

Introduction to IRAF

(Image Reduction and Analysis Facility)

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1. Installing and starting IRAF

- IRAF can be installed only under Linux, it is distributed by National Optical Astronomy Observatories:
<http://iraf.noao.edu/>
- Installation of IRAF and xgterm is described e.g. at:
<http://www.astr.tohoku.ac.jp/~akhlaghi/irafinstall.html>
- In the working directory run `mkiraf` and select `xgterm` as the terminal type, startup file `login.cl` and parameter directory `uparm/` are created
- IRAF is run by typing `cl` into the shell command prompt
- If you wanna work with IRAF plots run `xgterm` and start IRAF from there !
- Size and position of the graphical terminal is good to customize in `.bashrc` file e.g. as:

```
alias xgterm='xgterm -bg black -fg green -cr purple -geometry 80x40+100+50 -fn 10x20 -G 1500x900+50-50&'
```

2. Customise your settings

- Edit startup file `login.cl` to customise your session, hash `#` is used to comment out text
- selecting packages to be loaded at the beginning:

```
apphot      # Aperture photometry
astcat      # astrometry and listings of stars
echelle     # echelle spectroscopy
```

- selecting image extensions to be accepted by IRAF

```
set imextn = "oif:imh fxf:fits,fit,FIT"
```

- defining your own scripts/tasks, tasks without parameters start with `$`

```
# User aliases
task $red34 = /scisoft/share/iraf/iraf/local/scripts/red34.cl
task $red12 = /scisoft/share/iraf/iraf/local/scripts/red12.cl
task $redsp = /scisoft/share/iraf/iraf/local/scripts/redsp.cl
task $spoj = /scisoft/share/iraf/iraf/local/scripts/spojall.cl
task extract = extract.cl
```

- defining standard image size (depends on your monitor)

```
set      stdimage      = imt2048
```

3. Working in the command language

- When starting IRAF the defined tasks and packages are listed (packages finish with a dot)

```
Visit http://iraf.net if you have questions or to report problems.
```

```
The following commands or packages are currently defined:
```

```
color.      dimsum.    fitsutil.  images.    mxtools.   plot.      redsp      stecf.
ctio.       eis.       gemini.    language.  nmisc.     proto.     rvsao.     stlocal.
dataio.     esowfi.   gmisc.     lists.     noao.      red12      softools.  stsdas.
dbms.       extract   guiapps.   mscred.    obsolete.  red34      spoj       system.
```

```
ecl>
```

- A package is loaded typing its name to the command prompt, e.g. `noao`, list of available tasks and packages is displayed
- cl is exited typing `log` and a package is left by `bye`
- IRAF supports many UNIX commands, e.g., `ls`, `mkdir`, `mv`, `cd`
- A general shell command is recognized by a starting `!`
- all available tasks are listed with `??`
- `help` typed without a task name provides a brief help for all tasks in the loaded package

4. Tasks and parameter editing

- a task is run by typing its name and parameters, e.g.

```
splot ../DATASP/20140612/n1D_df_tauboo_300-001.ec.fits xmin=5870 xmax=5920
```

- parameters of a task are stored in `uparm/` directory
- they are listed with `lpar` command
- parameters are changed typing e.g. `epar splot`

```

                                I R A F
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PACKAGE = echelle
  TASK = splot

images = AGLeo/20161231_n1D_AGLeo.rc.ec.fits  List of images to plot
line   =                1  Image line/aperture to plot
band   =                1  Image band to plot
(units =                ) Plotting units
(options= auto wreset) Combination of plotting options:
                        auto, zero, xydraw, histogram,
                        nosysid, wreset, flip, overplot
(xmin  =                INDEF) Minimum X value of initial graph
```

- `vi` editor is the default for IRAF, edited parameters are saved with `:q` and discarded by `:q!`
- setting back the defaults for a parameter is done by `unlearn` task

