sea muy fuerte e inclinado. Es posible que este este relacionado con los pixeles malos en la umbra de manchas que estan fuera del centro del disco. Arreglar la sintesis es muy facil, pero tambien tengo que cambiar las derivadas. En cuanto sepa como hacerlo te digo los cambios que hay que hacer vale ?

Estaria bien ver si, una vez que los cambios esten implementados, los pixeles malos en la umbra desaparecen. Podrias preparar una inversion de alguna mancha donde se vean esos pixeles ?

Nos dimos cuenta del problema en Berna la semana pasado, donde comparamos condigos de inversion entre Andres, Arturo, Bruce Lites, Andreas Lagg y yo. Todos los codigos daban el mismo resultado al comparar la sintesis, excepto VFISV. Las diferencias (para varias sintesis que hicimos) estaban en torno a 1E-3 (alrededor del nivel del ruido), asi que puede afectar un poco. Ya veremos.

JM

So, the imaginary part of the Voigt function has to be multiplied by 2, which affects the magneto-optical effects in strong field regions. The difference in the synthetic profiles is more or less at noise level (10^-3). It seems that the weighting scheme has to be changed in oder to accommodate the differences (but why, if they're so small?).

I'm running the code with different sets of weights in a 200x200 px area that includes a big sunspot and some quiet sun. I need to find a set of weights that works for both. Results are in /home/rce/work/hmi/for_keiji/data.

