

AN ESTIMATE OF THE EIS SLIT TILT

Harry Warren, NRL
v0.2 June 26, 2007

The EIS slit is not oriented perpendicular to the CCD. This creates a systematic drift in the line centroids along the slit. To estimate the magnitude of this effect I have fit line profiles from 7 different emission lines (4 on the short wavelength band and 3 on the long wavelength band) from 7 quiet Sun observations that include the full extent of the 512'' slit. Rasters in the Fe XII 195 Å line are shown below. The other emission lines are Fe X 185.43, Fe XII 186.88, Fe XIII 202.04, Si X 258.37, Si X 261.04, and Si VIII 275.35. Since many of these lines are relatively weak we have averaged the line profiles from 8 pixels along the slit before fitting with single Gaussians.

To estimate slit tilt for each observation we first remove the temporal oscillation in the line centroids by subtracting the column average and then average the residuals along the x direction. Formally this is

$$\Delta\lambda(y) = \langle \lambda(x, y) - \langle \lambda(x, y) \rangle_y \rangle_x.$$

We then perform a linear fit to the residuals as a function of position along the slit. These results are shown in Figure 1.2.

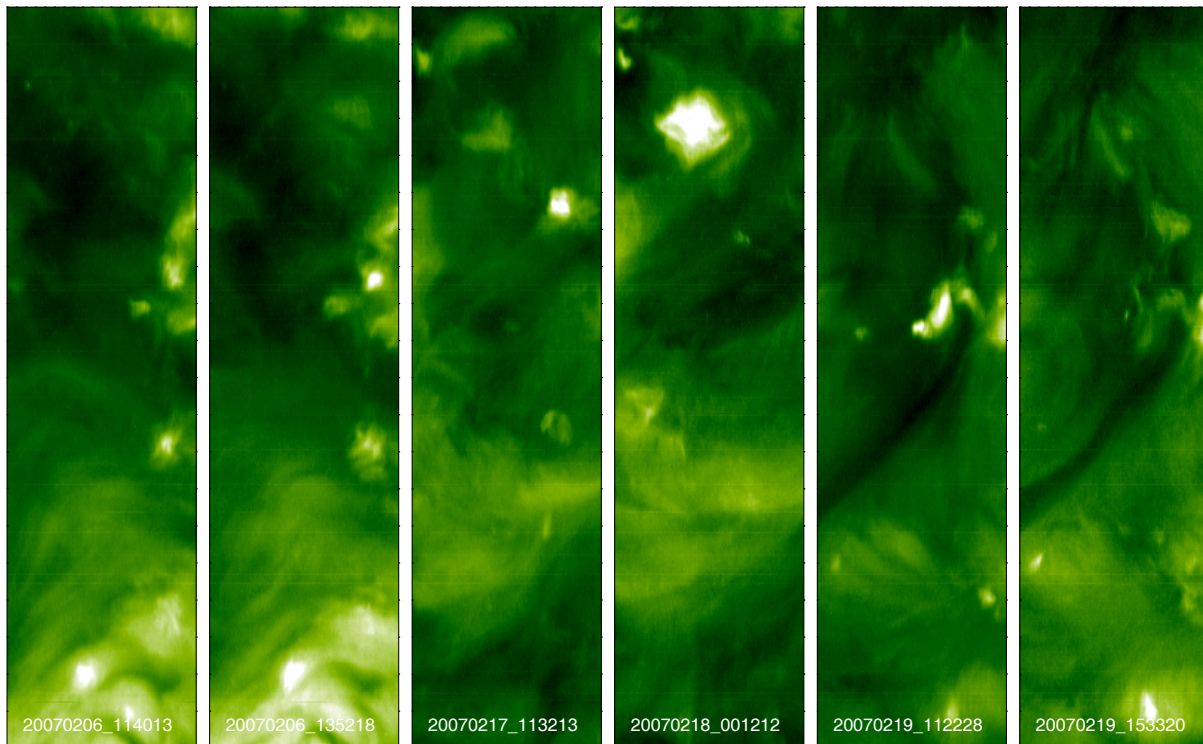


Figure 1.1: EIS rasters in the Fe XII 195 Å from 7 relatively quiet regions. The field of view is 128'' × 512''. The exposure time at each slit position is 60 s.

