

Hands-on Session

Tecniche e strumenti di analisi dati per sorgenti astrofisiche
e polarimetria nei raggi X

Dipartimento di Fisica - UniTo

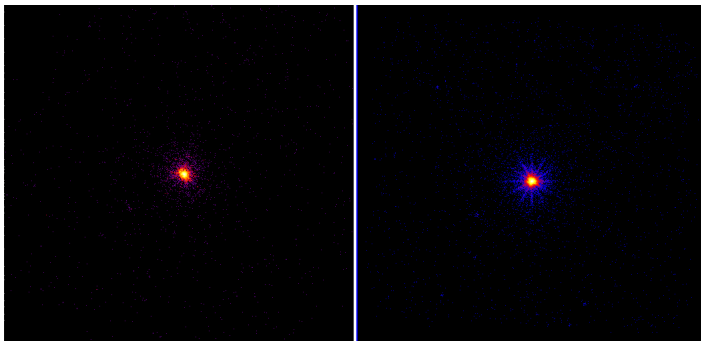
Martedì 09/05/2018



Point Source

BLAZAR 3C454.3

- 00031018031
- 00035030001



Data Reduction

```
xrtpipeline createexpomap=yes srcra=343.4906163  
srcdec=16.1482111 indir=00035030001/  
outdir=repro/00035030001/ steminputs=sw00035030001  
clobber=yes gtiexpr="CCDTemp>=-102&&CCDTemp=<-50" >  
repro/00035030001/repro_00035030001.log
```

Data Filter

```
fkeyprint sw00031018031xpcw3po-cl.evt RA_PNT  
fkeyprint sw00031018031xpcw3po-cl.evt DEC_PNT  
echo annulus(343.495537584296,16.1472757760781,660",780") > border.reg
```

Filter data

```
XSELECT  
read eve sw00031018031xpcw3po_cl.evt  
filter reg border.reg  
extra curve  
filter intensity **-40.  
save intensity intensity  
exit
```

Apply Filter

```
XSELECT
read eve sw00031018031xpcw3po_cl.evt
filter time file intensity.int
filter pha_cutoff 30 700
extract eve copyall=yes
save eve 00031018031_pc_filters.evt
exit
```

Create Exposure Map

```
xrtexpomap infile=00035030001_pc_filters.evt  
attfile=../../00035030001/auxil/sw00035030001pat.fits.gz  
hdfile=../../00035030001/xrt/hk/sw00035030001xhd.hk.gz outdir=./ stemout=00035030001_pc_filters
```

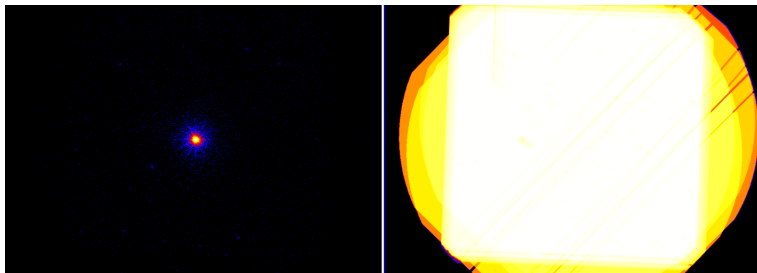
Merge Event Files

```
ls *_pc_filters.evt > input.lis
XSELECT
set mission swift
set datadir ./
read eve "@input.lis"
extract eve copyall=yes
save eve pc_sum.evt
yes
exit
```


Merge Exposure Maps

```
XIMAGE
read_ima 00031018031_pc_filters_ex.img
save_ima
read_ima 00035030001_pc_filters_ex.img
sum_ima
save_ima
write_ima/file=MAPPATOT.exp
exit
fparkey F MAPPATOT.exp+0 VIGNAPP add=yes
```

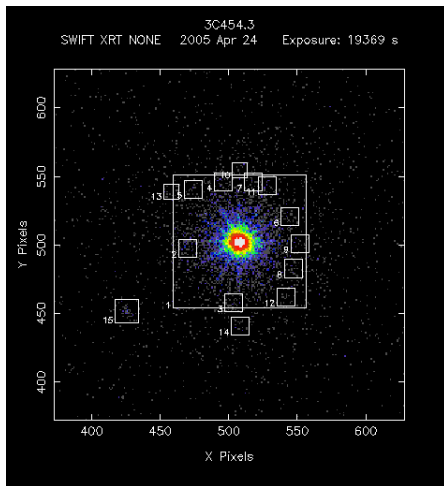
Merged Event Files and Exposure Maps



Source Detection

```
XIMAGE  
read pc_sum.evt  
read/exposure pc_ex_sum.img  
cpd /xtk  
disp  
det/snr=3  
sosta/detect_sources/optimize  
exit
```

