2011 年 05 月 30 日 (林 2011 年版)
2012 年 06 月 06 日 (日下部 改訂)

データ解析講習 (MOIRCS) 補足資料
講習テキスト ver. 4.01 対応

1　データ解析実習

- 5/29 15:30 – 17:00 (1.5h)
- 5/30 10:30 – 16:00 (1.5+3.0=4.5h)
- 5/31 10:30 – 15:30 (1.5+2.5=4.0h)

実習の進め方 (※あくまで目安です)

[5/29]
- 実習の進め方の説明
- 近赤外線撮像観測、MOIRCS などの説明
- データの取得 (SMOKA)
- MCSRED,IRAF の操作の確認、練習
- データの確認

[5/30]
(午前)
- 解析実習

(午後)
- モザイクをして最終画像まで
- 標準星のデータ解析

[5/31]
(午前)
- 標準星データの解析の説明

(午後)
- 標準星データの解析
- モザイクをして最終画像
- 測光について

2　解析講習に用いるデータ

MCSA00038477 から **MCSA00039156** までの 102 フレーム
SMOKA、または、/mfs02j/hayshiso/data/RAW_A2390.tar.gz からデータを取得

- **Abell2390 銀河団 (赤方偏移 0.231)**

バンド	フレーム ID			露出時間 (1 フレームあたり)	観測日
K_s	MCSA00038477	–	MCSA00038494	150 秒	2006-09-01
J	MCSA00039001	–	MCSA00039018	150 秒	2006-09-02
H	MCSA00039021	–	MCSA00039038	120 秒	2006-09-02

※ 参考文献の一例
Bezecourt & Soucail, 1997, A&A, 317, 661
Frye & Broadhurst, 1998, ApJ, 499, L115

- **測光標準星 (FS103)**

バンド	フレーム ID			露出時間	観測日	備考
K_s	MCSA00039115	–	MCSA00039126	2 秒	2006-09-02	chip1:21,23,25, chip2:16,18,20
J	MCSA00039129	–	MCSA00039140	2 秒	2006-09-02	chip1:29,31,33, chip2:36,38,40
H	MCSA00039143	–	MCSA00039156	2 秒	2006-09-02	chip1:46,48,50, chip2:51,53,55

※ 512 ピクセル ×512 ピクセルの部分読み出しデータ

※ FS カタログ:
http://www.jach.hawaii.edu/UKIRT/astronomy/calib/phot_cal/fs_izyjhklm.dat

※ Finding chart:
http://www.gemini.edu/sciops/instruments/nir/photstandards/UKIRT-fs-charts.html

