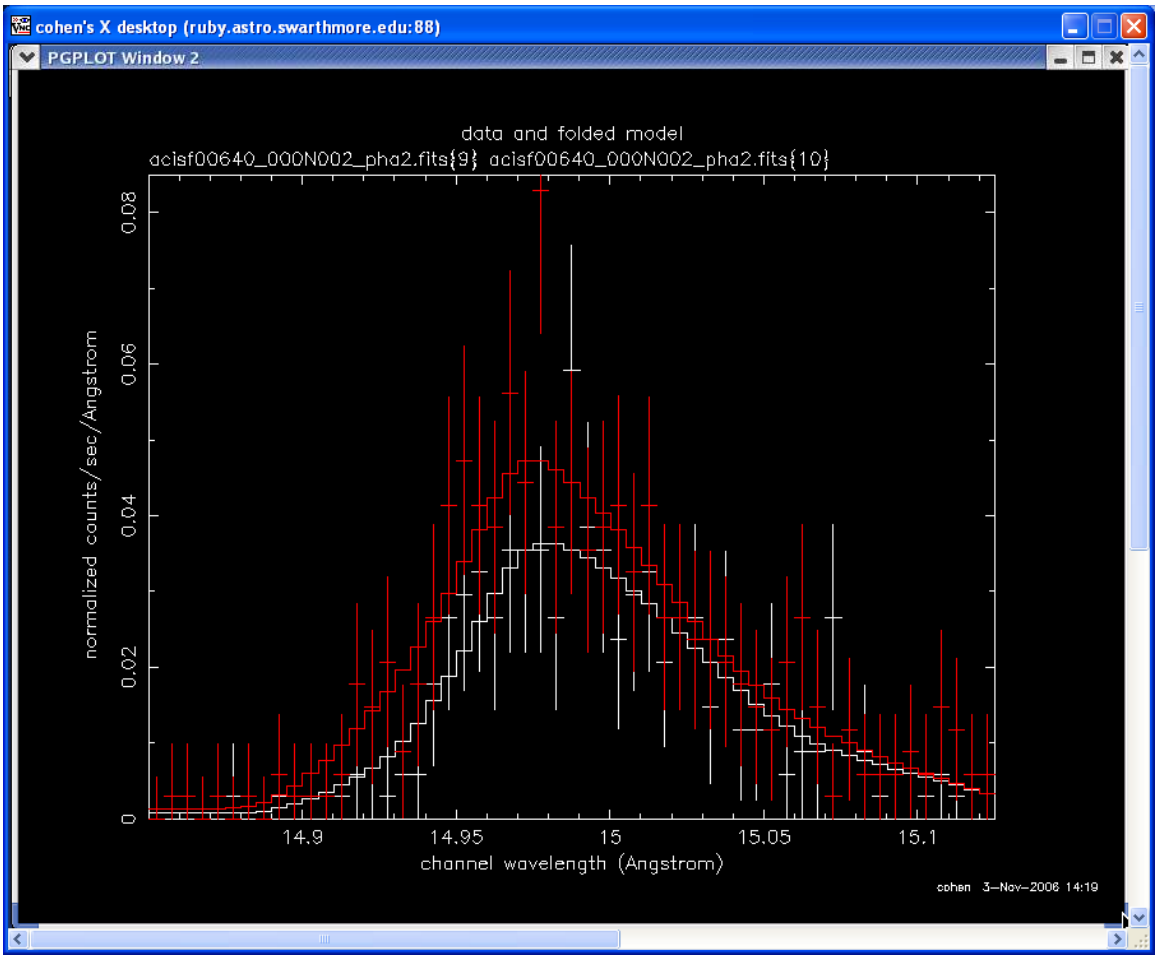
Once again, fitting the 15.014 line in the MEG +/-1 Chandra spectrum of zeta Pup with a windprof model. Using Maurice's 30Aug06 implementation of windprof (not the very latest version).

Best fit on (14.85:15.13 Angstroms) in the MEG.

