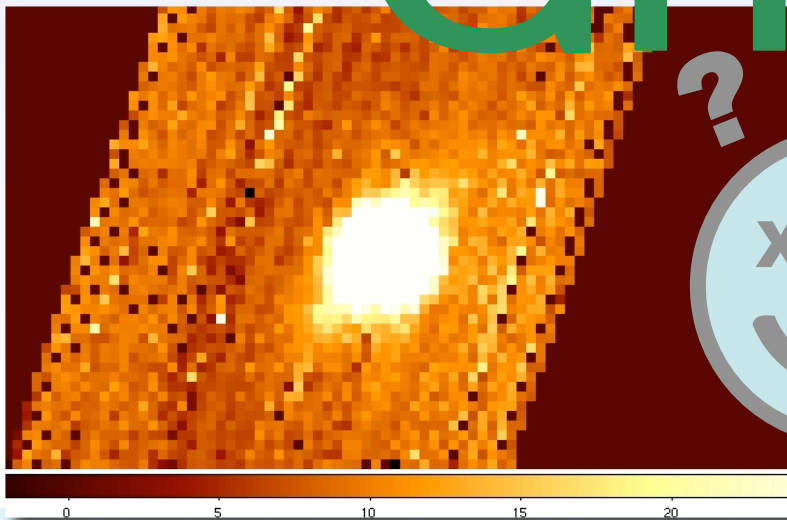
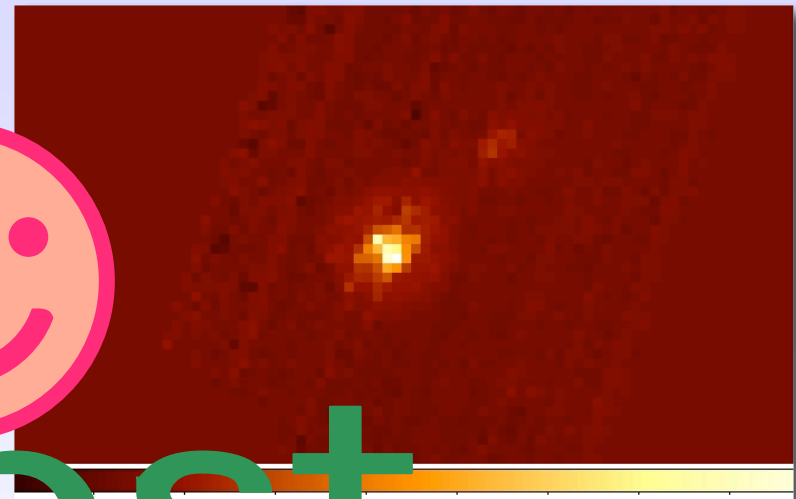
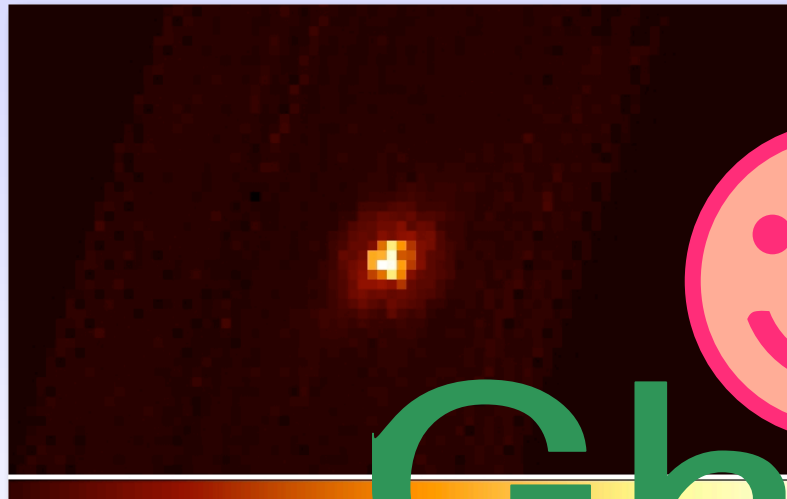


- LW detector does not have the monolithic structure.
→ The cross-talk does not appear.

Output Image : Wide-L / N160

Wide-L

N160



Ghost

?

?

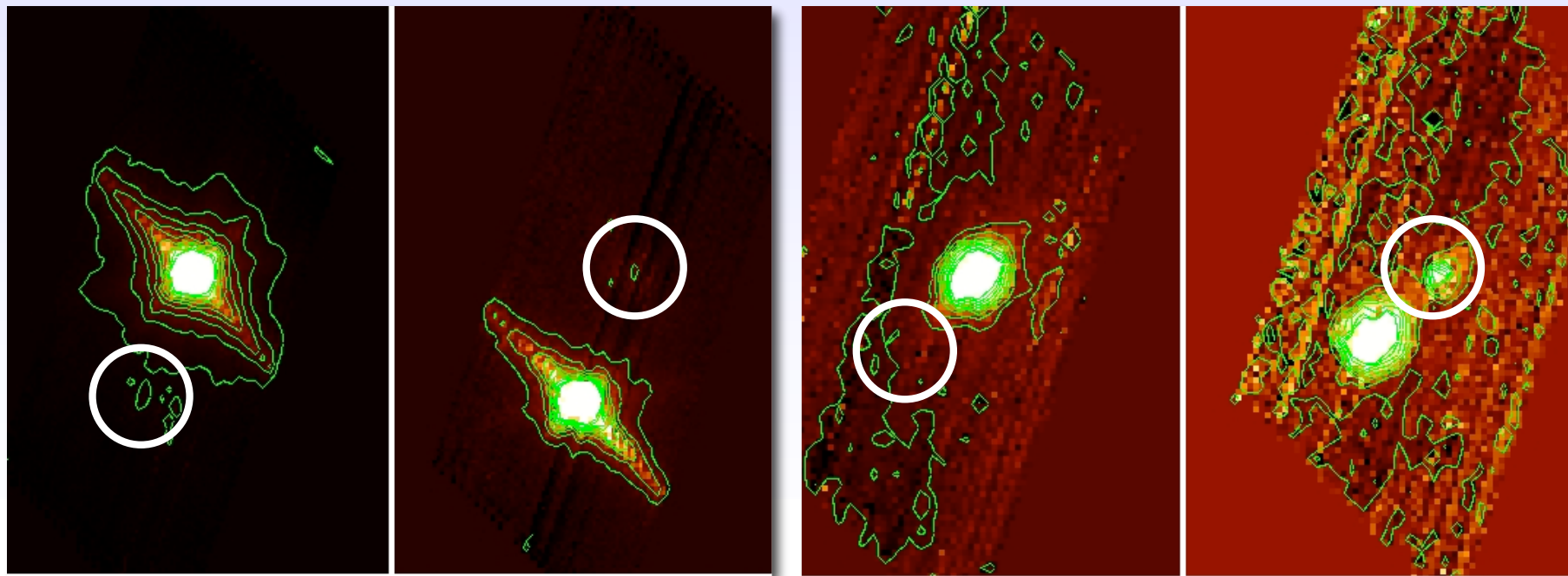
?



