

long as the spatial profile varies slowly in the spectral direction. Once a normalized profile model is calculated, the bias on pixels (as a function of position in the spatial direction), at a given spectral point can be removed (by dividing by the normalized profile). The pixels are then optimally summed by weighting the pixels by their precision (inverse variance). This optimal extraction can improve the S/N in a spectrum by as much as 30% for faint (background dominated) objects.

Calculating a model profile has the additional advantage in that pixels effected by radiation events or CCD defects can be automatically rejected, since these pixels will differ significantly from the value estimated by the model. In a similar way, bad pixels are rejected from the background (sky), which is modeled by polynomial fits in the spatial direction.

One disadvantage in the original Vista code was that the routine required the flat-field image to be approximately constant in the spectral direction in order to calculate the errors correctly (since the variance was calculated from the counts in flat-field-divided image). This required the fitting of a spline or polynomial to the flat-field image in the spectral direction. This correction often introduced additional “undulations” which would have to be corrected for by the standard star flux calibration (see section 10.3). Due to the lack of standard star calibration points and the difficulty of fitting a rapidly varying response function, it was often nearly impossible to get adequate flux calibration of the spectra.

To solve this problem, we modified the code such that the variance was calculated using *both* the flat-field image and the flat-field-divided object image. Using these images, we determined the counts (and variance) in the non-flat-field-divided object image, and then scaled this value to determine the variance in the flat-field-divided image. With this modified routine, it was unnecessary to “level” the flat-field image, and it was possible to get a satisfactory flux calibration. This routine has been added to the general Vista package, which is available (via lowell.edu) to other workers.