Here, *no* background is included:

```
---------------------------------------------------------------------------
Model:  windprof<1> + powerlaw<2>
Model Fit Model Component  Parameter  Unit     Value
par   par comp
  1    1    1  windprof   q              6.659093E-03 +/-  0.159451
  2    2    1  windprof   taustar          1.29494     +/-  0.285470
  3    3    1  windprof   umax             0.652458    +/-  0.518939E-01
  4    4    1  windprof   tauSobSt         0.00000     frozen
  5    5    1  windprof   h                0.00000     frozen
  6    6    1  windprof   velocity km/s      2485.00     frozen
  7    7    1  windprof   beta             1.00000     frozen
  8    8    1  windprof   betaSob          0.00000     frozen
  9    9    1  windprof   waveleng A         15.0140     frozen
 10   10    1  windprof   shift    mA        0.00000     frozen
 11   11    1  windprof   thick            0.00000     frozen
 12   12    1  windprof   pType              0.00000     frozen
 13   13    1  windprof   verbose          0.00000     frozen
 14   14    1  windprof   norm             5.303220E-04 +/-  0.534968E-04
 15   15    2  powerlaw   PhoIndex         2.00000     frozen
 16   16    2  powerlaw   norm             1.690475E-03 +/-  0.140769E-02
---------------------------------------------------------------------------
---------------------------------------------------------------------------
C-statistic =      82.18877     using   110 PHA bins.
```



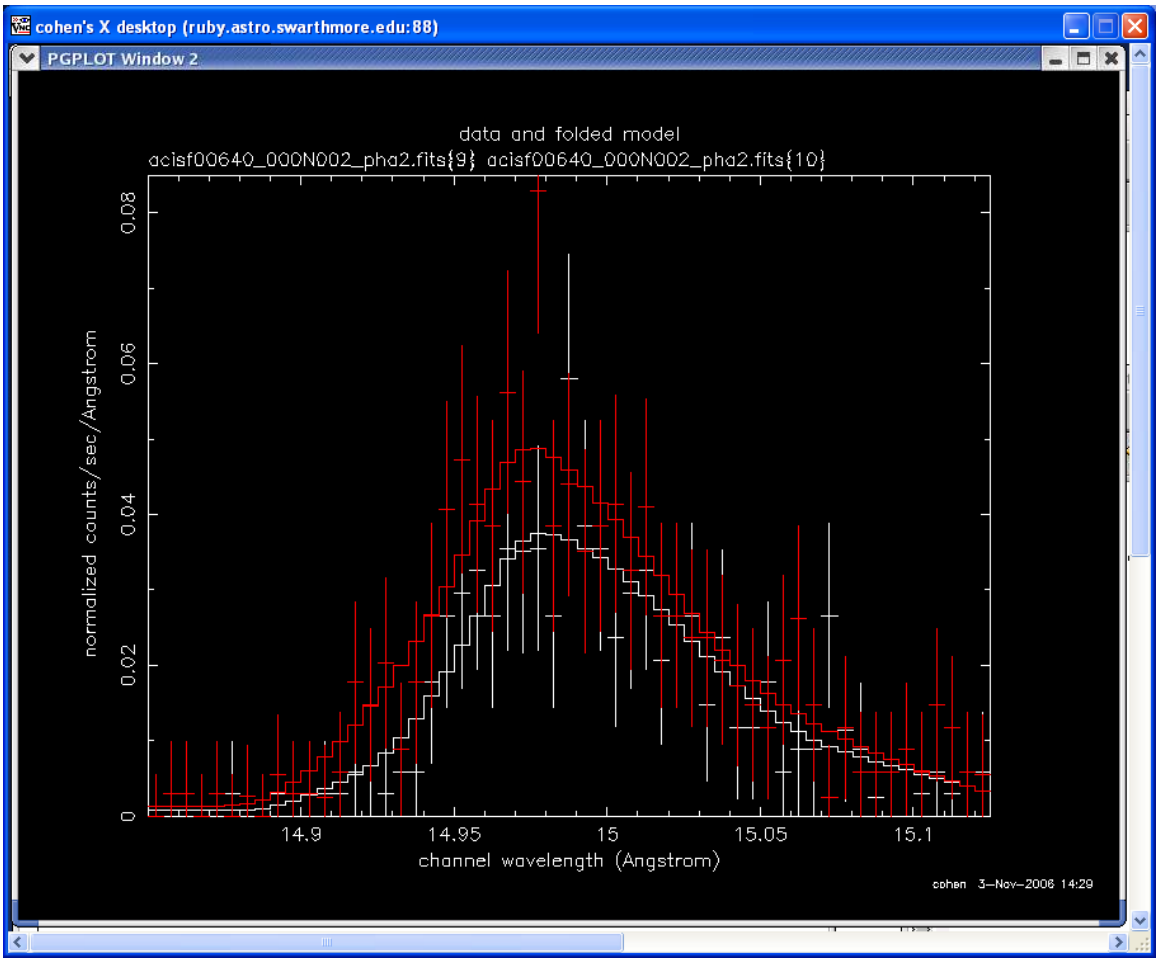
OK, Second, let's do the same model and fit but to the data with the background:

Model: windprof<1> + powerlaw<2>

Model Fit par	Model par	Component	Parameter	Unit	Value
1	1	1	windprof	q	1.441660E-02 +/- 0.158527
2	2	1	windprof	taustar	1.29241 +/- 0.281120
3	3	1	windprof	umax	0.648206 +/- 0.515143E-01
4	4	1	windprof	tauSobSt	0.00000 frozen
5	5	1	windprof	h	0.00000 frozen
6	6	1	windprof	velocity km/s	2485.00 frozen
7	7	1	windprof	beta	1.00000 frozen
8	8	1	windprof	betaSob	0.00000 frozen
9	9	1	windprof	waveleng A	15.0140 frozen
10	10	1	windprof	shift mA	0.00000 frozen
11	11	1	windprof	thick	0.00000 frozen
12	12	1	windprof	pType	0.00000 frozen
13	13	1	windprof	verbose	0.00000 frozen
14	14	1	windprof	norm	5.245492E-04 +/- 0.536592E-04
15	15	2	powerlaw	PhoIndex	2.00000 frozen
16	16	2	powerlaw	norm	1.614721E-03 +/- 0.140813E-02

C-statistic = 81.31116 using 110 PHA bins.

Hmmm… Maurice had found a higher Cstat (but, like here, essentially no difference in the best fit model parameters)



Is xspec treating this *any* differently? The messages to the screen indicate that the background file *is* being read in:

```
!XSPEC>  data 1 acisf00640_000N002_pha2.fits{9};
 Net count rate (cts/s) for file   1  0.1417    +/-  3.0994E-03
   1 data set is in use

!XSPEC>  data 2 acisf00640_000N002_pha2.fits{10};
 Net count rate (cts/s) for file   2  0.1163    +/-  2.9990E-03
   2 data sets are in use

!XSPEC>   back 1 acisf00640_000N002_pha2.fits_bkg{9};

!XSPEC>    tclunknown back 1 acisf00640_000N002_pha2.fits_bkg{9}
```

```
!XSPEC>        ::namespace current

!XSPEC>        backgrnd 1 acisf00640_000N002_pha2.fits_bkg{9}
 Net count rate (cts/s) for file   1  0.1402    +/-  3.0999E-03( 99.0% total)
   using background file...           acisf00640_000N002_pha2.fits_bkg{9}

!XSPEC>   back 2 acisf00640_000N002_pha2.fits_bkg{10};

!XSPEC>    tclunknown back 2 acisf00640_000N002_pha2.fits_bkg{10}

!XSPEC>        ::namespace current

!XSPEC>        backgrnd 2 acisf00640_000N002_pha2.fits_bkg{10}
 Net count rate (cts/s) for file   2  0.1153    +/-  2.9993E-03( 99.1% total)
   using background file...           acisf00640_000N002_pha2.fits_bkg{10}
```

*Fix a model with “round” parameter values and compare it to both the background-subtracted data and the unsubtracted data:

i) with the background subtraction:

```
 ------------------------------------------------------------------------------
 Model:  windprof<1> + powerlaw<2>
 Model Fit Model Component  Parameter  Unit     Value
 par   par comp
   1   1   1  windprof   q                0.00000     +/-   0.00000
   2   2   1  windprof   taustar          1.00000     +/-   0.00000
   3   3   1  windprof   umax             0.600000    +/-   0.00000
   4   4   1  windprof   tauSobSt         0.00000     frozen
   5   5   1  windprof   h                0.00000     frozen
   6   6   1  windprof   velocity km/s    2485.00     frozen
   7   7   1  windprof   beta             1.00000     frozen
   8   8   1  windprof   betaSob          0.00000     frozen
   9   9   1  windprof   waveleng A       15.0140     frozen
  10  10   1  windprof   shift    mA      0.00000     frozen
  11  11   1  windprof   thick            0.00000     frozen
  12  12   1  windprof   pType            0.00000     frozen
  13  13   1  windprof   verbose          0.00000     frozen
  14  14   1  windprof   norm             5.000000E-04 +/-   0.00000
  15  15   2  powerlaw   PhoIndex         2.00000     frozen
  16  16   2  powerlaw   norm             2.000000E-03 +/-   0.00000
 ------------------------------------------------------------------------------
 ------------------------------------------------------------------------------
 C-statistic =      85.96943     using   110 PHA bins.
```

