Noise characterization of high-pass filtered PACS photometer mini-maps

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Change Record

Version	Date	Changes	Remarks
Issue 0.95	Sep 23, 2016	–	Pre-release 70µm analysis to selected ICC-members for review
Issue 1.0	Oct 18, 2016	Completion 160µm map analysis	Complete issue 70+160µm analysis
Issue 1.5	Feb 17, 2018	Additional 100µm map analysis	Complete 100µm analysis
Issue 2.0	June 22, 2018	Additional map parameter combinations	Include map parameter combinations typical for photometric flux calibration analysis

Contents

1 Introduction

We investigate the noise properties of high-pass-filtered (HPF) mini-maps for point source photometry and how they vary depending on

a) the selected **HPF radius**[1],

b) the mapping parameter **pixfrac** (ratio of drop size to input pixel size used for the Drizzle algorithm [c.f. Fruchter, A.S. & Hook, R.N., PASP, 114,144] employed within the photProject mapper), and

c) the **output pixel size** in the final map.

We compare the noise measured in the intensity maps with the error map values, which are based on a noise model as presented in Popesso et al. (2012, arXiv:1211.4257v1 [astro-ph.IM]) and check the consistency of the correlated noise correction.

For that study two pairs of mini-maps on the intermediate bright standard star β Gem, OBSIDs 1342242770+1342242771 (only 100 µm analysis) and 1342242772+1342242773 (70 and 160 µm analysis) (cf. Table 1), were processed with the ipipe mapper script "HPF" up to level L2.0 with the combination of mapping parameters as listed in Table 2. The co-added L2.5 product is generated by applying the "mosaic" task. The used HIPE version was 14.2.0, equivalent to build number 14.0.3597. For details of the data processing, please refer to the PACS data reduction guide photometry.

Table 1: Properties of the mini-maps. The 160 µm maps of OBSIDs 1342242770 and 1342242771 are not used in the analysis presented in this report.

OBSID	λ (µm)	scan speed ("/s)	orientation (^{o} wrt. S/C y-axis)	# scan legs	leg length (')	leg separation (")
1342242770	100+160	20	70	10	3	4
1342242771	100+160	20	110	10	3	4
1342242772	70+160	20	70	10	3	4
1342242773	70+160	20	110	10	3	4

2 Analysis overview

A representative 1-σ noise level of the L2.0 and L2.5 intensity maps is derived in two ways:

1) The standard deviation is determined in two rectangular boxes located in source-free and clean areas of the map close to the central position with the source. A mean $\sigma_{\rm mean} = \frac{\sigma_{\rm box1}+\sigma_{\rm box2}}{2.}$ is determined for further analysis.

2) A flux histogram is constructed for all output pixels of the image map, where the corresponding coverage map indicates that $cover_{\rm pix} \gtrsim \frac{1}{2}\, cover_{\rm max}$. A Gauss fit is performed to the histogram but restricted to the part with fluxes below the flux bin associated with the peak of the histogram, which is a good approximation of the mean background level. In this way we ensure that the derived $\sigma_{\rm hist}$ represents the noise of the background level only and is not contaminated by flux of faint sources. (In fact, to optimize the quality of the fit, typically about 10 histogram bins to the right of the peak of the histogram are included in the fit).

[1] This parameter determines the elementary section of a scan over which the filter algorithm computes a running median value. Its unit is "number of read-outs". The spatial interval between two readouts is $\alpha_{\rm ro} = \frac{v_{\rm scan}}{\nu_{\rm ro}}$. For the standard $\nu_{\rm ro} = 10$ Hz downlink rate in PACS prime mode (averaging 4 frames on-board read out with a frequency of 40 Hz) and a scan speed $v_{\rm scan} =$ 20"/s (cf. Table 1) the spatial interval $\alpha_{\rm ro}$ between two read-outs corresponds to 2". The entire width of the HPF window (") = $[(2 \times \text{HPF radius}) + 1] \times \alpha_{\rm ro}$.

Table 2: Combination of mapping parameters used for the study. The combinations high-lighted in bold face are used in the Standard Product Generation (SPG). The combinations in italics were typical for the PACS photometric flux calibration, except that a HPF radius of 20 was used at 100µm and a HPF radius of 35 at 160 µm.

blue (70 µm) filter		
HPF radius	pixfrac	output pixel size
15	0.1	1.″1
15	**0.1**	**1.″6**
15	0.1	2.″4
15	0.1	3.″2
15	0.5	1.″6
15	*1.0*	*1.″1*
15	1.0	1.″6
15	1.0	2.″4
15	1.0	3.″2
30	0.1	1.″6
30	1.0	1.″6
green (100 µm) filter		
HPF radius	pixfrac	output pixel size
15	0.1	1.″4
15	**0.1**	**1.″6**
15	0.1	2.″4
15	0.1	3.″2
15	0.5	1.″6
15	*1.0*	*1.″4*
15	1.0	1.″6
15	1.0	2.″4
15	1.0	3.″2
30	0.1	1.″6
30	1.0	1.″6
red (160 µm) filter		
HPF radius	pixfrac	output pixel size
25	0.1	2.″1
25	**0.1**	**3.″2**
25	0.1	4.″8
25	0.1	6.″4
25	0.5	3.″2
25	*1.0*	*2.″1*
25	1.0	3.″2
25	1.0	4.″8
25	1.0	6.″4
50	0.1	3.″2
50	1.0	3.″2

For the error maps of the L2.0 products the same $cover_{\mathrm{pix}}$ threshold is used to produce a histogram. From this we derive a mean σ_{mean} (and median σ_{median}) noise value. For comparison with the measured σ_{hist}, the latter must be multiplied with the correlated noise correction factor f

[2] c_{ijk} is related to the 20 parameters P(0) . . . P(19) in Table 9 of Popesso et al. (2012) by running 3 nested DO-loops with (from outer to inner) k = 0, n; j = 0, (n-k); and i = 0, (n-k-j))

$$f = \sum_{0 \leq i+j+k \leq n}^{n=3} c_{ijk}\, hpf^i\, outpix^j\, pixfrac^k \qquad k = 0, n;\ j = 0, (n-k);\ i = 0, (n-k-j)^2 \tag{1}$$

to derive the corrected noise per pixel:

$$\sigma_{\rm pixcorr} = f\, \sigma_{\rm hist}. \tag{2}$$

For the verification of the error maps of the L2.5 products the following algorithm described in Popesso et al. (2012) is used to calculate the uncorrected noise per pixel:

$$\sigma_{\rm pixcover} = 10^{\alpha \log_{10}({\rm cover_{pix}})+\beta} \tag{3}$$

with α and β being derived in the same manner from the 20 parameters P(0) ... P(19) in Table 9 of Popesso et al. (2012) as the f-factor above (calculated values of all three factors for the map parameter combinations used in this study are listed in Table 3):

$$\alpha = \sum_{0 \leq i+j+k \leq n}^{n=3} a_{ijk}\, hpf^i\, outpix^j\, pixfrac^k \tag{4}$$

$$\beta = \sum_{0 \leq i+j+k \leq n}^{n=3} b_{ijk}\, hpf^i\, outpix^j\, pixfrac^k \tag{5}$$

The corrected noise per pixel is then calculated via Eqn. 2 by inserting $\sigma_{\rm pixcover}$ instead of $\sigma_{\rm hist}$.

For a photometric measurement, the noise inside the measurement aperture must be determined from the noise per pixel $\sigma_{\rm pix}$. This is given by

$$\sigma_{\rm aperture} = \sqrt{N_{\rm outpixinaper}} \times \sigma_{\rm pix} \tag{6}$$

with $N_{\rm outpixinaper}$ being the number of output pixels inside the measurement aperture.

Table 3: α, β and f-factors calculated according to Eqs. 4, 5 and 1 used in the analysis. The combinations high-lighted in bold face are used in the Standard Product Generation (SPG). The combinations in italics were used for the photometric flux calibration analysis.

HPF/pixfrac/outpix	α	β	f
70µm map factors			
15 / 0.1 / 1.″1	−0.501863	−3.30016	1.47003
15 / 0.1 / 1.″6	−0.501830	−3.11796	1.38642
15 / 0.1 / 2.″4	−0.500192	−2.96825	1.30378
15 / 0.1 / 3.″2	−0.500173	−2.76504	1.17576
15 / 0.5 / 1.″6	−0.502250	−2.60539	1.89745
15 / 1.0 / 1.″1	−0.502032	−2.76077	3.12663
15 / 1.0 / 1.″6	−0.500302	−2.41860	2.34220
15 / 1.0 / 2.″4	−0.497850	−2.13750	1.64066
15 / 1.0 / 3.″2	−0.499353	−1.95621	1.51210
30 / 0.1 / 1.″6	−0.502160	−3.09060	1.53629
30 / 1.0 / 1.″6	−0.500875	−2.38287	2.60027
100µm map factors			
15 / 0.1 / 1.″4	−0.415499	−3.35599	1.43590
15 / 0.1 / 1.″6	−0.410676	−3.29616	1.41157
15 / 0.1 / 2.″4	−0.394431	−3.14629	1.33312
15 / 0.1 / 3.″2	−0.393743	−2.94929	1.18794
15 / 0.5 / 1.″6	−0.401789	−2.95044	1.90949
15 / 1.0 / 1.″4	−0.420330	−2.87269	2.64995
15 / 1.0 / 1.″6	−0.422149	−2.75061	2.37049
15 / 1.0 / 2.″4	−0.422871	−2.44735	1.66385
15 / 1.0 / 3.″2	−0.423781	−2.24992	1.51819
30 / 0.1 / 1.″6	−0.398476	−3.29034	1.53702
30 / 1.0 / 1.″6	−0.397331	−2.79784	2.60266
160µm map factors			
25 / 0.1 / 2.″1	−0.435876	−3.46169	1.74613
25 / 0.1 / 3.″2	−0.409194	−3.23597	1.54527
25 / 0.1 / 4.″8	−0.361526	−2.86422	1.43937
25 / 0.1 / 6.″4	−0.412735	−2.59025	1.25115
25 / 0.5 / 3.″2	−0.363151	−2.82315	1.93410
25 / 1.0 / 2.″1	−0.404275	−2.97952	3.96257
25 / 1.0 / 3.″2	−0.375782	−2.45456	2.51013
25 / 1.0 / 4.″8	−0.329690	−1.94453	1.51518
25 / 1.0 / 6.″4	−0.387470	−1.88422	1.54181
50 / 0.1 / 3.″2	−0.284172	−1.89009	1.74796
50 / 1.0 / 3.″2	−0.463820	−2.25810	2.72807

3 Analysis of 70µm maps

3.1 70 µm: HPF radius 15, Pixfrac 0.1, Pixsize 1.″1

3.1.1 L 2.0 OBSID 1342242772

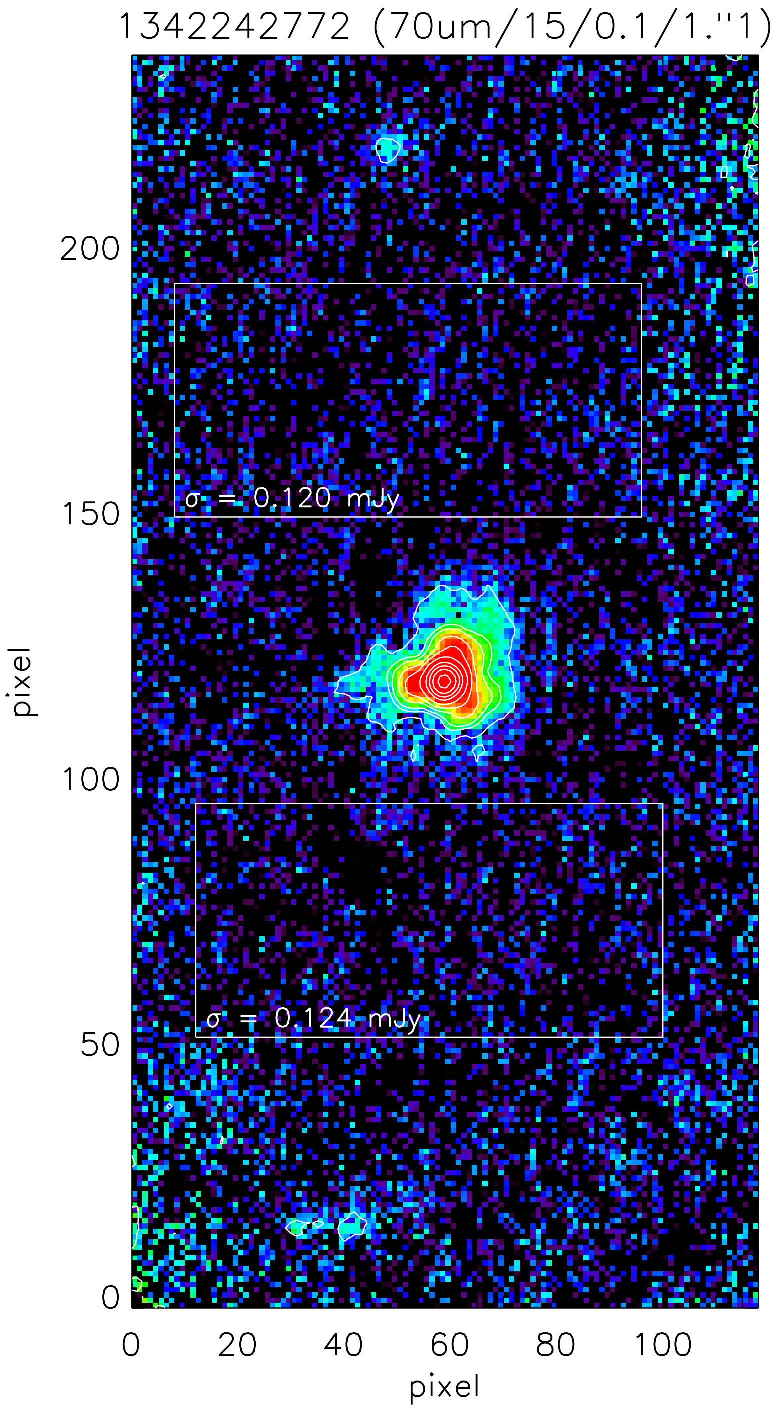

Figure 1: 70 µm L2.0 map for OBSID 1342242772 with HPF radius 15, pixfrac 0.1 and output pixel size of 1.″1. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

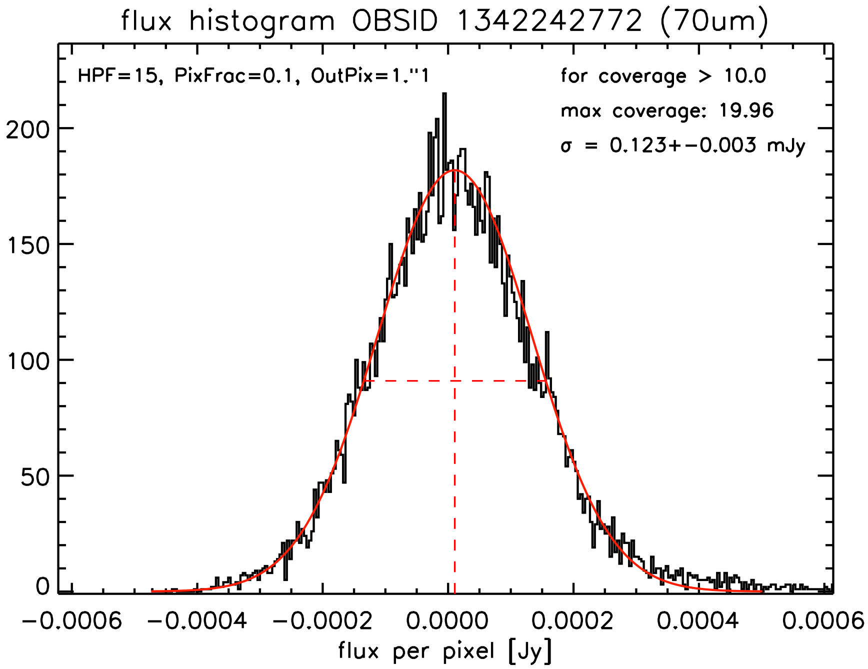

Figure 2: Noise determination for the 70 µm L2.0 map of OBSID 1342242772 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

For this map parameter combination no error map analysis was done.

3.1.2 L 2.0 OBSID 1342242773

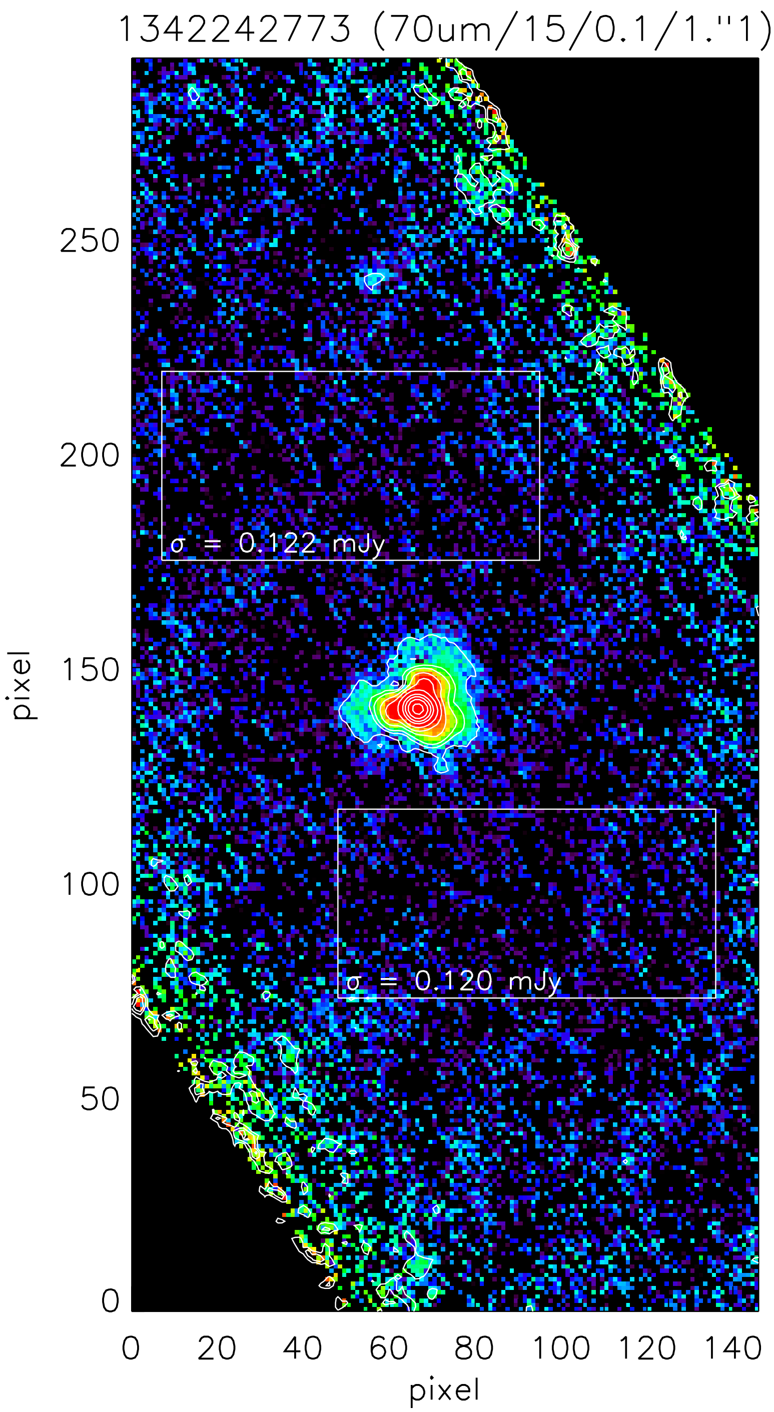

Figure 3: 70 µm L2.0 map for OBSID 1342242773 with HPF radius 15, pixfrac 0.1 and output pixel size of 1.″1. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

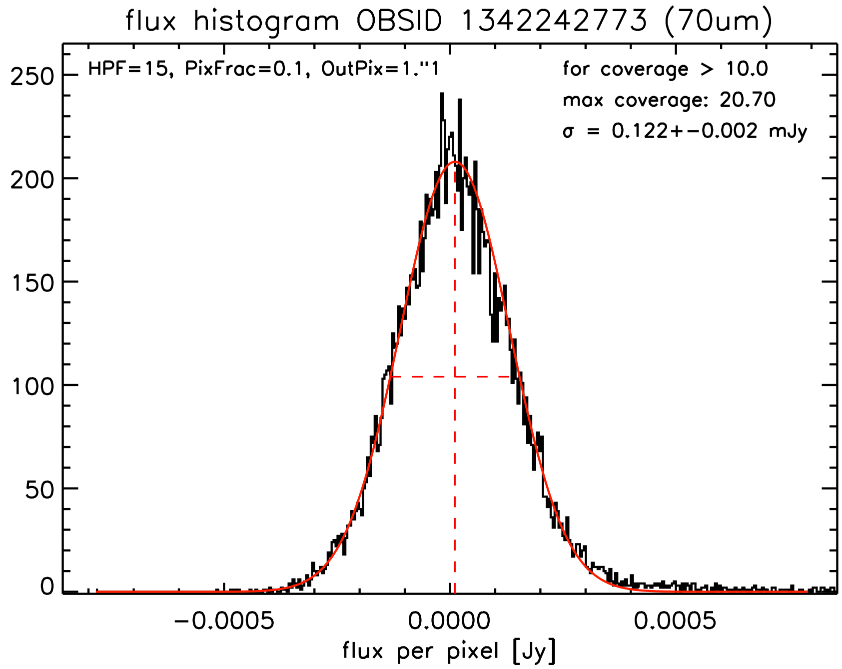

Figure 4: Noise determination for the 70 µm L2.0 map of OBSID 1342242773 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

For this map parameter combination no error map analysis was done.

3.1.3 L 2.5 OBSIDs 1342242772+1342242773

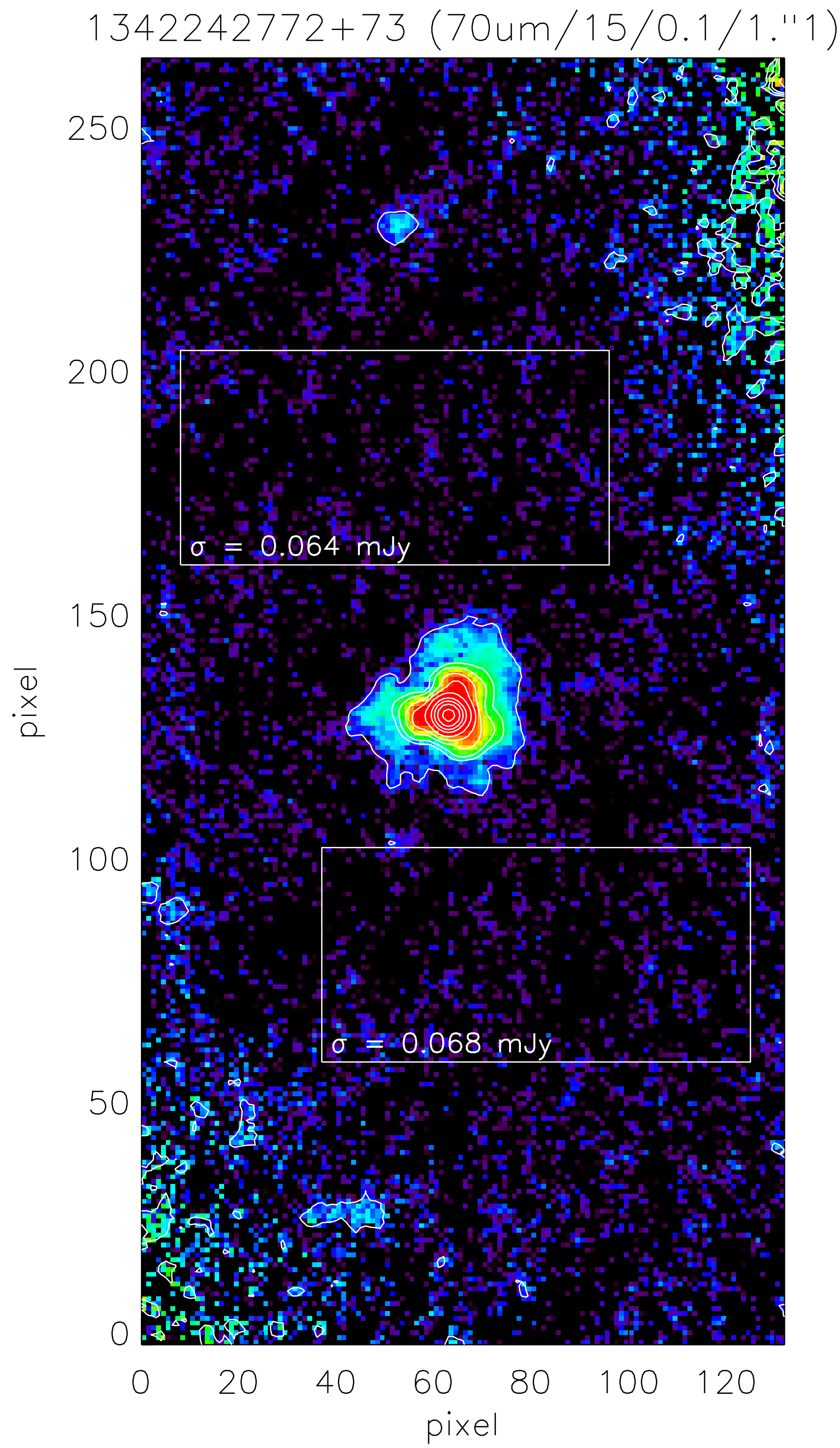

Figure 5: 70 µm L2.5 combined map for OBSIDs 1342242772+73 with HPF radius 15, pixfrac 0.1 and output pixel size of 1.″1 (SPG product parameter set). The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

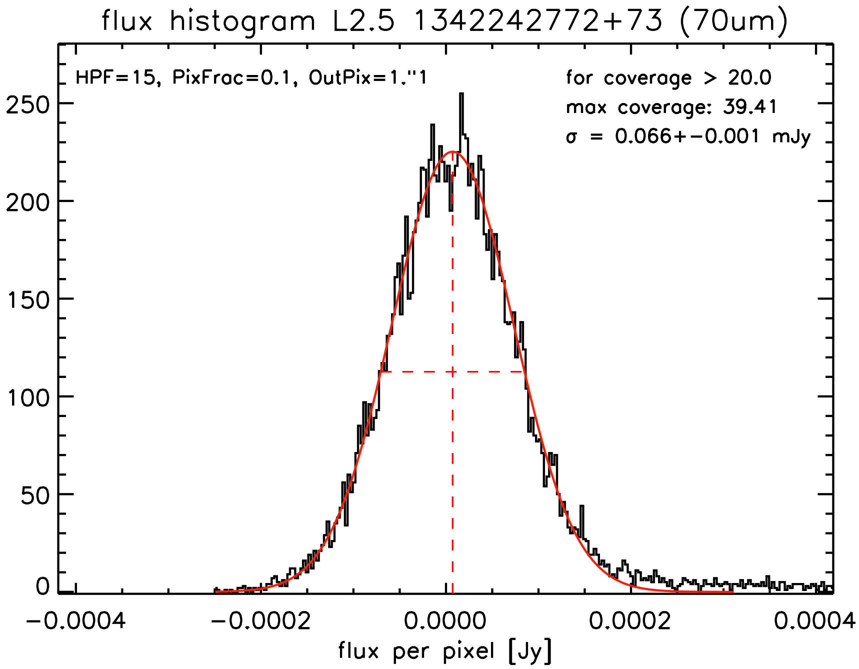

Figure 6: Noise determination for the 70 µm coadded L2.5 map of OBSIDs 1342242772+73 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

For this map parameter combination no error map analysis was done.

3.2 70 µm: HPF radius 15, Pixfrac 0.1, Pixsize 1.″6

3.2.1 L 2.0 OBSID 1342242772

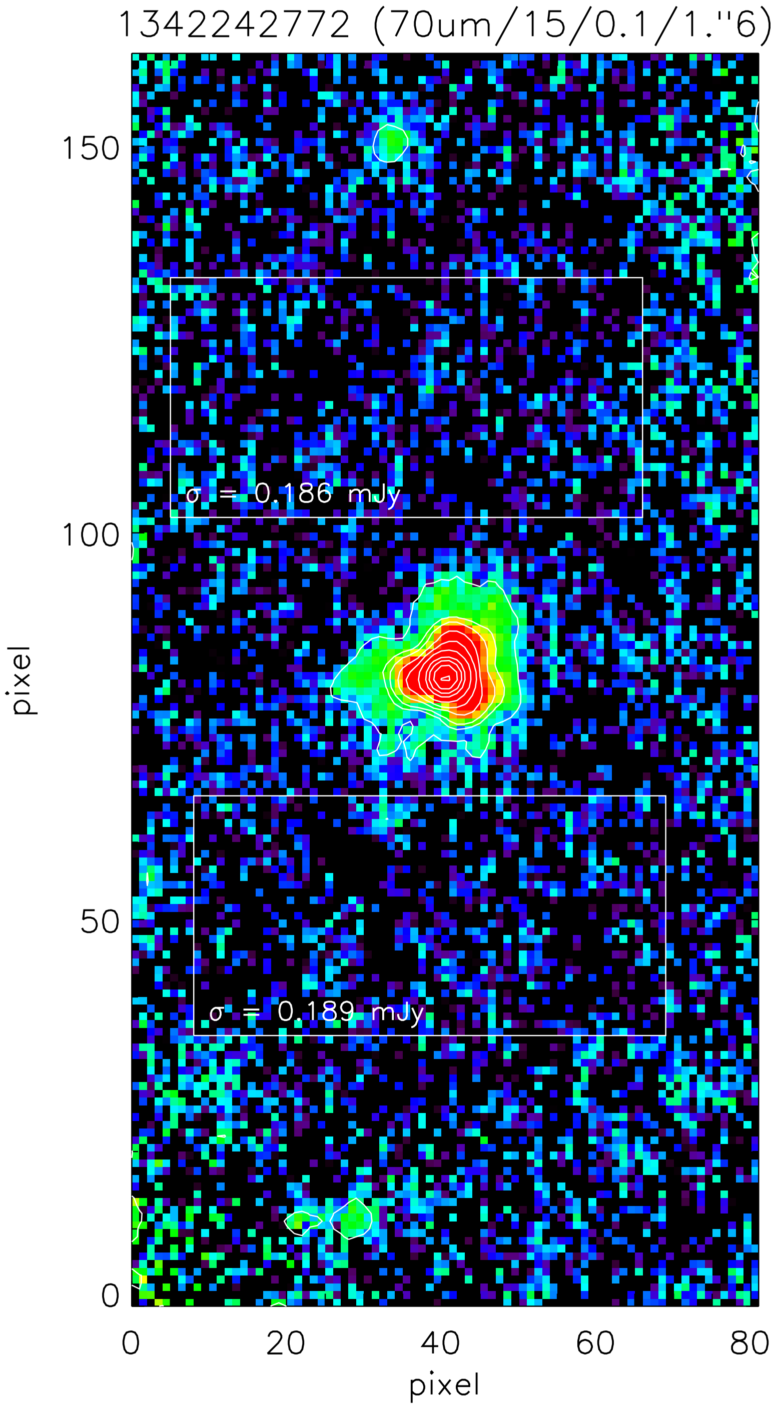

Figure 7: 70 µm L2.0 map for OBSID 1342242772 with HPF radius 15, pixfrac 0.1 and output pixel size of 1.″6 (SPG product parameter set). The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

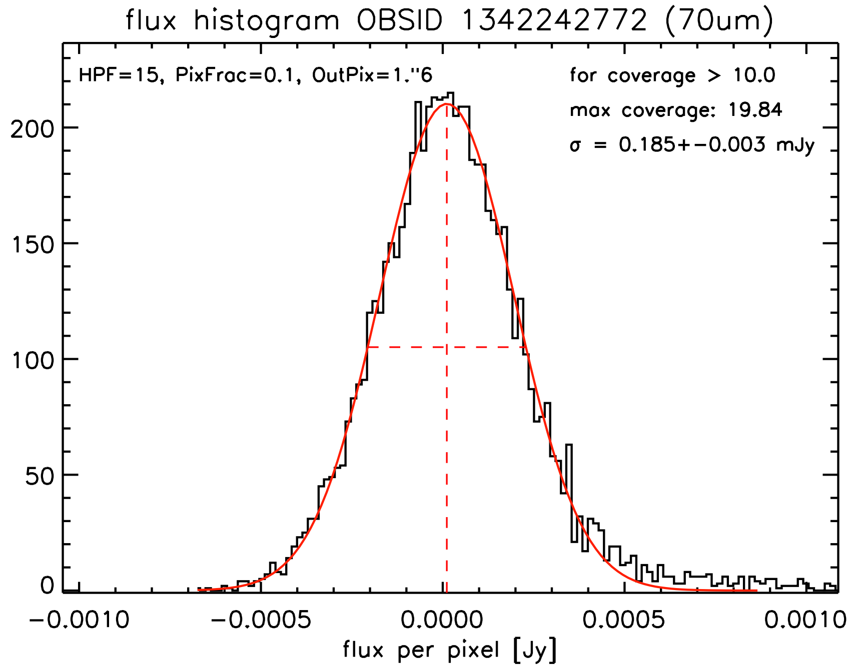

Figure 8: Noise determination for the 70 µm L2.0 map of OBSID 1342242772 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\ \sigma_{\text{hist}}$).

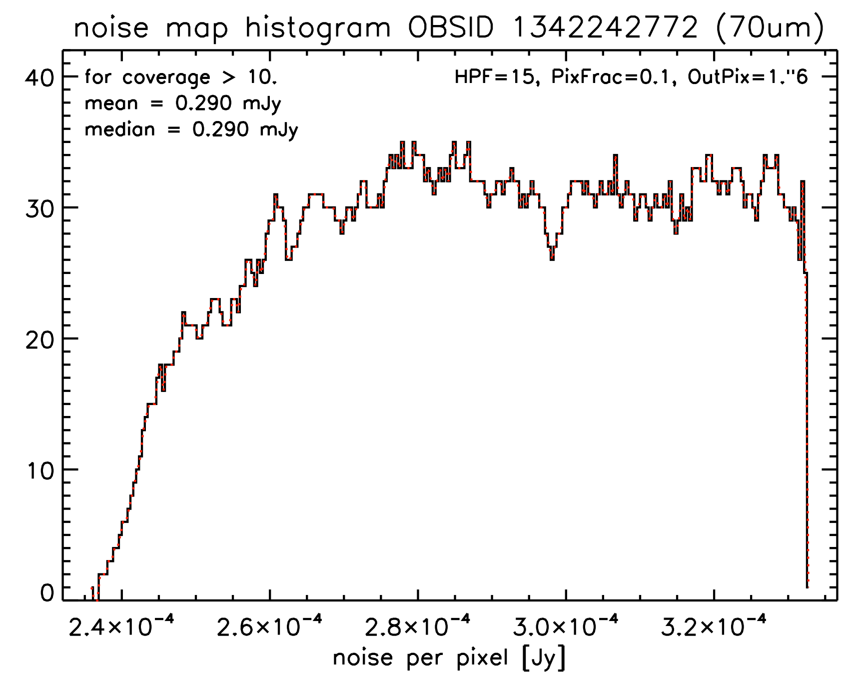

Figure 9: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

3.2.2 L 2.0 OBSID 1342242773

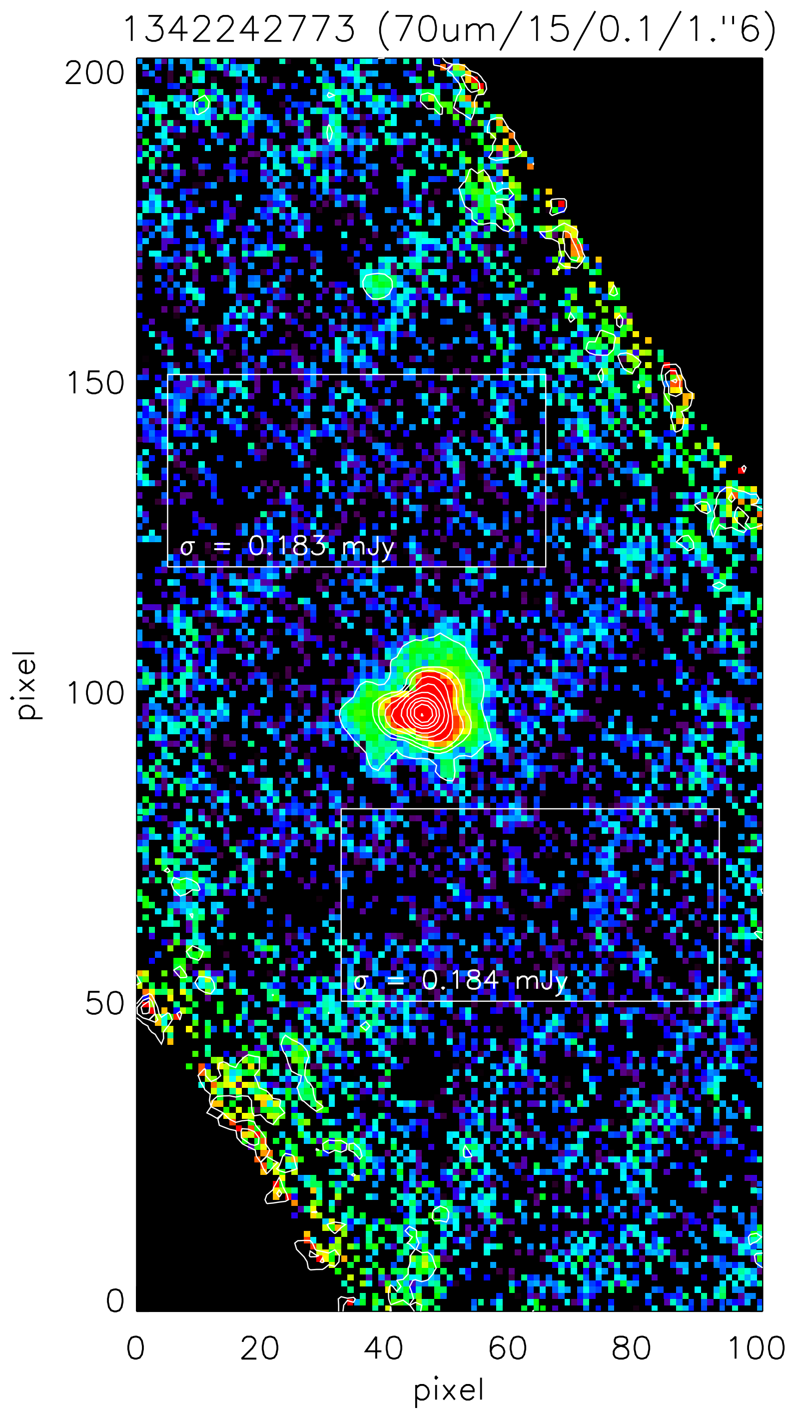

Figure 10: 70 μm L2.0 map for OBSID 1342242773 with HPF radius 15, pixfrac 0.1 and output pixel size of 1.″6 (SPG product parameter set). The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

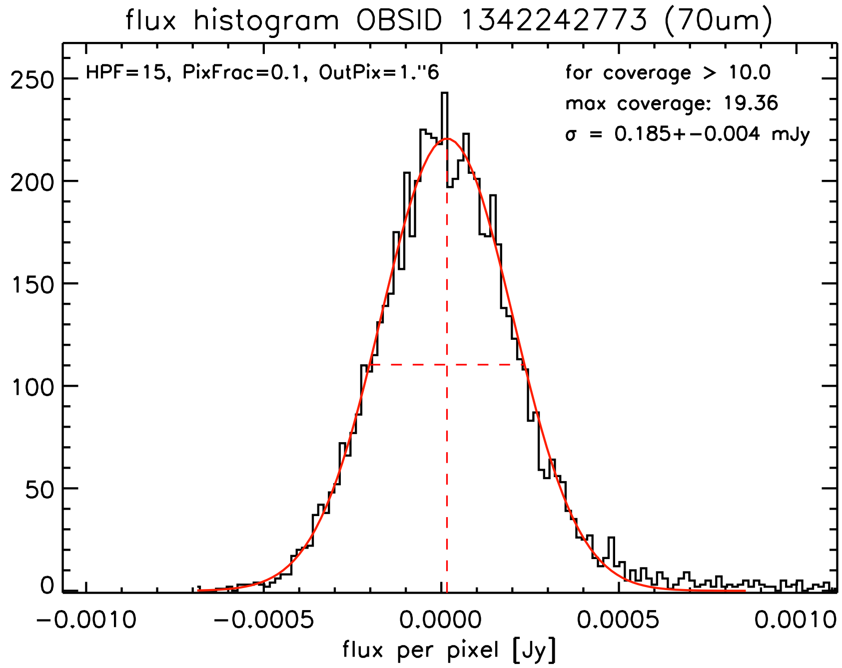

Figure 11: Noise determination for the 70 µm L2.0 map of OBSID 1342242773 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

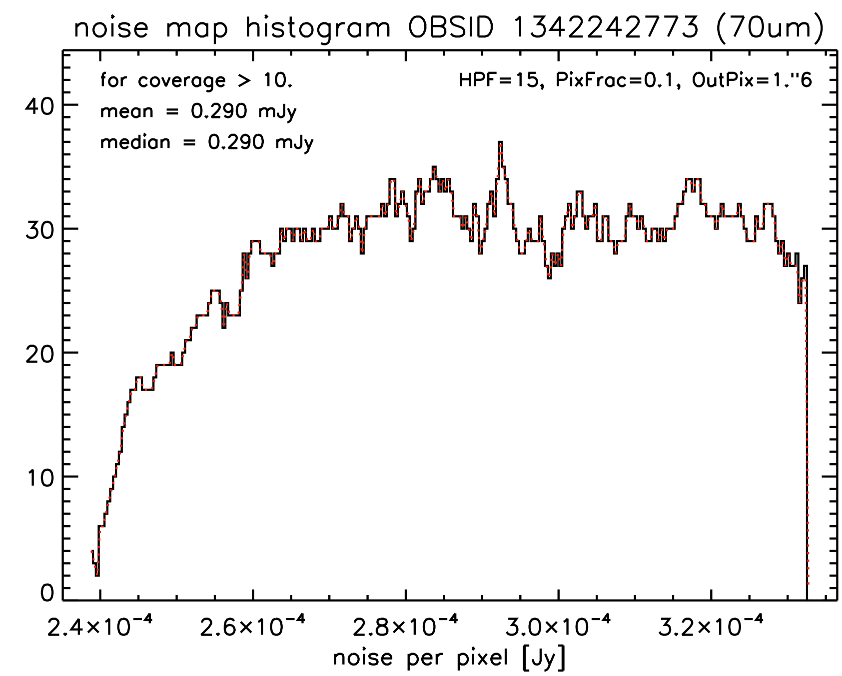

Figure 12: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

3.2.3 L 2.5 OBSIDs 1342242772+1342242773

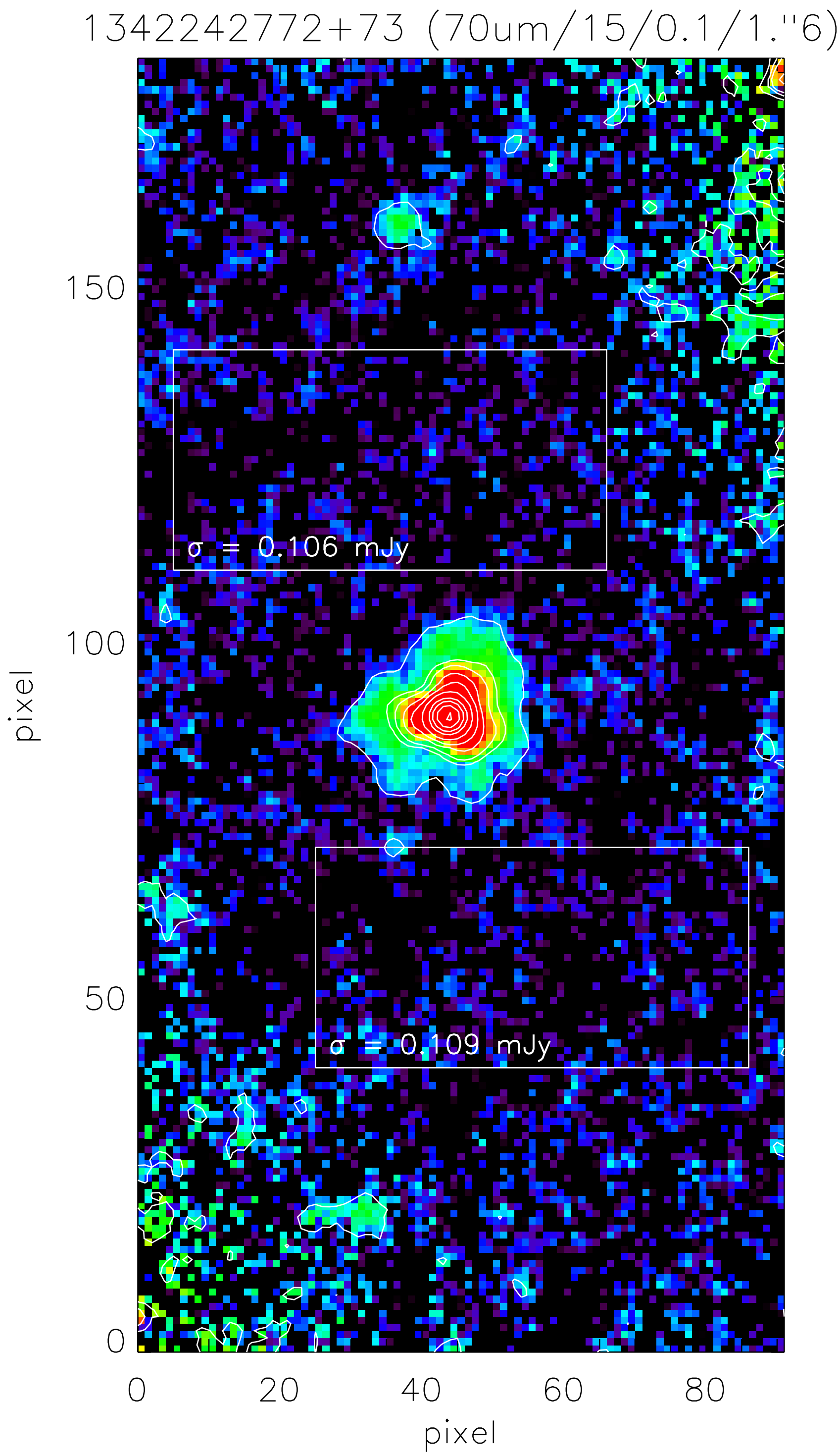

Figure 13: 70 μm L2.5 combined map for OBSIDs 1342242772+73 with HPF radius 15, pixfrac 0.1 and output pixel size of 1.″6 (SPG product parameter set). The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

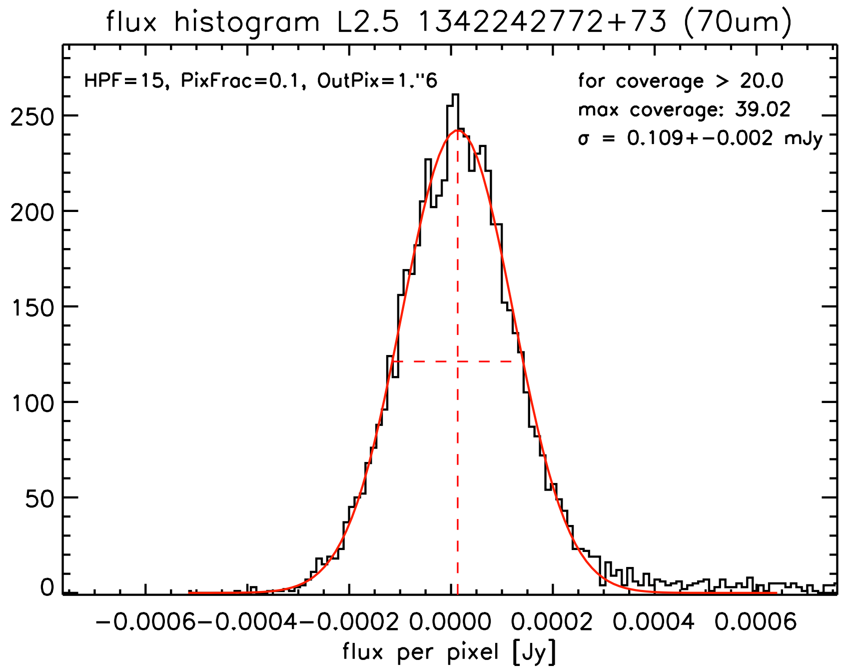

Figure 14: Noise determination for the 70 µm coadded L2.5 map of OBSIDs 1342242772+73 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\ \sigma_{\rm hist}$).

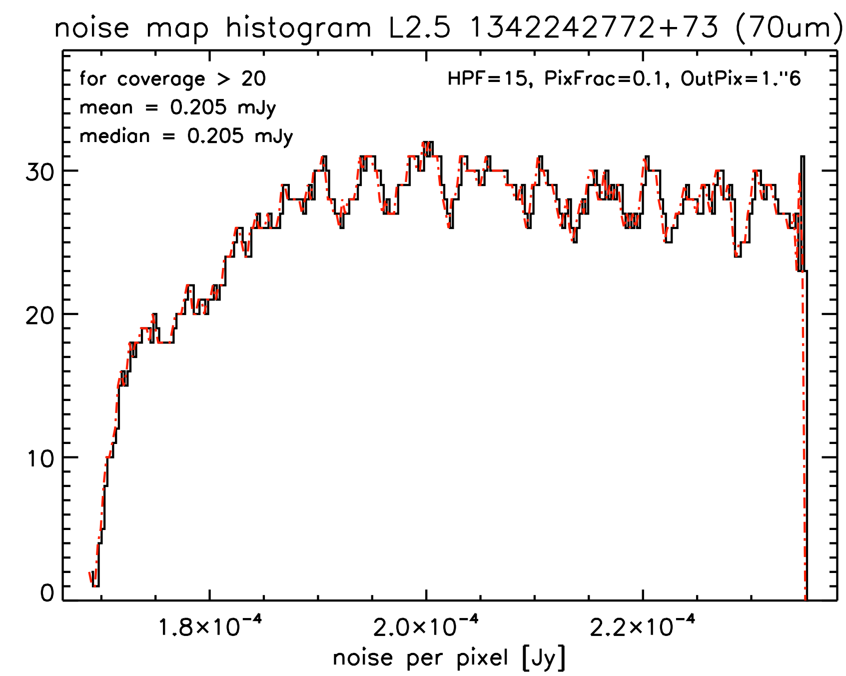

Figure 15: Histogram of the noise value distribution in the L2.5 error map above the coverage threshold indicated in the plot (in black). Mean and median value of the distribution are given. The red dashed-dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

3.3 70 µm: HPF radius 30, Pixfrac 0.1, Pixsize 1.″6

3.3.1 L 2.0 OBSID 1342242772

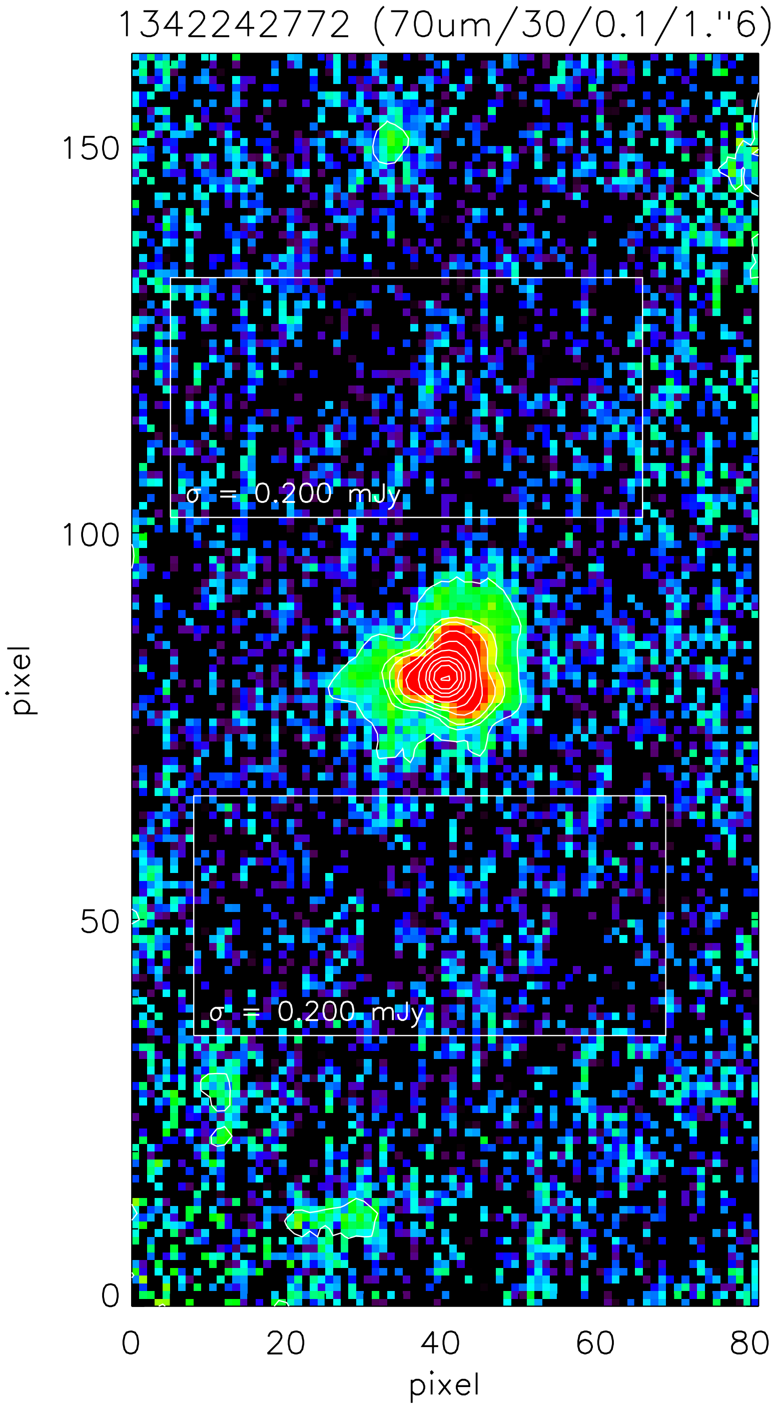

Figure 16: 70 µm L2.0 map for OBSID 1342242772 with HPF radius 30, pixfrac 0.1 and output pixel size of 1.″6. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

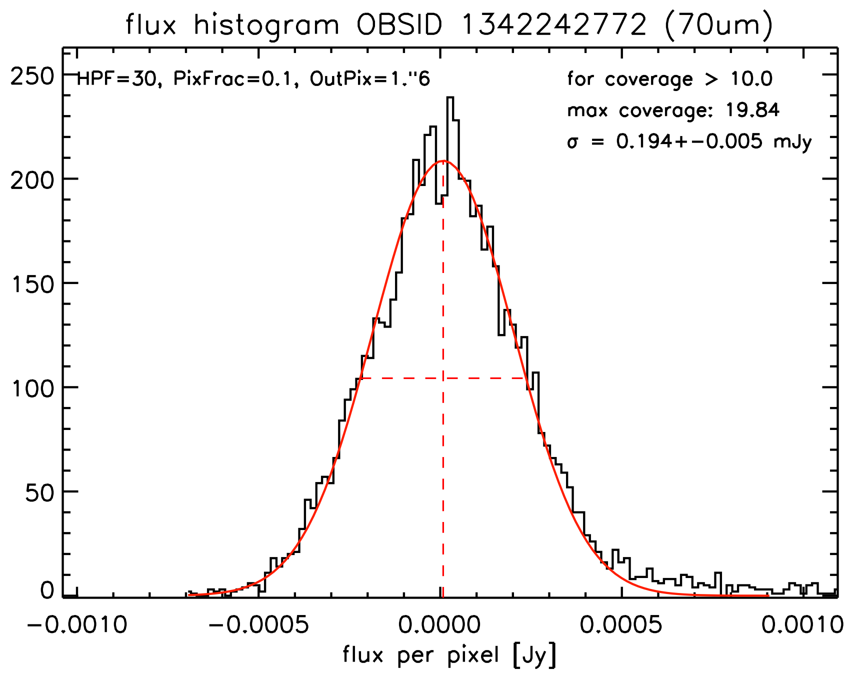

Figure 17: Noise determination for the 70 µm L2.0 map of OBSID 1342242772 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

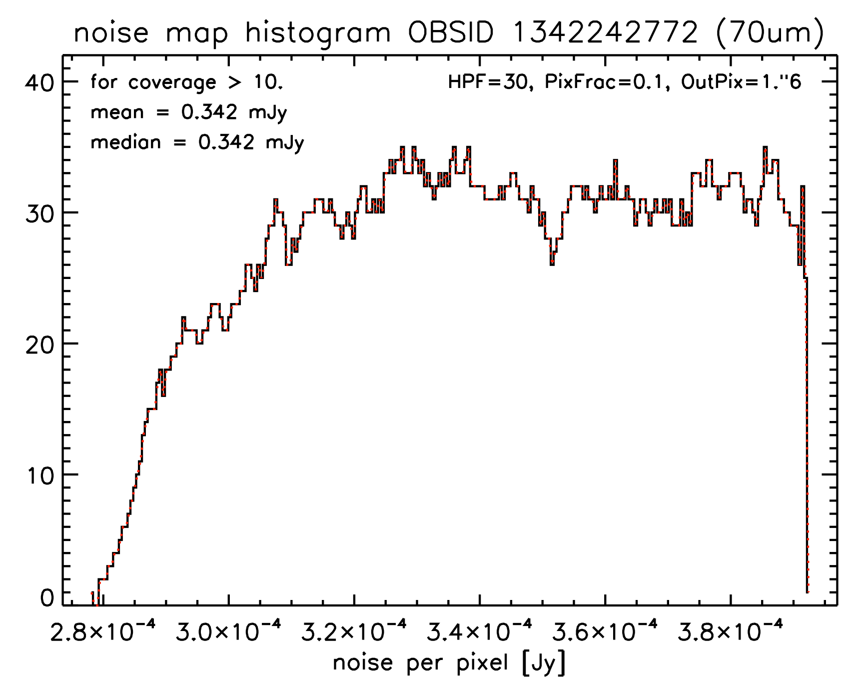

Figure 18: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

3.3.2 L 2.0 OBSID 1342242773

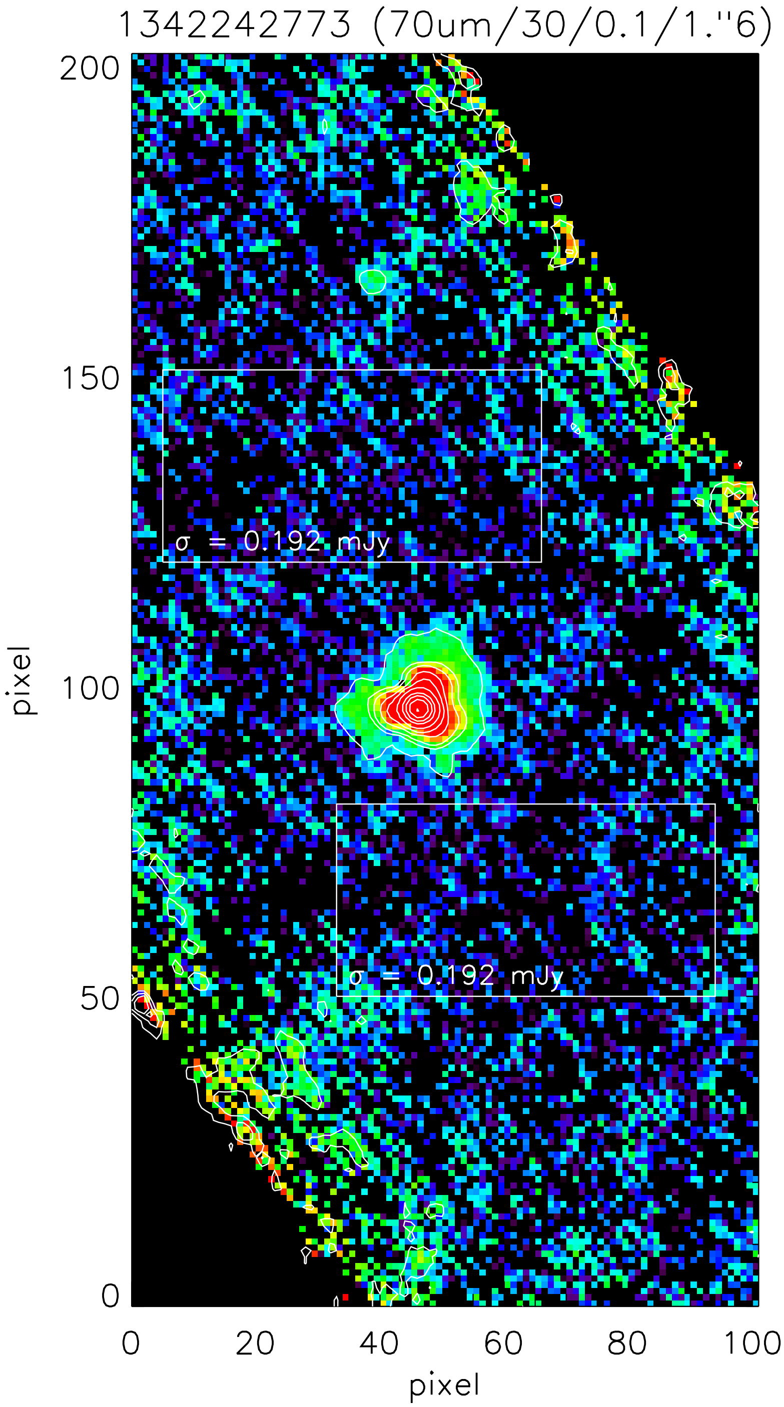

Figure 19: 70 µm L2.0 map for OBSID 1342242773 with HPF radius 30, pixfrac 0.1 and an output pixels size of 1.″6. The two background fields for noise determination are outlined by the white boxes and the σ is indicated.

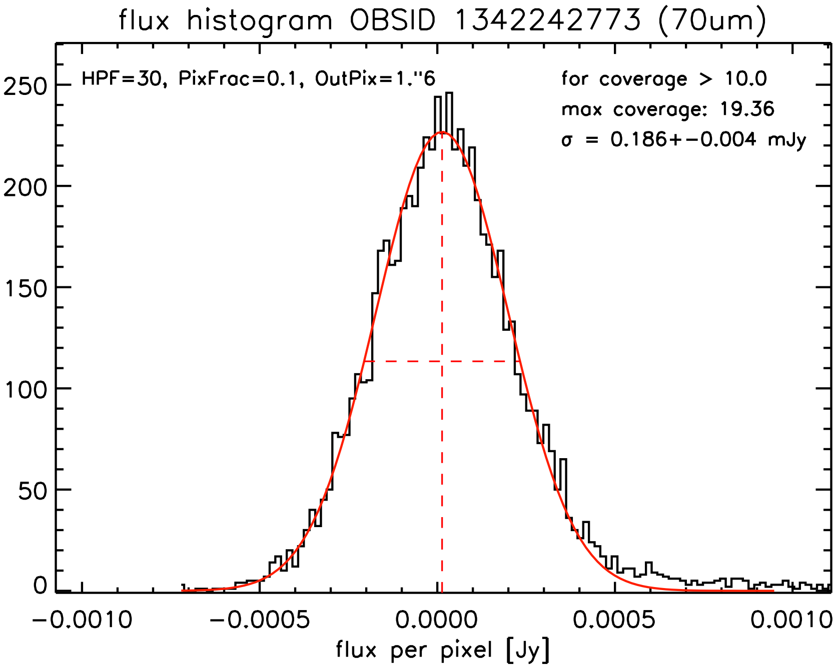

Figure 20: Noise determination for the 70 µm L2.0 map of OBSID 1342242773 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

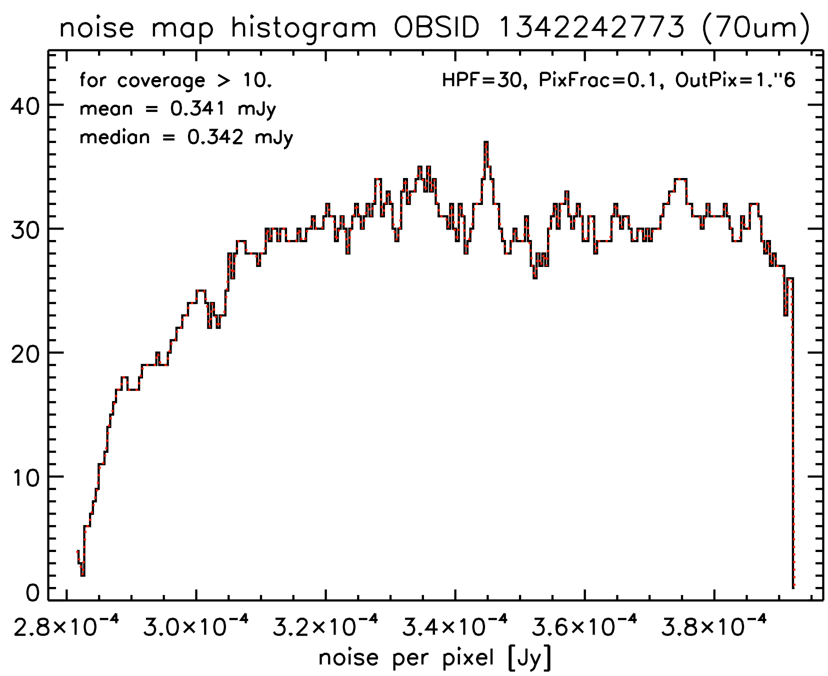

Figure 21: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

3.3.3 L 2.5 OBSIDs 1342242772+1342242773

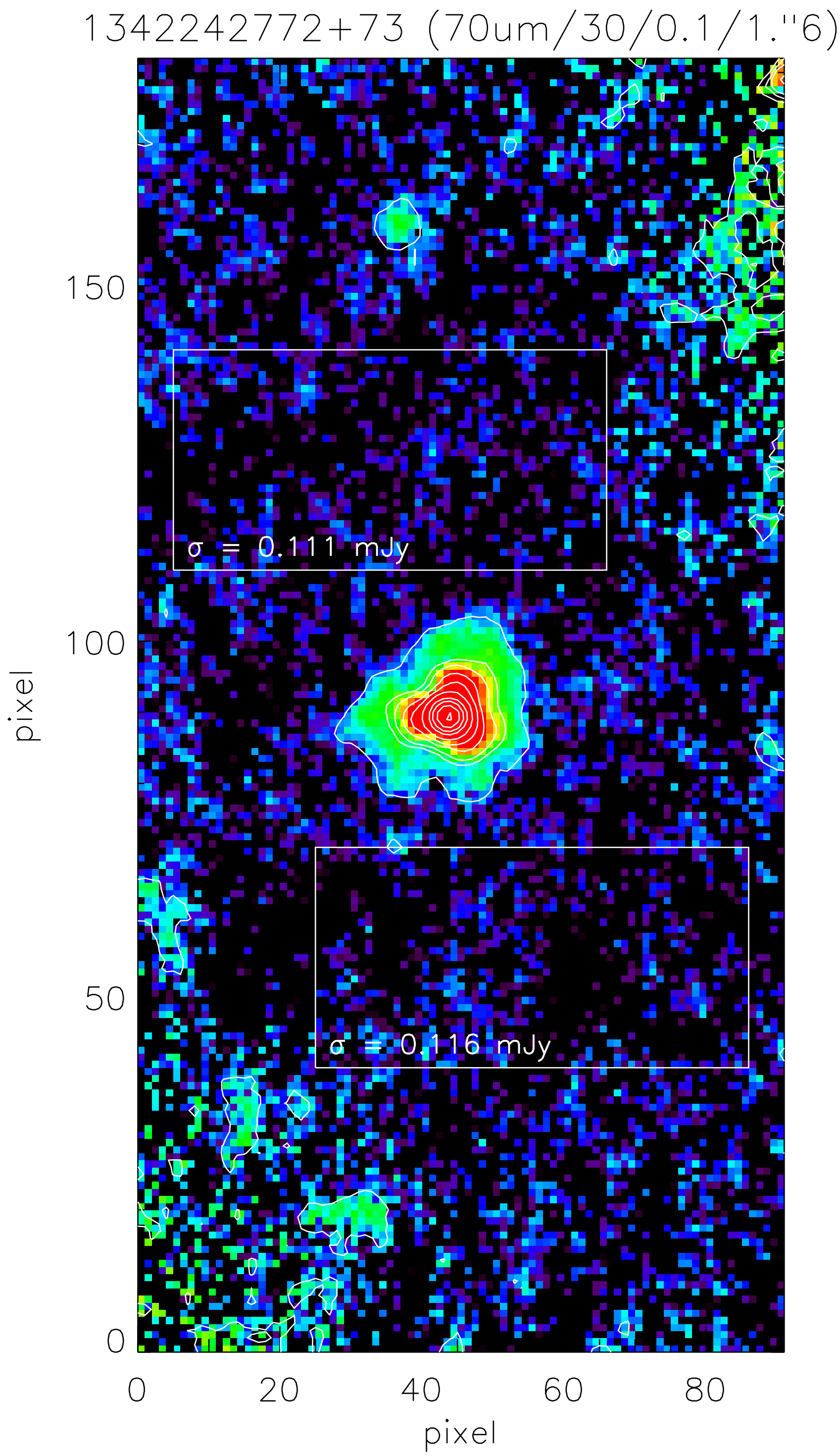

Figure 22: 70 µm L2.5 combined map for OBSIDs 1342242772+73 with HPF radius 30, pixfrac 0.1 and output pixel size of 1.″6. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

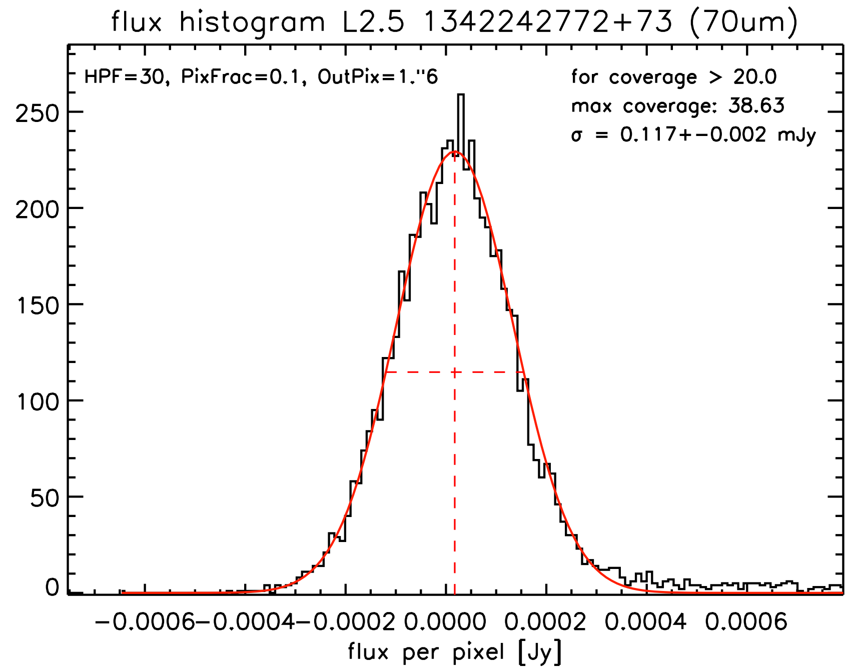

Figure 23: Noise determination for the 70 µm coadded L2.5 map of OBSIDs 1342242772+73 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

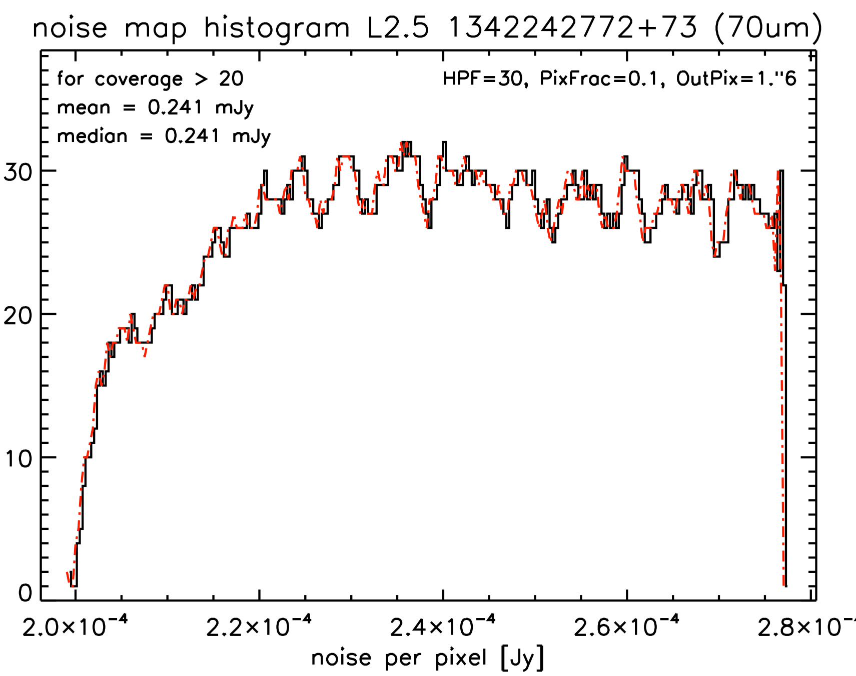

Figure 24: Histogram of the noise value distribution in the L2.5 error map above the coverage threshold indicated in the plot (in black). Mean and median value of the distribution are given. The red dashed-dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

3.4 70 µm: HPF radius 15, Pixfrac 0.1, Pixsize 2.″4

3.4.1 L 2.0 OBSID 1342242772

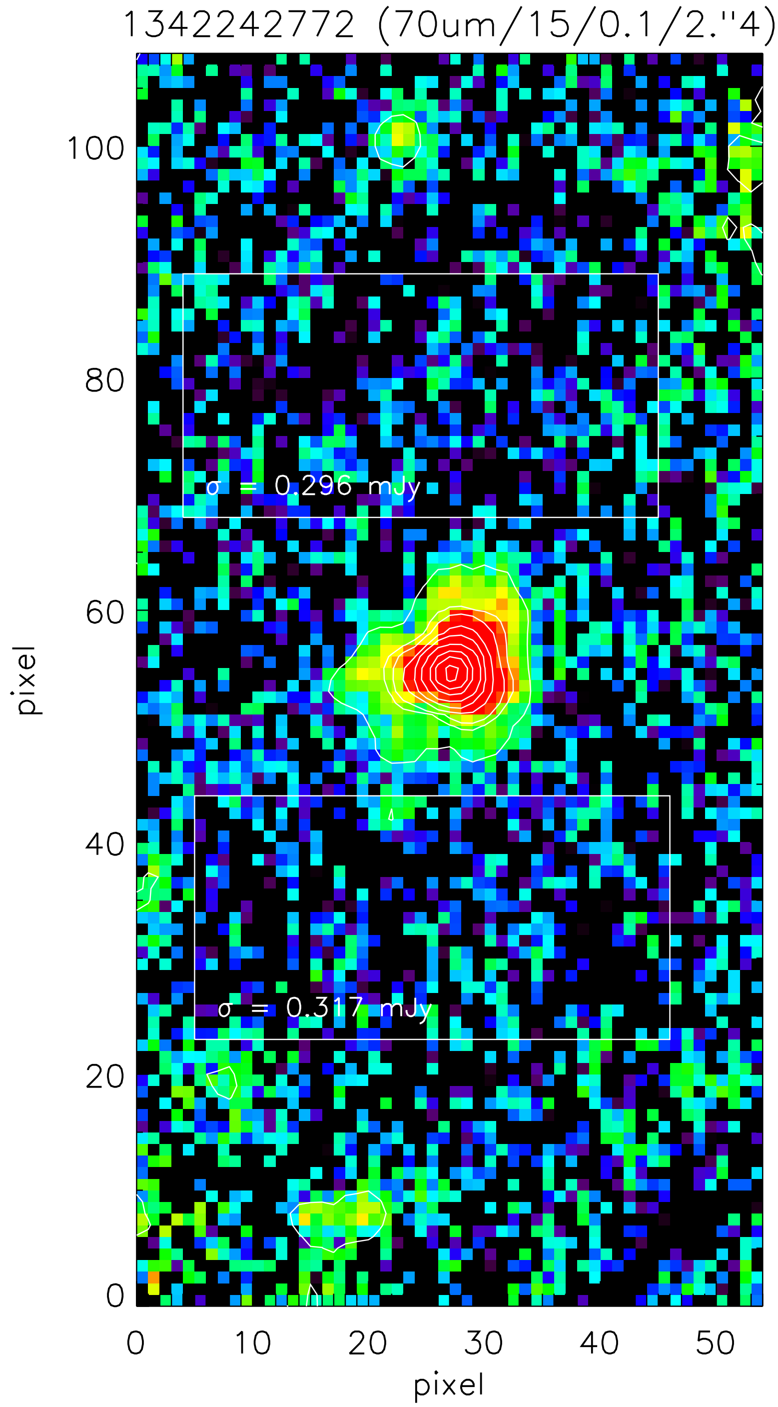

Figure 25: 70 µm L2.0 map for OBSID 1342242772 with HPF radius 15, pixfrac 0.1 and output pixel size of 2.″4. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

