6April2007
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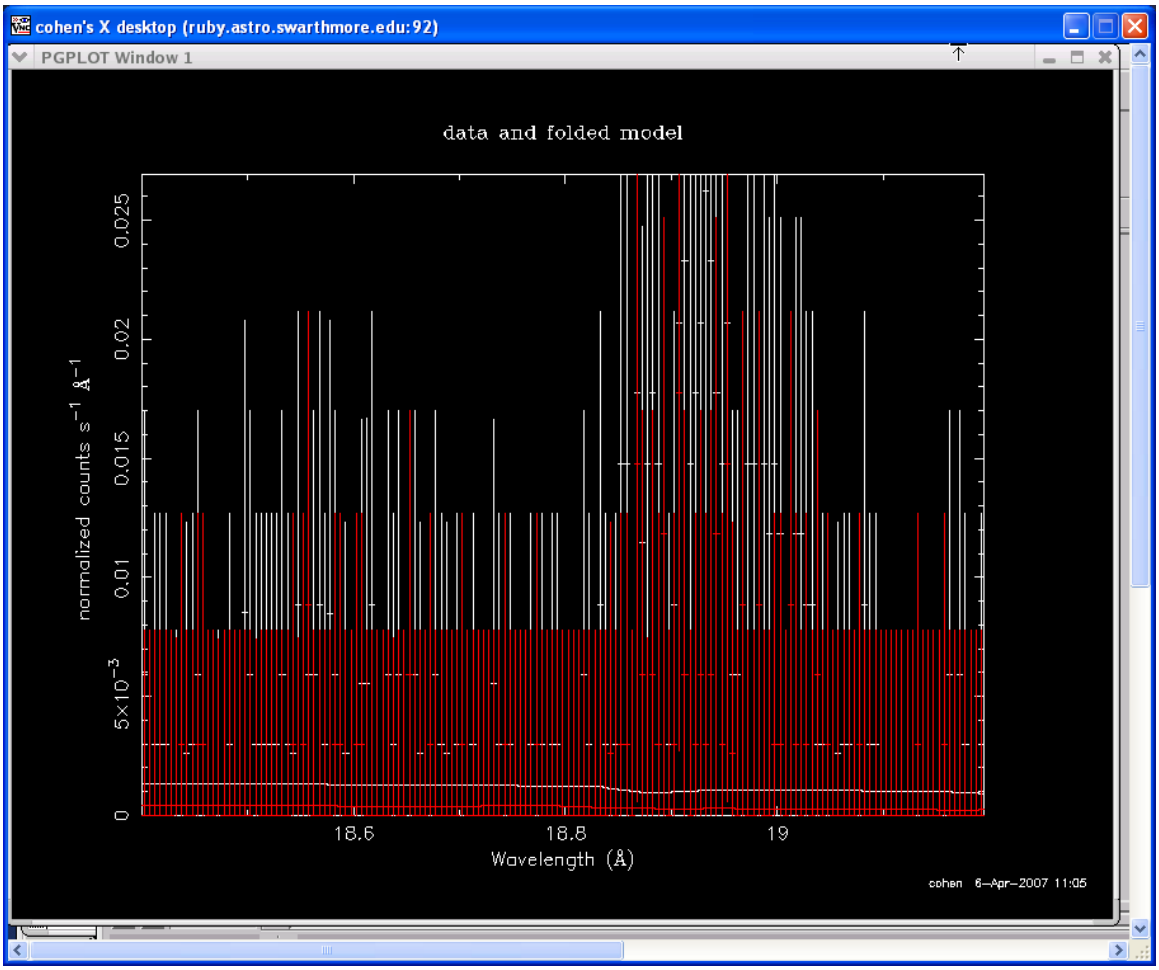
Analyzing the O VIII Ly-alpha line in the MEG spectrum of zeta Pup using Maurice's Jan. 2007 version of windproof in xspec v.12

This is a follow-on to the memo describing the Fe XVII 15.014 fit; just to see how robust the results are (not just best-fit parameters, but also trends with the assumed terminal velocity)…and see what other unanticipated problems come up.