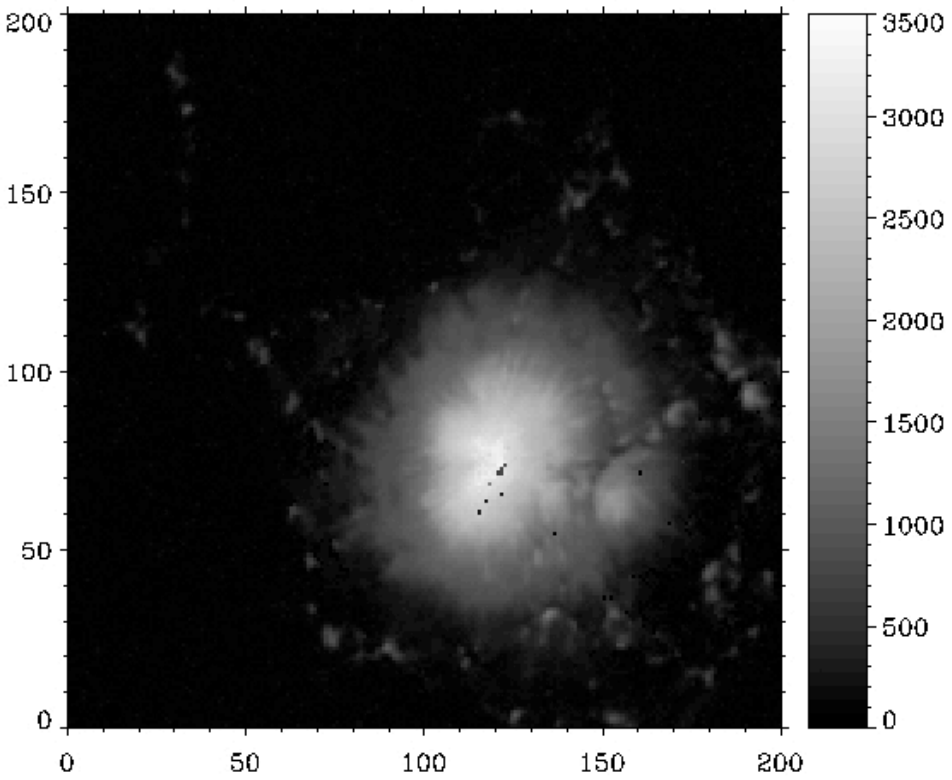
Feb 16, 2011

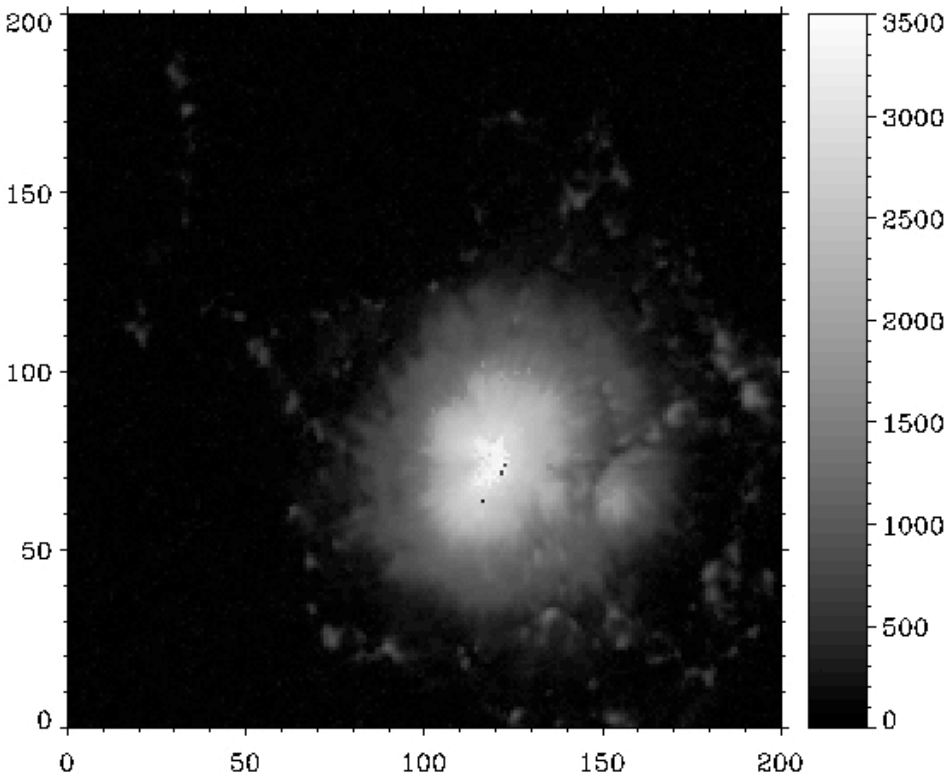
Found the problem!!! I'd copied Juanma's voigt.f but not voigt_taylor.f90, so there was an inconsistent factor of 2 in the routines.

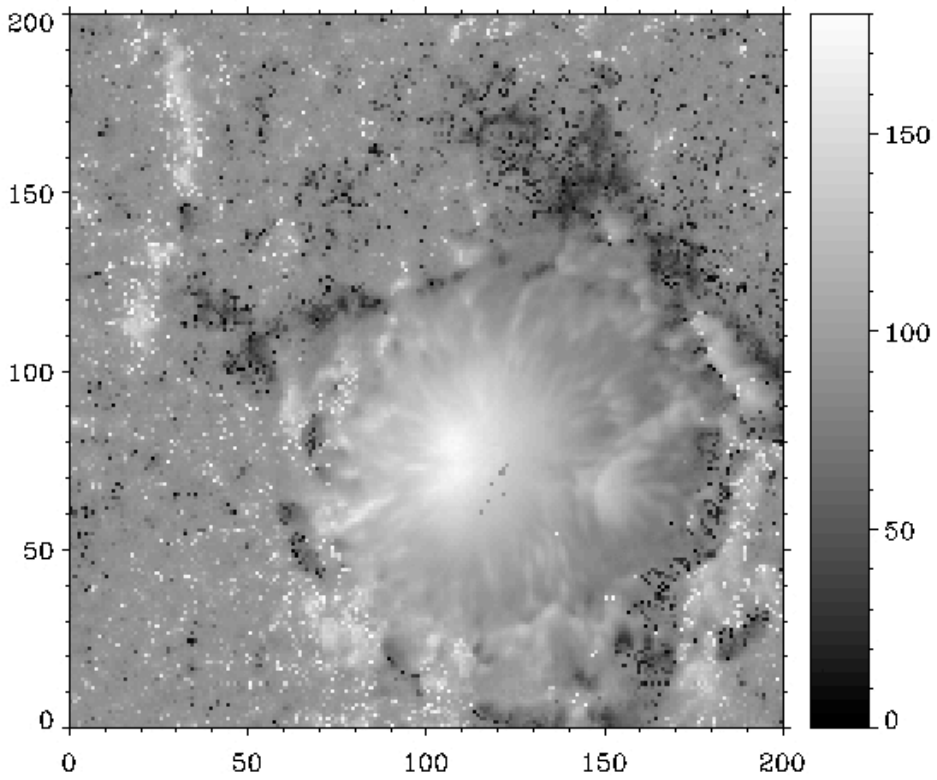
There are some differences with the previous inversion (before the changes in the Voigt functions). The magnetic field shows a more abrupt discontinuity in certain areas of strong fields, especially in the center-side of the sunspot. This doesn't disappear when tightening the requirement for the chi2-stop (the only effect that this has is that it reduces the number of spikes outside the sunspot).