ii) with no background:

```
 ------------------------------------------------------------------------------
 Model:  windprof<1> + powerlaw<2>
 Model Fit Model Component  Parameter  Unit     Value
 par   par comp
   1   1   1  windprof   q                0.00000     frozen
   2   2   1  windprof   taustar          1.00000     frozen
   3   3   1  windprof   umax             0.600000    frozen
   4   4   1  windprof   tauSobSt         0.00000     frozen
   5   5   1  windprof   h                0.00000     frozen
   6   6   1  windprof   velocity km/s    2485.00     frozen
```

```
  7   7   1  windprof  beta            1.00000     frozen
  8   8   1  windprof  betaSob         0.00000     frozen
  9   9   1  windprof  waveleng A      15.0140     frozen
 10  10   1  windprof  shift   mA      0.00000     frozen
 11  11   1  windprof  thick           0.00000     frozen
 12  12   1  windprof  pType           0.00000     frozen
 13  13   1  windprof  verbose         0.00000     frozen
 14  14   1  windprof  norm            5.000000E-04 +/-  0.00000
 15  15   2  powerlaw  PhoIndex        2.00000     +/-  0.00000
 16  16   2  powerlaw  norm            2.000000E-03 +/-  0.00000
 ------------------------------------------------------------------------
 ------------------------------------------------------------------------
 C-statistic =     87.09071     using   110 PHA bins.
```

OK; the models are identical, but the C statistics are different (just a little), so the data must actually be a bit different with the background subtraction. (But is xspec simply subtracting the background?)

*writing out ascii files from iplot (to compare the bkg and no bkg *data*; the models in the two files are identical).

OK, the data columns differ slightly (for some wavelength bins); the uncertainty column differs a bit too. My spot check indicates that the data column values are slightly lower (though often equivalent) in the background subtracted case.

See:
http://astro.swarthmore.edu/~cohen/projects/porosity/bkgsub.dat
http://astro.swarthmore.edu/~cohen/projects/porosity/nobkg.dat

So, now my working hypothesis is that xspec simply subtracts the background, even when using the C statistic. I don't think that this is good.

Question:

Why did Maurice get significantly higher C statistic values when we were fitting these models in his office in late August?

Bigger question:

Is it better to use the background or not? Maybe we should do it both ways and show that we get the same results (more or less); though this won't be good enough for the XMM data.

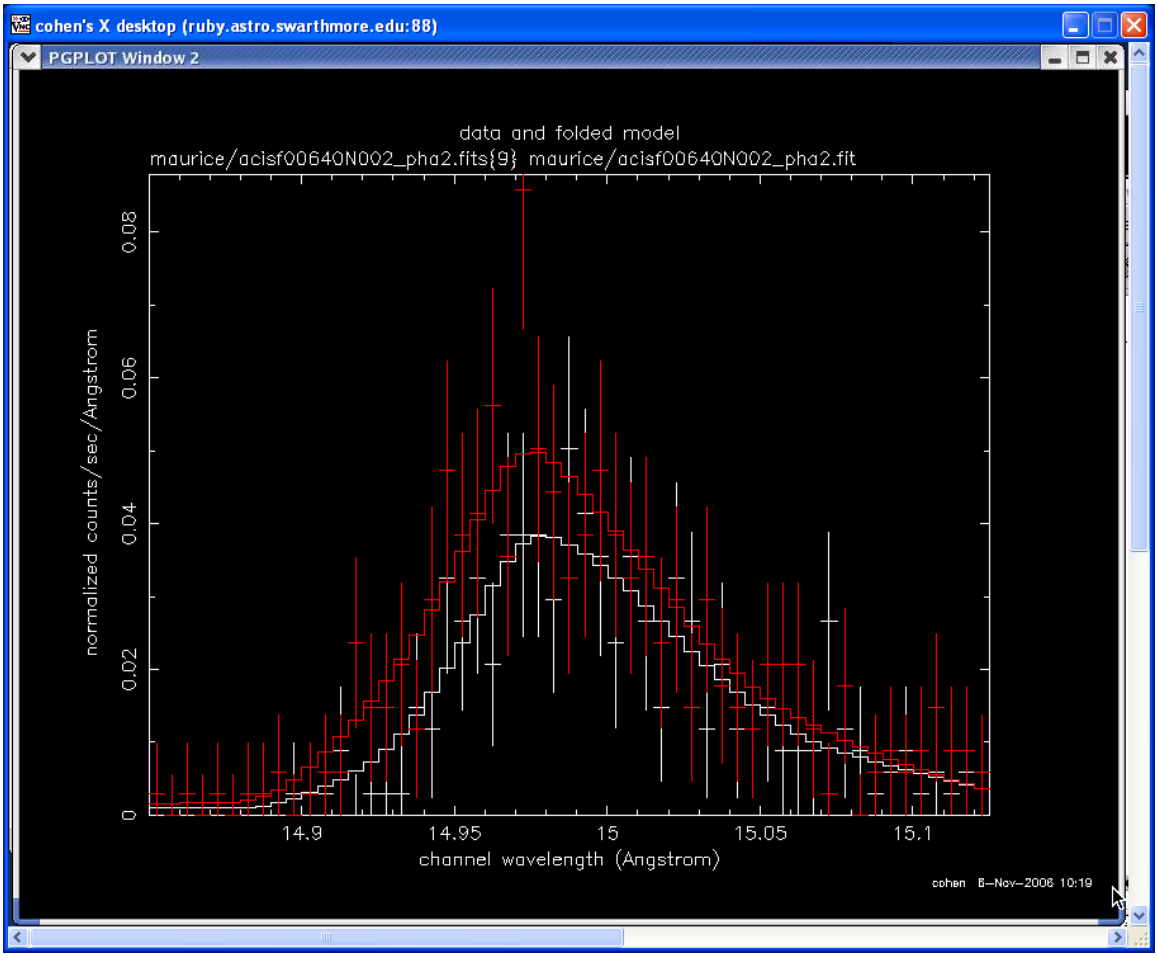
6Nov2006:

Comparing these fits to the data – pha2 file – that Maurice has been using

1. Use Maurice's data, but do *not* do a background subtraction; use *my* rmfs and garfs.

Indeed, the best-fit has a C stat value in the high 90s:

```
------------------------------------------------------------------------
Model:  windprof<1> + powerlaw<2>
Model Fit Model Component  Parameter  Unit     Value
par   par comp
  1    1    1   windprof   q              5.280272E-02 +/-  0.165862
  2    2    1   windprof   taustar          1.50696     +/-  0.322252
  3    3    1   windprof   umax             0.654939    +/-  0.591773E-01
  4    4    1   windprof   tauSobSt         0.00000     frozen
  5    5    1   windprof   h                0.00000     frozen
  6    6    1   windprof   velocity km/s      2485.00     frozen
  7    7    1   windprof   beta             1.00000     frozen
  8    8    1   windprof   betaSob          0.00000     frozen
  9    9    1   windprof   waveleng A         15.0140     frozen
 10   10    1   windprof   shift    mA        0.00000     frozen
 11   11    1   windprof   thick            0.00000     frozen
 12   12    1   windprof   pType              0.00000     frozen
 13   13    1   windprof   verbose          0.00000     frozen
 14   14    1   windprof   norm             5.252822E-04 +/-  0.556691E-04
 15   15    2   powerlaw   PhoIndex           2.00000     frozen
 16   16    2   powerlaw   norm             2.004294E-03 +/-  0.151390E-02
------------------------------------------------------------------------
------------------------------------------------------------------------
C-statistic =      98.70365     using   110 PHA bins.
```



The best-fit model has parameters very similar to what I found, but the C stat is 98 instead of 81.

