Hanle effect Workshop

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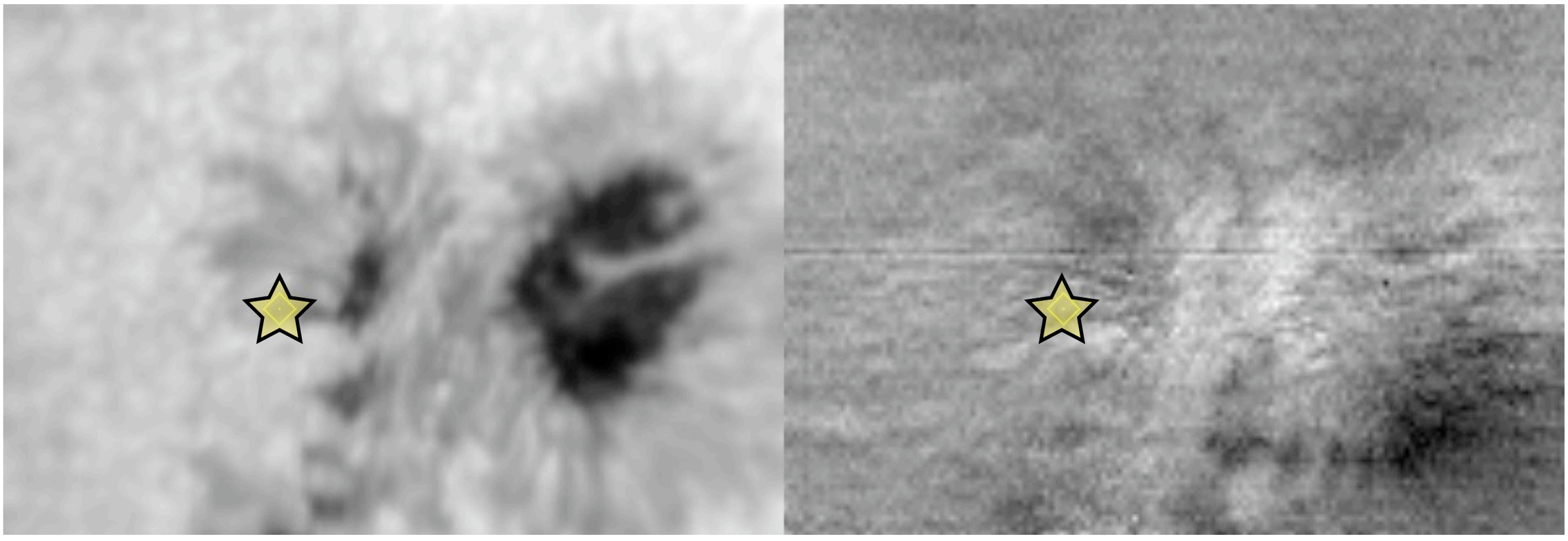
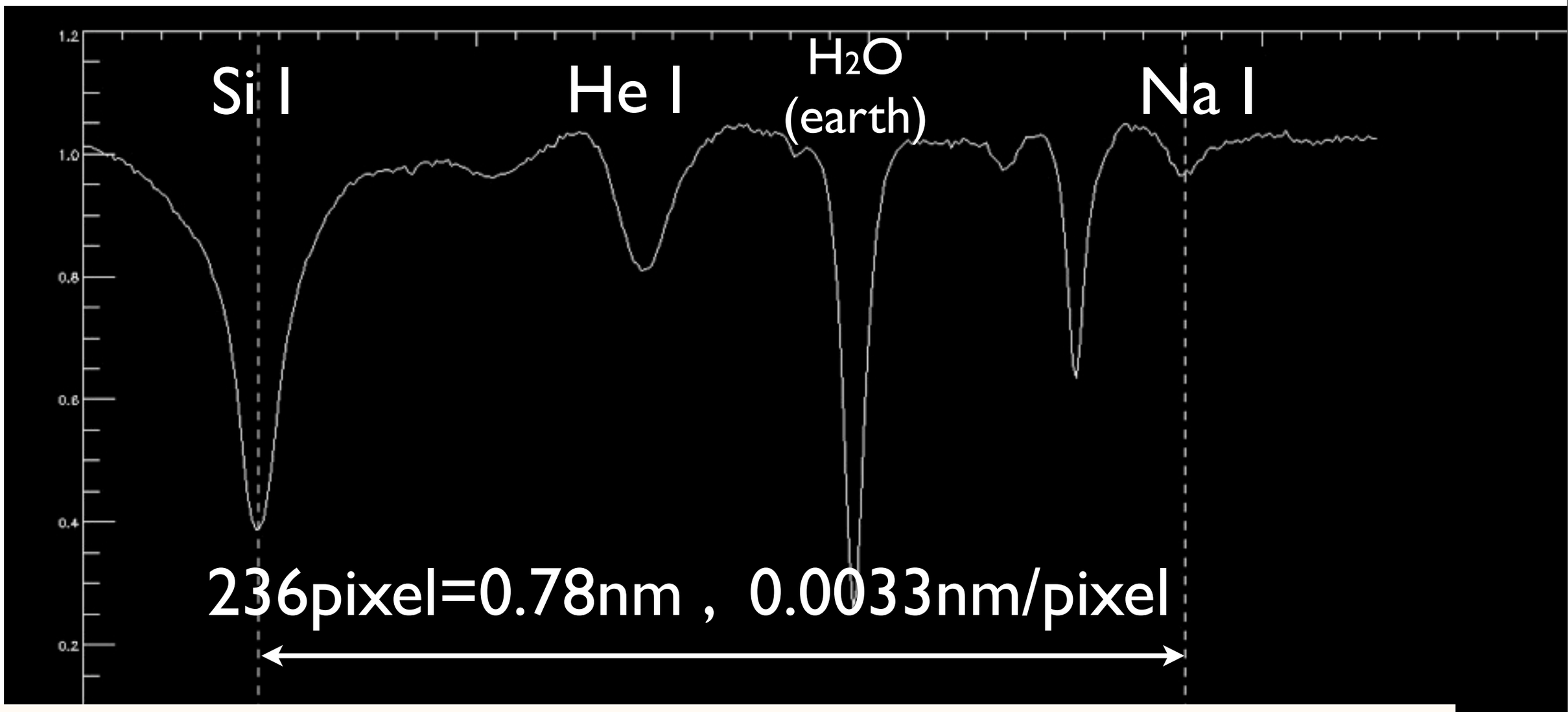
2009.04.03

