M82 Data Analysis

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ABSTRACT

Here is a summary on the 350um M82 data analysis.

1. Data

Data files were divided into 3 groups, base on the observation time.

2007-02 (31 files):

36239, 36240, 36241, 36242, 36243, 36244, 36245, 36246, 36247, 36248, 36249, 36250, 36251, 36252, 36253, 36254, 36255, 36256, 36257, 36258, 36259, 36260, 36261, 36262, 36263, 36264, 36265, 36266, 36267, 36268, 36269.

2007-04a (28 files):

36764, 36765, 36766, 36767, 36769, 36770, 36771, 36772, 36774, 36775, 36782, 36783, 36784, 36785, 36991, 36992, 36993, 36994, 36995, 36996, 36997, 36998, 36999, 37000, 37003, 37004, 37005, 37006.

2007-04b (15 files):

38233, 38234, 38236, 38237, 38238, 38239, 38240, 38241, 38242, 38243, 38244, 38245, 38246, 38247, 38248.

Here are the file lists: (Table 1), (Table 2) and (Table 3).

2. Software Parameters:

Tau, and pointing are from Zamin:

~sharp/Runs/giles-m82/all-three/

Did linear interpolation if needed.

./sharpinteg_2 sharc2-036239.fits -r rgm.dat -f 1 -w -sil -em

File	Tau	FAZO	FZAO
36252_int.fits	0.0539	-121.8028	92.1155
36253_int.fits	0.0535	-122.47736	91.269522
36254_int.fits	0.0529	-120.78327	90.572436
36255_int.fits	0.0522	-124.31532	89.720657
36256_int.fits	0.0515	-123.0027	91.028766
36257_int.fits	0.0507	-122.16037	91.333686
36258_int.fits	0.0499	-119.80564	91.981918
36259_int.fits	0.0490	-122.92648	90.622172
36260_int.fits	0.0484	-119.78885	89.879235
36261_int.fits	0.0480	-124.44584	89.711371
36262_int.fits	0.0479	-122.75275	91.761071
36263_int.fits	0.0480	-122.20468	90.593621
36264_int.fits	0.0484	-122.15765	91.217828
36265_int.fits	0.0489	-121.98316	91.772083
36266_int.fits	0.0496	-122.31779	94.721857
36267_int.fits	0.0506	-120.6504	93.266247
36268_int.fits	0.0513	-123.85694	96.003128
36269_int.fits	0.0519	-120.73067	96.949666

Table 1: Data 1

File	Tau	FAZO	FZAO
36764_int.fits	0.0286	-118.1016	102.49946
36765_int.fits	0.0279	-120.0243	104.10441
36766_int.fits	0.0275	-120.8760	105.00008
36767_int.fits	0.0271	-121.7276	105.90015
36769_int.fits	0.0263	-123.43096	107.70470
36770_int.fits	0.0266	-120.92377	108.49738
36771_int.fits	0.0269	-118.41657	109.29006
36772_int.fits	0.0274	-116.93893	106.93609
36774_int.fits	0.0284	-117.62417	108.89978
36775_int.fits	0.0289	-117.96679	109.88163
36782_int.fits	0.0331	-121.58365	109.78401
36783_int.fits	0.0328	-119.94666	110.05851
36784_int.fits	0.0325	-118.30967	110.33301
36785_int.fits	0.0322	-116.67268	110.60751
36991_int.fits	0.0423	-117.32238	103.11417
36992_int.fits	0.0421	-119.60868	106.03763
36993_int.fits	0.0419	-118.74033	105.91898
36994_int.fits	0.0417	-117.87200	105.80032
36995_int.fits	0.0415	-117.00365	105.68167
36996_int.fits	0.0414	-121.17055	108.17859
36997_int.fits	0.0413	-120.07040	107.24590
36998_int.fits	0.0413	-118.97025	106.31321
36999_int.fits	0.0412	-117.8701	105.38052
37000_int.fits	0.0412	-119.83403	108.41416
37003_int.fits	0.0416	-118.69727	107.18774
37004_int.fits	0.0418	-118.01179	110.93206
37005_int.fits	0.0420	-118.65345	110.44458
37006_int.fits	0.0421	-119.29511	109.9571

Table 2: Data 2

./sharp_combine M82list M82.fits -hwp 90 -l 51 51 -sm 2 -ma 5 -ps 9.5 -pm 12.0 -bg 10 0 -ip 0.0034 0.00017 0.0036 0.0

polsharp5, '1.fits', /vec, maxsig=3.0, sig2=2.0, onep=1, color=2, xvoffset=1, yvoffset=1, scale=1.0, skipv=4

3. Result:

Here are the fits files:

http://www.pha.jhu.edu/~lingzz/SHARP/M81

The first result is in Figure 1. Three groups show very different results. I used different "-m" values, trying to filter out those noisy vectors. But this method seems not working well.