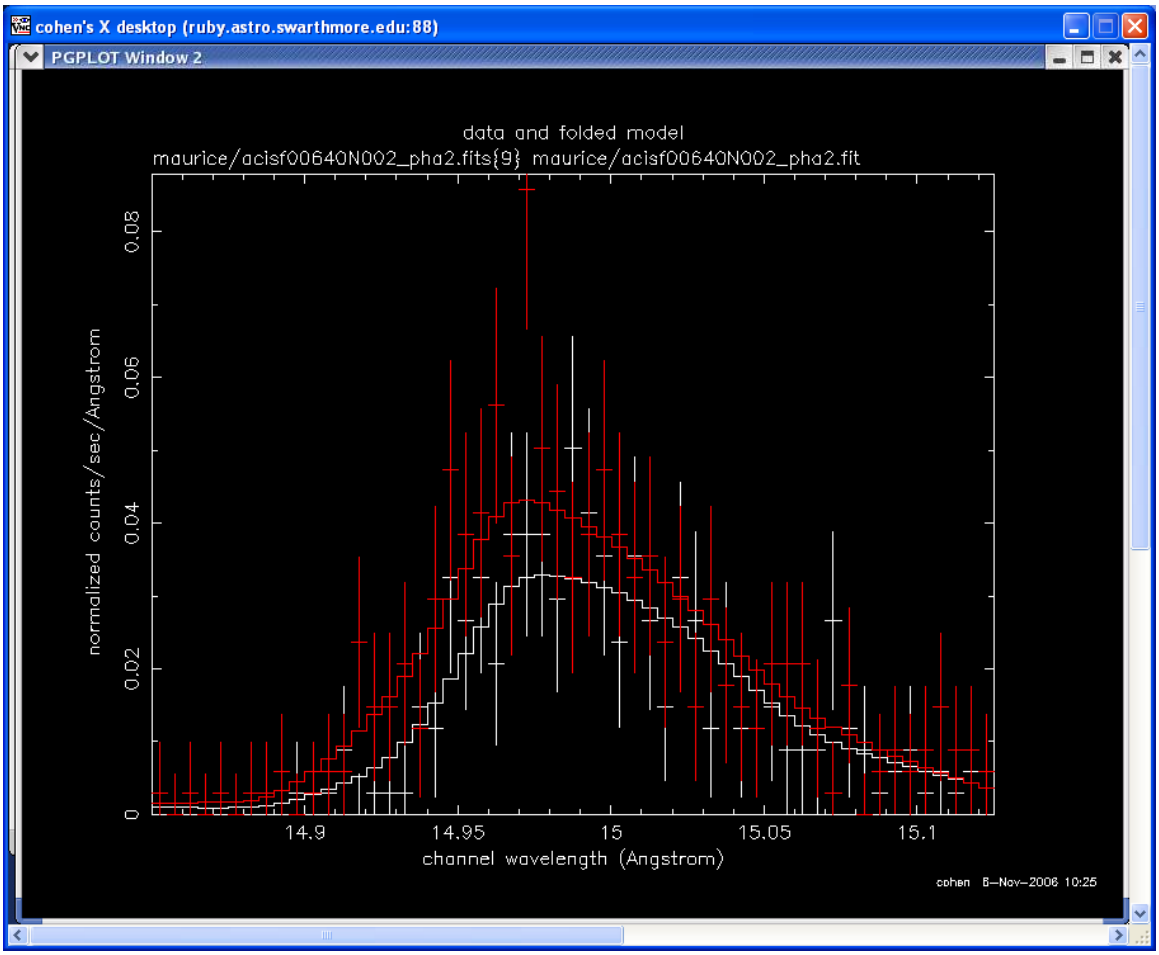
I'd point out, also, that my loaddata* script gives an error when reading in Maurice's data (no background) - but it looks like it's using the data and just not doing the background subtraction (*however, when I do this with my data - not specifying a background - no error message is generated)

*How different does the data look? Impose the "round" model used above:

Model: windprof<1> + powerlaw<2>

Model Fit par	Model Fit par	Component	Component	Parameter	Unit	Value		
1	1	1	windprof	q		0.00000	+/-	0.00000
2	2	1	windprof	taustar		1.00000	+/-	0.00000
3	3	1	windprof	umax		0.600000	+/-	0.00000
4	4	1	windprof	tauSobSt		0.00000	frozen	
5	5	1	windprof	h		0.00000	frozen	
6	6	1	windprof	velocity	km/s	2485.00	frozen	
7	7	1	windprof	beta		1.00000	frozen	
8	8	1	windprof	betaSob		0.00000	frozen	

```
  9    9    1   windprof   waveleng A         15.0140      frozen
 10   10    1   windprof   shift    mA        0.00000      frozen
 11   11    1   windprof   thick              0.00000      frozen
 12   12    1   windprof   pType                0.00000      frozen
 13   13    1   windprof   verbose            0.00000      frozen
 14   14    1   windprof   norm               5.000000E-04 +/-   0.00000
 15   15    2   powerlaw   PhoIndex           2.00000      frozen
 16   16    2   powerlaw   norm               2.000000E-03 +/-   0.00000
 ------------------------------------------------------------------------------
 ------------------------------------------------------------------------------
C-statistic =      105.2387     using   110 PHA bins.
```



Writing it out:

nobkg_maurice.dat

*see comparison plots of the -1 order data