What I did

- HAZEL fitting to VTT Active Region data

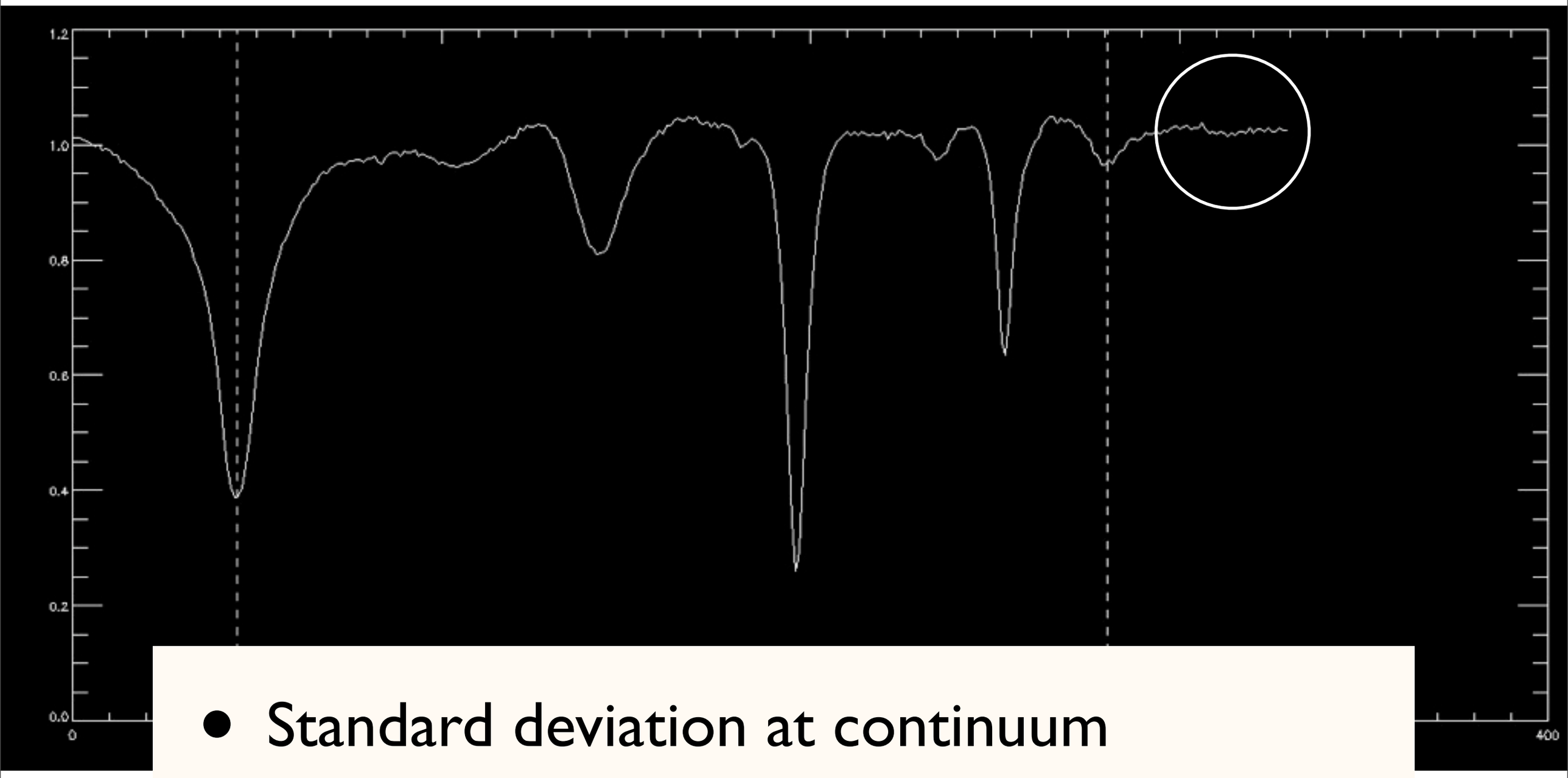


Wavelength alignment



- shift and scale wavelength to fixed position of Si I 1082.71 nm and Na I 1083.49 nm