We're just fitting the standard Owocki-Cohen smooth wind profile model.

O VIII 18.9689 (emissivity weighted mean wavelength of the Ly-alpha doublet)

Looking at the nearby continuum:



Looks like some fuzz blueward of about 18.7; so let's try fitting 18.7:18.8, 19.1:19.2

```
========================================================================
Model powerlaw<1> Source No.: 1   Active/On
Model Model Component  Parameter  Unit     Value
 par  comp
   1    1   powerlaw   PhoIndex          2.00000      frozen
   2    1   powerlaw   norm             2.06743E-03  +/-  7.67464E-04
------------------------------------------------------------------------

 C-statistic =         55.46 using 76 PHA bins and 75 degrees of freedom.

XSPEC12>error 1.0 2
 Parameter   Confidence Range (1.000000)
    2     0.001601     0.002569    (-0.000466,0.000501)
```

Note that we've used both the negative and positive orders, but the m=+1 order is kind of screwed up near 18.97 A – we saw this in zeta Ori too. Maybe a chip gap that's not perfectly calibrated.

In any case, I made several fits to both orders simultaneously and got fits that were just barely adequate (MC ~ 92%) and had quite unrealistic values of q (approaching +1.0).

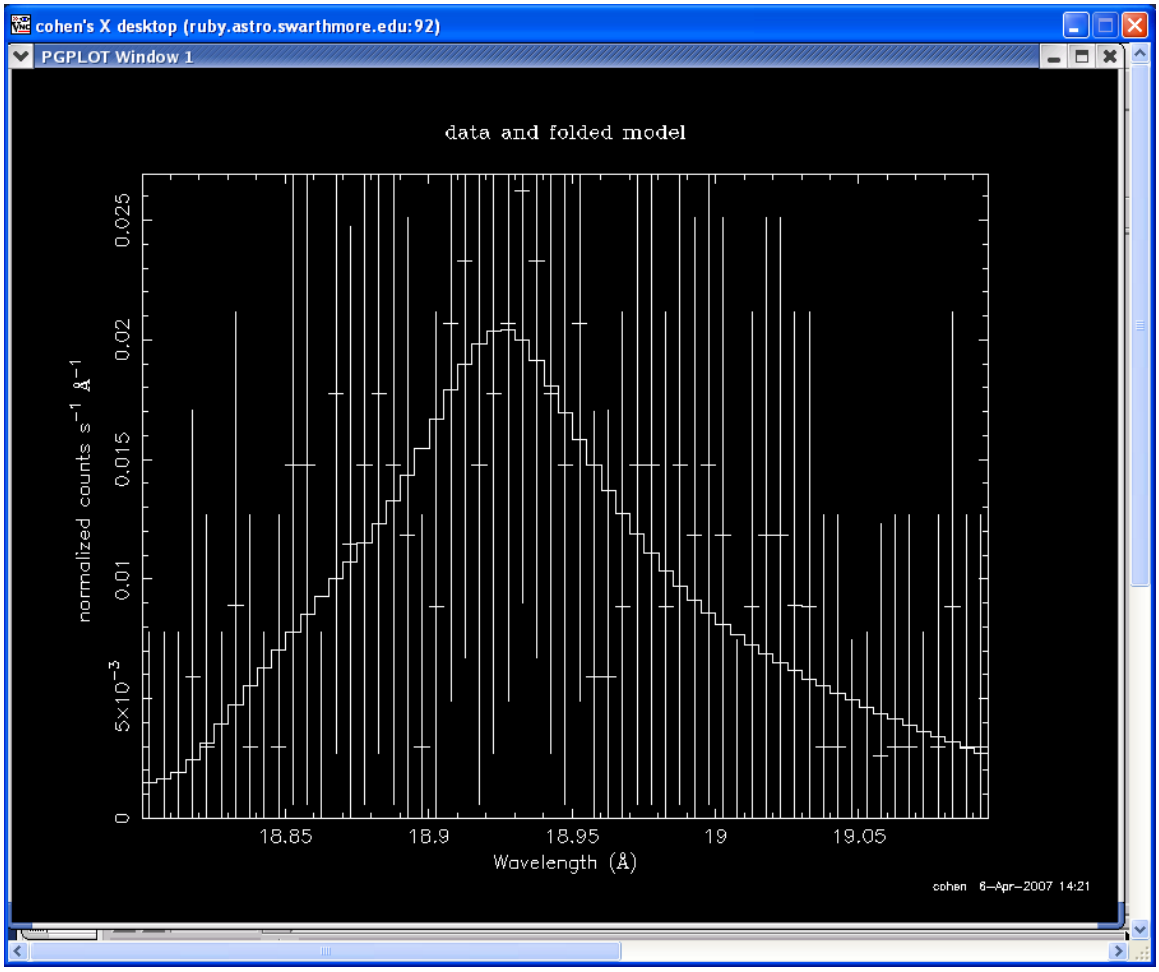
Then I excluded the +1 order data and fit only the -1 order data. Note that I kept the results of the powerlaw fit to the nearby continuum shown above, which was done for both orders simultaneously.

```
========================================================================
Model windprof<1> + powerlaw<2> Source No.: 1   Active/On
Model Model Component  Parameter  Unit     Value
 par  comp
   1    1   windprof   q              8.22351E-02  +/-  0.272452
   2    1   windprof   taustar          2.37997     +/-  0.840934
   3    1   windprof   u0              0.729405     +/-  0.210764
   4    1   windprof   h               0.0          frozen
   5    1   windprof   tau0star         0.0         frozen
   6    1   windprof   beta            1.00000      frozen
   7    1   windprof   betaSob          0.0         frozen
   8    1   windprof   numerica          0          frozen
   9    1   windprof   anisotro          0          frozen
  10    1   windprof   rosselan          0          frozen
  11    1   windprof   expansio          0          frozen
  12    1   windprof   thick             0          frozen
  13    1   windprof   waveleng   "A"     18.9689     frozen
  14    1   windprof   shift      "mA"    0.0         frozen
  15    1   windprof   velocity   (scale) 2485.00
  16    1   windprof   verbose           0          frozen
  17    1   windprof   norm             3.65997E-04  +/-  5.83324E-05
  18    2   powerlaw   PhoIndex          2.00000      frozen
  19    2   powerlaw   norm             2.07000E-03  frozen
------------------------------------------------------------------------
```