Detected Sources

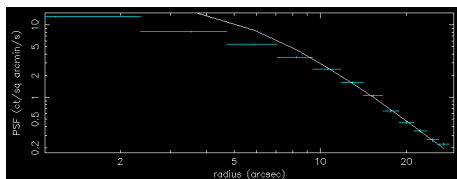


XRTCENTROID

```
xrtcentroid infile=pc_sum.evt outfile=centroids.log  
outdir=./ calcpos=yes interactive=no boxra="22 53  
57.7" boxdec="+16 08 54.8" boxradius=0.1
```

Pileup

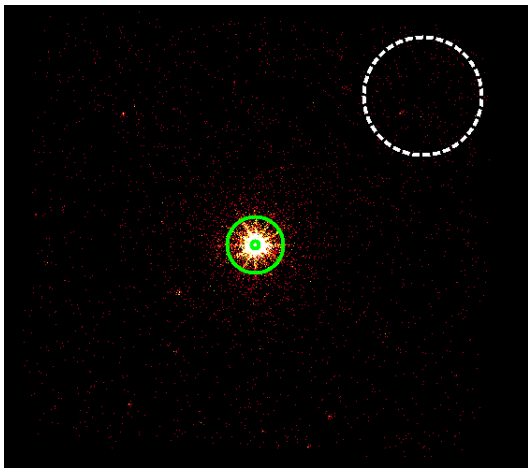
```
XIMAGE
read pc_sum.evt size=800
read/exposure pc_ex_sum.img size=800
cpd /xtk
psf/xfpix=507.8/ypix=502.5/radius=0.5
col of 1 2 3 4 6
re x 10
mo king
5.8 -1
1.55 -1
1
fit
re x
exit
```



Spectral Extraction

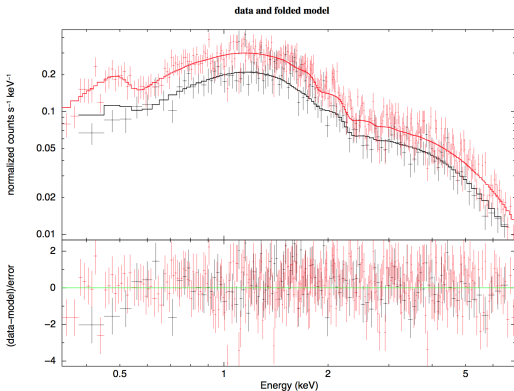
```
xrtproducts plotdevice=ps clobber=yes expofile=00035030001_pc_filters_ex.img
infile=00035030001_pc_filters.evt phafile=00035030001_pc.pha regionfile=src.reg
outdir=./spectrum/ rmffile=CALDB inarffile=CALDB binsize=-99 arffile=00035030001_pc.arf
lcfile=00035030001_pc.lc attfile=../../00035030001/auxil/sw00035030001pat.fits.gz
hdfile=../../00035030001/xrt/hk/sw00035030001xhd.hk.gz > products_00035030001_pc.log
```

Extraction Regions



Xspec Fitting

```
data 1:1 00031018031_pc.reb
data 2:2 00035030001_pc.reb
ignore bad
ignore *:-0.3 7.0:-
editmo wabs*powerlaw
6.5e-2 -1
1.8
1e-5
fit
setp add
pl ld delchi
ipl
rescale y
hard spectrum.ps/cps
exit
err 1.0 1-6
editmo wabs*zwabs*powerlaw
0.01
0.859 -1
0.01
0.859 -1
fit
save all session.xcm
```



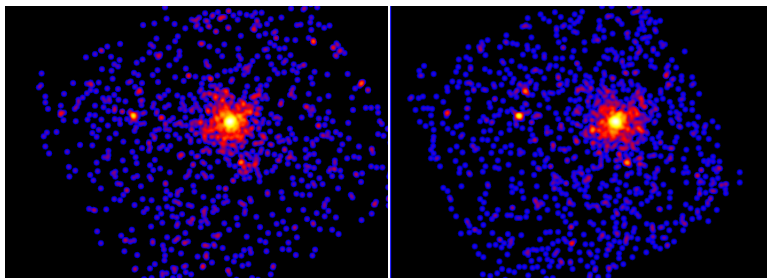
Xspec Fitting

Test curved spectra without absorption...