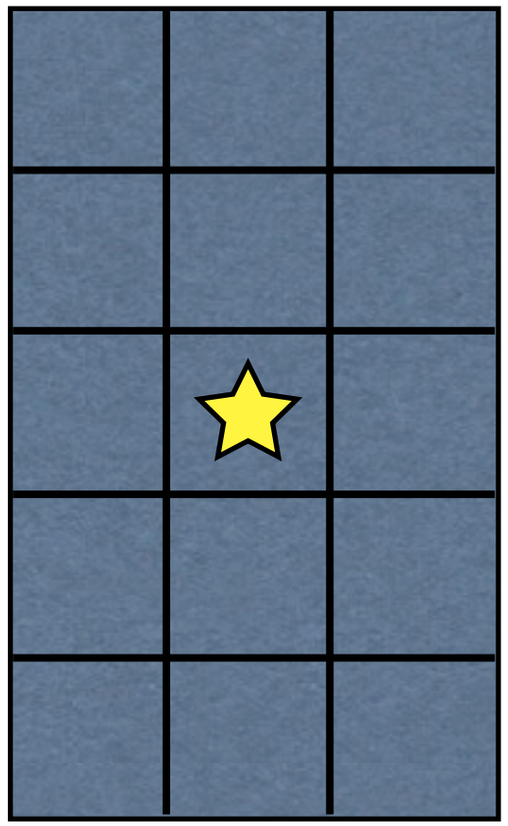
S/N ratio



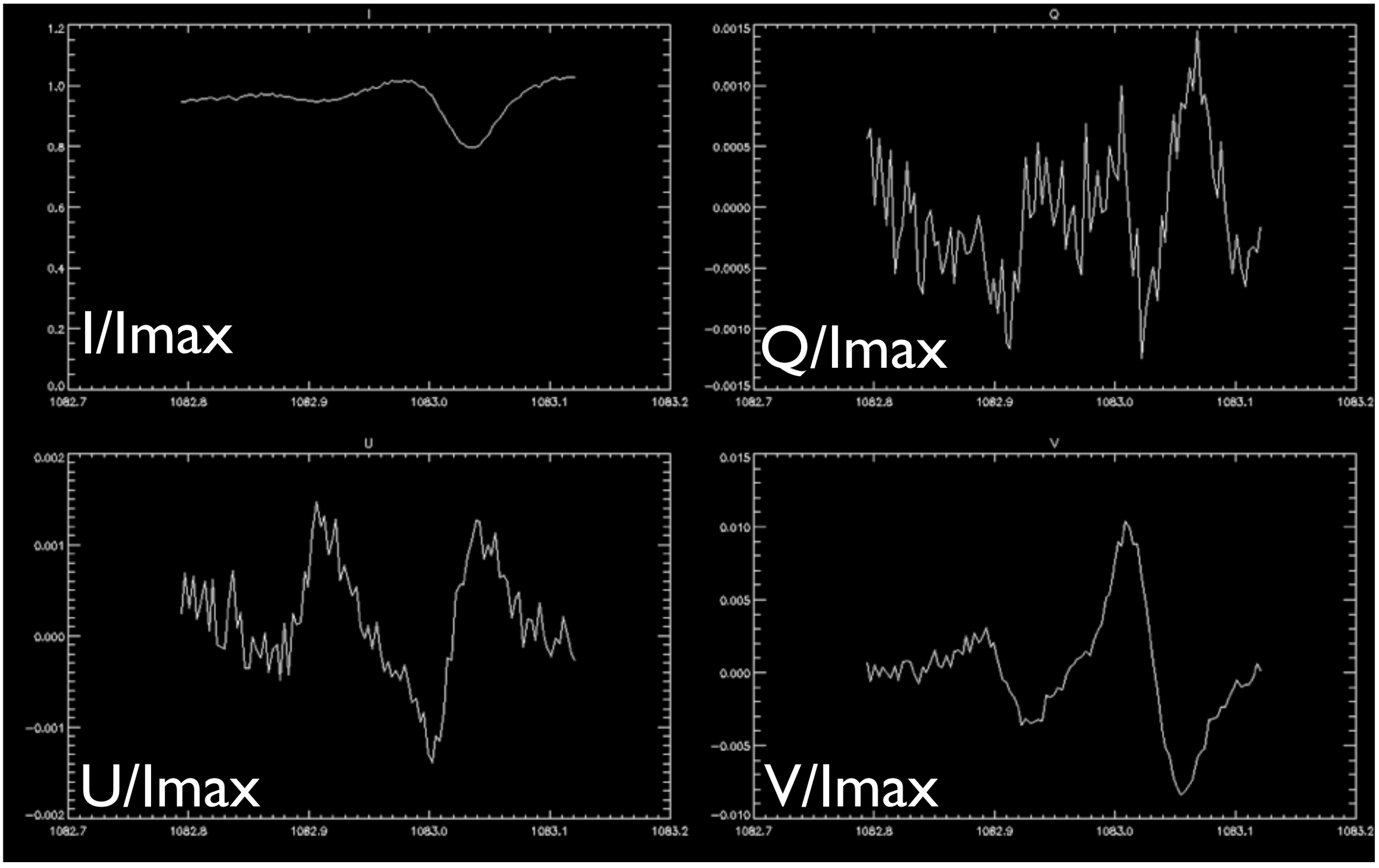
- Standard deviation at continuum
- I 0.0050, Q 0.0013, U 0.0054, V 0.0012

Improve S/N ratio

- Sum up profiles in the slit direction ±2 pixel, and in the scan direction ± l
- I 0.0050 → 0.0458
- Q 0.0013 → 0.00036
- U 0.0054 → 0.00040
- V 0.0012 → 0.00062



