ξ Per: *Chandra* HETGS data

Re-reduction and spectral analysis

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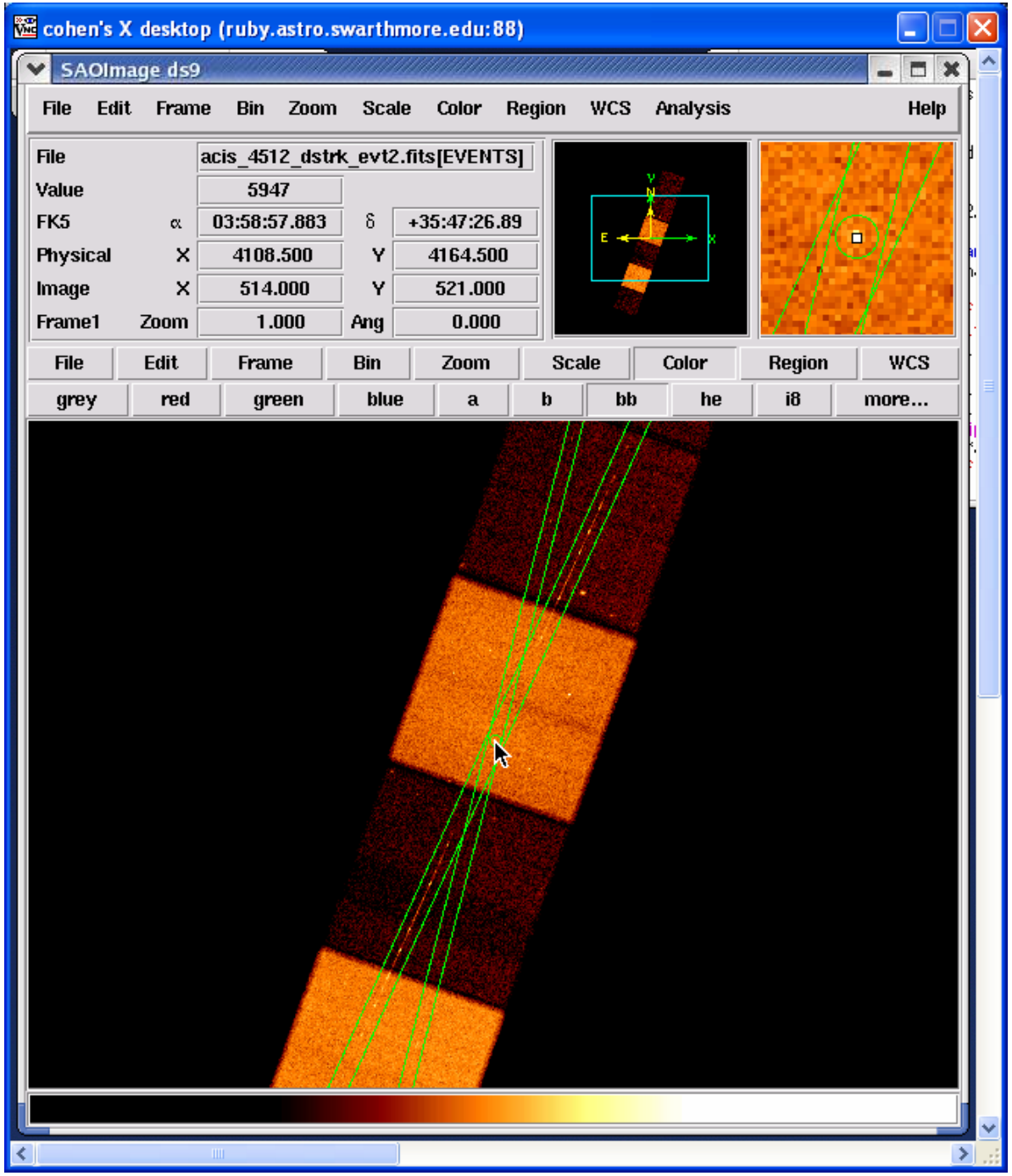
The archival data – like the data delivered to PIs – is basically usable. It's been subject to "pipeline" processing.

However, it's always advisable for investigators to check various aspects of the data set and the pipeline reduction, both because of possible non-standard situations (source confusion and contamination, non-standard pointing, problems with the centering of the zeroth order spectrum and the associated grating spectrum extraction). Furthermore, in order to do spectral analysis (model fitting), custom response matrices (RMFs) and grating auxiliary response files (gARFs – i.e. effective area tabulations) need to be made.

So, I retrieved the data from the archives, reran the pipeline, and created RMFs and gARFs.