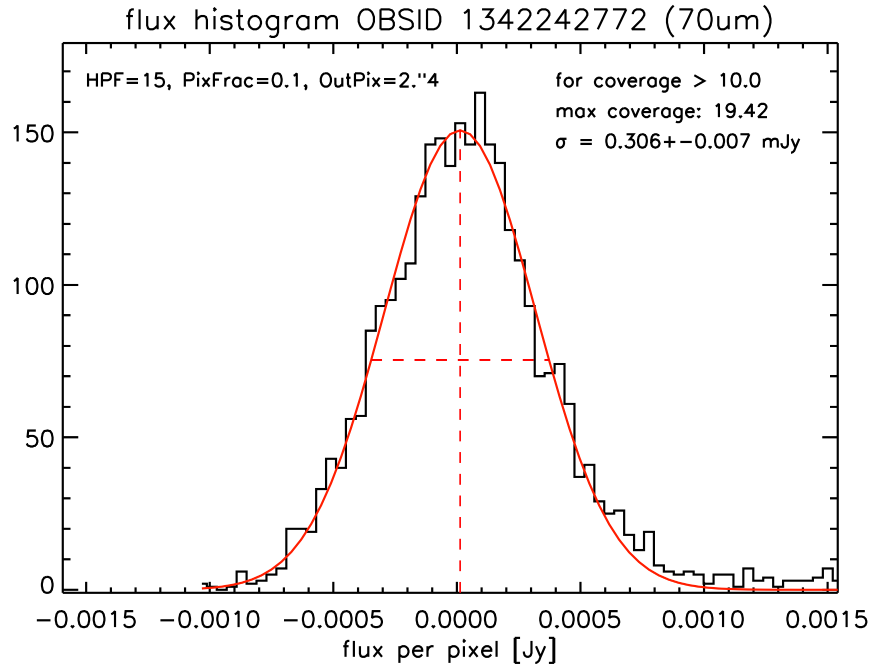

Figure 26: Noise determination for the 70 µm L2.0 map of OBSID 1342242772 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

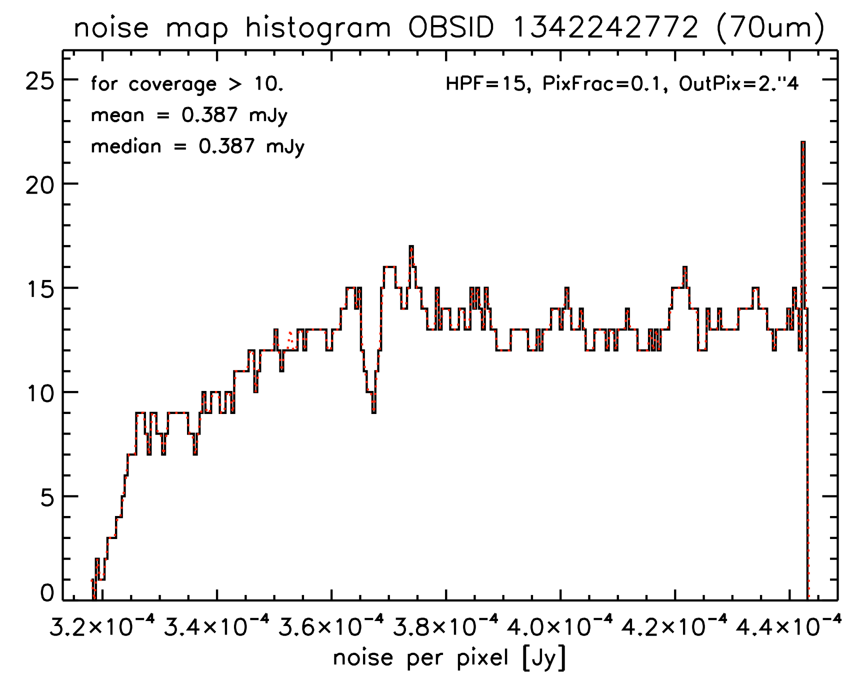

Figure 27: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

3.4.2 L 2.0 OBSID 1342242773

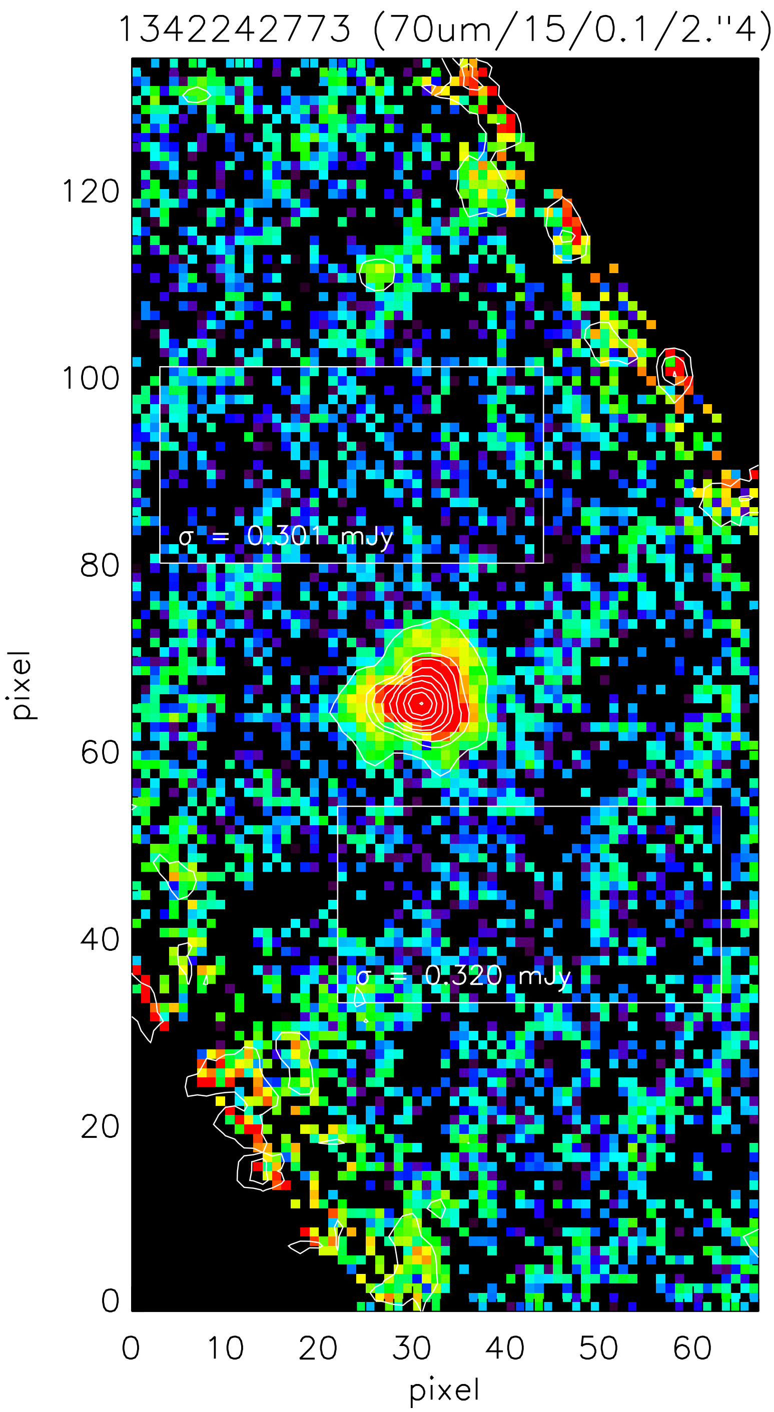

Figure 28: 70 µm L2.0 map for OBSID 1342242773 with HPF radius 15, pixfrac 0.1 and output pixel size of 2.″4. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

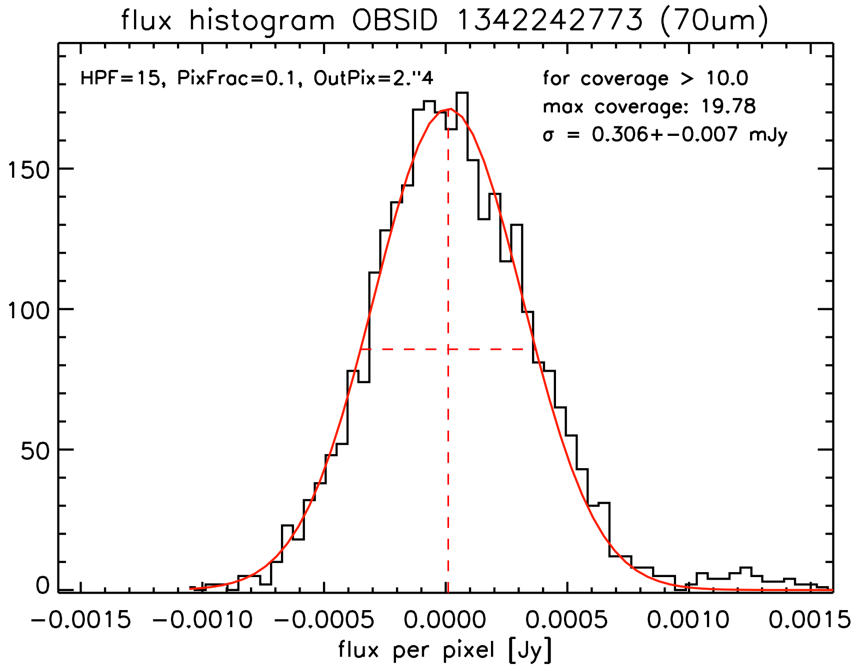

Figure 29: Noise determination for the 70 µm L2.0 map of OBSID 1342242773 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

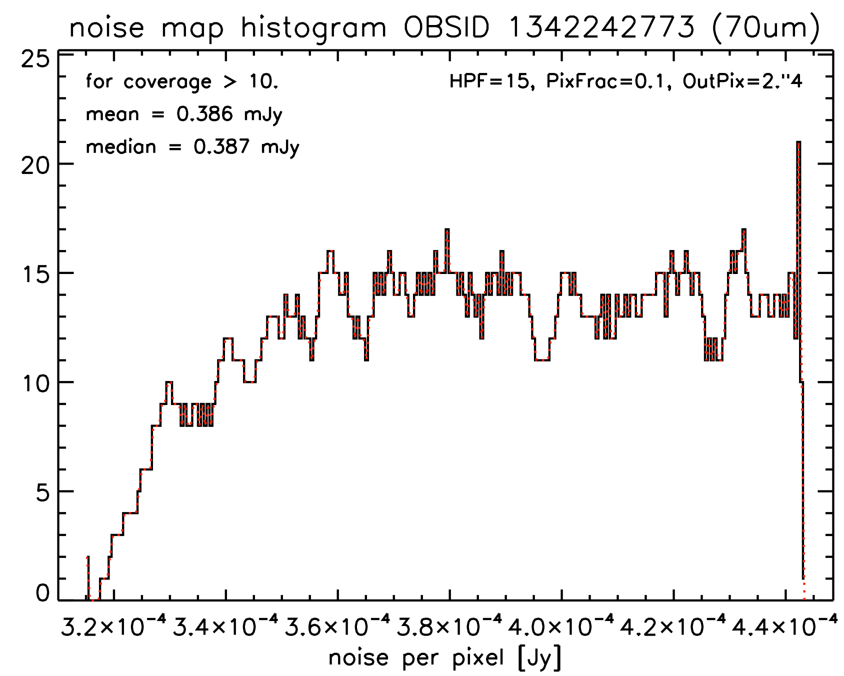

Figure 30: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

3.4.3 L 2.5 OBSIDs 1342242772+1342242773

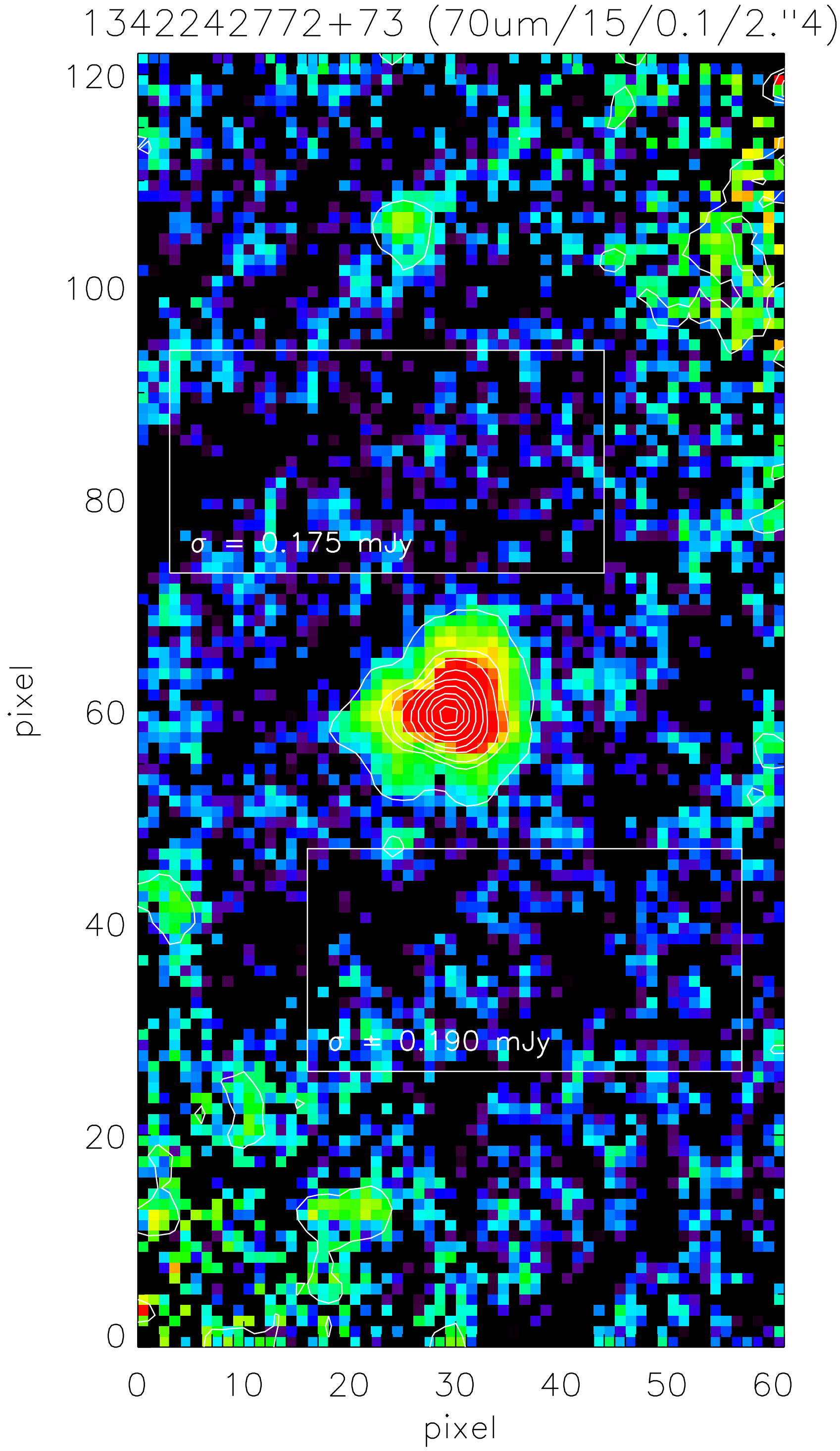

Figure 31: 70 µm L2.5 combined map for OBSIDs 1342242772+73 with HPF radius 15, pixfrac 0.1 and output pixel size of 2.″4. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

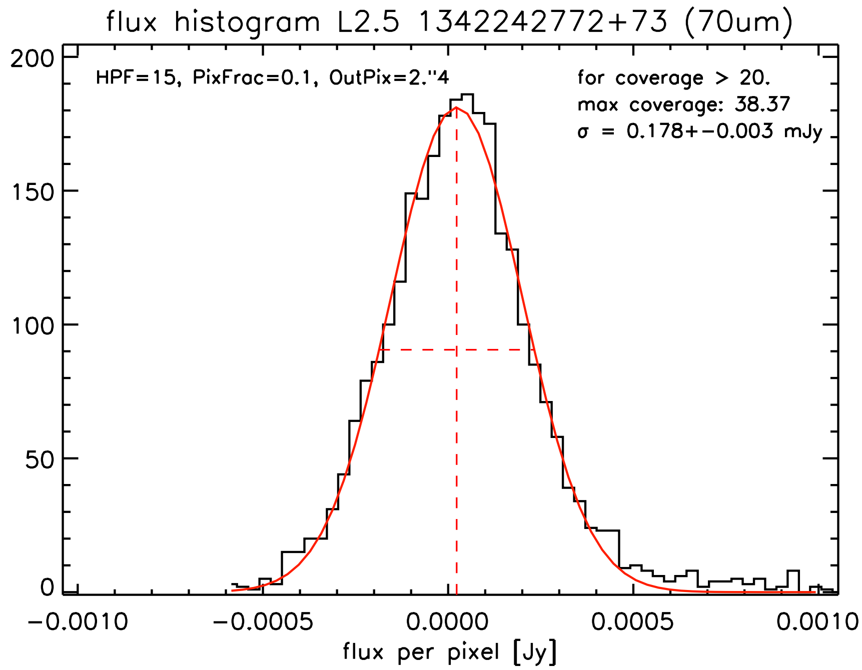

Figure 32: Noise determination for the 70 µm coadded L2.5 map of OBSIDs 1342242772+73 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\ \sigma_{\rm hist}$).

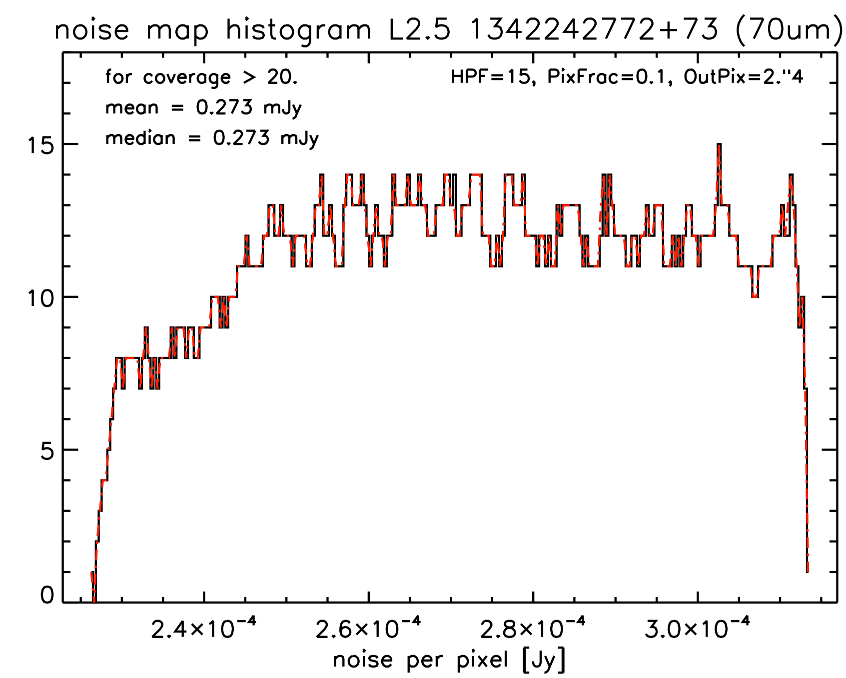

Figure 33: Histogram of the noise value distribution in the L2.5 error map above the coverage threshold indicated in the plot (in black). Mean and median value of the distribution are given. The red dashed-dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

3.5 70 µm: HPF radius 15, Pixfrac 0.1, Pixsize 3.″2

3.5.1 L 2.0 OBSID 1342242772

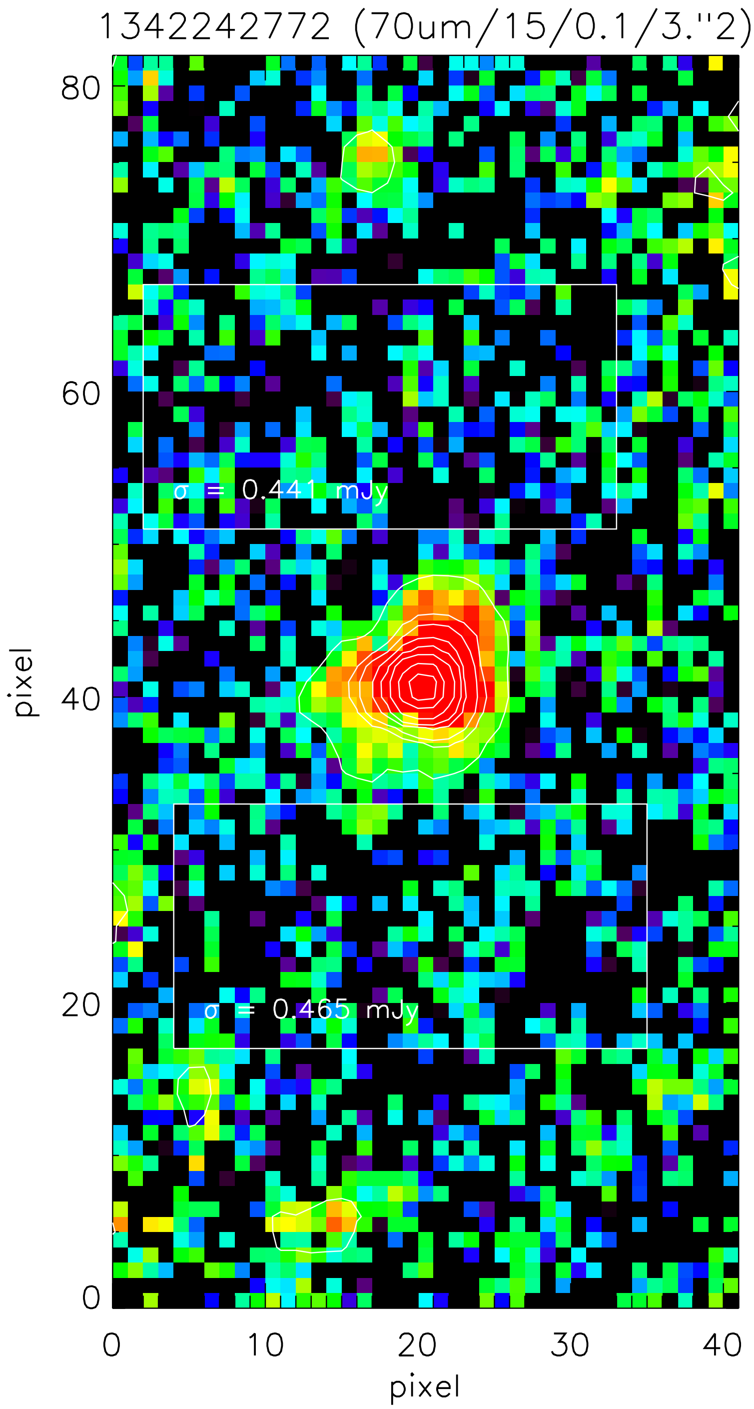

Figure 34: 70 µm L2.0 map for OBSID 1342242772 with HPF radius 15, pixfrac 0.1 and output pixel size of 3.″2. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

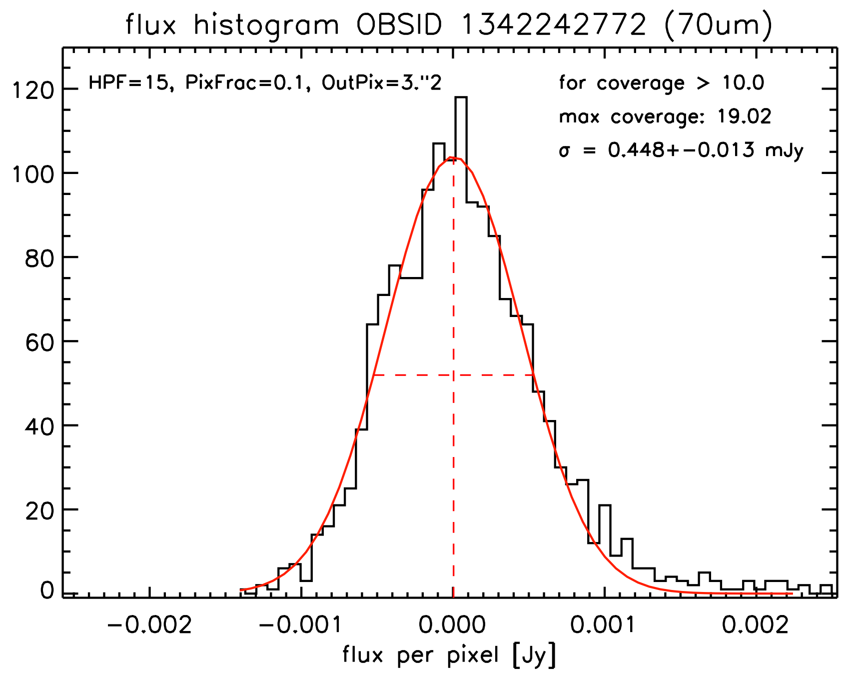

Figure 35: Noise determination for the 70 µm L2.0 map of OBSID 1342242772 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\ \sigma_{\rm hist}$).

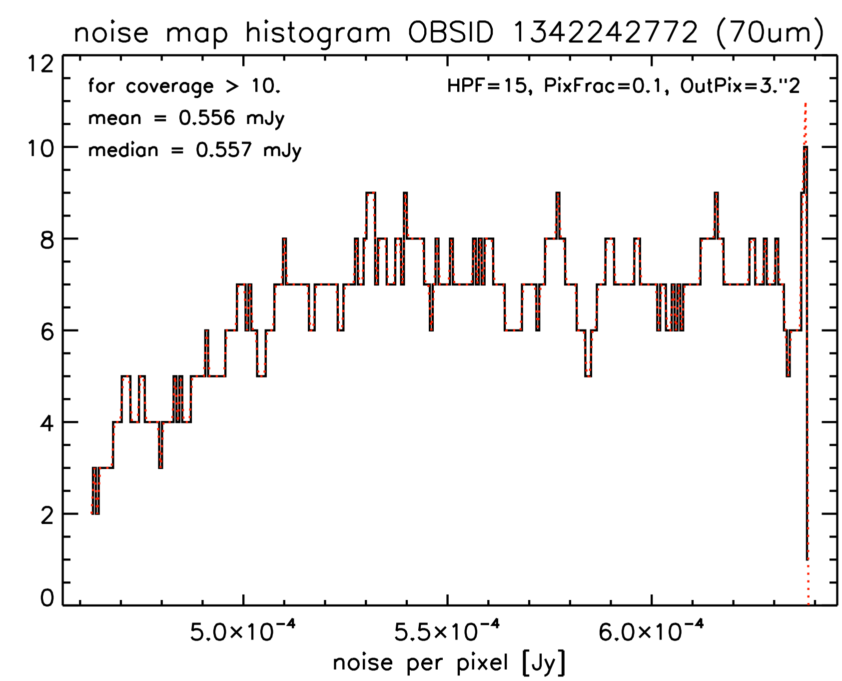

Figure 36: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

3.5.2 L 2.0 OBSID 1342242773

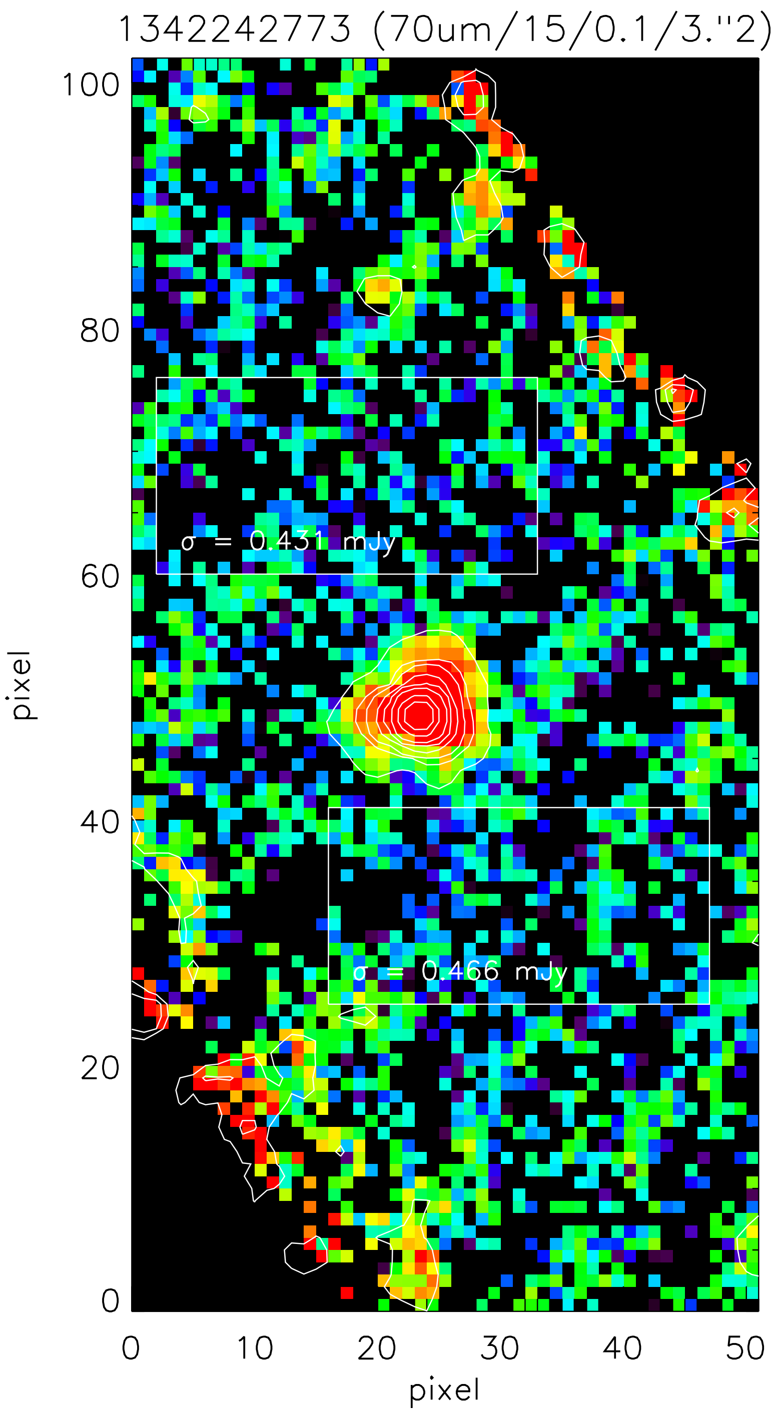

Figure 37: 70 µm L2.0 map for OBSID 1342242773 with HPF radius 15, pixfrac 0.1 and output pixel size of 3.″2. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

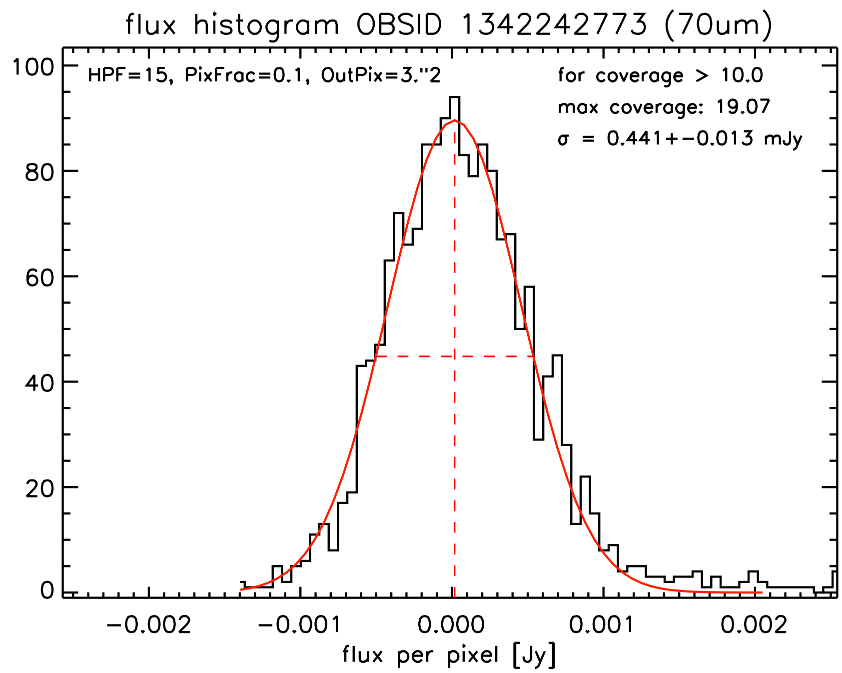

Figure 38: Noise determination for the 70 µm L2.0 map of OBSID 1342242773 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\ \sigma_{\rm hist}$).

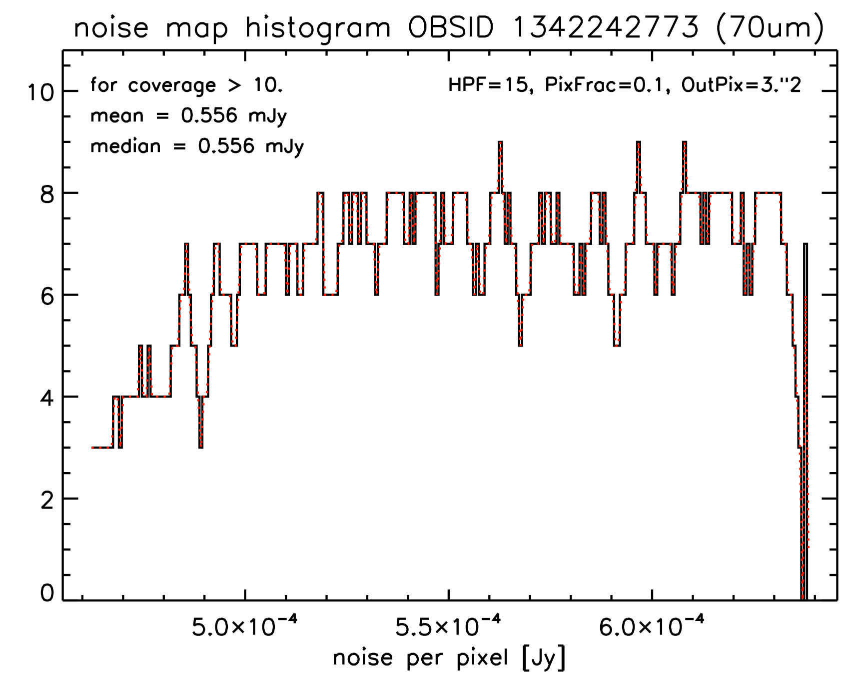

Figure 39: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

3.5.3 L 2.5 OBSIDs 1342242772+1342242773

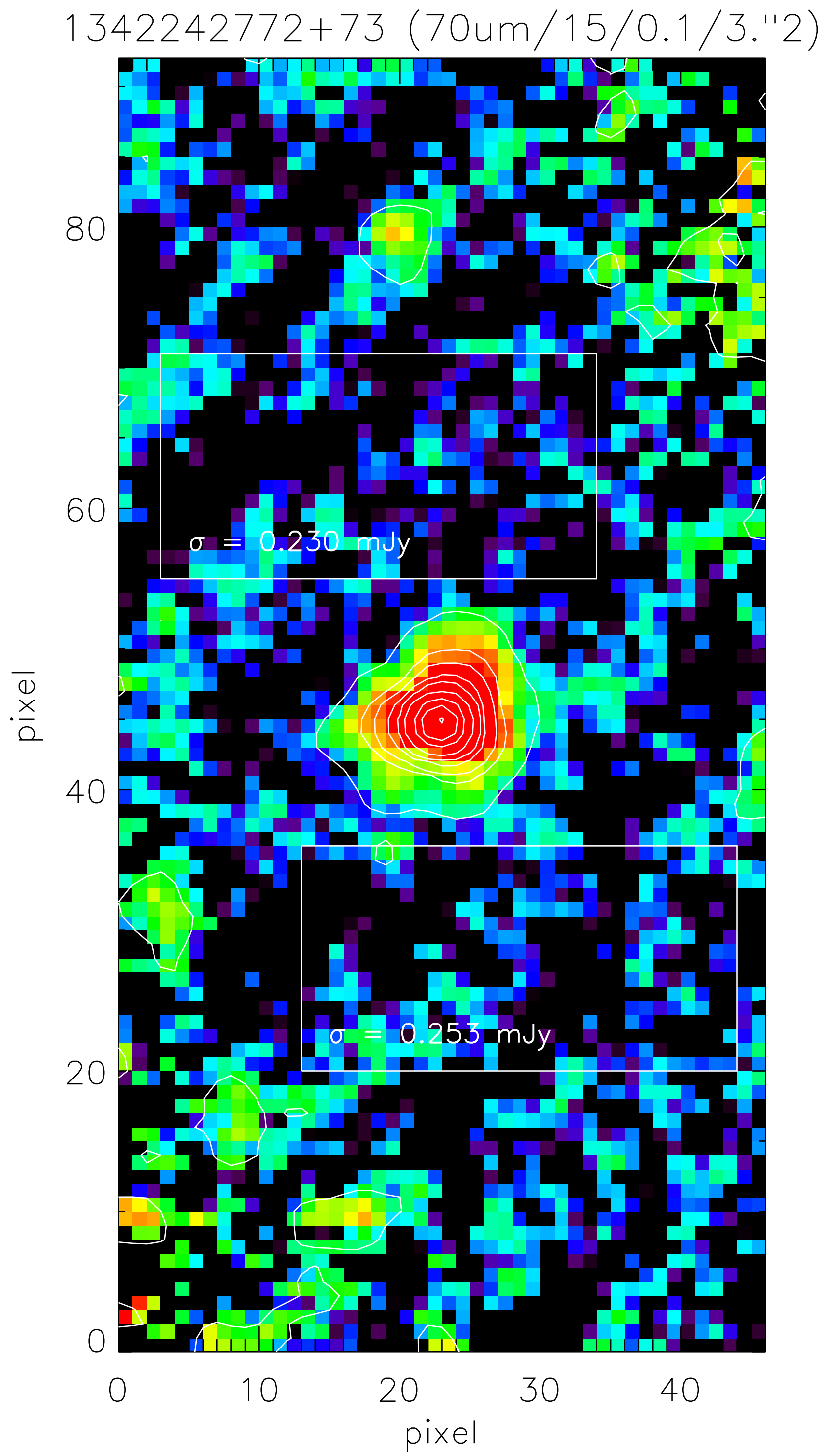

Figure 40: 70 µm L2.5 combined map for OBSIDs 1342242772+73 with HPF radius 15, pixfrac 0.1 and output pixel size of 3.″2. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

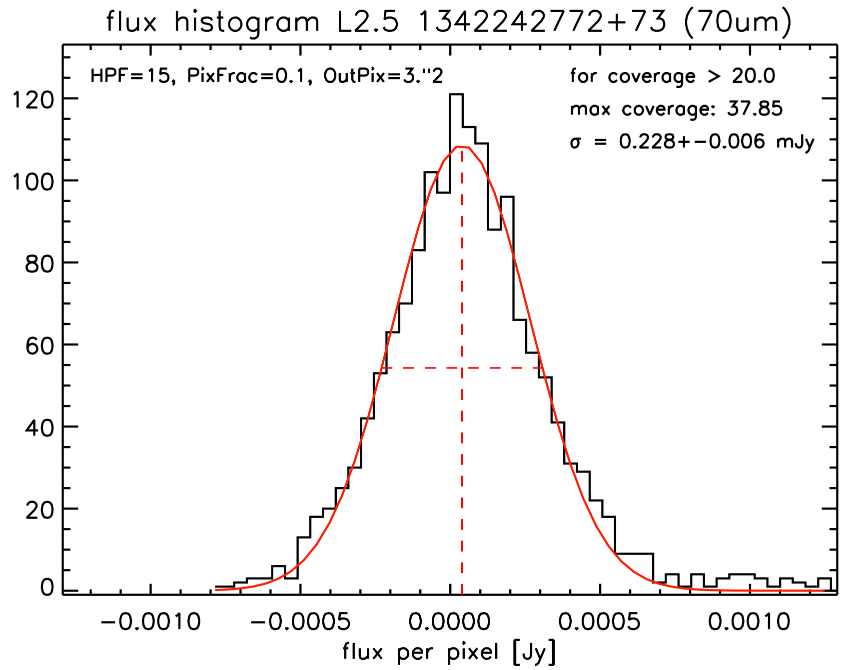

Figure 41: Noise determination for the 70 µm coadded L2.5 map of OBSIDs 1342242772+73 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

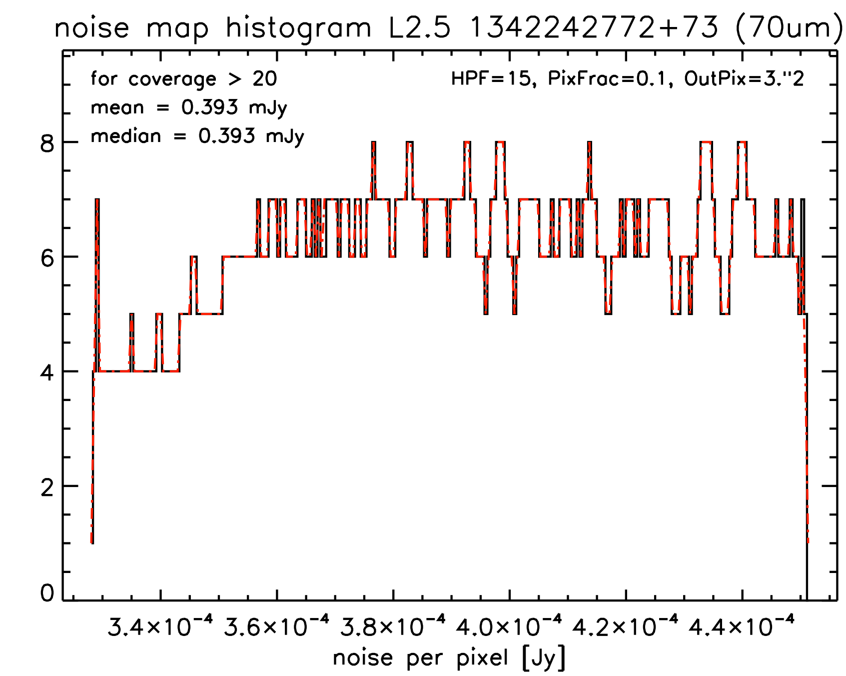

Figure 42: Histogram of the noise value distribution in the L2.5 error map above the coverage threshold indicated in the plot (in black). Mean and median value of the distribution are given. The red dashed-dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

3.6 70 µm: HPF radius 15, Pixfrac 0.5, Pixsize 1.″6

3.6.1 L 2.0 OBSID 1342242772

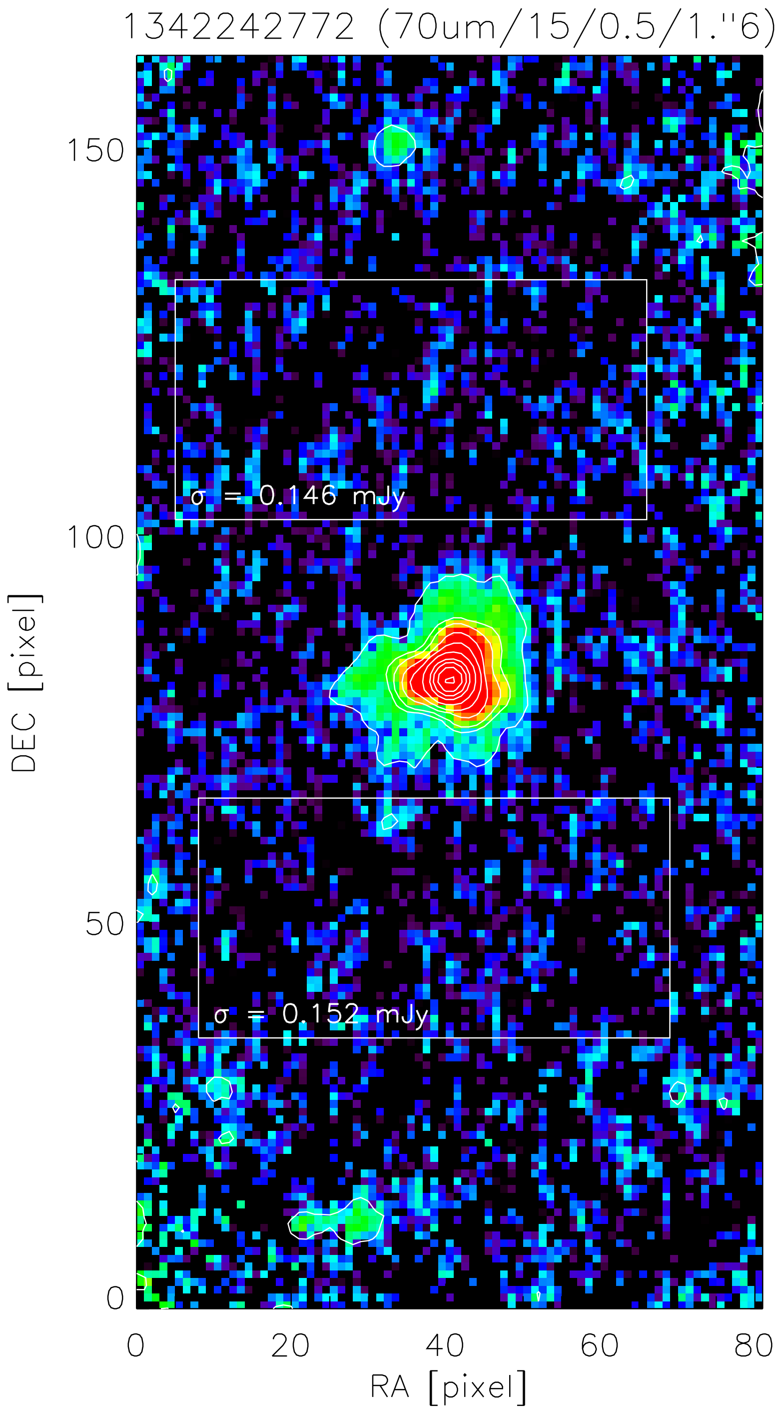

Figure 43: 70 µm L2.0 map for OBSID 1342242772 with HPF radius 15, pixfrac 0.5 and output pixel size of 1.″6. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

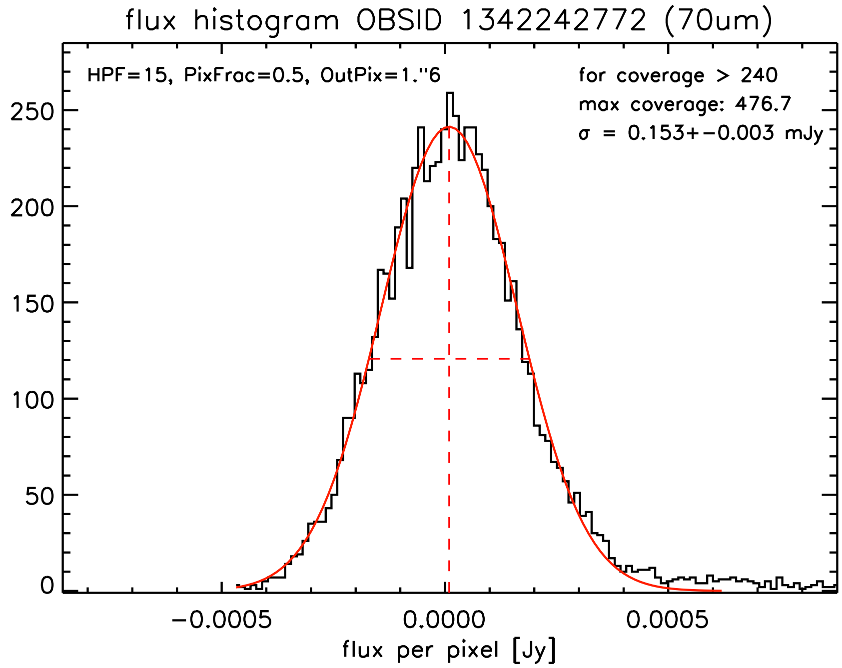

Figure 44: Noise determination for the 70 µm L2.0 map of OBSID 1342242772 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

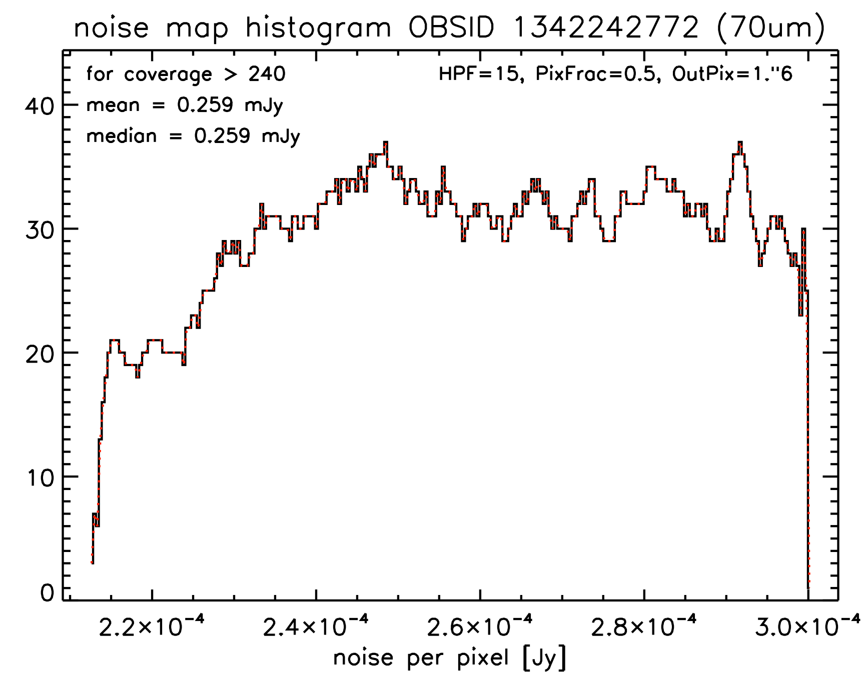

Figure 45: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

3.6.2 L 2.0 OBSID 1342242773

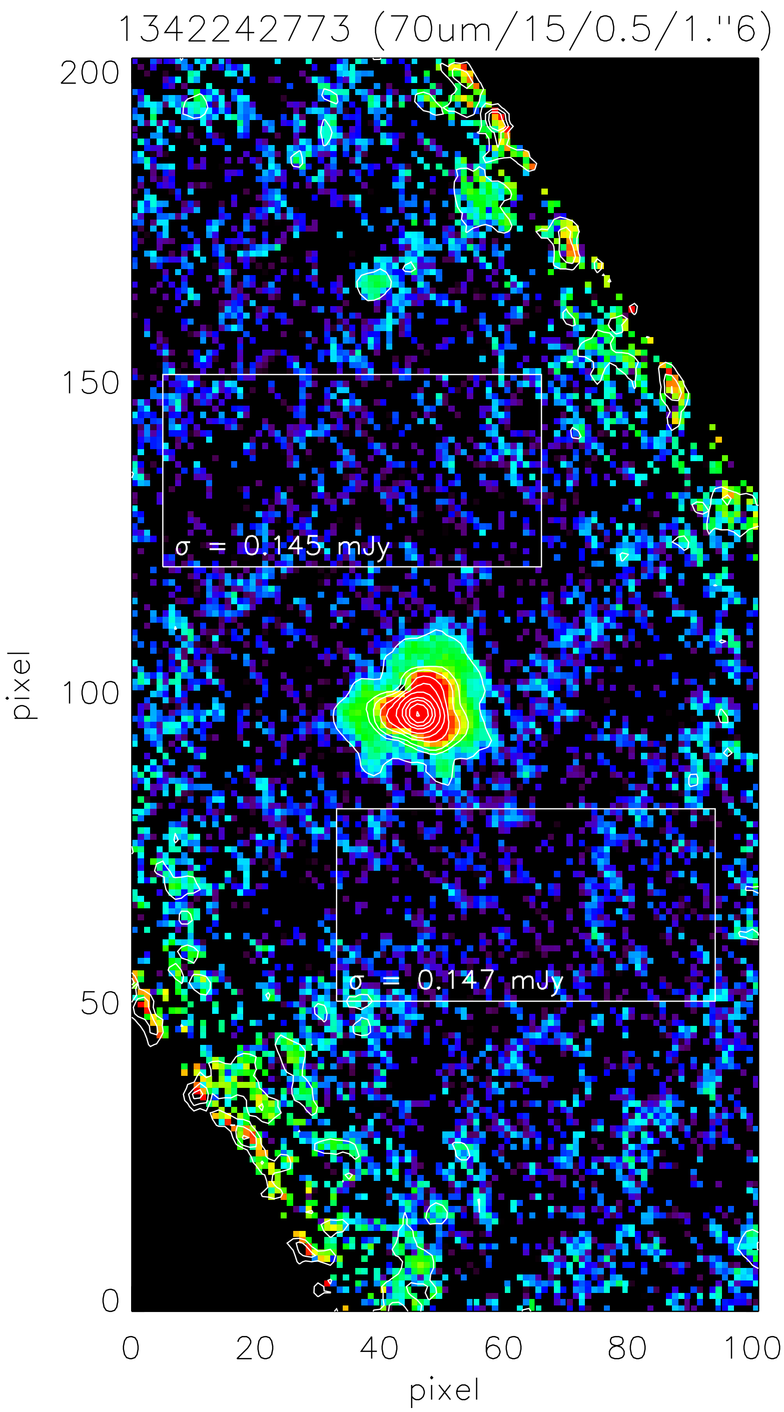

Figure 46: 70 µm L2.0 map for OBSID 1342242773 with HPF radius 15, pixfrac 0.5 and an output pixels size of 1.″6. The two background fields for noise determination are outlined by the white boxes and the σ is indicated.

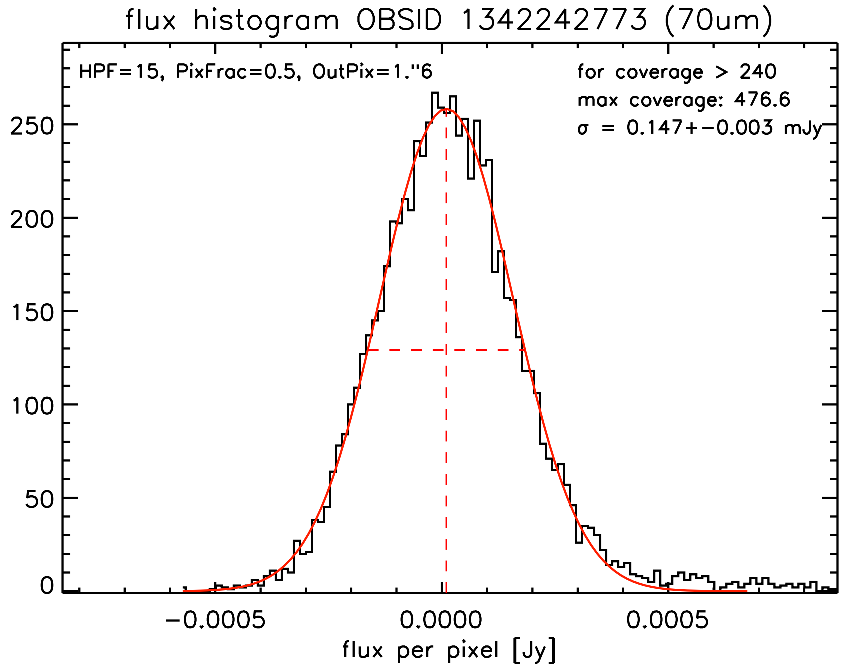

Figure 47: Noise determination for the 70 µm L2.0 map of OBSID 1342242773 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\ \sigma_{\rm hist}$).

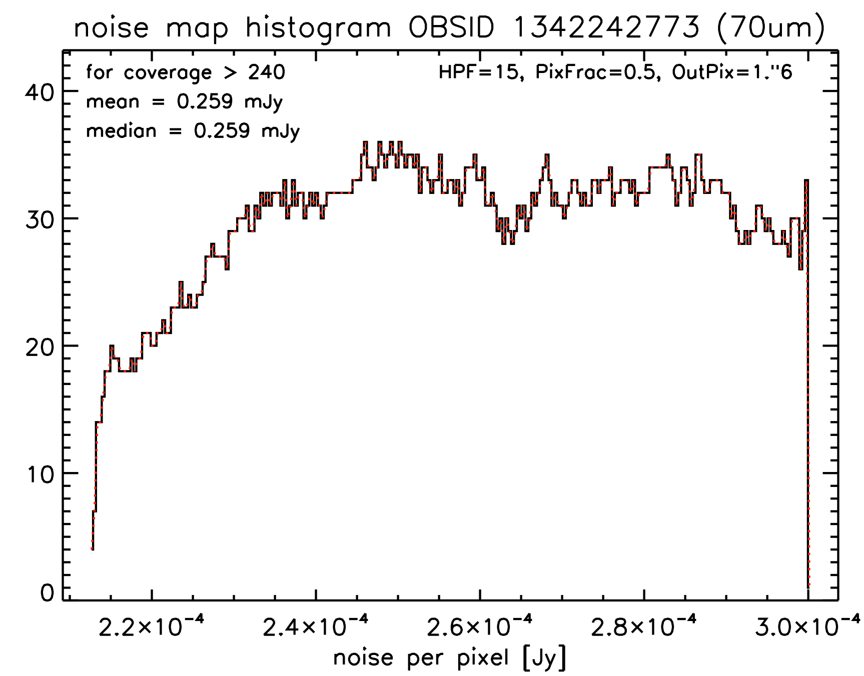

Figure 48: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

3.6.3 L 2.5 OBSIDs 1342242772+1342242773

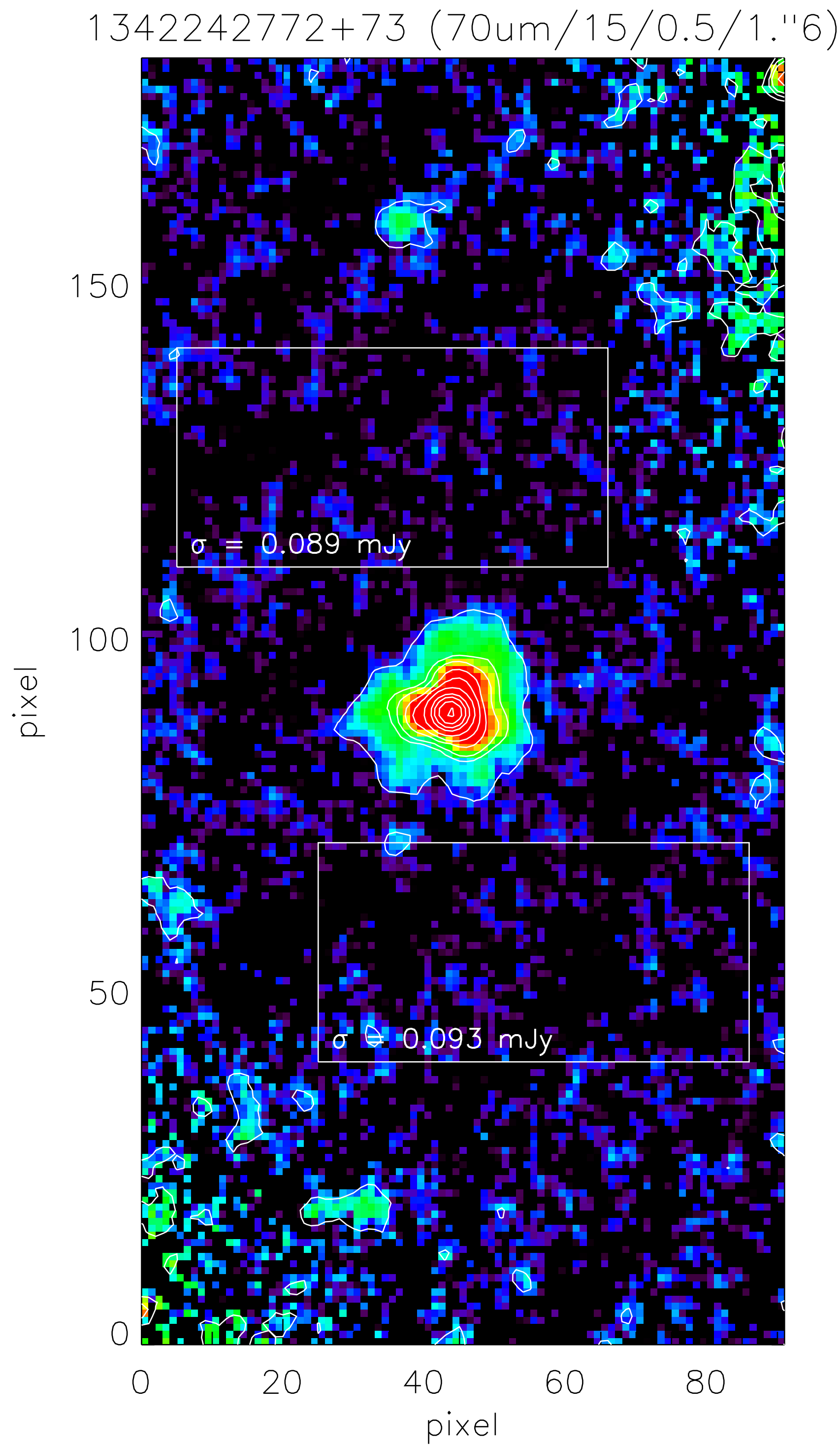

Figure 49: 70 µm L2.5 combined map for OBSIDs 1342242772+73 with HPF radius 15, pixfrac 0.5 and output pixel size of 1.″6. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

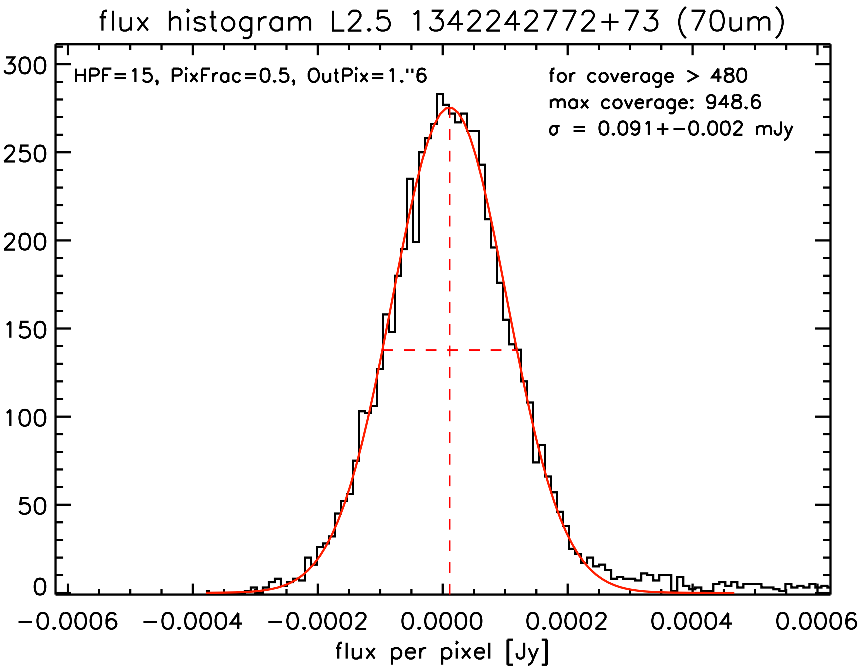

Figure 50: Noise determination for the 70 µm coadded L2.5 map of OBSIDs 1342242772+73 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

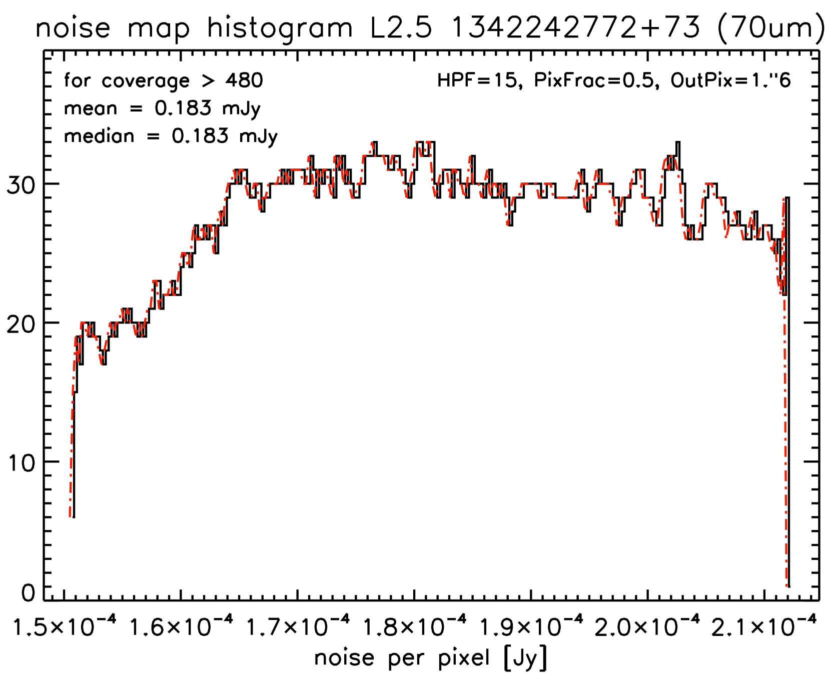

Figure 51: Histogram of the noise value distribution in the L2.5 error map above the coverage threshold indicated in the plot (in black). Mean and median value of the distribution are given. The red dashed-dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

3.7 70 µm: HPF radius 15, Pixfrac 1.0, Pixsize 1.″1

3.7.1 L 2.0 OBSID 1342242772

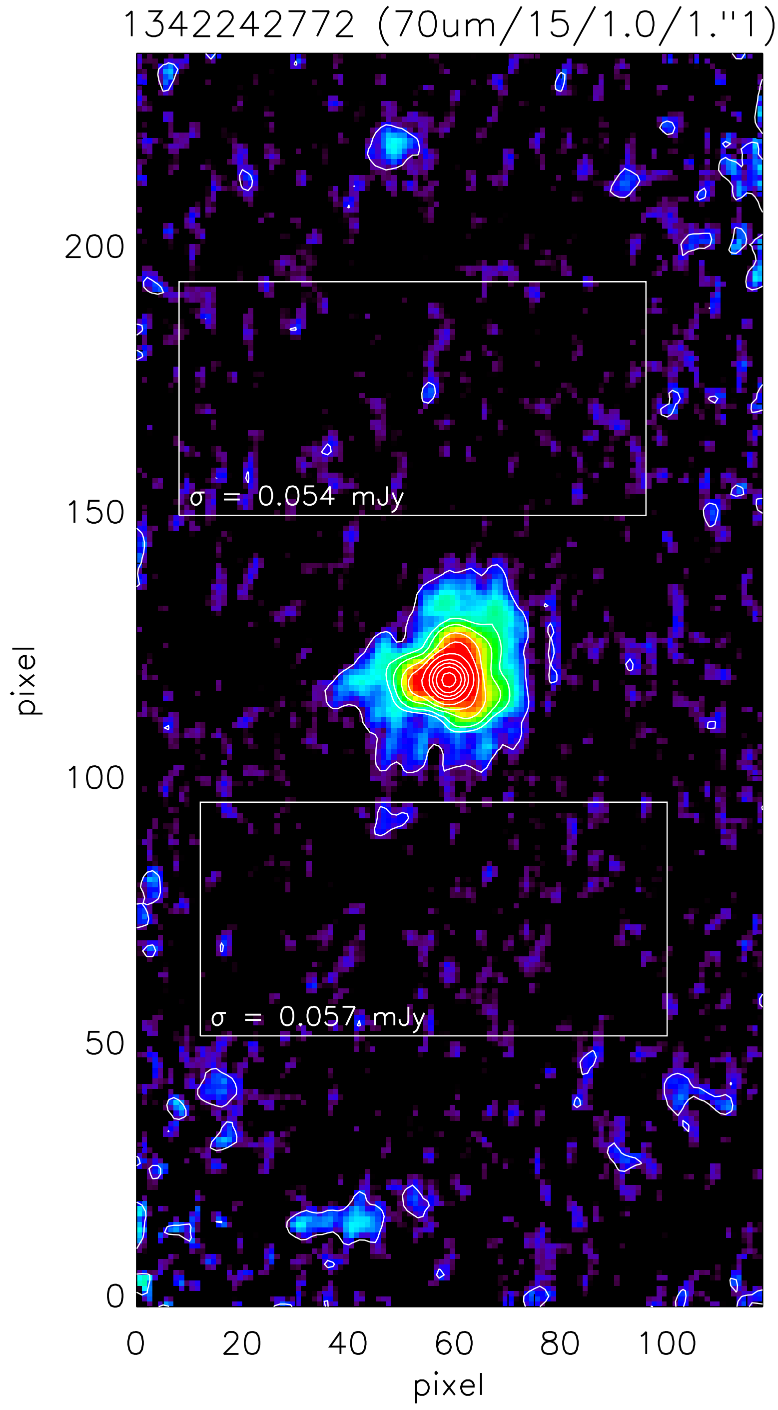

Figure 52: 70 µm L2.0 map for OBSID 1342242772 with HPF radius 15, pixfrac 1.0 and output pixel size of 1.″1. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

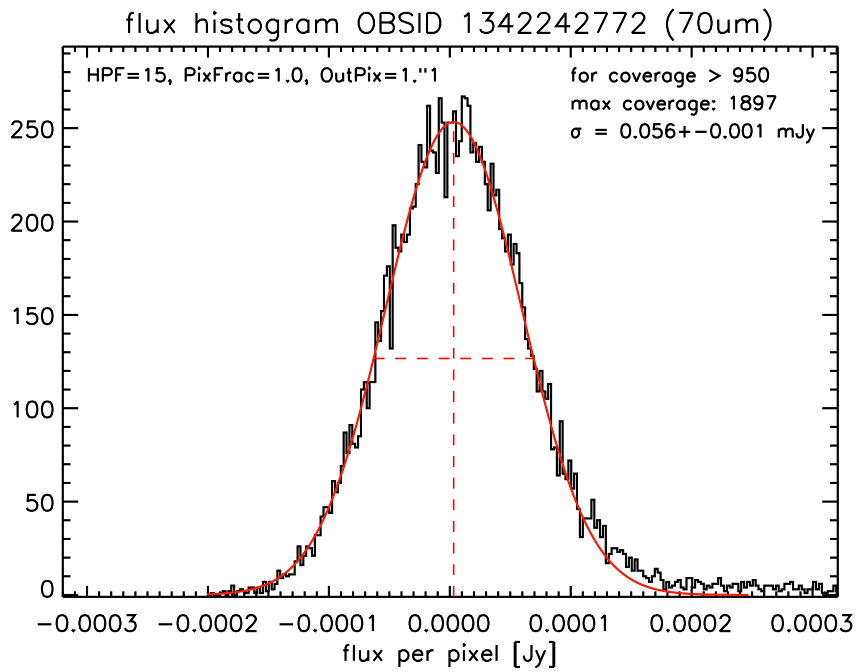

Figure 53: Noise determination for the 70 µm L2.0 map of OBSID 1342242772 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\ \sigma_{\rm hist}$).

For this map parameter combination no error map analysis was done.

3.7.2 L 2.0 OBSID 1342242773

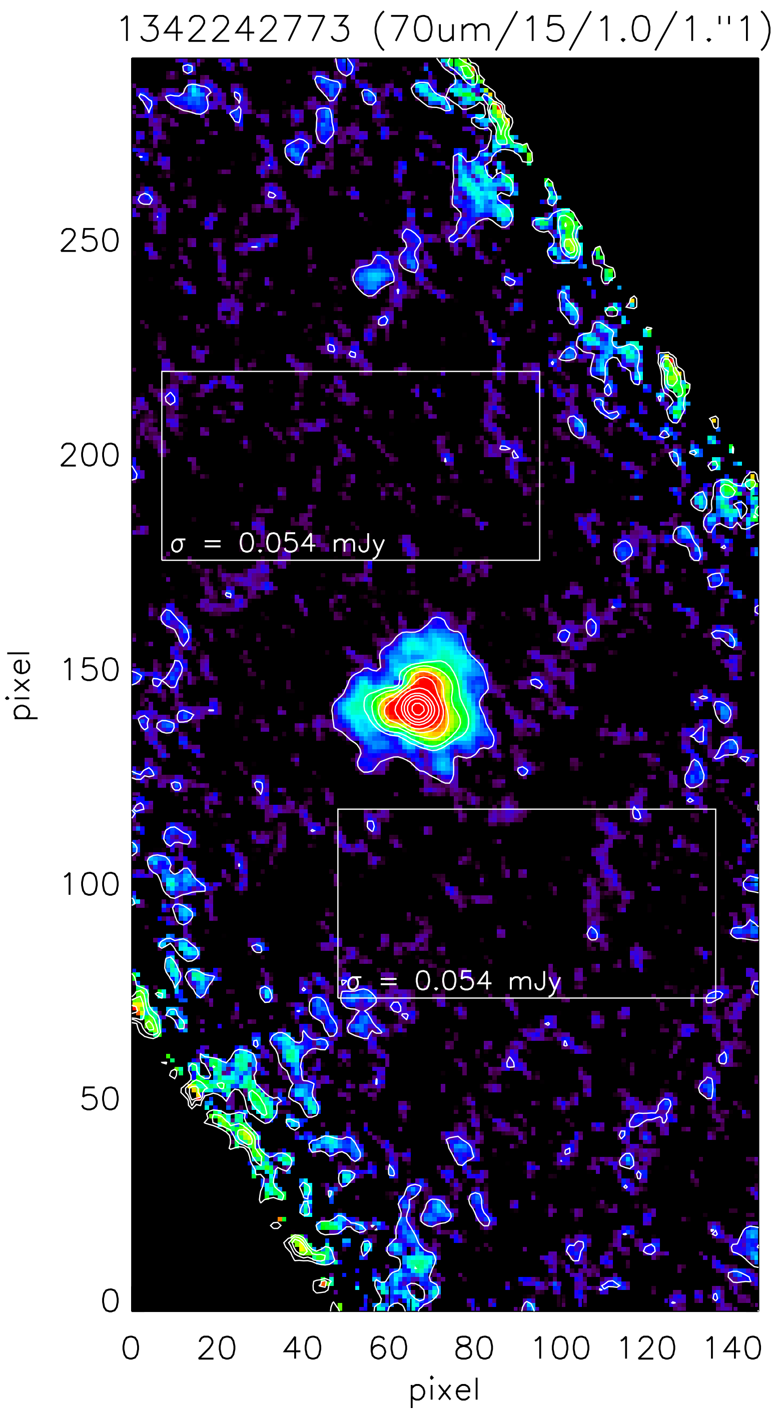

Figure 54: 70 µm L2.0 map for OBSID 1342242773 with HPF radius 15, pixfrac 1.0 and output pixel size of 1.″1. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

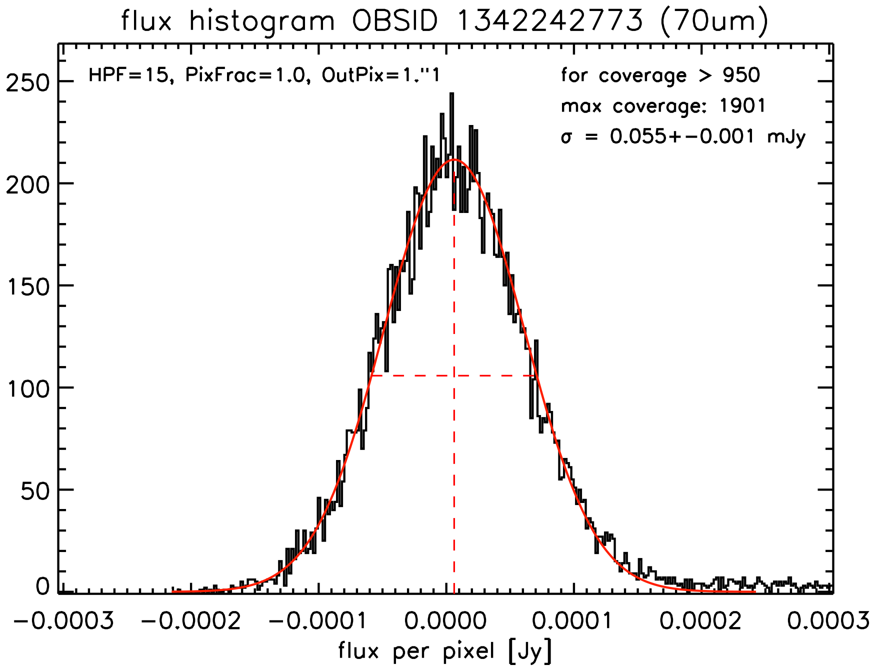

Figure 55: Noise determination for the 70 µm L2.0 map of OBSID 1342242773 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

For this map parameter combination no error map analysis was done.