Ghost

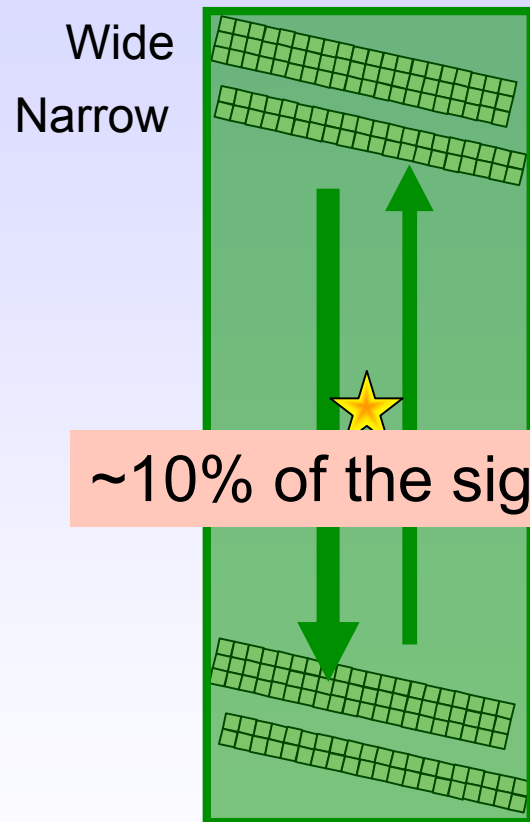
- The ghost image appears in all bands.
 - **Cause:** Electrical cross-talk in the MPX of the CRE.
 - The ghost signal appears in wide(narrow) band, when the narrow(wide) band observes a target.

Wide-S ↔ N60 Wide-L ↔ N160



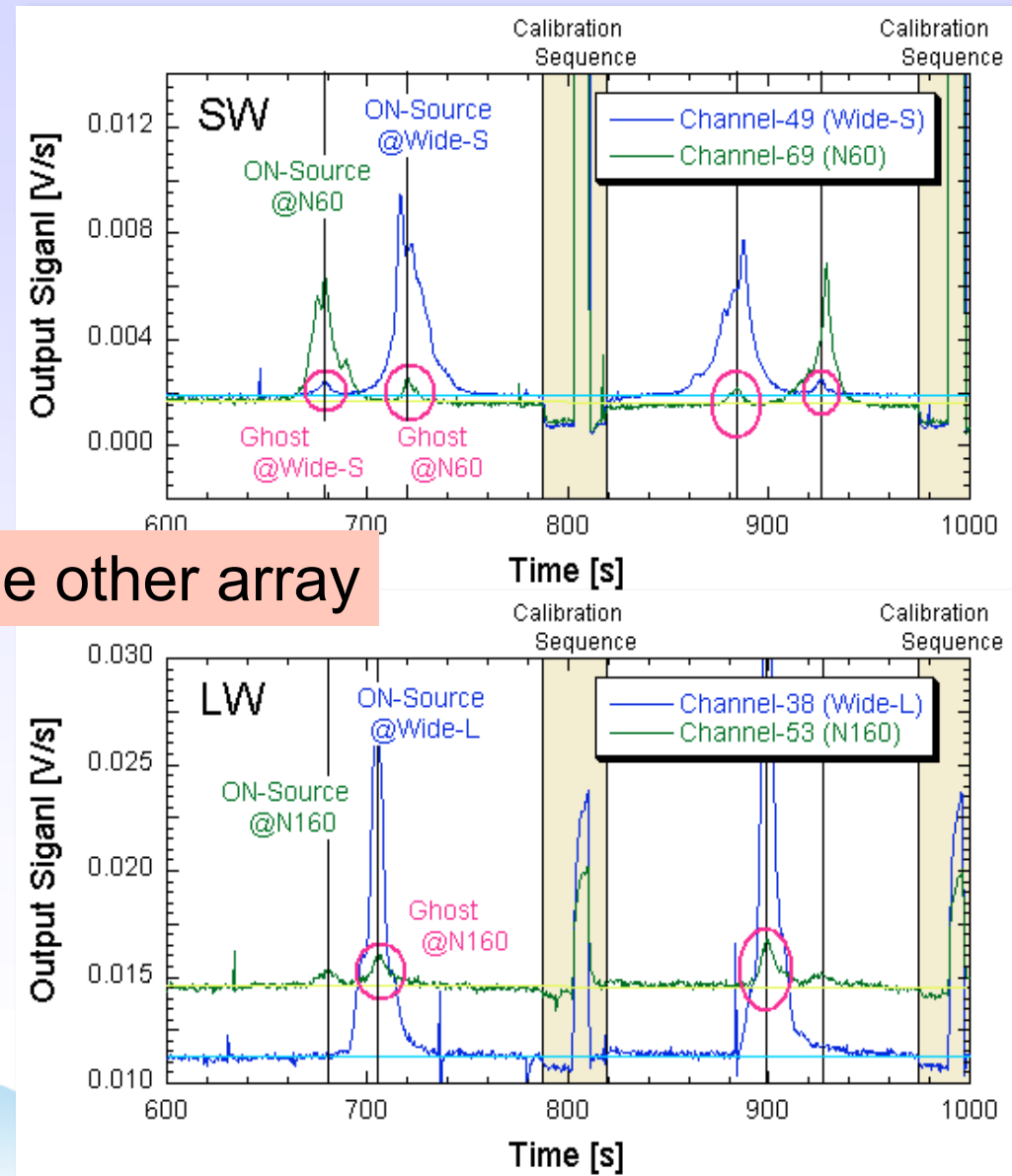
Ghost

SW/LW detector have two arrays.