3　解析ログ

```
###################
#   preparation
###################

## IRAF
anad02{hayshiso}: mkiraf

## modify login.cl
anad02{hayshiso}: emacs login.cl

> # MCSRED
> task $mcsred=/usr/local/subaru/MCSRED/mcsred.cl
> set dir_mcsred="/usr/local/subaru/MCSRED/"
>
> "#set stdimage = imt800"  ==>> "set stdimage = imt2048"
```

```
## modify .bashrc
anad02{hayshiso}: cd
anad02{hayshiso}: emacs .bashrc

> # MCSRED
> export MCSRED_DIR="/usr/local/subaru/MCSRED"

anad02{hayshiso}: source .bashrc

################################################################################

####################
#    reduction
####################

## raw data:  /home/hayshiso/data/SCHOOL/RAW_A2390
## reduction: /home/hayshiso/red

## check a FITS header

hselect ../data/SCHOOL/RAW_A2390/*.fits FRAMEID,OBJECT,FILTER01,EXPTIME,DATE-OBS yes > header.txt

#################
#  Abell 2390
#################

## (0) list

listprep /home/hayshiso/data/SCHOOL/RAW_A2390/ a2390ks 38477 38494
listprep /home/hayshiso/data/SCHOOL/RAW_A2390/ a2390j 39001 39018
listprep /home/hayshiso/data/SCHOOL/RAW_A2390/ a2390h 39021 39038


## (1) object mask and sky flat image [mcsall step=1]

## Ks
mcs_mksflat a2390ks_1.lst SFlat_ks_1 crrej+
mcs_mksflat a2390ks_2.lst SFlat_ks_2 crrej+
## J
mcs_mksflat a2390j_1.lst SFlat_j_1 crrej+
mcs_mksflat a2390j_2.lst SFlat_j_2 crrej+
## H
mcs_mksflat a2390h_1.lst SFlat_h_1 crrej+
mcs_mksflat a2390h_2.lst SFlat_h_2 crrej+

## Ks,chip1: SKYflat frame is created: sky & sigma = 34554.82 2532.692
## Ks,chip2: SKYflat frame is created: sky & sigma = 44959.72 2954.95
## sc = 34554.82/44959.72 = 0.768572847
```

```
## J, chip1: SKYflat frame is created: sky & sigma = 10719.45 818.7844
## J, chip2: SKYflat frame is created: sky & sigma = 12127.78 896.7458
## sc = 10719.45/12127.78 = 0.883875697
## H, chip1: SKYflat frame is created: sky & sigma = 64646.91 4681.673
## H, chip2: SKYflat frame is created: sky & sigma = 73884.91 5003.853
## sc = 64646.91/73884.91 = 0.874967703


## (2) flat fielding [mcsall step=2]

## Ks
imarith @bisa2390ks_1.lst / SFlat_ks_1.fits @flbsa2390ks_1.lst
imarith @bisa2390ks_2.lst / SFlat_ks_2.fits @flbsa2390ks_2.lst
## J
imarith @bisa2390j_1.lst / SFlat_j_1.fits @flbsa2390j_1.lst
imarith @bisa2390j_2.lst / SFlat_j_2.fits @flbsa2390j_2.lst
## H
imarith @bisa2390h_1.lst / SFlat_h_1.fits @flbsa2390h_1.lst
imarith @bisa2390h_2.lst / SFlat_h_2.fits @flbsa2390h_2.lst


## (3) subtract the median sky from each frame [mcsall step=3]

## Ks
sbselfsky flbsa2390ks_1.lst nsf=3 nmin=5
sbselfsky flbsa2390ks_2.lst nsf=3 nmin=5
## J
sbselfsky flbsa2390j_1.lst nsf=3 nmin=5
sbselfsky flbsa2390j_2.lst nsf=3 nmin=5
## H
sbselfsky flbsa2390h_1.lst nsf=3 nmin=5
sbselfsky flbsa2390h_2.lst nsf=3 nmin=5


## (4) subtract the residual sky level by fitting [mcsall step=4]

## Ks
qmsepskysb @sbflbsa2390ks_1.lst
qmsepskysb @sbflbsa2390ks_2.lst
## J
qmsepskysb @sbflbsa2390j_1.lst
qmsepskysb @sbflbsa2390j_2.lst
## H
qmsepskysb @sbflbsa2390h_1.lst
qmsepskysb @sbflbsa2390h_2.lst


## (5) fix each quadrant boundary  [mcsall step=5]
```

```
## Ks
quadcor @SBsbflbsa2390ks_1.lst @SBsbflbsa2390ks_1.lst