Summed profile



Write input text file

of Wavelength position

GNOME 端末

ファイル(F)　編集(E)　表示(V)　端末(T)　タブ(T)　ヘルプ(H)

```
100
 -2.060547e-01   9.448341e-01   5.658568e-04   2.461143e-04   6.417914e-04   4.580000e-03   3.600000e-04   4.000000e-04   6.200000e-04
 -2.027588e-01   9.473284e-01   6.478734e-04   6.905211e-04  -6.149066e-04   4.580000e-03   3.600000e-04   4.000000e-04   6.200000e-04
 -1.994629e-01   9.513560e-01   1.927764e-05   3.021657e-04   4.988146e-04   4.580000e-03   3.600000e-04   4.000000e-04   6.200000e-04
 -1.961670e-01   9.519636e-01   5.651551e-04   6.556675e-04  -2.597484e-04   4.580000e-03   3.600000e-04   4.000000e-04   6.200000e-04
 -1.928711e-01   9.483473e-01   2.315644e-04   1.905348e-04   3.501192e-04   4.580000e-03   3.600000e-04   4.000000e-04   6.200000e-04
 -1.895752e-01   9.571971e-01  -1.456290e-04   3.773103e-04   2.300434e-05   4.580000e-03   3.600000e-04   4.000000e-04   6.200000e-04
 -1.862793e-01   9.551446e-01   4.682634e-04   5.949824e-04  -3.541705e-04   4.580000e-03   3.600000e-04   4.000000e-04   6.200000e-04
 -1.829834e-01   9.589847e-01  -5.452261e-04   5.438711e-05   4.483523e-04   4.580000e-03   3.600000e-04   4.000000e-04   6.200000e-04
 -1.796875e-01   9.584840e-01  -3.012696e-04   6.247378e-04  -5.036560e-04   4.580000e-03   3.600000e-04   4.000000e-04   6.200000e-04
 -1.762695e-01   9.537714e-01  -1.383628e-04  -9.420065e-05   7.116677e-04   4.580000e-03   3.600000e-04   4.000000e-04   6.200000e-04
 -1.729736e-01   9.605032e-01   3.726813e-04  -1.159552e-04   7.734613e-04   4.580000e-03   3.600000e-04   4.000000e-04   6.200000e-04
 -1.696777e-01   9.603018e-01  -4.771667e-05  -1.357099e-04   7.162644e-04   4.580000e-03   3.600000e-04   4.000000e-04   6.200000e-04
 -1.663818e-01   9.676606e-01   1.187269e-04   3.740026e-04  -1.431801e-04   4.580000e-03   3.600000e-04   4.000000e-04   6.200000e-04
 -1.630859e-01   9.549829e-01  -6.225770e-04   7.179603e-04  -7.039660e-04   4.580000e-03   3.600000e-04   4.000000e-04   6.200000e-04
 -1.597900e-01   9.515670e-01  -7.126022e-04   9.473386e-05   3.669368e-04   4.580000e-03   3.600000e-04   4.000000e-04   6.200000e-04
 -1.564941e-01   9.630857e-01  -1.225747e-04   2.591629e-04  -1.069533e-05   4.580000e-03   3.600000e-04   4.000000e-04   6.200000e-04
 -1.531982e-01   9.676655e-01  -2.792557e-05  -3.491701e-04   7.688471e-04   4.580000e-03   3.600000e-04   4.000000e-04   6.200000e-04
 -1.499023e-01   9.711913e-01  -3.205087e-04  -3.568211e-04   1.573639e-03   4.580000e-03   3.600000e-04   4.000000e-04   6.200000e-04
 -1.466064e-01   9.697412e-01  -2.811794e-04  -9.491054e-06   5.457759e-04   4.580000e-03   3.600000e-04   4.000000e-04   6.200000e-04
 -1.433105e-01   9.639174e-01  -5.453723e-04  -1.588511e-04   3.790185e-04   4.580000e-03   3.600000e-04   4.000000e-04   6.200000e-04
 -1.400146e-01   9.727699e-01  -4.025419e-04  -2.335338e-04   1.188890e-03   4.580000e-03   3.600000e-04   4.000000e-04   6.200000e-04
 -1.365967e-01   9.717471e-01  -1.645272e-04   4.013347e-05   3.965920e-04   4.580000e-03   3.600000e-04   4.000000e-04   6.200000e-04
 -1.333008e-01   9.697683e-01  -6.239776e-04  -3.969959e-04   1.488108e-03   4.580000e-03   3.600000e-04   4.000000e-04   6.200000e-04
 -1.300049e-01   9.740069e-01  -1.932375e-04  -1.447393e-04   1.518814e-03   4.580000e-03   3.600000e-04   4.000000e-04   6.200000e-04
 -1.267090e-01   9.638726e-01  -2.337142e-04  -9.314647e-05   1.235528e-03   4.580000e-03   3.600000e-04   4.000000e-04   6.200000e-04
```

wavelength-10830[Å], I/Imax, Q/Imax, U/Imax,V/Imax, sigma I, sigma Q, sigma U, sigma V

array of [9, 100(+1)]