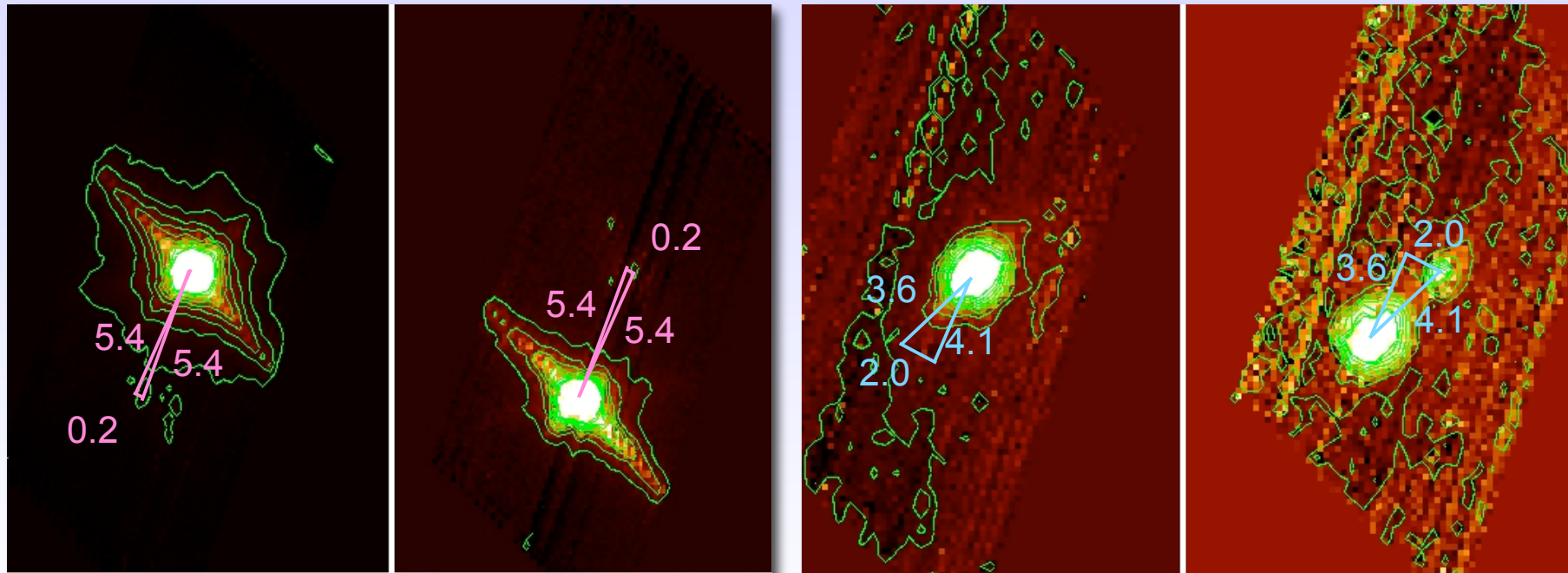
~10% of the signal in the other array

The ghost signal appears in one array when the other array observes a target.