5. More on tasks and cl shell

- some results that can be re-used are stored in [database/](#)
- tasks can be shortened if non-ambiguous e.g. [ecreidentify](#) by [ecre](#)
- there are various ways to enter parameters, the following commands have the same meaning:

```
echelle> hselect raw/haume-* $I,HJD,EXPTIME expr=yes
echelle> hselect raw/haume-* $I,HJD,EXPTIME expr+
echelle> hs raw/haume-* $I,HJD,EXPTIME e+
```

- "yes" and "no" can be replaced by "+" and "-"e
- package where a task is included can be found in the first line of the corresponding [help](#)
- executed commands are stored in [history](#) (expires upon closing cl)
- There are two kinds of commands in interactive regime
 1. key commands, one key is presses
 2. colon commands, e.g. [:b_sample -20:-5,5:20](#)
- help is invoked by pressing [?](#) in interactive regime

6. Setting observatory

- to set the local parameters run `observatory` task, e.g. for setting KPNO use:

```
observatory set kpno
```

- observatory database is stored typically in:
`/iraf/iraf/noao/lib/obsdb.dat`

```
observatory = "kpno"  
  name = "Kitt Peak National Observatory"  
  longitude = 111:36.0  
  latitude = 31:57.8  
  altitude = 2120.  
  timezone = 7  
  
observatory = "ctio"  
  name = "Cerro Tololo Interamerican Observatory"  
  longitude = 70.815  
  latitude = -30.16527778  
  altitude = 2215.  
  timezone = 4
```


7. Setting instruments

- CCD translation files (for IRAF to understand FITS keywords) are stored typically in:
`/iraf/iraf/noao/imred/ccdred/ccddb/kpno`

```
setinstrument MaximDL site=asuG12
```

- a translation file typically looks like:

```
# Images obtained with Maxim DL V5

subset                FILTER

exptime               EXPTIME
darktime              darktime
imagetyp              IMAGETYP
biassec               biassec
datasec               datasec
trimsec               trimsec
fixfile               fixfile

LIGHT                 object
DARK                   dark
BIAS                   zero
FLAT                   flat
COMP                   other
```


8. Images and image lists

- lists of images stored in files start with @ character, e.g.:

```
imstat @eecep.lst
```

- image subsections are denoted by square brackets:

```
imstat raw/adf_eecep-003I.fit[100:200,100:200]
```

- multiple images (inputs) are separated by a comma:

```
imstat eecep-002I.fit,eecep-003I.fit,eecep-004I.fit
```

- images can be effectively examined by starting `ds9` as a display tool (external program) and then using `imexam`:

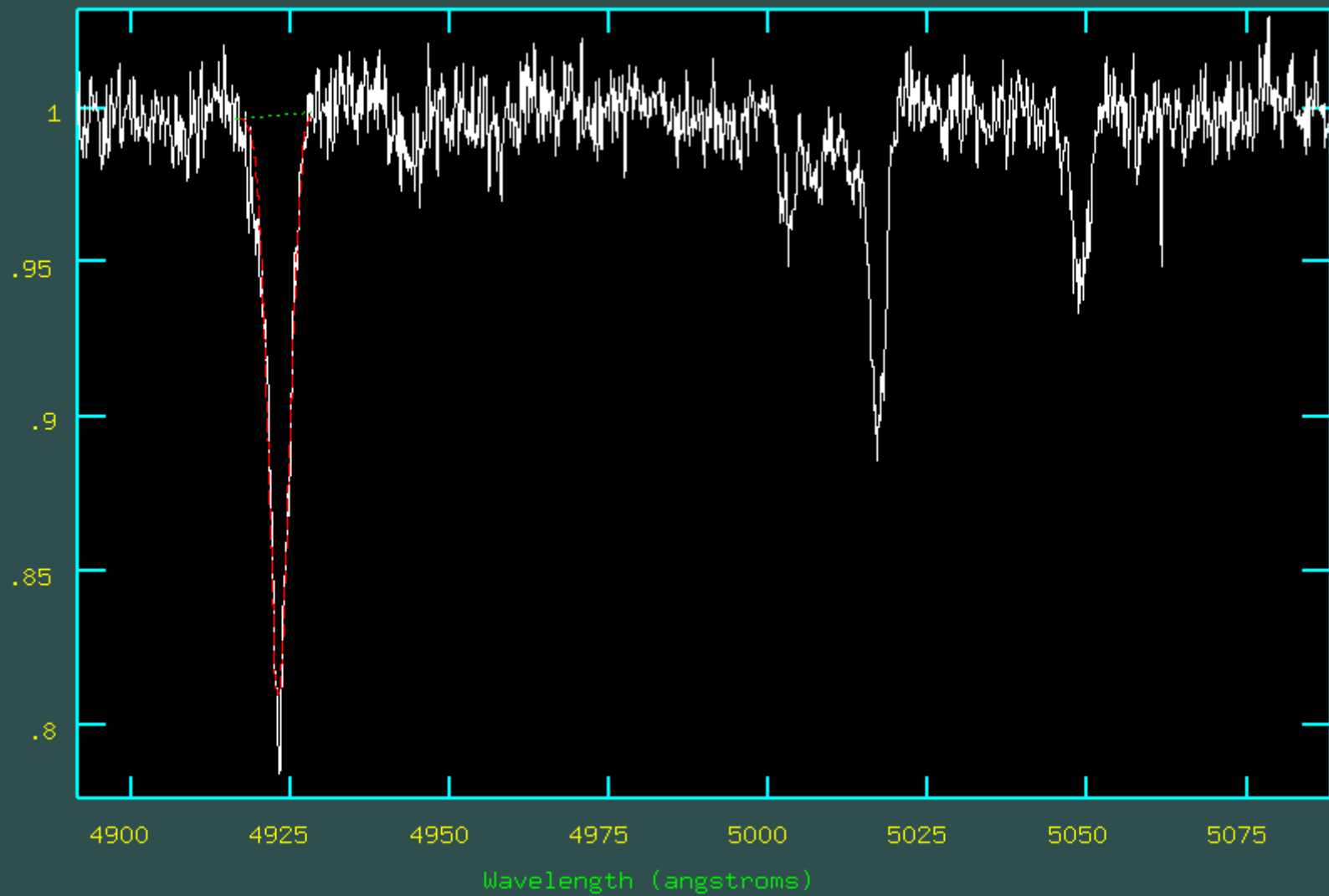
```
imexam raw/adf_nnser-004N.fit
```

- `imexam` produces plots e.g. vertical and horizontal graphs, aperture photometry on stars etc.
- important keys are: `l` line profile, `c` column profile, `r` radial plot, `v` vector profile