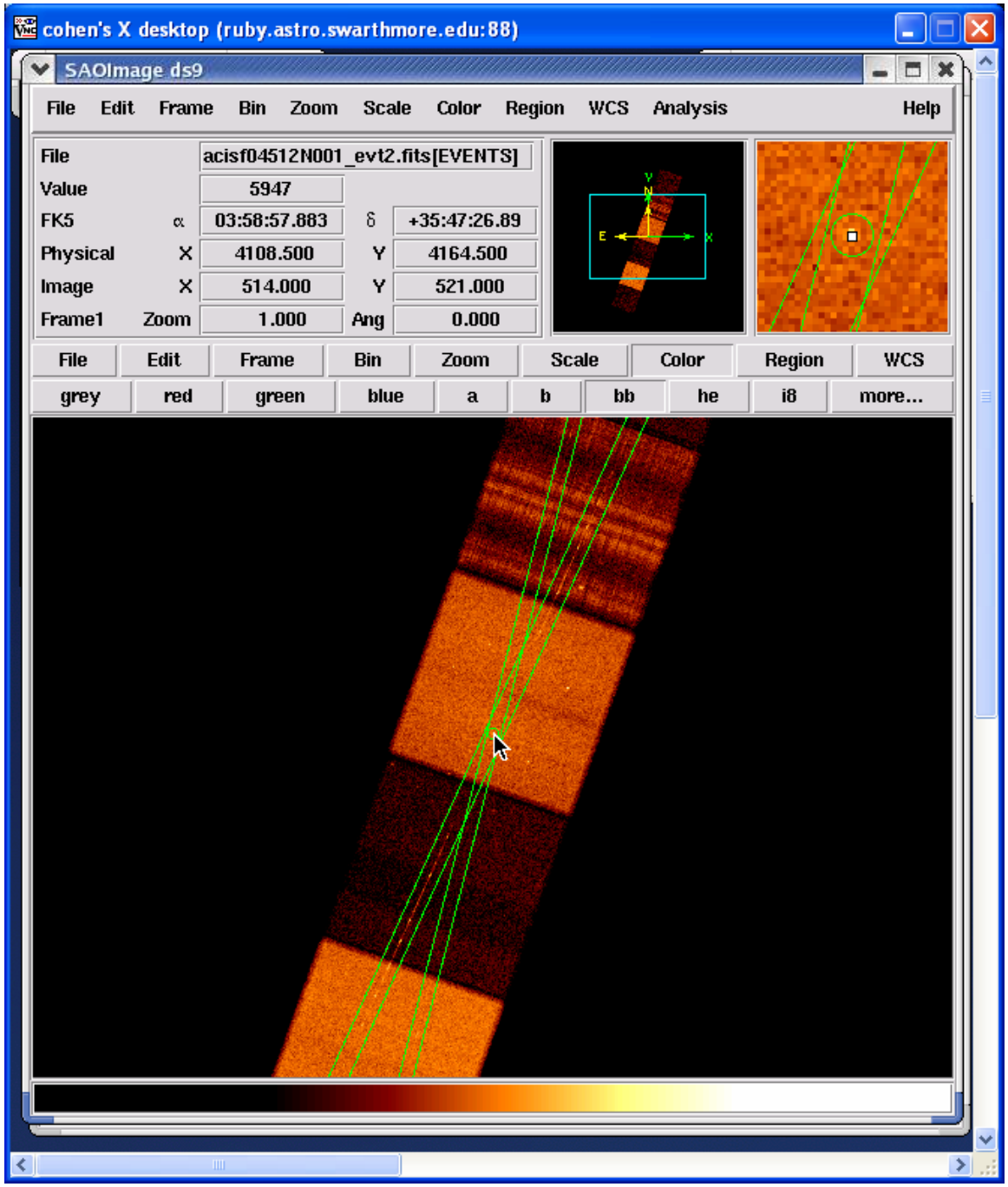
Rerunning the pipeline means creating a new "evt2.fits" – events table – from the "level 1 events table" (evt1.fits). During this procedure, we do a better job destreaking the data (removing hot pixels and columns in various CCDs) and also remove spurious events from the zeroth order spectrum due to the incorrect application of the "afterglow" correction. (Let me know if you want to see some documentation about these things.) The upshot is, the evt2 file I made is different than the one that was sent to the PI team (or that can be downloaded directly from the archives).



This is an image created from the new evt2 file I made by rerunning the pipeline processing tasks. Note: the zeroth order is well centered (see inset at upper right of ds9 window) and thus the grating arms are well defined and the various spectra properly extracted (i.e. the wavelength solution should be good).

Also, the backgrounds on various chips look relatively low and uniform.

Compare to the next slide...