Ghost

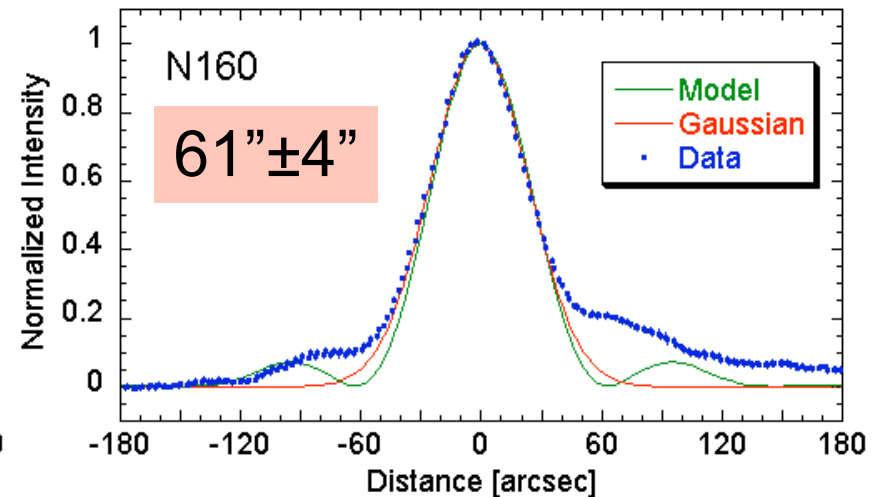
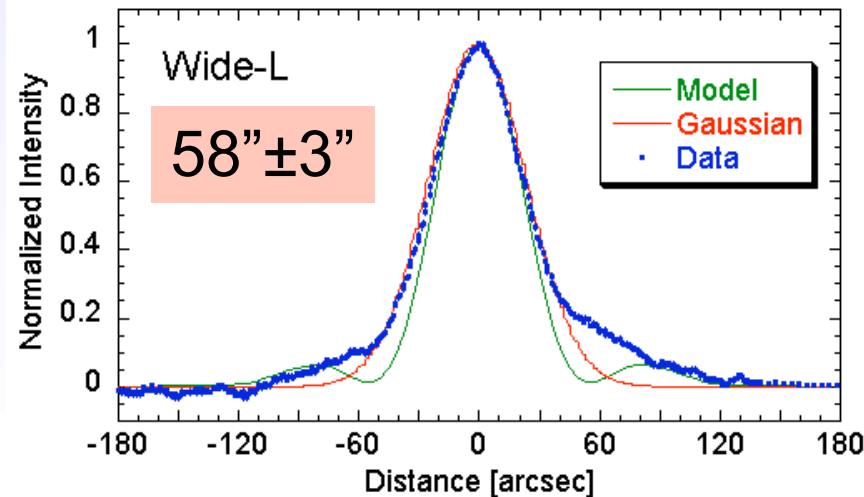
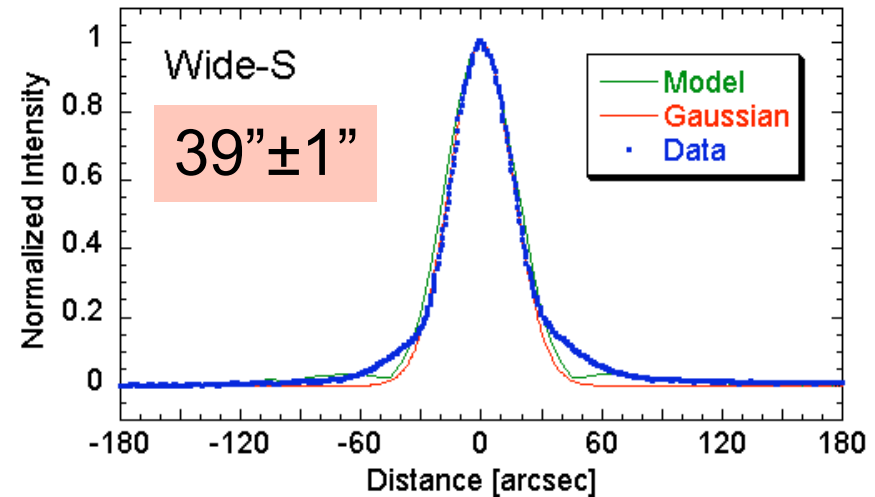
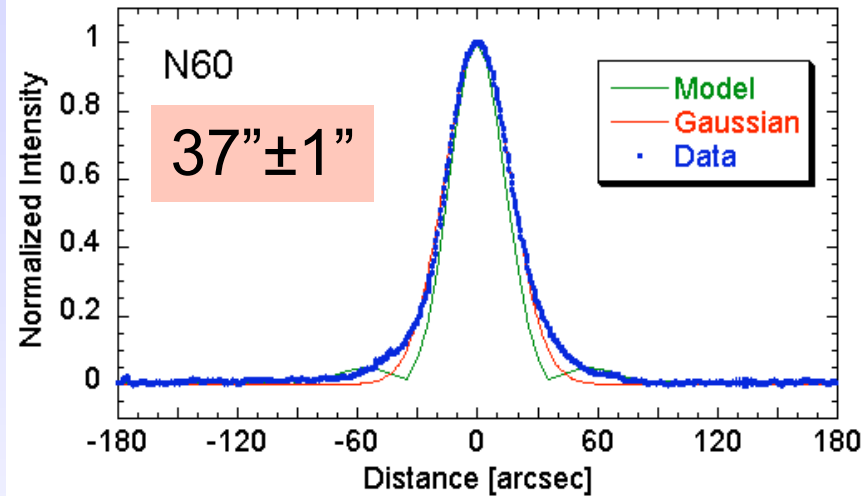
- The ghost image appears in all bands.
 - Cause: Electrical cross-talk in the MPX of the CRE.



- The position where the ghost appears can be calculated.
- The position and strength are stable.
 - possible to remove it. (will be developing)

Point Spread Function (PSF)

- The PSF of each band measured by the asteroids observations.



- There are significant excesses around tails of the PSFs.
- The contributions are about 30% of the total power.

The advanced tools

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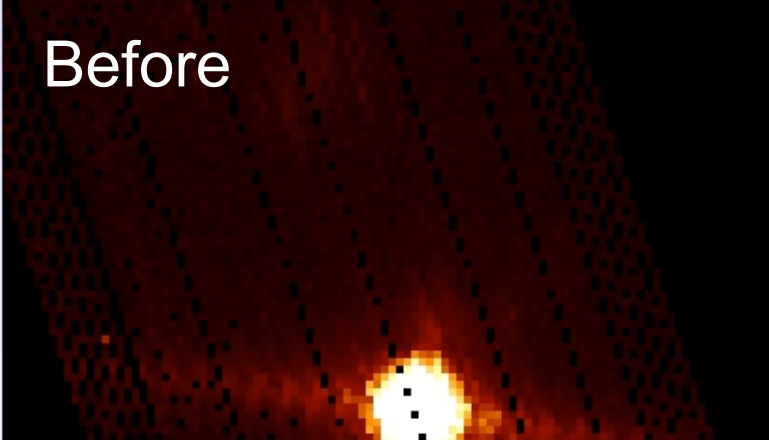
Mai Shirahata (ISAS/JAXA)
Shuji Matsuura (ISAS/JAXA)
Sin' itirou Makiuti (ISAS/JAXA)
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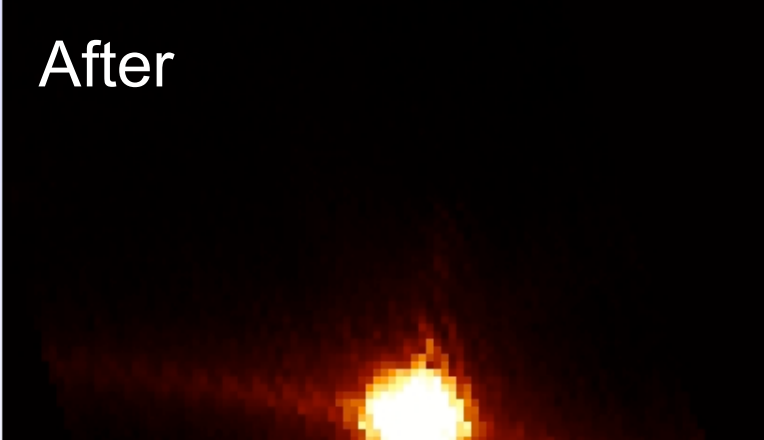
Bad Pixel Correction Tool