I found that there was some field effect on Q and U error maps of most(90%+) sharpinteg_2 files. Figure 2 show this effect. This effect can be part of the reason why there are some many noise vectors in the sharp_combine map.

There is the new result of M82 analysis Figure 3. In our previous results, we have large vectors from the low-emission areas. Now, but setting a value for "minf" in sharp_plot5.pro, we can do the polarization vectors cut-off based on the flux relative to the peak value. Only the vectors where the flux is greater than "minf" of the peak value are plotted. I found that "minf=0.15" was a reasonable cut-off.

Figure 4 shows the result from the area with at least 20% peak intensity.

We can see that the magnetic field is roughly along the galaxy plane base on our new result. This result is quite different from this paper:

http://www.nature.com/nature/journal/v404/n6779/fig_tab/404732a0_F1.html

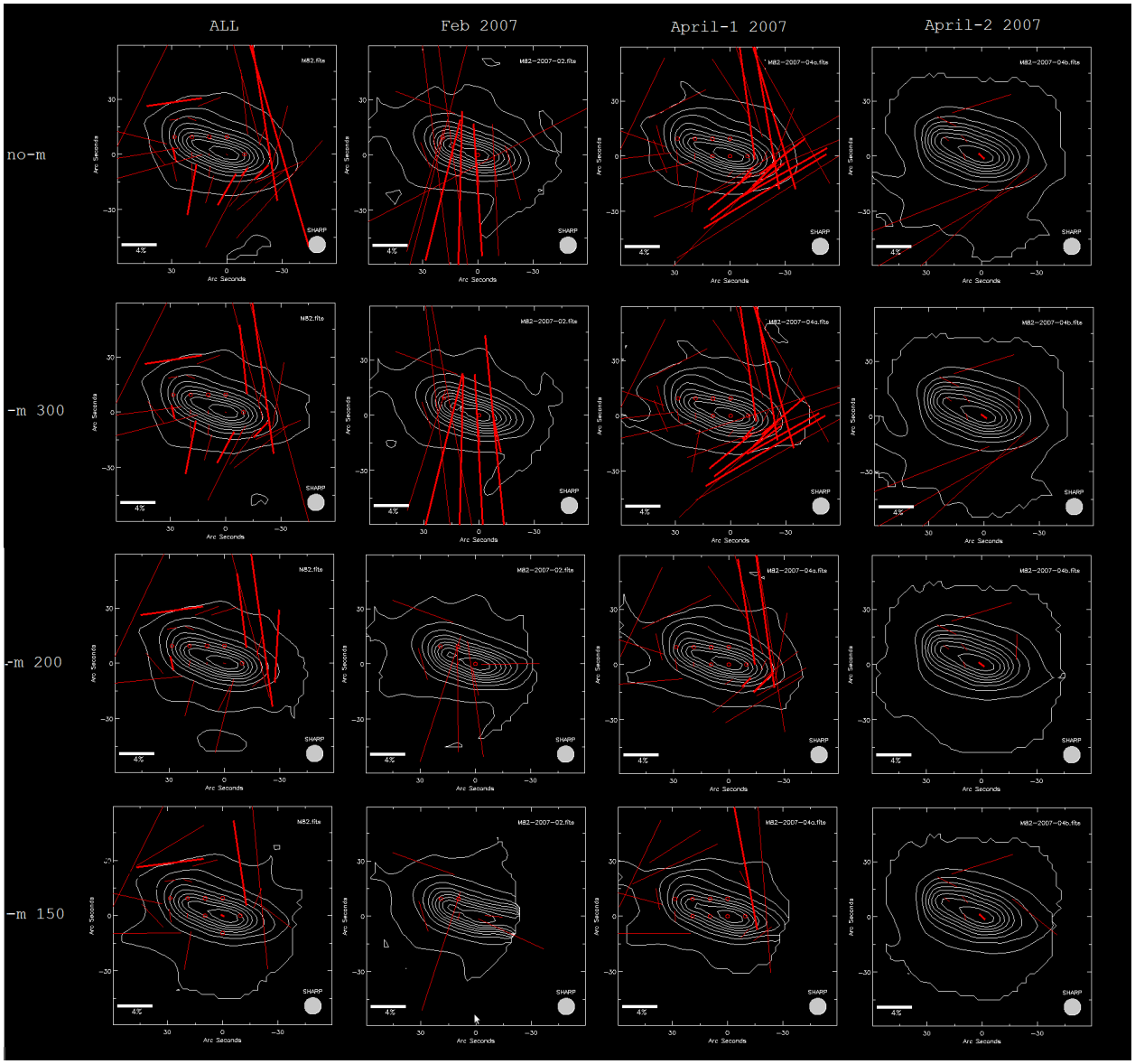

Fig. 1.— First step result

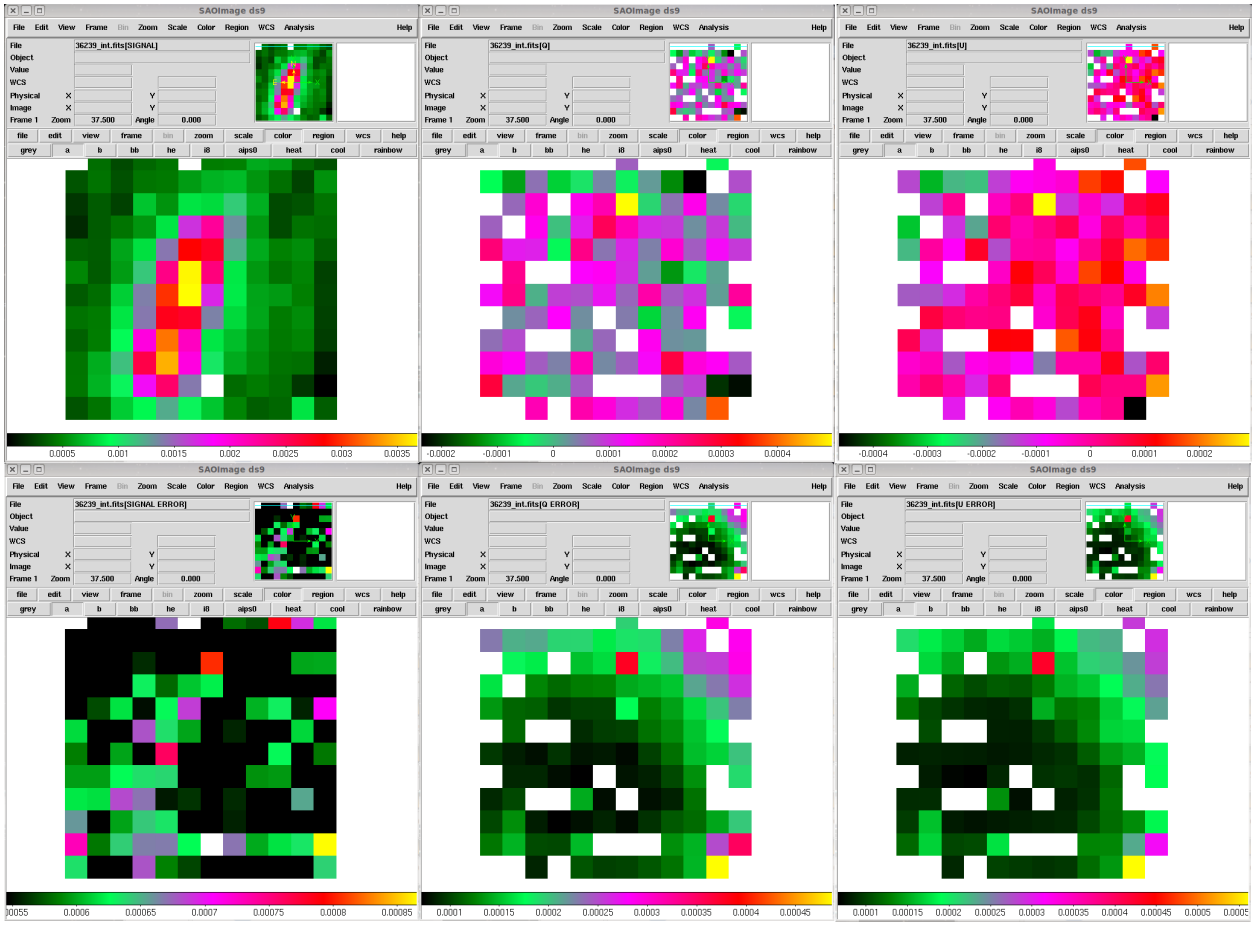

Fig. 2.— noise in raw file

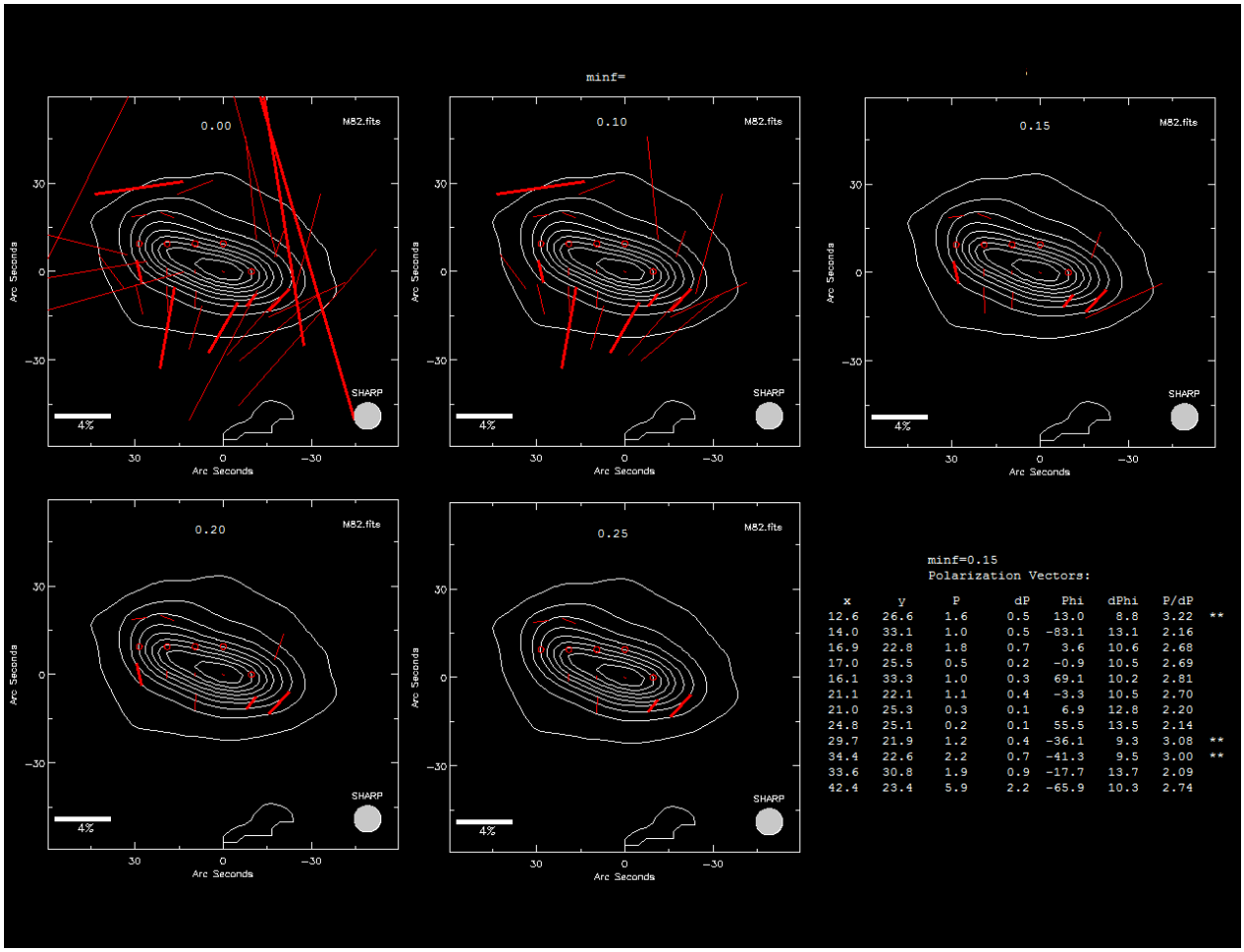

Fig. 3.— minf optimization

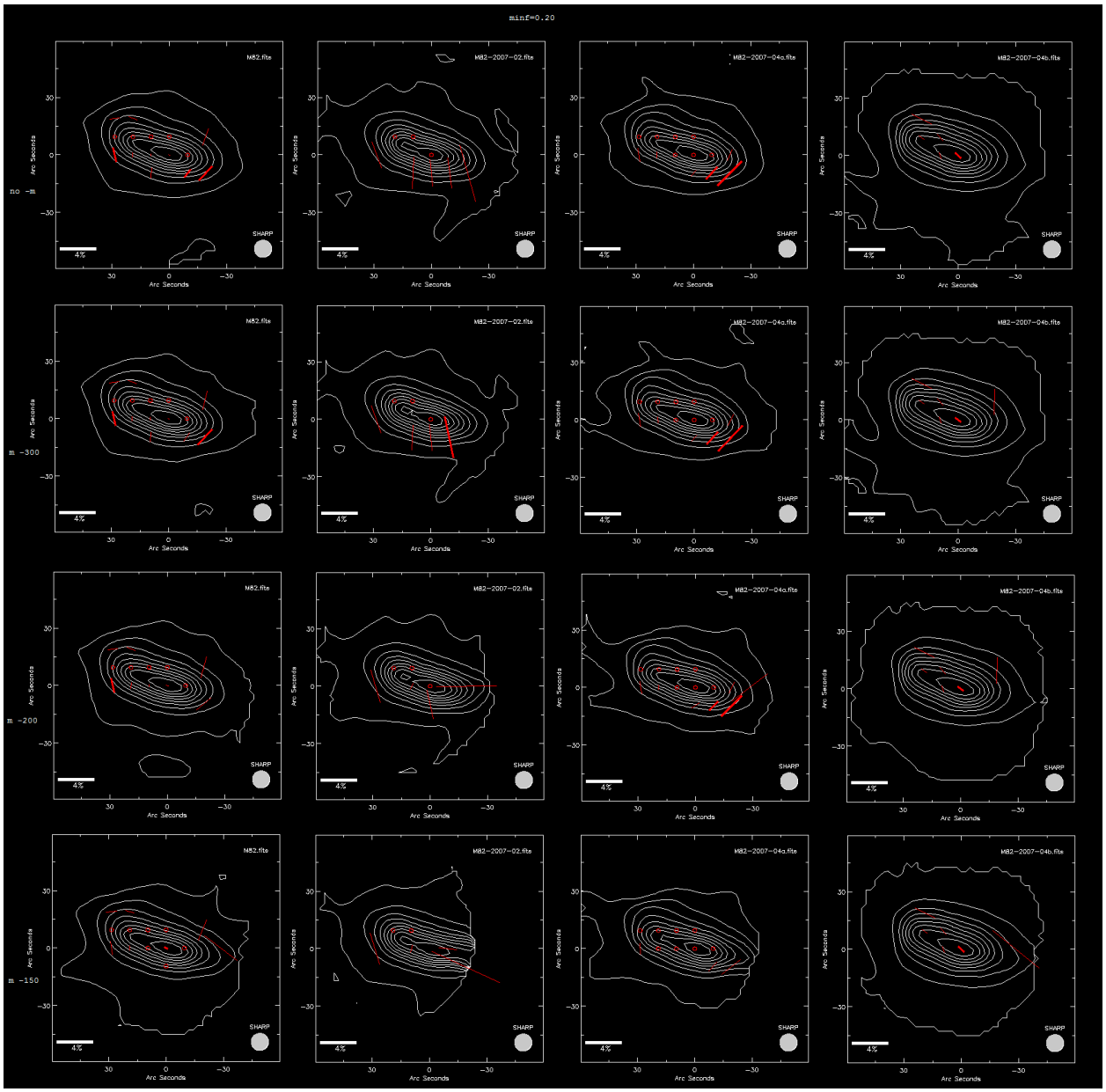

Fig. 4.— minf20, 20% cut off

File	Tau	FAZO	FZAO
38233_int.fits	0.0400	-128.19156	86.031157
38234_int.fits	0.0399	-129.2288	86.227971
38236_int.fits	0.0395	-126.91756	87.602962
38237_int.fits	0.0394	-128.00476	88.425880
38238_int.fits	0.0392	-129.09195	89.2488
38239_int.fits	0.0392	-128.45917	89.473053
38240_int.fits	0.0393	-127.8264	89.697306
38242_int.fits	0.0399	-128.83481	90.570485
38243_int.fits	0.0406	-128.48547	91.934708
38244_int.fits	0.0414	-128.13615	93.298935
38245_int.fits	0.0421	-127.78683	94.663162
38246_int.fits	0.0428	-127.4375	96.027383
38247_int.fits	0.0432	-126.17664	96.173996
38248_int.fits	0.0435	-124.91579	96.320603

Table 3: Data 3