3.7.3 L 2.5 OBSIDs 1342242772+1342242773

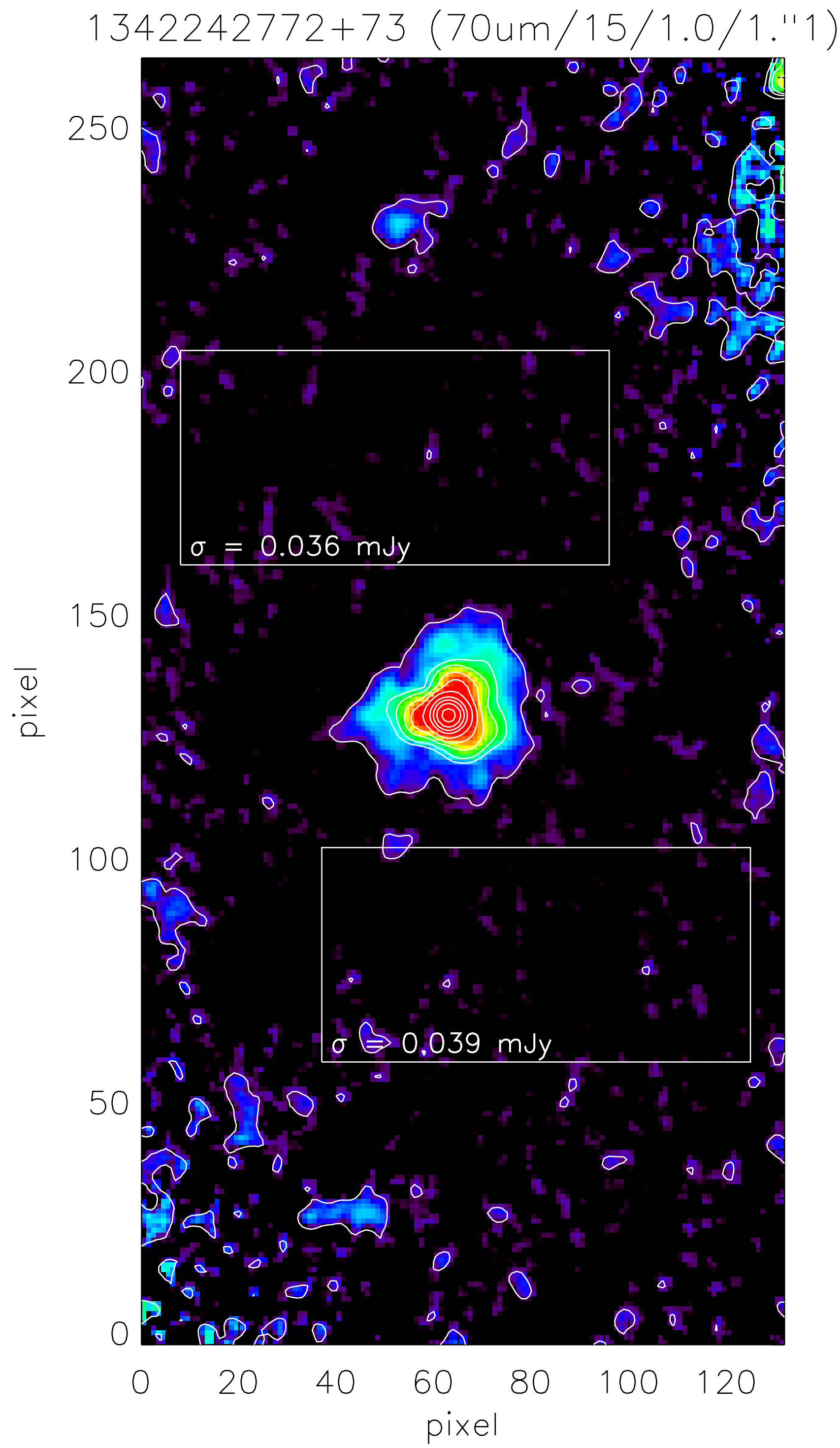

Figure 56: 70 µm L2.5 combined map for OBSIDs 1342242772+73 with HPF radius 15, pixfrac 1.0 and output pixel size of 1.″1 (SPG product parameter set). The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

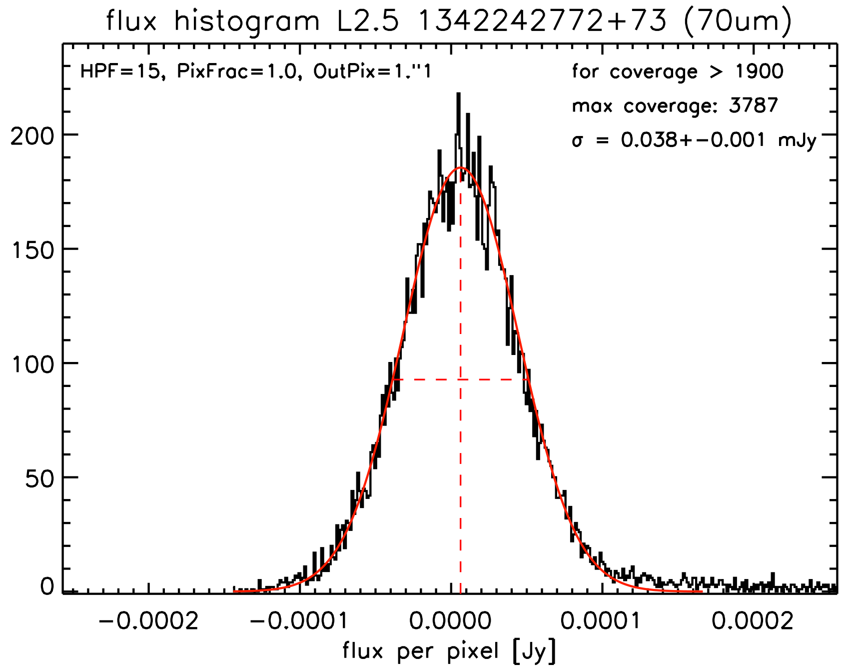

Figure 57: Noise determination for the 70 µm coadded L2.5 map of OBSIDs 1342242772+73 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

For this map parameter combination no error map analysis was done.

3.8 70 µm: HPF radius 15, Pixfrac 1.0, Pixsize 1.″6

3.8.1 L 2.0 OBSID 1342242772

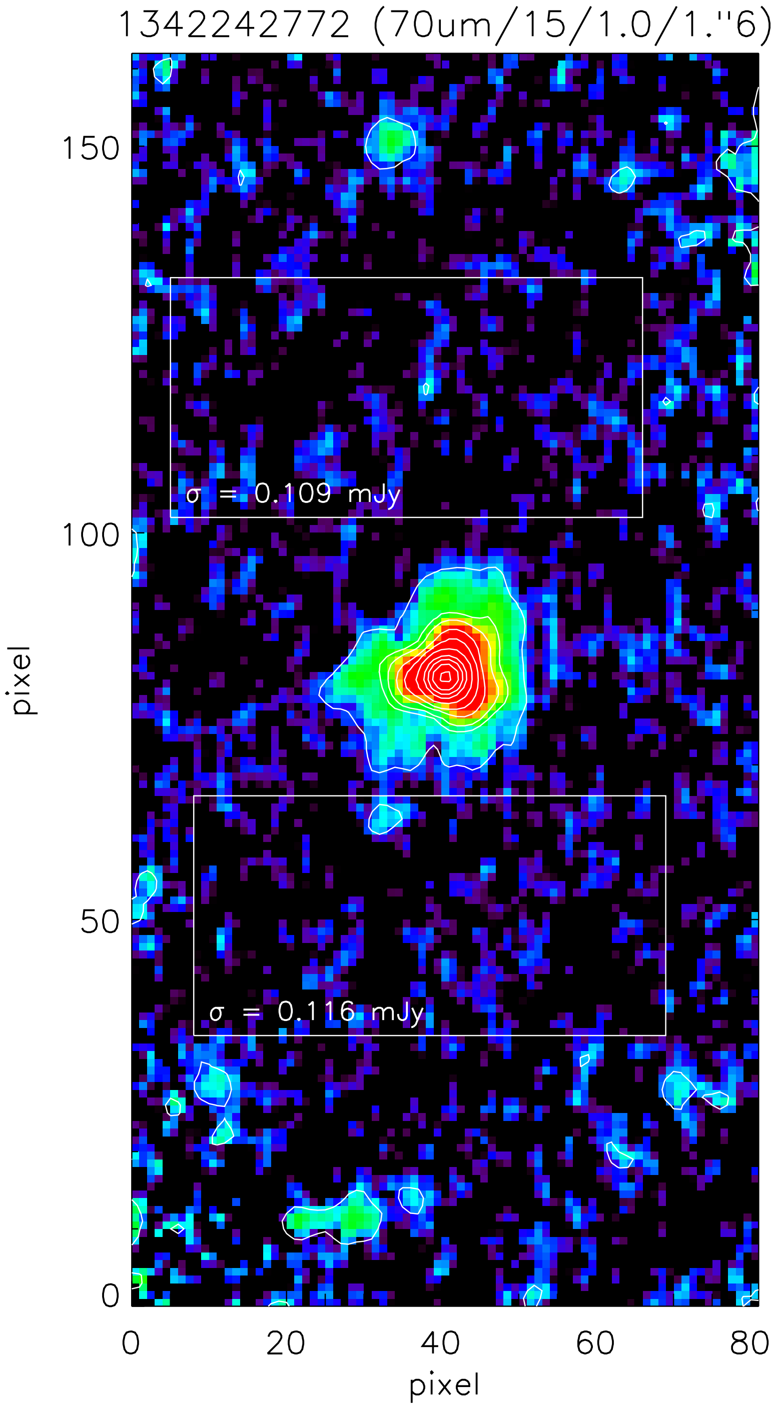

Figure 58: 70 µm L2.0 map for OBSID 1342242772 with HPF radius 15, pixfrac 1.0 and output pixel size of 1.″6. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

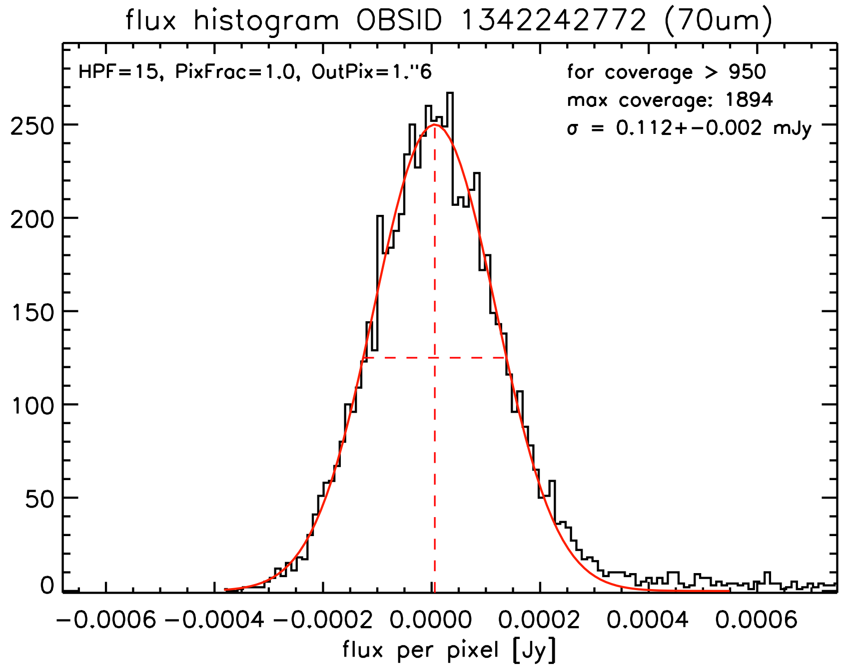

Figure 59: Noise determination for the 70 µm L2.0 map of OBSID 1342242772 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\ \sigma_{\rm hist}$).

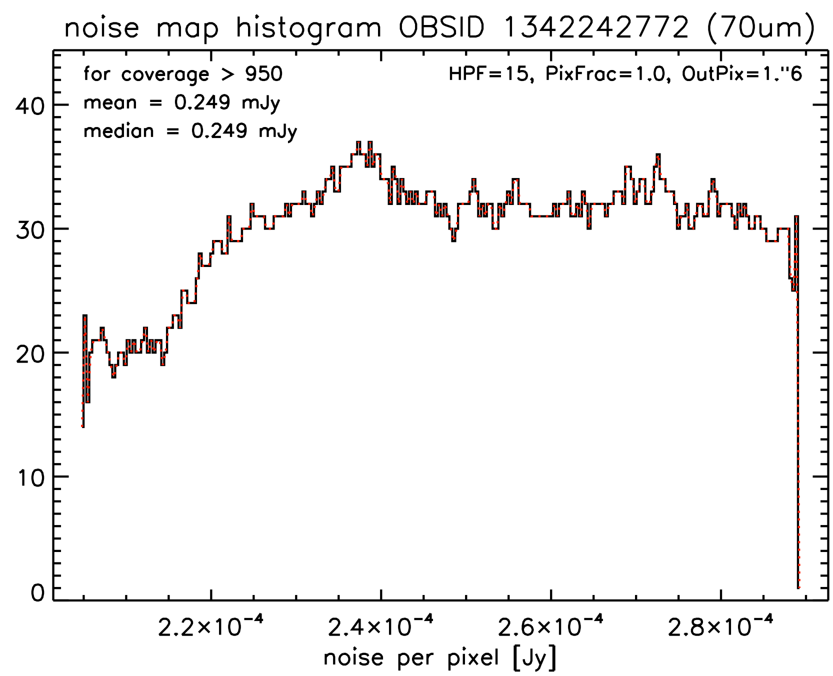

Figure 60: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

3.8.2 L 2.0 OBSID 1342242773

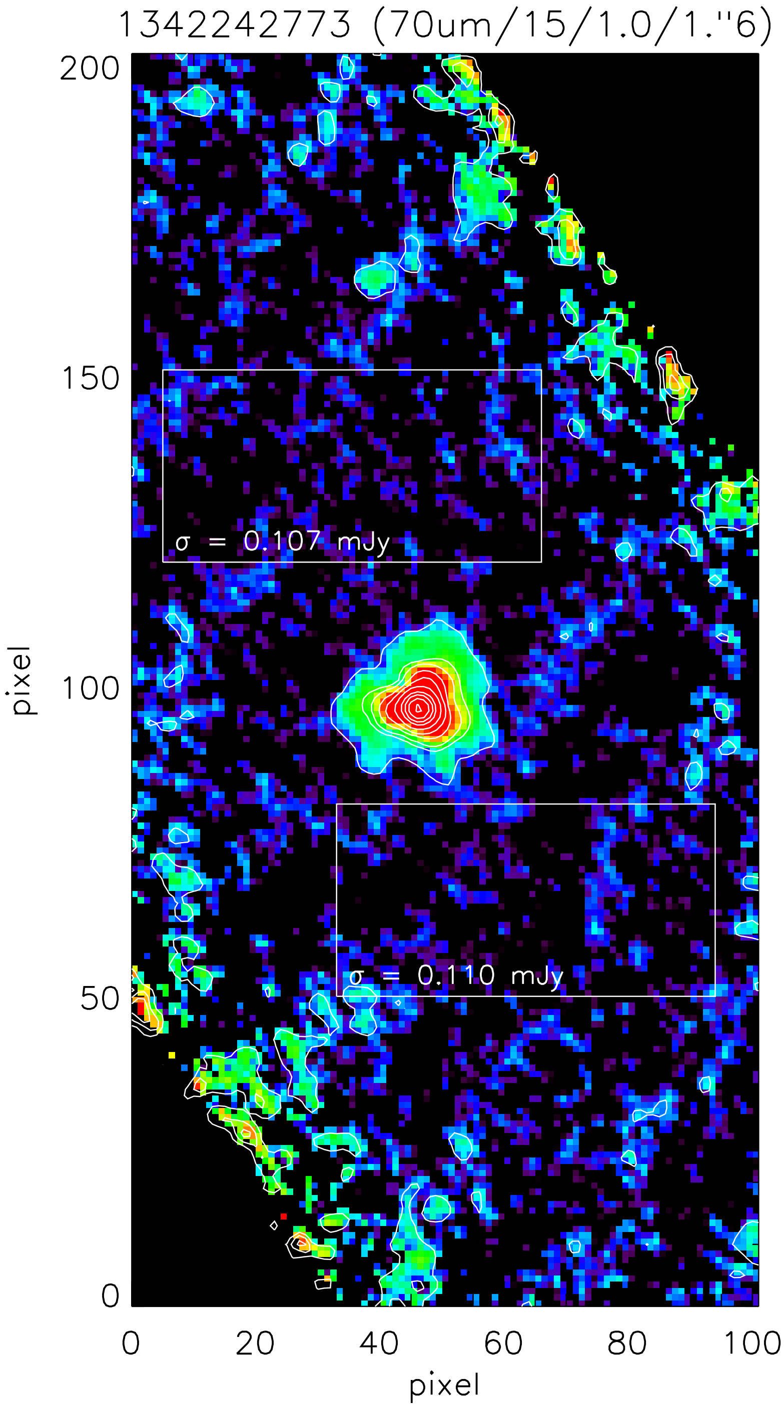

Figure 61: 70 µm L2.0 map for OBSID 1342242773 with HPF radius 15, pixfrac 1.0 and an output pixels size of 1.″6. The two background fields for noise determination are outlined by the white boxes and the σ is indicated.

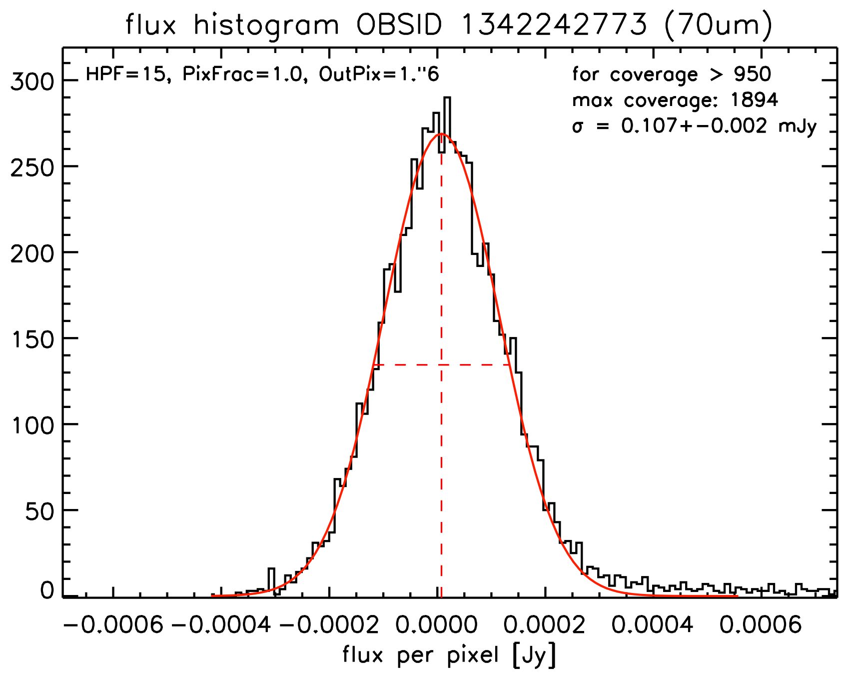

Figure 62: Noise determination for the 70 µm L2.0 map of OBSID 1342242773 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\ \sigma_{\rm hist}$).

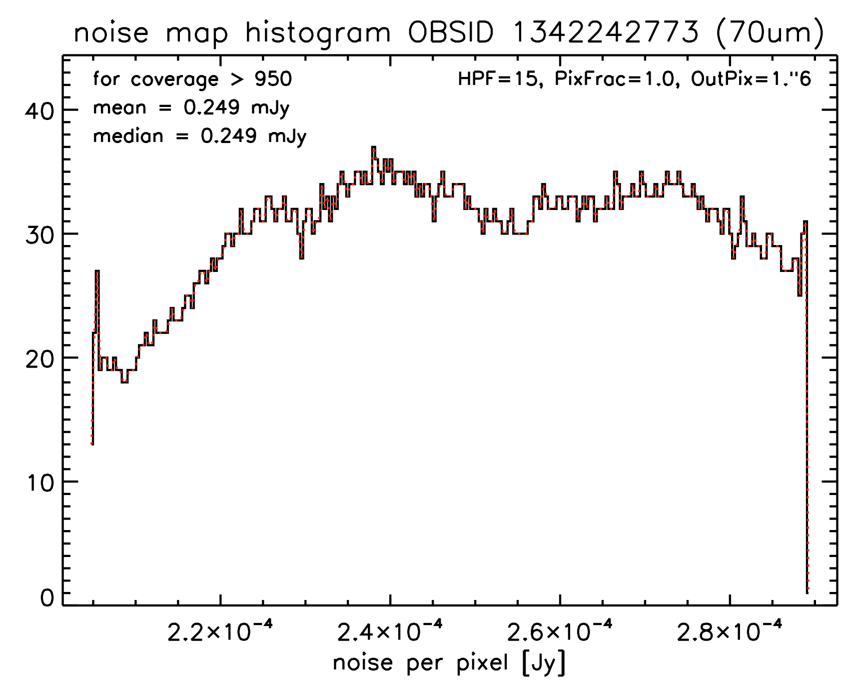

Figure 63: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

3.8.3 L 2.5 OBSIDs 1342242772+1342242773

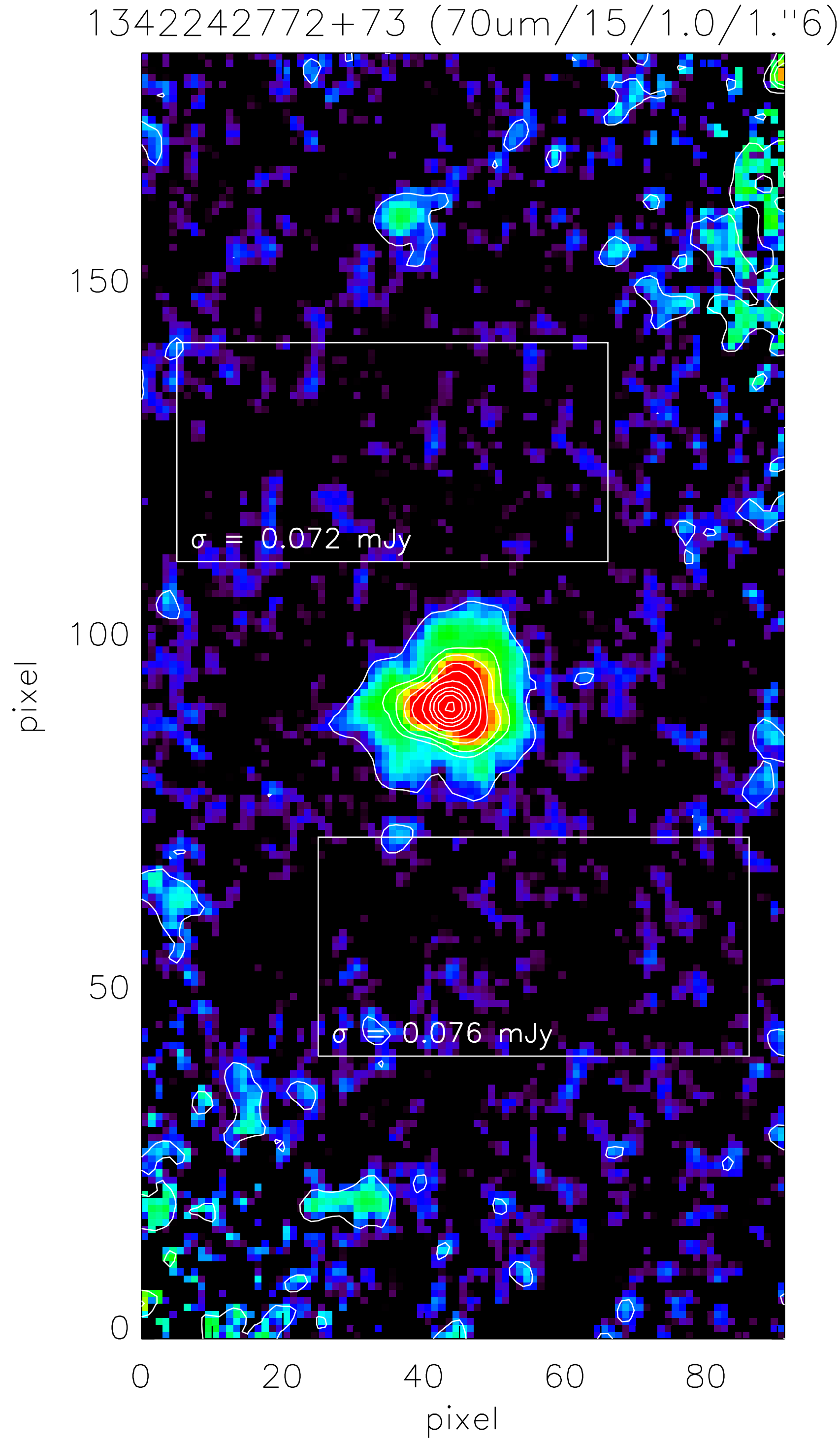

Figure 64: 70 µm L2.5 combined map for OBSIDs 1342242772+73 with HPF radius 15, pixfrac 1.0 and output pixel size of 1.″6. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

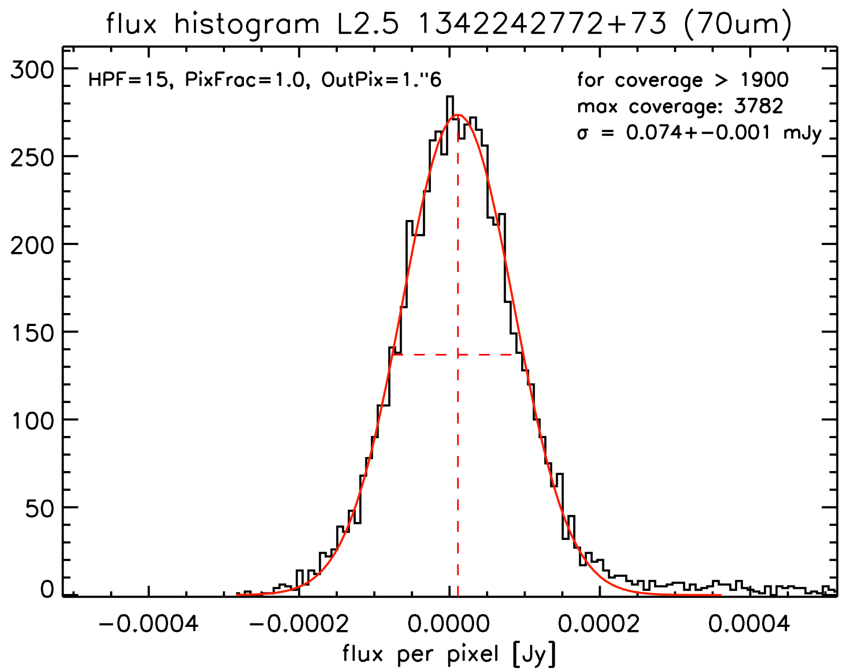

Figure 65: Noise determination for the 70 µm coadded L2.5 map of OBSIDs 1342242772+73 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

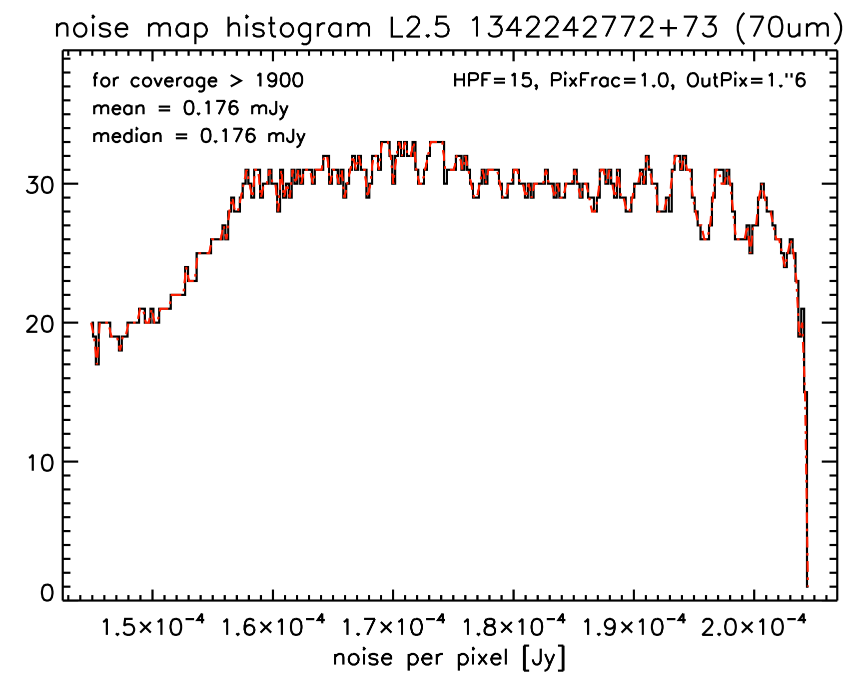

Figure 66: Histogram of the noise value distribution in the L2.5 error map above the coverage threshold indicated in the plot (in black). Mean and median value of the distribution are given. The red dashed-dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

3.9 70 µm: HPF radius 30, Pixfrac 1.0, Pixsize 1.″6

3.9.1 L 2.0 OBSID 1342242772

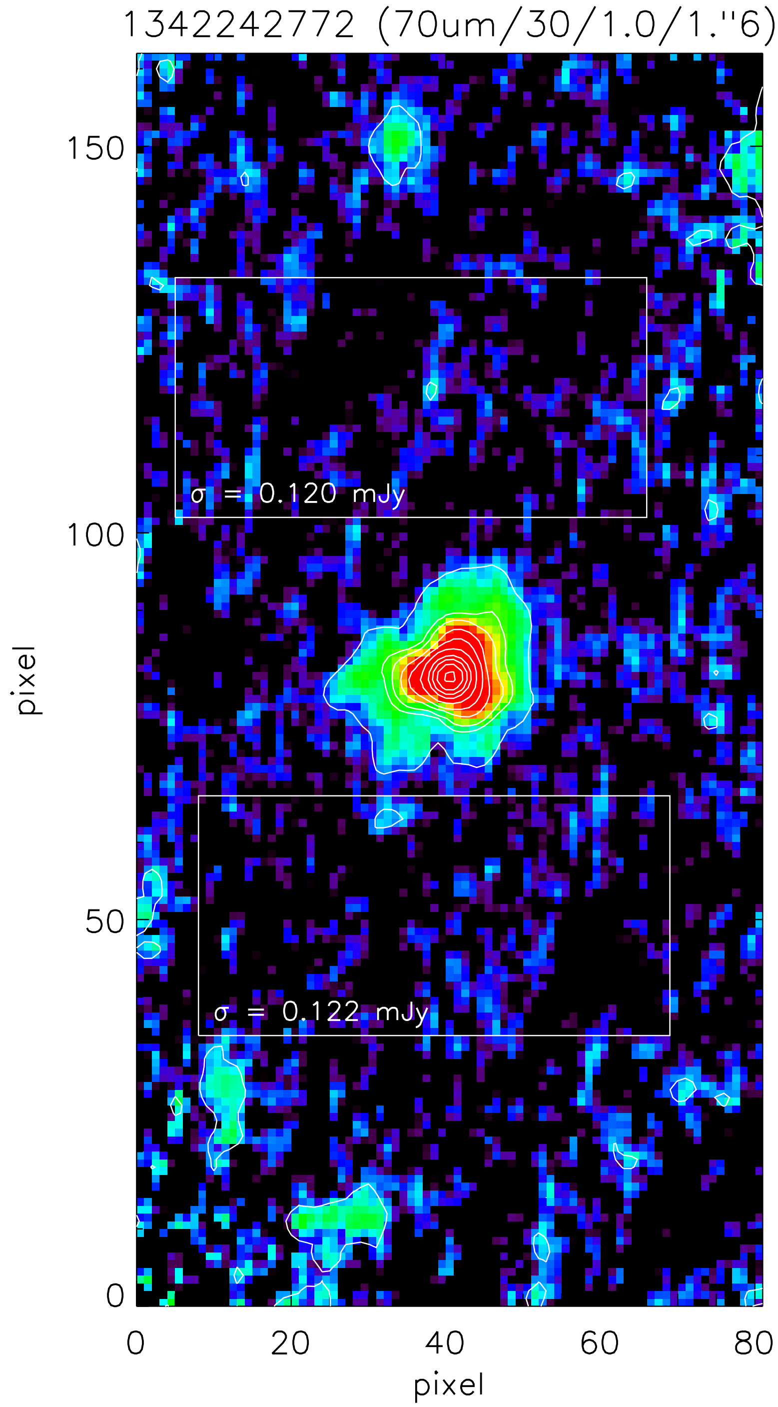

Figure 67: 70 µm L2.0 map for OBSID 1342242772 with HPF radius 30, pixfrac 1.0 and output pixel size of 1.″6. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

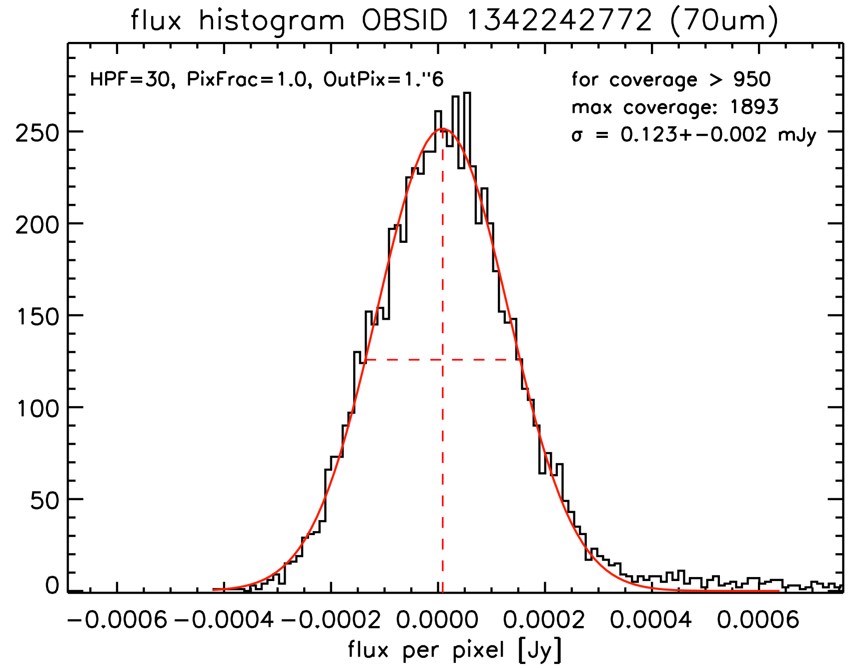

Figure 68: Noise determination for the 70 µm L2.0 map of OBSID 1342242772 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

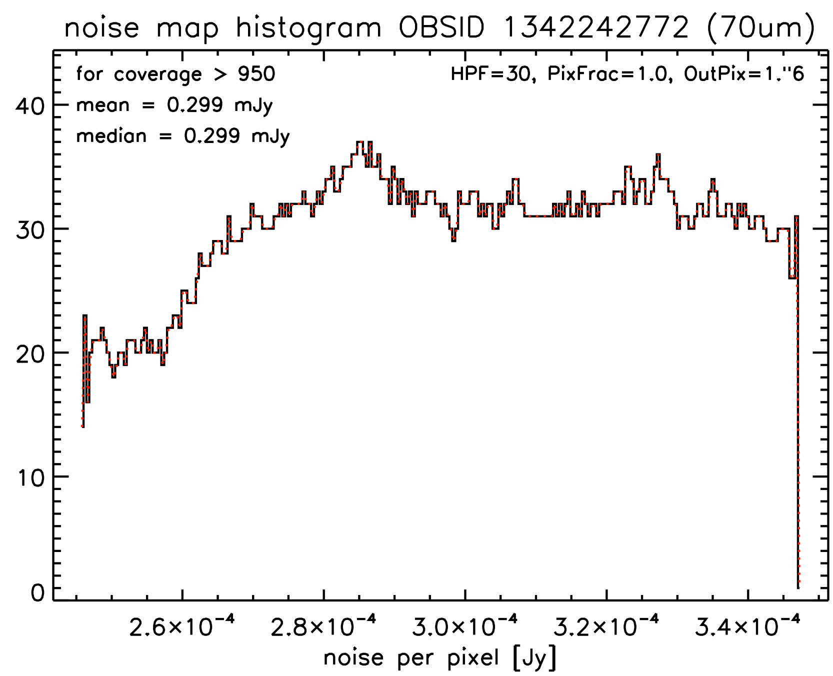

Figure 69: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

3.9.2 L 2.0 OBSID 1342242773

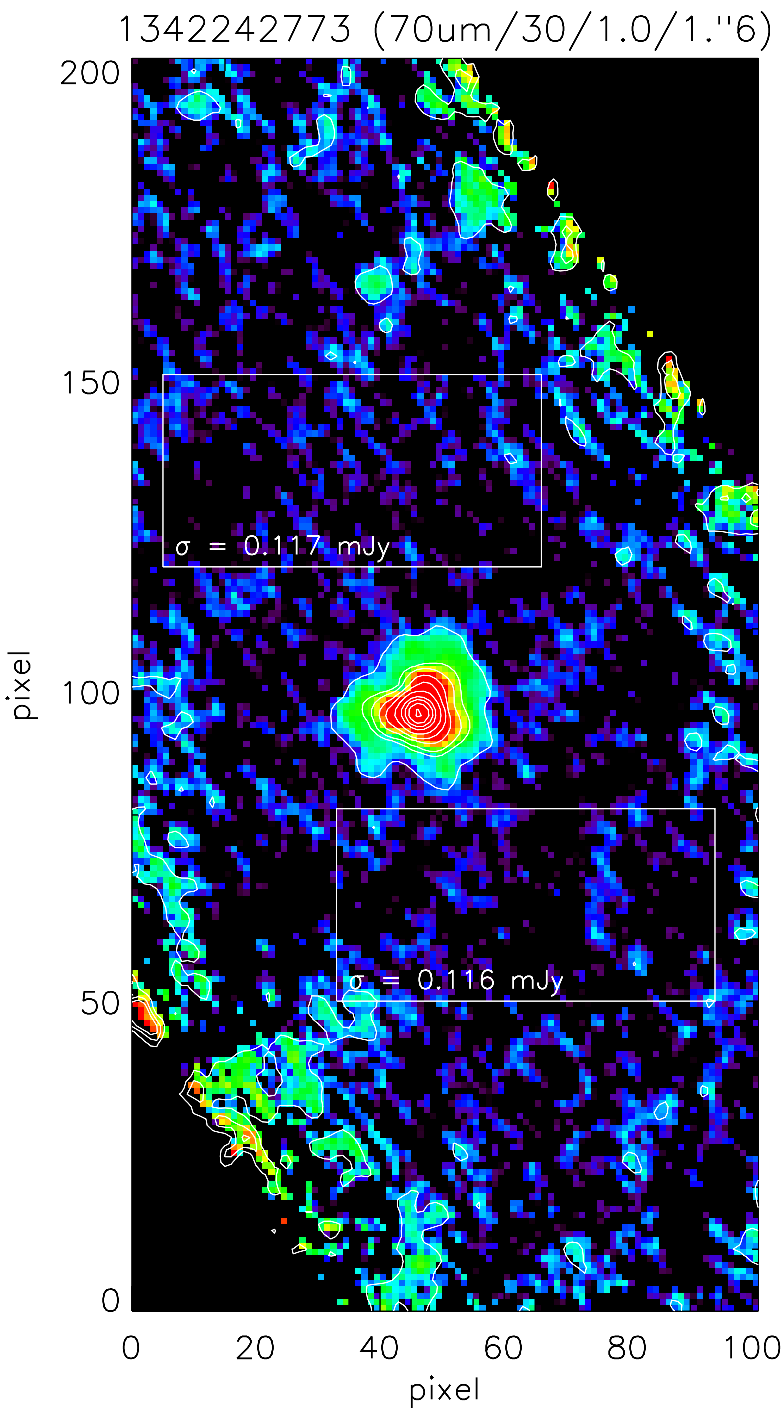

Figure 70: 70 µm L2.0 map for OBSID 1342242773 with HPF radius 30, pixfrac 1.0 and output pixel size of 1.″6. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

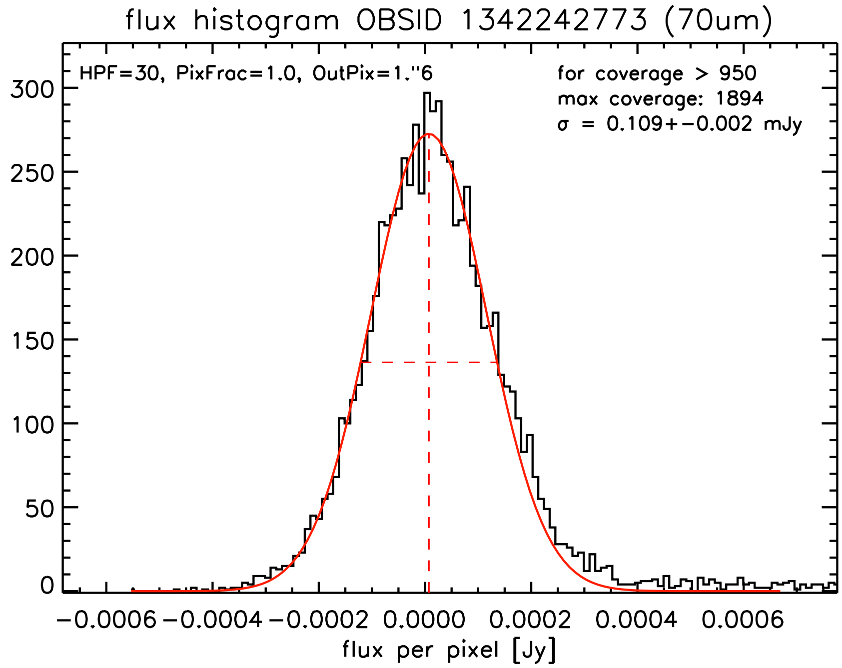

Figure 71: Noise determination for the 70 µm L2.0 map of OBSID 1342242773 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

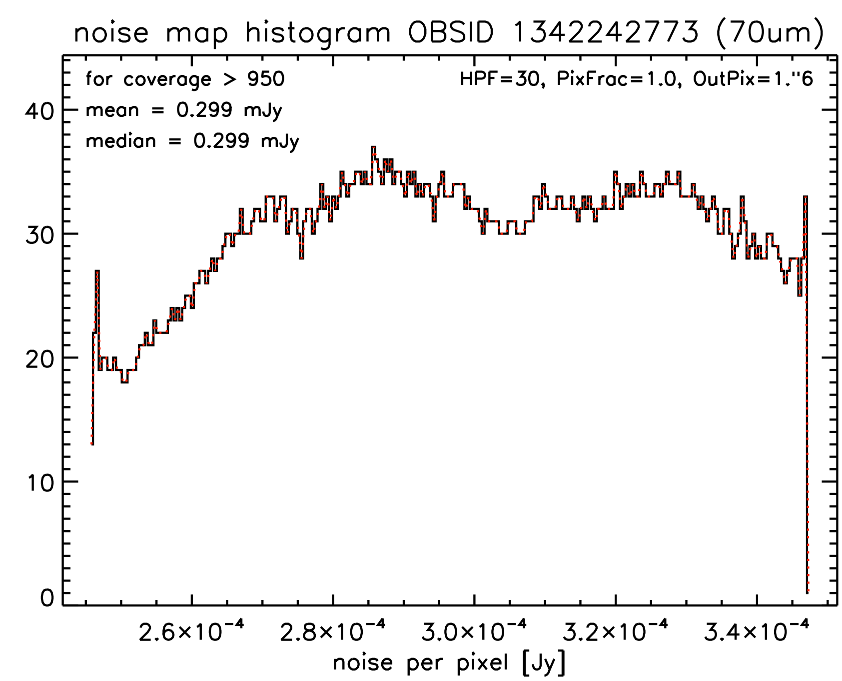

Figure 72: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

3.9.3 L 2.5 OBSIDs 1342242772+1342242773

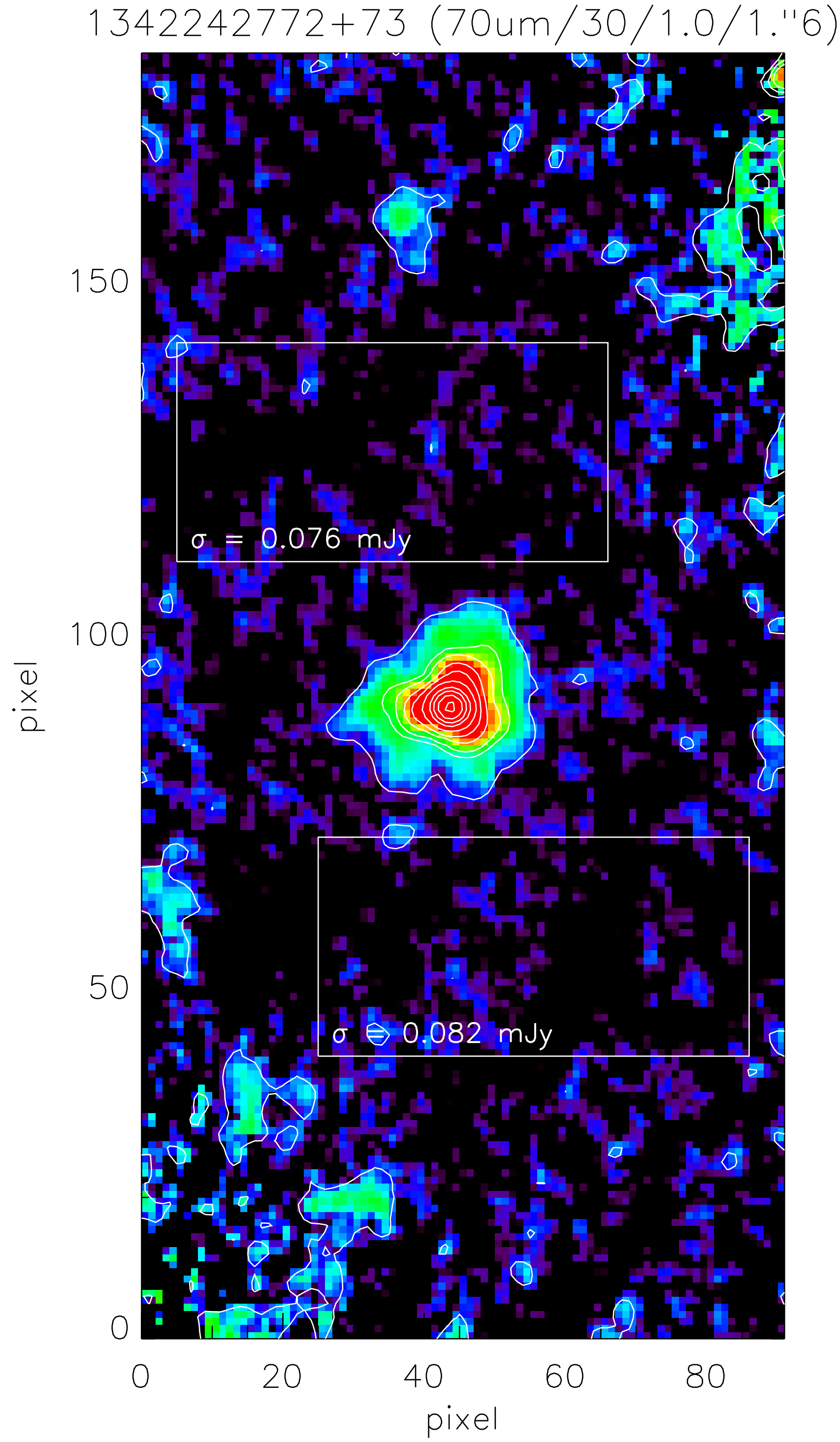

Figure 73: 70 µm L2.5 combined map for OBSIDs 1342242772+73 with HPF radius 30, pixfrac 1.0 and output pixel size of 1.″6. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

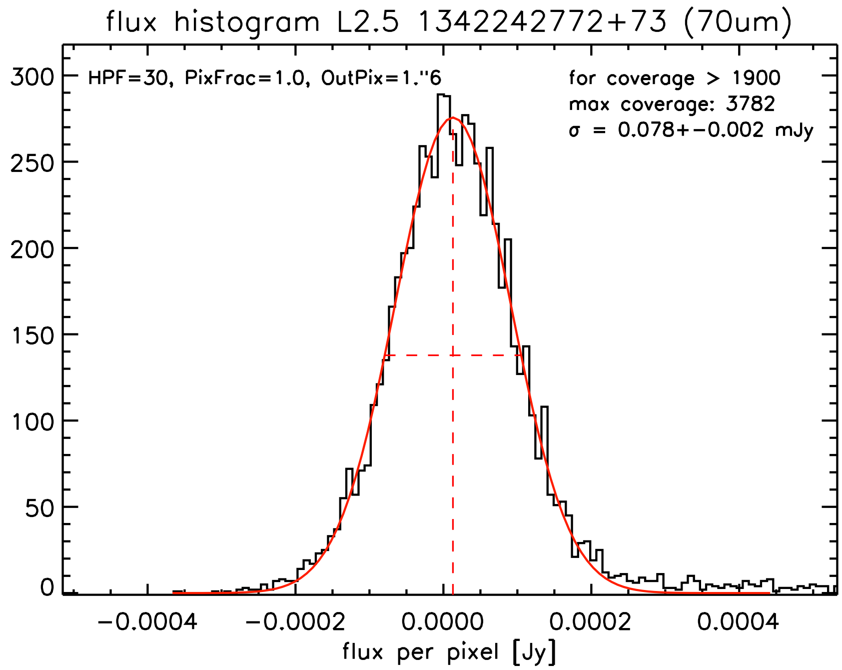

Figure 74: Noise determination for the 70 μm coadded L2.5 map of OBSIDs 1342242772+73 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

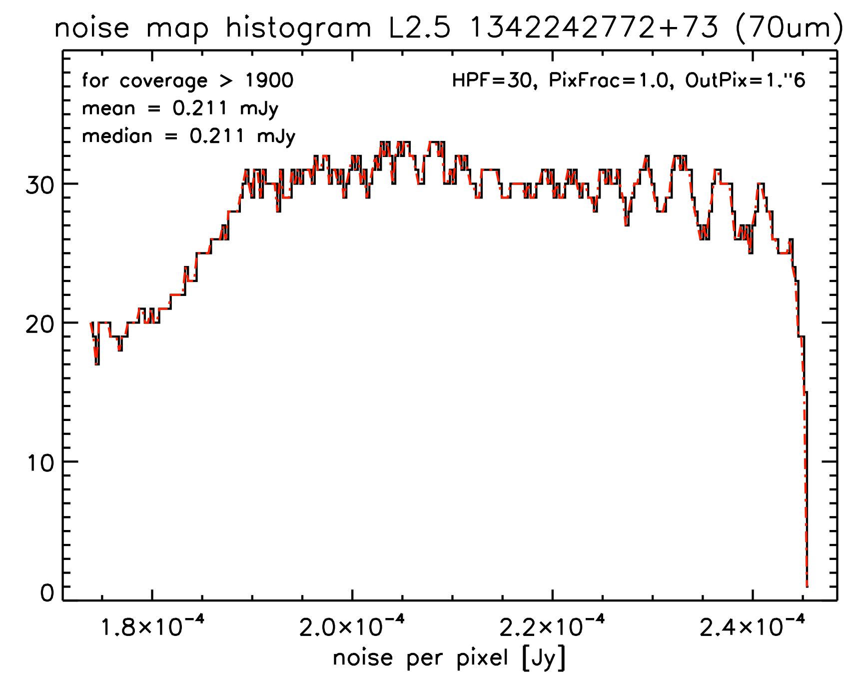

Figure 75: Histogram of the noise value distribution in the L2.5 error map above the coverage threshold indicated in the plot (in black). Mean and median value of the distribution are given. The red dashed-dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

3.10 70 µm: HPF radius 15, Pixfrac 1.0, Pixsize 2."4

3.10.1 L 2.0 OBSID 1342242772

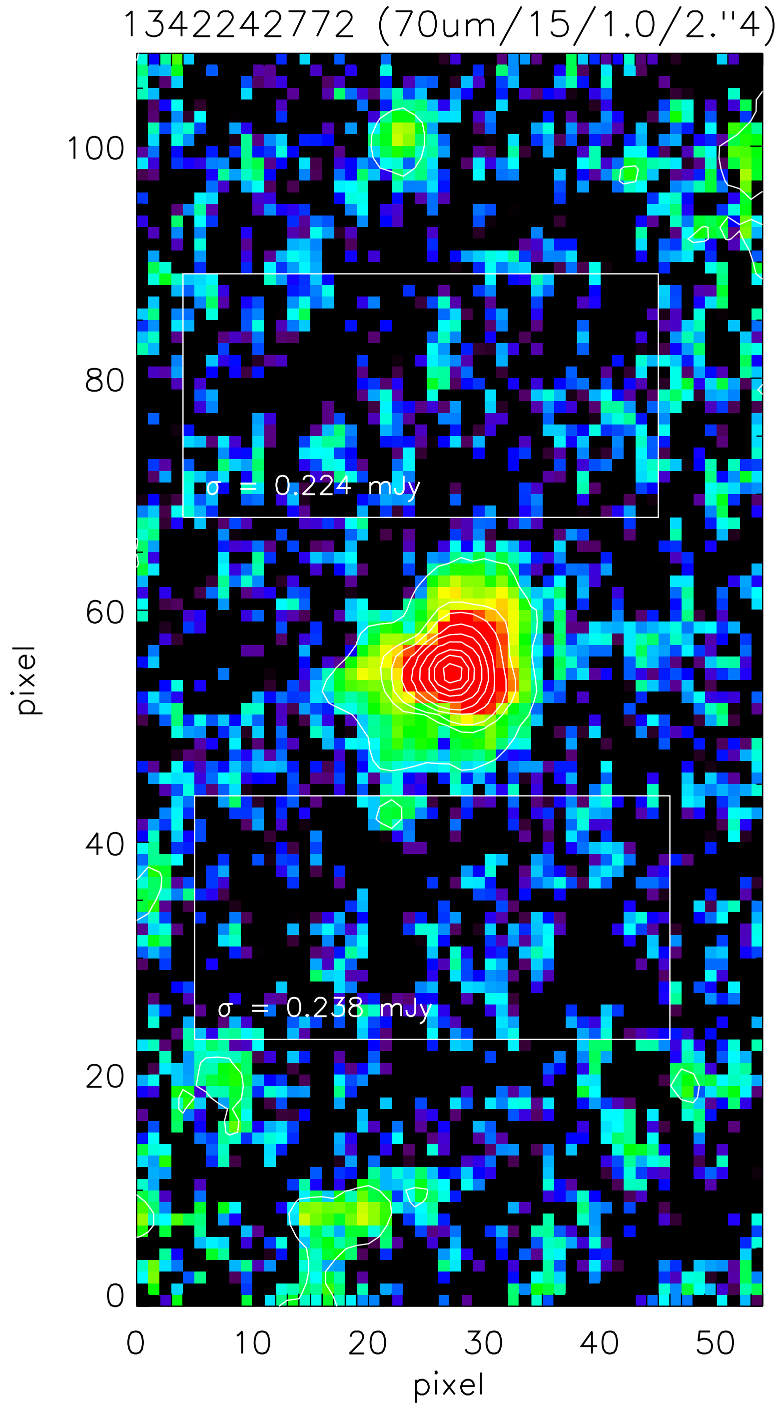

Figure 76: 70 µm L2.0 map for OBSID 1342242772 with HPF radius 15, pixfrac 1.0 and output pixel size of 2."4. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

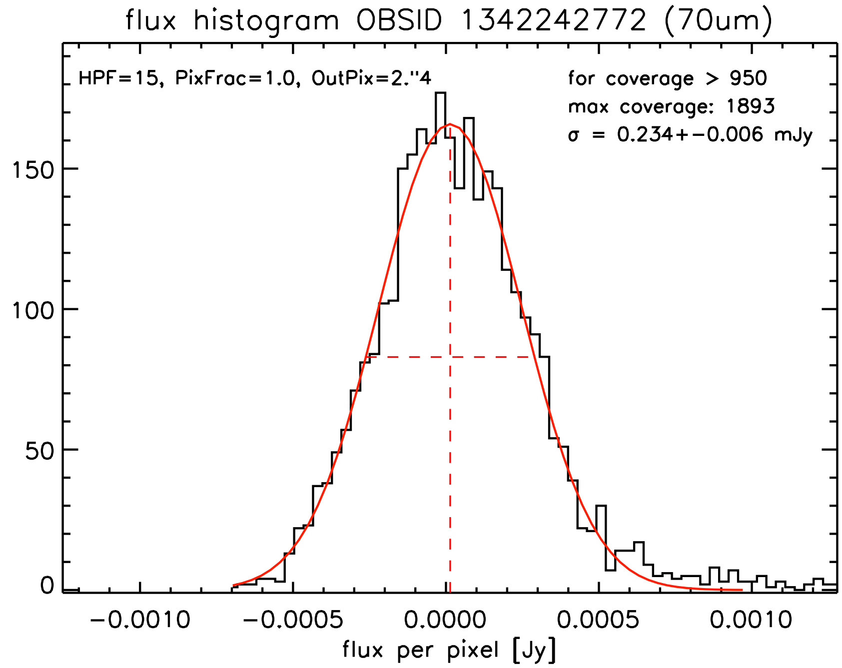

Figure 77: Noise determination for the 70 µm L2.0 map of OBSID 1342242772 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\ \sigma_{\rm hist}$).

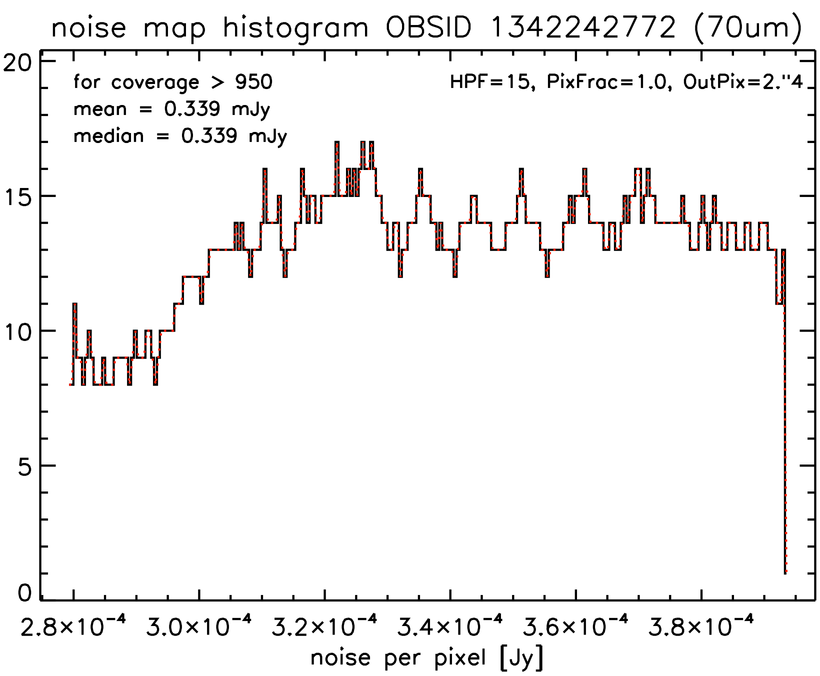

Figure 78: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

3.10.2 L 2.0 OBSID 1342242773

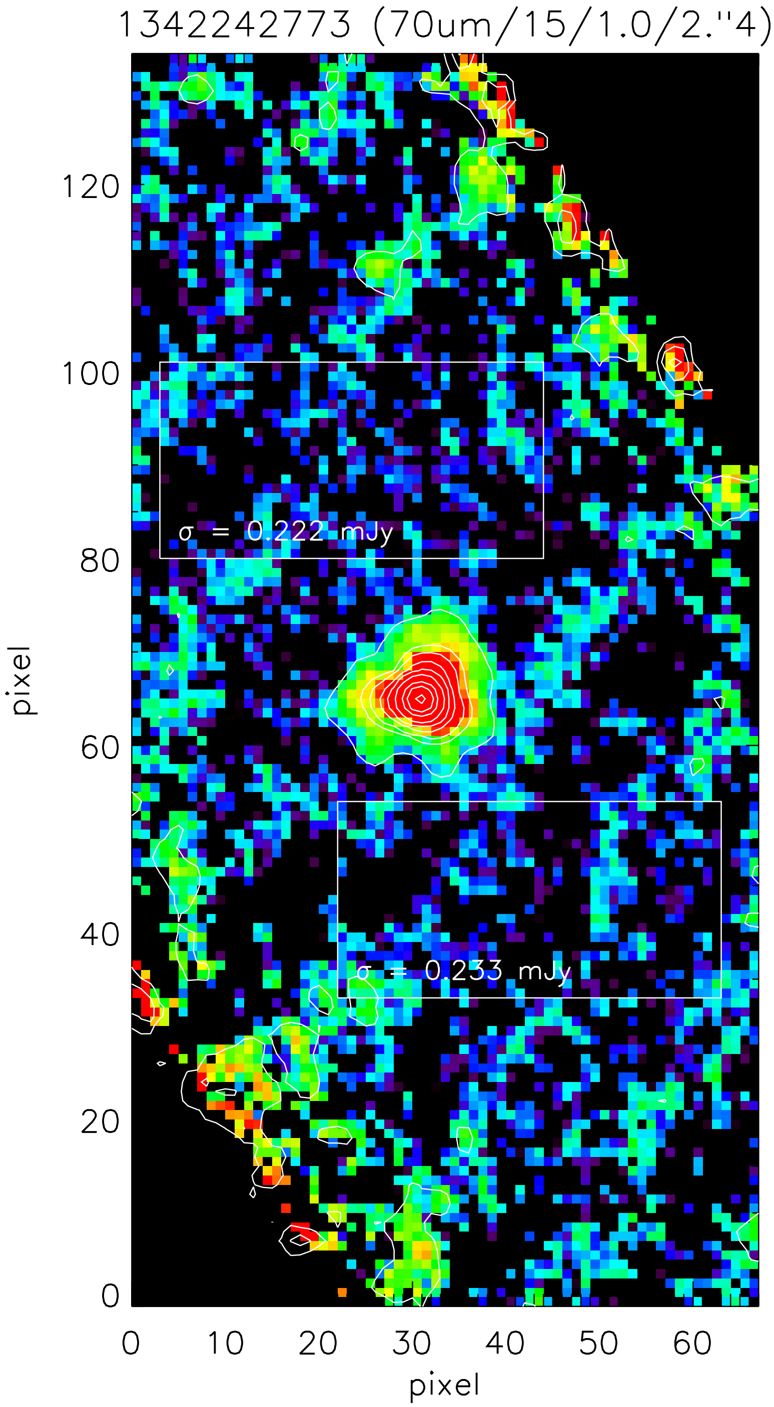

Figure 79: 70 µm L2.0 map for OBSID 1342242773 with HPF radius 15, pixfrac 1.0 and output pixel size of 2.″4. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

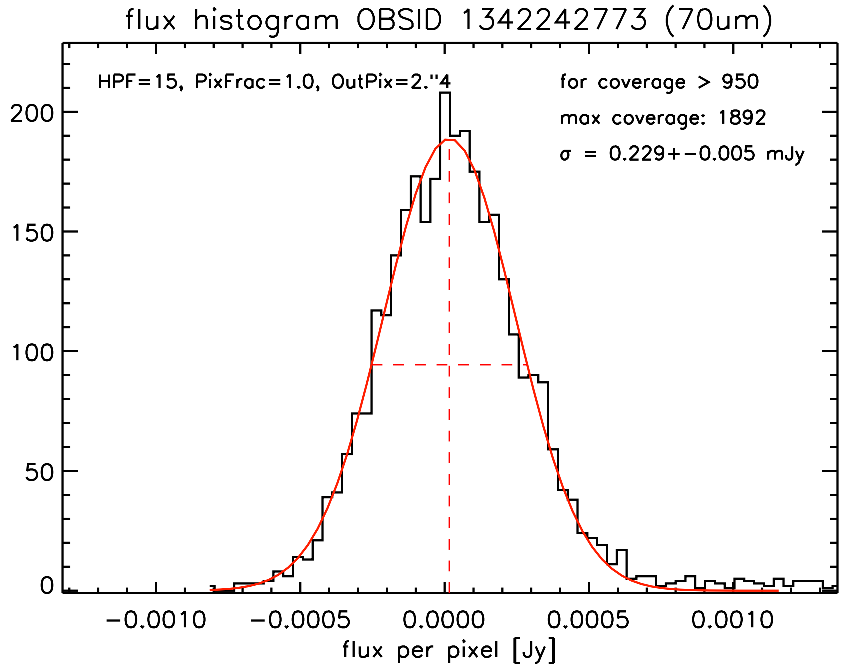

Figure 80: Noise determination for the 70 µm L2.0 map of OBSID 1342242773 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

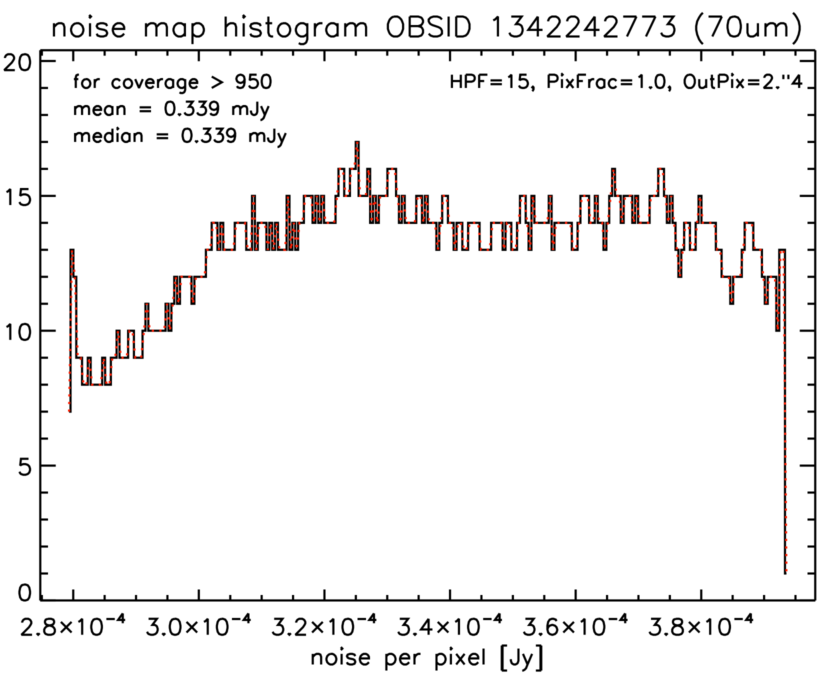

Figure 81: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

3.10.3 L 2.5 OBSIDs 1342242772+1342242773

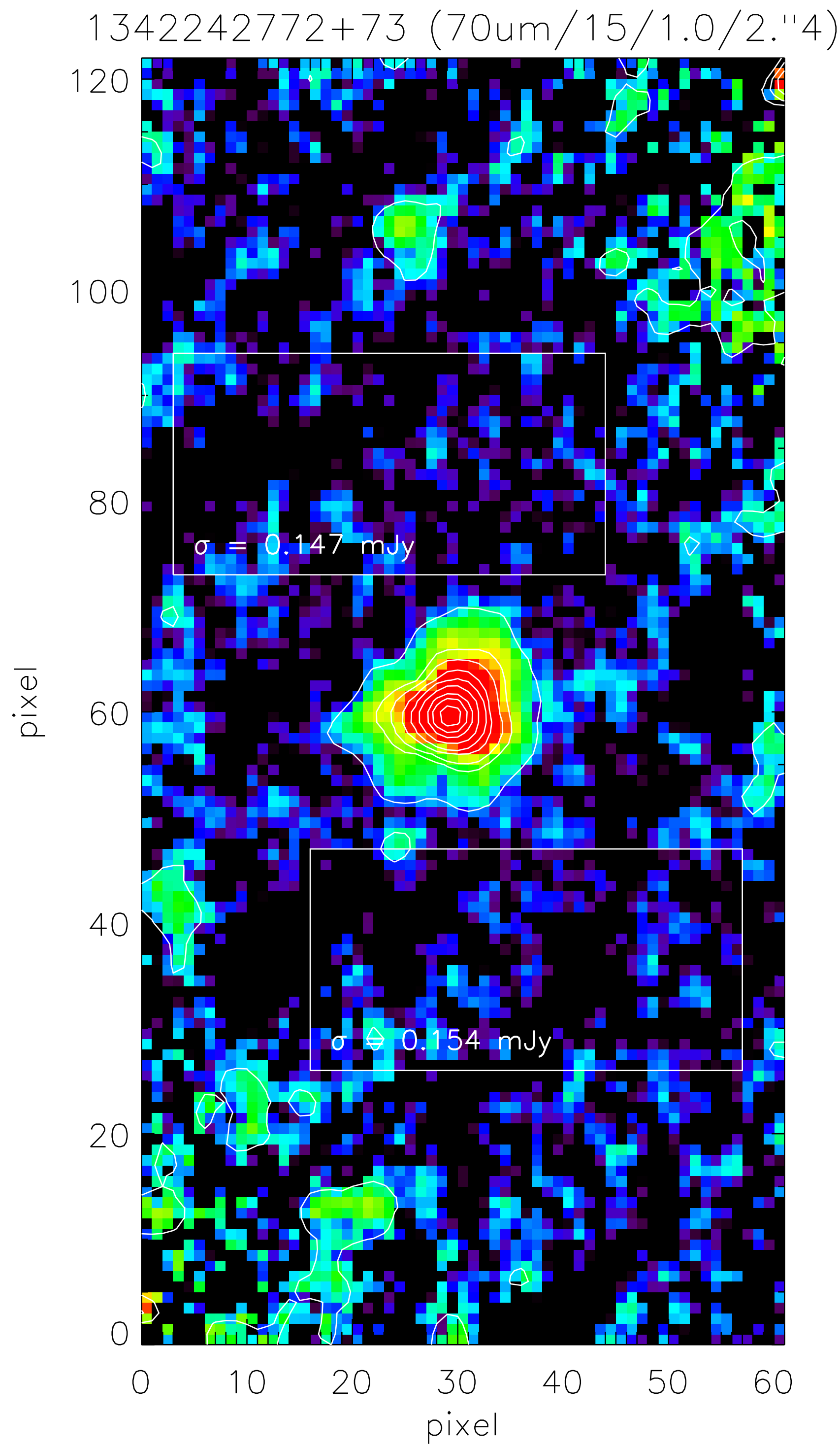

Figure 82: 70 µm L2.5 combined map for OBSIDs 1342242772+73 with HPF radius 15, pixfrac 1.0 and output pixel size of 2.″4. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

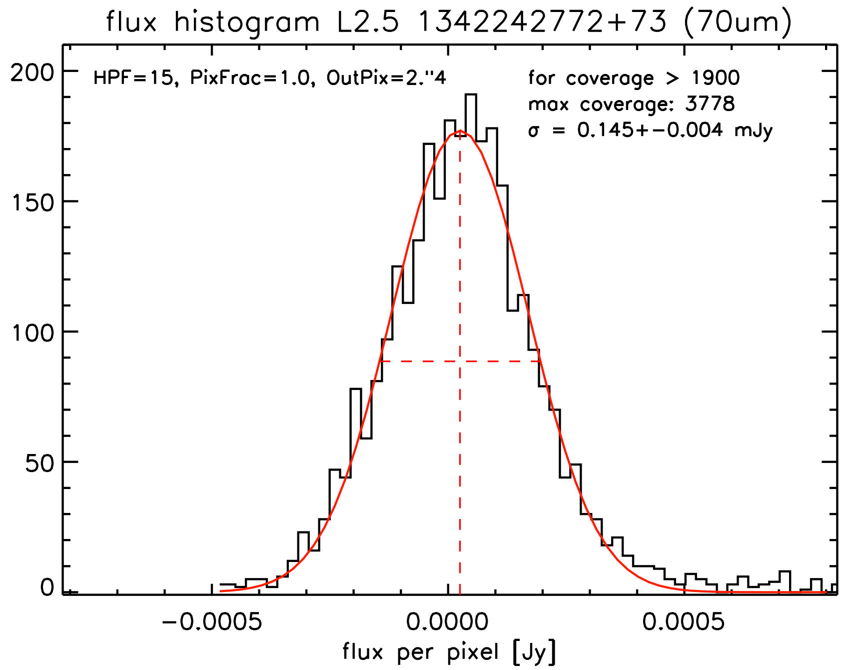

Figure 83: Noise determination for the 70 µm coadded L2.5 map of OBSIDs 1342242772+73 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

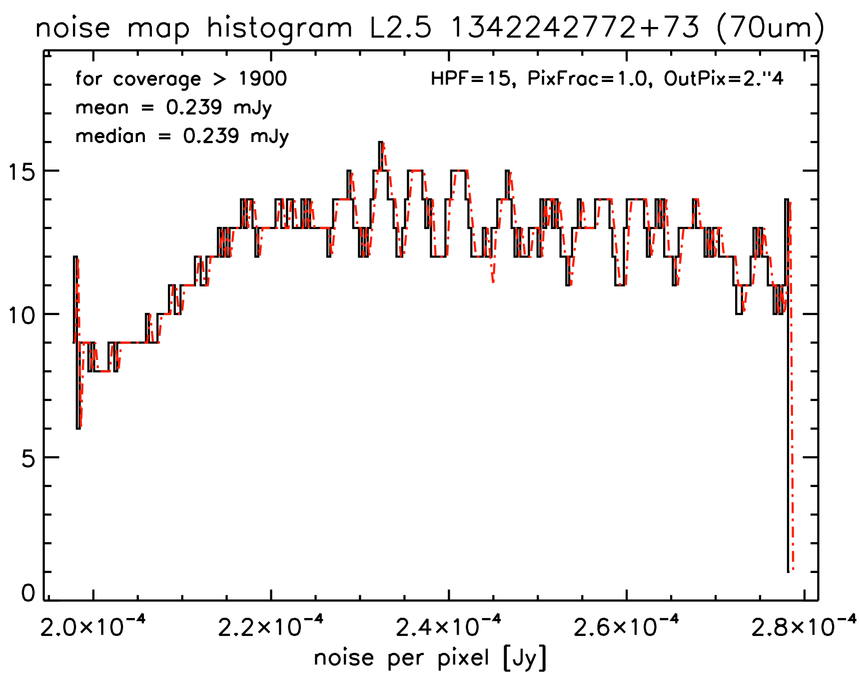

Figure 84: Histogram of the noise value distribution in the L2.5 error map above the coverage threshold indicated in the plot (in black). Mean and median value of the distribution are given. The red dashed-dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

3.11 70 µm: HPF radius 15, Pixfrac 1.0, Pixsize 3.″2

3.11.1 L 2.0 OBSID 1342242772

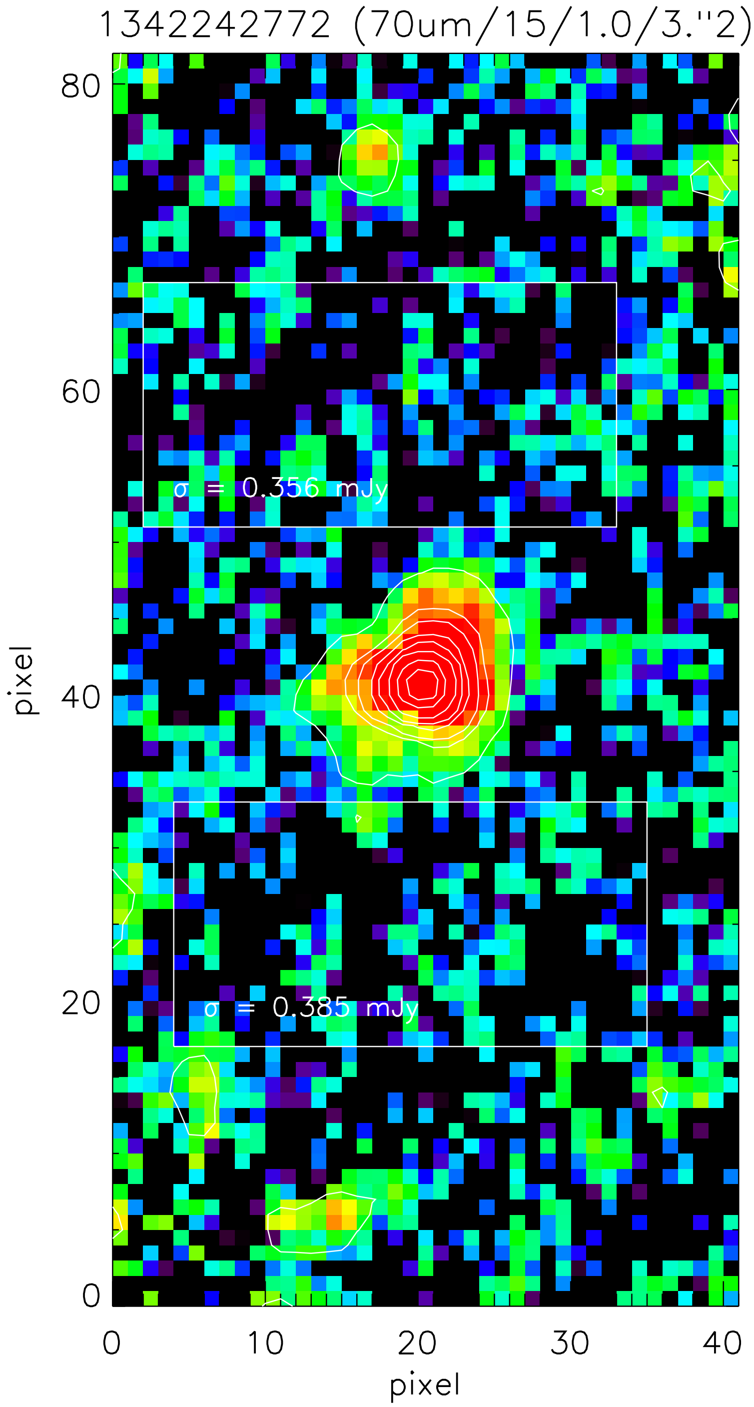

Figure 85: 70 µm L2.0 map for OBSID 1342242772 with HPF radius 15, pixfrac 1.0 and output pixel size of 3.″2. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

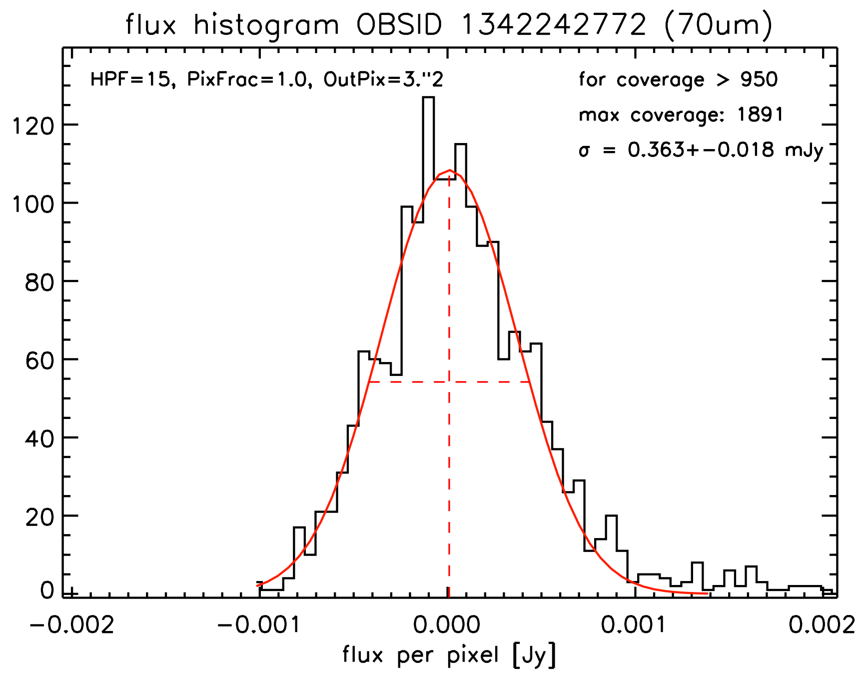

Figure 86: Noise determination for the 70 µm L2.0 map of OBSID 1342242772 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\mathrm{hist}}$).