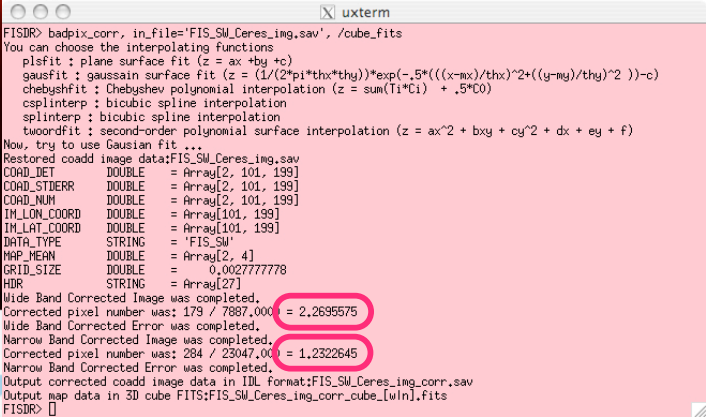
- badpix_corr, in_file='FIS_SW_**_img.sav',
[func=', /cube_fits]

Before



After





```

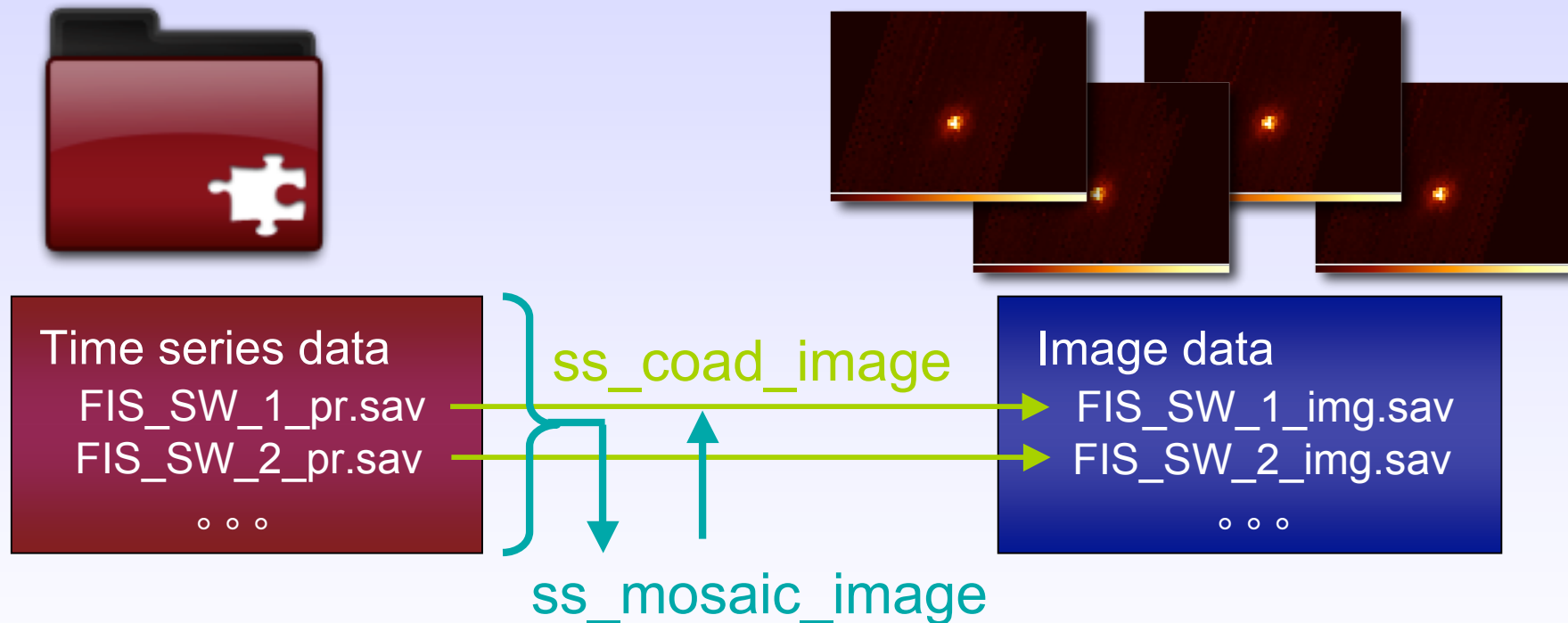
FISDR> badpix_corr, in_file='FIS_SW_Ceres_img.sav', /cube_fits
You can choose the interpolating functions
plsfitt : plane surface fit (z = ax +by +c)
gausffit : gaussian surface fit (z = 1/(2*pi*thx*thy))*exp(-.5*((x-mx)/thx)^2+((y-my)/thy)^2))-c)
chebushfit : Chebyshev polynomial interpolation (z = sum(Ti*Ci) + .5*C0)
cslinterp : bicubic spline interpolation
splinterp : bicubic spline interpolation
twoordfit : second-order polynomial surface interpolation (z = ax^2 + bxy + cy^2 + dx + ey + f)
Now, try to use Gaussian fit ...
Restored coadd image data:FIS_SW_Ceres_img.sav
COORD_DET    DOUBLE    = Array[2, 101, 199]
COORD_STDERR DOUBLE    = Array[2, 101, 199]
COORD_NUM    DOUBLE    = Array[2, 101, 199]
IM_LON_COORD DOUBLE    = Array[101, 199]
IM_LAT_COORD DOUBLE    = Array[101, 199]
DATA_TYPE    STRING    = 'FIS_SW'
MAP_MEAN     DOUBLE    = Array[2, 4]
GRID_SIZE    DOUBLE    = 0.0027777778
HDR          STRING    = Array[27]
Wide Band Corrected Image was completed.
Corrected pixel number was: 179 / 7887,000 = 2,2695975
Wide Band Corrected Error was completed.
Narrow Band Corrected Image was completed.
Corrected pixel number was: 284 / 23047,000 = 1,2322645
Narrow Band Corrected Error was completed.
Output corrected coadd image data in IDL format:FIS_SW_Ceres_img_corr.sav
Output map data in 3D cube FITS:FIS_SW_Ceres_img_corr_cube[win].fits
FISDR> ]

```

- Please check the fraction of the corrected pixels !!