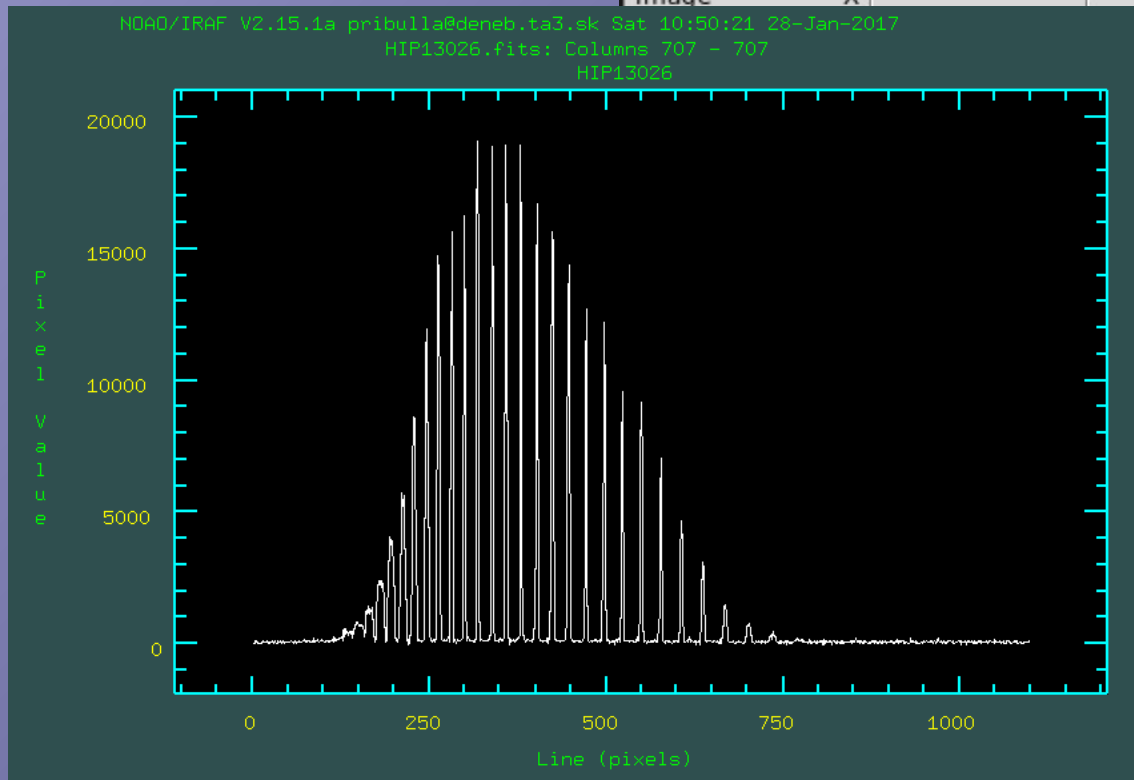
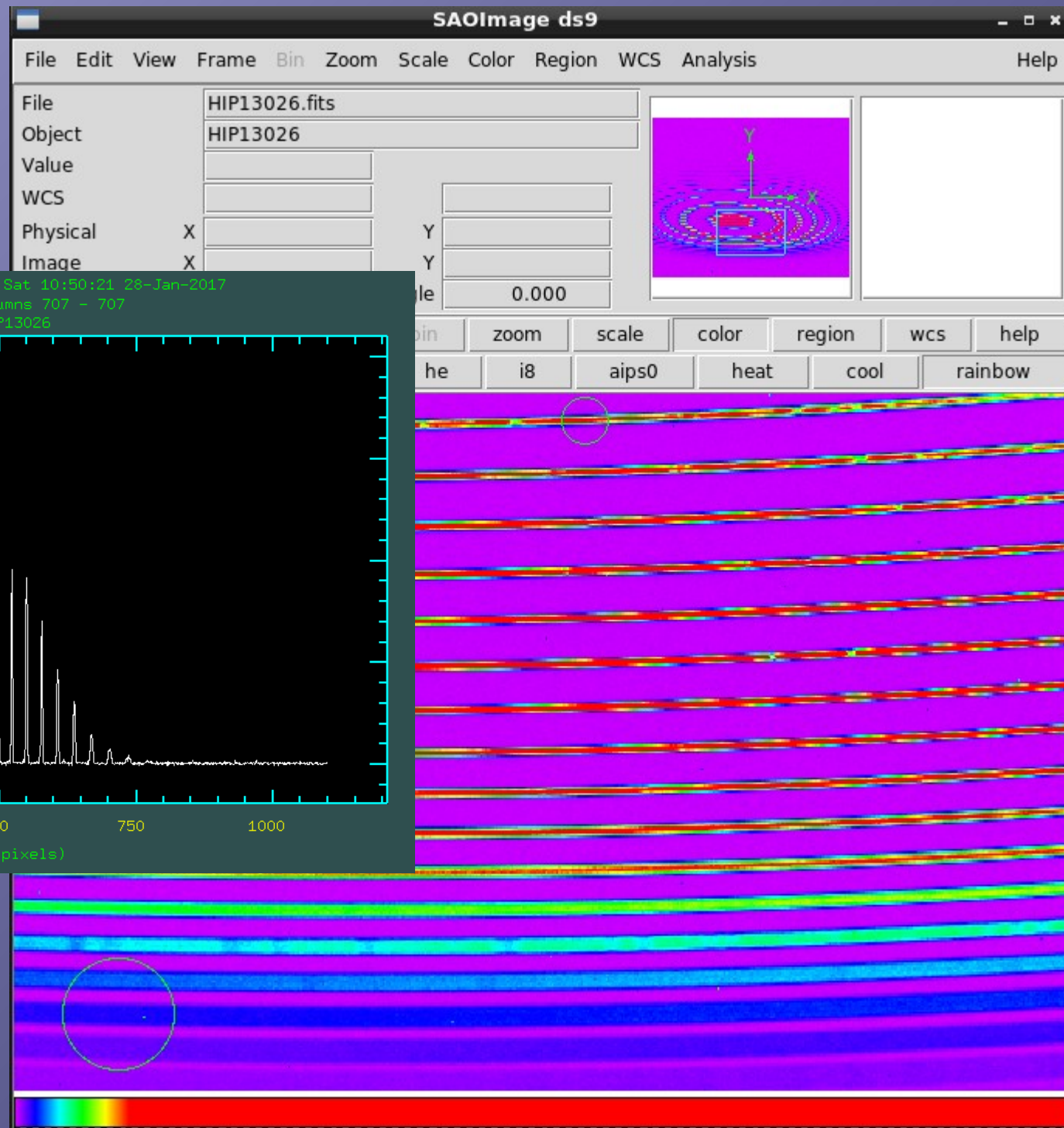
9. Useful IRAF tools/tricks

