Astro 500 Project #1

Due Thursday 03 Nov, 2022 10:45 PM local time

Use definitions and numbers given in the class notes. Show all work. You can discuss the problem with your classmates but your write up needs to be your own work.

Determine the read-noise (e- rms) and the gain (e-/DN) using the photon propagation method for the two detectors and their corresponding data sets found at this url:
http://user.astro.wisc.edu/~mab/education/astro500/hw/data_characterization.html

a) The first data set is for an idealized detector with uniform quantum efficiency and illumination. A single bias frame and a single 'dome flat' are provided. The dome flat has *not* been bias subtracted. From simple image statistics and algebra you should be able to derive the read-noise and gain.

b) The second data-set is for a realistic detector with a range of quantum efficiency and somewhat non-uniform illumination. The data consists of 4 sets of dome-flat images, 10 exposures each at different exposure times of 1 sec, 10s sec, 100 sec and 1000 sec. Note there is a bad column and a few hot and dead pixels. Include in your write-up a graphical presentation of the results of your analysis showing the gain and read-noise. Explain how you made the calculation, and justify your approach.

c) The third data-set is real data from the Bench Spectrograph using the SparsePak IFU. The data consists of bias frames and dome-flats. There are a number of each flavor, which allows you to compute statistics on a pixel-by-pixel basis. Note that all of the frames still have their over-scan intact, i.e., this is the raw data. Think about if you need to use or avoid the over-scan. Again, explain how you made the calculation, and justify your approach.

In all cases, illustrate your results in an appropriate way.