calculating the difference between the variance in the true error (σ_T^2) and the variance in the formal error (σ_F^2), $\sigma_{NF}^2 = \sigma_T^2 - \sigma_F^2$. Here, we define σ_F^2 as the variance calculated from counting statistics derived from the number of photons detected, and σ_T^2 as the variance derived by fitting a Gaussian to the distribution of deviations from the mean. For all of the derivations of σ_T^2 below, we restrict ourselves to observations at the Lick 1 meter with the TI500 CCD and the R_s filter.

We can divide the non-formal errors into two categories: (1) deviations in the values among images taken on the same night and (2) *additional* deviations between nights and/or observing runs. The causes of (1) include pixelation error, radiation events (cosmic rays), CCD defects (*e.g.* hot pixels), and small scale flat-field changes within the same night. The causes of (2) include extinction-airmass-color corrections, CCD defects, and large scale flat-fielding changes between nights and/or observing runs.

7.4.1 Deriving Errors Using Same Night Deviations in the Comparison Star Light Curves

To identify the errors in category (1), we group the light curve points by observing night and calculate the deviation of each value from the mean calculated from the remaining values from that night. We restrict the values to those from groups of at least three. Using the data from all runs, all stars, and all QSO fields (including the FOS QSO target fields), we have 10,486 deviations.

We separate these numbers into divisions based on the calculated formal errors. Each division is 0.1% wide and contains roughly 500 to 1000 points. A selection of these distributions, along with Gaussian fits, is shown in 7-5 . Note that the distributions are significantly non-Gaussian in the sense that there is an excessive number of points with large deviations. This effect is probably due to the non-Gaussian nature of some of the non-formal errors discussed earlier. This departure from a normal distribution will be important to consider for the χ^2 tests discussed later. In the fitting program, we have