Image Combining Tool

- `ss_mosaic_image` (previously known as `ss_multi_scan_map2`)
make wide/deep image map with combining the multi-scan data



- `ss_mosaic_image, targetdir, [SIGMA=sigma, T_START=t_start, T_END=t_end, GRID_SW(LW) = grid_sw(LW), /cube_fits, tag_name=' * ', /no_display, /aot_mix LON_CENTER = lon_center, LAT_CENTER = lat_center, LON_SIZE = lon_size, LAT_SIZE = lat_size, ECLIPTIC = ecliptic, GALACTIC = galactic,`

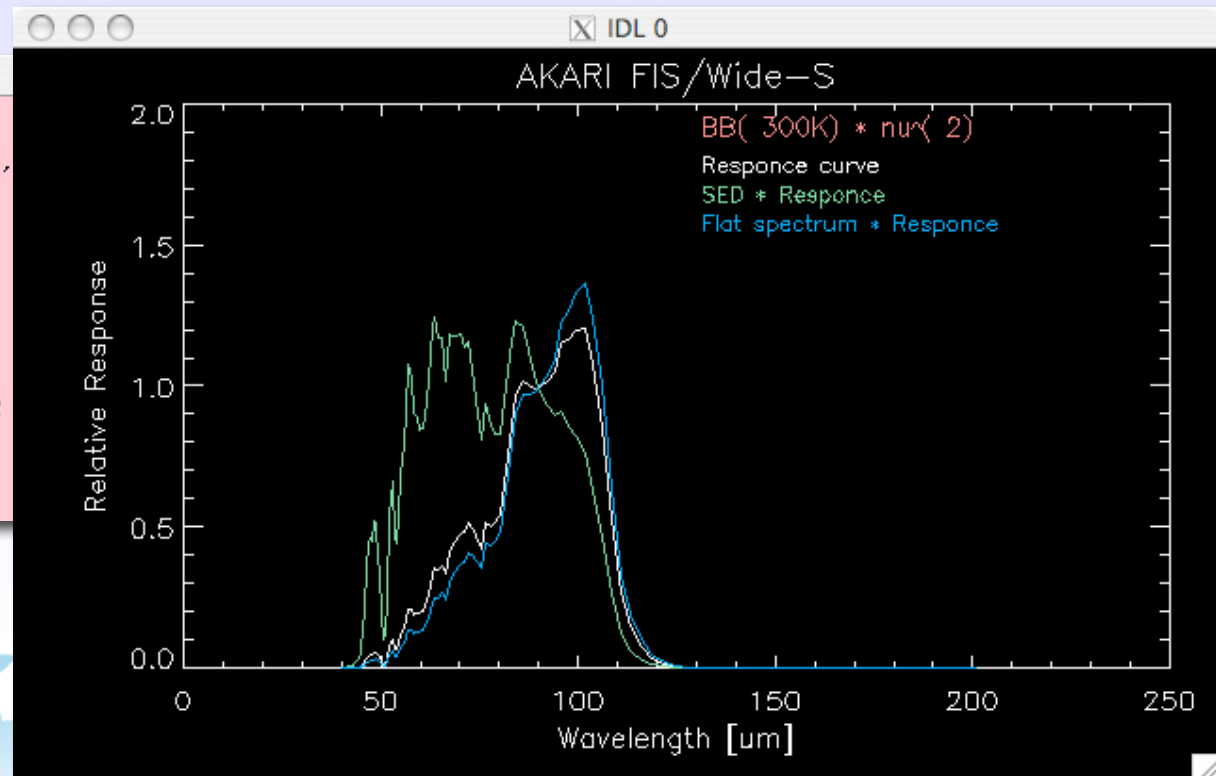
Color Correction Factor Tool

- The FIS photometric flux is defined for a flat spectrum at the defined central wavelength of each band.
→ Color correction is necessary.
- `color_corr, band, factor, bb=[temp,beta] or power=[alpha], [,/check]`
(N60=0, Wide-S=1, Wide-L=2, N160=3)

```

uxterm
FISDR> color_corr
# USAGE #
color_corr, band, bb=[temp,beta] or power=[alpha] [,
band      : 1=N60, 2=Wide-S, 3=Wide-L, 4=N160
spectrum  : Blackbody or Power Law
            Blackbody : bb=[temp,beta]
            Power Law : power=[alpha]
factor    : color correction factor (output)
/check    : display the response graph
FISDR> color_corr, 1, bb=[300,2], /check
Read FIS_RSFR_070122.txt file
--- Wide-S band ---
Blackbody Spectrum : temperature = 300(K), beta = 2
d_nu_flat : 1.5327850 (THz)
d_nu_SED  : 3.0759437 (THz)
Color correction factor : 2.0067678
FISDR>

```



Aperture Photometry

Images are in brightness scale units of **MJy/sr**.



The absolute calibration has been done by
the **zodiacal light** for **SW** and **IR cirrus** for **LW**.

Aperture photometry should give the flux of the sources in **Jy**.

As the flux calibrator, 19 asteroids, 20 stars and 18 galaxies were observed.