- window function in the interactive regime, **w** is followed by a command: consecutive **e** key expands part of the plot, **x** and **y** zoom the plot centered on the cursor, **a** returns to automatic scaling
- IRAF has nice fitting capabilities, e.g. in task **splot** one can fit various kinds of profiles to spectral lines or determine SNR, e.g. **m** followed by **m** measures SNR, and average, **k** followed by **g**, **l**, or **v** fits the Gaussian, Lorentzian and Voight profile to a line, **h** is used to measure EQW

NOAO/IRAF V2.15.1a pribulla@deneb.ta3.sk Sat 10:28:26 28-Jan-2017
1a/IRAF/DATASP/G1_60cm_Esh1/20170127/20170127_n1D_FMCMa.rc.ec.fits]: FMCMa 2400.



1: center = 4923.2, flux = -0.77, eqw = 0.7716, gfwhm = 3.837



10. Useful IRAF tools/tricks

- FITS headers are edited using `hedit` command, e.g.

```
hedit raw/TXUMa_900-00* RA "12 18 06.5" ver-
```

- FITS files are selected and listed using `ccdlist` command:

```
ccdlist raw/* ccdtype=object l-
```

- only object frames are listed and long format is suppressed:

```
raw/HIP67301_020-001.fit[1374,1099][ushort][object] []:HIP67301
raw/HIP67301_020-002.fit[1374,1099][ushort][object] []:HIP67301
raw/HIP67301_020-003.fit[1374,1099][ushort][object] []:HIP67301
raw/HIP67301_020-004.fit[1374,1099][ushort][object] []:HIP67301
raw/HIP67301_020-005.fit[1374,1099][ushort][object] []:HIP67301
raw/HIP67301_030-001.fit[1374,1099][ushort][object] []:HIP67301
raw/HIP67301_030-002.fit[1374,1099][ushort][object] []:HIP67301
raw/HIP67301_030-003.fit[1374,1099][ushort][object] []:HIP67301
raw/HIP67301_030-004.fit[1374,1099][ushort][object] []:HIP67301
```