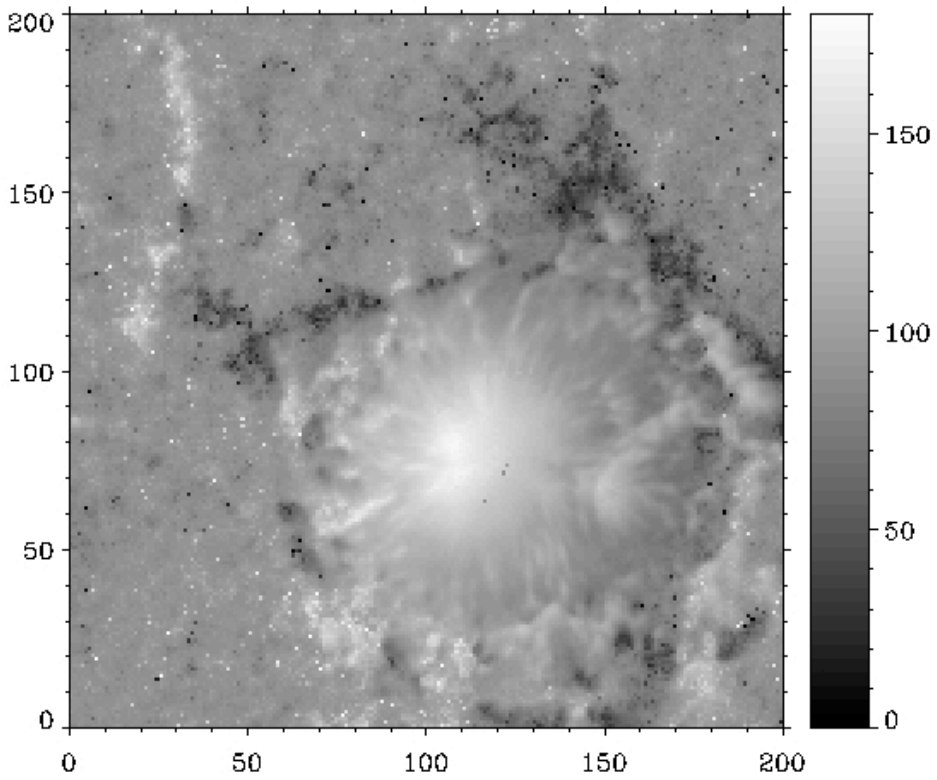
The next figure shows the magnetic field strength in the August 1 dataset. The top figure is the original inversion, the bottom one has the corrections in the Voigt functions. It's easy to see the more pronounced discontinuity in the umbra-penumbra boundary, and also inside the umbra in the strong field area.
The second page shows the inclination angle of the magnetic field for the original (top) and the corrected Voigt function (bottom) cases. The number of spikes is reduced because in the second case we put a stricter chi2-stop value.

