AY257 Spring 2008 Homework Problem #2

There are fits files from an LRIS night in 1997 that can be downloaded from here:

http://www.ucolick.org/~bolte/ClassFrames/

These are raw frames from the telescope. There are dome flats and darksky/twilight flats along with images of the Hickson Compact Group #22 and the center of the Coma Cluster of galaxies.

The titles for the frames are entered by the astronomer at the telescope and may or may not be correct. The other information in the header (selected filter, exposure time, UT time, coordinates of the field etc.) is generated automatically at the time of the exposure and is usually accurate. The first thing I do when I load a bunch of frames for a night or run to my local disk for analysis is check the headers and correct any frame titles that are incorrect. In IRAF the two tasks to do this are hselect and hedit. For example:

> cl> hselect *fits $I, title, redfilt

> cl> hselect *fits $I, title, redfilt >filename

will produce a list with file name ($I is code for that), the title entered by the astronomer at the telescope and the filter (redfilt) that was in place at the time of the observation. The second version will redirect the output to a file called "filename". You can use imhead in the verbose mode to find out what the header entries are.

> cl> imhead lris0001.fits lo+

Note that for any of these IRAF tasks you can use the command line input (as above) or you can type the task name and respond to prompts for the detailed input or you can use the edit parameter mode. An example of the latter:

> cl> epar hselect

will produce:

```
                         I R A F
                Image Reduction and Analysis Facility
        PACKAGE = imutil
          TASK = hselect

        images =              *fits    images from which selection is to be drawn
        fields  =    $I,title,redfilt  fields to be extracted
        expr    =              yes     boolean expression governing selection
        (mode  =               ql)
```

and you can complete the fields, then use ":go" to execute the task.

1. Start by checking the title information and correcting if necessary and making a list of the files with frame name, title, exposure time, filter and airmass.

2. These frames were taken in two-amplifier mode. Use implot or imexam to identify the two overscan regions and then ccdproc to overscan correct and trim the images. With two amplifiers, you will need make two copies of each image, carry out the overscan and trim for each "half" then put to two halves together into one. mkpattern and imcopy will be useful.

3. Combine the R-band dome flats using imcombine with scaling based on modes and minmax rejection. Combine the R-band dark-sky frames in a way that minimizes or eliminates the stars and galaxies on individual frames. Divide the averaged dome flat into the dark sky frames and document any large-scale spatial variations between the two flats. Divide the dark-sky and dome flats into one of the program R-band frames and evaluate the large spatial frequency errors and test to see if the RMS variations in blanker areas in the frame are consistent with the shot noise in the pixels with only sky counts.