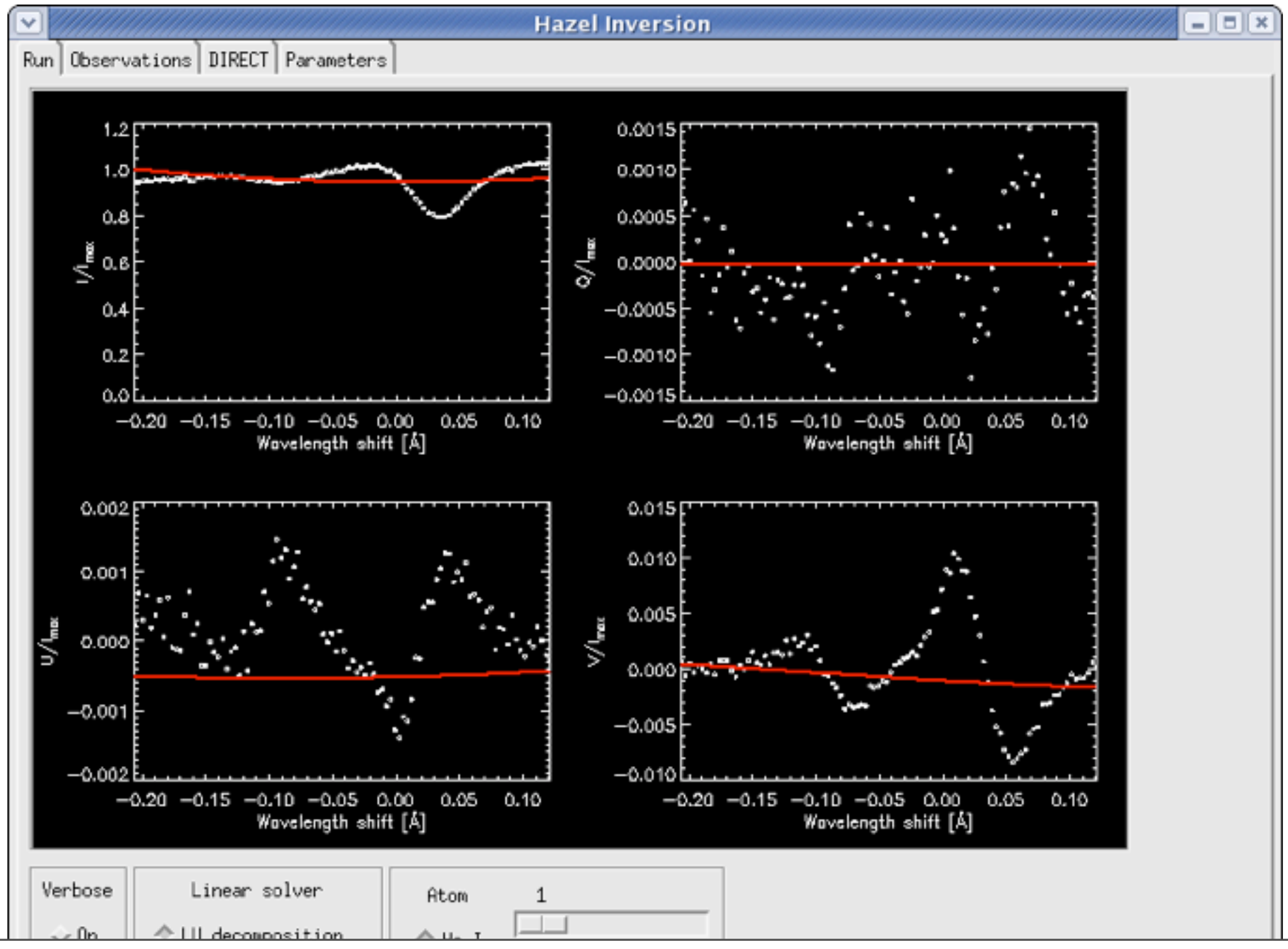
```
 -9.362793e-02   9.441577e-01  -4.365396e-04   1.466108e-03  -4.431180e-04   4.580000e-03   3.600000e-04   4.000000e-04   6.200000e-04
 -9.033203e-02   9.476832e-01  -1.118911e-03   1.201739e-03  -6.579832e-04   4.580000e-03   3.600000e-04   4.000000e-04   6.200000e-04
 -8.703613e-02   9.511941e-01  -1.164557e-03   1.315227e-03  -1.288980e-03   4.580000e-03   3.600000e-04   4.000000e-04   6.200000e-04
 -8.374023e-02   9.505967e-01  -5.281202e-04   8.947973e-04  -1.692586e-03   4.580000e-03   3.600000e-04   4.000000e-04   6.200000e-04