The define of the sky area

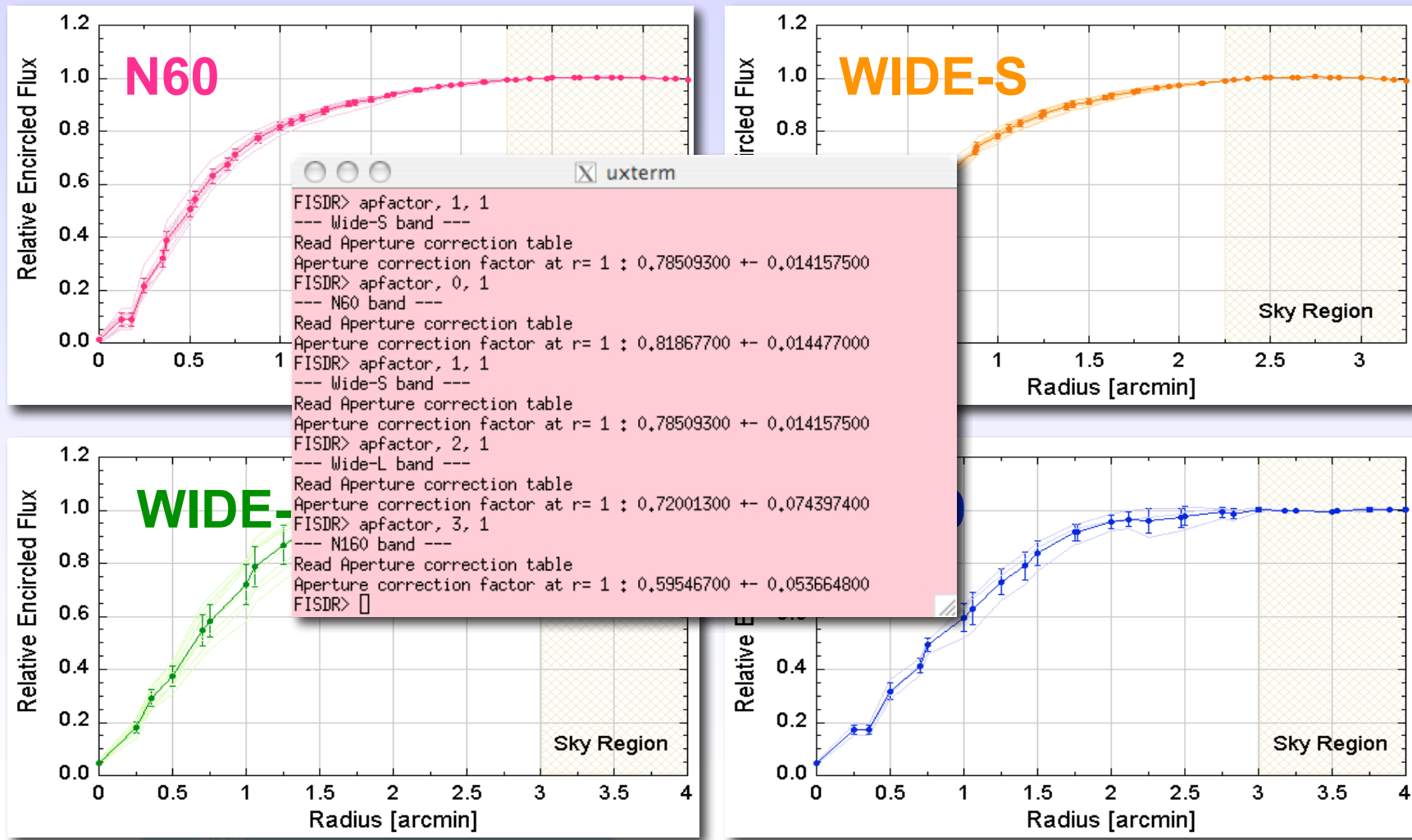
SW = 2.25-3.25 [arcmin], LW = 3.00-4.00 [arcmin]

The results of aperture photometry are ...



Aperture Correction Factor Tool

- From this plot, we can get the aperture correction factor.



- apfactor, band, radius[arcmin], factor, factor_error

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The define of the sky area

SW = 2.25-3.25 [arcmin], LW = 3.00-4.00 [arcmin]

The results of aperture photometry are ...

This aperture correction table may depend on

the grid size of image,

AOTs such as reset interval and scan speed,

the data reduction method (the option of the ss-tool),

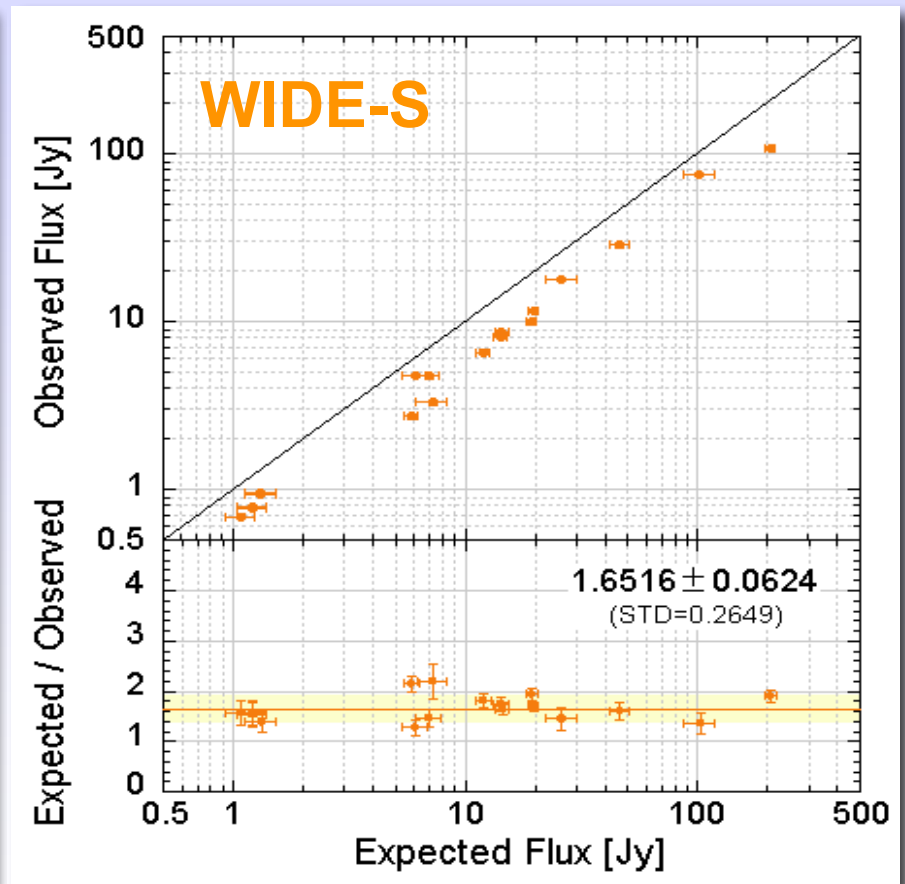
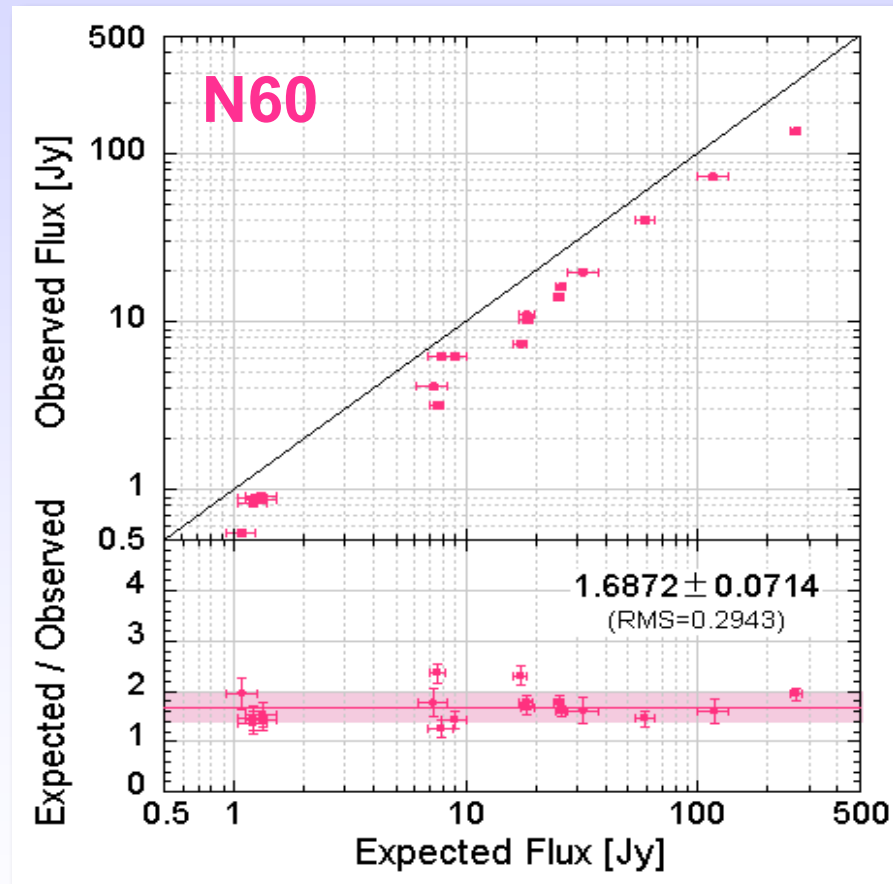
the sky area.

