Jan 24, 2011

Summary of Montecarlo simulation

I run VFISV over a 100x100 pixel patch of Quiet Sun at disk center on dataset 2010.11.01_00:00:00. Then, I set up the code to add random noise to the Stokes profiles, using a normal distribution with sigma = 49 for Q, U and V, and sigma = 28 for Stokes I.
96 different realizations with simulated photon noise were run, yielding 96 different results for the magnetic field strength, inclination, azimuth... for each of the 10^4 pixels.

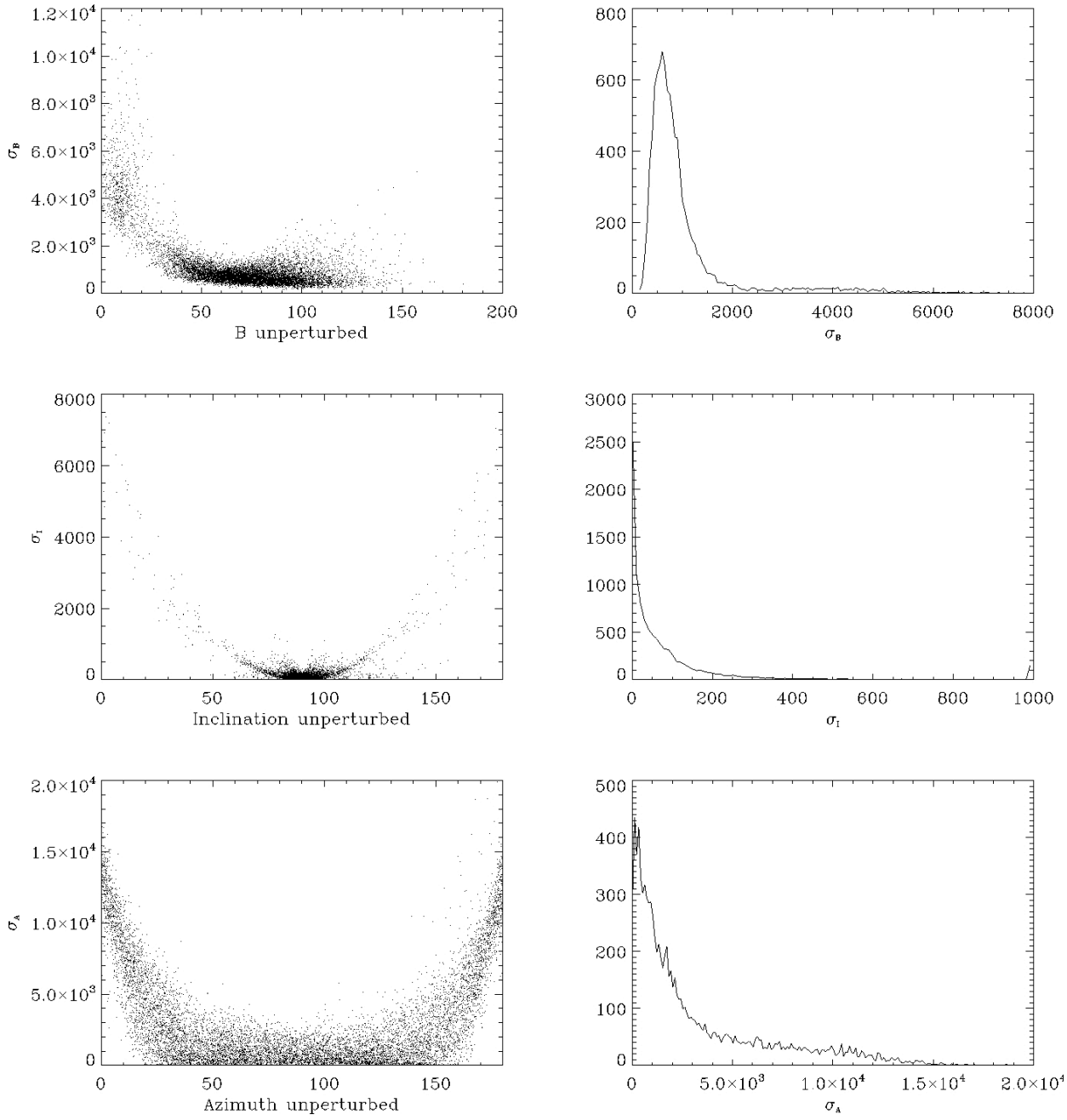
The variances and covariances are defined (for each pixel in the patch) as follows:

$\sigma_B = 1/N \ \sum_j (B_j - B_0)^2$
$\sigma_{BA} = 1/N \ \sum_j (B_j - B_0)(A_j - A_0)$

Where the index 'j' runs over the N realizations (96 in our case) and the subindex '0' refers to the unperturbed case (the run without the extra noise).
We have 10000 estimations for these variances and covariances, one for each pixel in the patch.