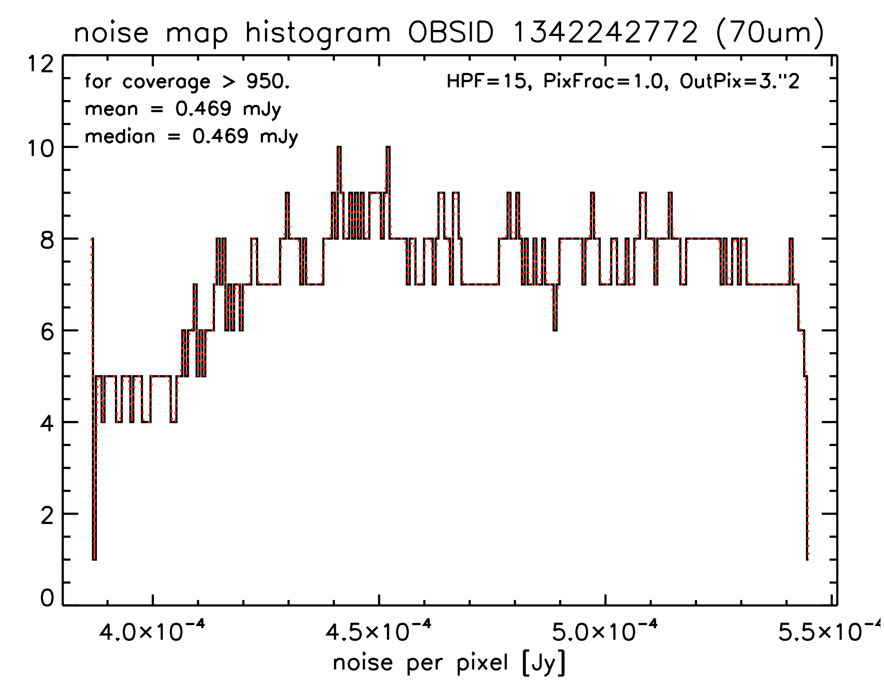

Figure 87: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

3.11.2 L 2.0 OBSID 1342242773

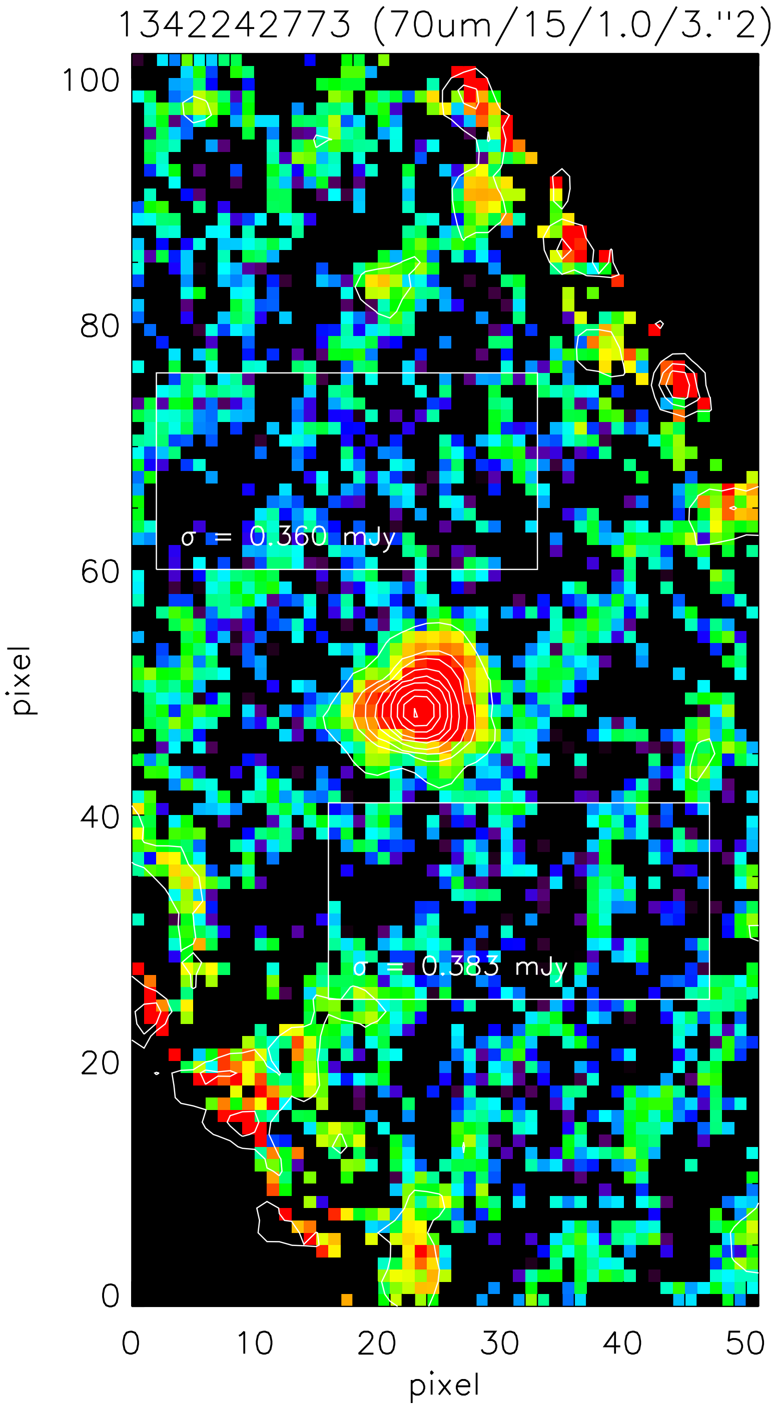

Figure 88: 70 µm L2.0 map for OBSID 1342242773 with HPF radius 15, pixfrac 1.0 and output pixel size of 3.″2. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

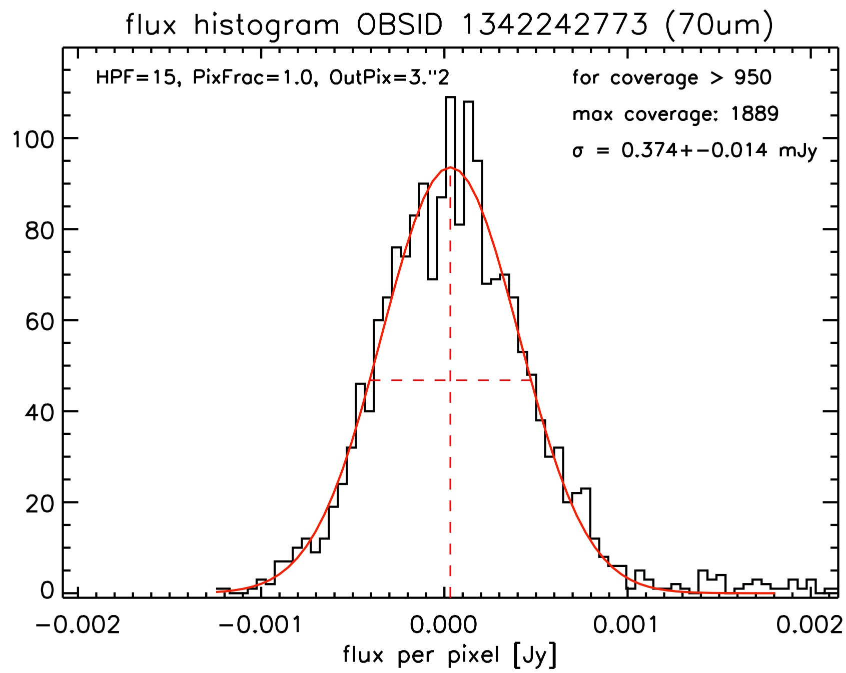

Figure 89: Noise determination for the 70 µm L2.0 map of OBSID 1342242773 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\ \sigma_{\rm hist}$).

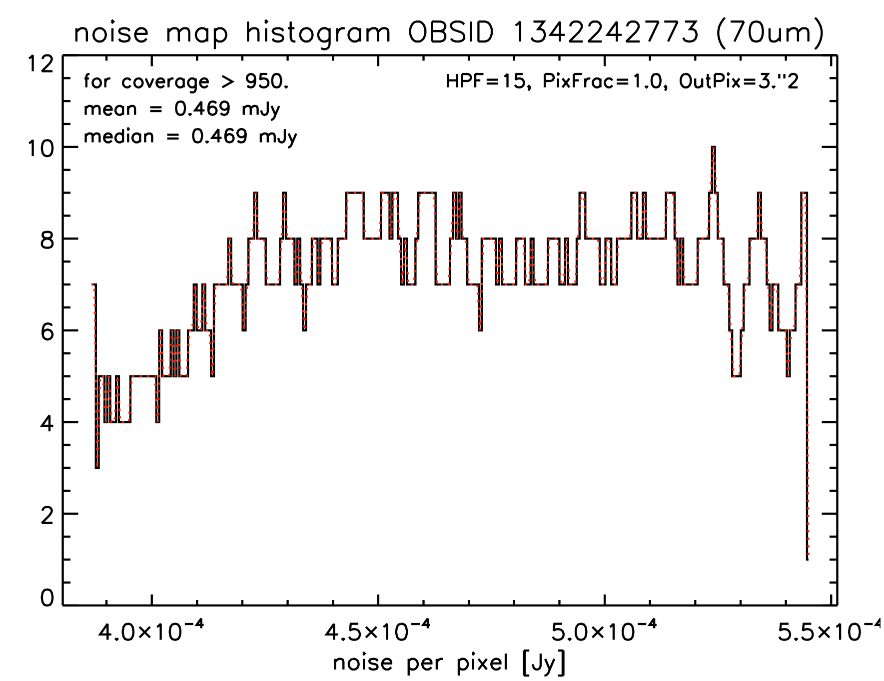

Figure 90: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

3.11.3 L 2.5 OBSIDs 1342242772+1342242773

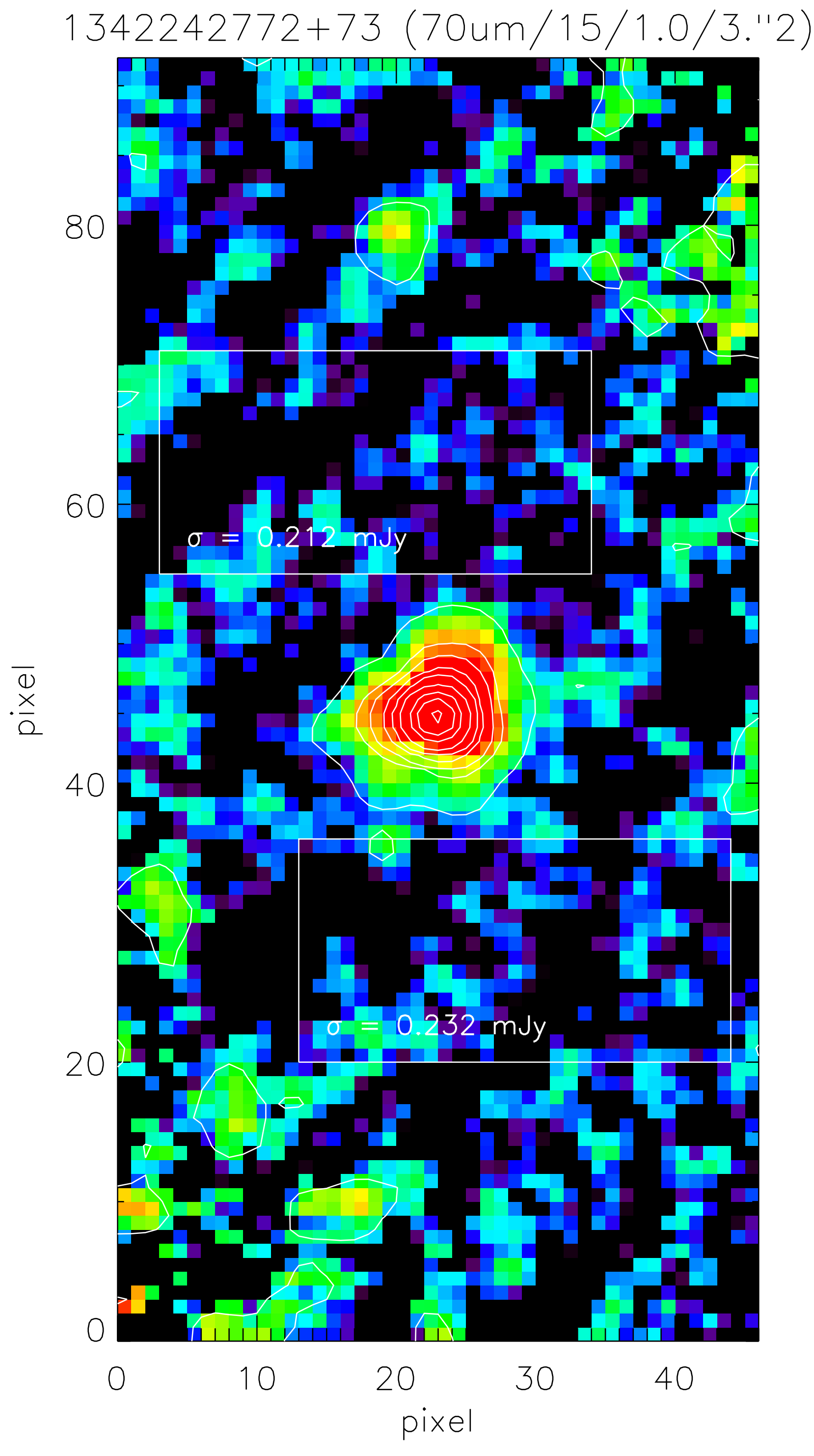

Figure 91: 70 µm L2.5 combined map for OBSIDs 1342242772+73 with HPF radius 15, pixfrac 1.0 and output pixel size of 3.″2. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

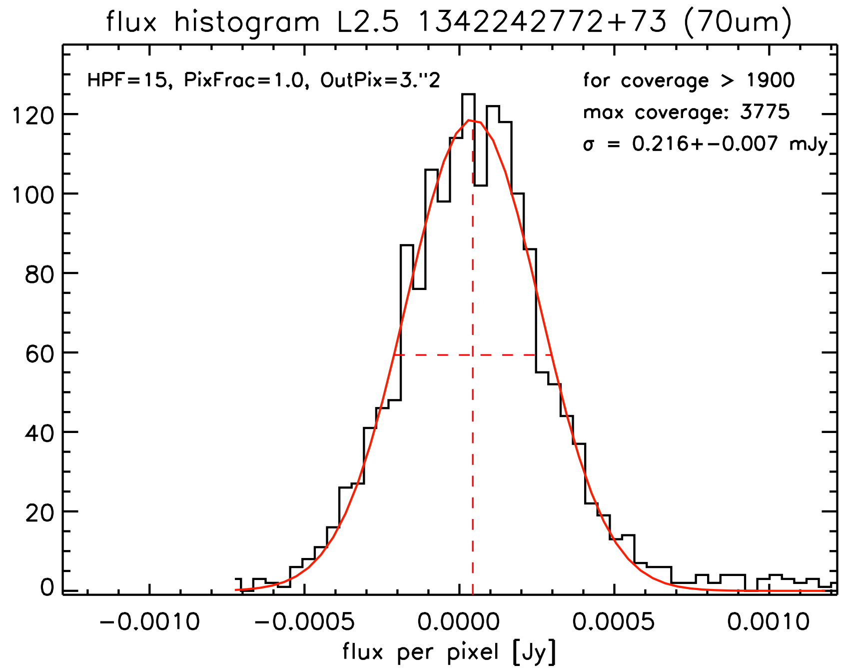

Figure 92: Noise determination for the 70 µm coadded L2.5 map of OBSIDs 1342242772+73 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\ \sigma_{\rm hist}$).

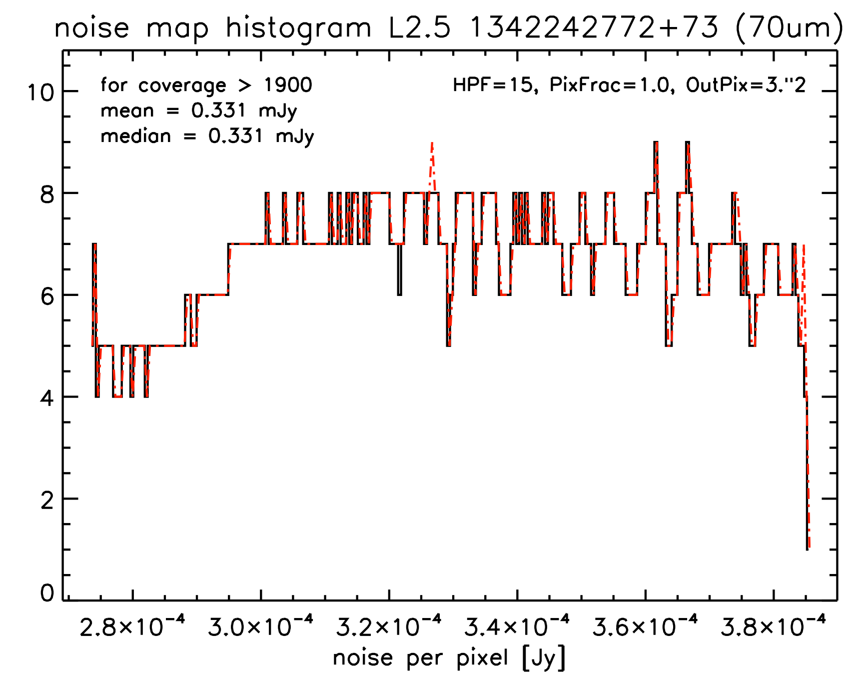

Figure 93: Histogram of the noise value distribution in the L2.5 error map above the coverage threshold indicated in the plot (in black). Mean and median value of the distribution are given. The red dashed-dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

4 Analysis of 100μm maps

4.1 100 µm: HPF radius 15, Pixfrac 0.1, Pixsize 1.″4

4.1.1 L 2.0 OBSID 1342242770

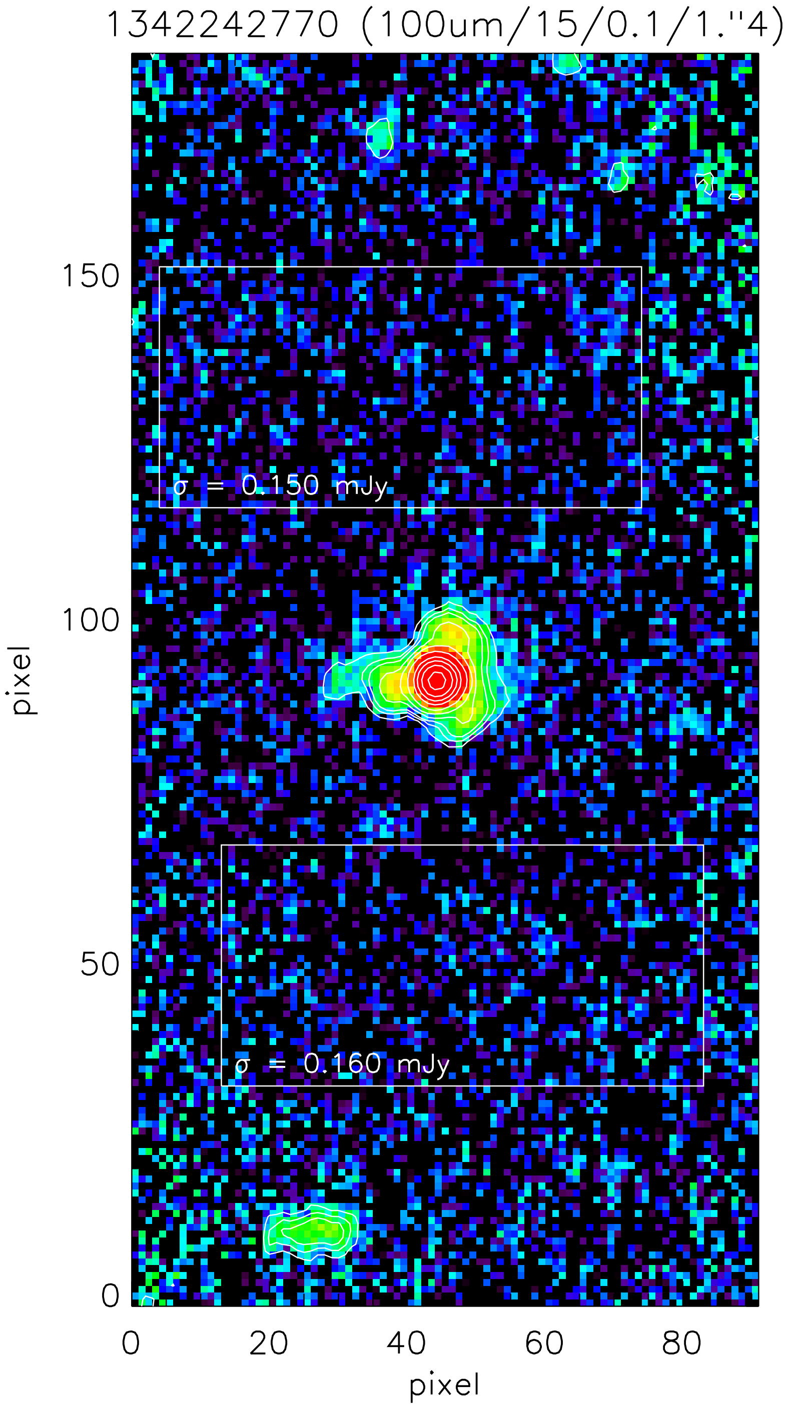

Figure 94: 100 µm L2.0 map for OBSID 1342242770 with HPF radius 15, pixfrac 0.1 and output pixel size of 1.″4. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

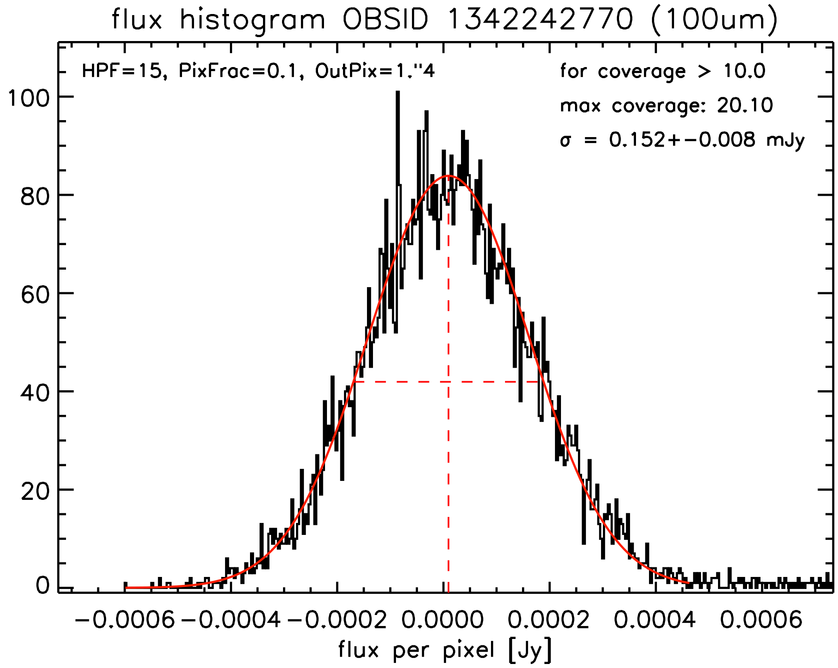

Figure 95: Noise determination for the 100 µm L2.0 map of OBSID 1342242770 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

For this map parameter combination no error map analysis was done.

4.1.2 L 2.0 OBSID 1342242771

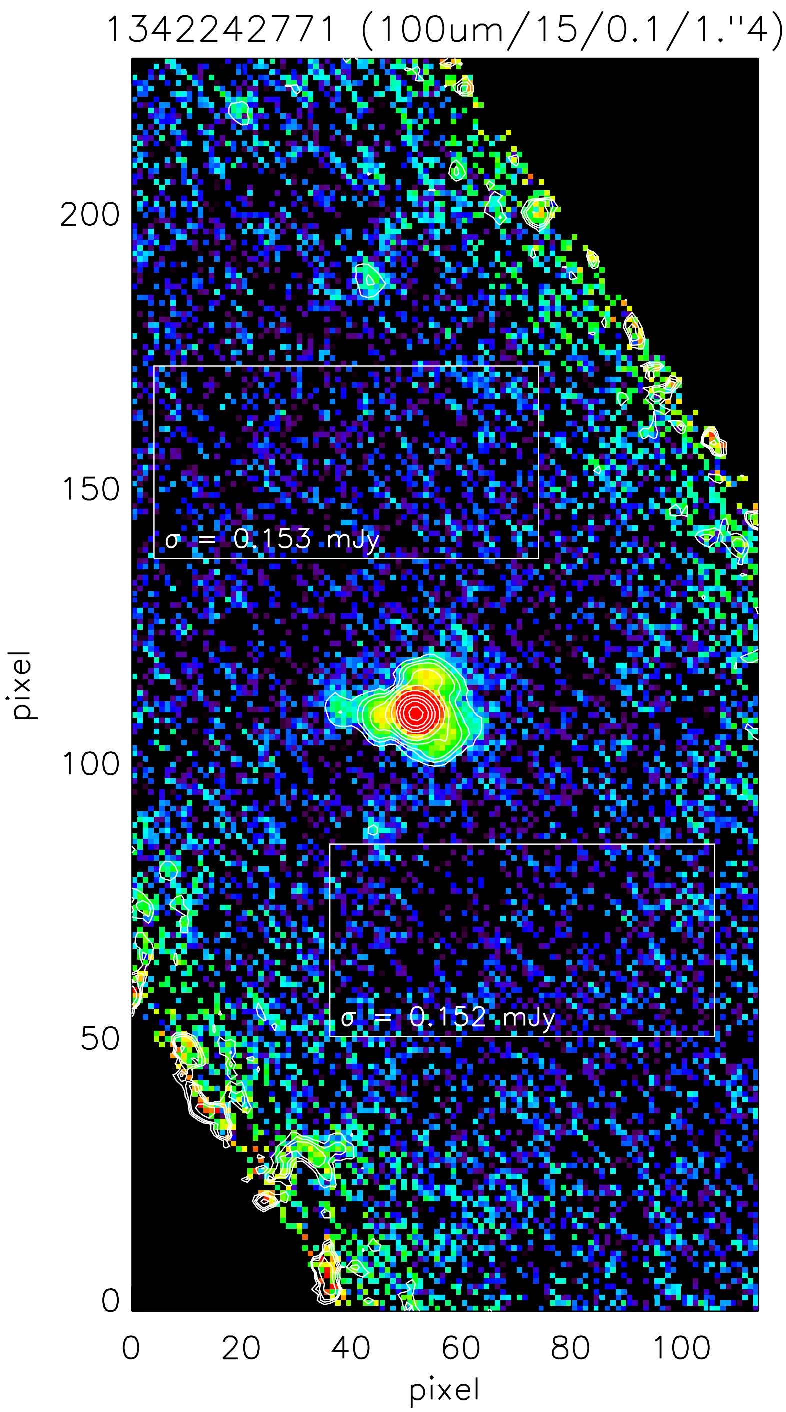

Figure 96: 100 μm L2.0 map for OBSID 1342242771 with HPF radius 15, pixfrac 0.1 and output pixel size of 1.″4. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

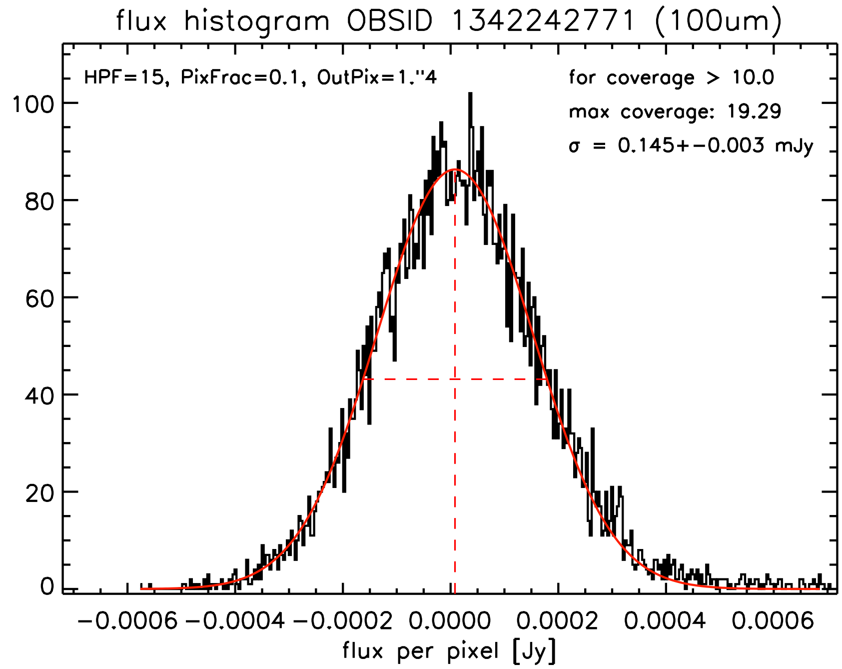

Figure 97: Noise determination for the 100 μm L2.0 map of OBSID 1342242770 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\ \sigma_{\rm hist}$).

For this map parameter combination no error map analysis was done.

4.1.3 L 2.5 OBSIDs 1342242770+1342242771

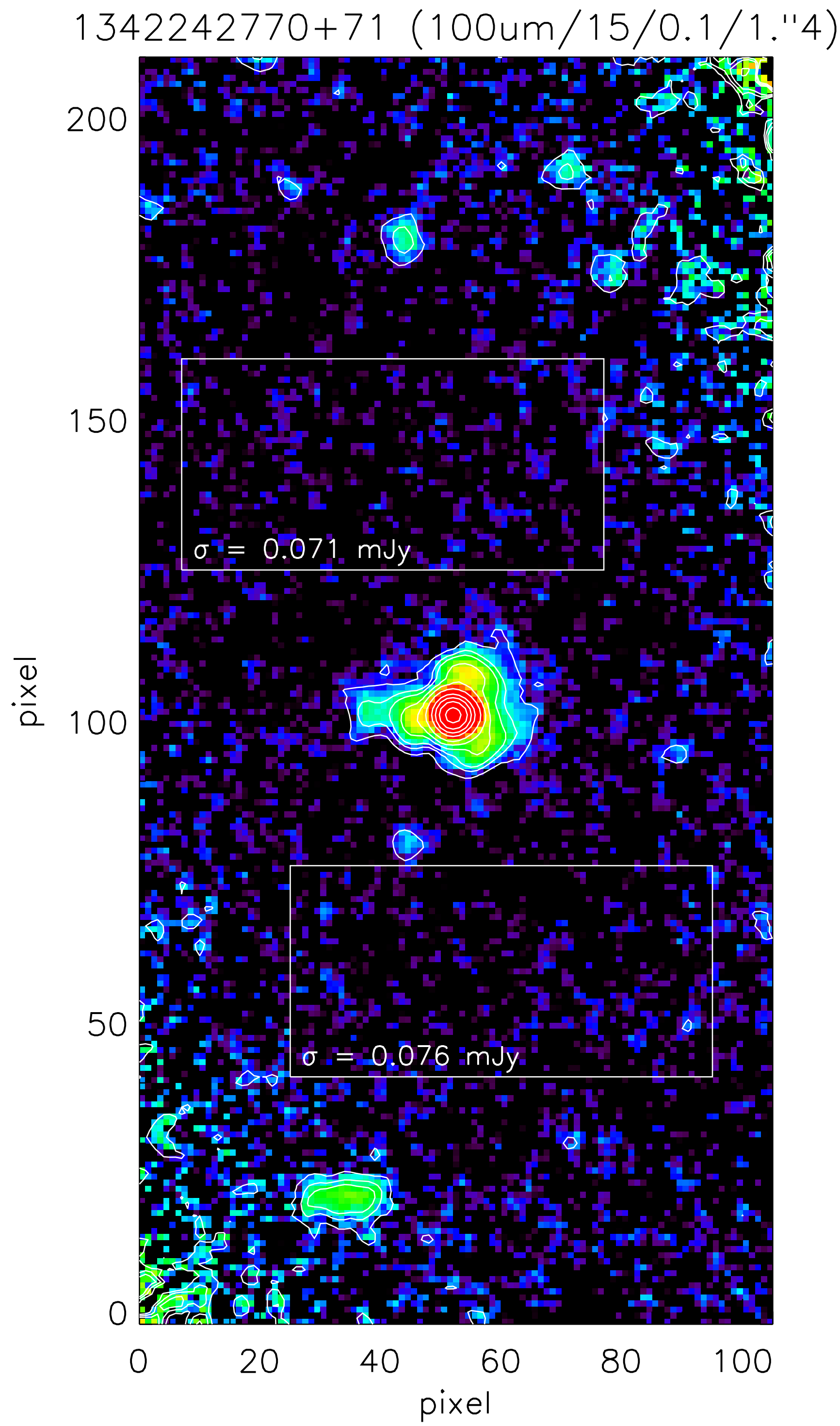

Figure 98: 100 µm L2.5 combined map for OBSIDs 1342242770+71 with HPF radius 15, pixfrac 0.1 and output pixel size of 1.″4. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

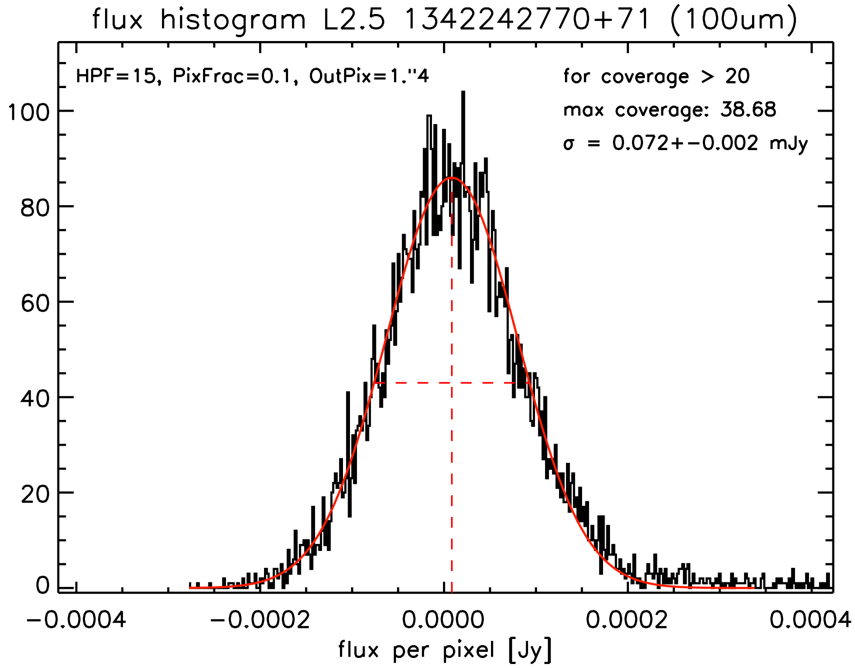

Figure 99: Noise determination for the 100 μm coadded L2.5 map of OBSIDs 1342242770+71 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\ \sigma_{\rm hist}$).

For this map parameter combination no error map analysis was done.

4.2 100 µm: HPF radius 15, Pixfrac 0.1, Pixsize 1.″6

4.2.1 L 2.0 OBSID 1342242770

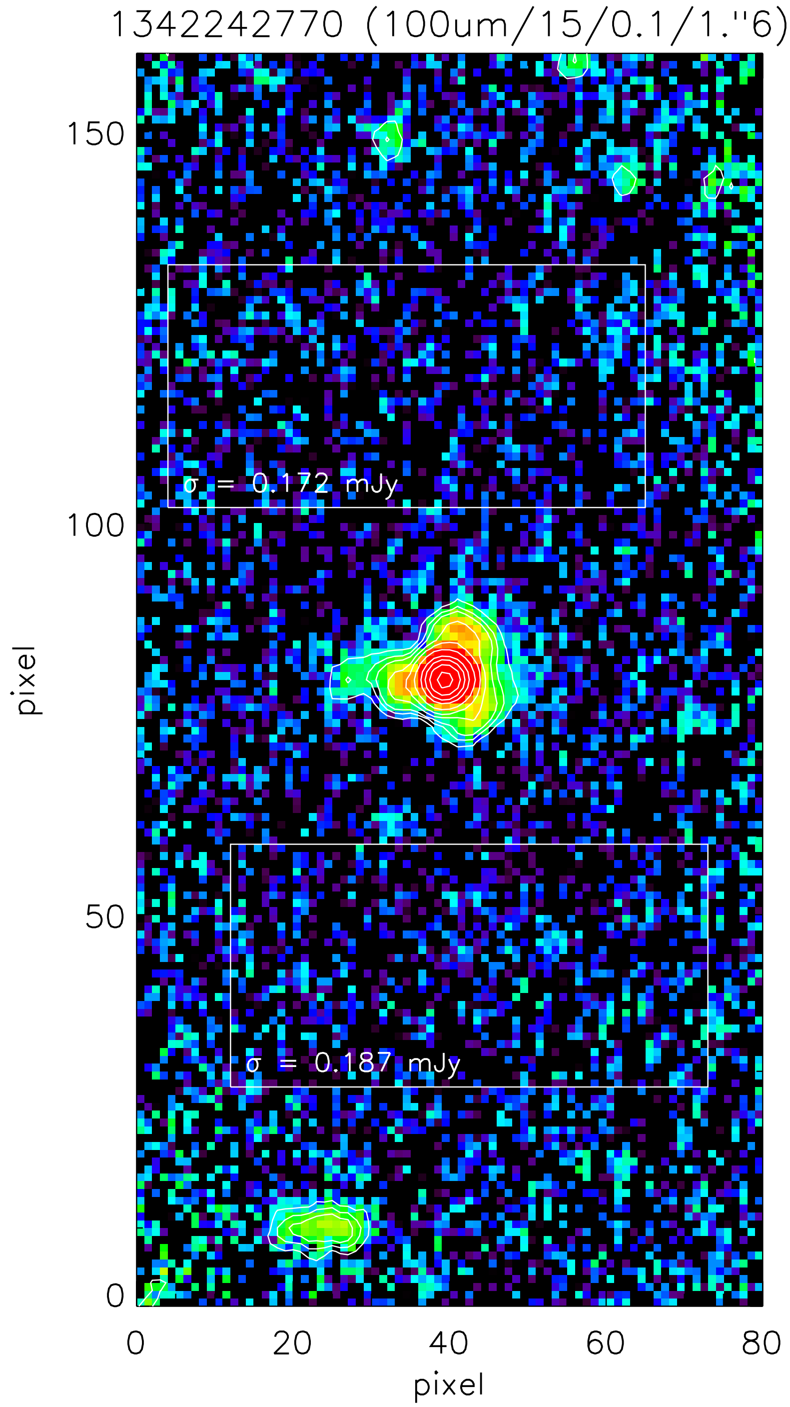

Figure 100: 100 µm L2.0 map for OBSID 1342242770 with HPF radius 15, pixfrac 0.1 and output pixel size of 1.″6. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

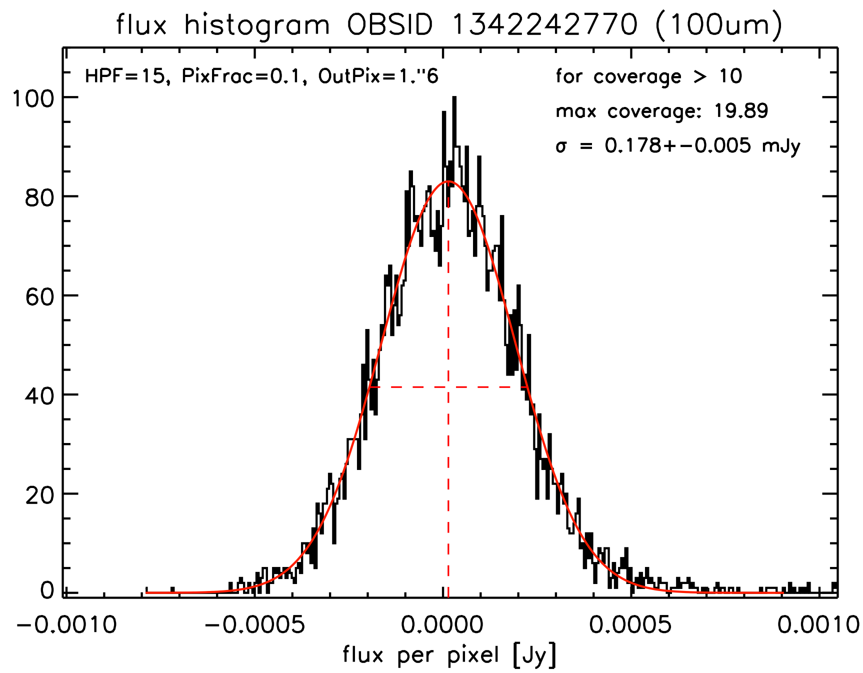

Figure 101: Noise determination for the 100 µm L2.0 map of OBSID 1342242770 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

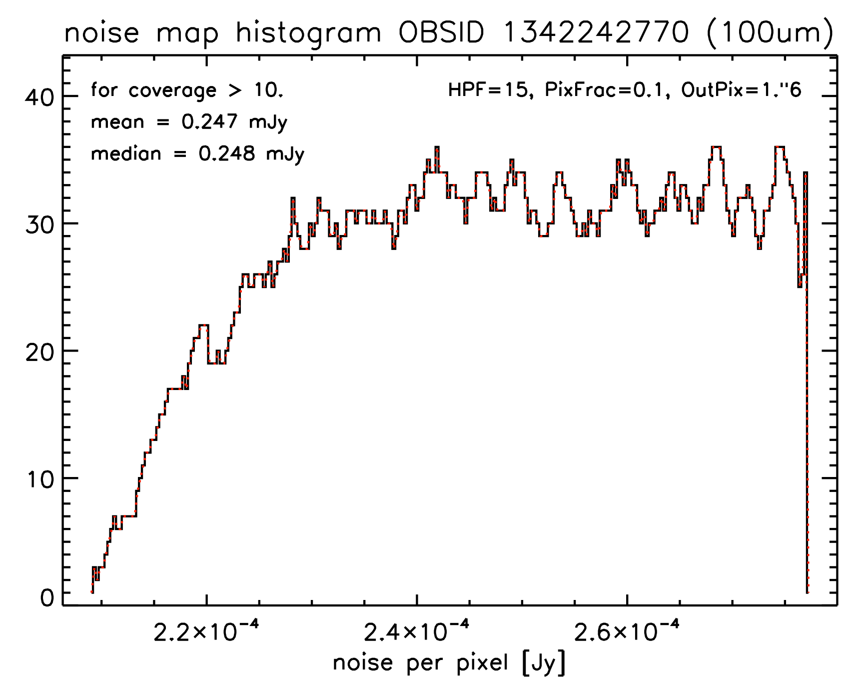

Figure 102: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

4.2.2 L 2.0 OBSID 1342242771

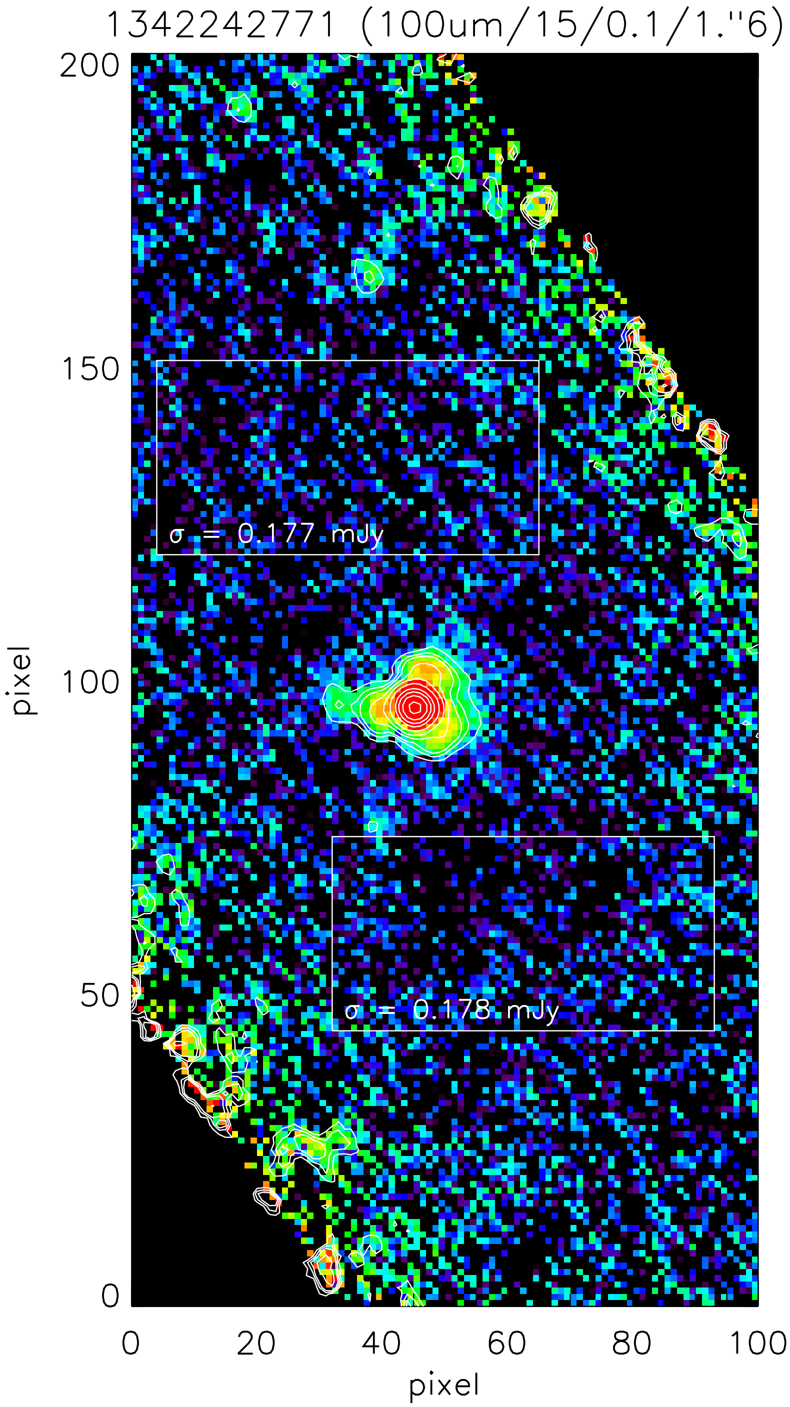

Figure 103: 100 µm L2.0 map for OBSID 1342242771 with HPF radius 15, pixfrac 0.1 and output pixel size of 1.″6. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

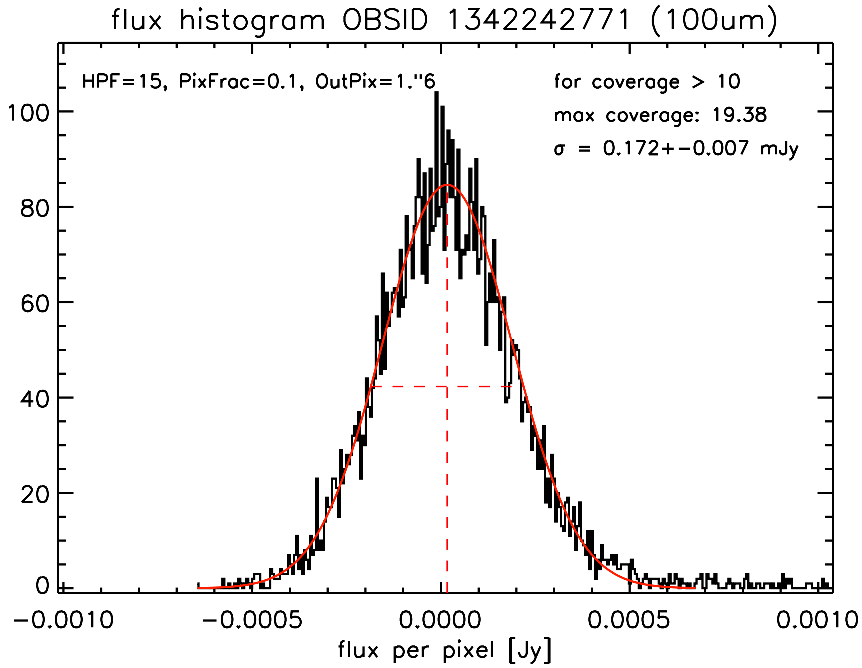

Figure 104: Noise determination for the 100 µm L2.0 map of OBSID 1342242771 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

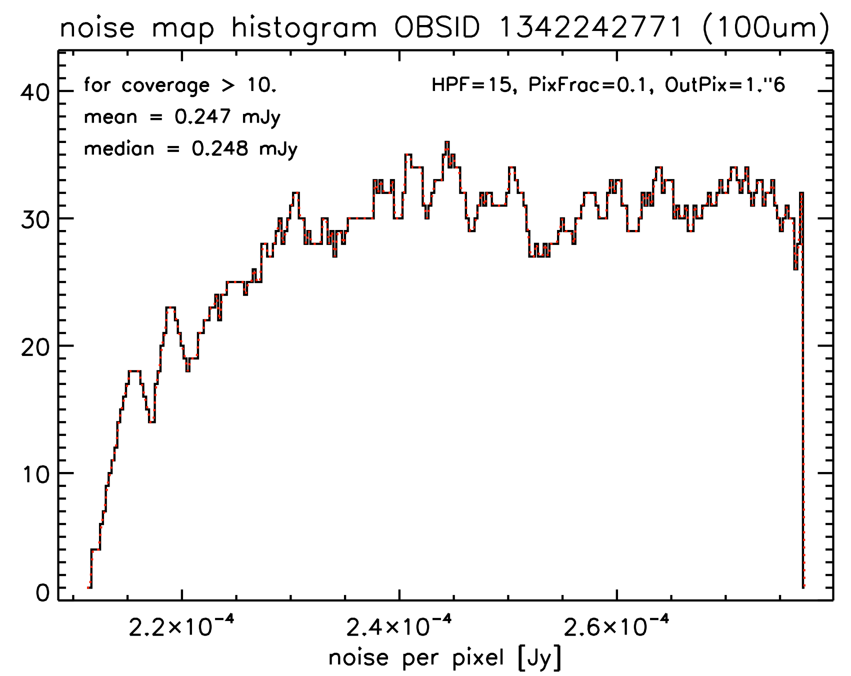

Figure 105: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

4.2.3 L 2.5 OBSIDs 1342242770+1342242771

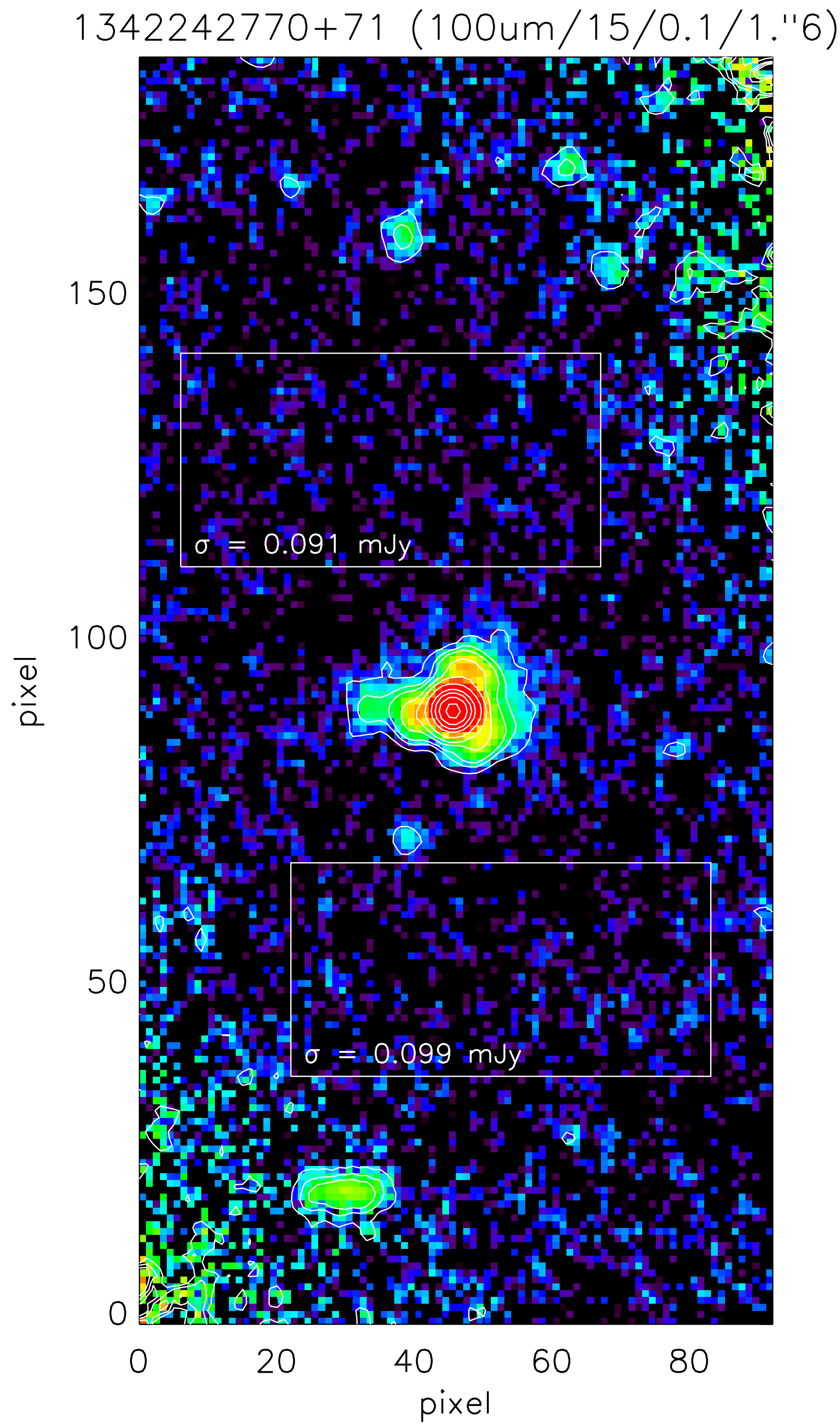

Figure 106: 100 µm L2.5 combined map for OBSIDs 1342242770+71 with HPF radius 15, pixfrac 0.1 and output pixel size of 1.″6. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

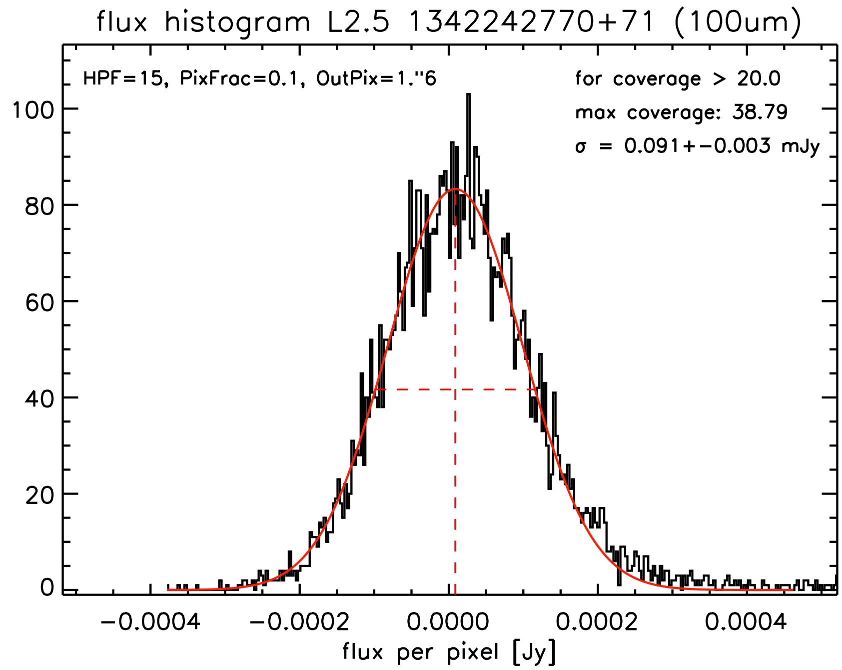

Figure 107: Noise determination for the 100 μm coadded L2.5 map of OBSIDs 1342242770+71 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

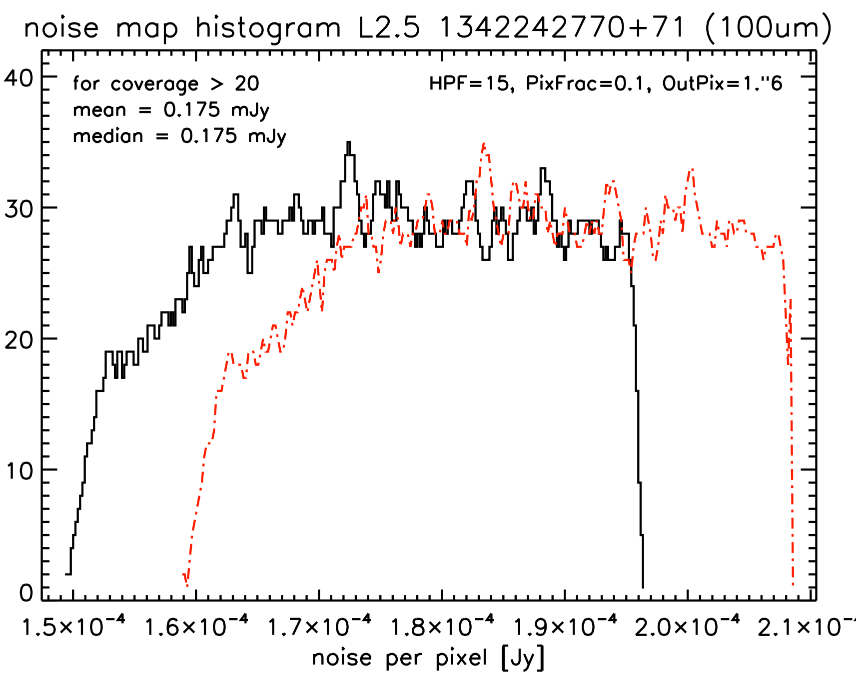

Figure 108: Histogram of the noise value distribution in the L2.5 error map above the coverage threshold indicated in the plot (in black). Mean and median value of the distribution are given. The red dashed-dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

4.3 100 µm: HPF radius 30, Pixfrac 0.1, Pixsize 1."6

4.3.1 L 2.0 OBSID 1342242770

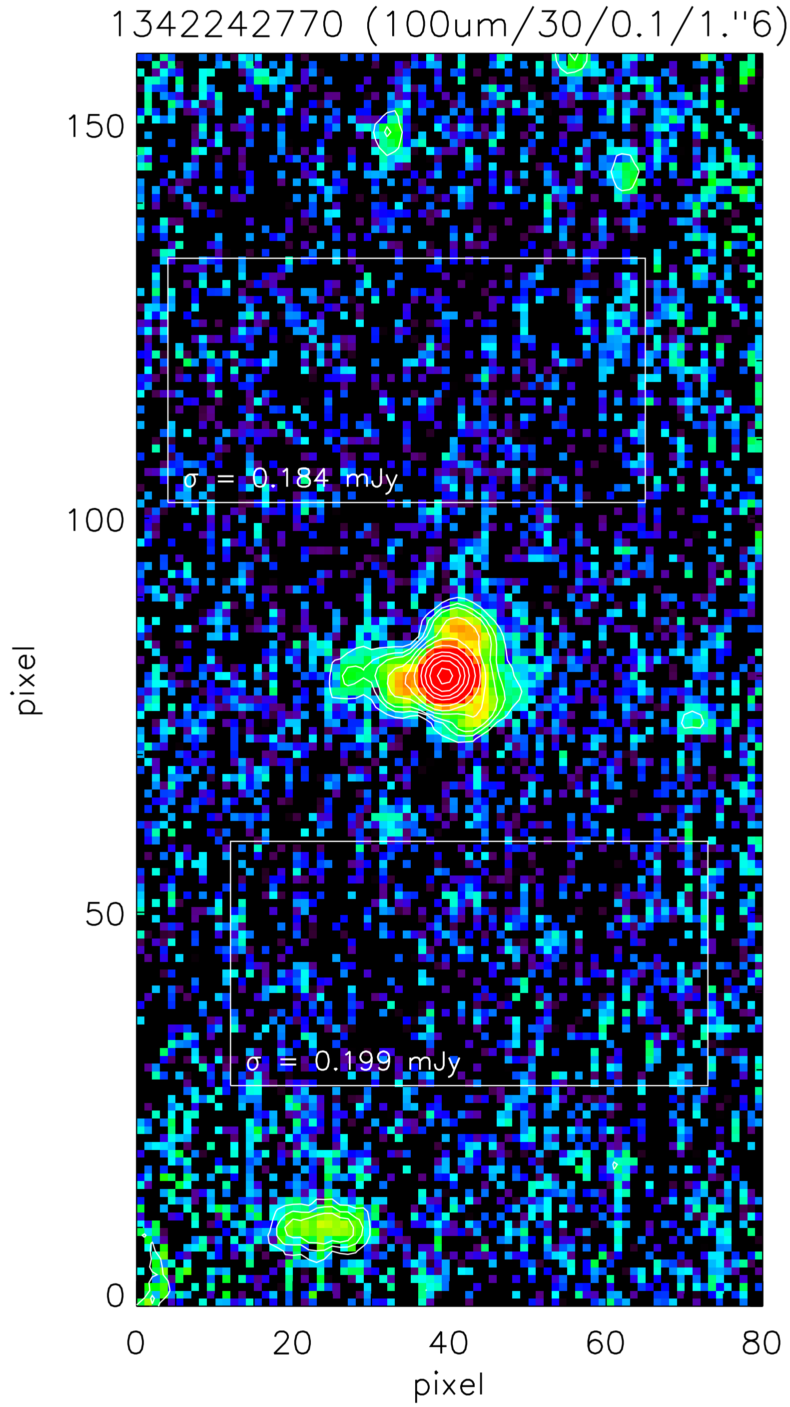

Figure 109: 100 µm L2.0 map for OBSID 1342242770 with HPF radius 15, pixfrac 0.1 and output pixel size of 1."6. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

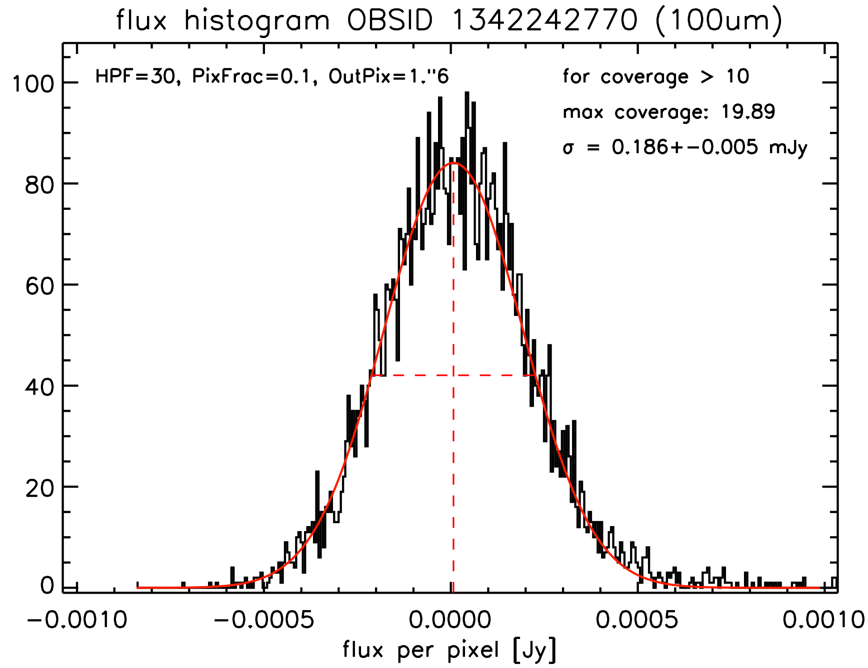

Figure 110: Noise determination for the 100 µm L2.0 map of OBSID 1342242770 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

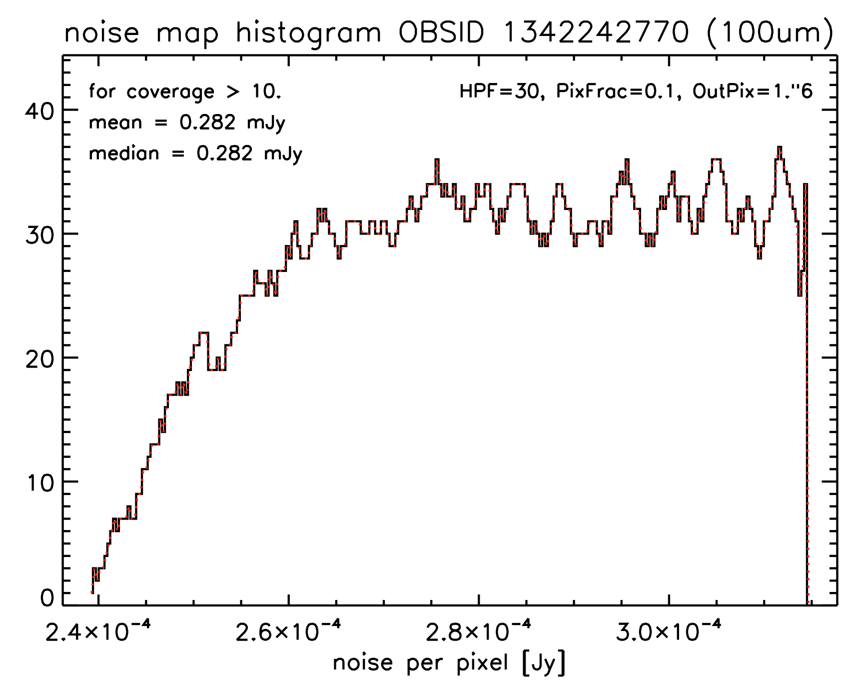

Figure 111: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

4.3.2 L 2.0 OBSID 1342242771

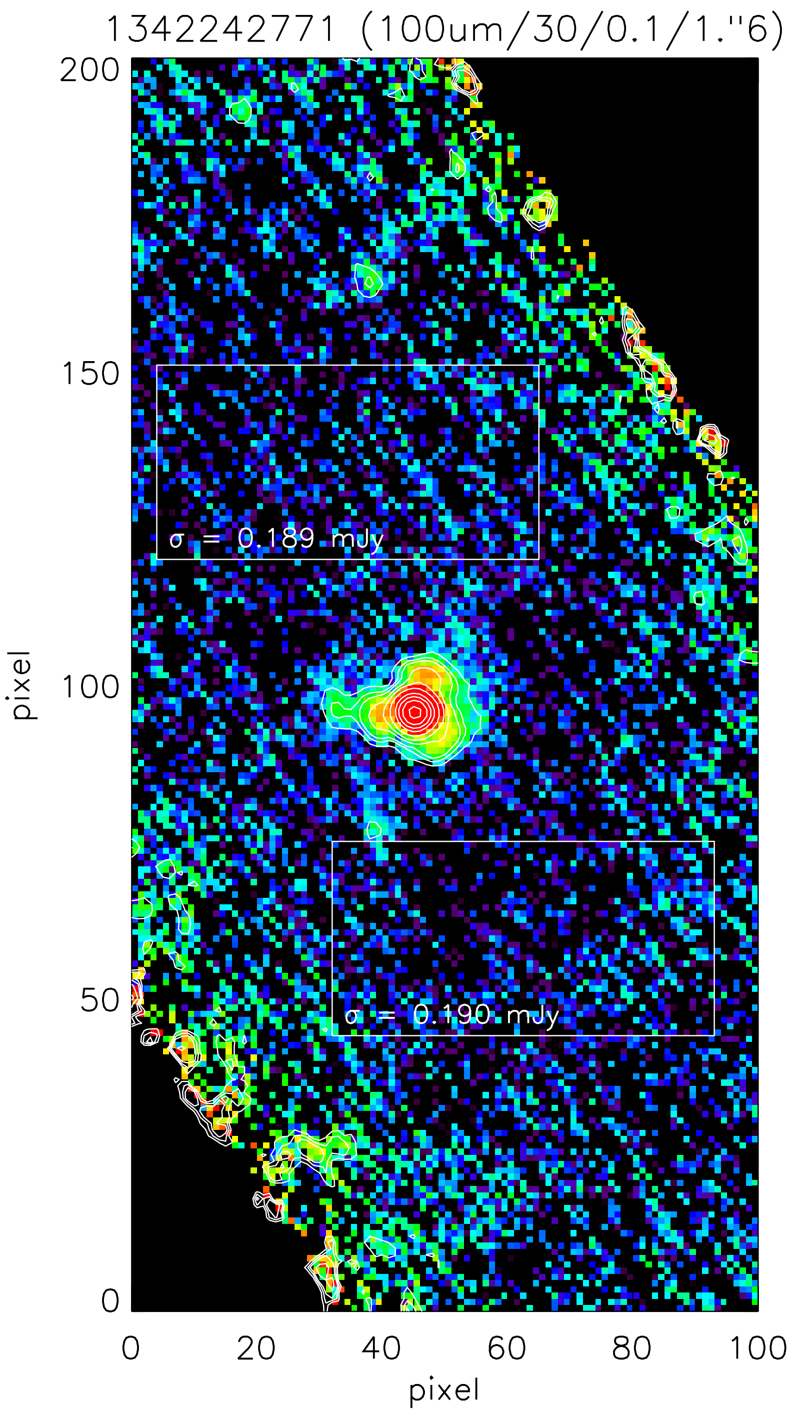

Figure 112: 100 µm L2.0 map for OBSID 1342242771 with HPF radius 30, pixfrac 0.1 and output pixel size of 1.″6. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

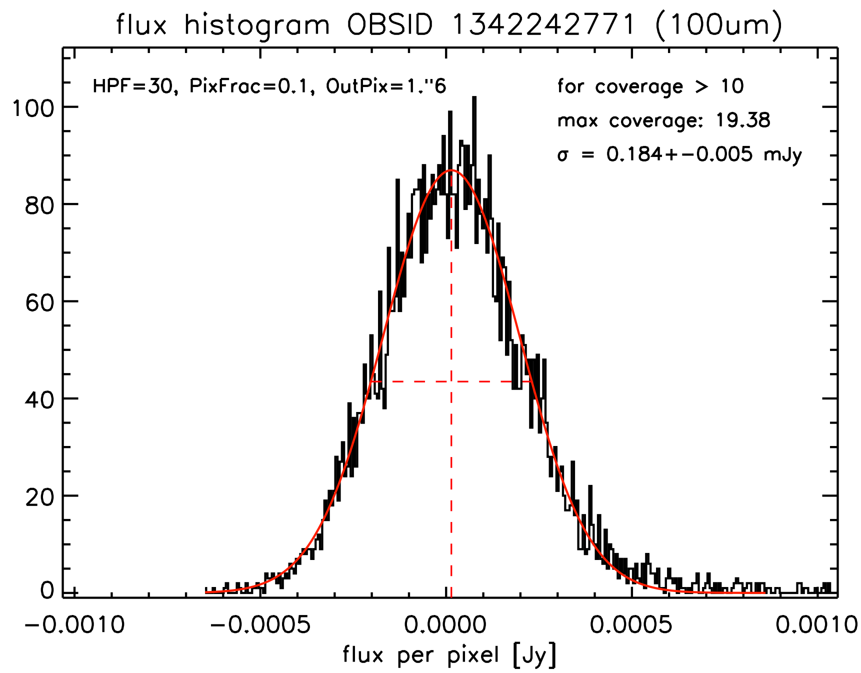

Figure 113: Noise determination for the 100 µm L2.0 map of OBSID 1342242771 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\ \sigma_{\rm hist}$).