The weighting scheme is the same in both cases (1-7-7-3).

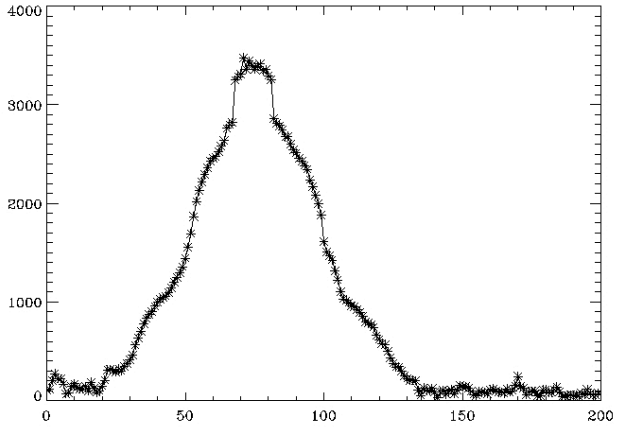

200
150
100
50
0
0
50
100
150
200
3500
3000
2500
2000
1500
1000
500
0


200
150
100
50
0
0
50
100
150
200
3500
3000
2500
2000
1500
1000
500
0


200
150
100
50
0
0
50
100
150
200
150
100
50
0

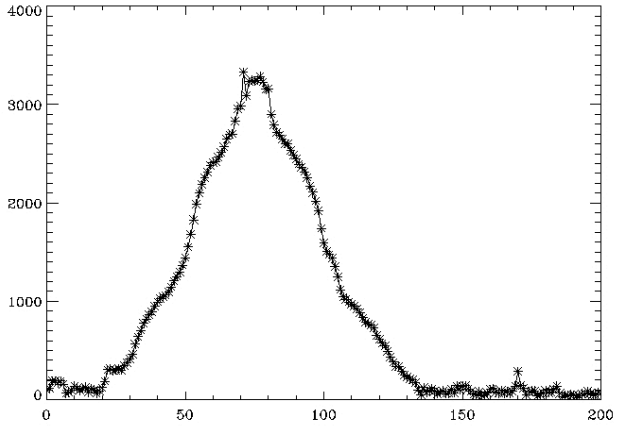

200
150
100
50
0
0
50
100
150
200
150
100
50
0

The discontinuity in the magnetic field at x=120 looks like this:



We can see the discontinuity in the center of the umbra where the fields reach values as large as 3400 G (300-400 G above the surroundings), and also in the inner penumbra at the center-side of the sunspot (there's a 200G gap in field strength).
Going to stricter chi2-stop values doesn't prevent this.

I'm changing the weights slightly to see if it disappears:
1-6.5-3.5 -- maybe better
1-6.5-2 -- definitely worse
1-6-3 -- better on the limb-side for the center of the umbra
1-5-3 -- slightly better
1-4-3 -- similar to former one
1-3-2 -- makes the discontinuities almost disappear
1-2-2 -- same as before.