C-statistic = 64.73 using 59 PHA bins and 55 degrees of freedom.

XSPEC12>goodness 100 nosim
63.00% of realizations are < best fit statistic 64.73

XSPEC12>iplot
PLT> wdata 18969/18969_best_m1only_v2485.dat



Trying a fit with the lower terminal velocity (also just to m=-1)

```
========================================================================
Model windprof<1> + powerlaw<2> Source No.: 1   Active/On
Model Model Component  Parameter  Unit     Value
 par  comp
   1    1   windprof   q              3.18039E-02  +/-  0.260227
   2    1   windprof   taustar          3.51398     +/-  1.27414
   3    1   windprof   u0             0.806805     +/-  1.10923
   4    1   windprof   h              0.0          frozen
   5    1   windprof   tau0star       0.0          frozen
   6    1   windprof   beta           1.00000      frozen
   7    1   windprof   betaSob        0.0          frozen
   8    1   windprof   numerica       0            frozen
   9    1   windprof   anisotro       0            frozen
  10    1   windprof   rosselan       0            frozen
  11    1   windprof   expansio       0            frozen
  12    1   windprof   thick          0            frozen
  13    1   windprof   waveleng   "A"     18.9689     frozen
  14    1   windprof   shift      "mA"    0.0         frozen
  15    1   windprof   velocity   (scale) 2200.00
  16    1   windprof   verbose        0            frozen
  17    1   windprof   norm           3.59717E-04  +/-  5.81755E-05
  18    2   powerlaw   PhoIndex       2.00000      frozen
  19    2   powerlaw   norm           2.07000E-03  frozen
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 C-statistic =         65.12 using 59 PHA bins and 55 degrees of freedom.

XSPEC12>goodness 100 nosim
59.00% of realizations are < best fit statistic 65.12
```