quadcor @SBsbflbsa2390ks_2.lst @SBsbflbsa2390ks_2.lst
## J
quadcor @SBsbflbsa2390j_1.lst @SBsbflbsa2390j_1.lst
quadcor @SBsbflbsa2390j_2.lst @SBsbflbsa2390j_2.lst
## H
quadcor @SBsbflbsa2390h_1.lst @SBsbflbsa2390h_1.lst
quadcor @SBsbflbsa2390h_2.lst @SBsbflbsa2390h_2.lst


## (6) correct distortion [mcsall step=6]

## Ks
mcsgeocorr @SBsbflbsa2390ks_1.lst crrej+ config="dir_mcsred$DATABASE/ana_aug06.cfg"
mcsgeocorr @SBsbflbsa2390ks_2.lst crrej+ config="dir_mcsred$DATABASE/ana_aug06.cfg"
## J
mcsgeocorr @SBsbflbsa2390j_1.lst crrej+ config="dir_mcsred$DATABASE/ana_aug06.cfg"
mcsgeocorr @SBsbflbsa2390j_2.lst crrej+ config="dir_mcsred$DATABASE/ana_aug06.cfg"
## H
mcsgeocorr @SBsbflbsa2390h_1.lst crrej+ config="dir_mcsred$DATABASE/ana_aug06.cfg"
mcsgeocorr @SBsbflbsa2390h_2.lst crrej+ config="dir_mcsred$DATABASE/ana_aug06.cfg"


## (7) object detection [mcsall step=7]

## Ks
gsextcat @gcSBsbflbsa2390ks_1.lst 12 3.5 2.8 10 satur=18000
gsextcat @gcSBsbflbsa2390ks_2.lst 12 3.5 2.8 10 satur=18000
## J
gsextcat @gcSBsbflbsa2390j_1.lst 12 3.5 2.8 10 satur=18000
gsextcat @gcSBsbflbsa2390j_2.lst 12 3.5 2.8 10 satur=18000
## H
gsextcat @gcSBsbflbsa2390h_1.lst 12 3.5 2.8 10 satur=18000
gsextcat @gcSBsbflbsa2390h_2.lst 12 3.5 2.8 10 satur=18000


## (8) combine [mcsall step=8]

# check and combine the matchting results
## Ks
gmkgtrimages gcSBsbflbsa2390ks_1.lst a2390ks_1.fits gtrlst=GTR_a2390ks_1.lst reject=sigclip fstop+
gmkgtrimages gcSBsbflbsa2390ks_2.lst a2390ks_2.fits gtrlst=GTR_a2390ks_2.lst reject=sigclip fstop+
## J
gmkgtrimages gcSBsbflbsa2390j_1.lst a2390j_1.fits gtrlst=GTR_a2390j_1.lst reject=sigclip fstop+
gmkgtrimages gcSBsbflbsa2390j_2.lst a2390j_2.fits gtrlst=GTR_a2390j_2.lst reject=sigclip fstop+
## H
gmkgtrimages gcSBsbflbsa2390h_1.lst a2390h_1.fits gtrlst=GTR_a2390h_1.lst reject=sigclip fstop+
gmkgtrimages gcSBsbflbsa2390h_2.lst a2390h_2.fits gtrlst=GTR_a2390h_2.lst reject=sigclip fstop+
```

```
## (9) mosaic

# list (Ks)
!ls -1 gcSB*3847[789].fits > gcall_ks.lst
!ls -1 gcSB*3848?.fits >> gcall_ks.lst
!ls -1 gcSB*3849[0-4].fits >> gcall_ks.lst

# list (J)
!ls -1 gcSB*3900[1-9].fits > gcall_j.lst
!ls -1 gcSB*3901[0-8].fits >> gcall_j.lst

# list (H)
!ls -1 gcSB*3902[1-9].fits > gcall_h.lst
!ls -1 gcSB*3903[0-8].fits >> gcall_h.lst


dmosimg gcall_ks.lst kstmos sc=0.768572847 config="dir_mcsred$DATABASE/ana_aug06.cfg"
dmosimg gcall_j.lst jtmos sc=0.883875697 config="dir_mcsred$DATABASE/ana_aug06.cfg"
dmosimg gcall_h.lst htmos sc=0.874967703 config="dir_mcsred$DATABASE/ana_aug06.cfg"


## (10) object detection for mosaiced images

gsextcat @mos_gcall_ks.lst 12 5 4 10 satur=18000 cx0=100 cy0=100 cwx=3369 cwy=1848
gsextcat @mos_gcall_j.lst 12 5 4 10 satur=18000 cx0=100 cy0=100 cwx=3369 cwy=1848
gsextcat @mos_gcall_h.lst 12 5 4 10 satur=18000 cx0=100 cy0=100 cwx=3369 cwy=1848

## (11) combine all frames

# check the matchting results
gmkgtrimages mos_gcall_ks.lst a2390_mos_ks.fits gtrlst=GTR_mos_gcall_ks.lst reject=sigclip fstop+
gmkgtrimages mos_gcall_j.lst a2390_mos_j.fits gtrlst=GTR_mos_gcall_j.lst reject=sigclip fstop+
gmkgtrimages mos_gcall_h.lst a2390_mos_h.fits gtrlst=GTR_mos_gcall_h.lst reject=sigclip fstop+


#################