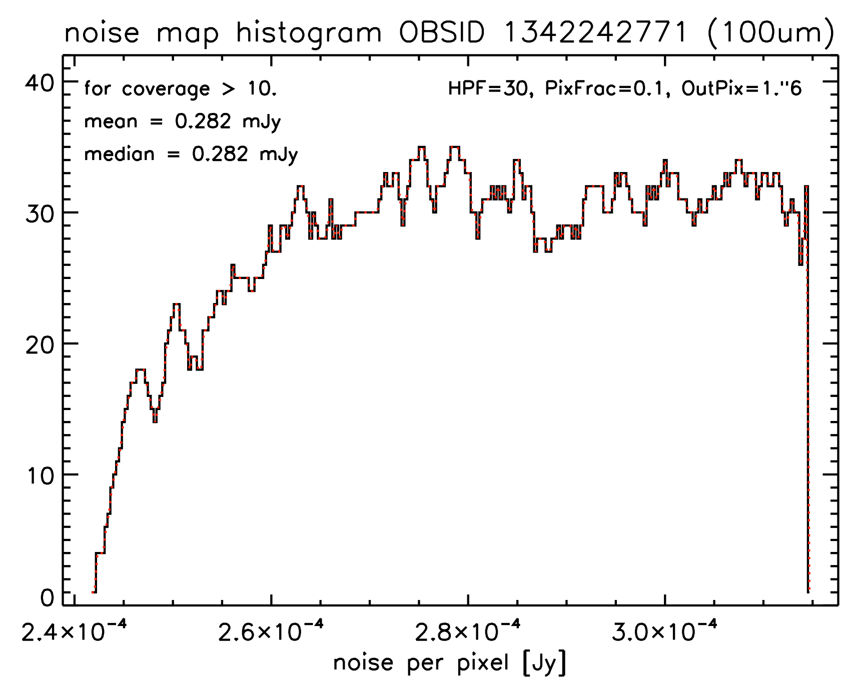

Figure 114: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

4.3.3 L 2.5 OBSIDs 1342242770+1342242771

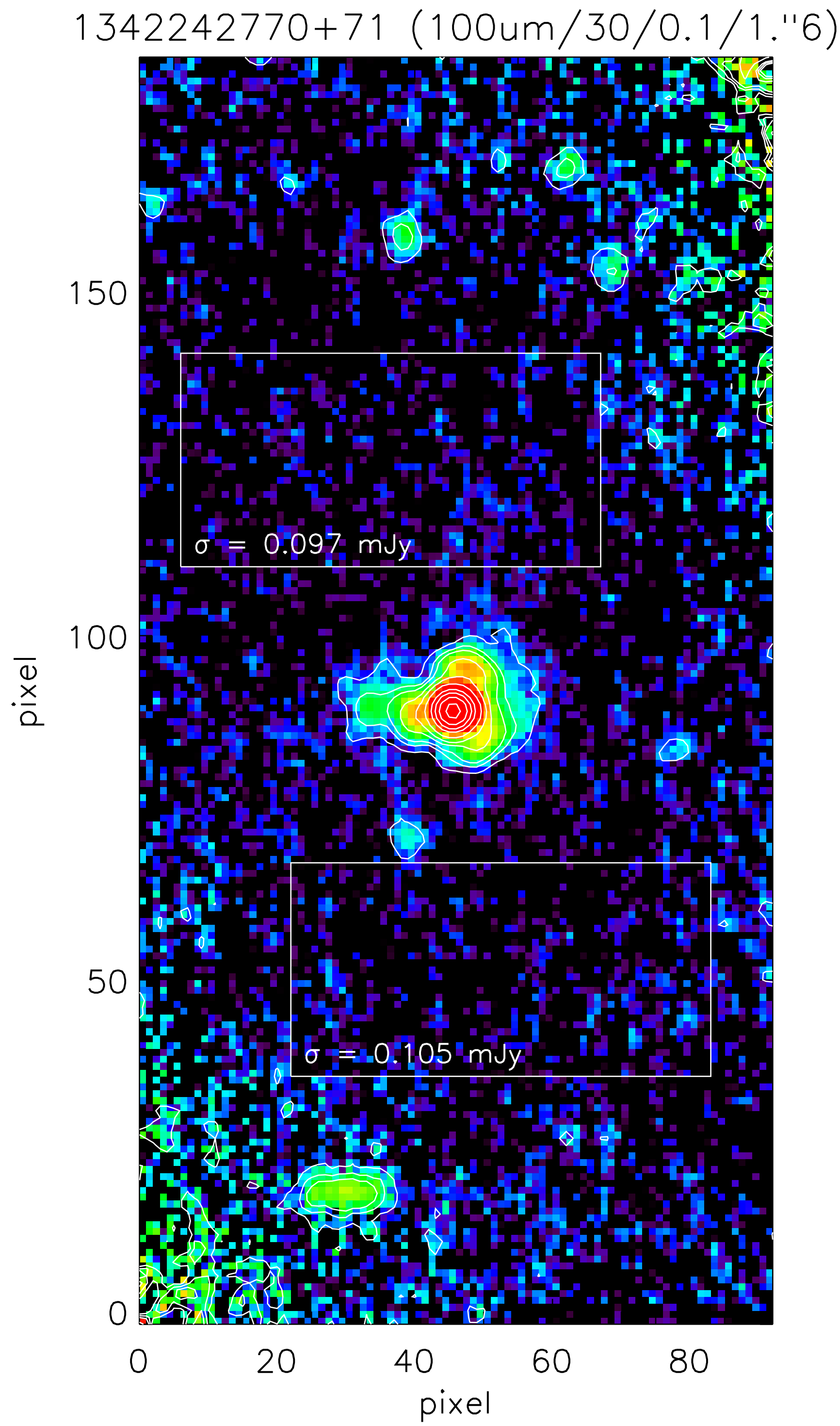

Figure 115: 100 µm L2.5 combined map for OBSIDs 1342242770+71 with HPF radius 30, pixfrac 0.1 and output pixel size of 1.''6. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

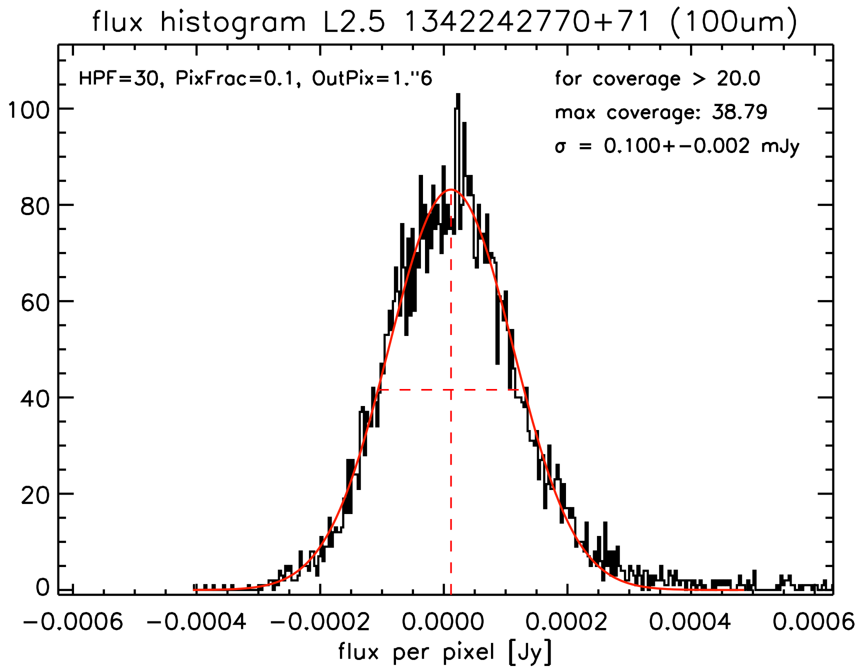

Figure 116: Noise determination for the 100 µm coadded L2.5 map of OBSIDs 1342242770+71 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\,\sigma_{\rm hist}$).

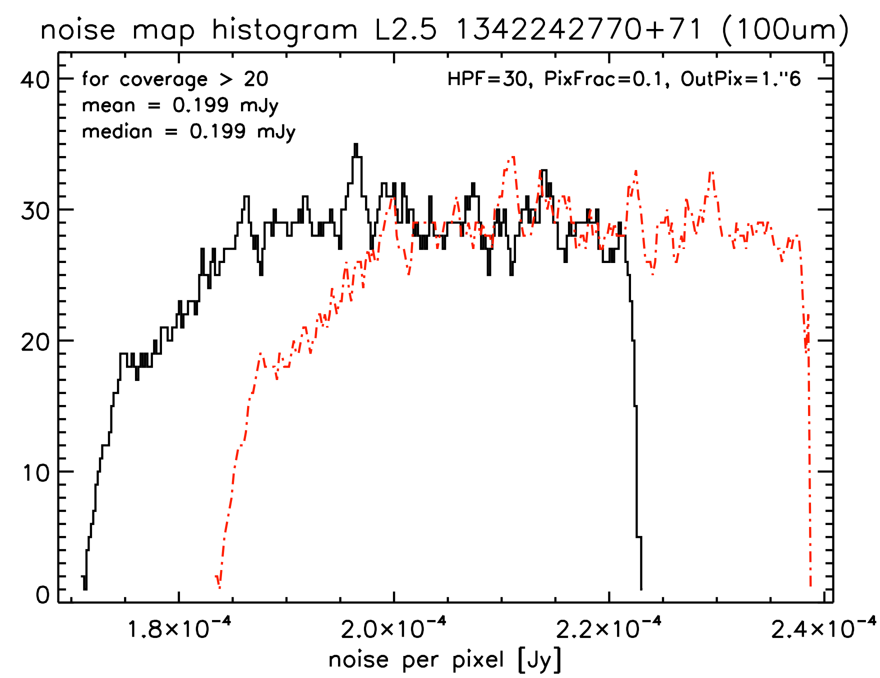

Figure 117: Histogram of the noise value distribution in the L2.5 error map above the coverage threshold indicated in the plot (in black). Mean and median value of the distribution are given. The red dashed-dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

4.4 100 µm: HPF radius 15, Pixfrac 0.1, Pixsize 2.″4

4.4.1 L 2.0 OBSID 1342242770

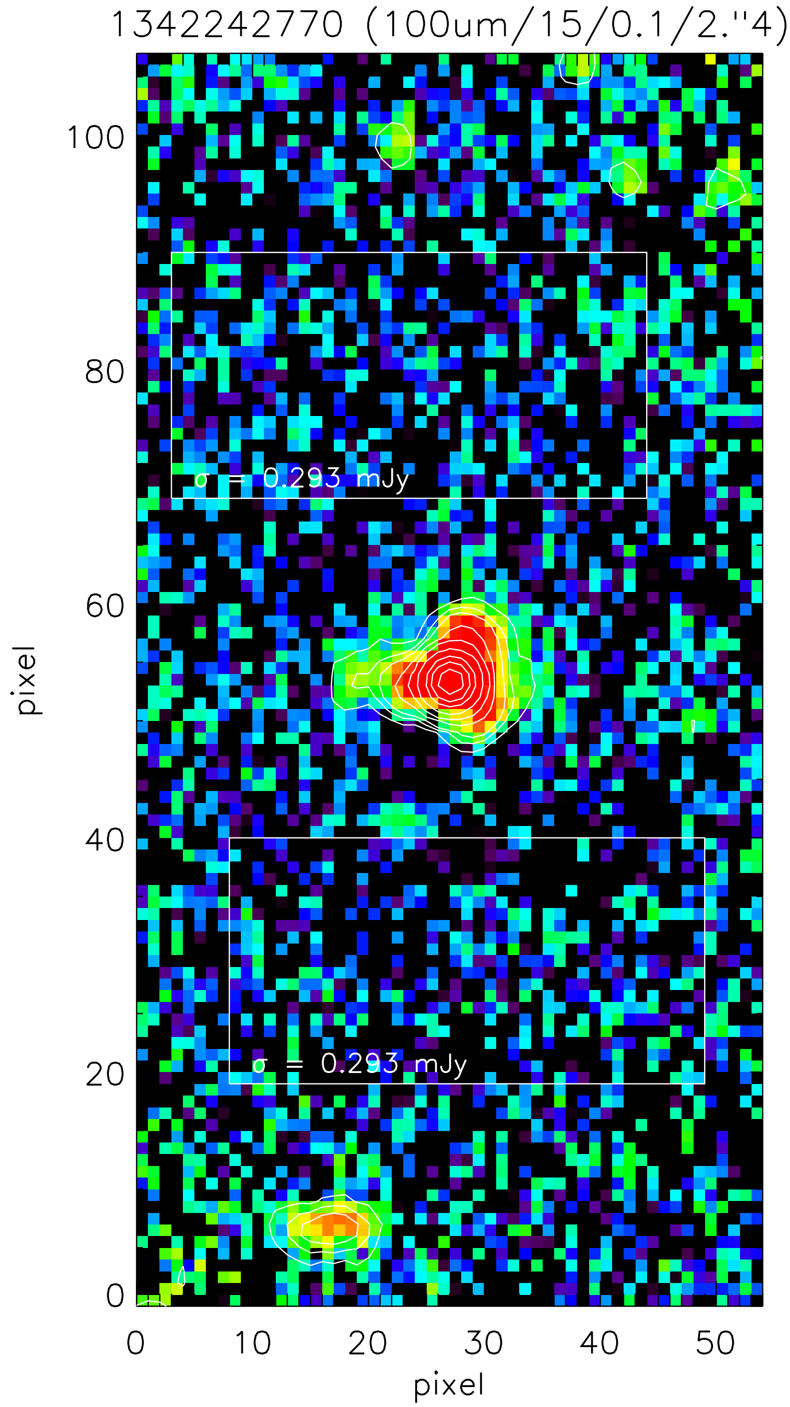

Figure 118: 100 µm L2.0 map for OBSID 1342242770 with HPF radius 15, pixfrac 0.1 and output pixel size of 2.″4. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

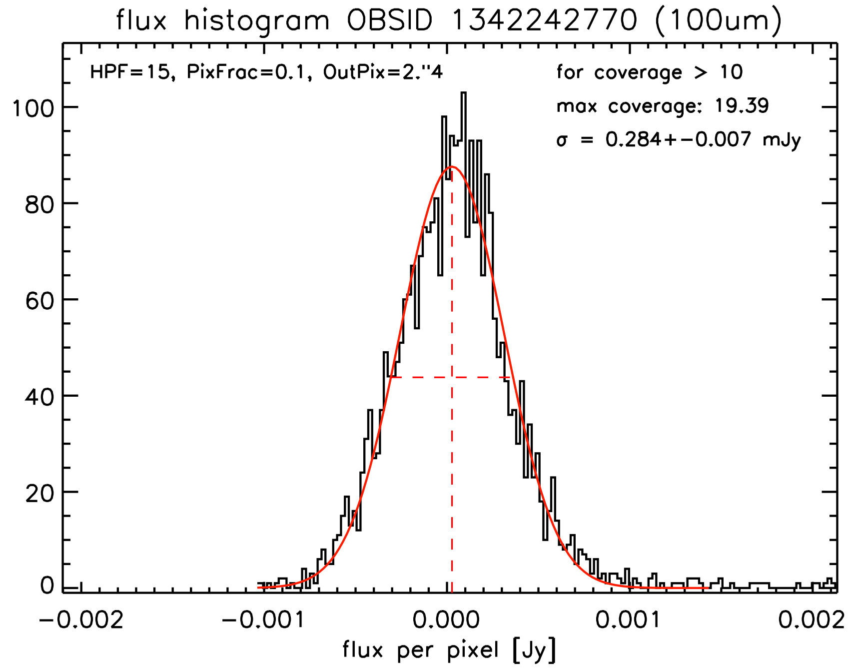

Figure 119: Noise determination for the 100 µm L2.0 map of OBSID 1342242770 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

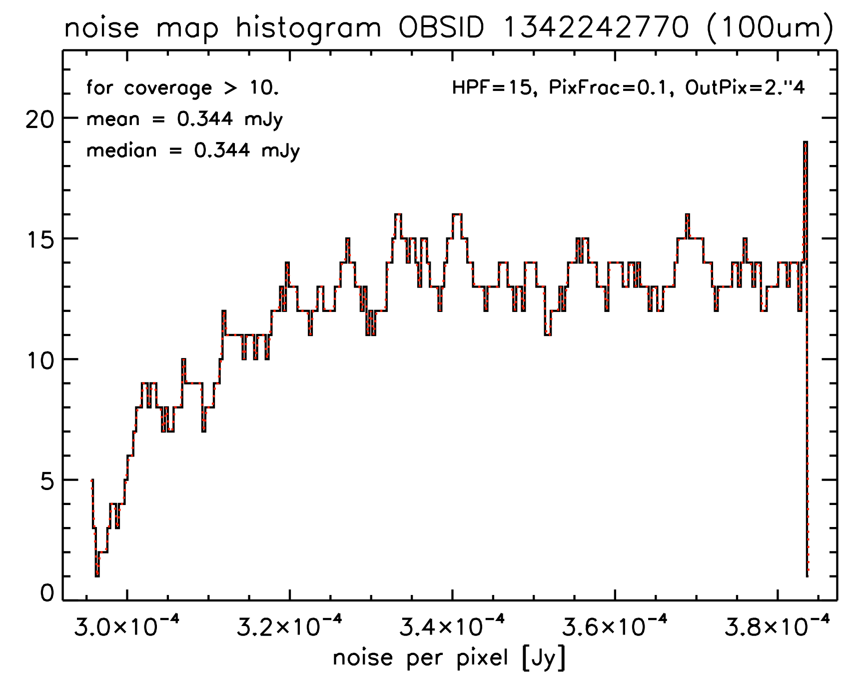

Figure 120: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

4.4.2 L 2.0 OBSID 1342242771

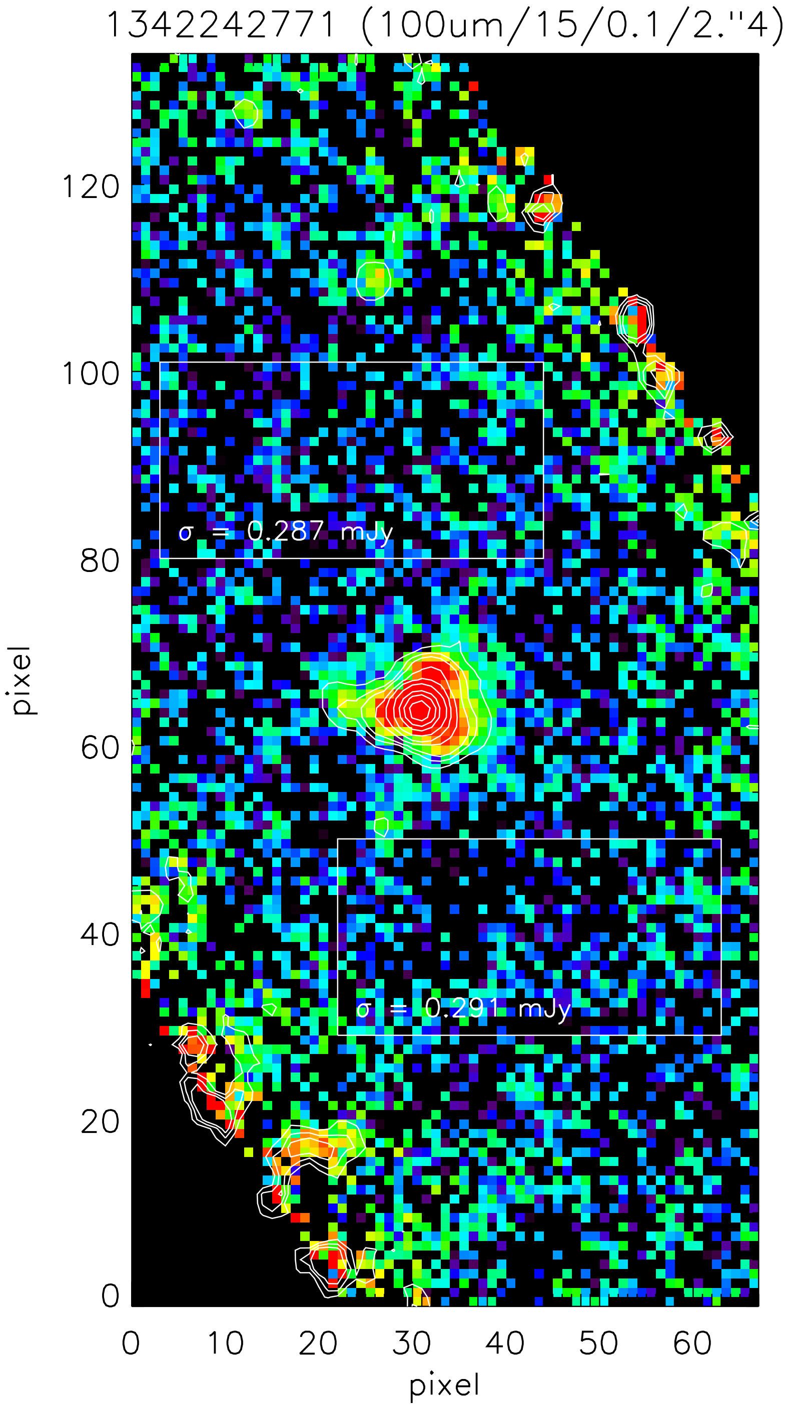

Figure 121: 100 µm L2.0 map for OBSID 1342242771 with HPF radius 15, pixfrac 0.1 and output pixel size of 2.''4. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

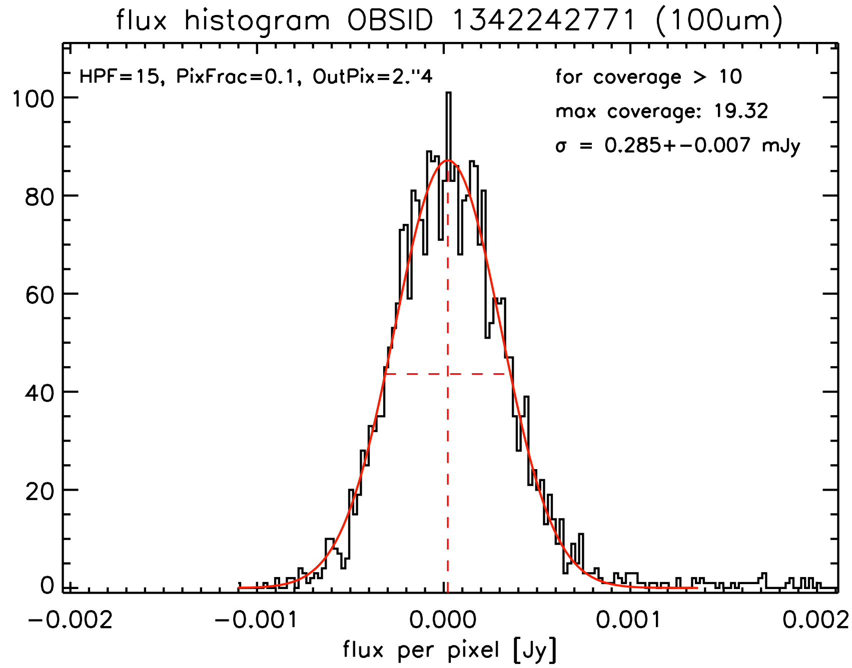

Figure 122: Noise determination for the 100 µm L2.0 map of OBSID 1342242771 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

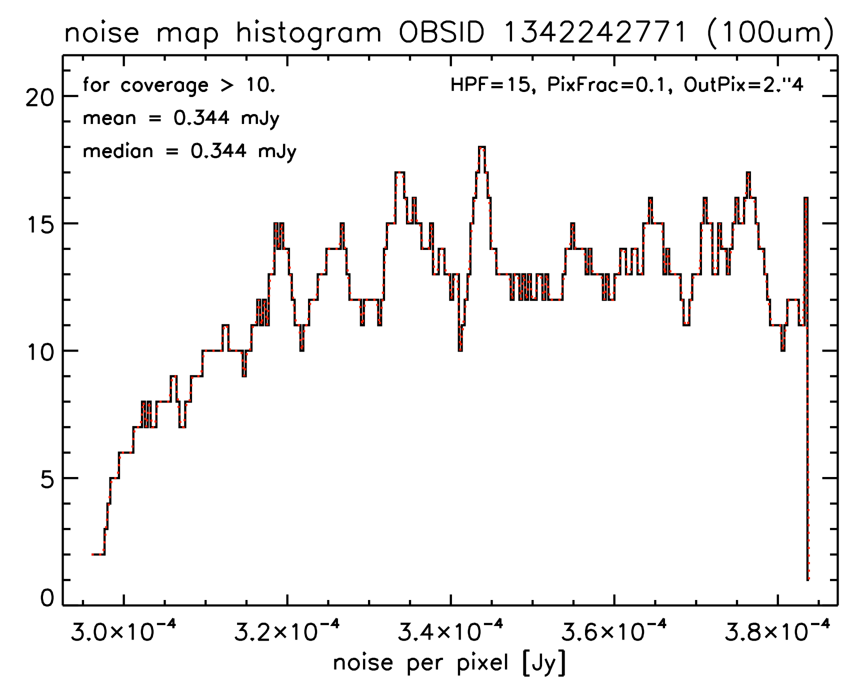

Figure 123: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

4.4.3 L 2.5 OBSIDs 1342242770+1342242771

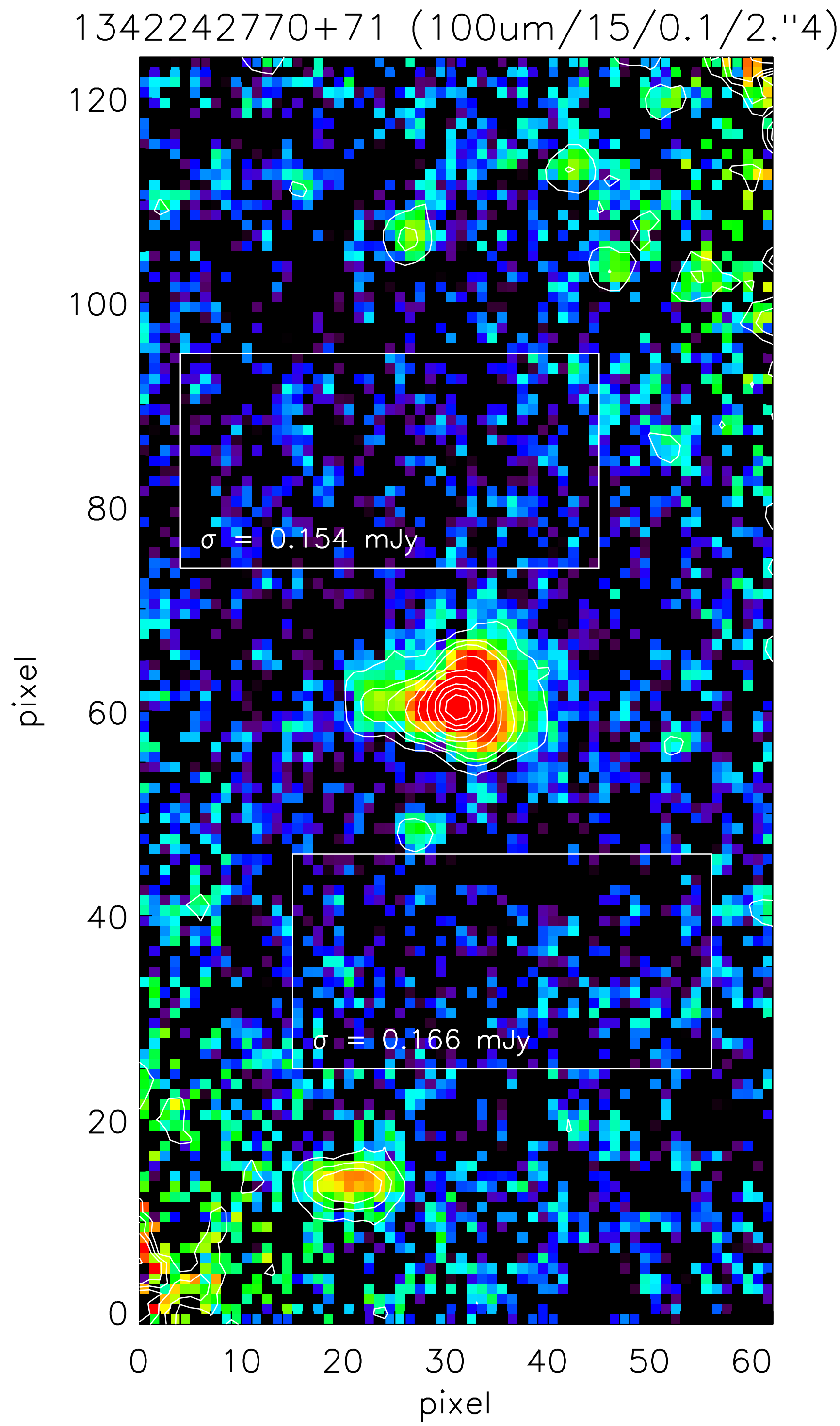

Figure 124: 100 µm L2.5 combined map for OBSIDs 1342242770+71 with HPF radius 15, pixfrac 0.1 and output pixel size of 2.″4. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

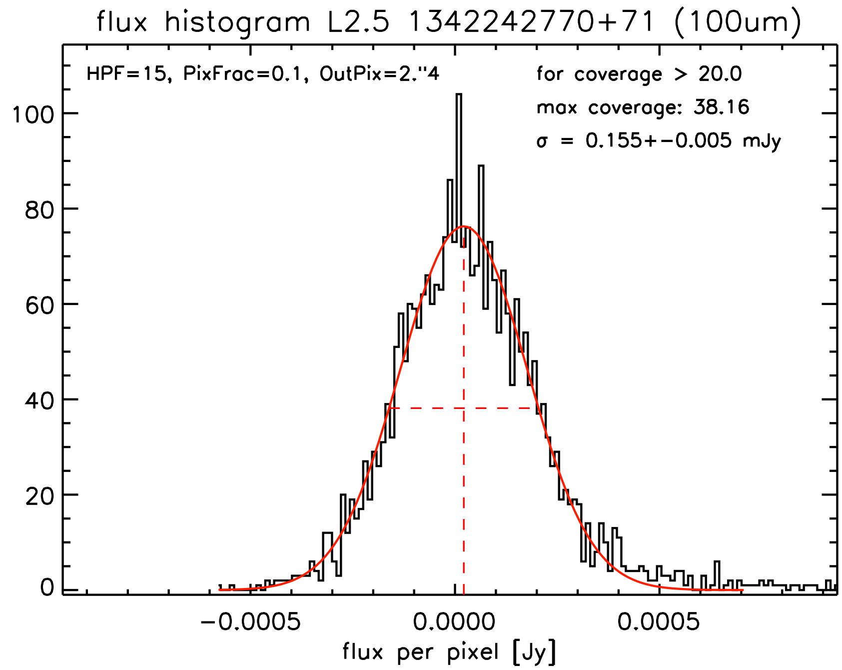

Figure 125: Noise determination for the 100 μm coadded L2.5 map of OBSIDs 1342242770+71 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\,\sigma_{\rm hist}$).

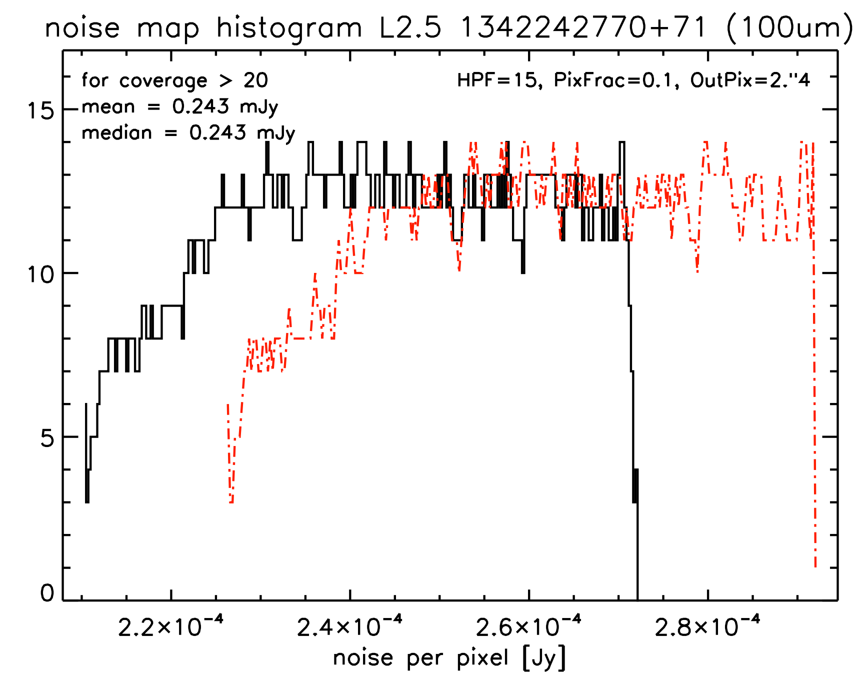

Figure 126: Histogram of the noise value distribution in the L2.5 error map above the coverage threshold indicated in the plot (in black). Mean and median value of the distribution are given. The red dashed-dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

4.5 100 µm: HPF radius 15, Pixfrac 0.1, Pixsize 3.″2

4.5.1 L 2.0 OBSID 1342242770

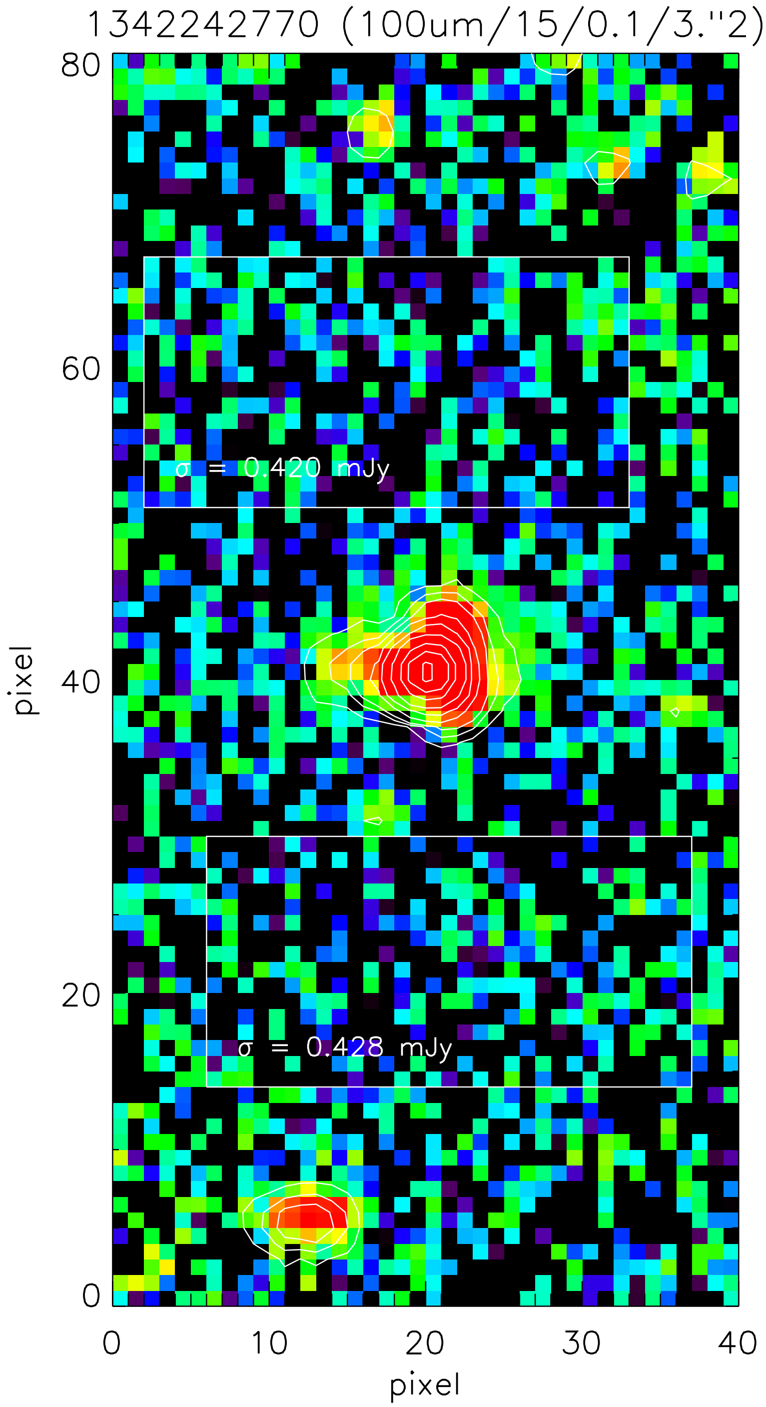

Figure 127: 100 µm L2.0 map for OBSID 1342242770 with HPF radius 15, pixfrac 0.1 and output pixel size of 3.″2. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

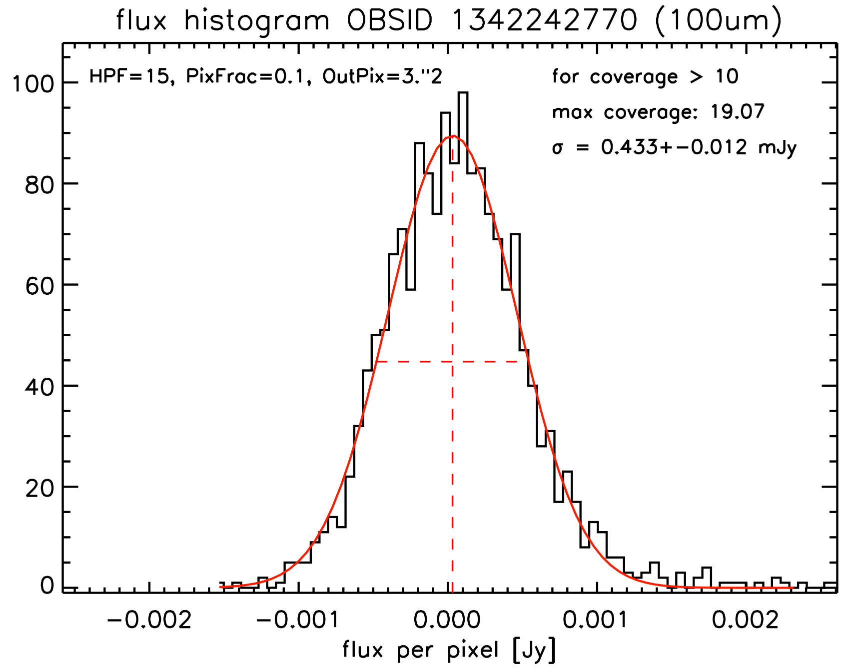

Figure 128: Noise determination for the 100 µm L2.0 map of OBSID 1342242770 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

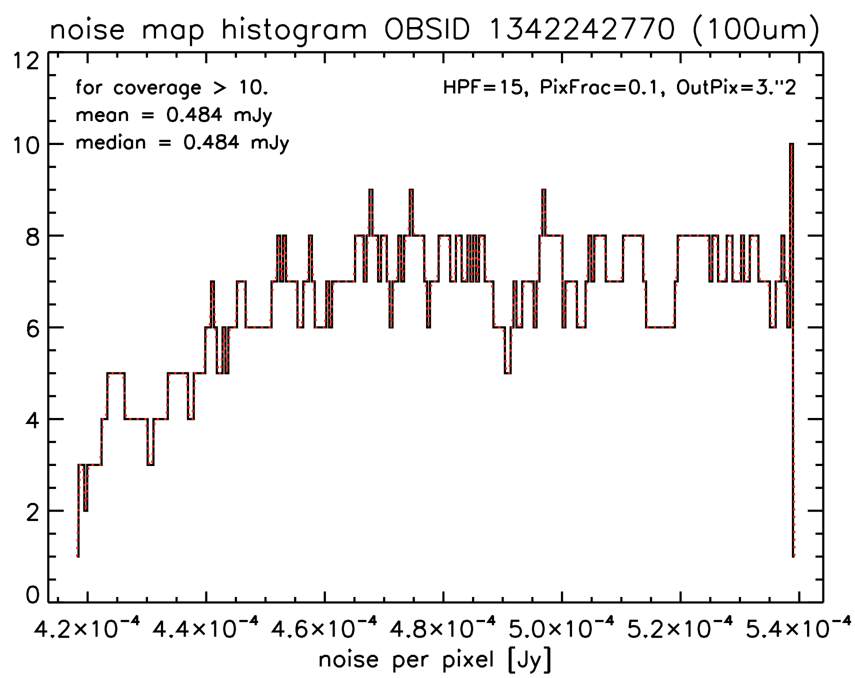

Figure 129: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

4.5.2 L 2.0 OBSID 1342242771

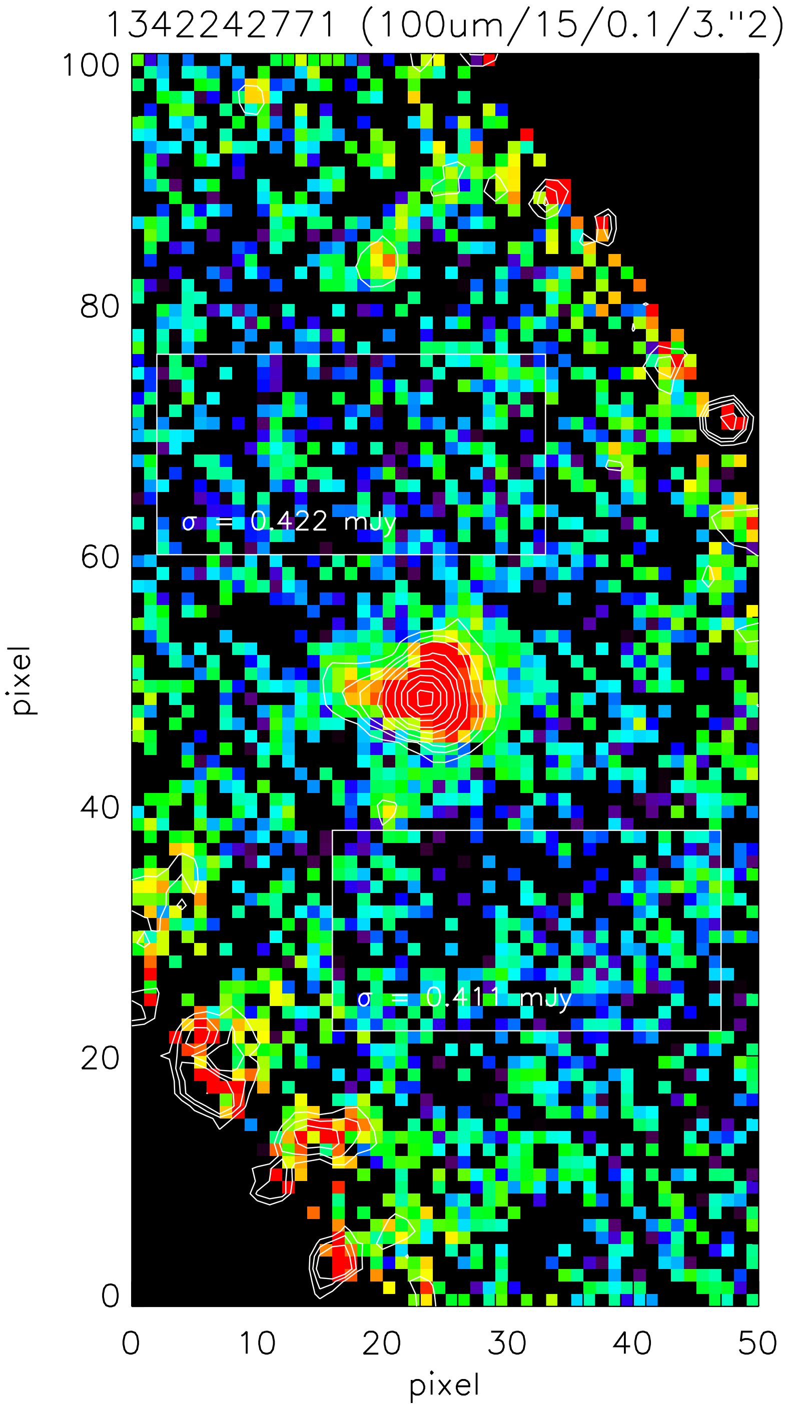

Figure 130: 100 µm L2.0 map for OBSID 1342242771 with HPF radius 15, pixfrac 0.1 and output pixel size of 3.''2. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

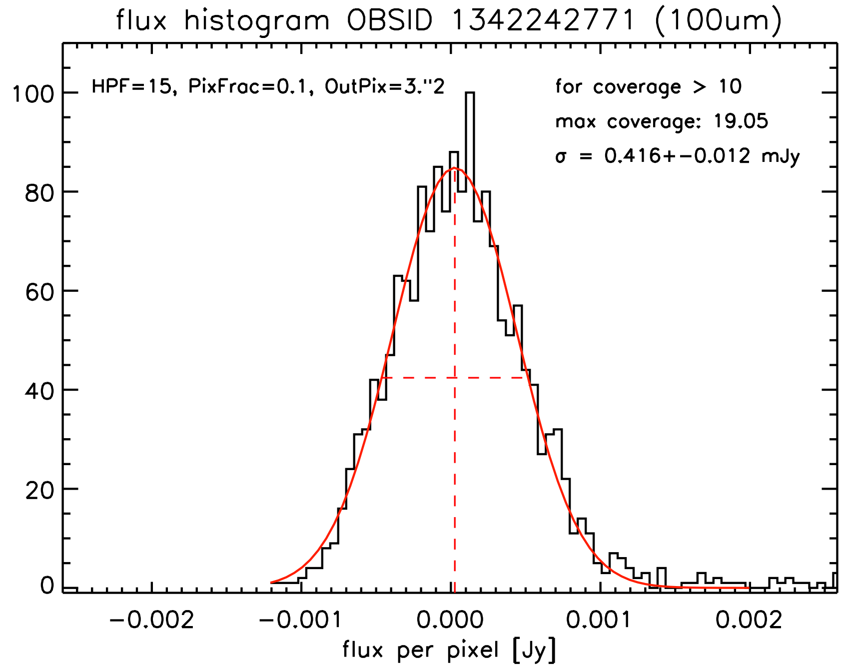

Figure 131: Noise determination for the 100 µm L2.0 map of OBSID 1342242771 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\ \sigma_{\rm hist}$).

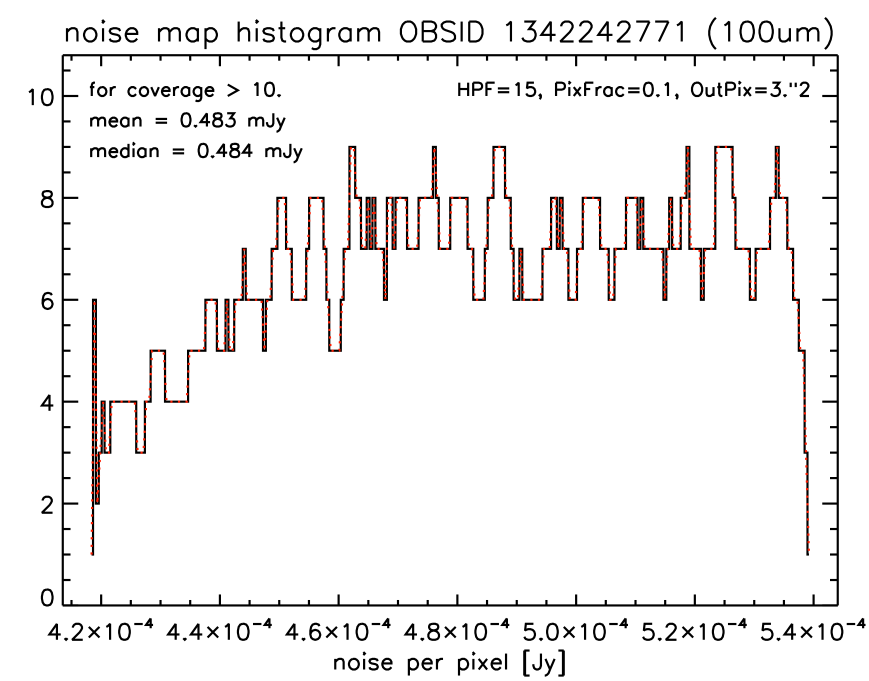

Figure 132: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

4.5.3 L 2.5 OBSIDs 1342242770+1342242771

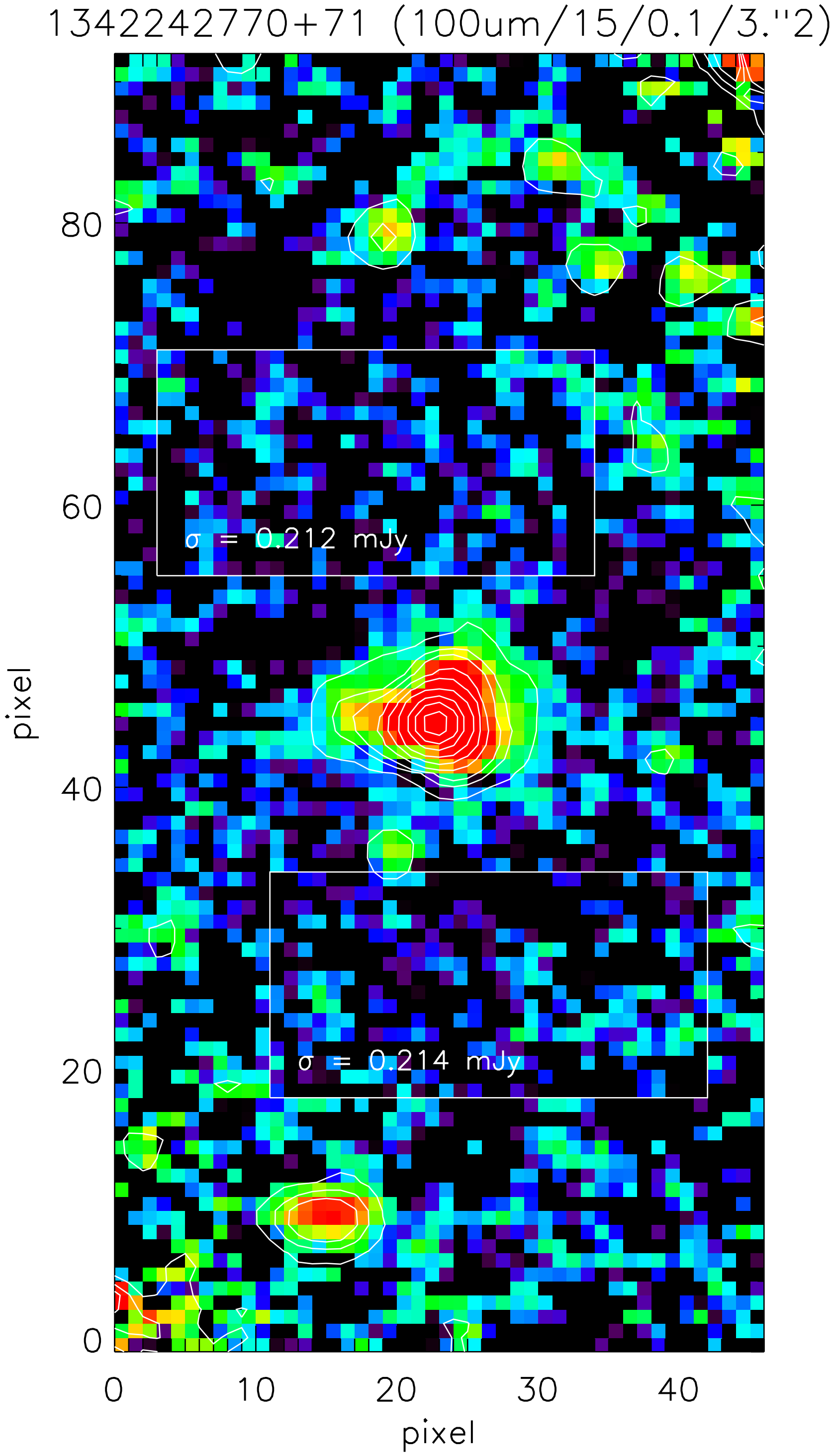

Figure 133: 100 µm L2.5 combined map for OBSIDs 1342242770+71 with HPF radius 15, pixfrac 0.1 and output pixel size of 3.″2. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

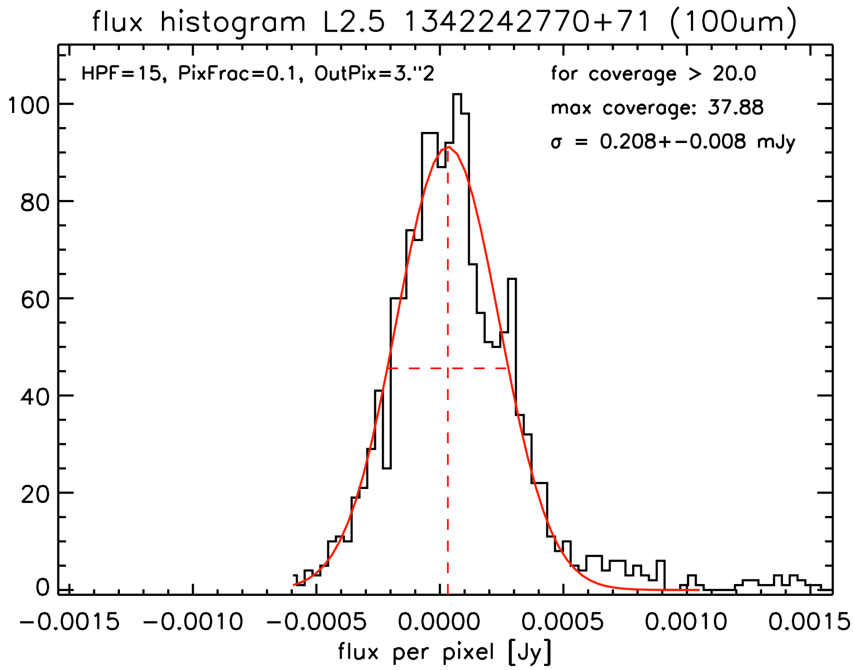

Figure 134: Noise determination for the 100 µm coadded L2.5 map of OBSIDs 1342242770+71 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

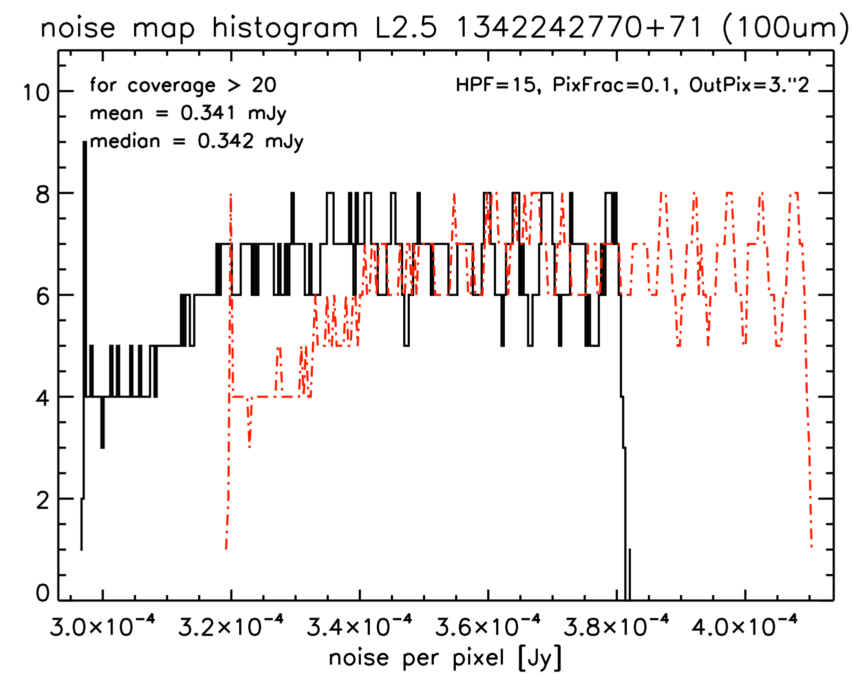

Figure 135: Histogram of the noise value distribution in the L2.5 error map above the coverage threshold indicated in the plot (in black). Mean and median value of the distribution are given. The red dashed-dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

4.6 100 µm: HPF radius 15, Pixfrac 0.5, Pixsize 1.″6

4.6.1 L 2.0 OBSID 1342242770

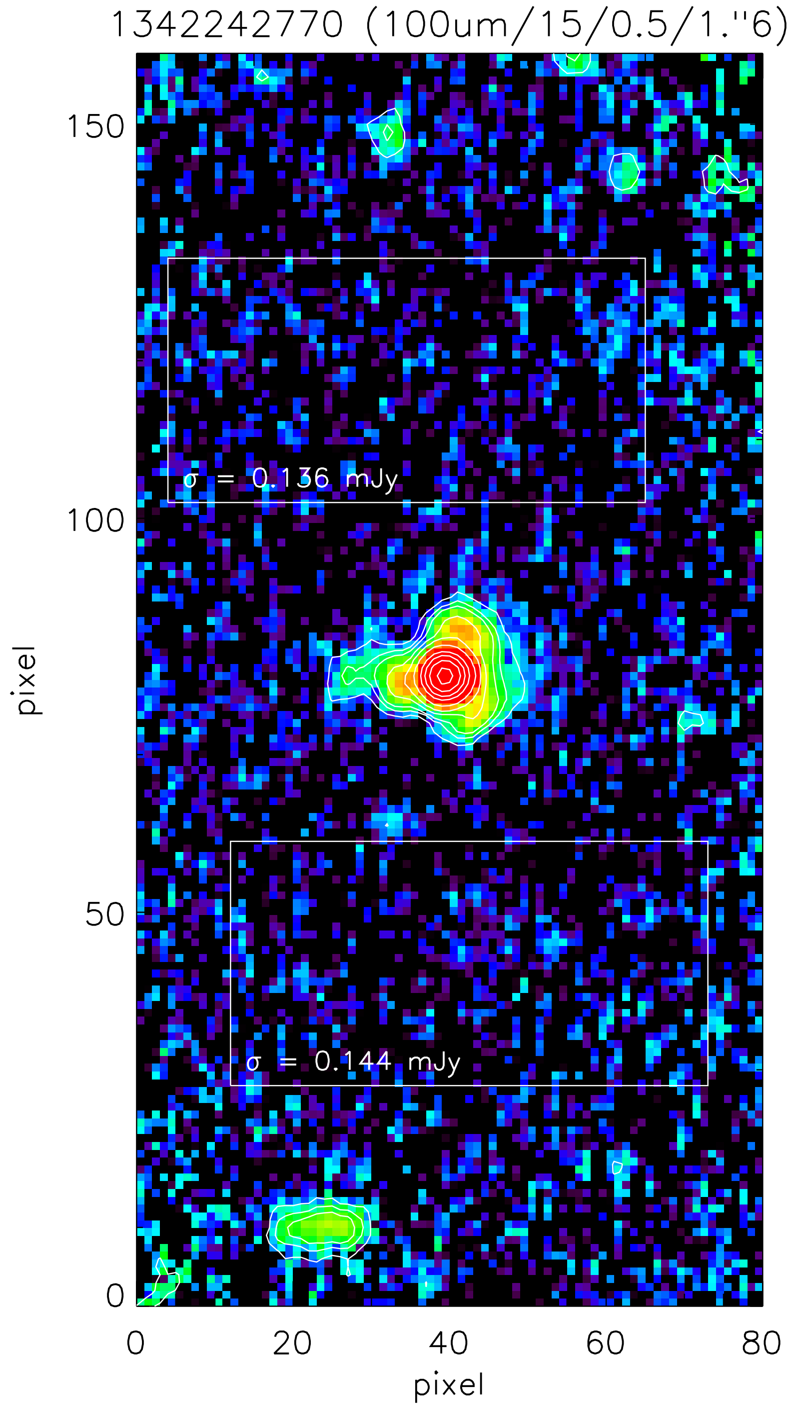

Figure 136: 100 µm L2.0 map for OBSID 1342242770 with HPF radius 15, pixfrac 0.5 and output pixel size of 1.″6. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

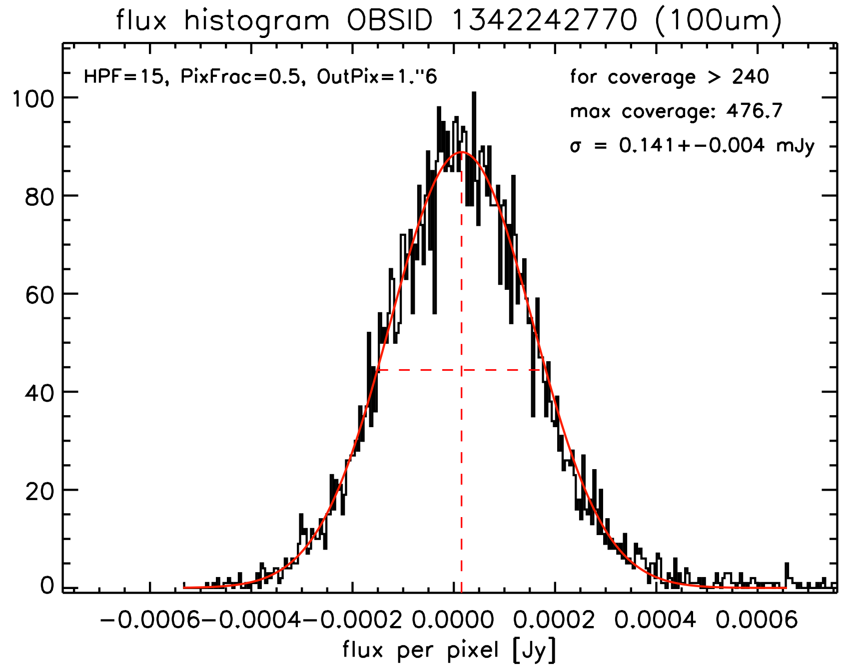

Figure 137: Noise determination for the 100 µm L2.0 map of OBSID 1342242770 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

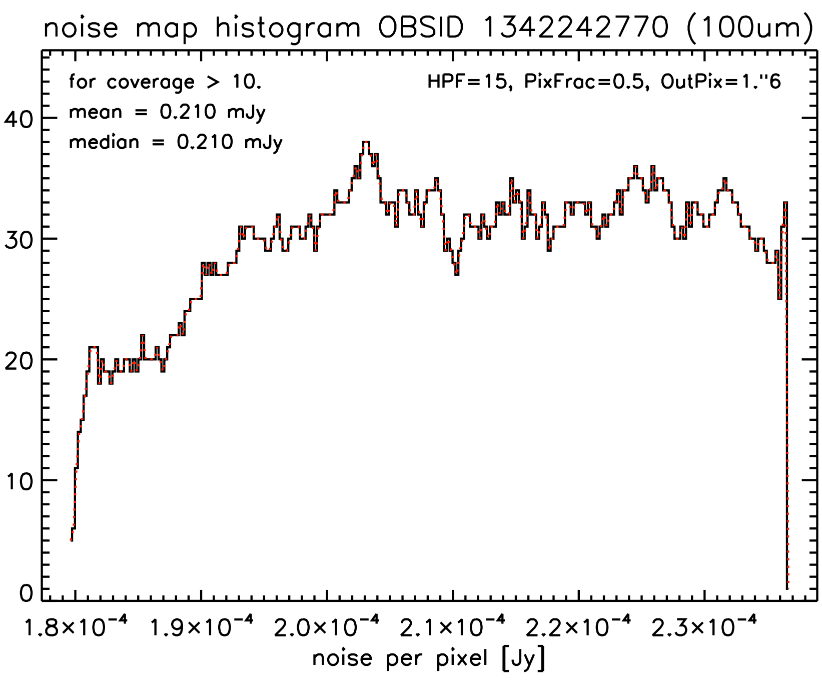

Figure 138: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

4.6.2 L 2.0 OBSID 1342242771

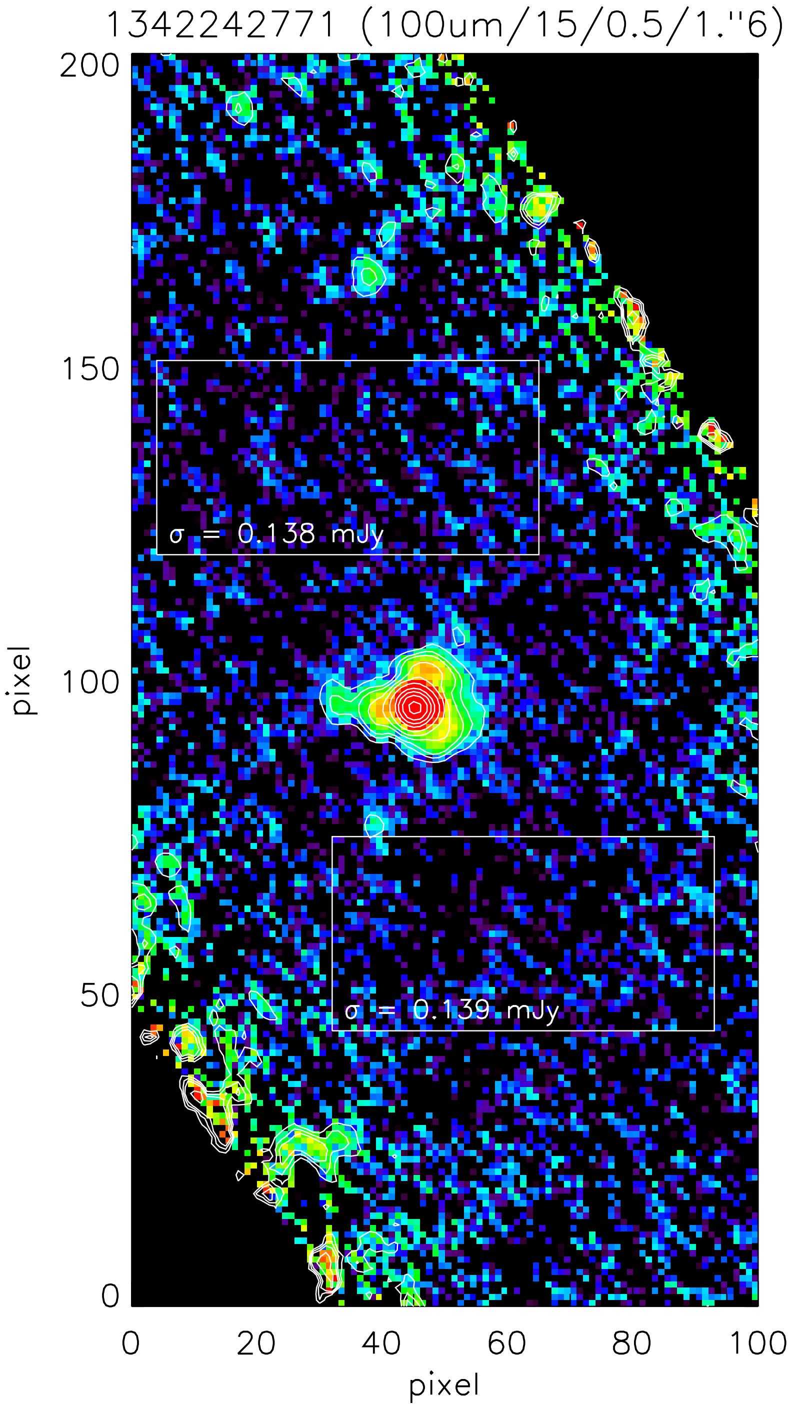

Figure 139: 100 µm L2.0 map for OBSID 1342242771 with HPF radius 15, pixfrac 0.5 and output pixel size of 1.″6. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

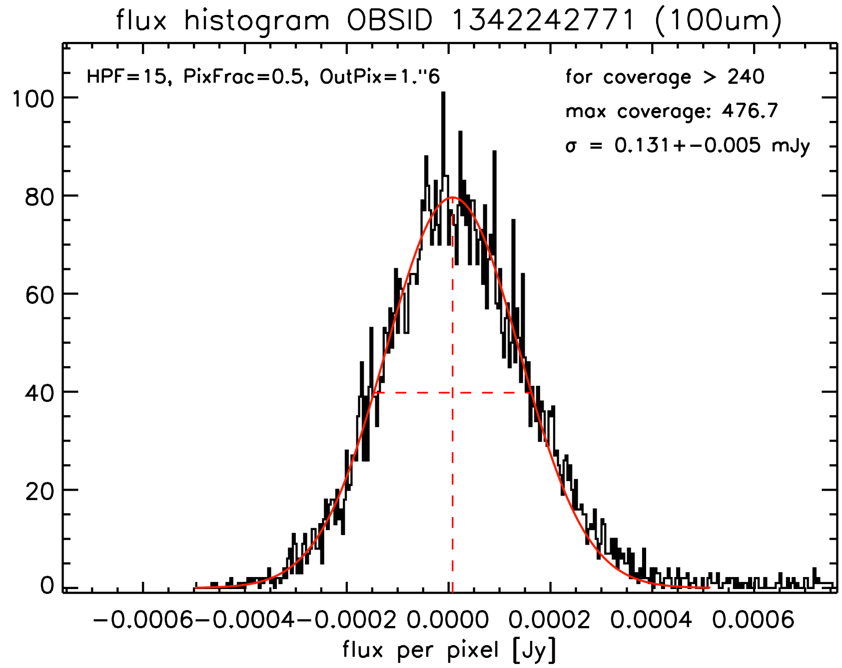

Figure 140: Noise determination for the 100 µm L2.0 map of OBSID 1342242771 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

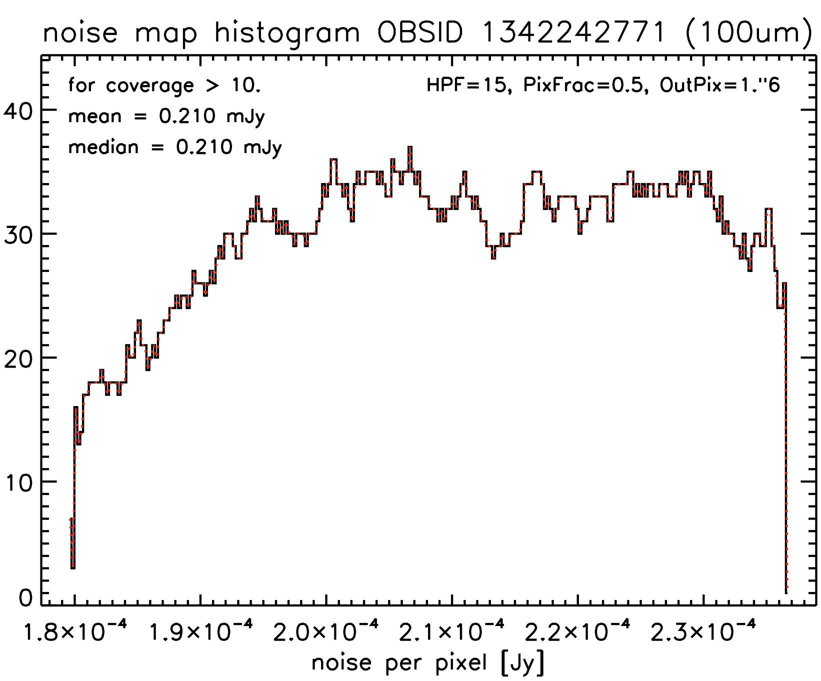

Figure 141: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

4.6.3 L 2.5 OBSIDs 1342242770+1342242771

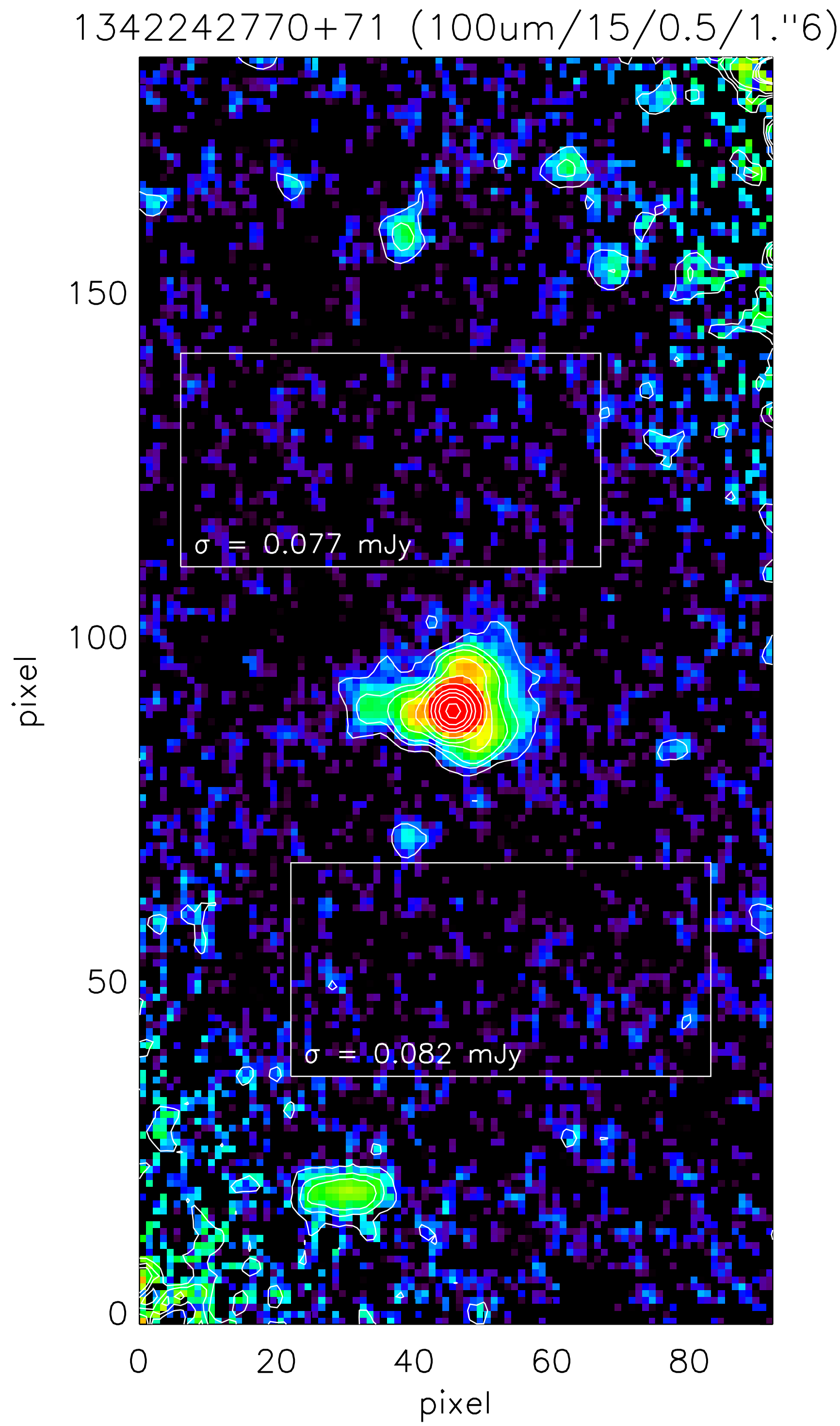

Figure 142: 100 µm L2.5 combined map for OBSIDs 1342242770+71 with HPF radius 15, pixfrac 0.5 and output pixel size of 1.″6. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

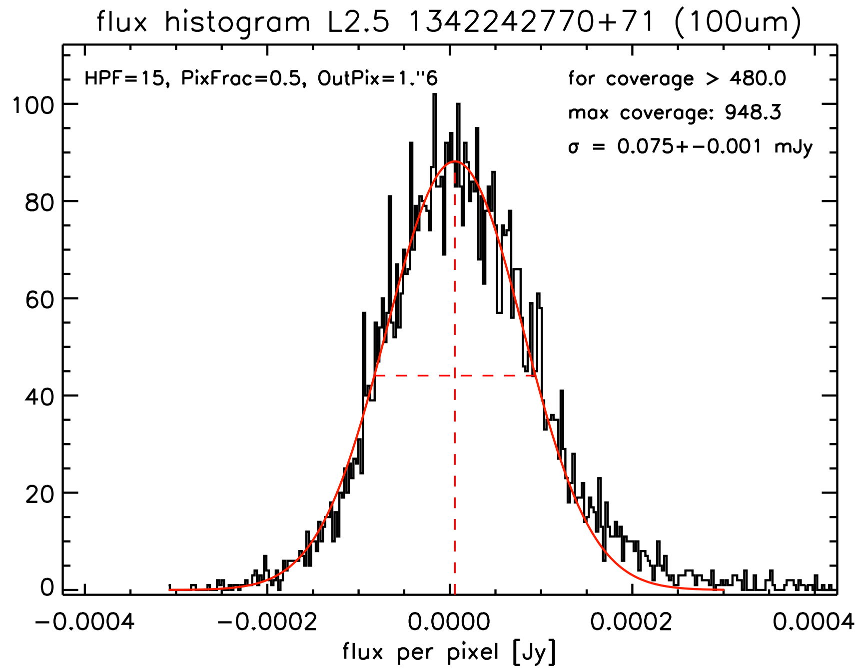

Figure 143: Noise determination for the 100 μm coadded L2.5 map of OBSIDs 1342242770+71 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

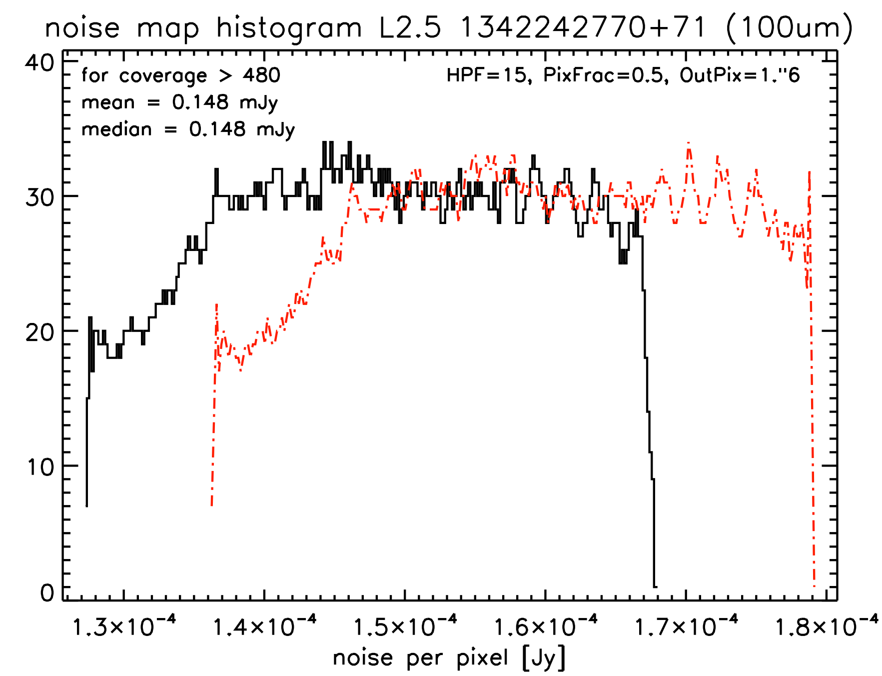

Figure 144: Histogram of the noise value distribution in the L2.5 error map above the coverage threshold indicated in the plot (in black). Mean and median value of the distribution are given. The red dashed-dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

4.7 100 µm: HPF radius 15, Pixfrac 1.0, Pixsize 1.″4

4.7.1 L 2.0 OBSID 1342242770

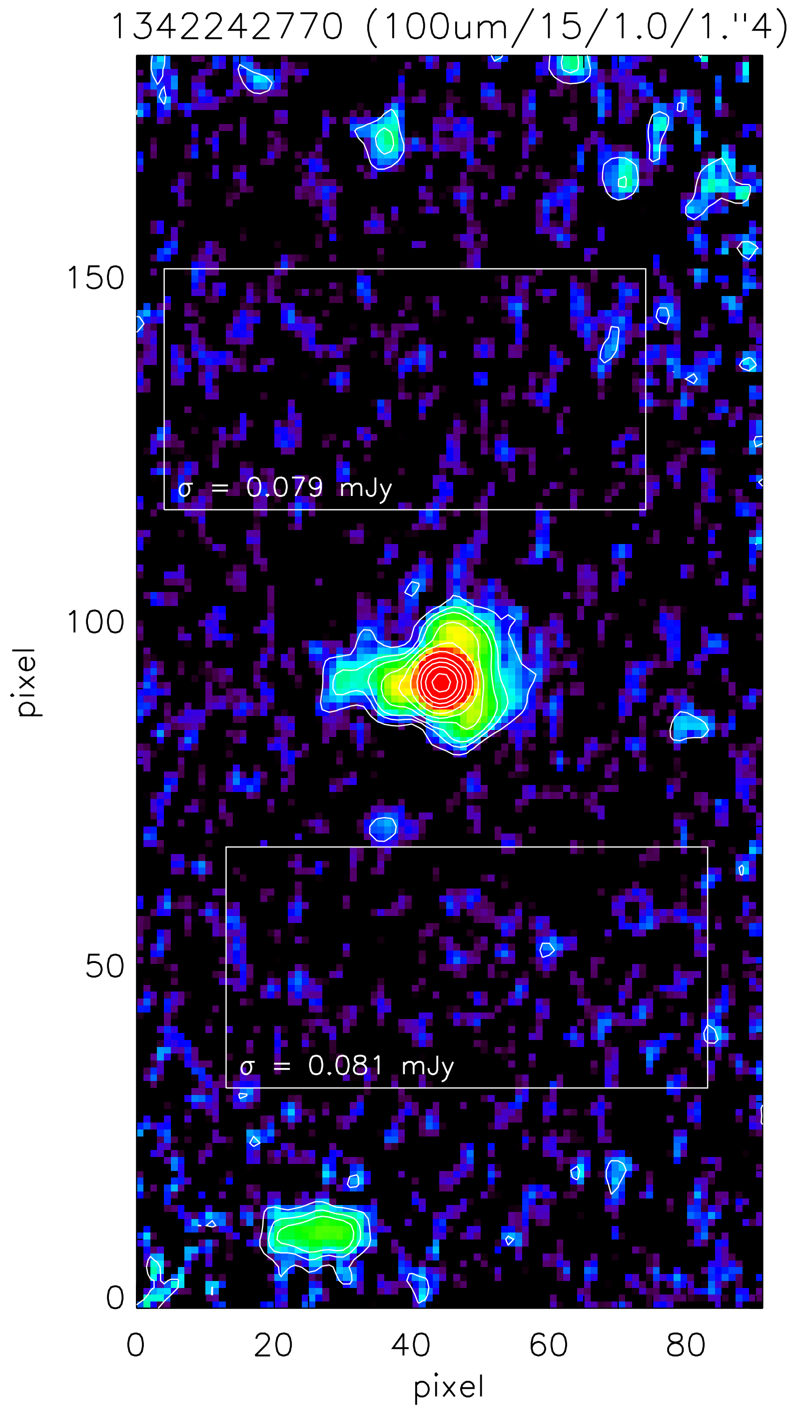

Figure 145: 100 µm L2.0 map for OBSID 1342242770 with HPF radius 15, pixfrac 1.0 and output pixel size of 1.″4. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

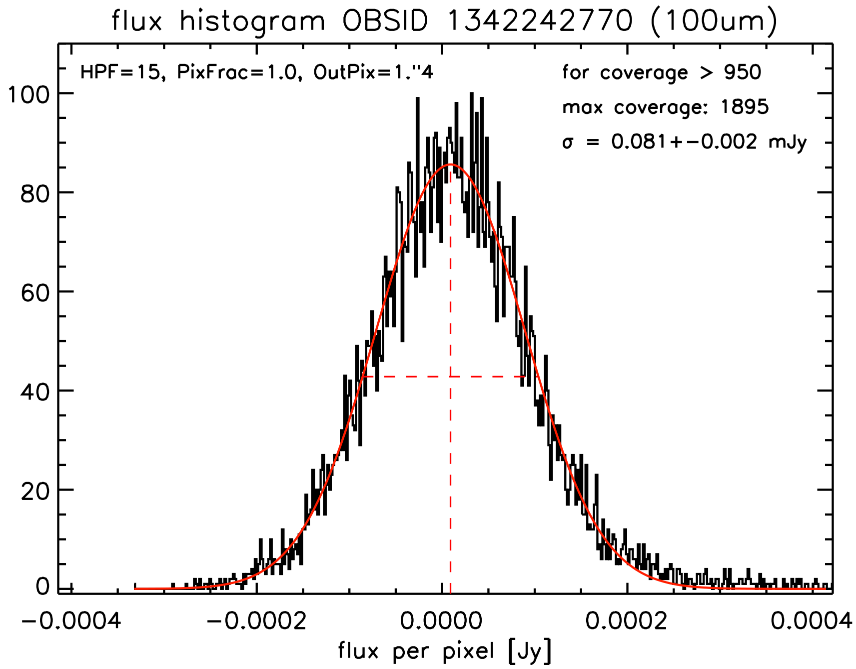

Figure 146: Noise determination for the 100 µm L2.0 map of OBSID 1342242770 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\mathrm{hist}}$).