 -8.044434e-02   9.520003e-01  -7.004662e-04   1.070158e-03  -2.397222e-03   4.580000e-03   3.600000e-04   4.000000e-04   6.200000e-04
 -7.714844e-02   9.530864e-01  -2.847015e-04   1.286964e-03  -3.610733e-03   4.580000e-03   3.600000e-04   4.000000e-04   6.200000e-04
 -7.385254e-02   9.578958e-01   4.053967e-04   6.086474e-04  -3.186684e-03   4.580000e-03   3.600000e-04   4.000000e-04   6.200000e-04
:
```

Other Information

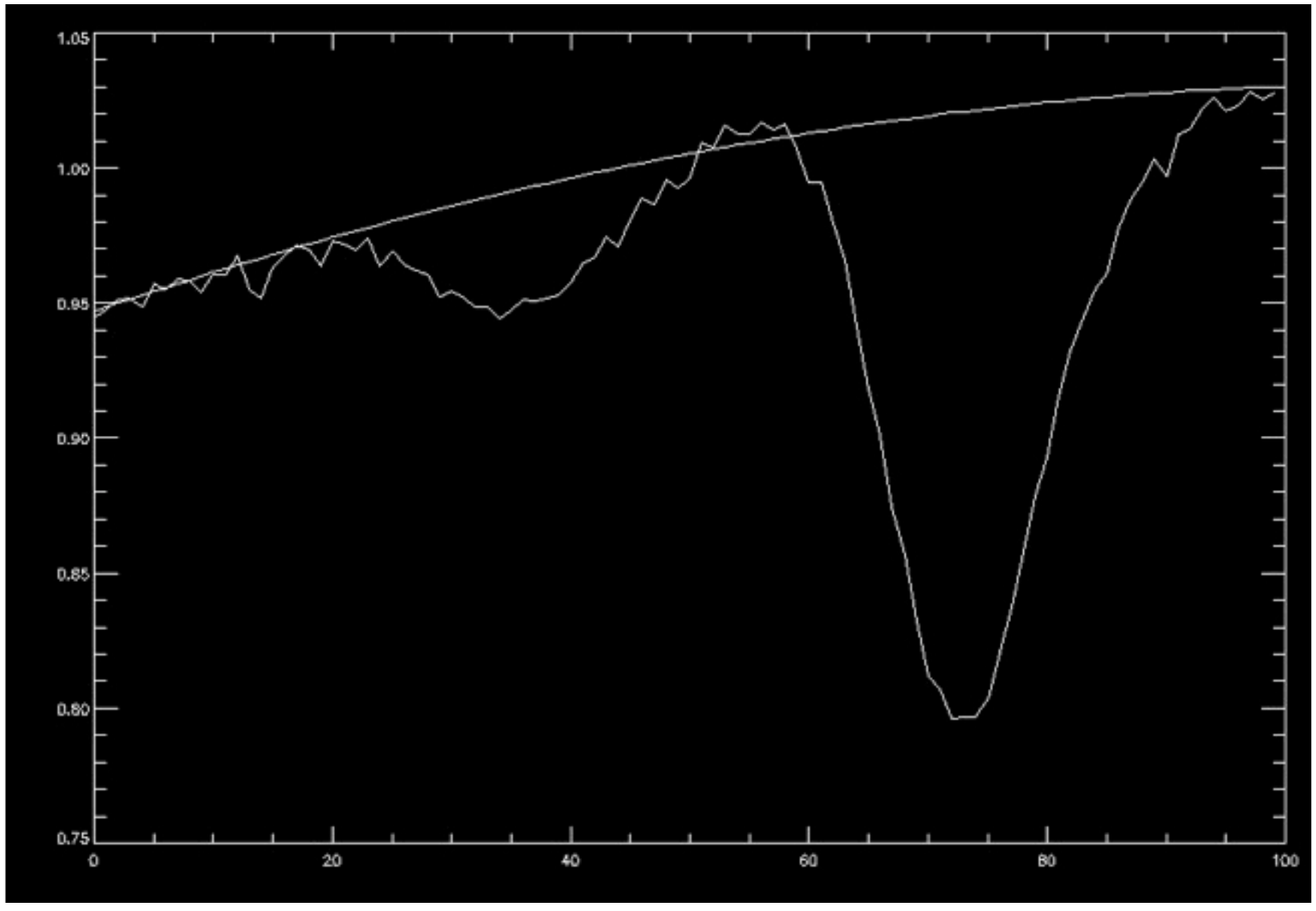
- Period 2005.07.06 08:17:16-08:52:36
- Pointing (-238”, 165”)
- theta 17.9° → I0=4.05E-5
- gamma -55.26°
- Number of slabs 1