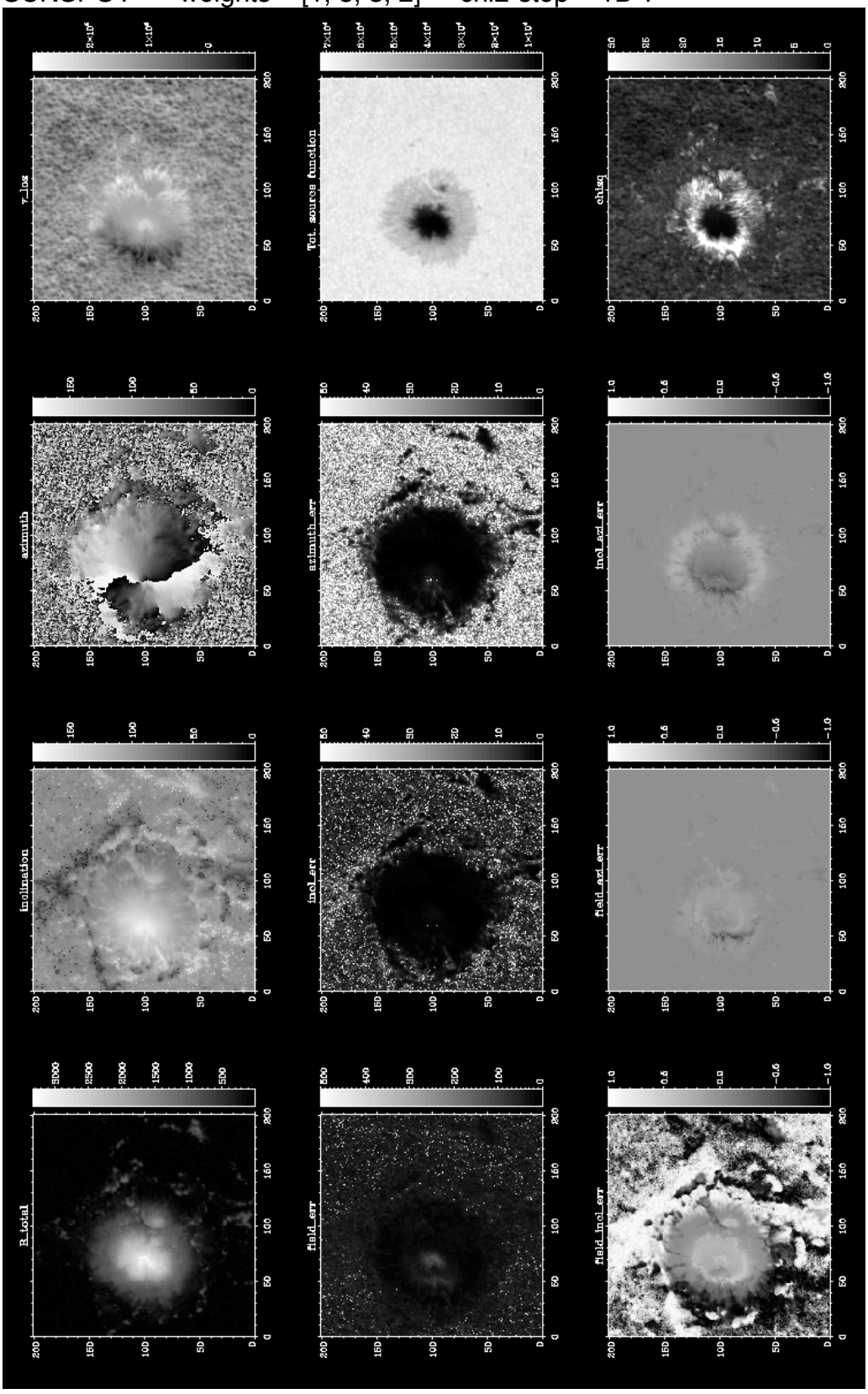


This is a cut through the middle of the umbra (x=120) in the magnetic field strength. The discontinuities almost disappear with the weighting scheme 1-3-3-2.