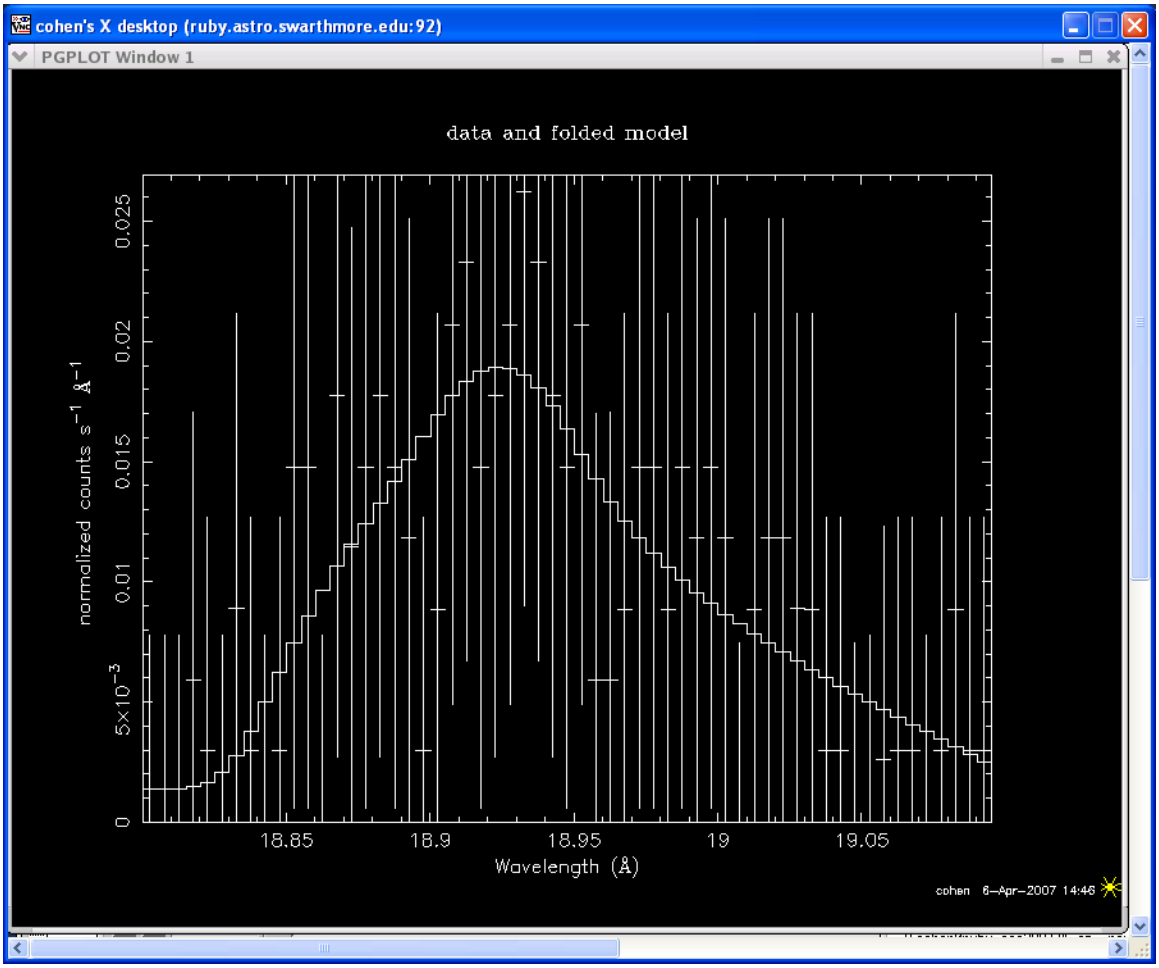

Summarizing the results of these two fits:

v_inf	q	tau_star	u_max	norm/10^{-4}	C	MC%
2485	0.08	2.38	0.729	3.66	64.73	63%
2200	0.03	3.51	0.807	3.6	65.12	59%

So, with this line too, tau_star is pretty strongly affected by the choice of terminal velocity, while other parameters less so (u_max a bit more than with the Fe line).