**<u>Second chi2 analysis for IC348 data from 2007</u>**

March 8, 2010

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*<u>Review:</u>*

The first chi squared analysis on the Fall 2007 IC 348 data was posted on the analysis logbook on May 22, 2009. This data set consisted of 20 good files collected during excellent weather. This initial first chi-squared analysis gave reasonable results (see that earlier memo for reference).

*<u>Analysis steps:</u>*

This memo reports on an analysis that is identical to what was reported in the first memo except for one difference: The "-m" flag is used to get rid of *sharpinteg* output data points having elevated *sharpinteg* Q- or U-errors. During work on the L1527 2008 data, it was found that this flag was very helpful for getting rid of data affected by high "correlated noise" (see my May 14 2009 memo for details). Even though the correlated noise was not especially high for the Fall 2007 IC348 data, it was nevertheless present (e.g., the reduced chi squared was of order 1.7), so it seemed prudent to make sure that the vectors we have been deriving for IC348 would not disappear after application of the "-m" cut.

The "-m" cut was done at a noise level of 20. Note that the observers had set the gain to "low" (by accident) so the noise floor is near 15 rather than the usual 100. The cut level of 20 was determined as follows: A file that was identified as having a "corner shadow" at the 2-sigma level during initial inspection of Q and U maps was found to have Q/U *errors* barely above 20 over most of the affected corner, so the level was set to 20 to get rid of this corner shadow in this file, and thus presumably also in other similarly affected files.

In this memo, just as all my memos from 2009, when I report $\chi_r^2$ results these are the result of averaging map-wide results for Q and U.

*<u>Dependence of reduced chi-squared on time scale:</u>*

The results for the map-wide Q-U average $\chi_r^2$ are:

*Bins 1, 2, and 3: Stokes* $\chi_r^2 = 1.27$

*Bins 4, 5, and 6: Stokes* $\chi_r^2 = 1.52$

The level of systematic error on three-bin time scales can therefore be estimated as Stokes $\chi_r^2$ = 1.40, which is the average of the above two values.

*Bins 1, 2, 3, 4, 5, and 6: Stokes $\chi_r^2$ = 1.50*

Since the Stokes $\chi_r^2$ does not go up too much (1.4 to 1.5) 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 $\chi_r^2$ .

*Methods for error-inflation and results:*

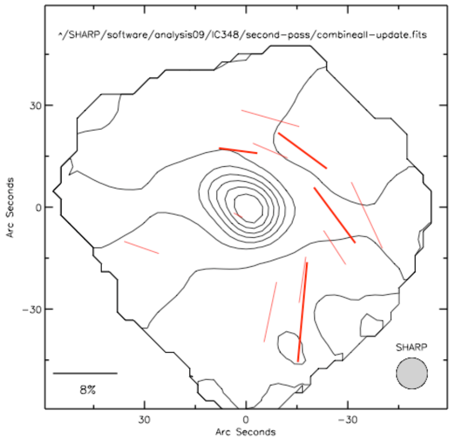
As in my previous work (e.g., see May 14th 2009 memo), I use two different methods for inflating the nominal errors: the *update* method and the *map-wide inflation factor* method.

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. Circles were used to indicate points with 2-sigma upper limits on P less then 1%, but there were no such points.

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 ten vectors, and only one would be a three-sigma vector.

To summarize the results of this memo, we get ten vectors rather than the ~25 that we got with the previous analysis, but the overall picture is similar. Since we are throwing out lots of data (approximately 15% of the data is a rough guess for the fraction discarded), it is perhaps not too surprising that we lost just over half of our 2-sigma vectors. The agreement between the two "superbins" ( *1+2+3* vs. *4+5+6* ) is not bad, but there is limited overlap (points where the detections are obtained in both superbins).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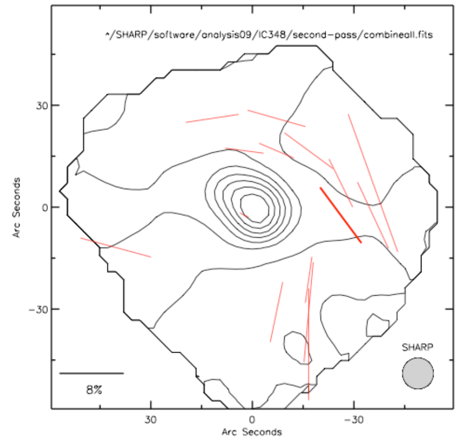
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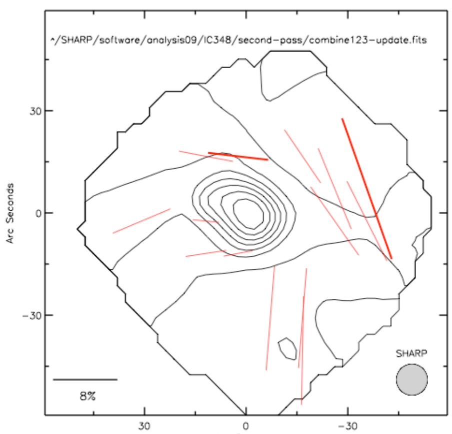
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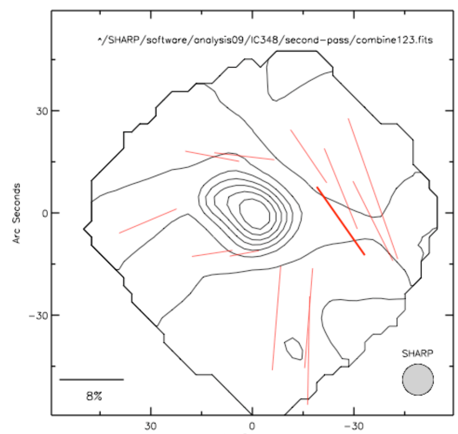
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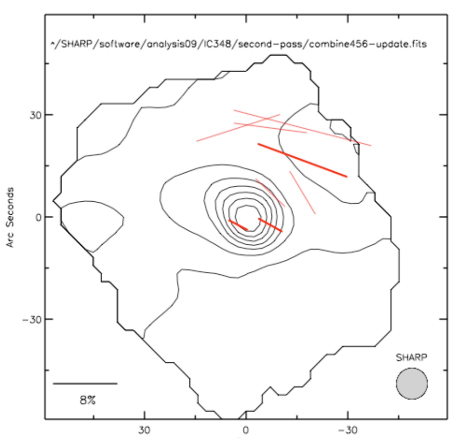
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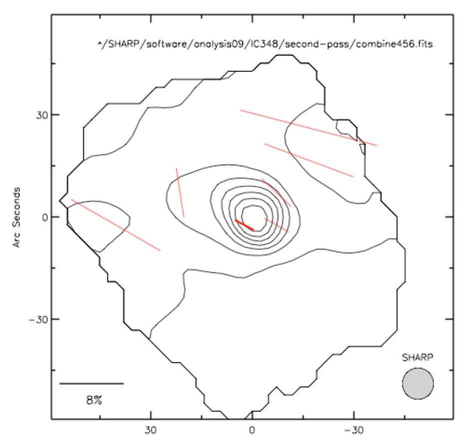
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