Note: The table of the current version is not well checked.

This table will be replaced in the near future.

Point source - Diffuse Factor

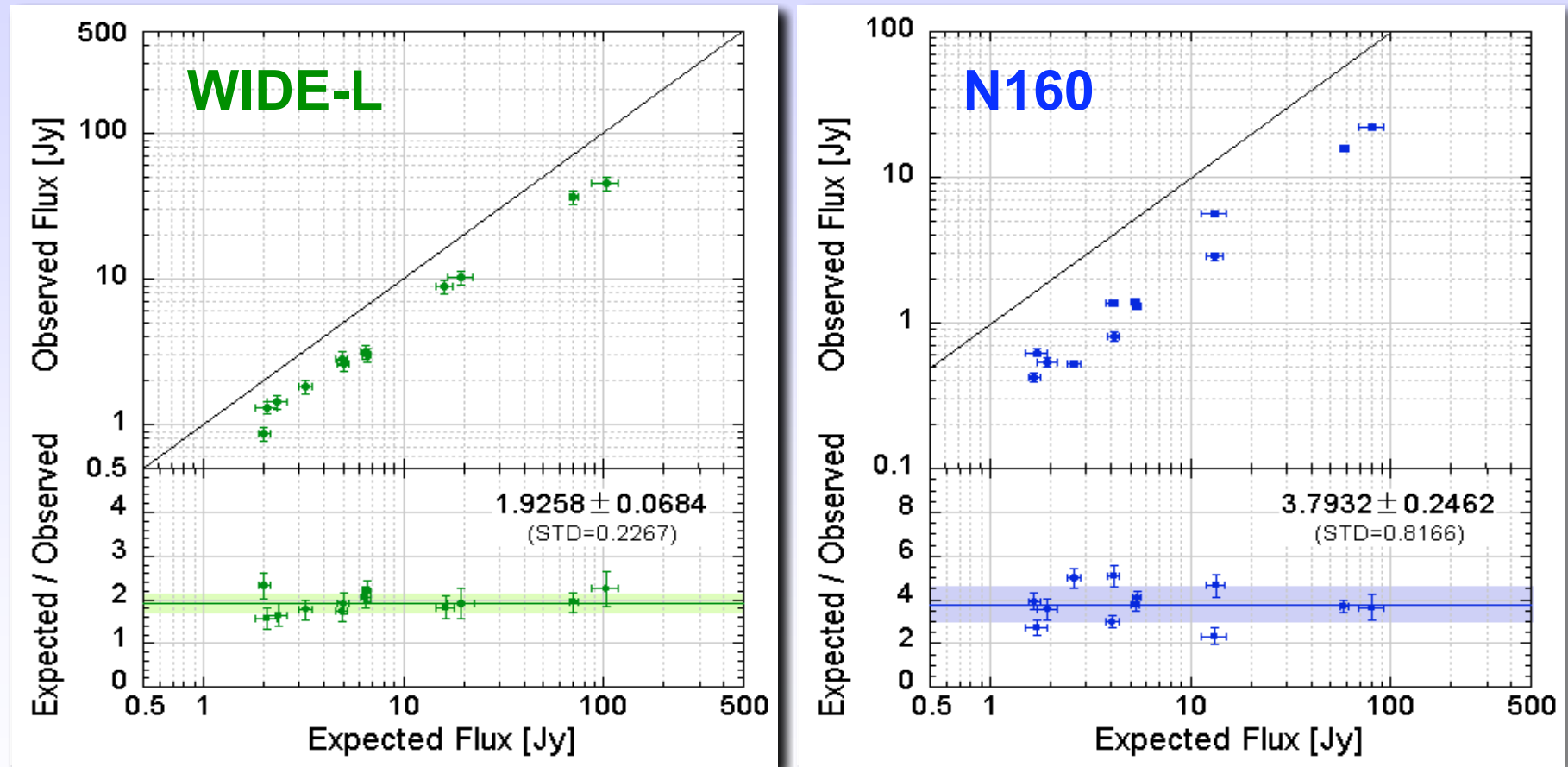
- The measured flux is compared with the expected flux.



- There are systematic differences.
- This ratio seems to be constant.
(does not depend on the source flux, the source color.)

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