Magnus Gålfalk / 2004-05-13

A practical introduction to IRAF - Near Infrared observations (NOTCam)

OVERVIEW OF REDUCTION STEPS

1. Calculation of differential flat
   All infrared observations use differential frames, this also applies to the flats! (bias & darks unnecessary in the IR)

2. Calculation of sky
   For 'beam switch' observations this is obtained by median filtering the 'off frames'
   For 'small step dithering' one instead median filter the 'on frames' (since no 'off frames' are taken)

3. Subtraction of sky and flatfielding
   The sky frame is simply subtracted from all 'on frames'. The sky corrected frames are then divided by the masterflat

4. Making a list of image shifts (dithering)
   Since dithering is used during the observations we must calculate the image shifts of all 'on frames'

5. Making a 'bad pixel' map
   This is a complicated step that often requires some experimentation, bad pixels can be found from the masterflat

6. Producing the final image
   Shifting the images back so that all images can be added (excluding all bad pixels)

STEP 1 - MAKING THE DIFFERENTIAL FLAT

In order to make things easier when reducing data with IRAF, we will make use of lists in most of the steps, so start by making one list for the "high ADU" flats (flat_high.list) and one for the "low ADU" flats...

flat_high.list	me170001[*,*,1]	flat_low.list	me170013[*,*,1]	flat_dif.list	flat1
	me170002[*,*,1]		me170014[*,*,1]		flat2
	me170003[*,*,1]		me170015[*,*,1]		flat3
	. . .		. . .		...
	me170010[*,*,1]		me170022[*,*,1]		flat10

The [*,*,1] part is needed since the 'exp' command (with NOTCam) gives a 1024x1024x2 structure where the first frame is the exposure frame and the second frame is a so called 'reset' frame (which we don't need).

The third list (flat_dif.list) will be used to instruct IRAF what the differential flats should be called

Now, calculating differential flats is easily done using the lists by typing:
imarith @flat_high.list - @flat_low.list @flat_dif.list

This yields 10 differential flats (with stars in them), so we must use a median filter to get a masterflat, but in order to avoid 'segmentation fault' type errors from imcombine we must first change a line in all fits headers (using hedit)...

epar hedit
images = @flat_dif.list
fields = wcsdim
value = 2
verify = no

This will change the value of 'wcsdim' in the fits headers of all 10 differential flats from '3' to '2' (nr of dimension used), this would otherwise confuse imcombine.

Now, we can calculate the masterflat using imcombine with the following recommended settings:

epar imcombine
input = @flat_dif.list
output = flat_Ks
combine = median
scale = mode

Finally, we need to normalize 'flat_Ks' to get the masterflat. As usual, use imstat on a centre region (e.g. 300:700,300:700) to find the mean value. Then divide with the mean (here called 'const') by typing imarith flat_Ks / const masterflat_Ks