For this map parameter combination no error map analysis was done.

4.7.2 L 2.0 OBSID 1342242771

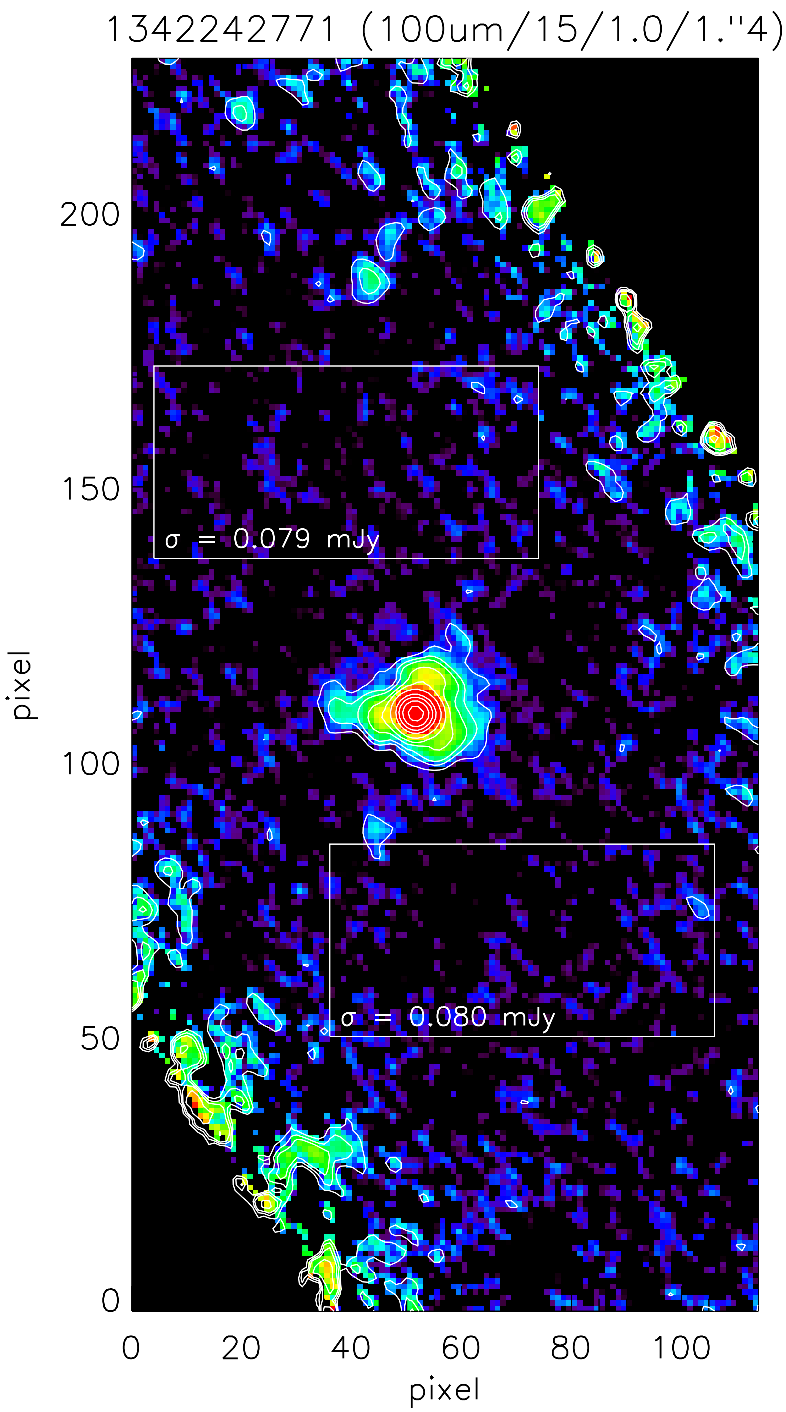

Figure 147: 100 µm L2.0 map for OBSID 1342242771 with HPF radius 15, pixfrac 1.0 and output pixel size of 1."4. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

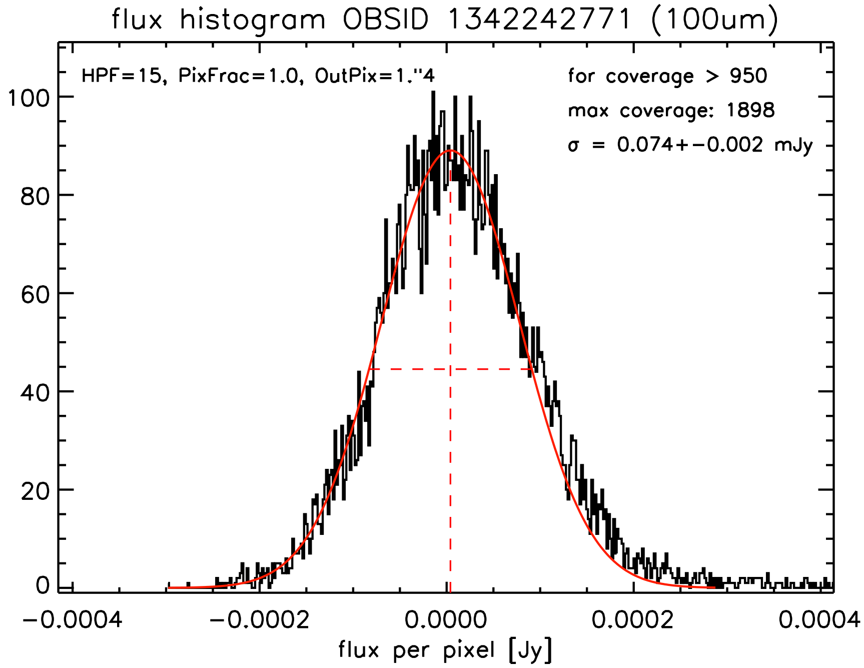

Figure 148: Noise determination for the 100 µm L2.0 map of OBSID 1342242771 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

For this map parameter combination no error map analysis was done.

4.7.3 L 2.5 OBSIDs 1342242770+1342242771

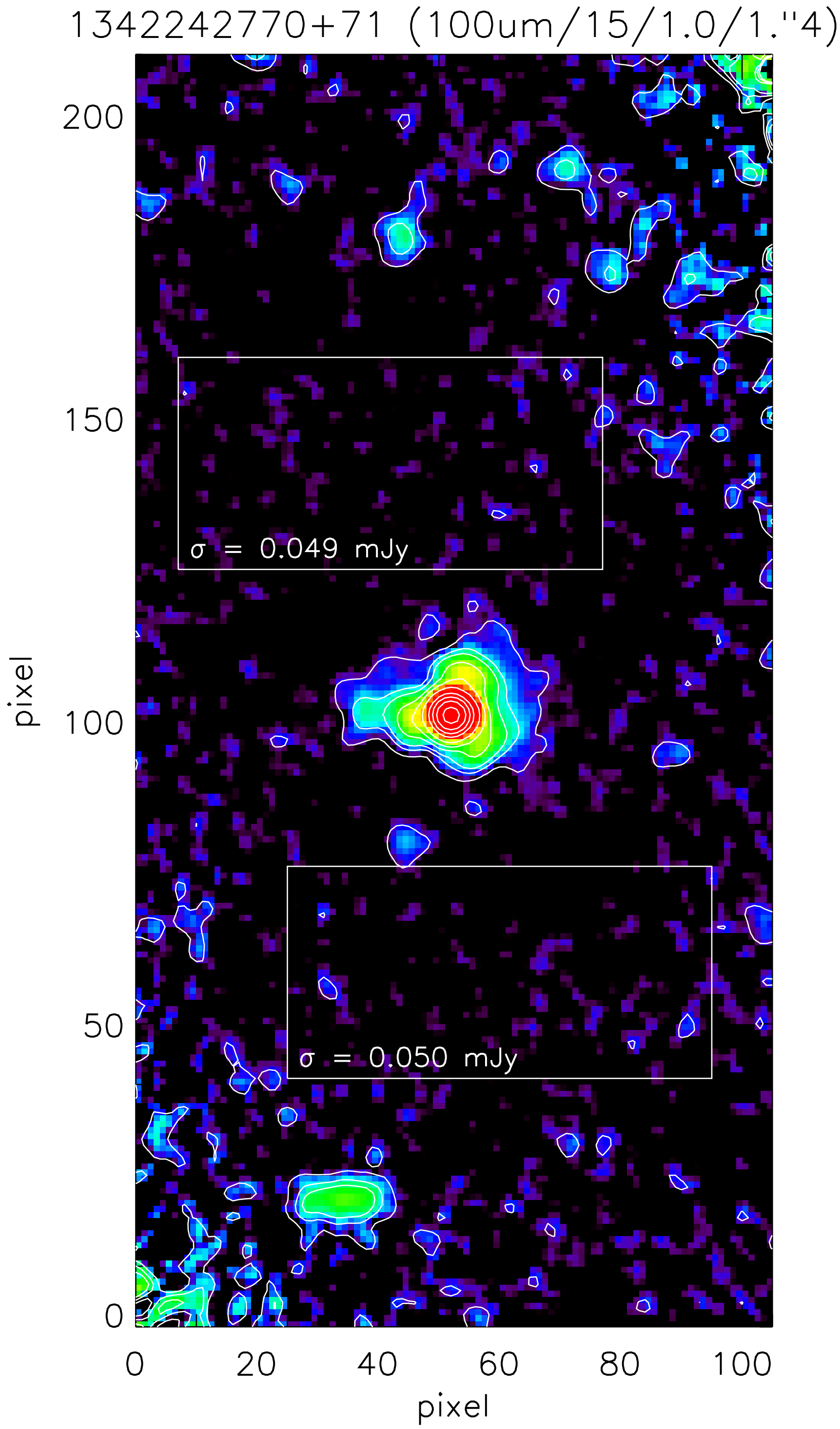

Figure 149: 100 µm L2.5 combined map for OBSIDs 1342242770+71 with HPF radius 15, pixfrac 1.0 and output pixel size of 1.″4. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

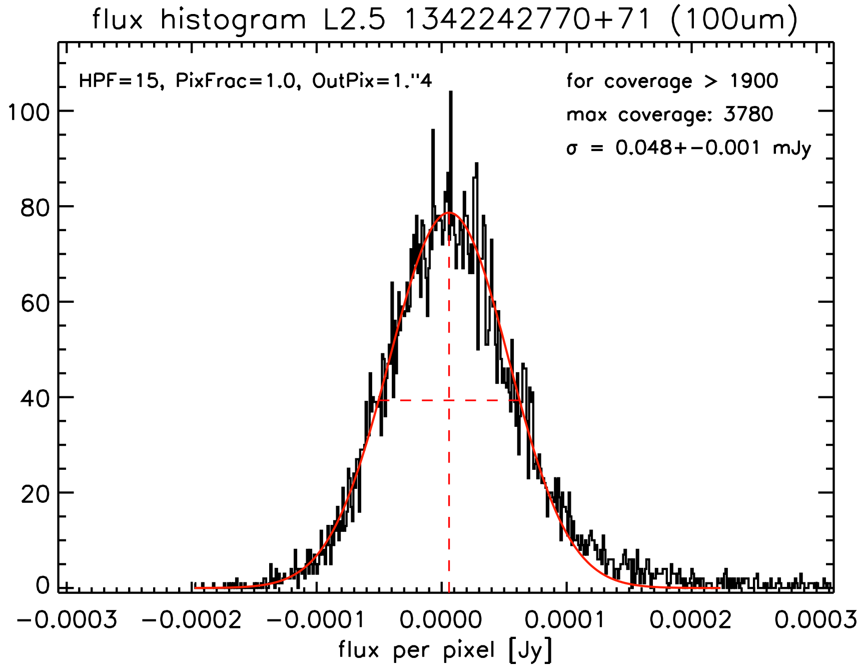

Figure 150: Noise determination for the 100 μm coadded L2.5 map of OBSIDs 1342242770+71 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\,\sigma_{\rm hist}$).

For this map parameter combination no error map analysis was done.

4.8 100 µm: HPF radius 15, Pixfrac 1.0, Pixsize 1.″6

4.8.1 L 2.0 OBSID 1342242770

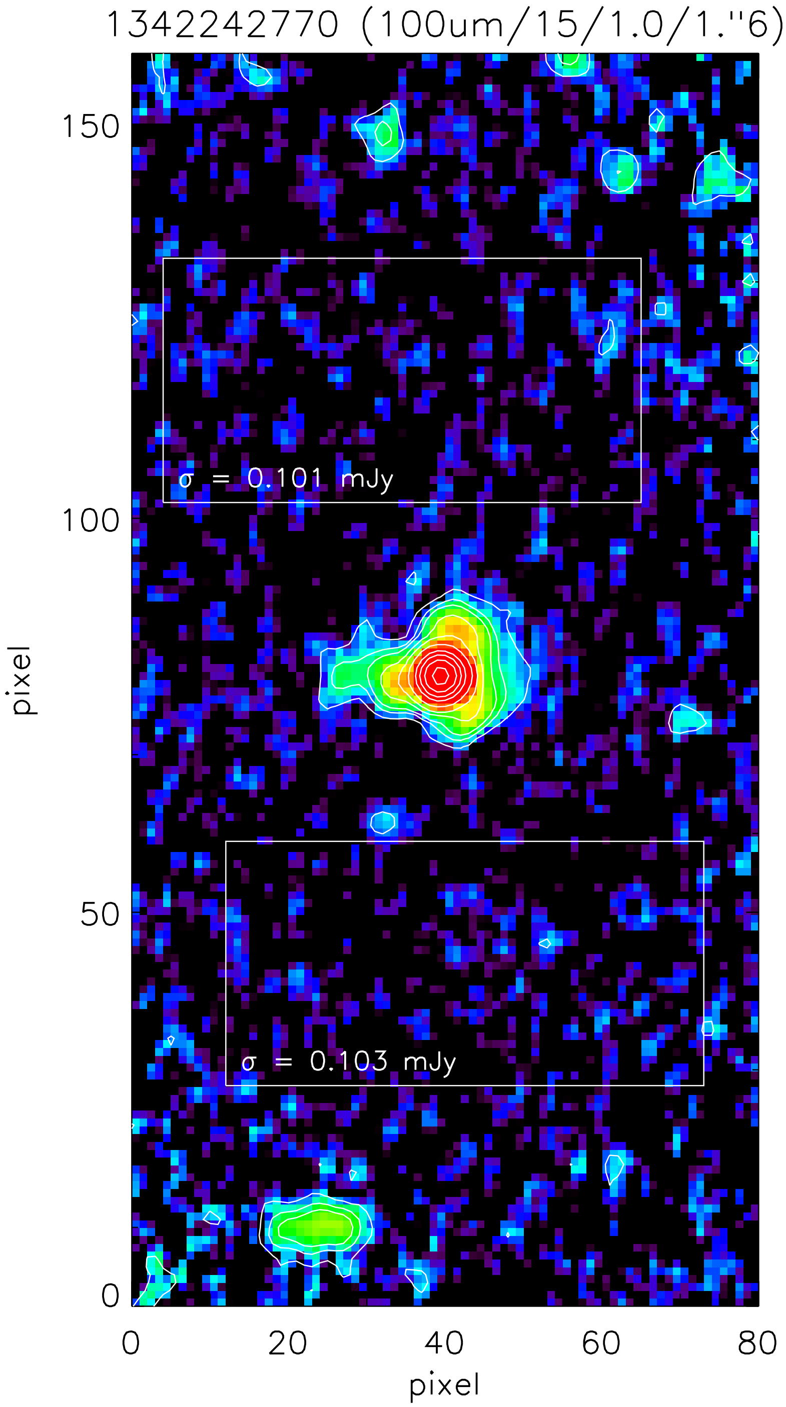

Figure 151: 100 µm L2.0 map for OBSID 1342242770 with HPF radius 15, pixfrac 1.0 and output pixel size of 1.″6. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

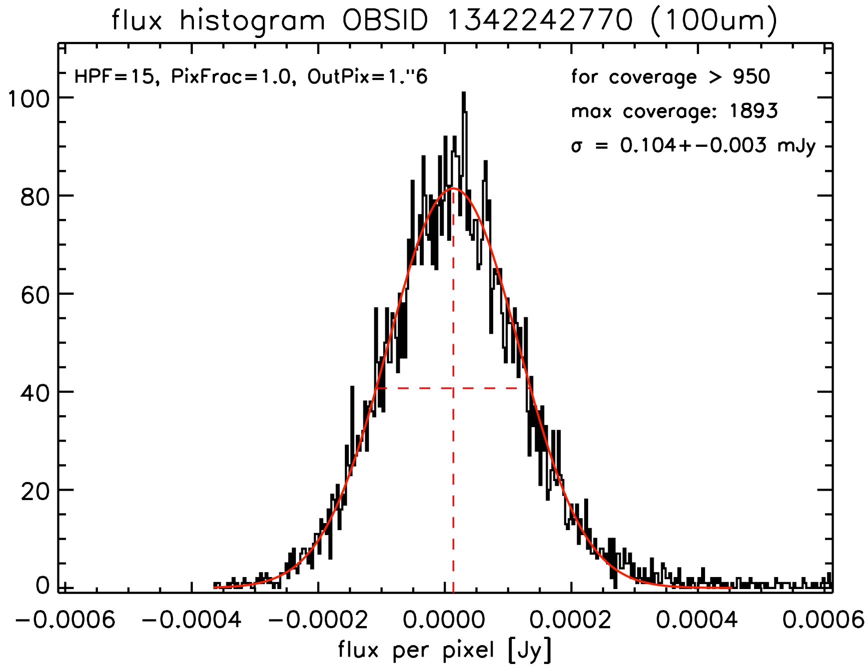

Figure 152: Noise determination for the 100 μm L2.0 map of OBSID 1342242770 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\ \sigma_{\rm hist}$).

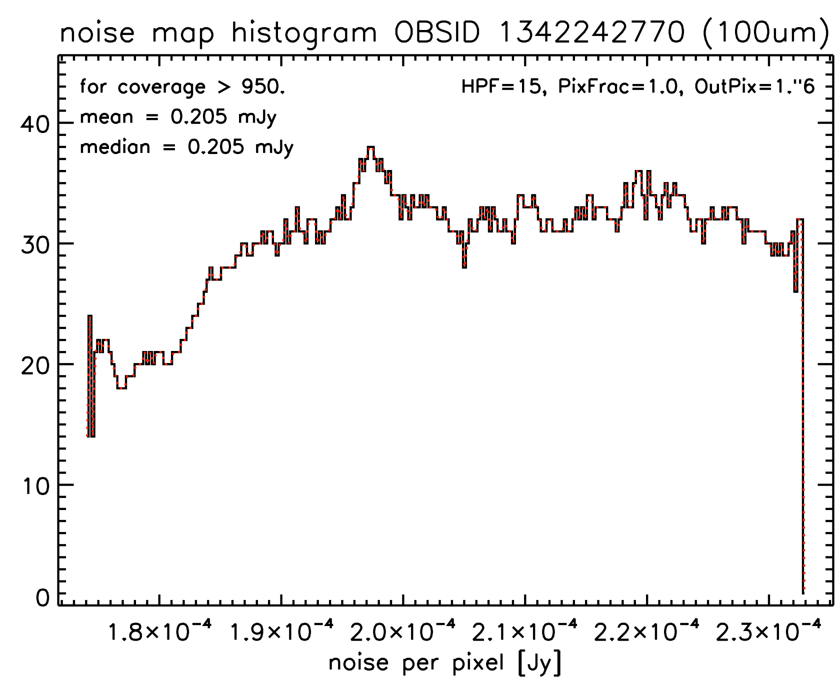

Figure 153: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

4.8.2 L 2.0 OBSID 1342242771

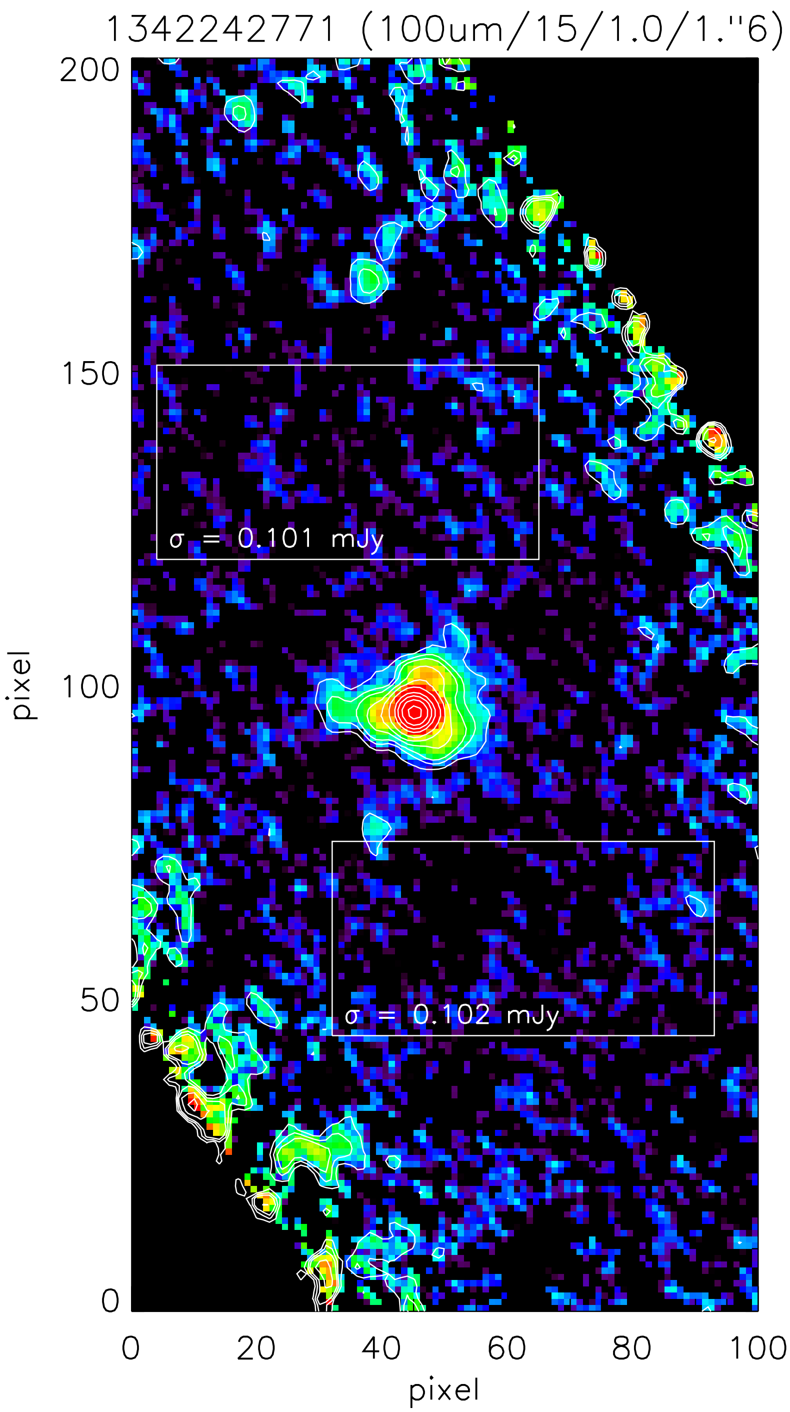

Figure 154: 100 µm L2.0 map for OBSID 1342242771 with HPF radius 15, pixfrac 1.0 and output pixel size of 1.″6. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

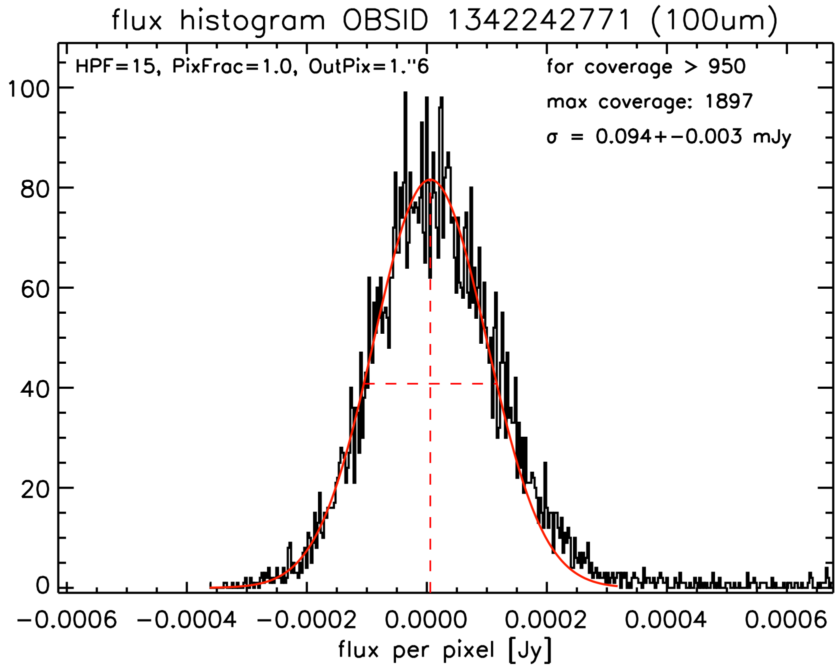

Figure 155: Noise determination for the 100 µm L2.0 map of OBSID 1342242771 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\ \sigma_{\text{hist}}$).

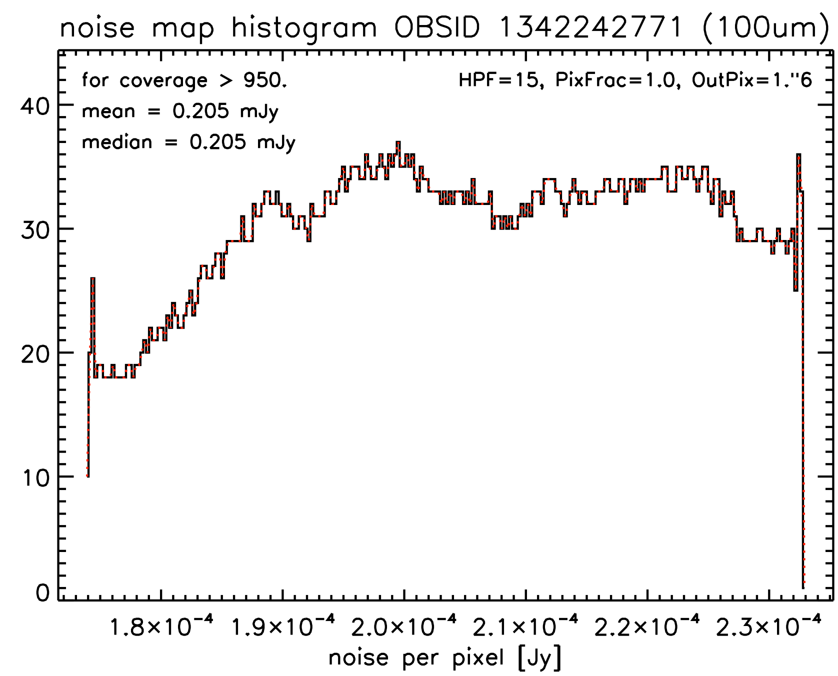

Figure 156: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

4.8.3 L 2.5 OBSIDs 1342242770+1342242771

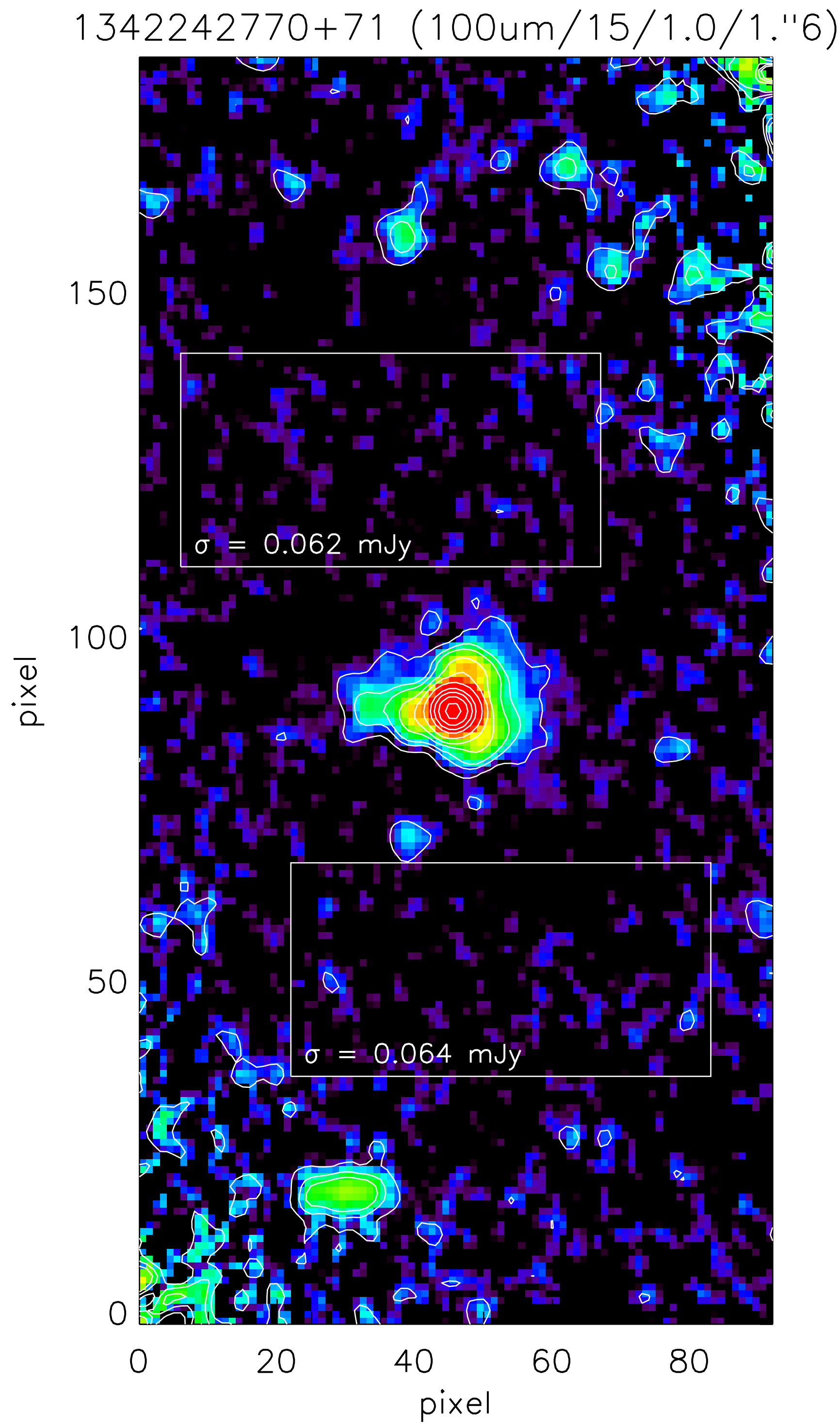

Figure 157: 100 µm L2.5 combined map for OBSIDs 1342242770+71 with HPF radius 15, pixfrac 1.0 and output pixel size of 1.″6. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

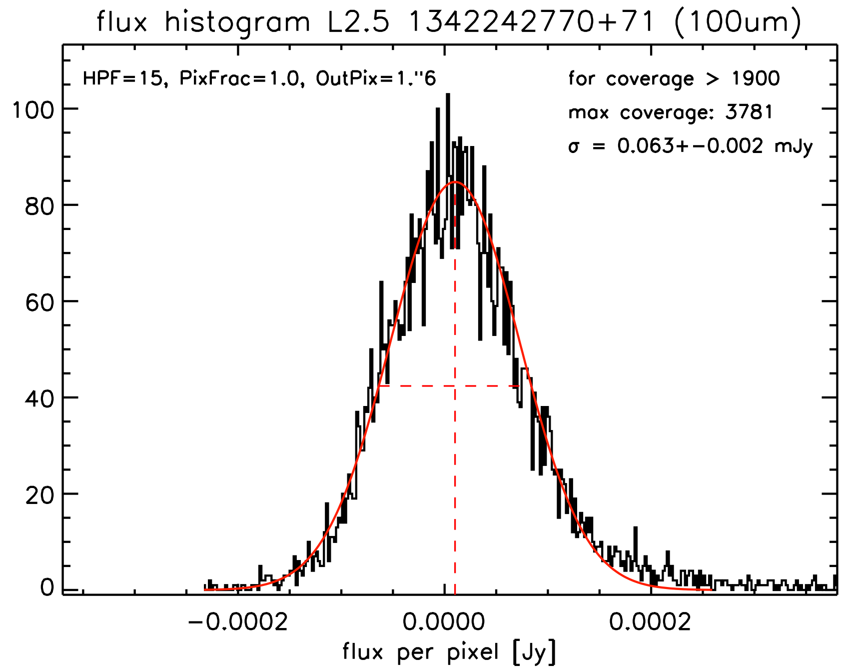

Figure 158: Noise determination for the 100 µm coadded L2.5 map of OBSIDs 1342242770+71 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\,\sigma_{\rm hist}$).

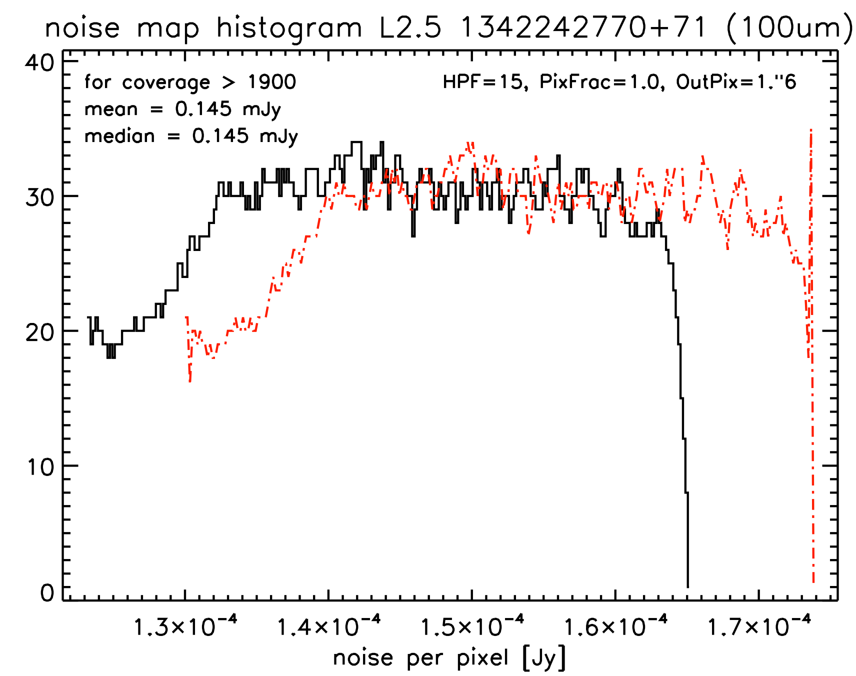

Figure 159: Histogram of the noise value distribution in the L2.5 error map above the coverage threshold indicated in the plot (in black). Mean and median value of the distribution are given. The red dashed-dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

4.9 100 µm: HPF radius 30, Pixfrac 1.0, Pixsize 1.″6

4.9.1 L 2.0 OBSID 1342242770

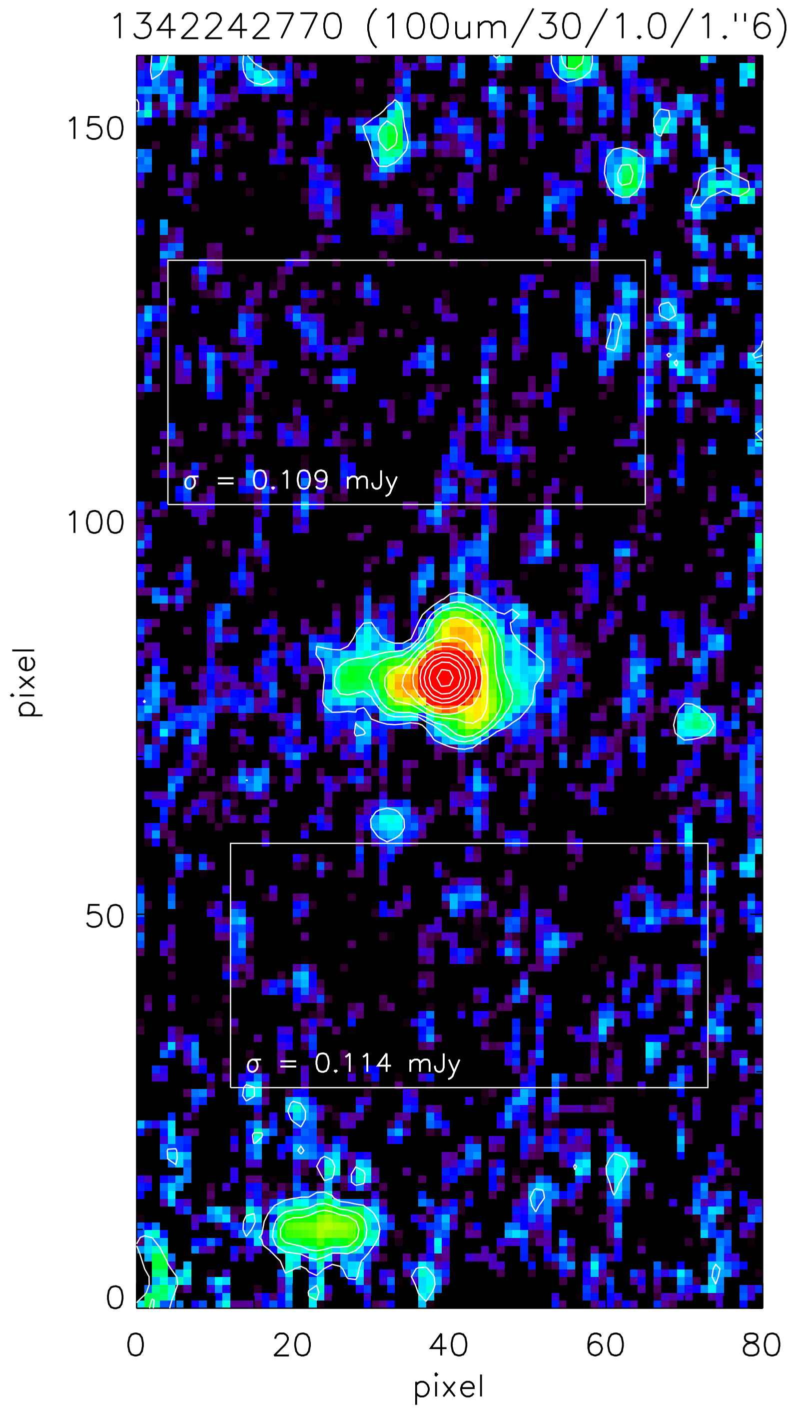

Figure 160: 100 µm L2.0 map for OBSID 1342242770 with HPF radius 30, pixfrac 1.0 and output pixel size of 1.″6. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

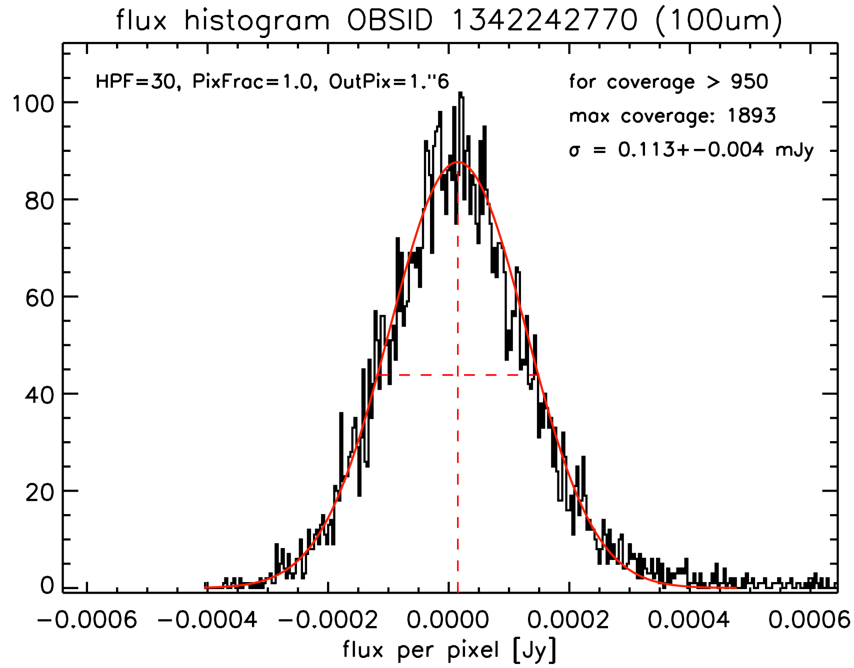

Figure 161: Noise determination for the 100 µm L2.0 map of OBSID 1342242770 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

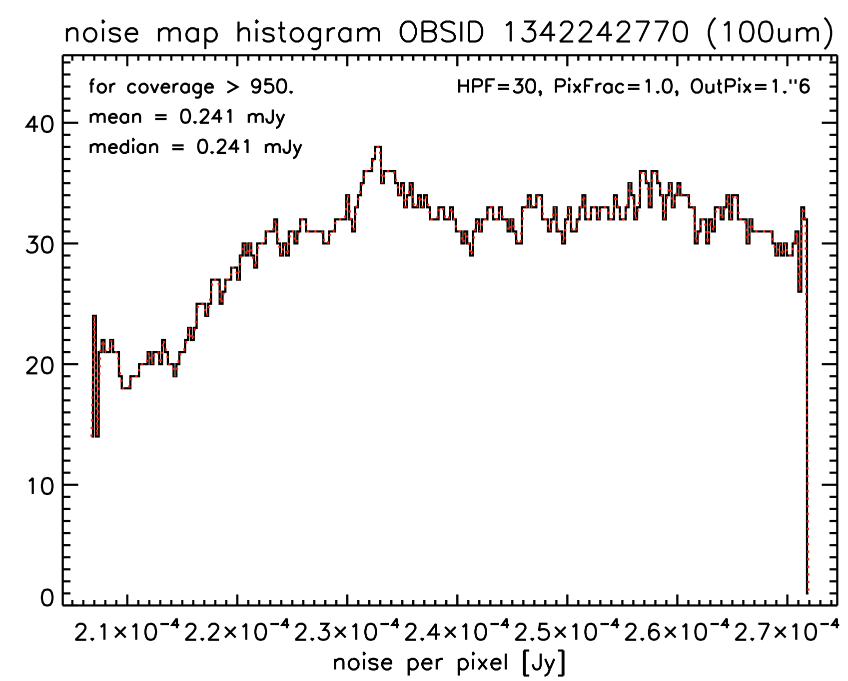

Figure 162: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

4.9.2 L 2.0 OBSID 1342242771

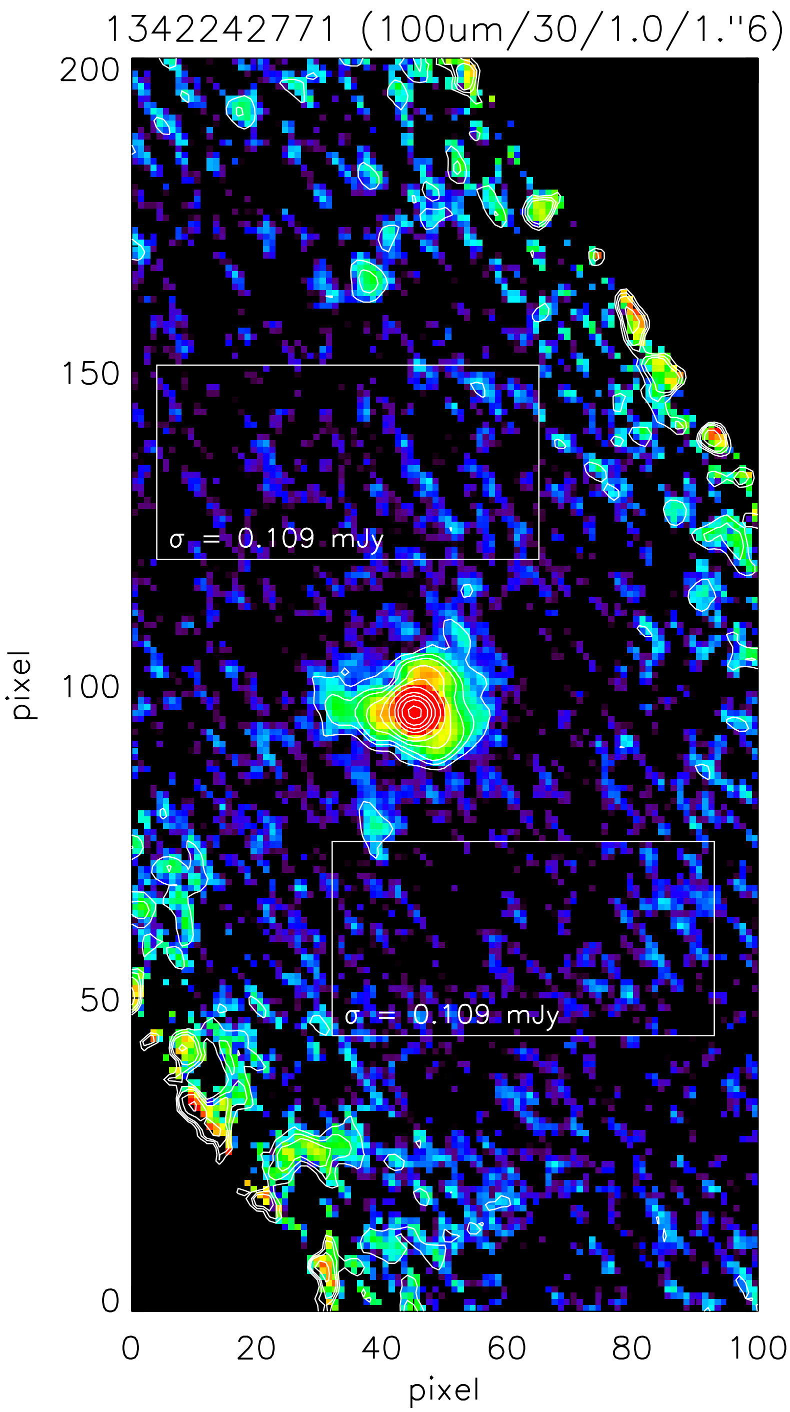

Figure 163: 100 µm L2.0 map for OBSID 1342242771 with HPF radius 30, pixfrac 1.0 and output pixel size of 1.″6. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

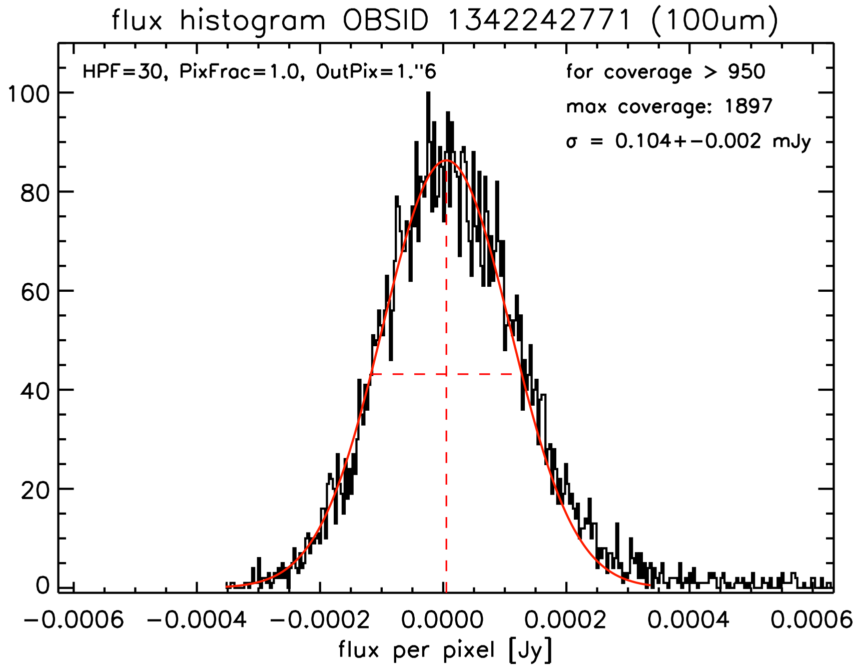

Figure 164: Noise determination for the 100 µm L2.0 map of OBSID 1342242771 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\ \sigma_{\rm hist}$).

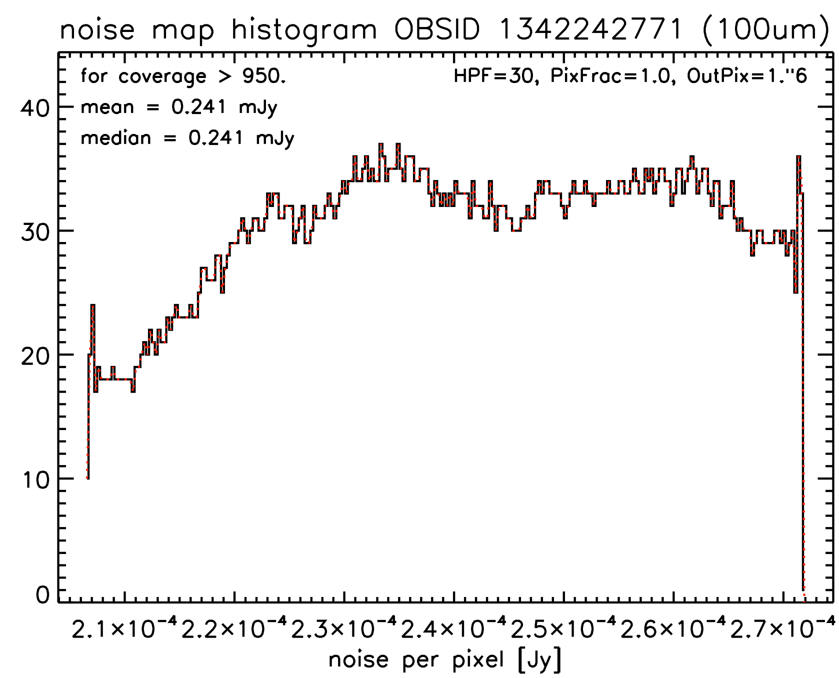

Figure 165: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

4.9.3 L 2.5 OBSIDs 1342242770+1342242771

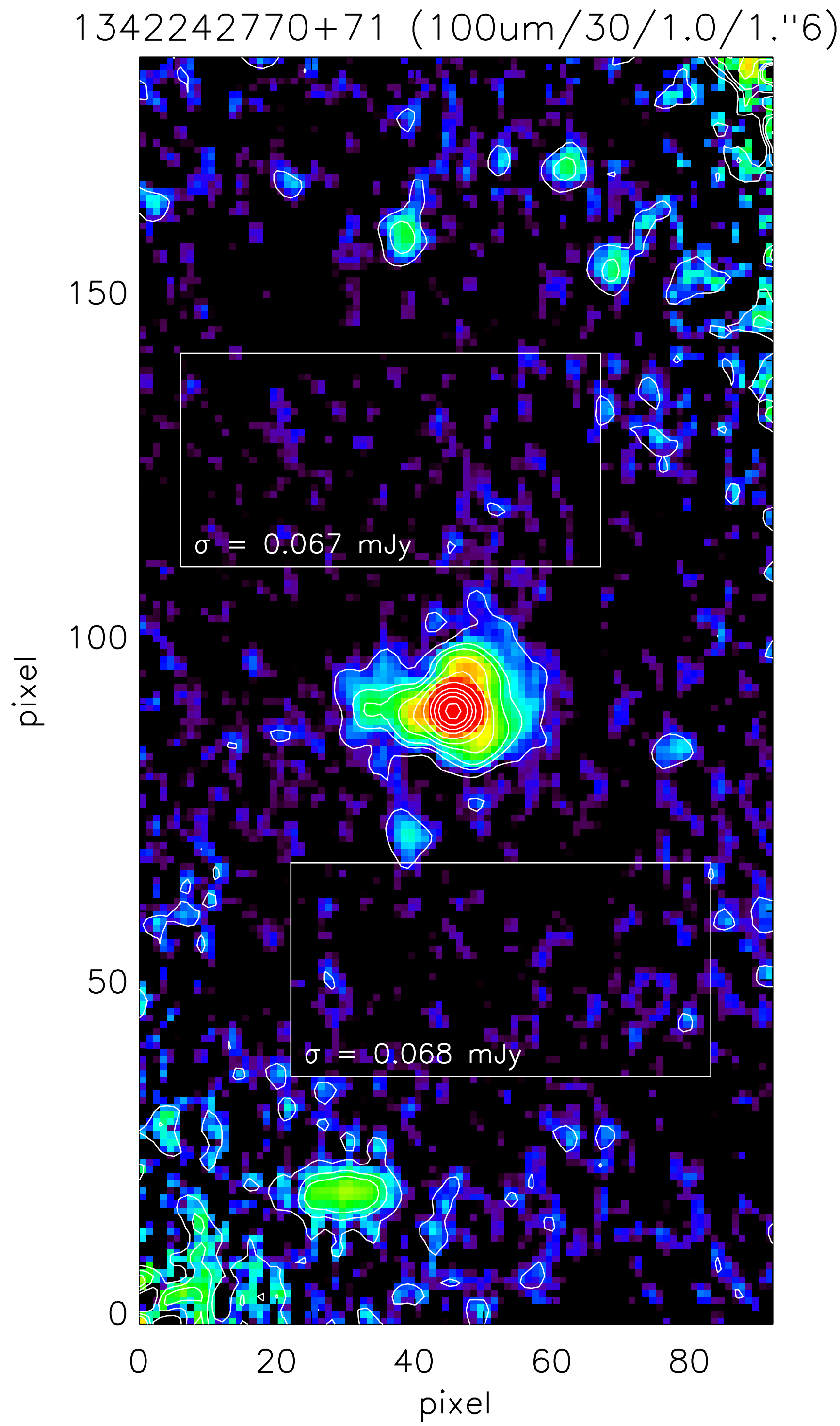

Figure 166: 100 µm L2.5 combined map for OBSIDs 1342242770+71 with HPF radius 30, pixfrac 1.0 and output pixel size of 1.″6. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

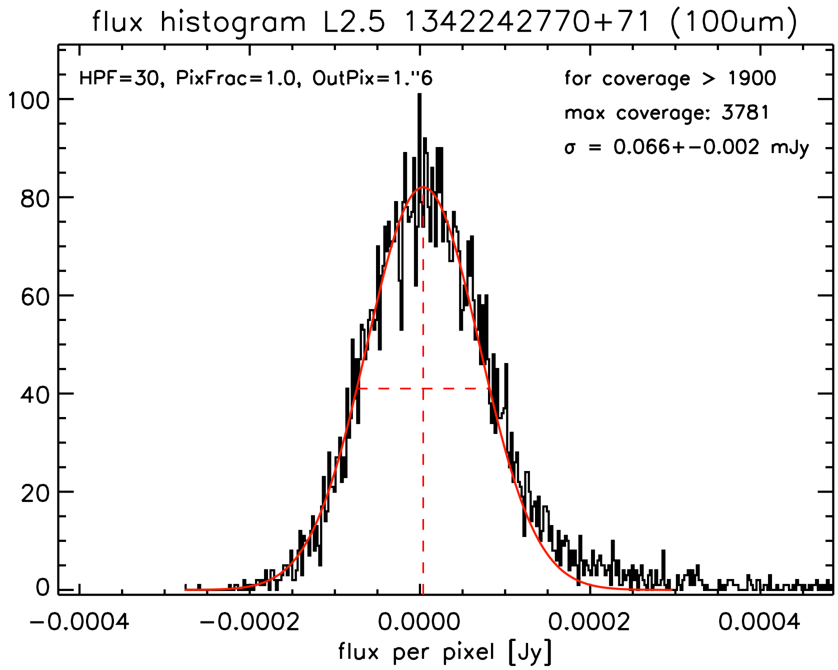

Figure 167: Noise determination for the 100 µm coadded L2.5 map of OBSIDs 1342242770+71 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\,\sigma_{\rm hist}$).

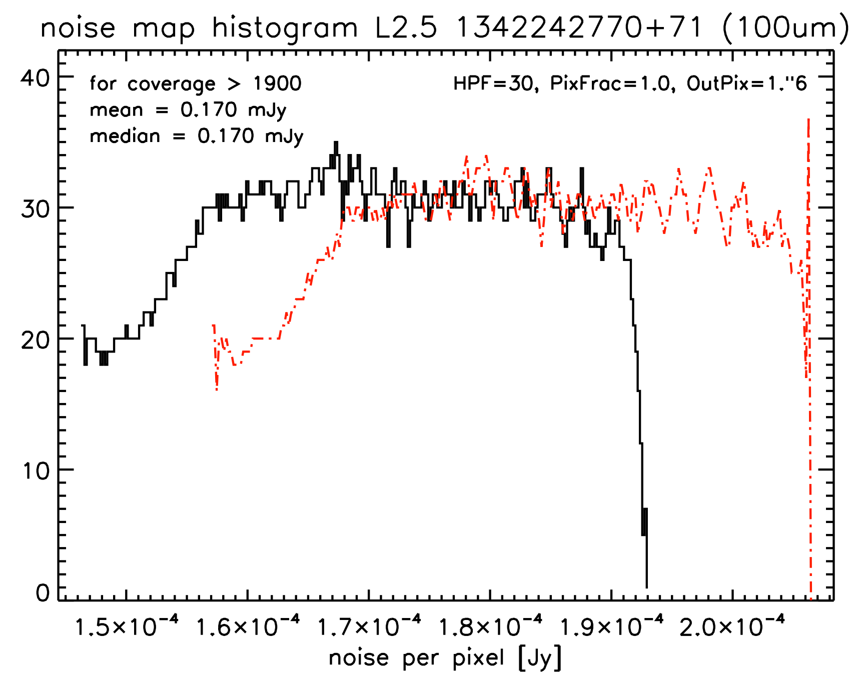

Figure 168: Histogram of the noise value distribution in the L2.5 error map above the coverage threshold indicated in the plot (in black). Mean and median value of the distribution are given. The red dashed-dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

4.10 100 µm: HPF radius 15, Pixfrac 1.0, Pixsize 2.″4

4.10.1 L 2.0 OBSID 1342242770

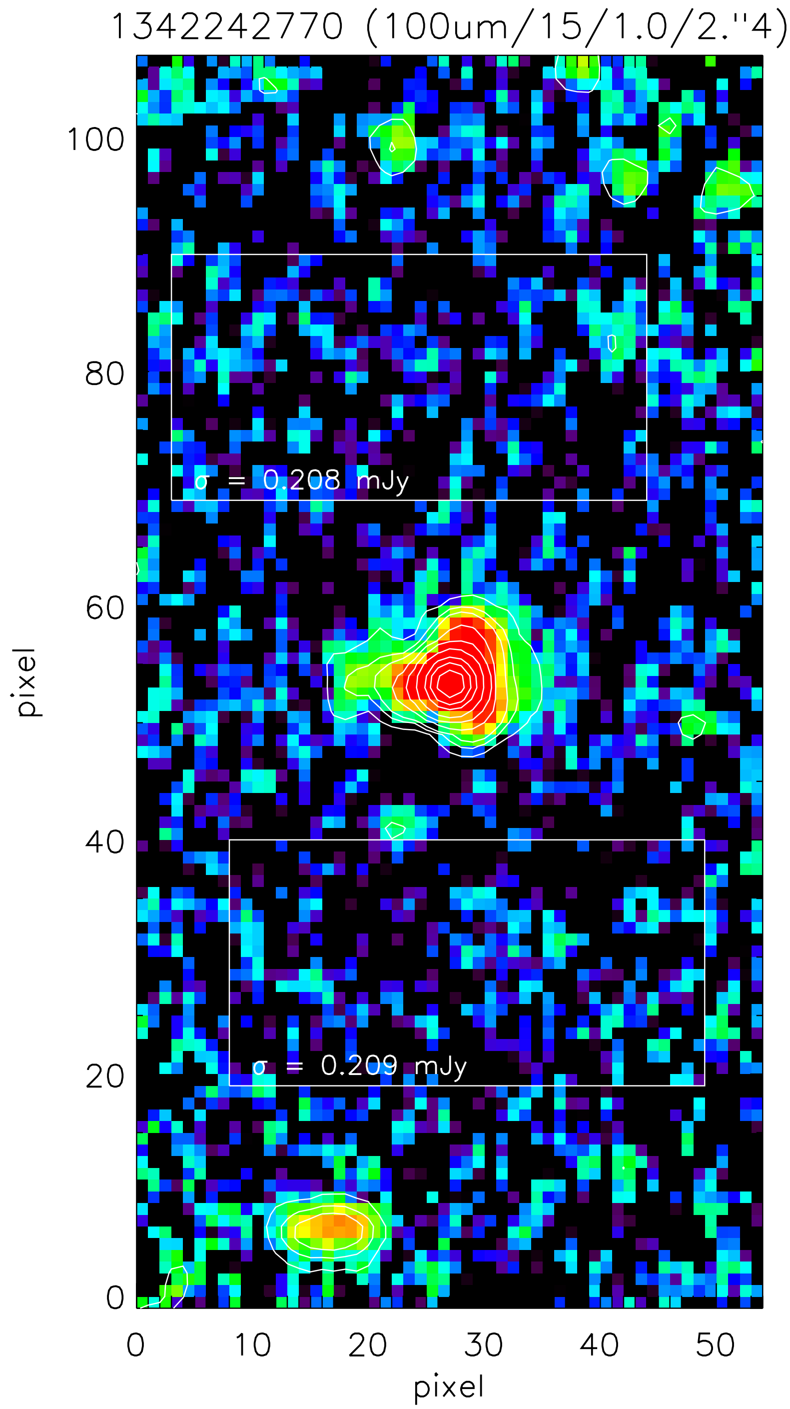

Figure 169: 100 µm L2.0 map for OBSID 1342242770 with HPF radius 15, pixfrac 1.0 and output pixel size of 2.″4. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

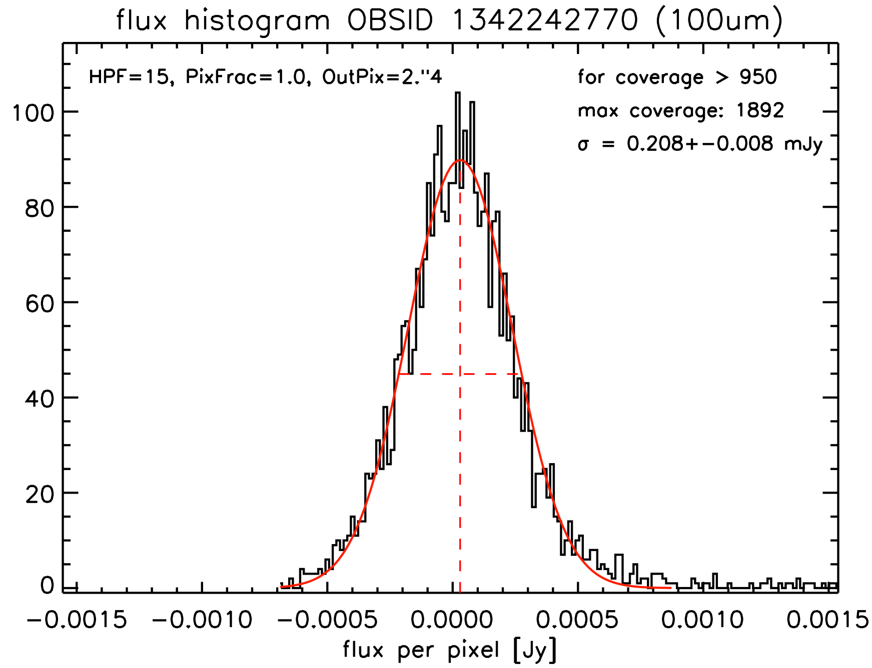

Figure 170: Noise determination for the 100 μm L2.0 map of OBSID 1342242770 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\mathrm{hist}}$).