This is the evt2 file that was sent to the PI and which I downloaded directly from the archive.

Note the higher backgrounds in some chips and, especially, the non-uniformity.

The centering of the zeroth order spectrum was fine, so the extraction of the dispersed spectra should also have been fine. But the newly extracted spectra should be less noisy.

Finally – and this is not shown directly here – the new afterglow correction did seem to affect the zeroth order spectrum.

Advice: you should redo (or at least spot-check) your time-variability analysis on the zeroth order spectrum, using my new evt2 file. You can pick it up at:

http://astro.swarthmore.edu/~cohen/projects/xper/acis_4512_dstrk_evt2.fits

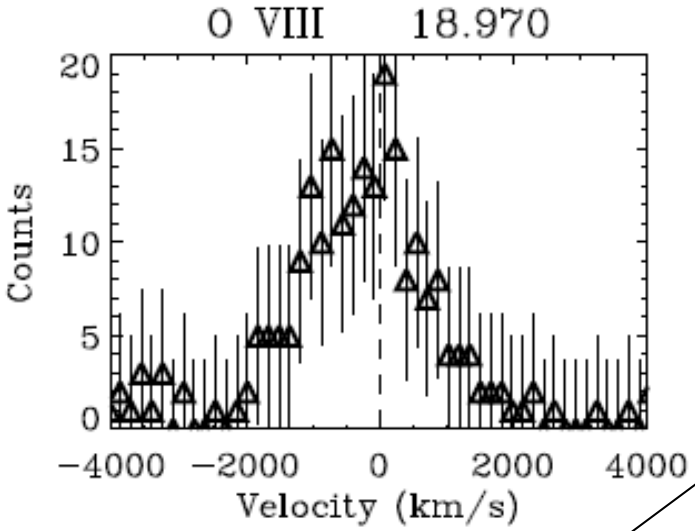
I have not made any kind of pile-up correction. I assume that you have checked to see if this is necessary and then applied the pile-up correction before doing any analysis on the zeroth order spectrum.

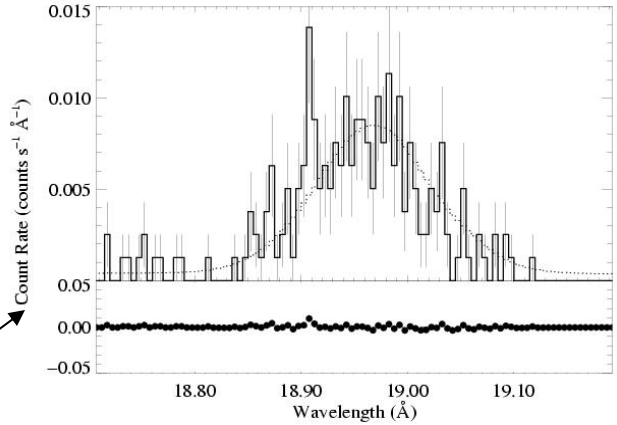
I've done some preliminary model fitting (see the next slide). Before I do more, I was hoping you could tell me what stellar and wind parameters you're using. In order to fit the wind profile model, we need to assume a v_inf. And to interpret the derived optical depth values, we need to know M-dot and R_star.

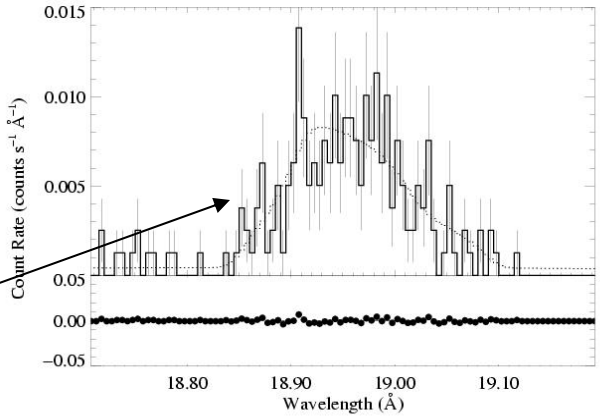
Please advise, and I'll systematically fit the rest of the lines, including the forbidden and intercombination lines of He-like species, and do the excitation kinematics modeling in order to place constraints on the physical location of the hot plasma (for that, I'll need to know what T_eff and log(g) to use).

Derck's extraction of the oxygen Lyman alpha line (left). Taken from the AAS poster. The same line (MEG only), coadded, Poisson error bars calculated (note the difference between these error bars and those tabulated in the pha2 file), and fit with two different models (right).

Derck, is it the MEG data that you're showing here too?







Gaussian ($\lambda_o = \lambda_{lab}$) and Owocki-Cohen wind profile model