HAZEL Fitting → Fail

- Because of the asymmetric profile of I
- Wrong unit in wavelength shift

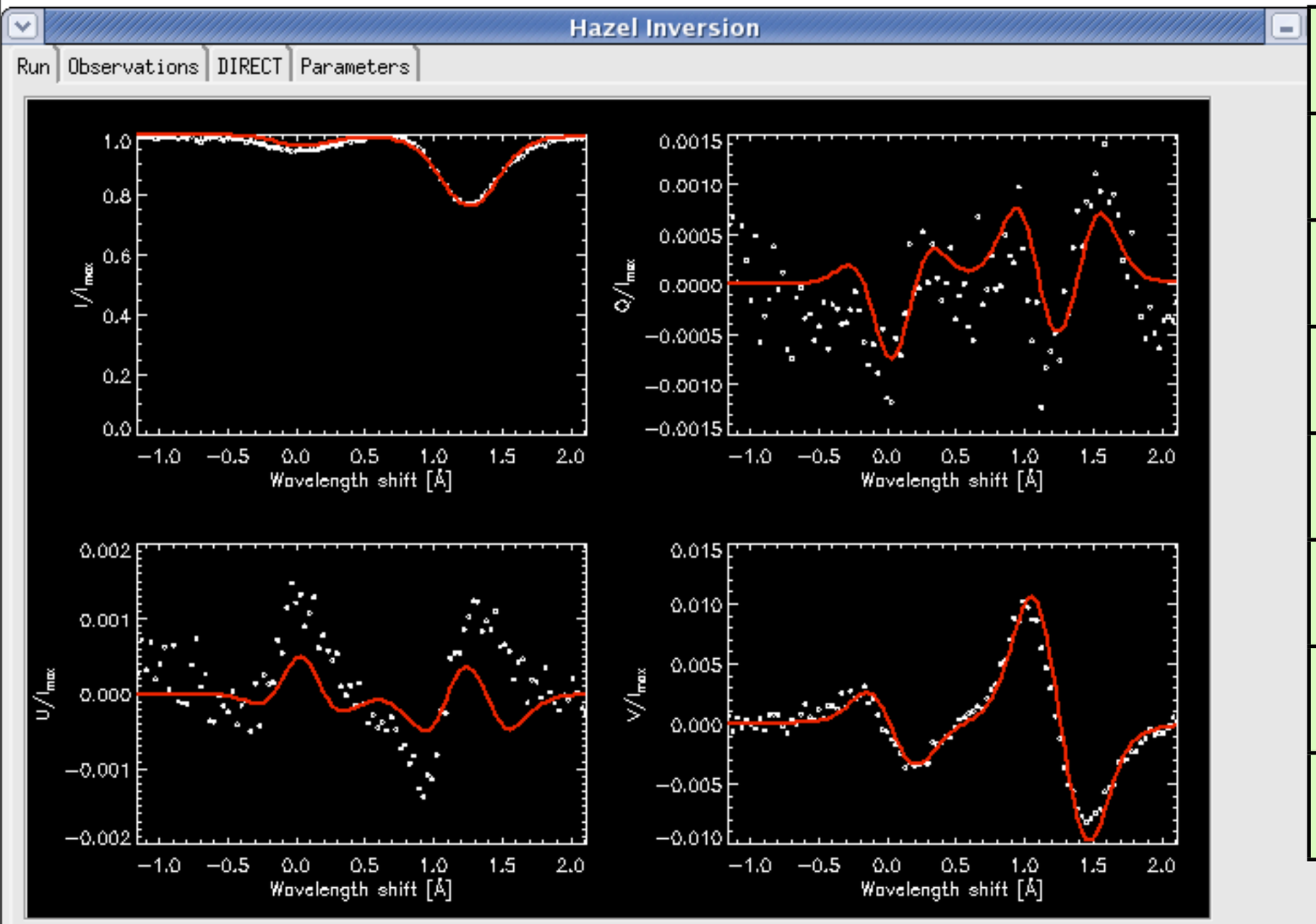


Calibration



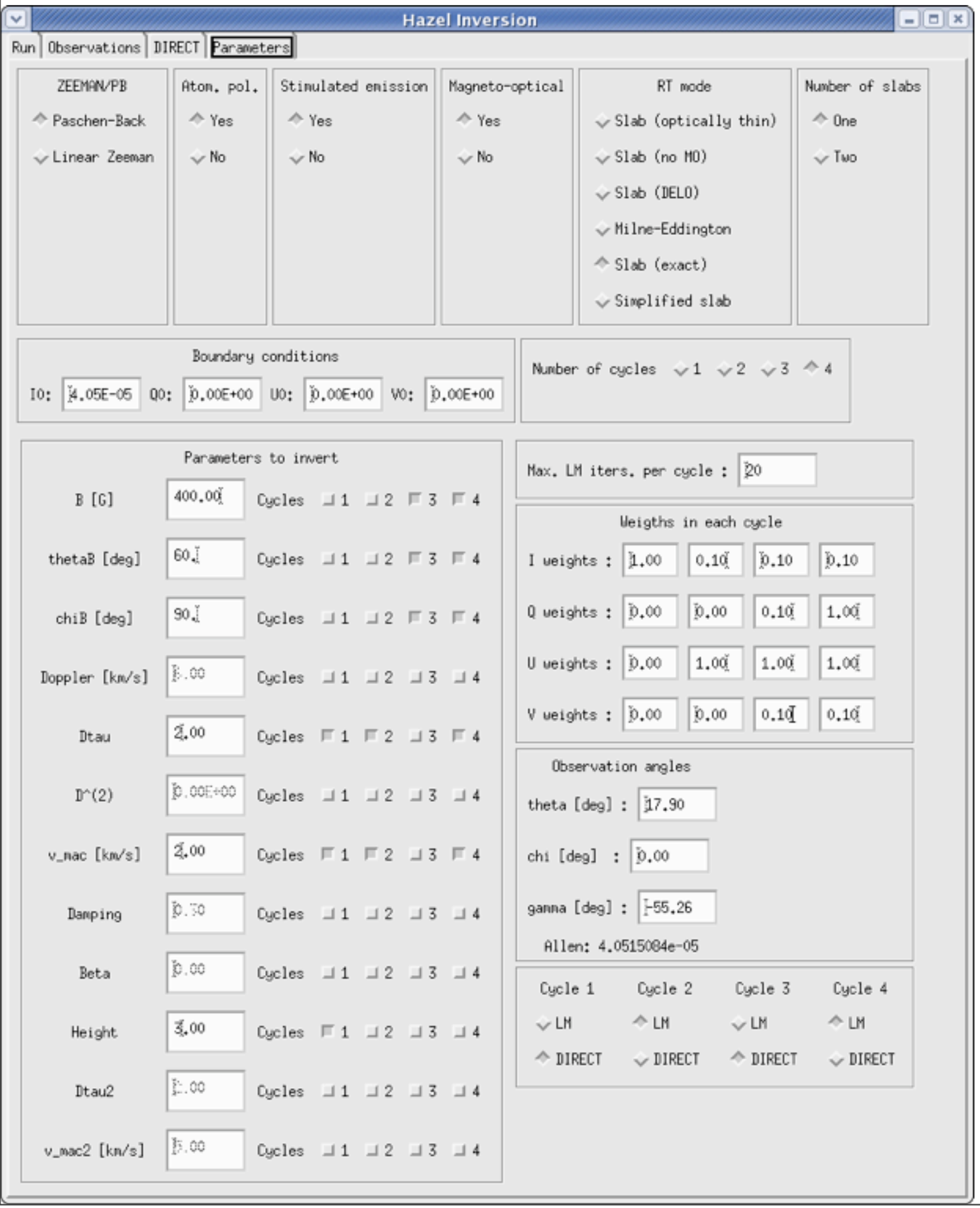
- Re-normalize the profiles (I,Q,U,V)