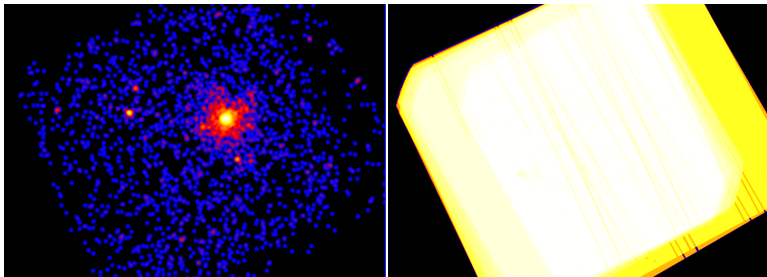
Extended Source

Galaxy M60 (NGC4649)

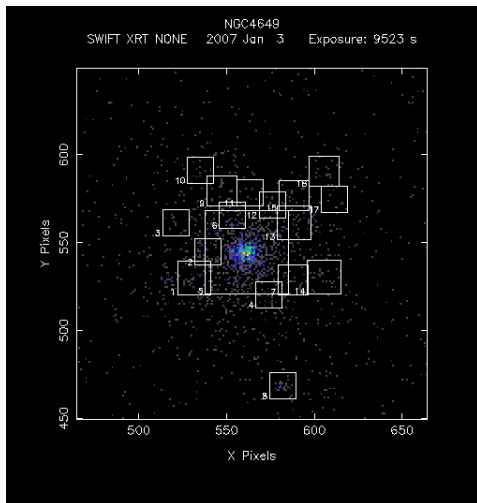
- 00035888001
- 00035888002



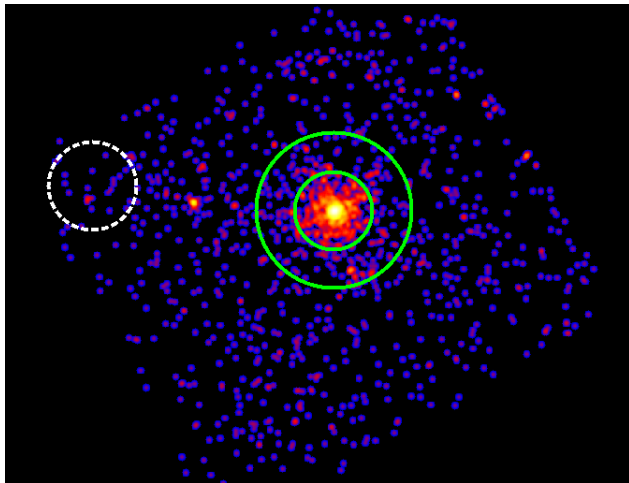
Merged Event Files and Exposure Maps



Detected Sources

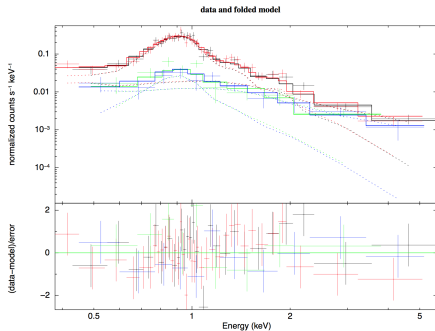


Extraction Regions



Xspec Fitting

```
data 1:1 00035888001_pc_src1.reb
data 1:2 00035888002_pc_src1.reb
data 2:3 00035888001_pc_src2.reb
data 2:4 00035888002_pc_src2.reb
ignore bad
ignore *:-0.3 7.0-**
mo wabs*apec+bremss
2.04e-2 -1
1
3.70300E-03 -1
1e-5
7.3 -1
1e-5
2.04e-2 -1
1
3.70300E-03 -1
1e-5
7.3 -1
1e-5
setp ene
pl ld delchi
setp add
ipl
rescale y
save all session.xcm
```



Further exercises

- 1 Window Timing observations
- 2 Surface brightness profiles
- 3 Remove point sources...