# standard star
#################

## list
listprep /home/hayshiso/data/SCHOOL/RAW_A2390/ fs103ks 39115 39126
listprep /home/hayshiso/data/SCHOOL/RAW_A2390/ fs103j 39129 39140
listprep /home/hayshiso/data/SCHOOL/RAW_A2390/ fs103h 39145 39156

## object mask
prmask fs103j_1.lst
prmask fs103j_2.lst
```

```
prmask fs103h_1.lst
prmask fs103h_2.lst

prmask fs103ks_1.lst
prmask fs103ks_2.lst

## flat fielding

!gawk '{printf("fl%s\n",$1)}' bisfs103j_1.lst > flbsfs103j_1.lst
!gawk '{printf("fl%s\n",$1)}' bisfs103j_2.lst > flbsfs103j_2.lst
!gawk '{printf("fl%s\n",$1)}' bisfs103h_1.lst > flbsfs103h_1.lst
!gawk '{printf("fl%s\n",$1)}' bisfs103h_2.lst > flbsfs103h_2.lst
!gawk '{printf("fl%s\n",$1)}' bisfs103ks_1.lst > flbsfs103ks_1.lst
!gawk '{printf("fl%s\n",$1)}' bisfs103ks_2.lst > flbsfs103ks_2.lst

imarith @bisfs103j_1.lst / SFlat_j_1.fits @flbsfs103j_1.lst
imarith @bisfs103j_2.lst / SFlat_j_2.fits @flbsfs103j_2.lst

imarith @bisfs103h_1.lst / SFlat_h_1.fits @flbsfs103h_1.lst
imarith @bisfs103h_2.lst / SFlat_h_2.fits @flbsfs103h_2.lst

imarith @bisfs103ks_1.lst / SFlat_ks_1.fits @flbsfs103ks_1.lst
imarith @bisfs103ks_2.lst / SFlat_ks_2.fits @flbsfs103ks_2.lst

## subtract the median sky

sbselfsky flbsfs103j_1.lst nsf=3 nmin=5
sbselfsky flbsfs103j_2.lst nsf=3 nmin=5

sbselfsky flbsfs103h_1.lst nsf=3 nmin=5
sbselfsky flbsfs103h_2.lst nsf=3 nmin=5

sbselfsky flbsfs103ks_1.lst nsf=3 nmin=5
sbselfsky flbsfs103ks_2.lst nsf=3 nmin=5


## cut the partial-read data

cutpr sbflMCSA00039116.fits prsbflMCSA00039116.fits
cutpr sbflMCSA00039118.fits prsbflMCSA00039118.fits
cutpr sbflMCSA00039120.fits prsbflMCSA00039120.fits

cutpr sbflMCSA00039121.fits prsbflMCSA00039121.fits
cutpr sbflMCSA00039123.fits prsbflMCSA00039123.fits
cutpr sbflMCSA00039125.fits prsbflMCSA00039125.fits

cutpr sbflMCSA00039129.fits prsbflMCSA00039129.fits
cutpr sbflMCSA00039131.fits prsbflMCSA00039131.fits
```

```
cutpr sbflMCSA00039133.fits prsbflMCSA00039133.fits

cutpr sbflMCSA00039136.fits prsbflMCSA00039136.fits
cutpr sbflMCSA00039138.fits prsbflMCSA00039138.fits
cutpr sbflMCSA00039140.fits prsbflMCSA00039140.fits

cutpr sbflMCSA00039146.fits prsbflMCSA00039146.fits
cutpr sbflMCSA00039148.fits prsbflMCSA00039148.fits
cutpr sbflMCSA00039150.fits prsbflMCSA00039150.fits

cutpr sbflMCSA00039151.fits prsbflMCSA00039151.fits
cutpr sbflMCSA00039153.fits prsbflMCSA00039153.fits
cutpr sbflMCSA00039155.fits prsbflMCSA00039155.fits


## subtract the residual sky

!ls -1 pr*.fits > SBsbflbsfs103.lst

tsubanomaly prsbflMCSA00039116.fits
tsubanomaly prsbflMCSA00039118.fits
tsubanomaly prsbflMCSA00039120.fits

tsubanomaly prsbflMCSA00039121.fits
tsubanomaly prsbflMCSA00039123.fits
tsubanomaly prsbflMCSA00039125.fits

tsubanomaly prsbflMCSA00039129.fits
tsubanomaly prsbflMCSA00039131.fits
tsubanomaly prsbflMCSA00039133.fits

tsubanomaly prsbflMCSA00039136.fits
tsubanomaly prsbflMCSA00039138.fits
tsubanomaly prsbflMCSA00039140.fits

tsubanomaly prsbflMCSA00039146.fits
tsubanomaly prsbflMCSA00039148.fits
tsubanomaly prsbflMCSA00039150.fits

tsubanomaly prsbflMCSA00039151.fits
tsubanomaly prsbflMCSA00039153.fits
tsubanomaly prsbflMCSA00039155.fits
```