Fitting result



B	545.4
theta	59.9
chiB	98.4
v_th	6.0
tau	0.50
vmacro	1.26
a	0.30
h	2.99

- chi2 1.045946

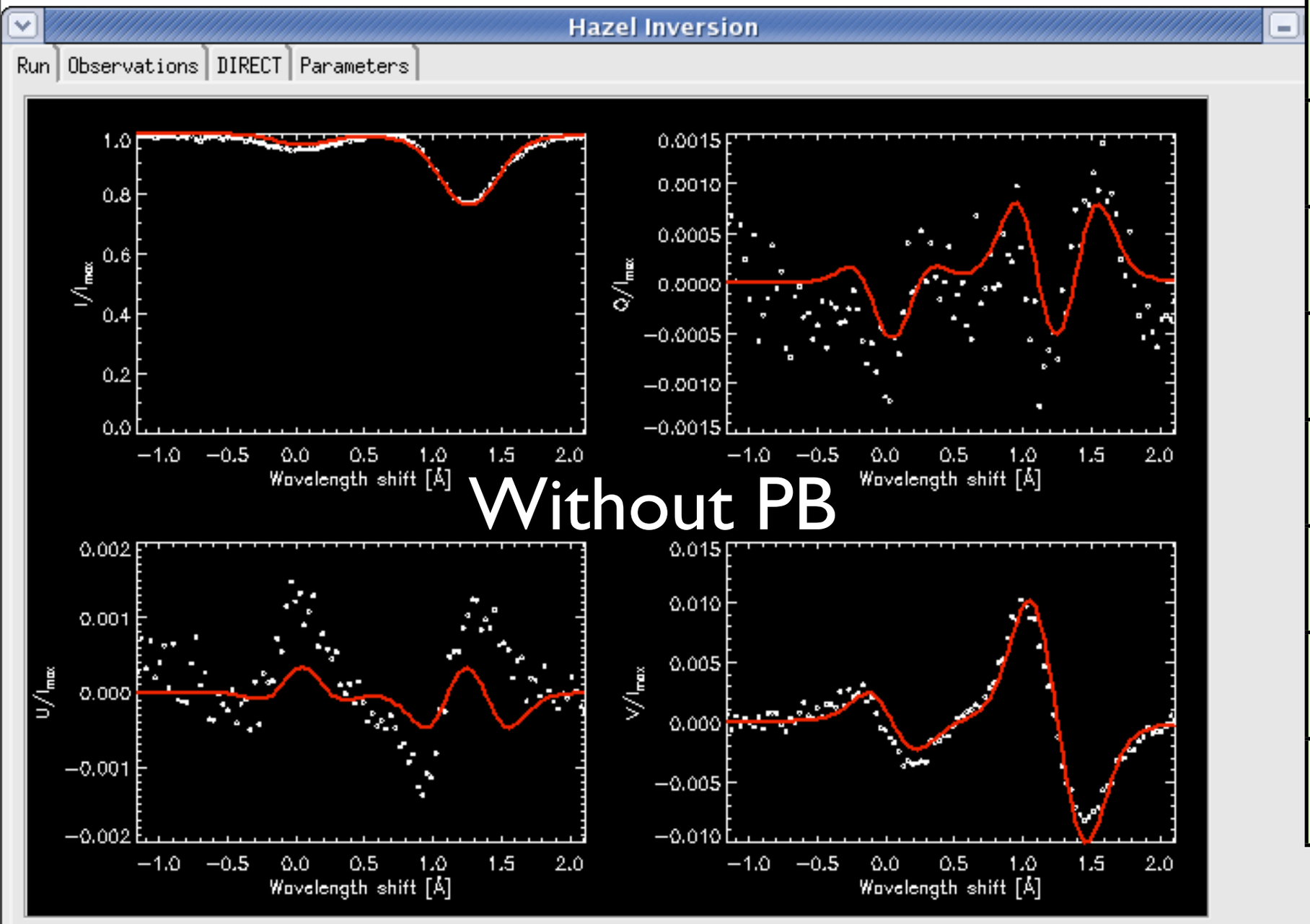


Idea for fitting

- Set higher weight for U
- Set smaller weight for V
- The sign of cos(thetaB) is determined by V

Extra

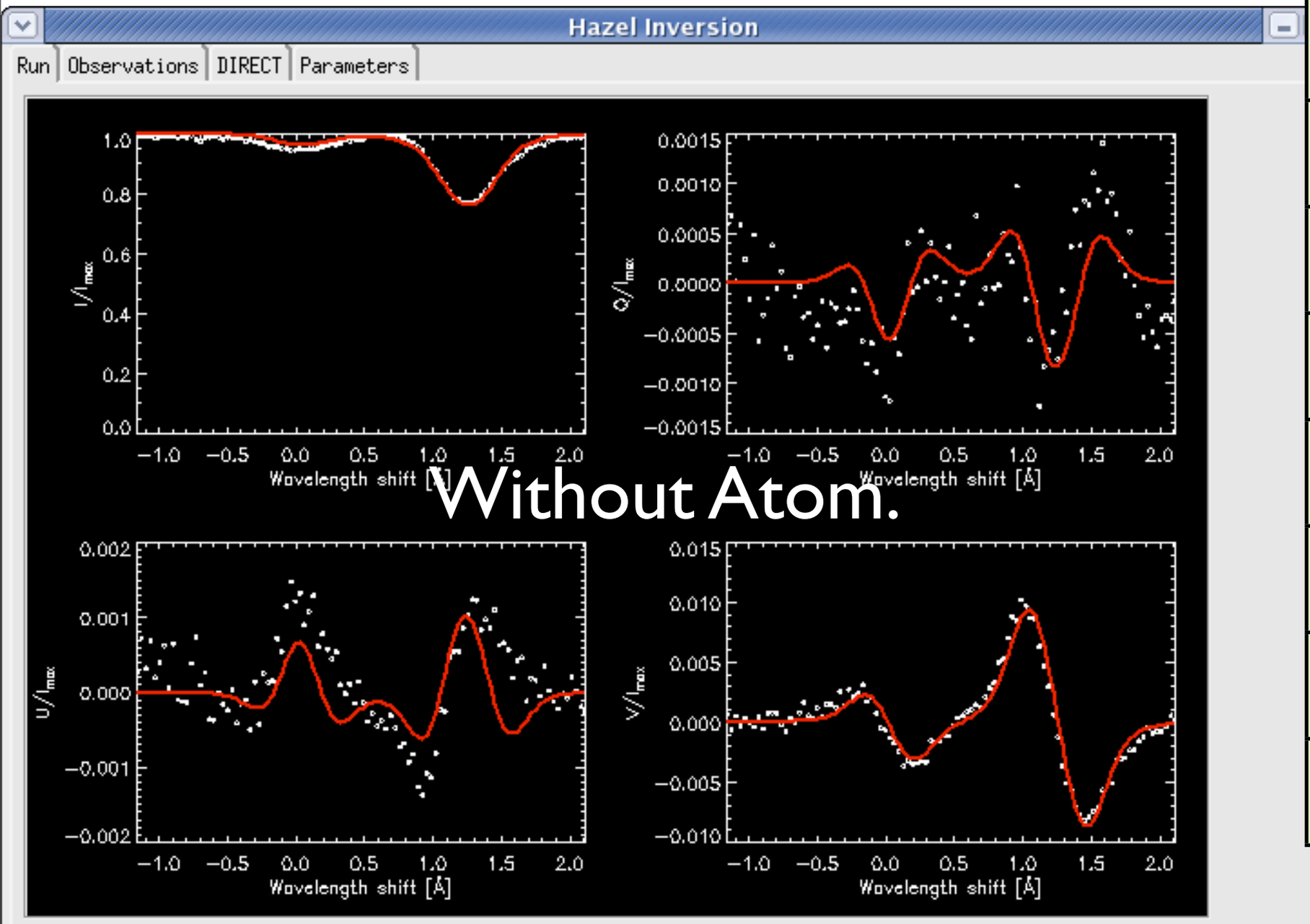
Without Paschen-Back effect



B	430.0 ↓
theta	60.17 ↓
chiB	100.16 ↑
v_th	6.0
tau	0.50
vmacro	1.27 ↑
a	0.30
h	3.09 ↑

- chi2 1.09236 ↑

Without Atomic Polarization



B	560.4 ↑
theta	65.9 ↑
chiB	92.2 ↓
v_th	6.0
tau	0.50
vmacro	1.15 ↓
a	0.30
h	2.99

- chi2 0.99046 ↓