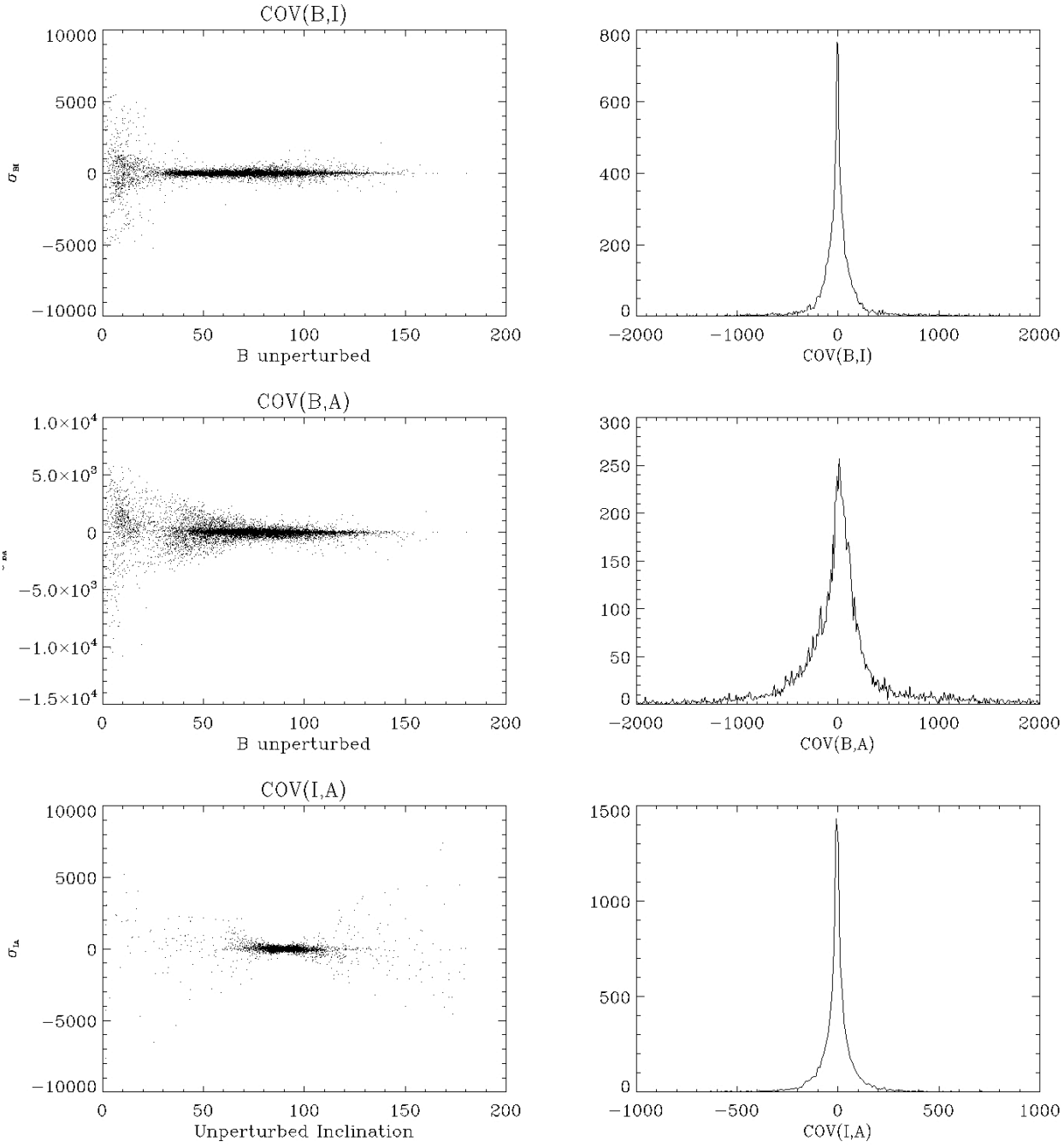
Plots on next two pages..

Variances:



The left column of the figure shows the scatter-plots of the variances of field strength, inclination and azimuth as a function of their respective unperturbed value. In each panel, there is one dot per pixel of the inverted submap (i.e. 10^4 dots). The right column shows the histograms for the variances of each quantity.

Covariances:



The figures show the covariances between the different magnetic quantities.
Left column, from top to bottom: Co-variance of field strength and inclination plotted against the ‘unperturbed’ field strength; covariance of field strength and azimuth plotted against field strength; and covariance of the inclination and azimuth plotted against inclination. Right column: histograms of the corresponding quantities.