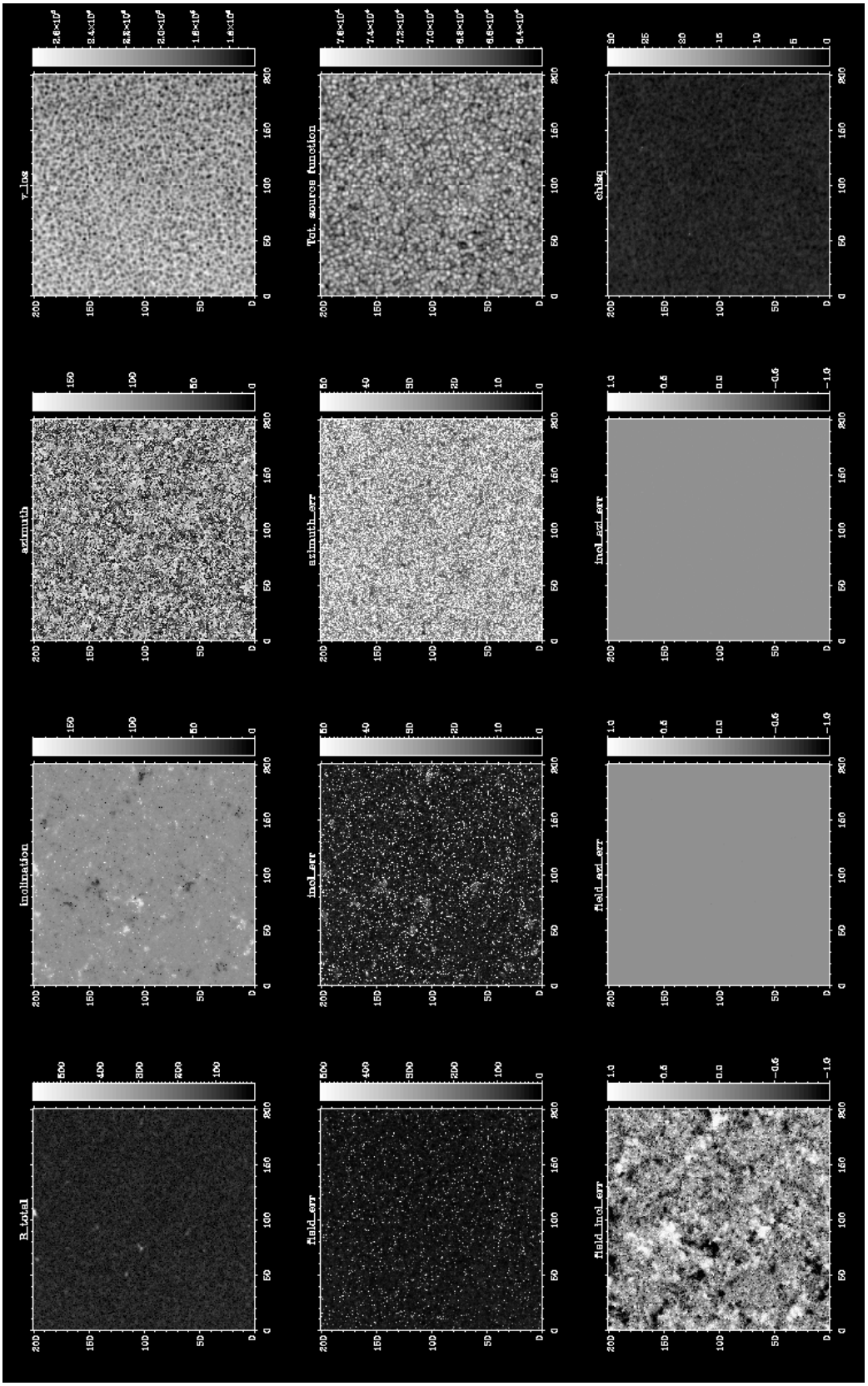
As we reduce the Q,U,V relative weights to I, we get more spikes in the inclination of the QS and plage areas. Also, it seems that the noise in the magnetic field is larger (? check this!)

Feb 17, 2011

SUNSPOT -- weights = [1, 3, 3, 2] - chi2-stop = 1D-7



QUIET SUN DISK CENTER -- weights = [1, 3, 3, 2] - chi2-stop = 1D-7



QUIET SUN LIMB -- weights = [1, 3, 3, 2] - chi2-stop = 1D-7