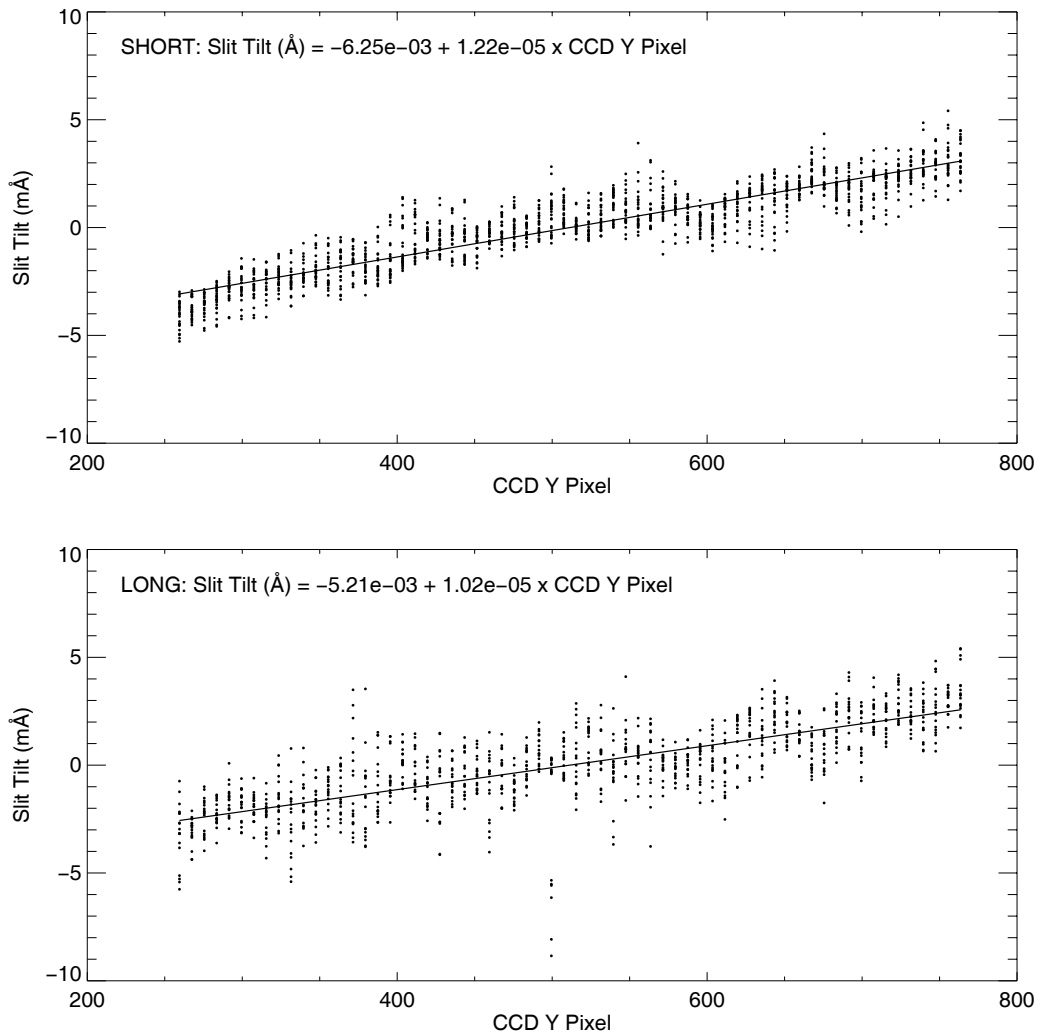


Figure 1.2: EIS slit tilt in each wavelength band as a function of pixel along the slit. Linear fits to the data are shown in the figure.

Implicit in this method is that the Doppler shifts average to zero along the slit. Using the Fe XII line we have confirmed that the results are independent of the spatial averaging along the slit.

The results of these fits have been incorporated into an SSW routine for correcting for the slit tilt. If the line profiles have been fit the slit tilt can be corrected by using

```
IDL> tilt = eis_slit_tilt(yws,ny,/short,locations=ccdy)
or
IDL> tilt = eis_slit_tilt(d,locations=ccdy) ;; d is from eis_getwindata
IDL> lambda = lambda - tilt
```

Note that `yws` is the y window start position on the CCD and `ny` is the number of pixels in the y direction. Alternatively, the slit tilt can be subtracted from the wavelength array before fitting.