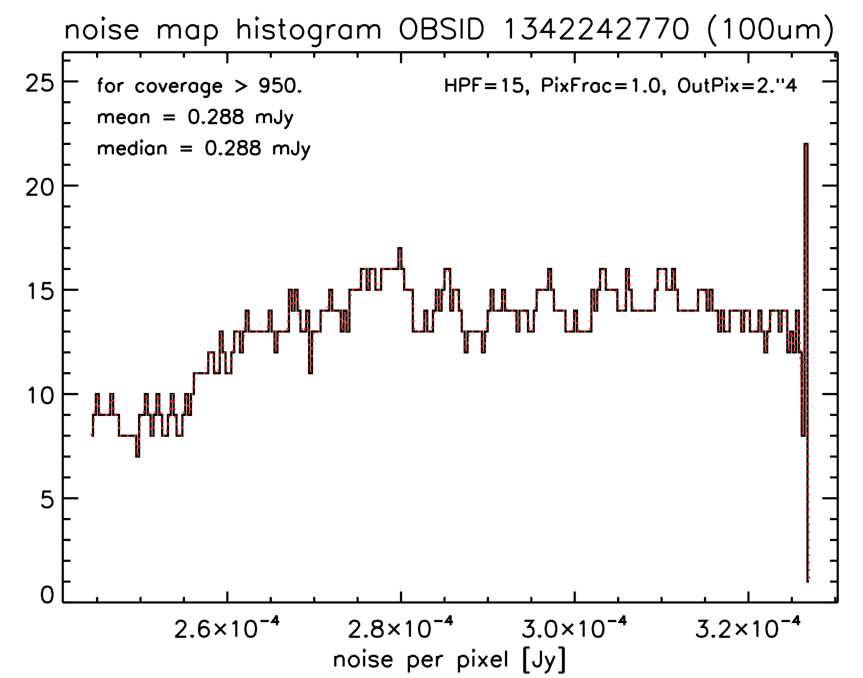

Figure 171: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

4.10.2 L 2.0 OBSID 1342242771

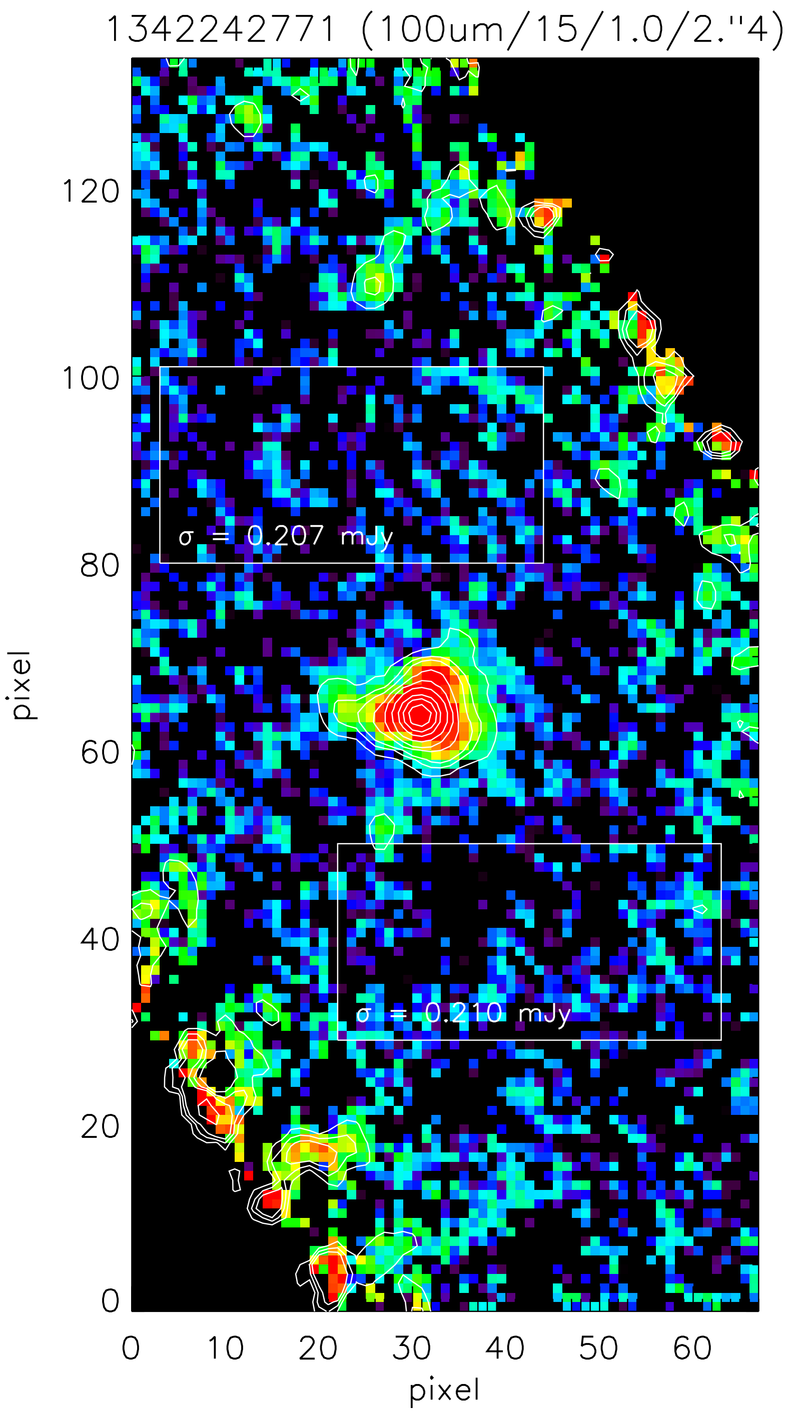

Figure 172: 100 µm L2.0 map for OBSID 1342242771 with HPF radius 15, pixfrac 1.0 and output pixel size of 2.″4. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

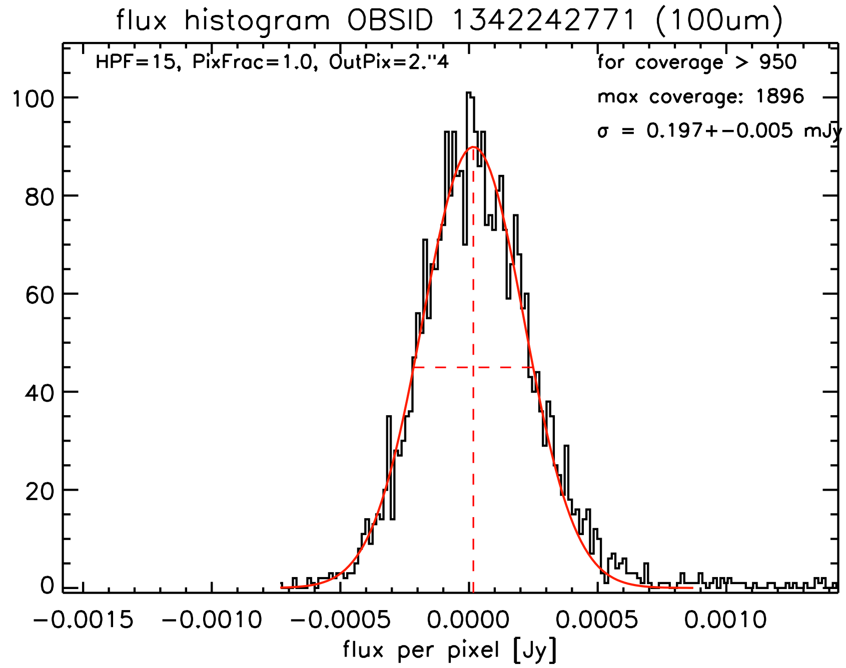

Figure 173: Noise determination for the 100 µm L2.0 map of OBSID 1342242771 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

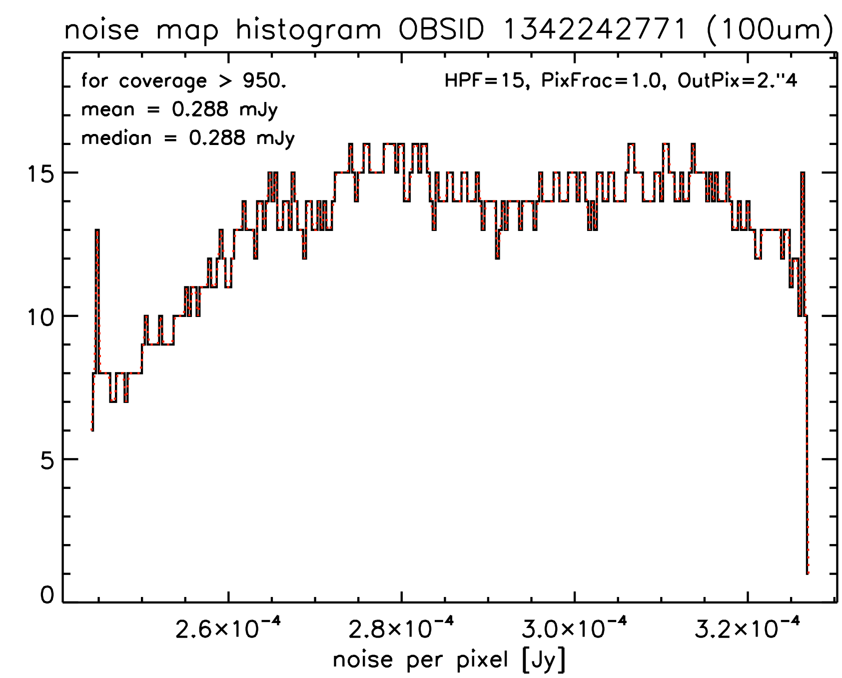

Figure 174: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

4.10.3 L 2.5 OBSIDs 1342242770+1342242771

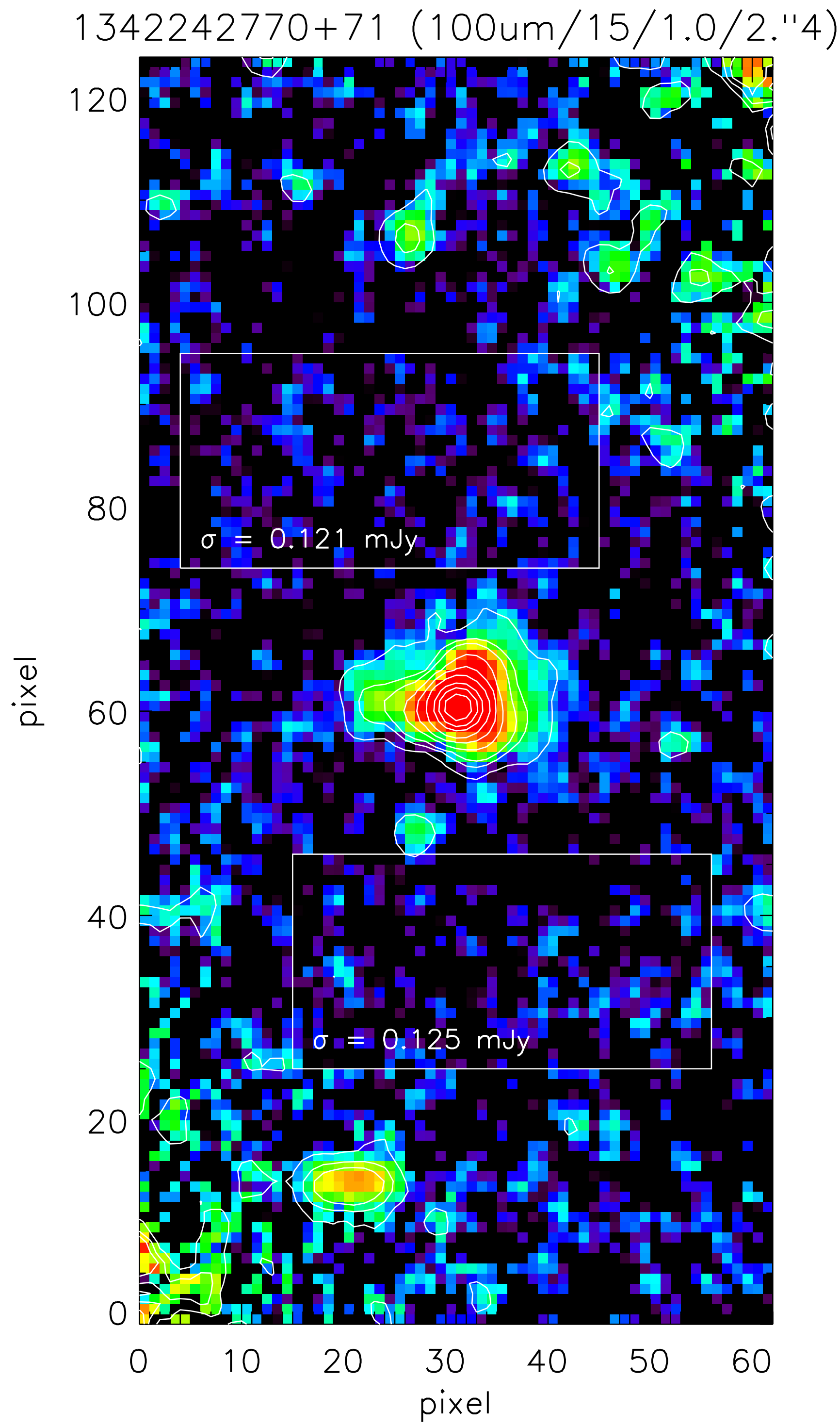

Figure 175: 100 µm L2.5 combined map for OBSIDs 1342242770+71 with HPF radius 15, pixfrac 1.0 and output pixel size of 2.″4. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

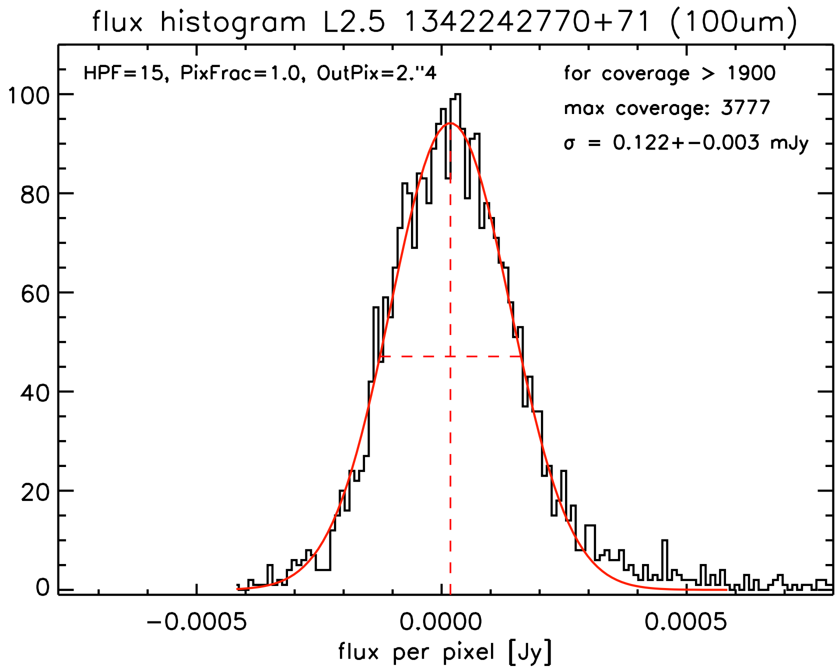

Figure 176: Noise determination for the 100 µm coadded L2.5 map of OBSIDs 1342242770+71 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\,\sigma_{\rm hist}$).

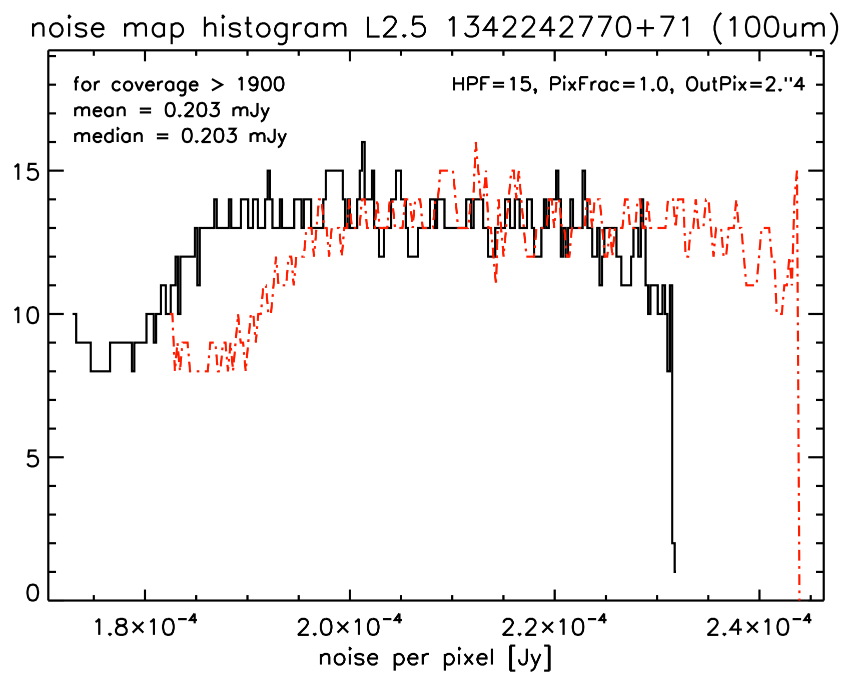

Figure 177: Histogram of the noise value distribution in the L2.5 error map above the coverage threshold indicated in the plot (in black). Mean and median value of the distribution are given. The red dashed-dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

4.11 100 µm: HPF radius 15, Pixfrac 1.0, Pixsize 3.″2

4.11.1 L 2.0 OBSID 1342242770

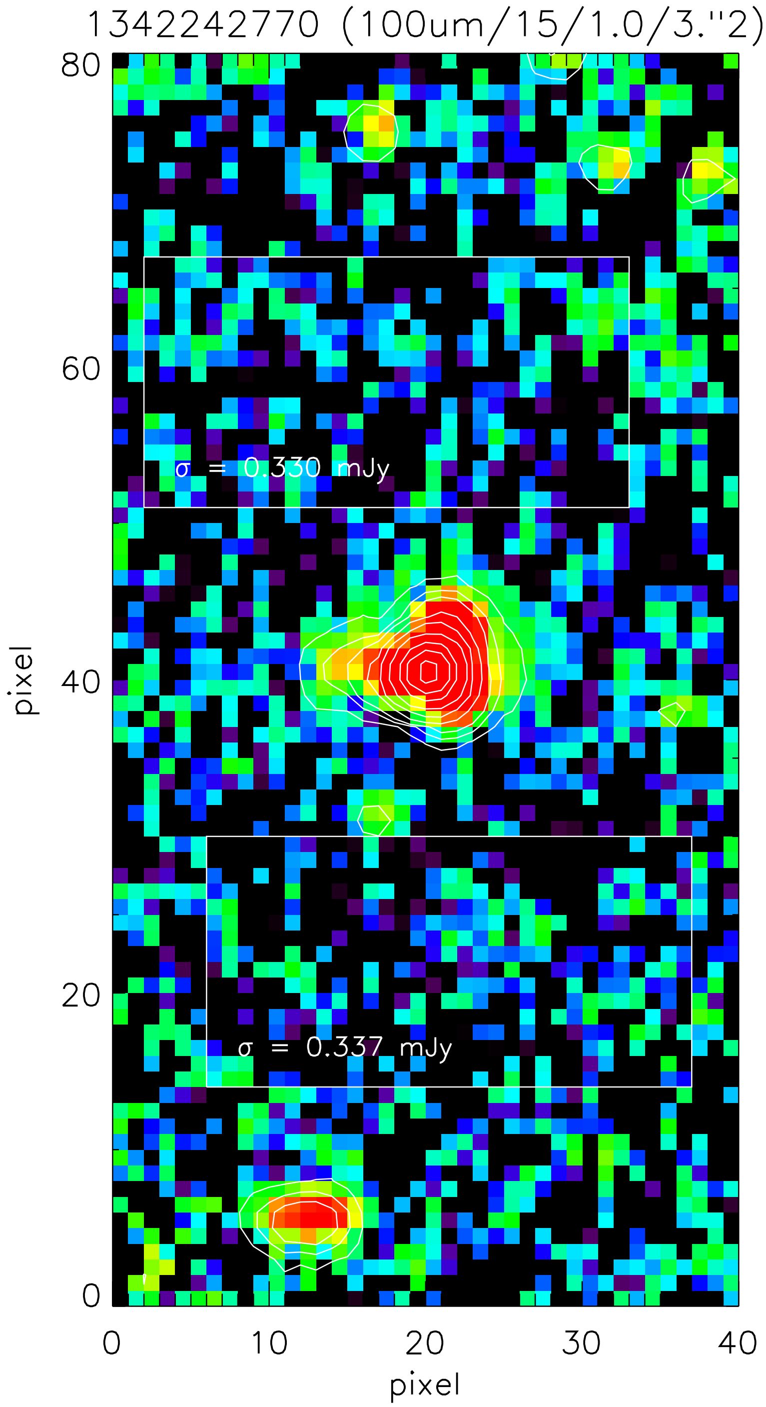

Figure 178: 100 µm L2.0 map for OBSID 1342242770 with HPF radius 15, pixfrac 1.0 and output pixel size of 3.″2. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

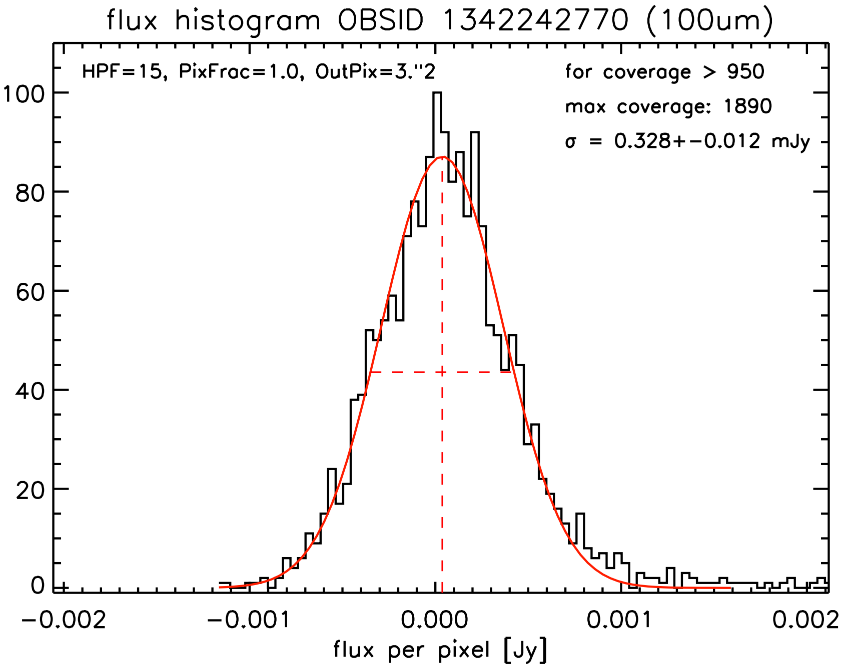

Figure 179: Noise determination for the 100 µm L2.0 map of OBSID 1342242770 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

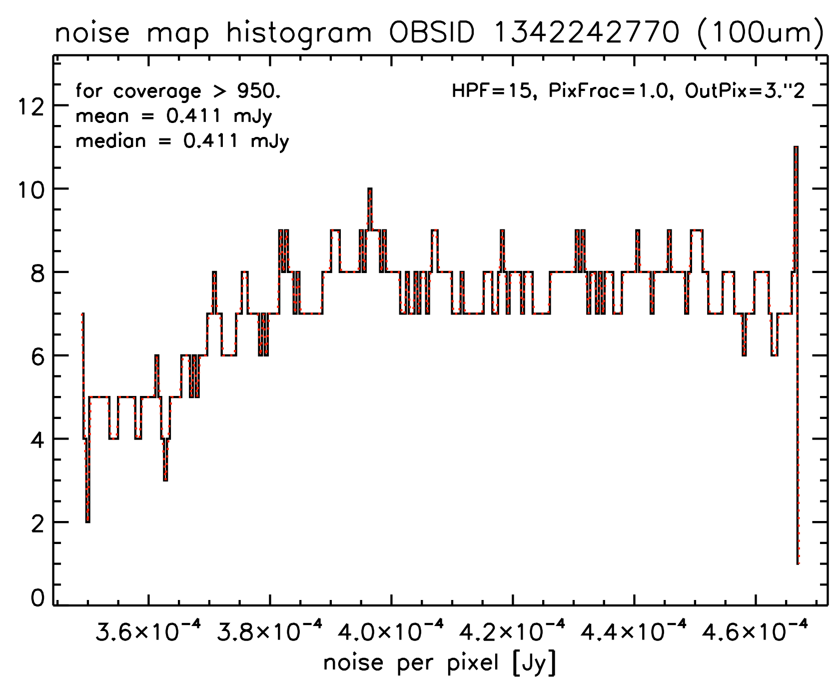

Figure 180: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

4.11.2 L 2.0 OBSID 1342242771

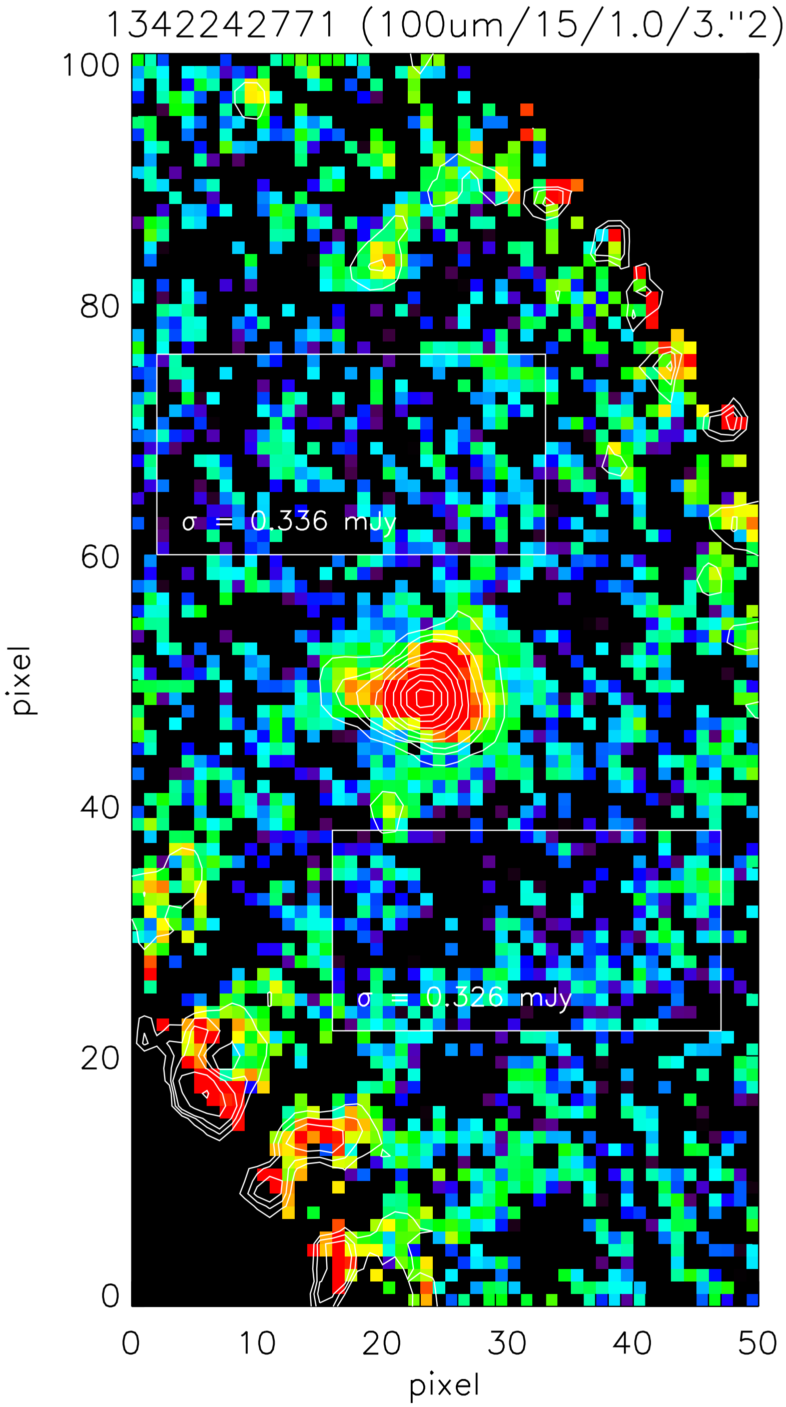

Figure 181: 100 µm L2.0 map for OBSID 1342242771 with HPF radius 15, pixfrac 1.0 and output pixel size of 3.″2. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

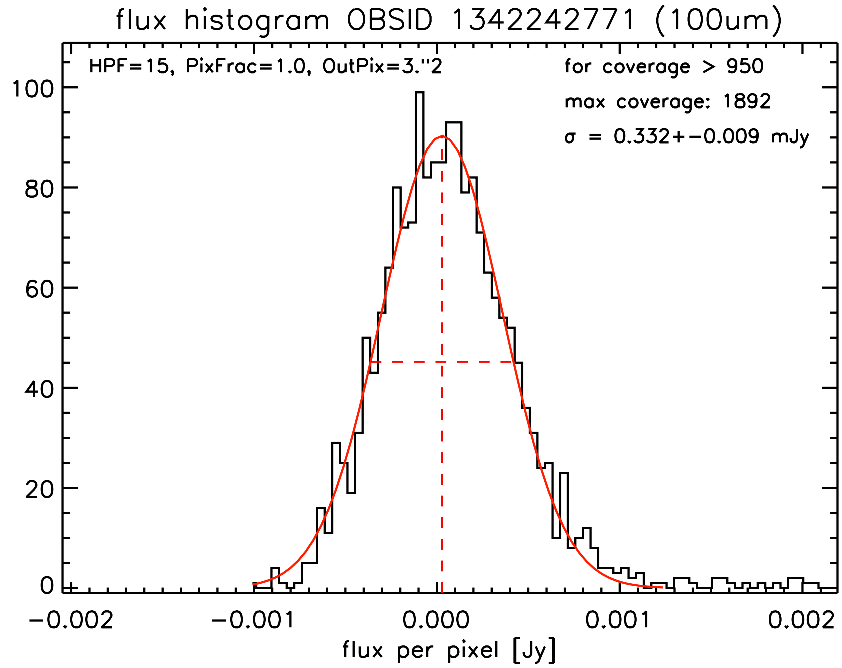

Figure 182: Noise determination for the 100 µm L2.0 map of OBSID 1342242771 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\ \sigma_{\rm hist}$).

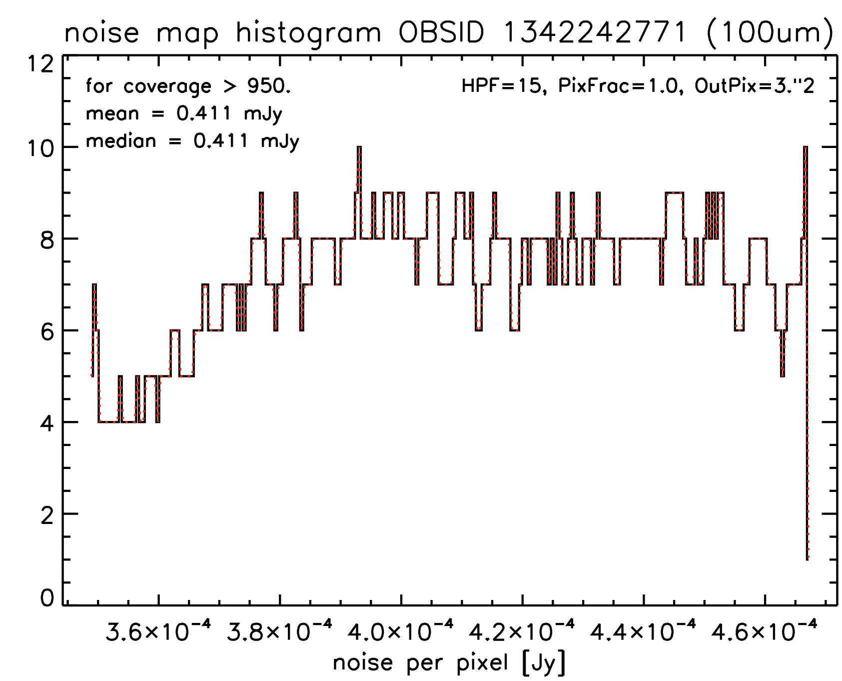

Figure 183: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

4.11.3 L 2.5 OBSIDs 1342242770+1342242771

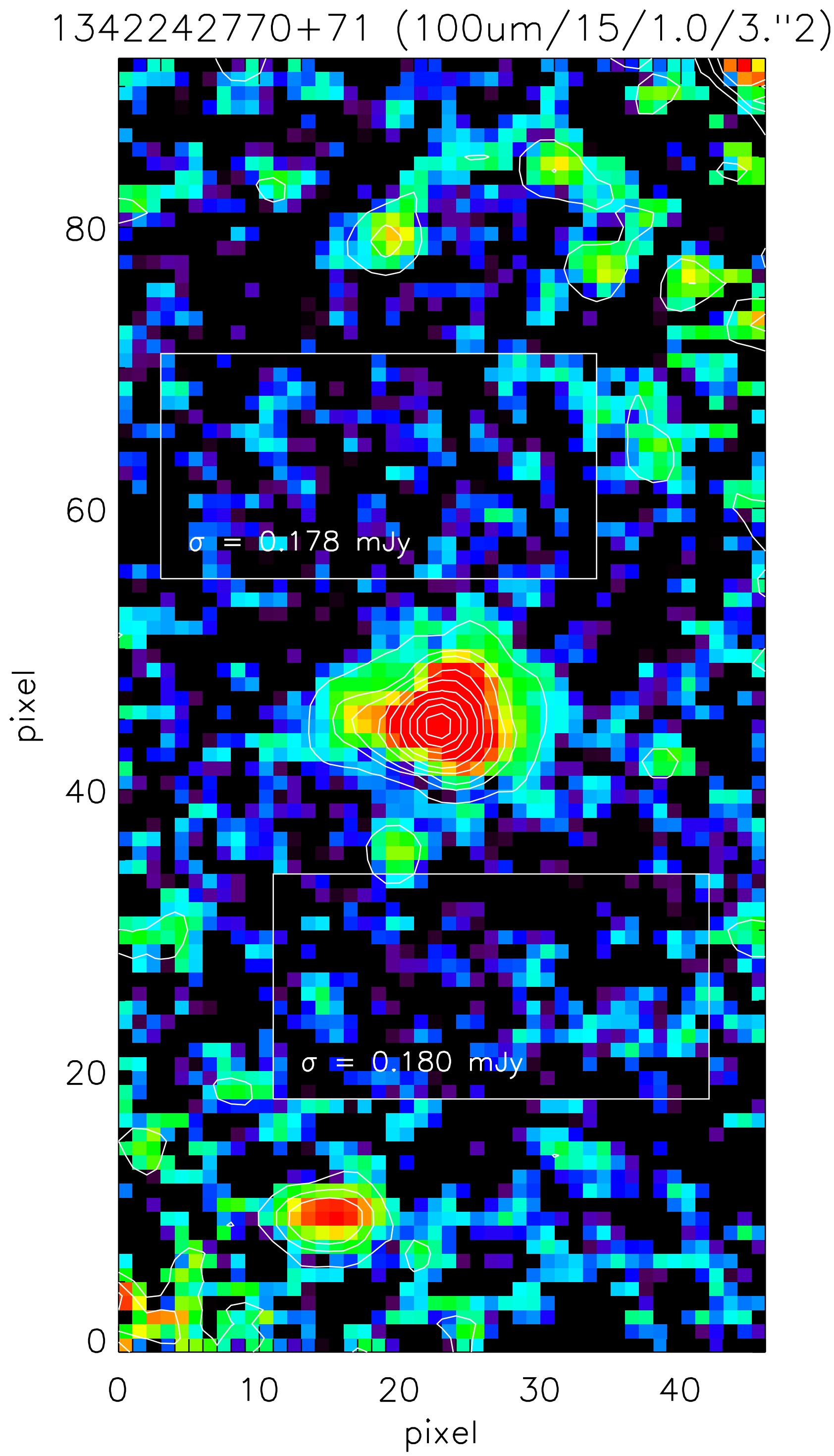

Figure 184: 100 µm L2.5 combined map for OBSIDs 1342242770+71 with HPF radius 15, pixfrac 0.1 and output pixel size of 3.″2. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

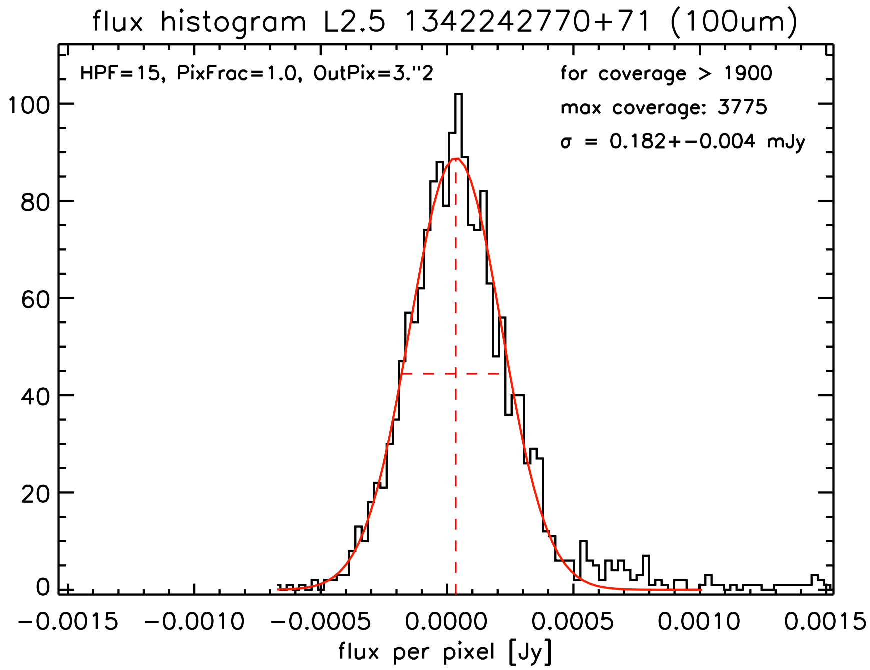

Figure 185: Noise determination for the 100 µm coadded L2.5 map of OBSIDs 1342242770+71 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

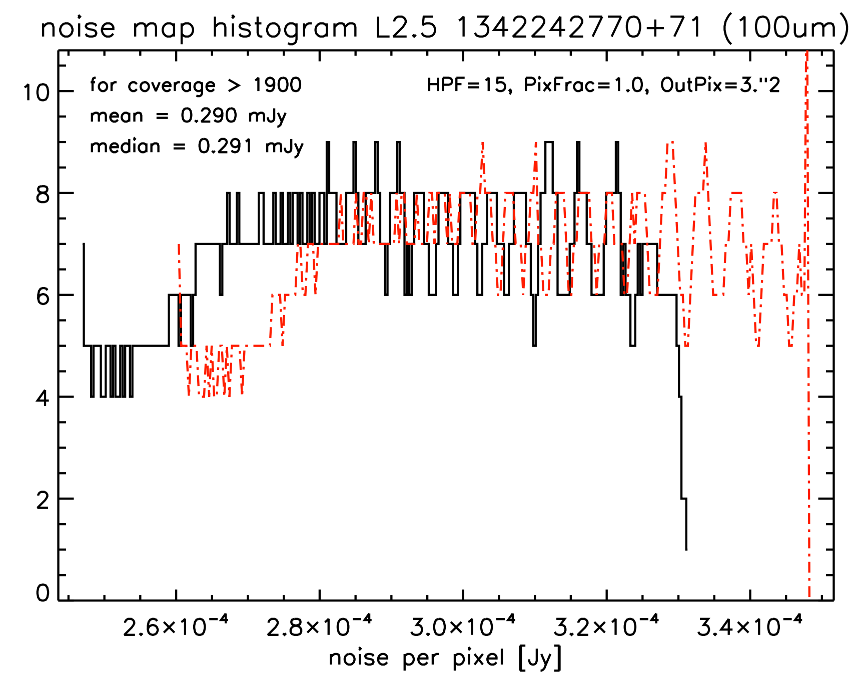

Figure 186: Histogram of the noise value distribution in the L2.5 error map above the coverage threshold indicated in the plot (in black). Mean and median value of the distribution are given. The red dashed-dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

5 Analysis of 160μm maps

5.1 160 µm: HPF radius 25, Pixfrac 0.1, Pixsize 2.″1

5.1.1 L 2.0 OBSID 1342242772

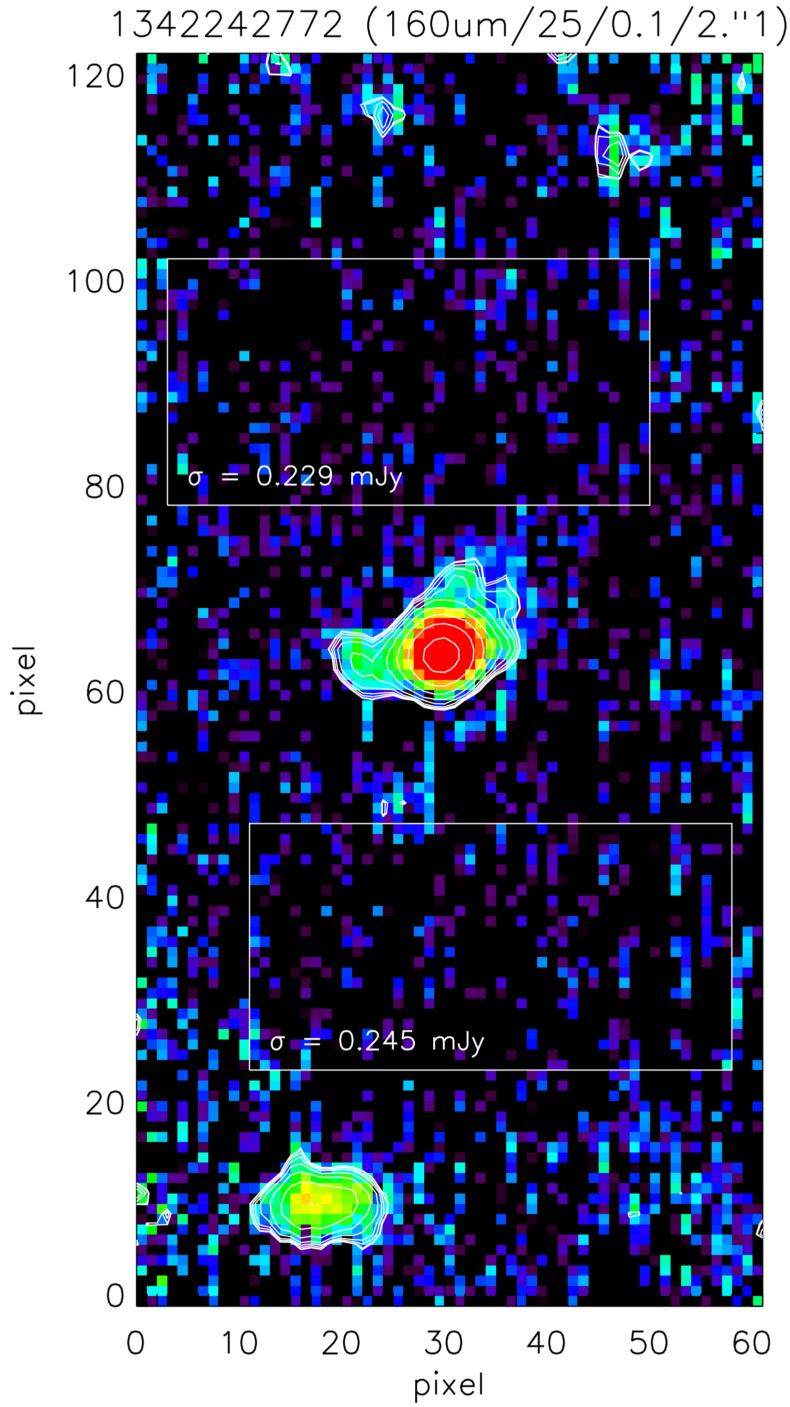

Figure 187: 160 µm L2.0 map for OBSID 1342242772 with HPF radius 25, pixfrac 0.1 and output pixel size of 2.″1 (SPG product parameter set). The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

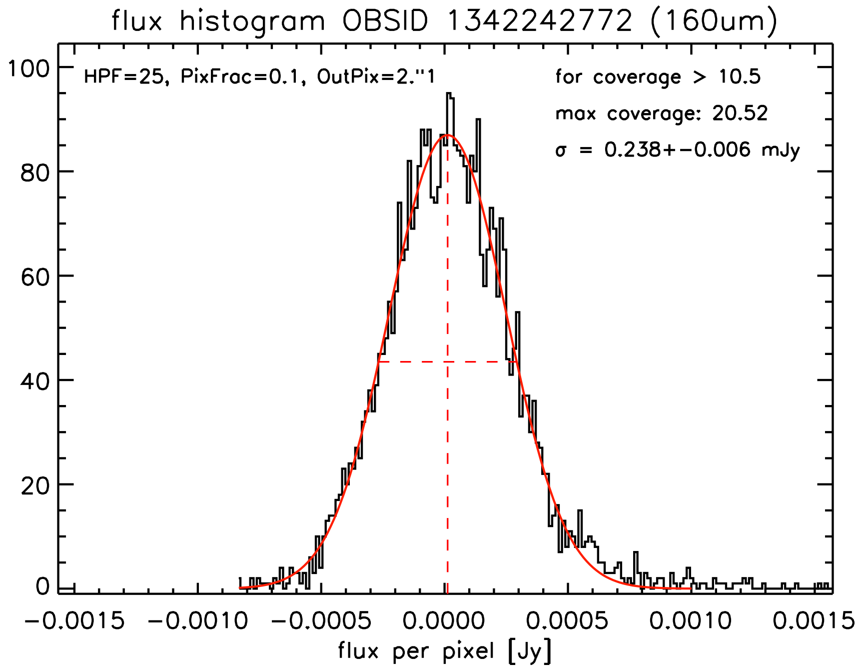

Figure 188: Noise determination for the 160 µm L2.0 map of OBSID 1342242772 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

For this map parameter combination no error map analysis was done.

5.1.2 L 2.0 OBSID 1342242773

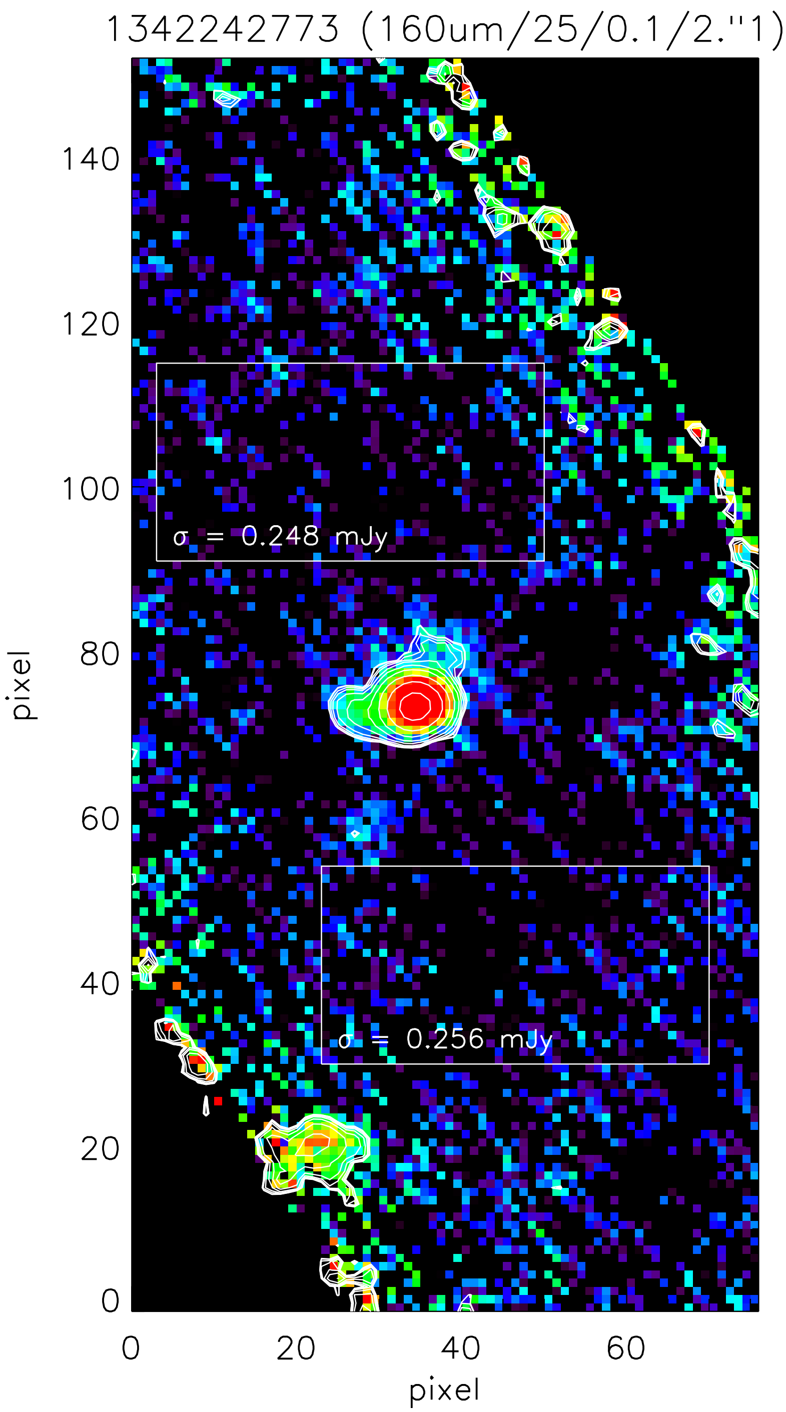

Figure 189: 160 µm L2.0 map for OBSID 1342242773 with HPF radius 25, pixfrac 0.1 and output pixel size of 2.″1 (SPG product parameter set). The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

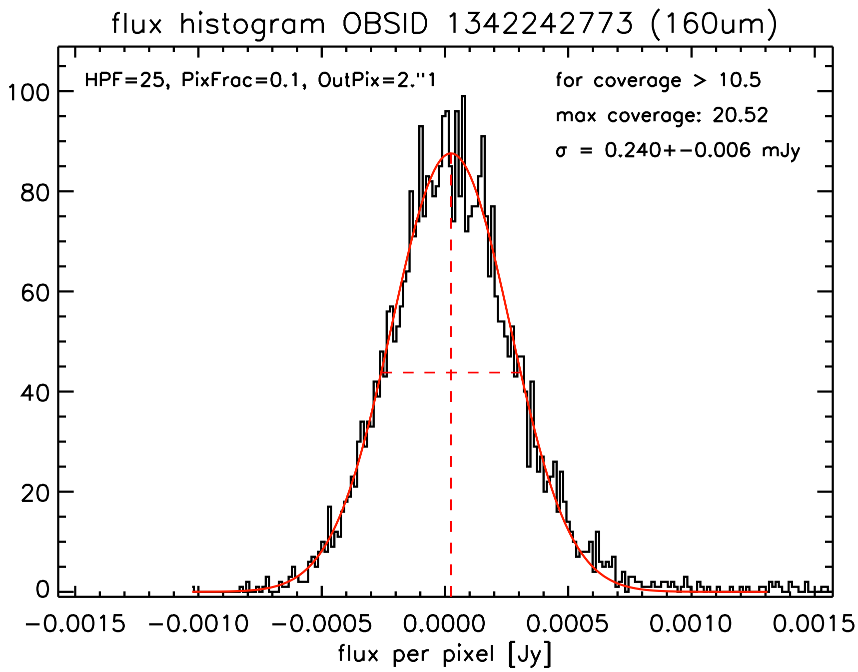

Figure 190: Noise determination for the 160 µm L2.0 map of OBSID 1342242773 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\ \sigma_{\rm hist}$).

For this map parameter combination no error map analysis was done.

5.1.3 L 2.5 OBSIDs 1342242772+1342242773

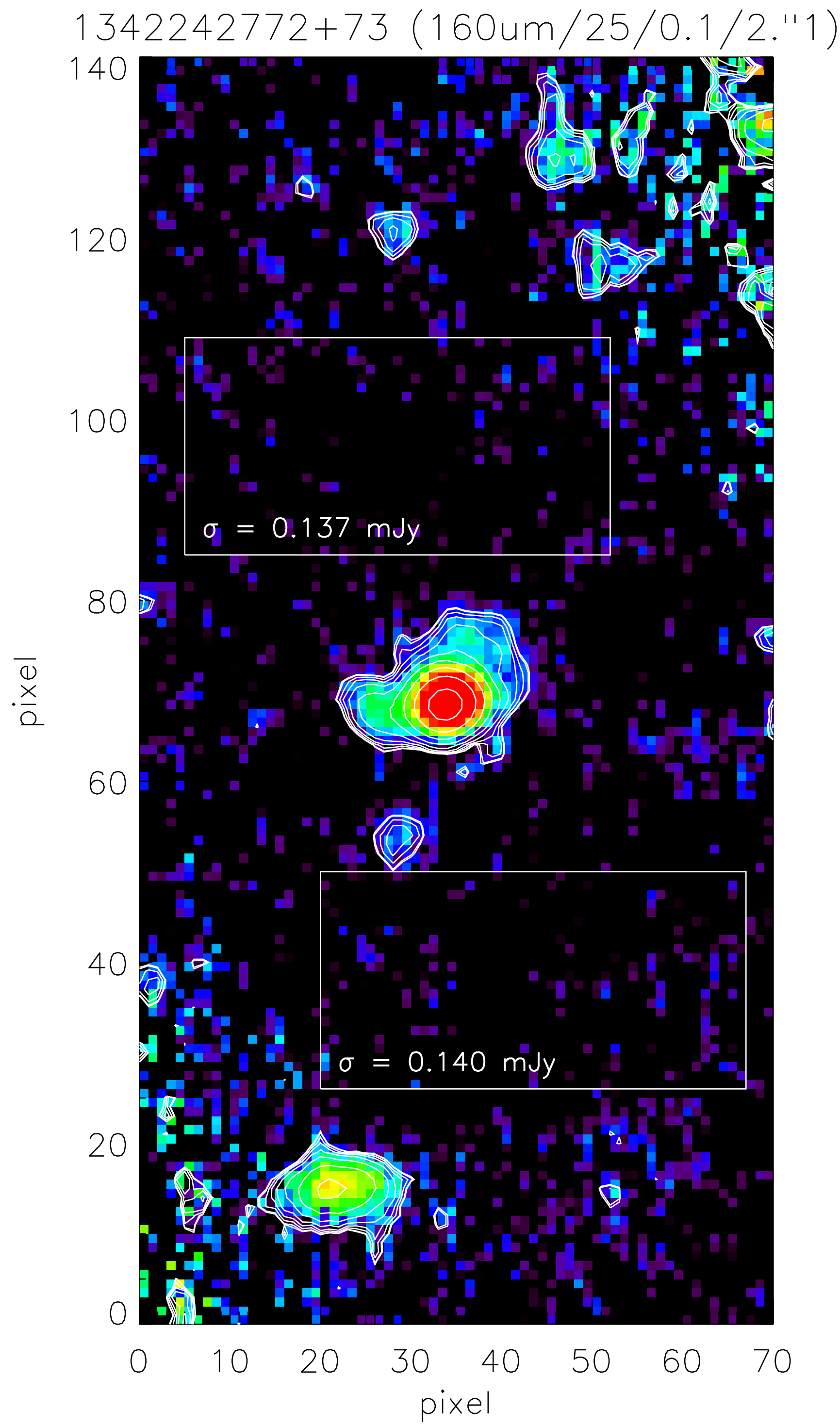

Figure 191: 160 µm L2.5 combined map for OBSIDs 1342242772+73 with HPF radius 25, pixfrac 0.1 and output pixel size of 2.″1 (SPG product parameter set). The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

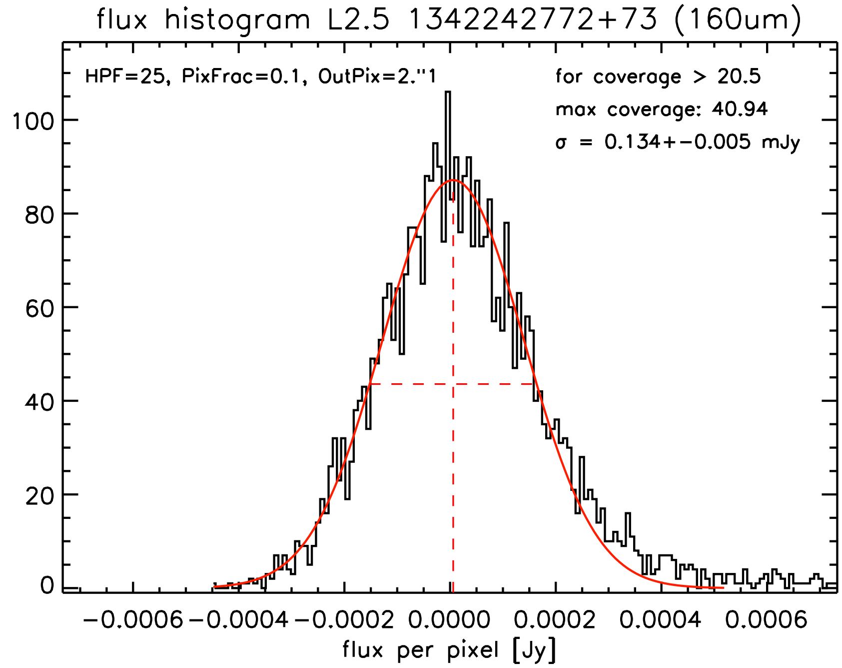

Figure 192: Noise determination for the 160 µm coadded L2.5 map of OBSIDs 1342242772+73 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

For this map parameter combination no error map analysis was done.

5.2 160 µm: HPF radius 25, Pixfrac 0.1, Pixsize 3.″2

5.2.1 L 2.0 OBSID 1342242772

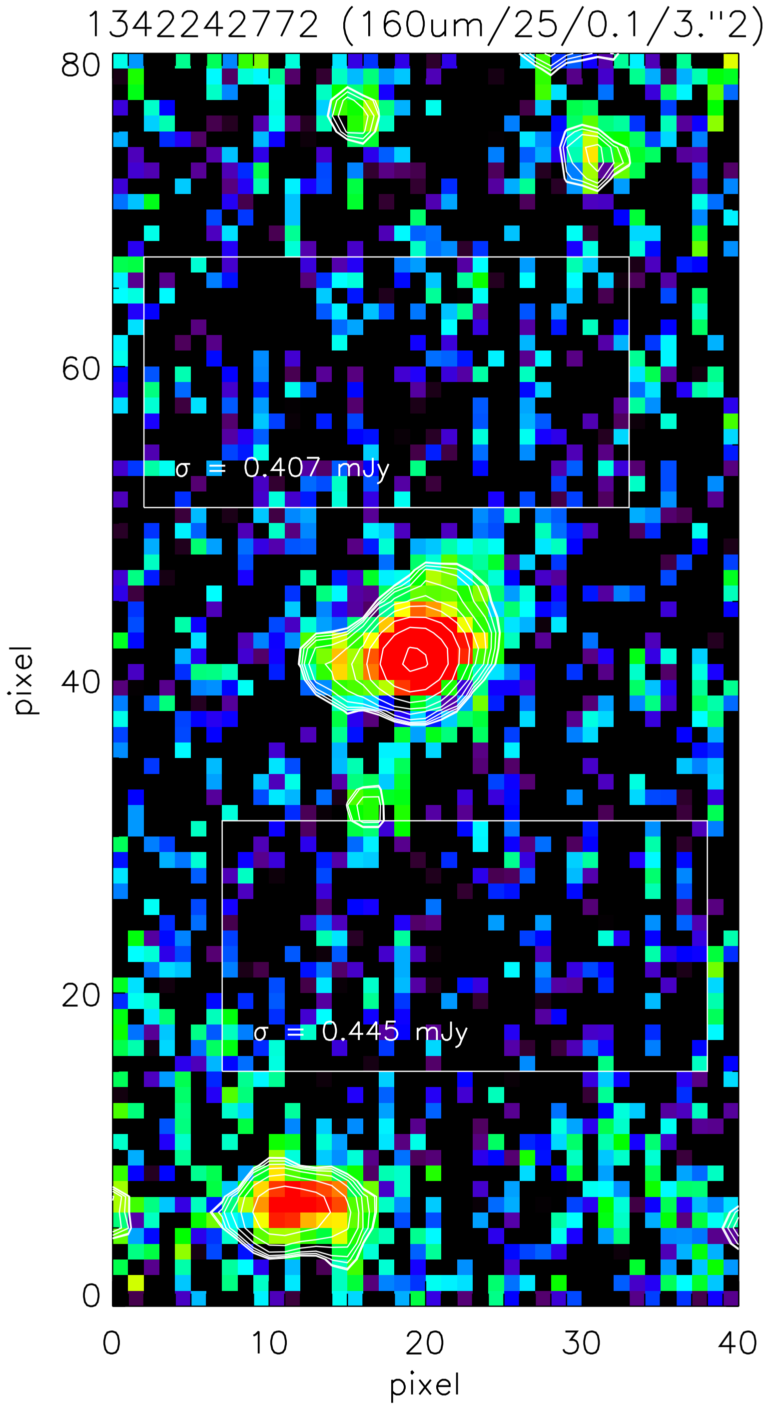

Figure 193: 160 µm L2.0 map for OBSID 1342242772 with HPF radius 25, pixfrac 0.1 and output pixel size of 3.″2 (SPG product parameter set). The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

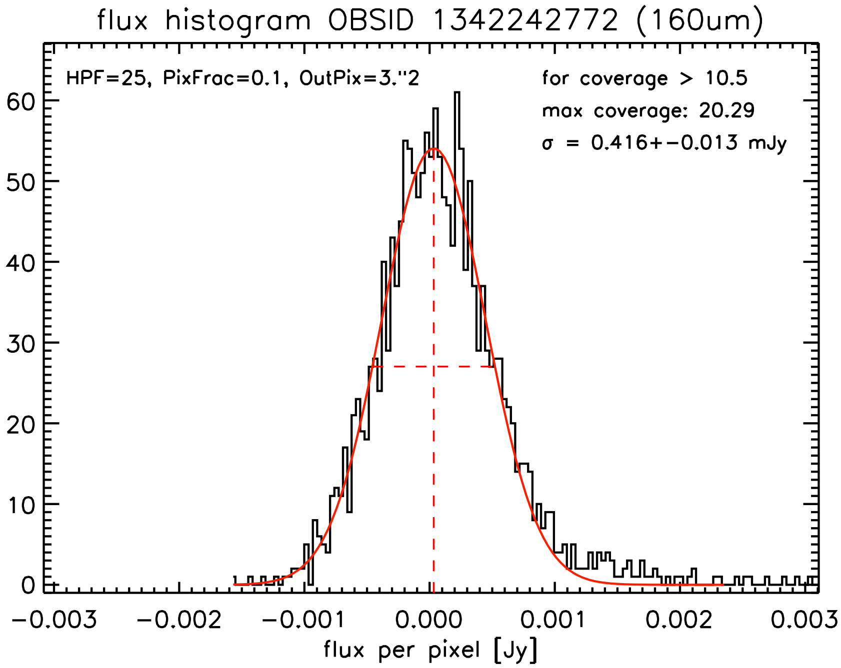

Figure 194: Noise determination for the 160 µm L2.0 map of OBSID 1342242772 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\ \sigma_{\rm hist}$).

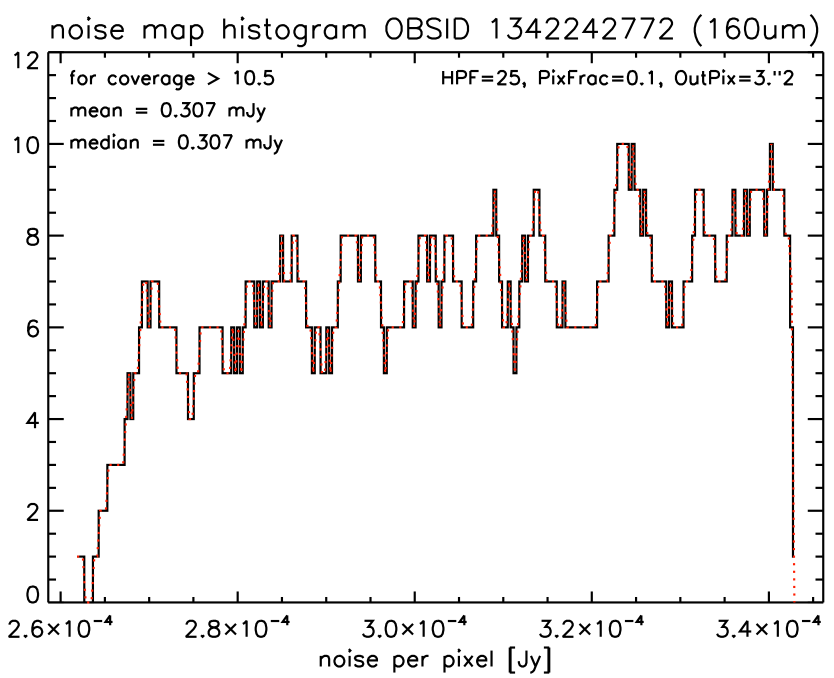

Figure 195: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

5.2.2 L 2.0 OBSID 1342242773

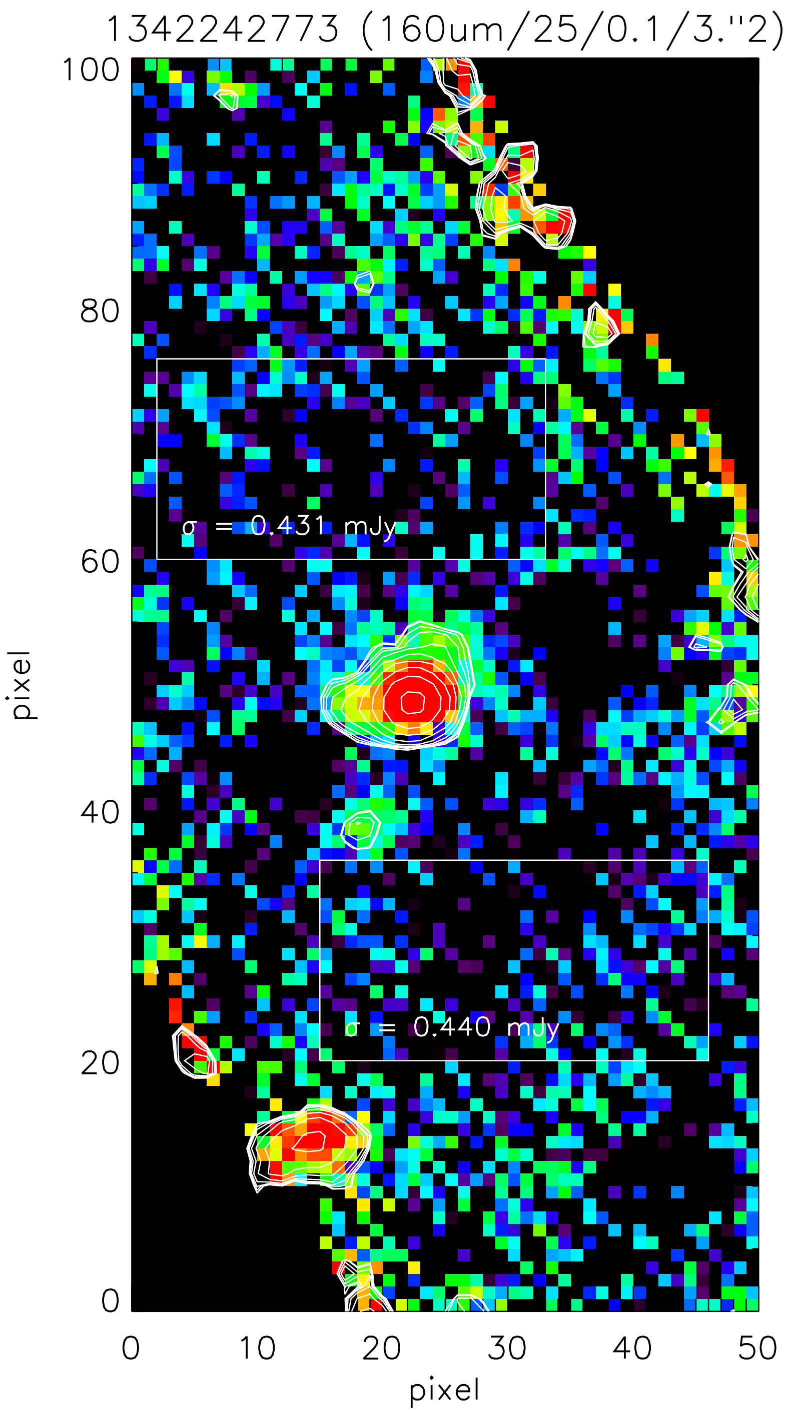

Figure 196: 160 µm L2.0 map for OBSID 1342242773 with HPF radius 25, pixfrac 0.1 and output pixel size of 3.″2 (SPG product parameter set). The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

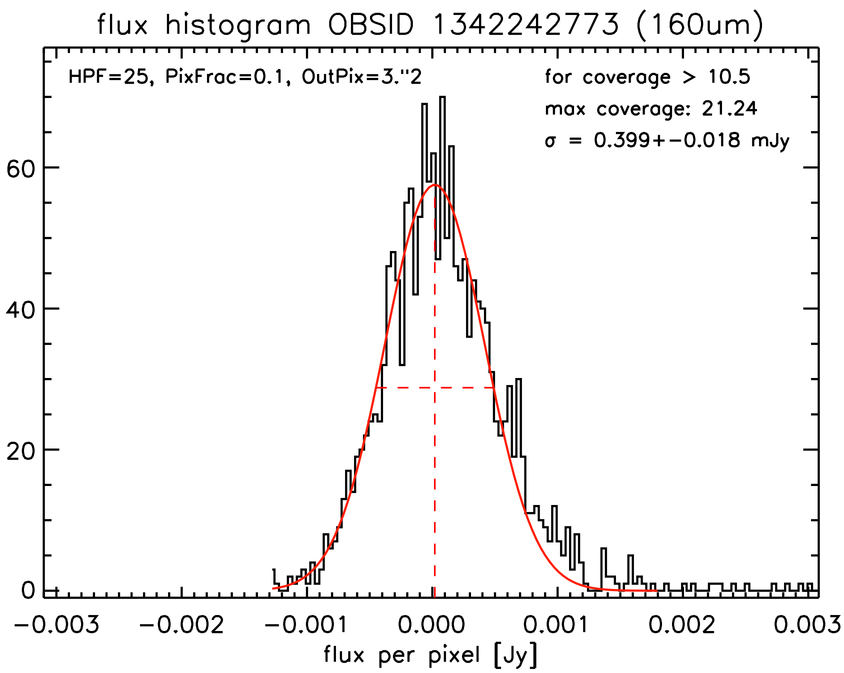

Figure 197: Noise determination for the 160 µm L2.0 map of OBSID 1342242773 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

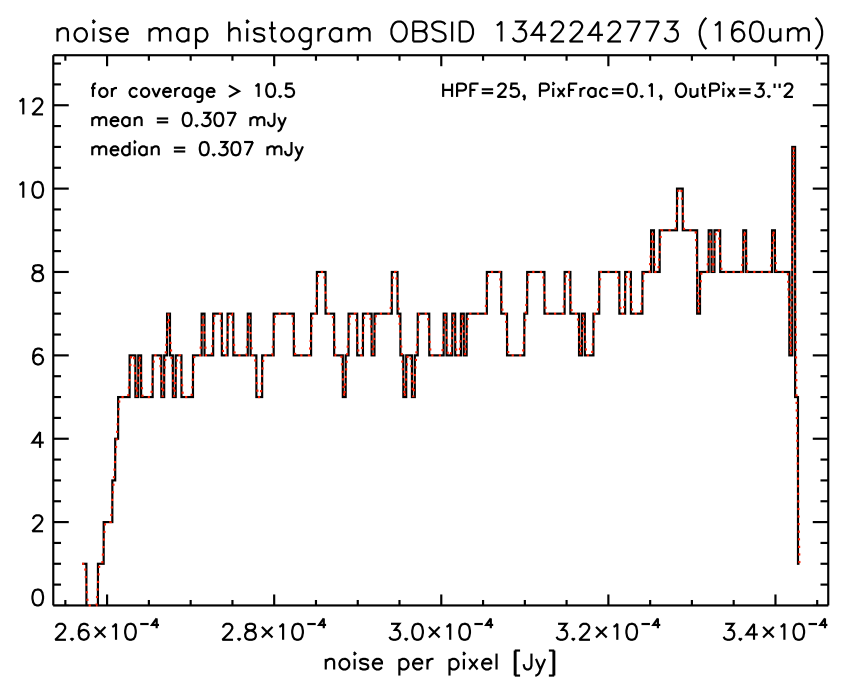

Figure 198: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

5.2.3 L 2.5 OBSIDs 1342242772+1342242773

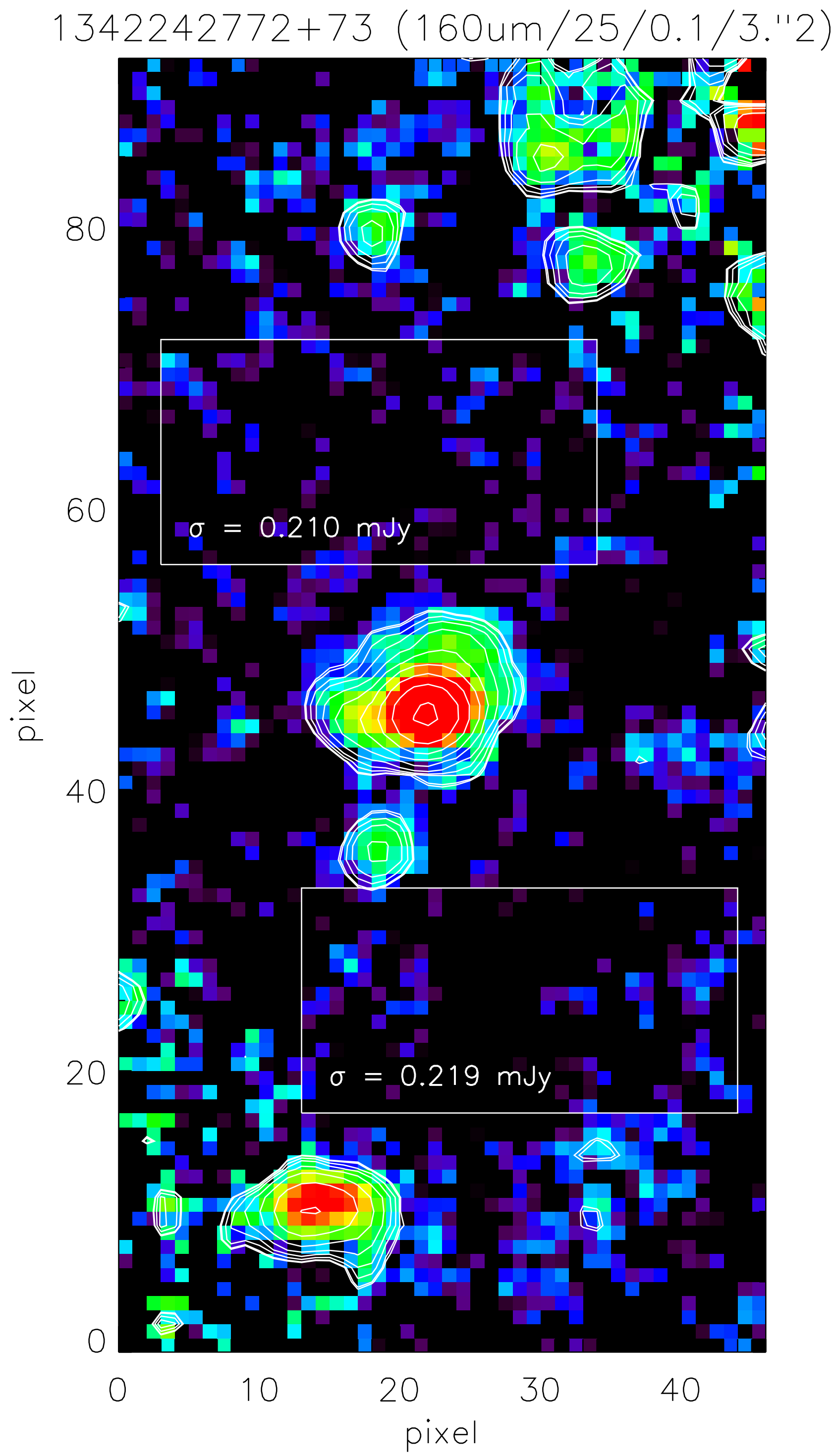

Figure 199: 160 µm L2.5 combined map for OBSIDs 1342242772+73 with HPF radius 25, pixfrac 0.1 and output pixel size of 3.″2 (SPG product parameter set). The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

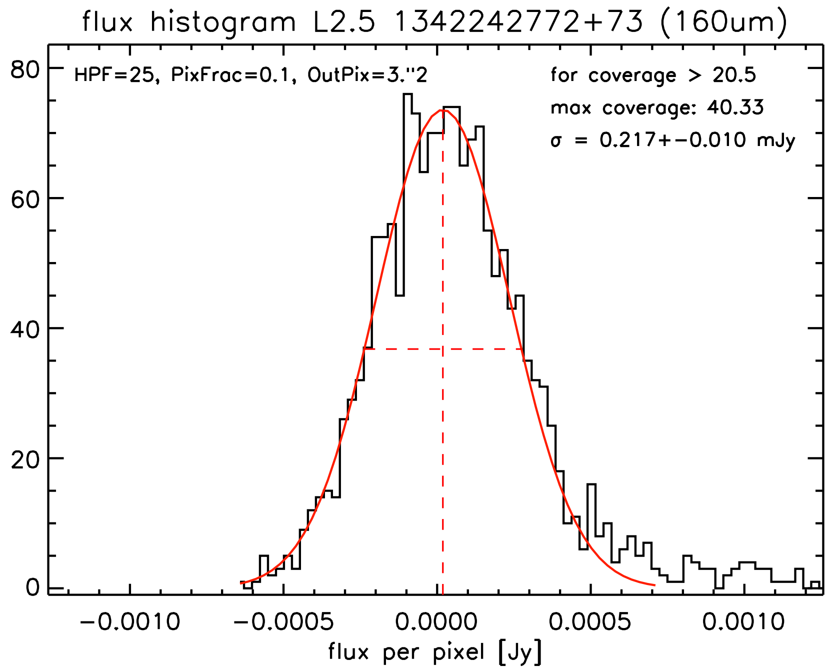

Figure 200: Noise determination for the 160 µm coadded L2.5 map of OBSIDs 1342242772+73 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\,\sigma_{\rm hist}$).

