Second chi2 analysis for B335 data from 2007

Dec. 9, 2009

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Review:

Approximately 85 files were collected during three nights in April 2007. Only 77 files were analyzed. The chopper throw was two arcminutes. The *tau* ranged from 0.04 to 0.075. More details are given in the memo I posted on November 27, 2009 describing my first chi2 analysis for B335.

Analysis steps:

The analysis steps were exactly the same as for my first B335 analysis (see above-mentioned November memo) except that I made a cut on the sharpinteg Q and U errors, just as I did for the L1527 data collected in September 2008 (see my May 14 2009 memo on L1527 for details). The reason that I carried out this second analysis was mainly in an effort to get a lower reduced chi squared. First I tried a cut at a noise level of 150, as per the May 14 2009 memo. This did not help as much as I'd hoped, so I did a second cut at a noise level of 125. The results of this second cut are reported here. The bins used were the same as were used for the initial posted analysis of B335 (see November 2009 memo).

In this memo, just as all my memos from this year, when I report χ_r^2 results these are the result of averaging map-wide results for Q and U.

Dependence of reduced chi-squared on time scale:

Recall that the 77 files are divided into six bins of 7-25 files each. Using the *chi2* program, the results for the map-wide Q-U average χ_r^2 are:

Bins 1, 2, and 3: Stokes $\chi_r^2 = 2.08$

Bins 4, 5, and 6: Stokes $\chi_r^2 = 1.79$

The level of systematic error on three-bin time scales can be estimated as Stokes χ_r^2 = 1.93, which is the average of the above two values.

Bins 1, 2, 3, 4, 5, and 6: Stokes χ_r^2 = 2.14

Since the Stokes χ_r^2 does not go up too much (~1.9 to ~2.1) as we lengthen the time-scale sampled, its probably reasonable to treat our extra errors as random errors occurring on the time scales that characterize the three-bin groupings. Accordingly I simply inflate the nominal errors by the square root of the Stokes χ_r^2 .

<u>Methods for error-inflation and results:</u>

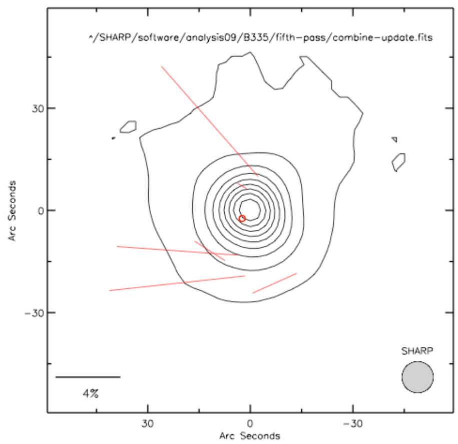
As in my previous work (e.g., see May 14th 2009 memo), I use two different methods for inflating the nominal errors: the *update* method and the *map-wide inflation factor* method.

Maps are shown on the next page. On the left I show maps made using the *update* method and on the right I show the results of the *map-wide inflation* method. For all maps, thick bars are 3-sigma, thin bars are 2-sigma. The top row is the six-bin case, the next row is the first group of three bins, and the bottom row is the last group of three bins. The circles indicate points with 2-sigma upper limits on P less then 1%.

Contours are 90%, 80%, 70%, … 10% of peak flux. Note that the use of the *update* method is quite inaccurate when there are only 3 bins (as is the case for bottom two rows).

If we follow the procedure used for the IC348 and L1527 maps shown in our Spring 2009 CSO proposals, then we would degrade each vector's significance to the lesser of that given by each of the two inflation methods. This would give us three vectors for this source, and they would all be two-sigma vectors.

The results and analysis shown here are still somewhat less satisfying than what I found for L1527 and IC384 this past spring, because the χ_r^2 is higher (2.14 vs. 1.73 and 1.72) and because the agreement between the first three bins and the second three bins seems worse. Note also that if we assume that the number of independent points in the map is of order (10 arcsec)^2/(60 arcsec)^2, then we expect 1.8 fake 2-sigma vectors just from statistics alone.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SHARP
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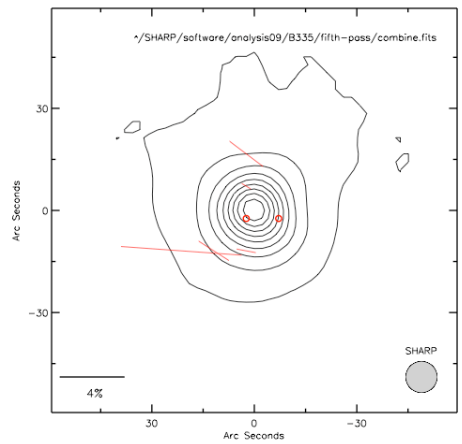
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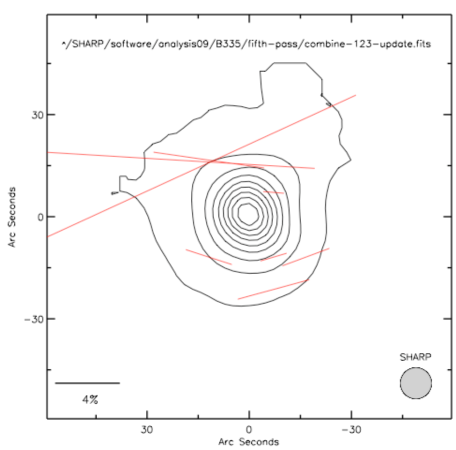
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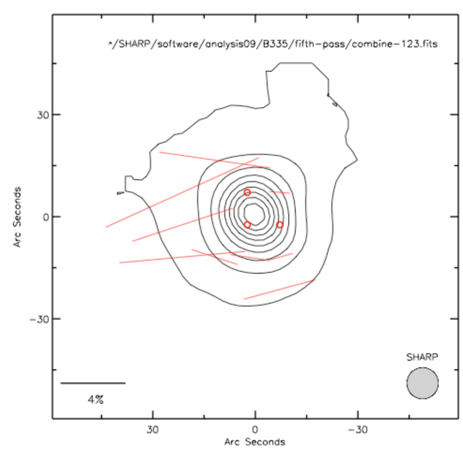
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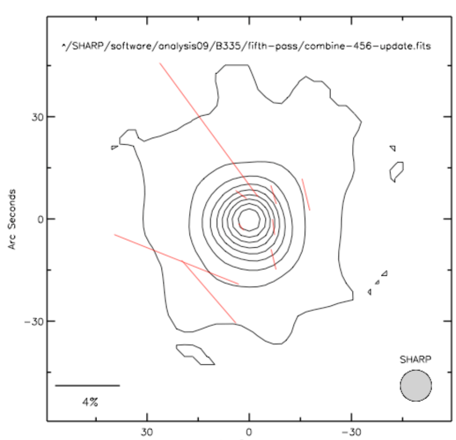
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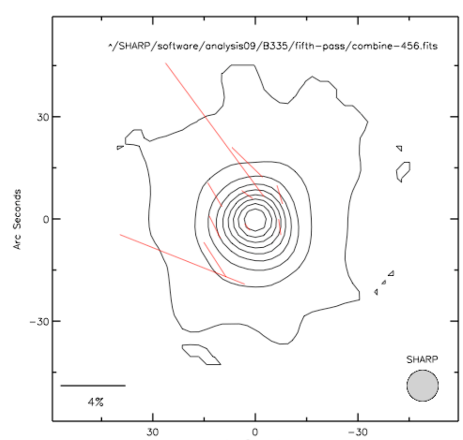
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