1 Introduction

In Lab 1, students found that the gain of CCD1 is roughly twice the value given in the manufacturer’s specifications, while the readout noise is similar to the value in the specifications. The explanation we offered for the increased gain is the redesigning of the computer interface electronics that took place in the spring and summer of 2000. I think this result is correct, based on other evidence; for example, the bias level, in ADU, is now about twice what it was before 2000.

In this lab, we will test this hypothesis further by performing the same analysis on data from 1993, when CCD1 was new, in order to determine the gain and read noise at that time. This analysis has never before been done on data taken before 2000.

2 Gain and Read Noise

In /mnt/vol01/ndm/iraf/course/F2005/19931229 you'll find three bias and five flat frames from Dec. 29, 1993 (UT). Create a folder for them in your account, and copy them to it.

Choose a pair of biases and a pair of flats. Survey one of the flats with splot or with ds9, and find a rectangular region of the image, preferably including at least a few hundred pixels, where the signal is uniform to within about 10%. Define this region by means of an image section, and operate on the same region in all frames. Carry out addition and subtraction of these image sections with imarith, and find standard deviations with imstat. With your report, include a row or column plot of the difference image, flat1-flat2.

Use Howell’s formulas (p. 53) to calculate the gain and the readout noise of the CCD.

By way of error analysis, repeat the calculation with two additional pairs of flat frames (the bias frames probably don’t matter much), processed in the same way, and discuss the similarities and differences in the results.

3 Your Report

Everything in this section of the instructions for Lab 1 also applies to this lab.