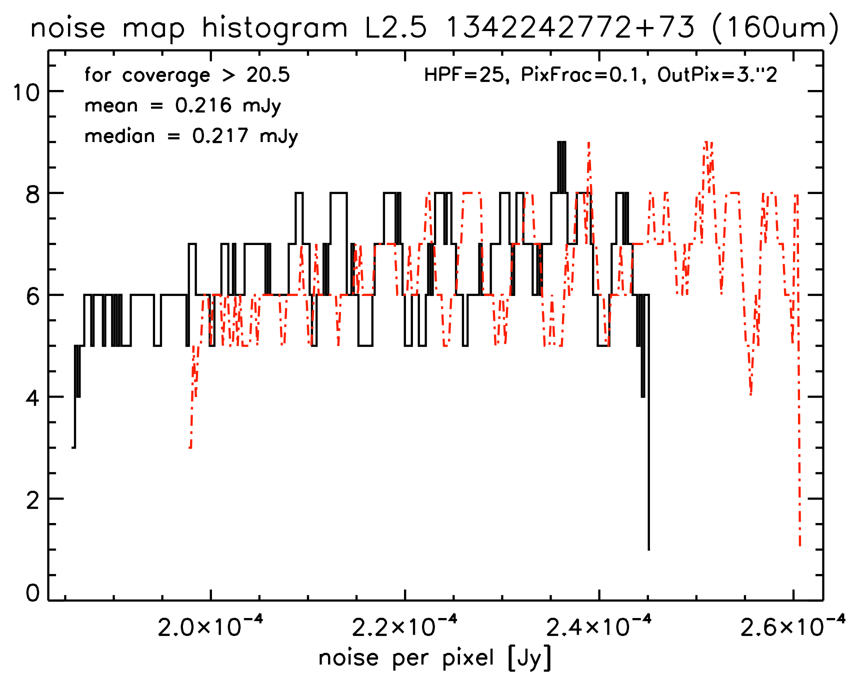

Figure 201: Histogram of the noise value distribution in the L2.5 error map above the coverage threshold indicated in the plot (in black). Mean and median value of the distribution are given. The red dashed-dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

5.3 160 µm: HPF radius 50, Pixfrac 0.1, Pixsize 3.″2

5.3.1 L 2.0 OBSID 1342242772

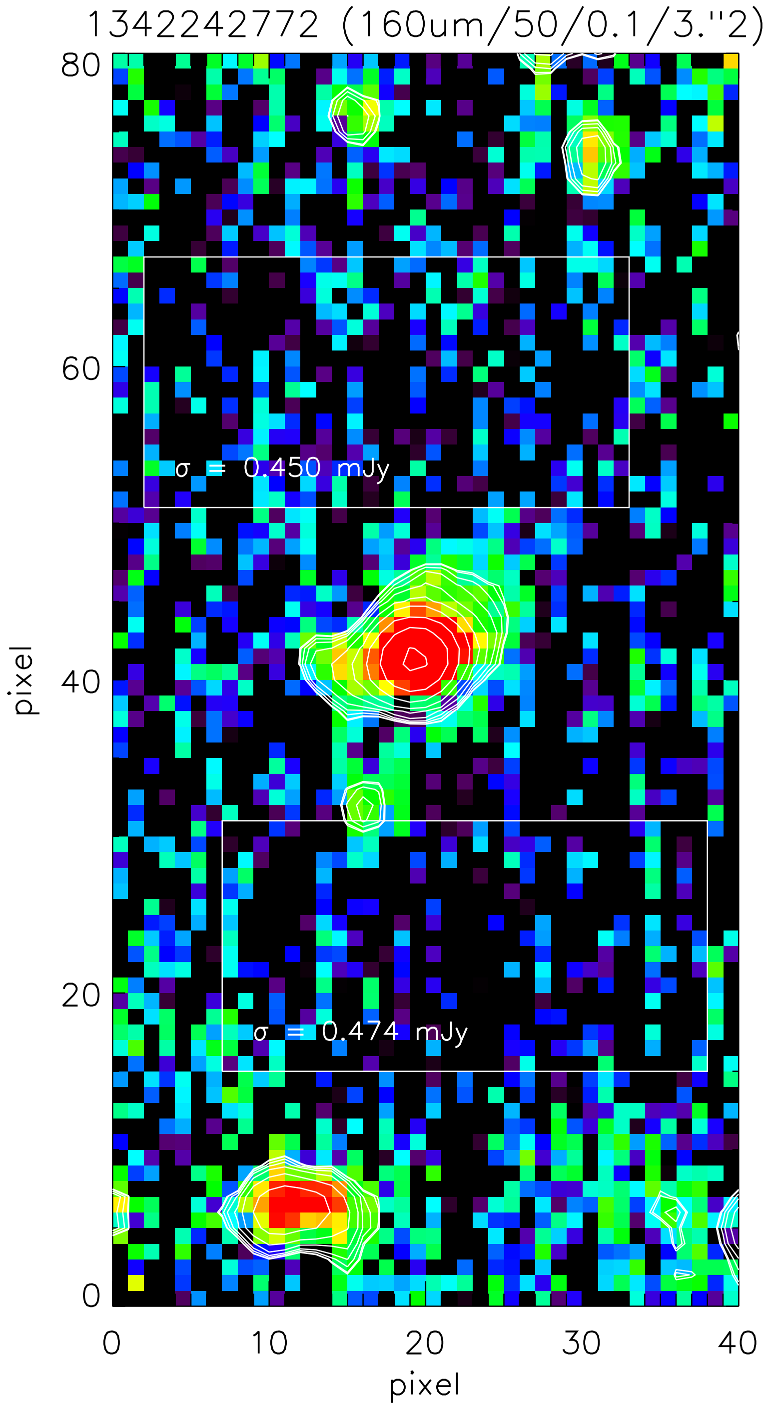

Figure 202: 160 µm L2.0 map for OBSID 1342242772 with HPF radius 50, pixfrac 0.1 and output pixel size of 3.″2. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

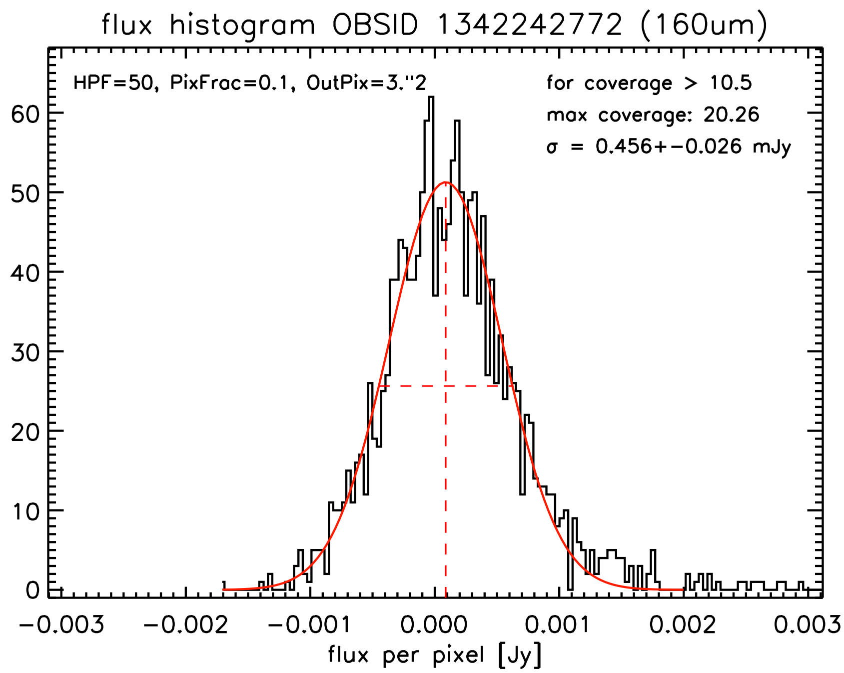

Figure 203: Noise determination for the 160 µm L2.0 map of OBSID 1342242772 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

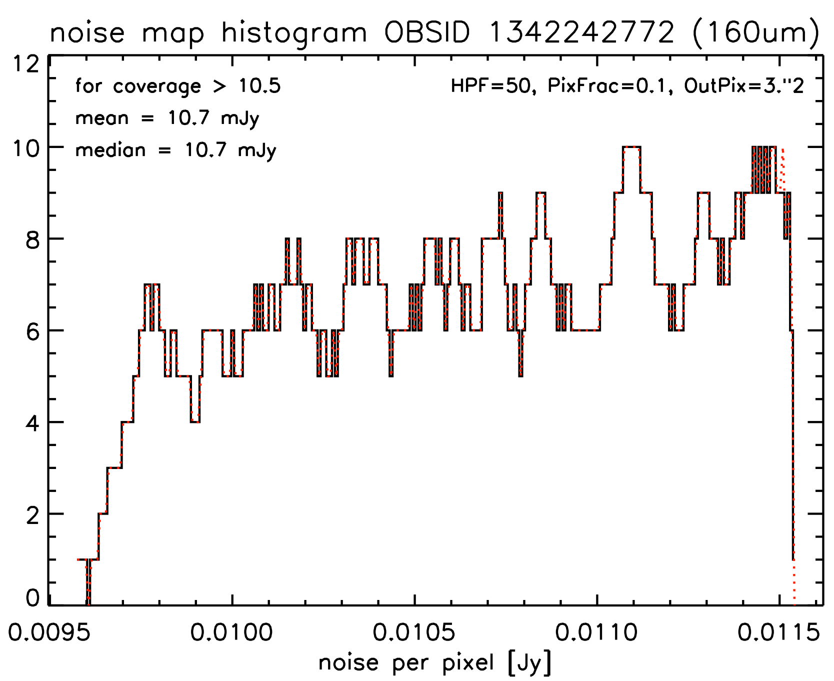

Figure 204: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

5.4 160 μm: HPF radius 25, Pixfrac 0.1, Pixsize 4.″8

5.4.1 L 2.0 OBSID 1342242772

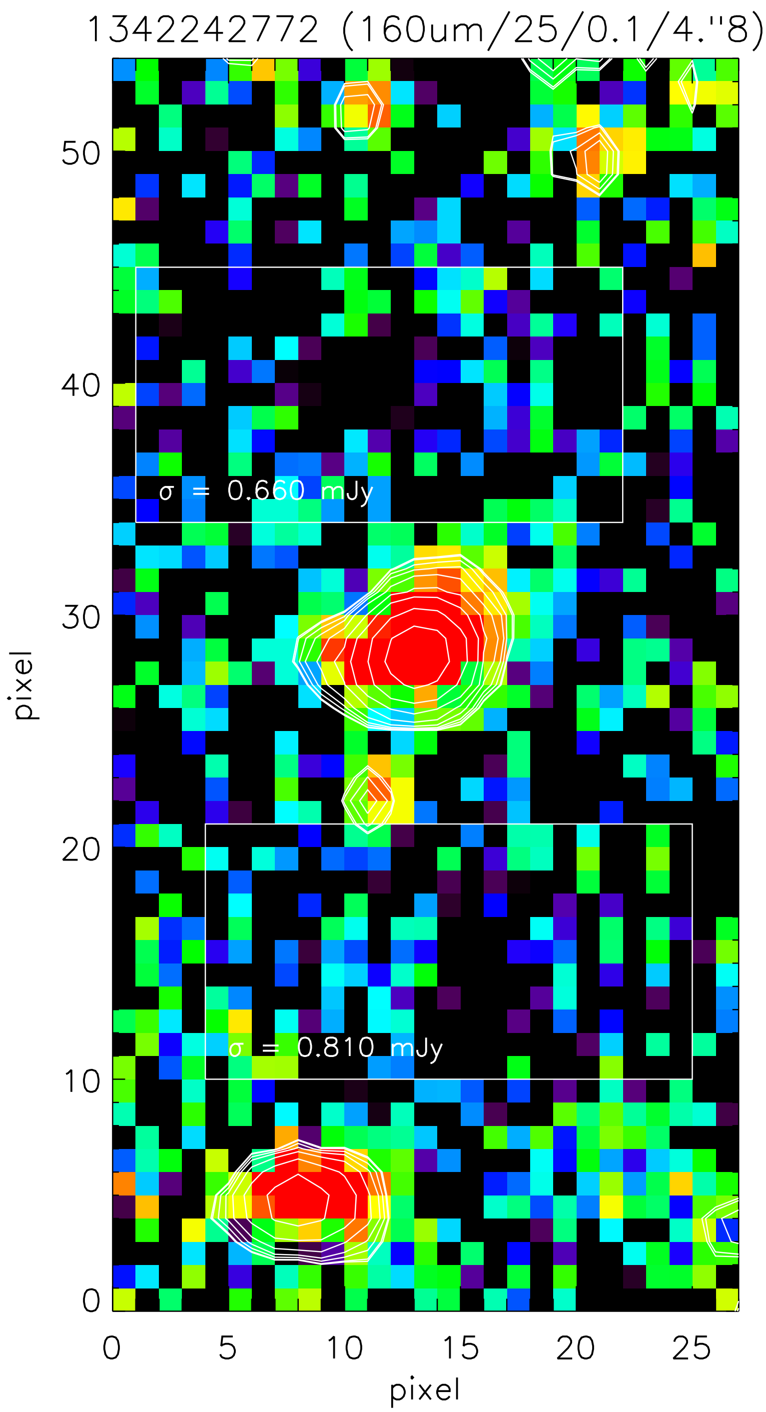

Figure 205: 160 μm L2.0 map for OBSID 1342242772 with HPF radius 25, pixfrac 0.1 and output pixel size of 4.″8. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

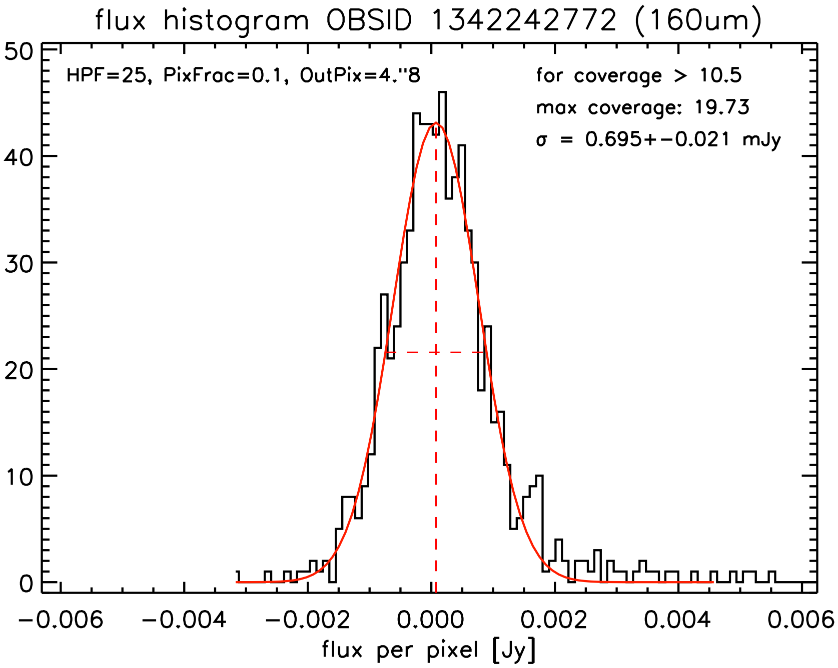

Figure 206: Noise determination for the 160 µm L2.0 map of OBSID 1342242772 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\ \sigma_{\rm hist}$).

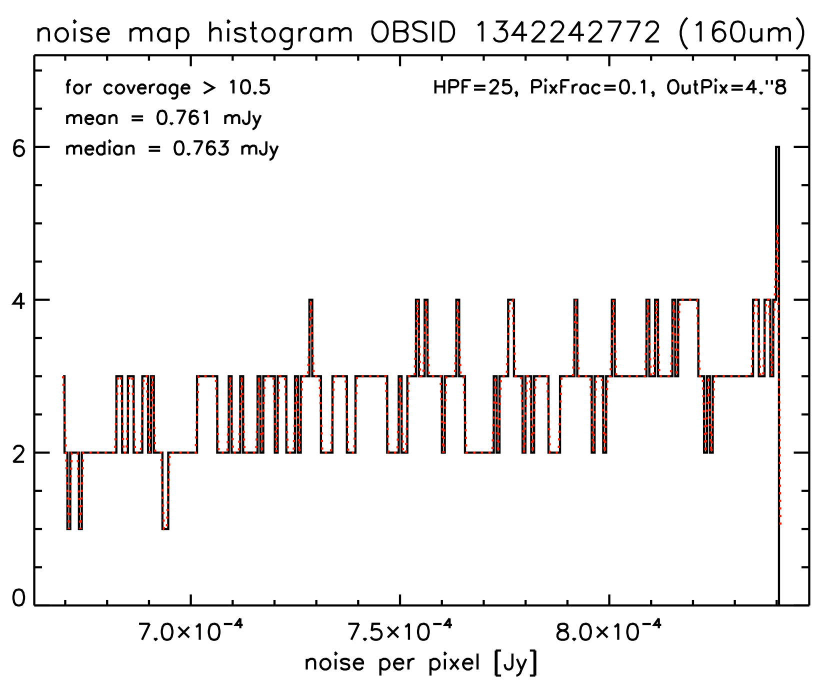

Figure 207: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

5.4.2 L 2.0 OBSID 1342242773

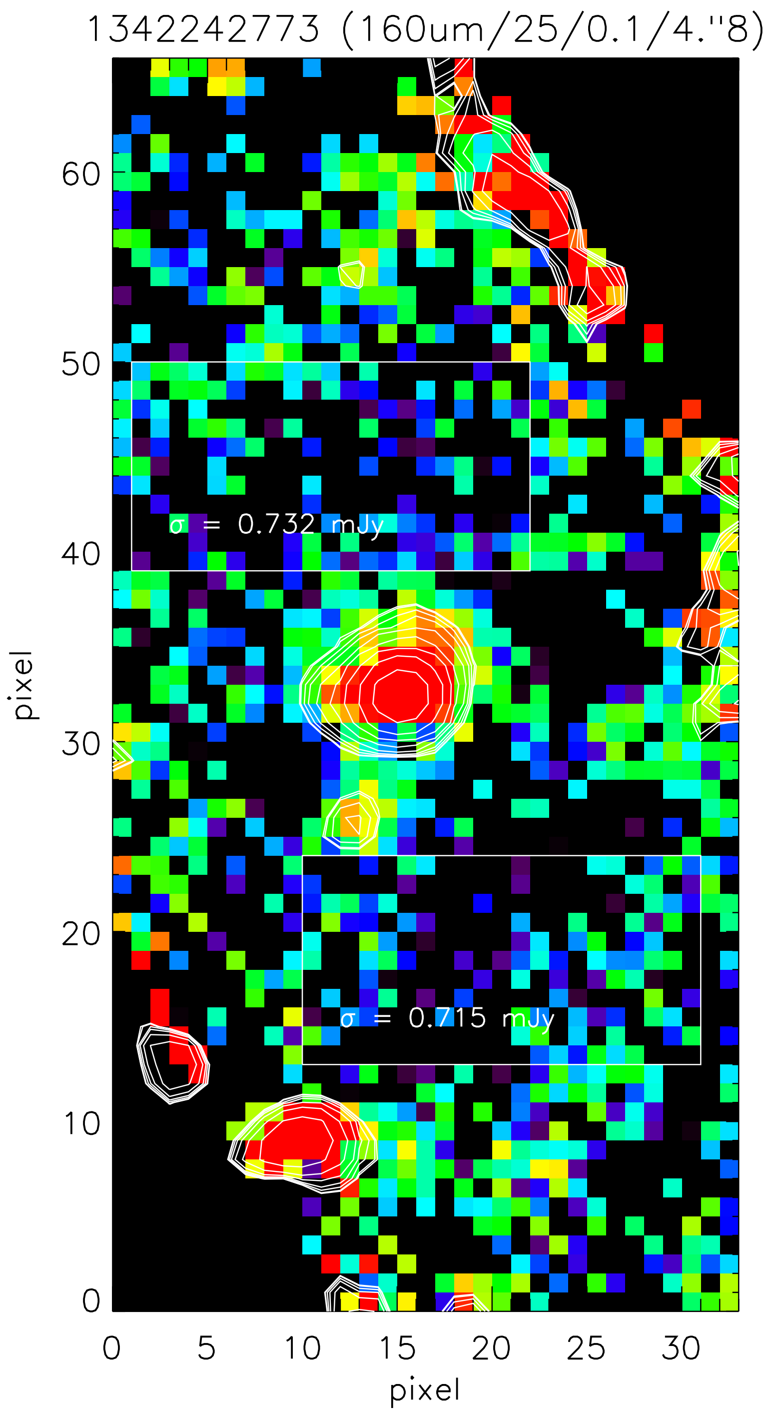

Figure 208: 160 μm L2.0 map for OBSID 1342242773 with HPF radius 25, pixfrac 0.1 and output pixel size of 4.″8. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

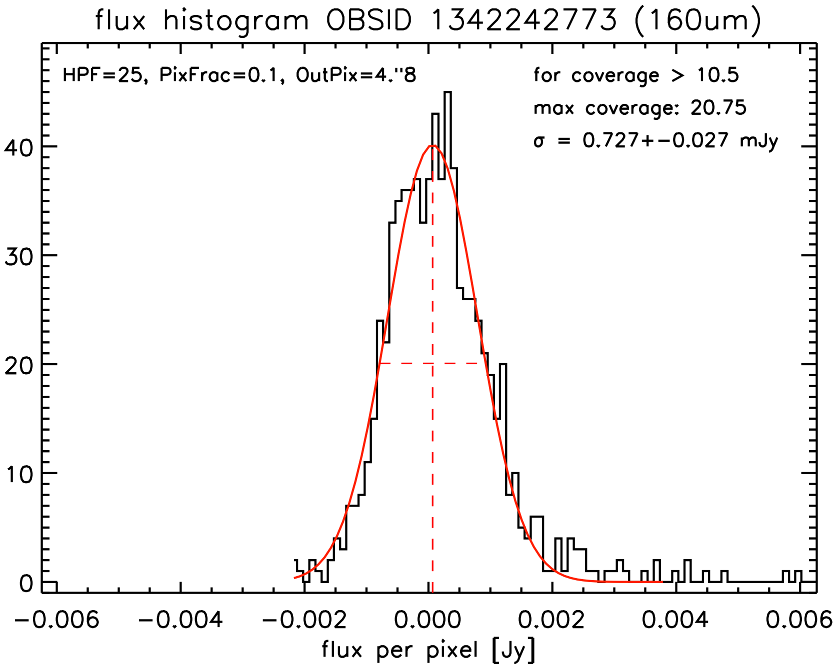

Figure 209: Noise determination for the 160 µm L2.0 map of OBSID 1342242773 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

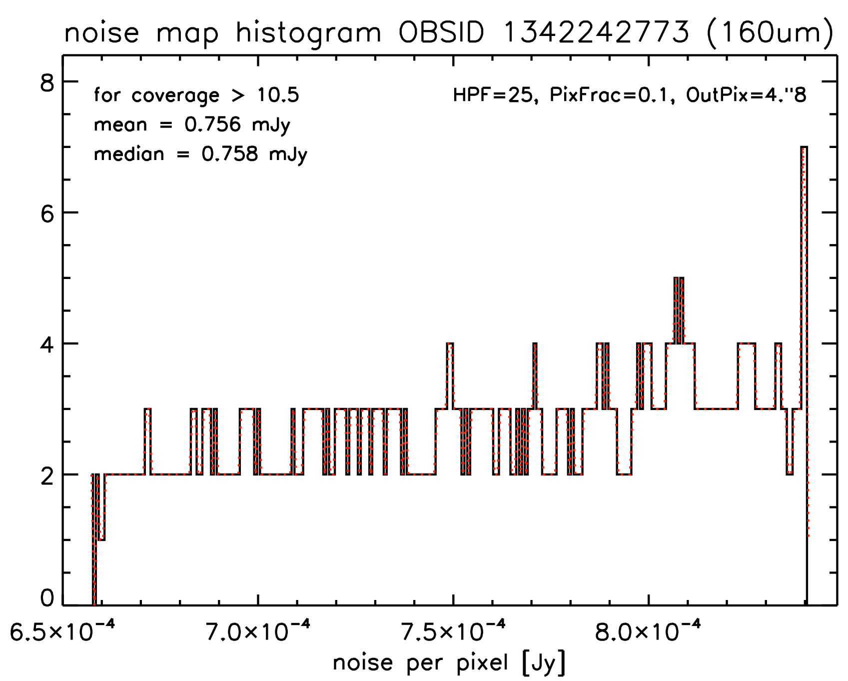

Figure 210: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

5.4.3 L 2.5 OBSIDs 1342242772+1342242773

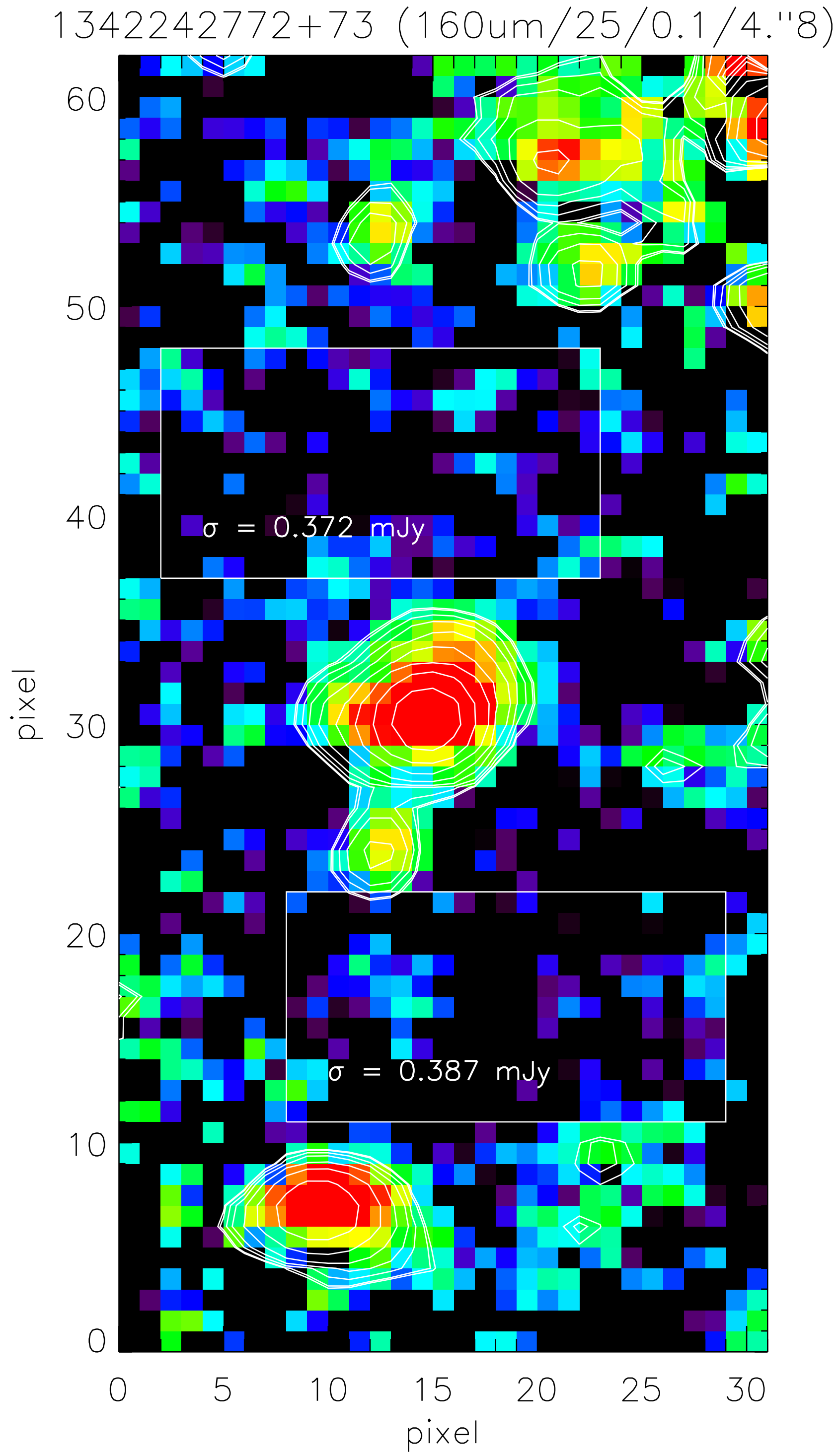

Figure 211: 160 µm L2.5 combined map for OBSIDs 1342242772+73 with HPF radius 25, pixfrac 0.1 and output pixel size of 3.″2. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

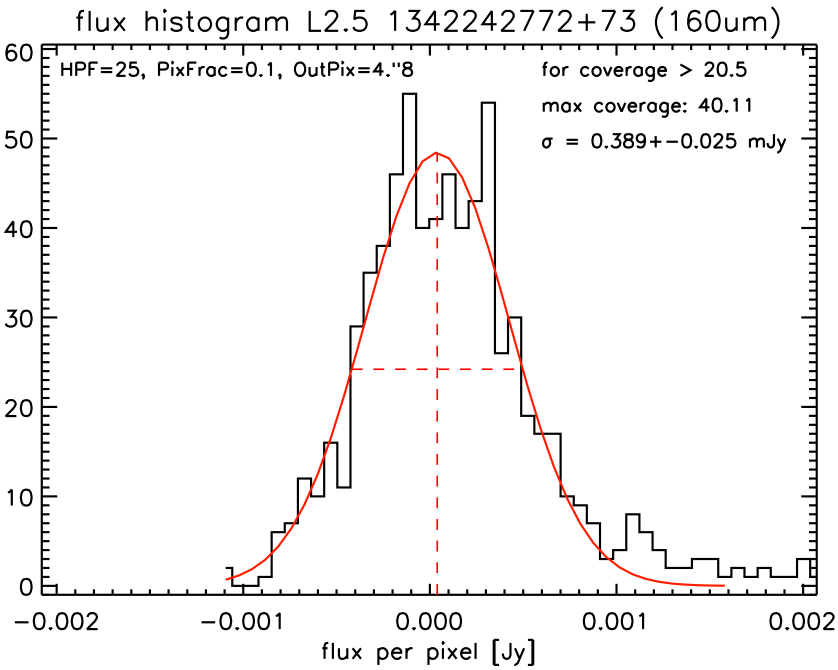

Figure 212: Noise determination for the 160 µm coadded L2.5 map of OBSIDs 1342242772+73 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\,\sigma_{\rm hist}$).

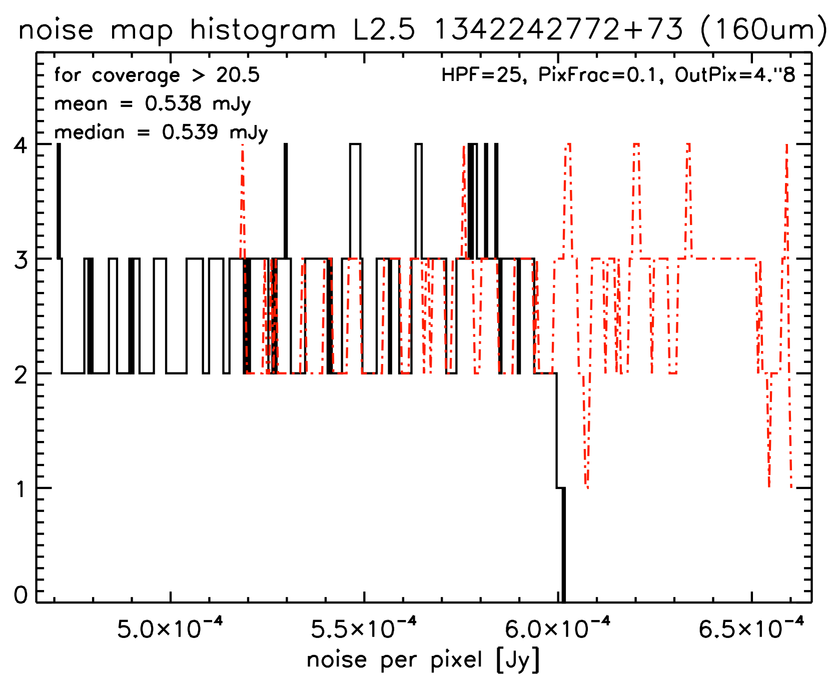

Figure 213: Histogram of the noise value distribution in the L2.5 error map above the coverage threshold indicated in the plot (in black). Mean and median value of the distribution are given. The red dashed-dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

5.5 160 µm: HPF radius 25, Pixfrac 0.1, Pixsize 6.″4

5.5.1 L 2.0 OBSID 1342242772

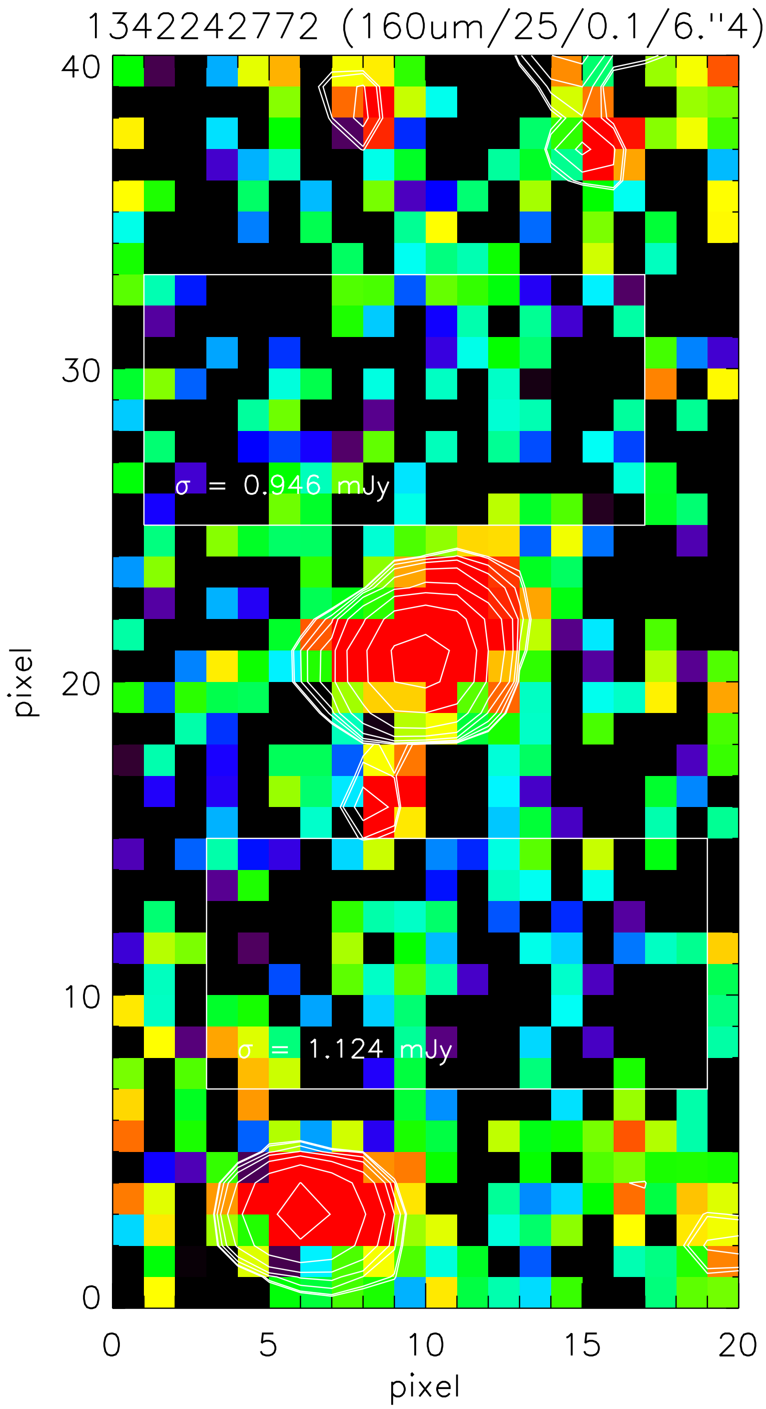

Figure 214: 160 µm L2.0 map for OBSID 1342242772 with HPF radius 25, pixfrac 0.1 and output pixel size of 6.″4. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

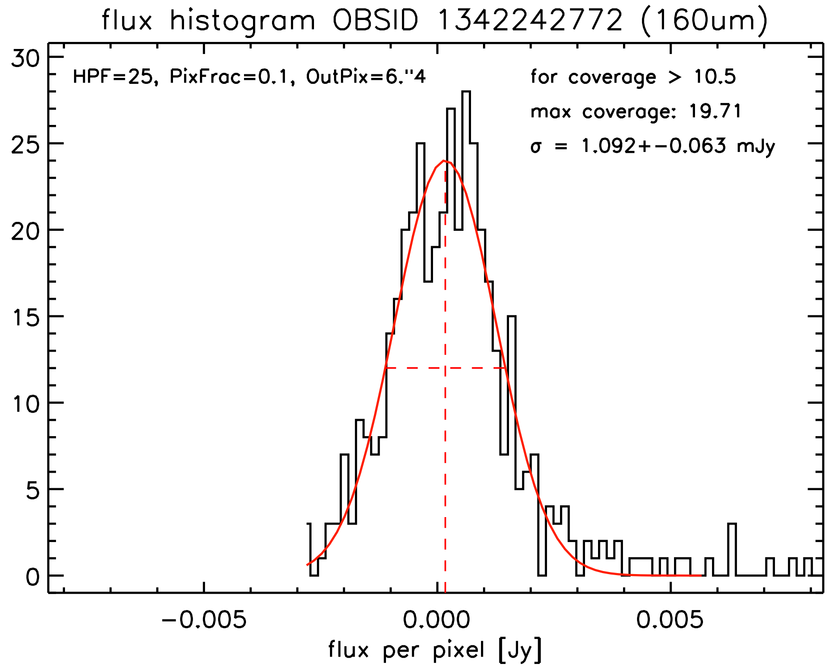

Figure 215: Noise determination for the 160 µm L2.0 map of OBSID 1342242772 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\ \sigma_{\rm hist}$).

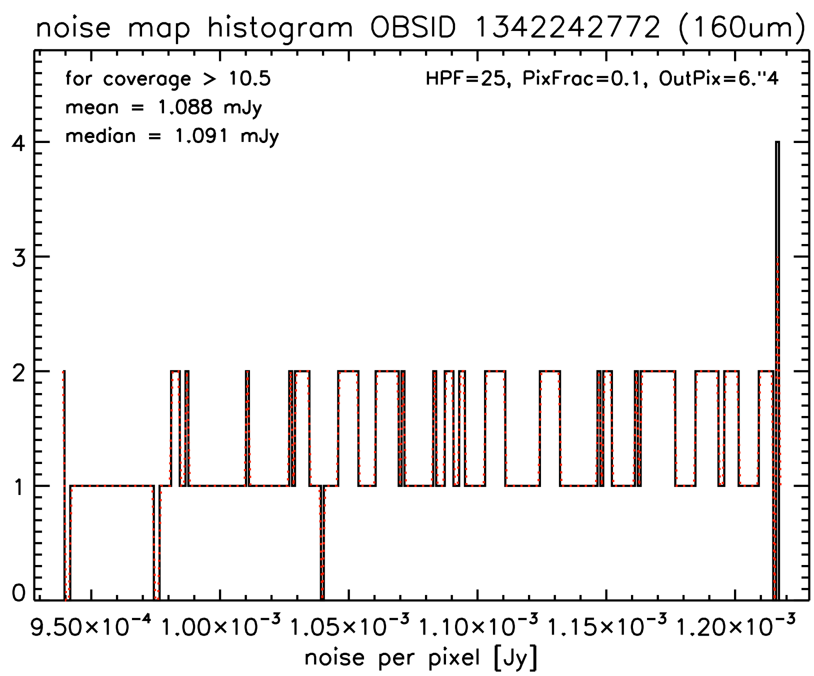

Figure 216: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

5.5.2 L 2.0 OBSID 1342242773

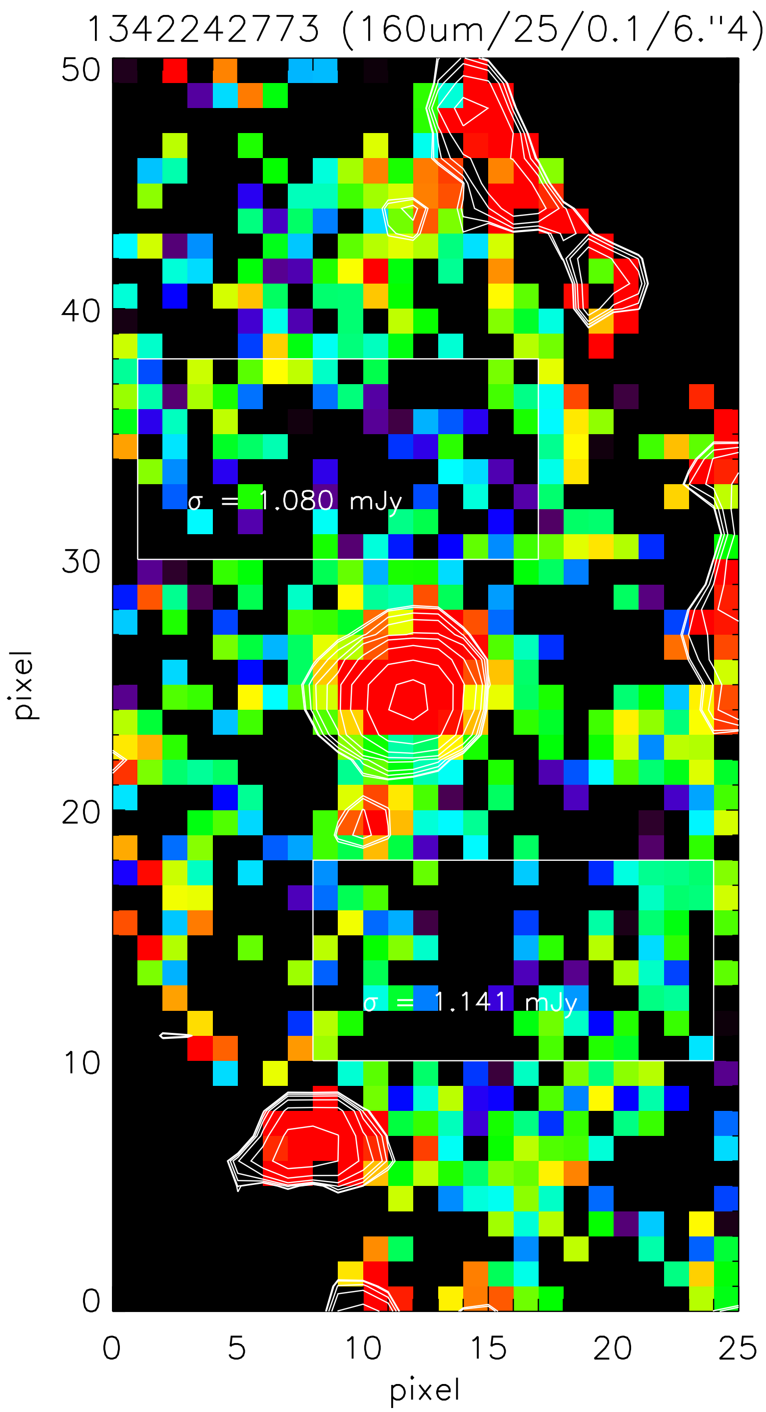

Figure 217: 160 µm L2.0 map for OBSID 1342242773 with HPF radius 25, pixfrac 0.1 and output pixel size of 6.″4. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

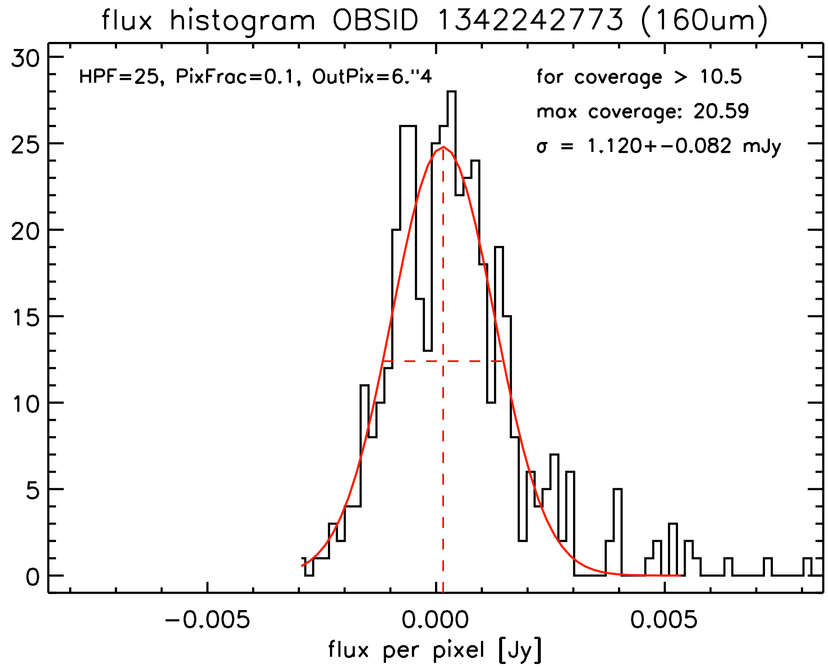

Figure 218: Noise determination for the 160 µm L2.0 map of OBSID 1342242773 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\ \sigma_{\rm hist}$).

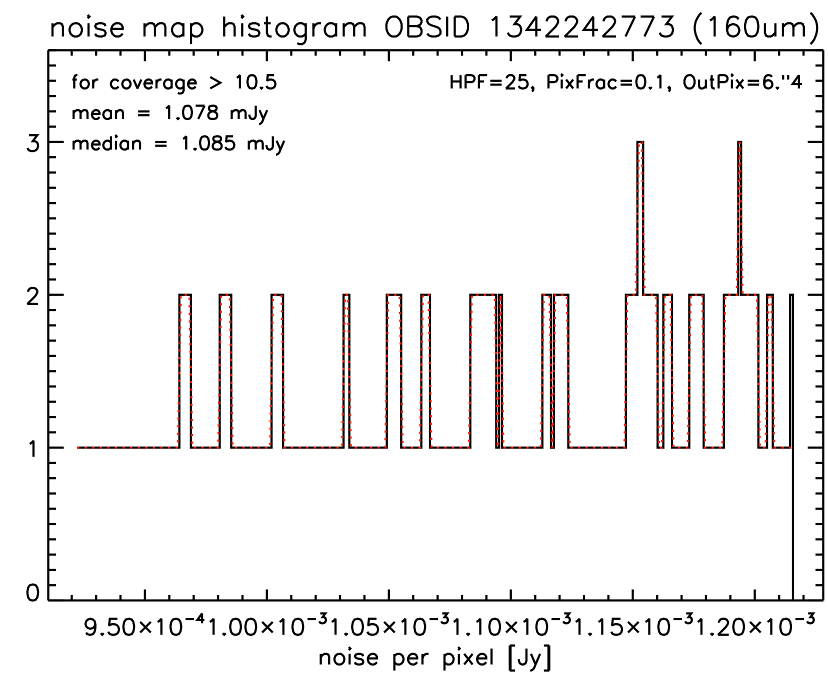

Figure 219: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

5.5.3 L 2.5 OBSIDs 1342242772+1342242773

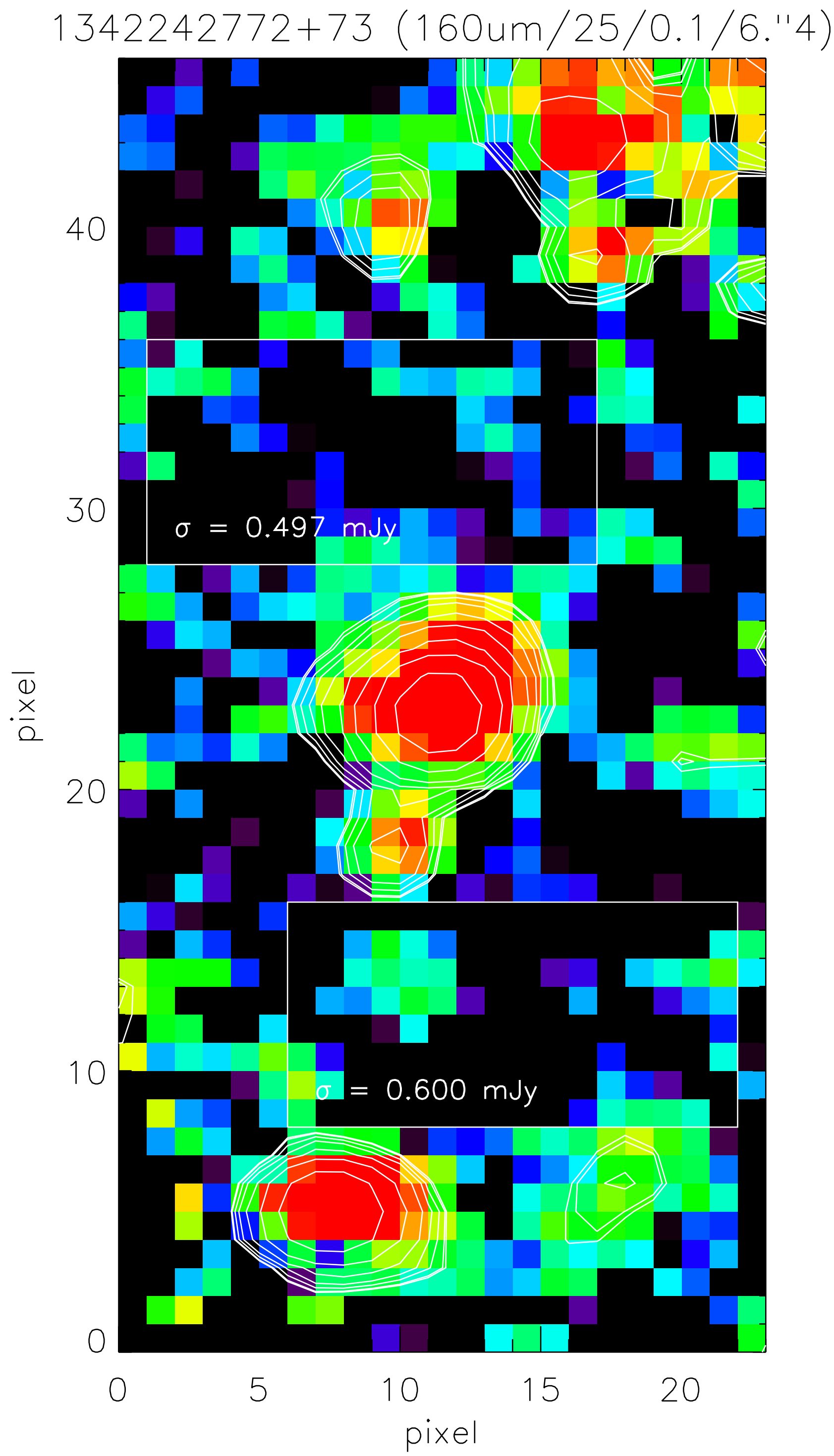

Figure 220: 160 μm L2.5 combined map for OBSIDs 1342242772+73 with HPF radius 25, pixfrac 0.1 and output pixel size of 6.″4. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

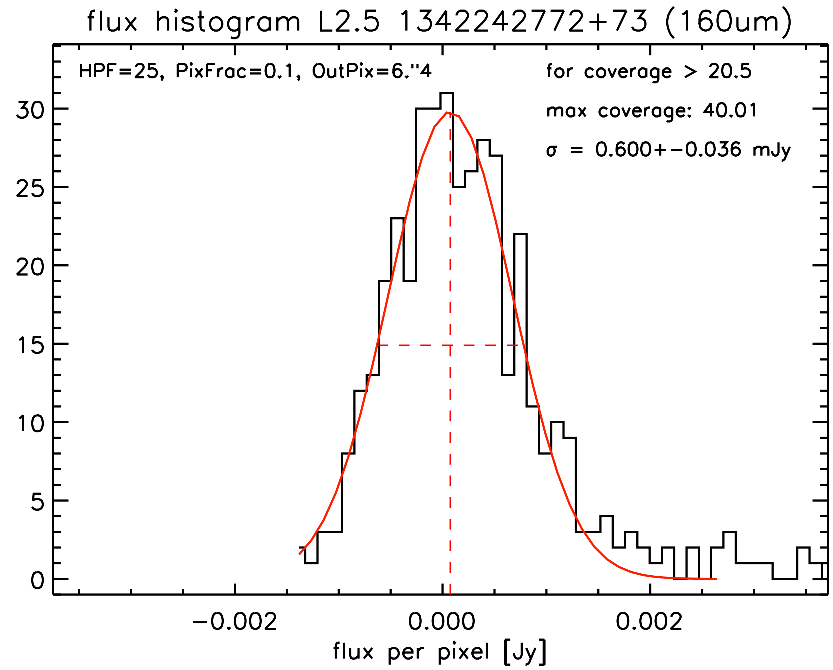

Figure 221: Noise determination for the 160 µm coadded L2.5 map of OBSIDs 1342242772+73 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

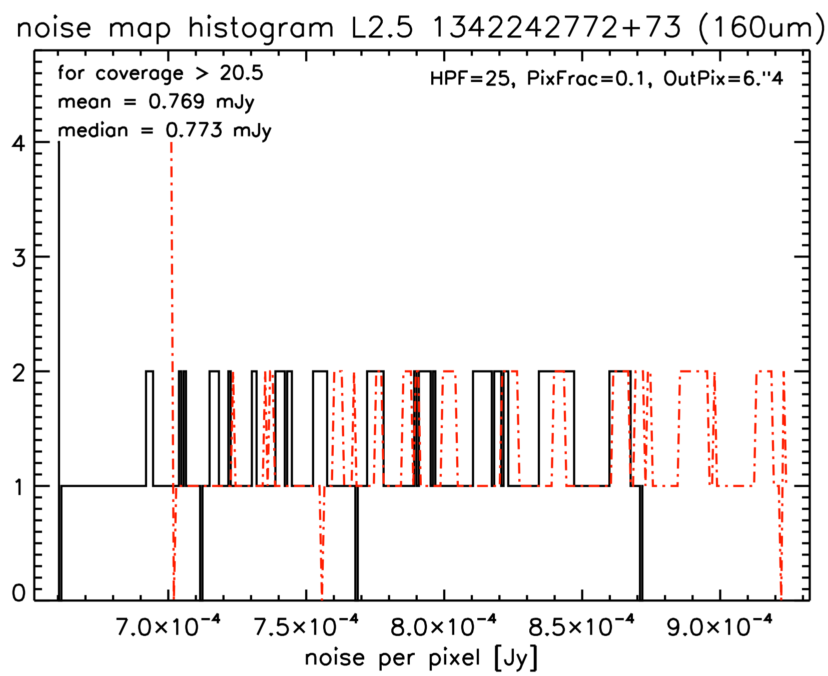

Figure 222: Histogram of the noise value distribution in the L2.5 error map above the coverage threshold indicated in the plot (in black). Mean and median value of the distribution are given. The red dashed-dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

5.5.4 L 2.0 OBSID 1342242773

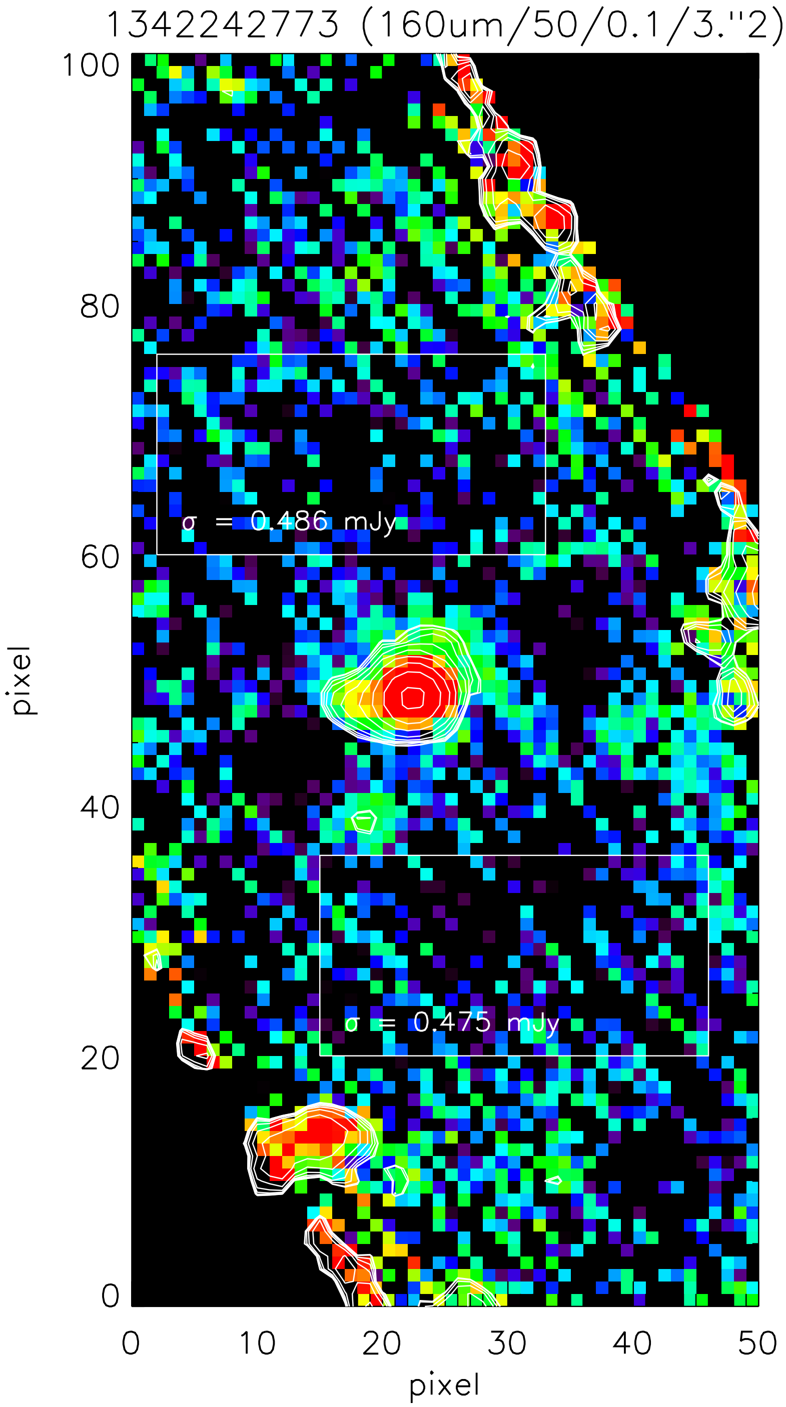

Figure 223: 160 µm L2.0 map for OBSID 1342242773 with HPF radius 50, pixfrac 0.1 and output pixel size of 3.″2. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

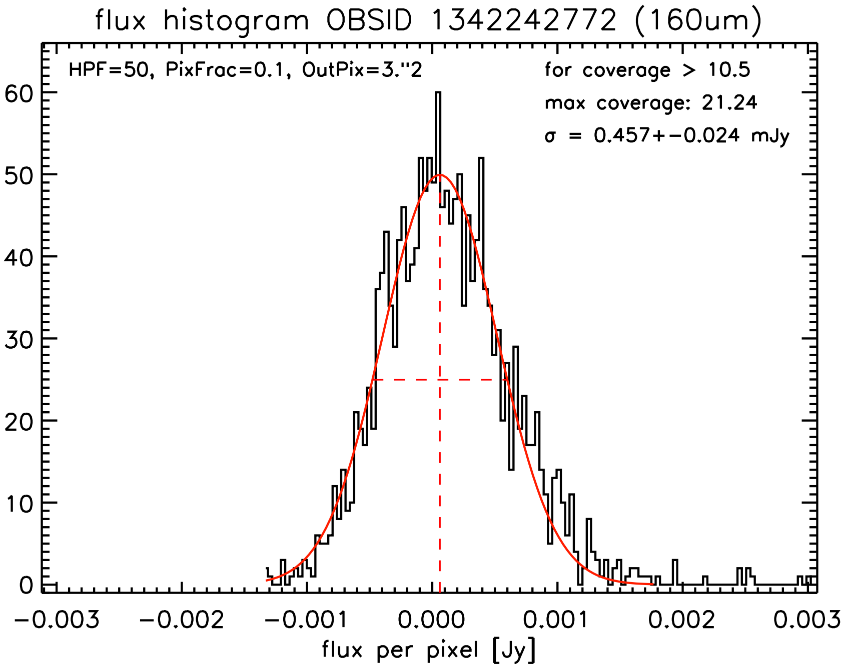

Figure 224: Noise determination for the 160 µm L2.0 map of OBSID 1342242773 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

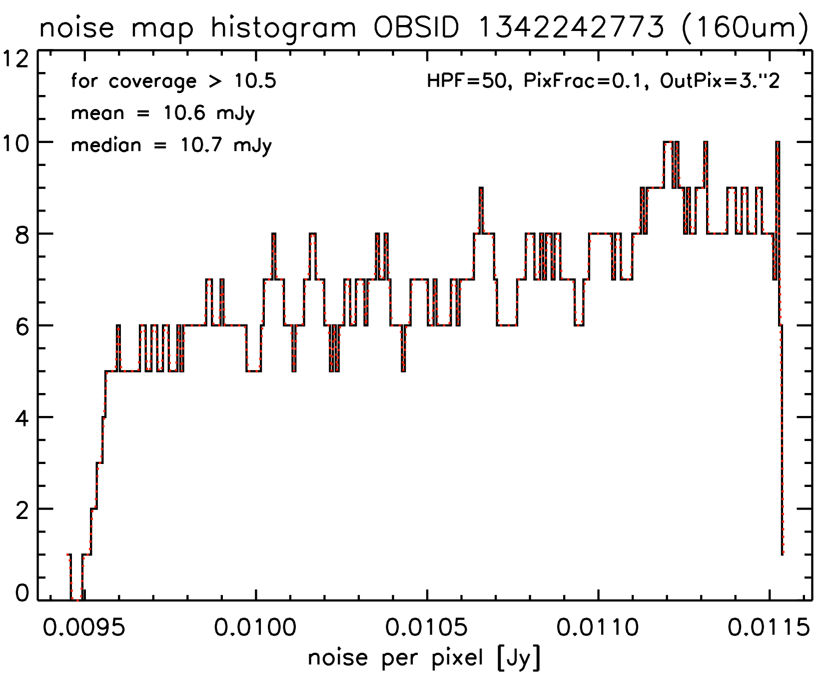

Figure 225: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

5.5.5 L 2.5 OBSIDs 1342242772+1342242773

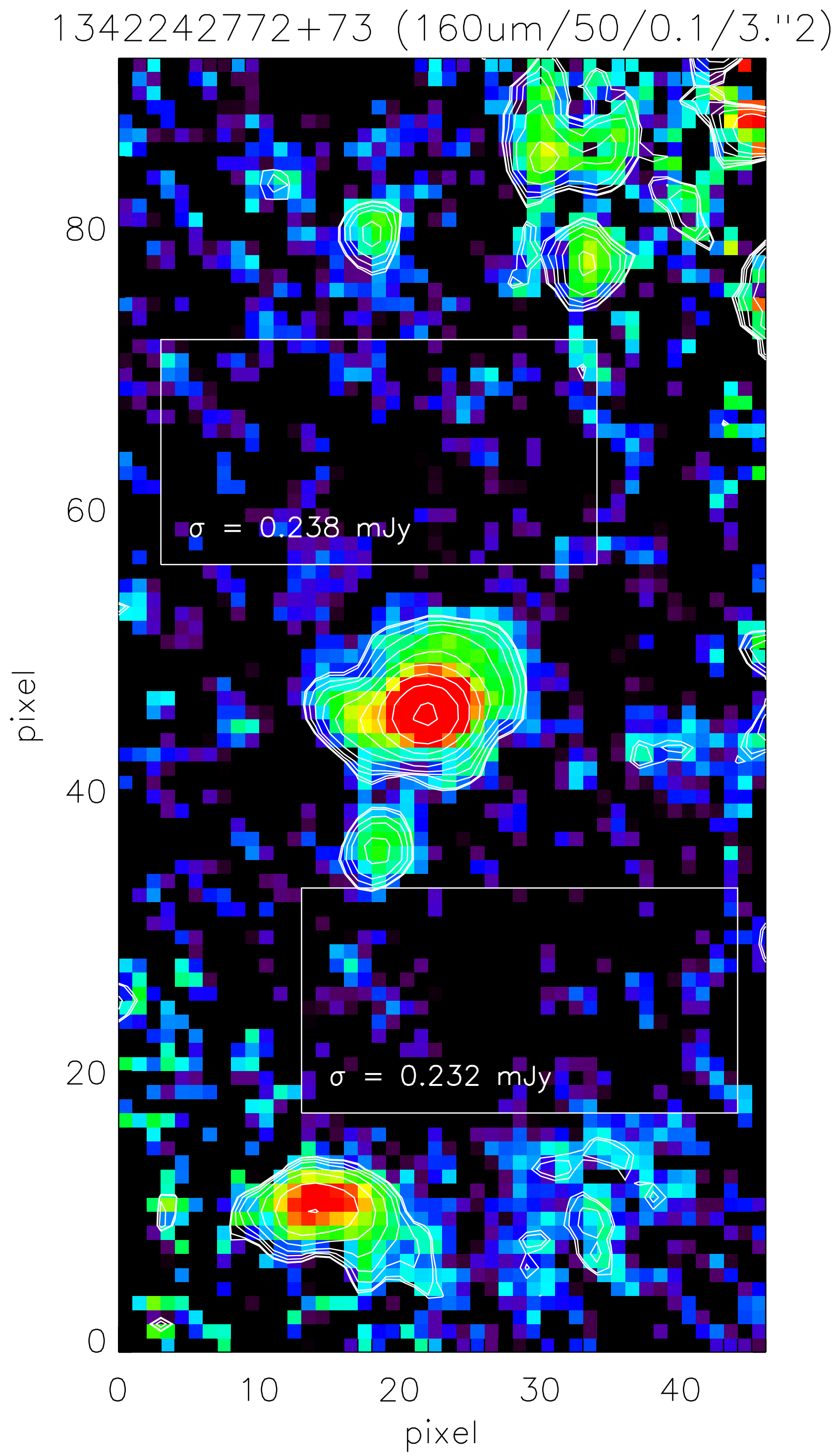

Figure 226: 160 µm L2.5 combined map for OBSIDs 1342242772+73 with HPF radius 50, pixfrac 0.1 and output pixel size of 3.″2. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

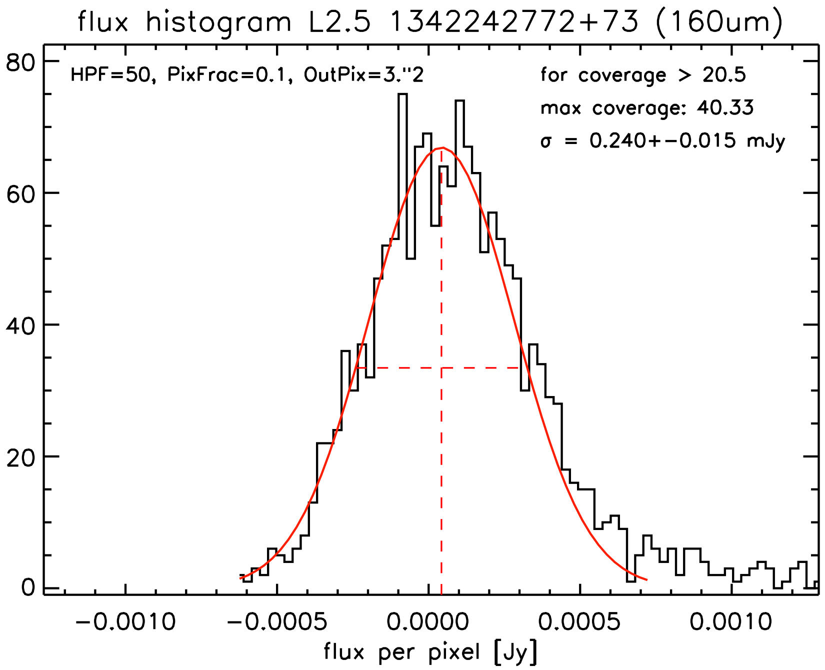

Figure 227: Noise determination for the 160 µm coadded L2.5 map of OBSIDs 1342242772+73 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

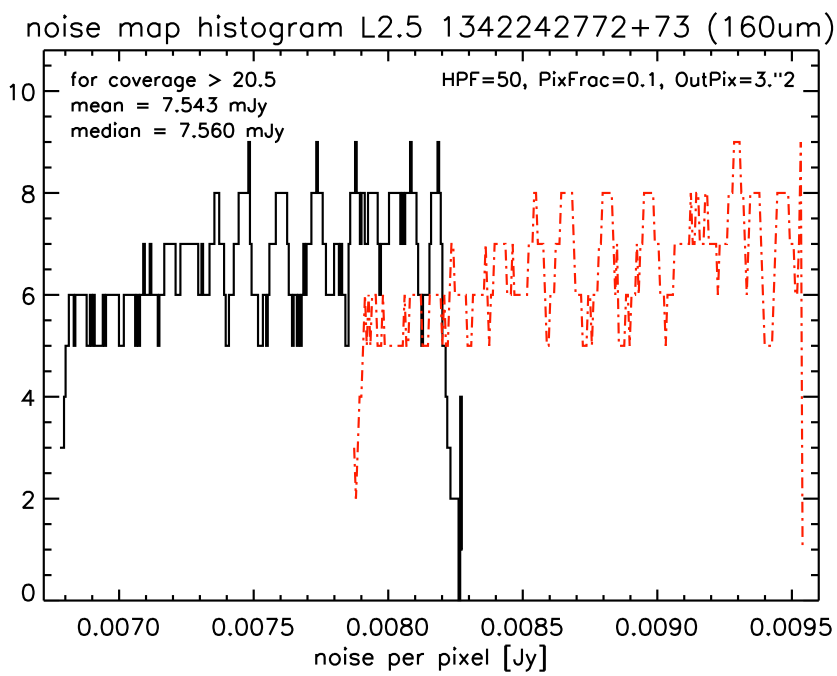

Figure 228: Histogram of the noise value distribution in the L2.5 error map above the coverage threshold indicated in the plot (in black). Mean and median value of the distribution are given. The red dashed-dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

5.6 160 µm: HPF radius 25, Pixfrac 0.5, Pixsize 3.″2

5.6.1 L 2.0 OBSID 1342242772

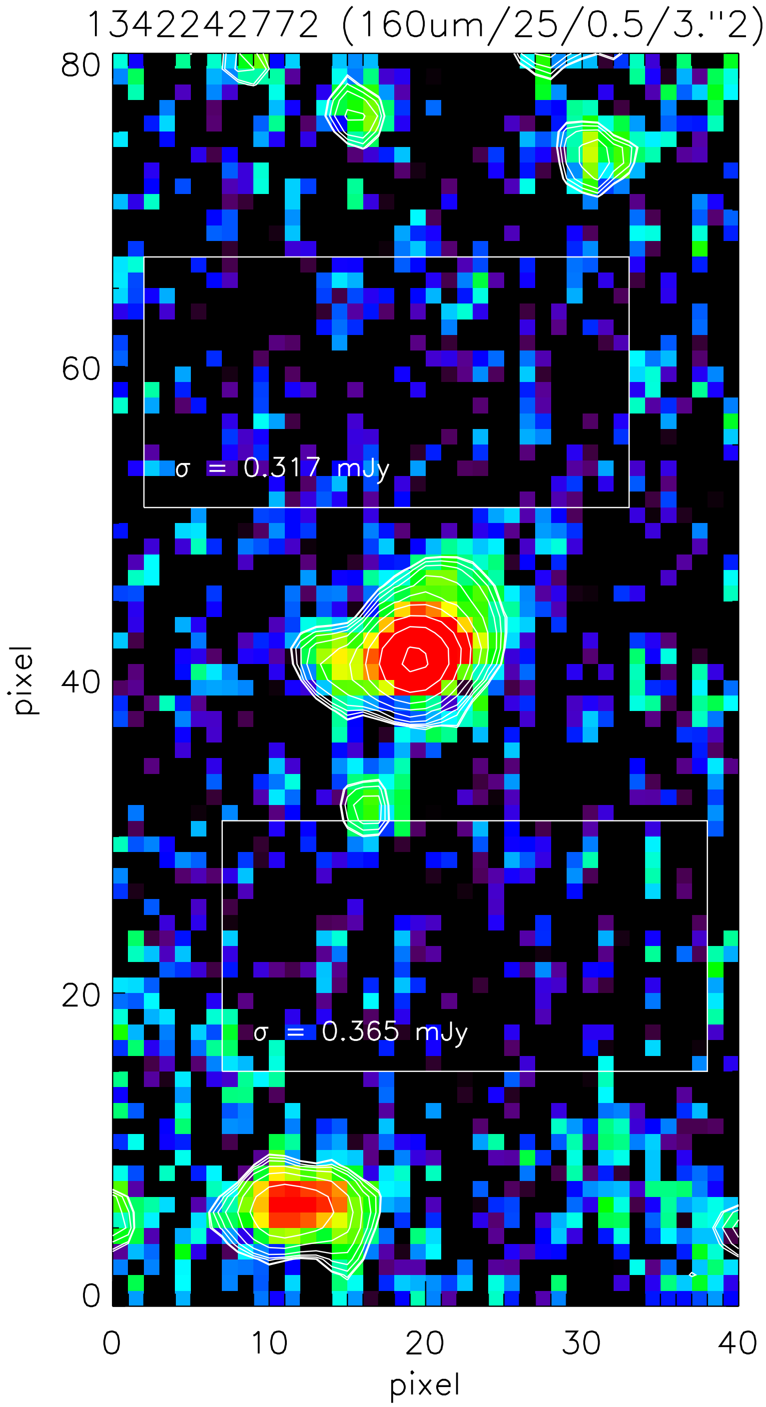

Figure 229: 160 µm L2.0 map for OBSID 1342242772 with HPF radius 25, pixfrac 0.5 and output pixel size of 3.″2. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

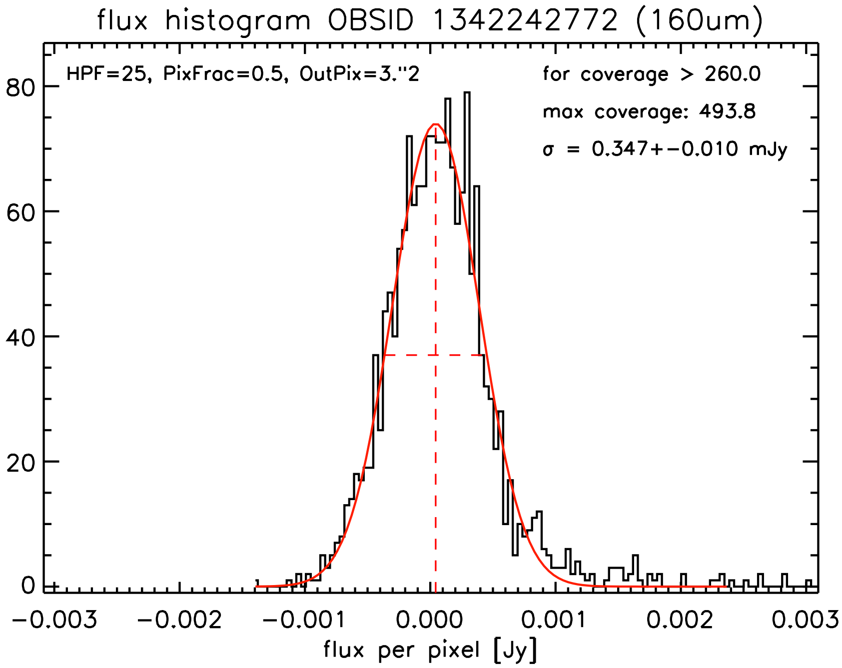

Figure 230: Noise determination for the 160 µm L2.0 map of OBSID 1342242772 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\mathrm{hist}}$).

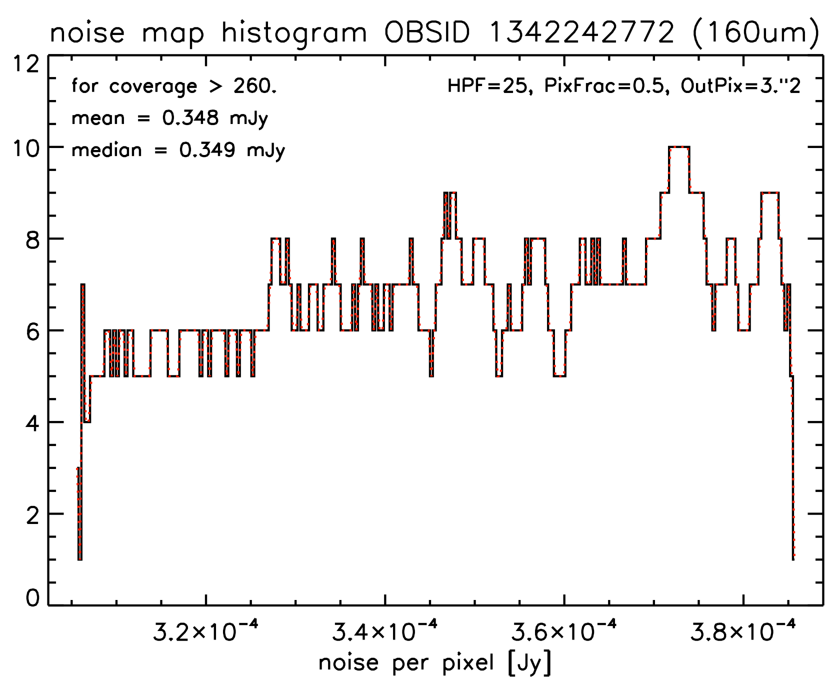

Figure 231: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

5.6.2 L 2.0 OBSID 1342242773

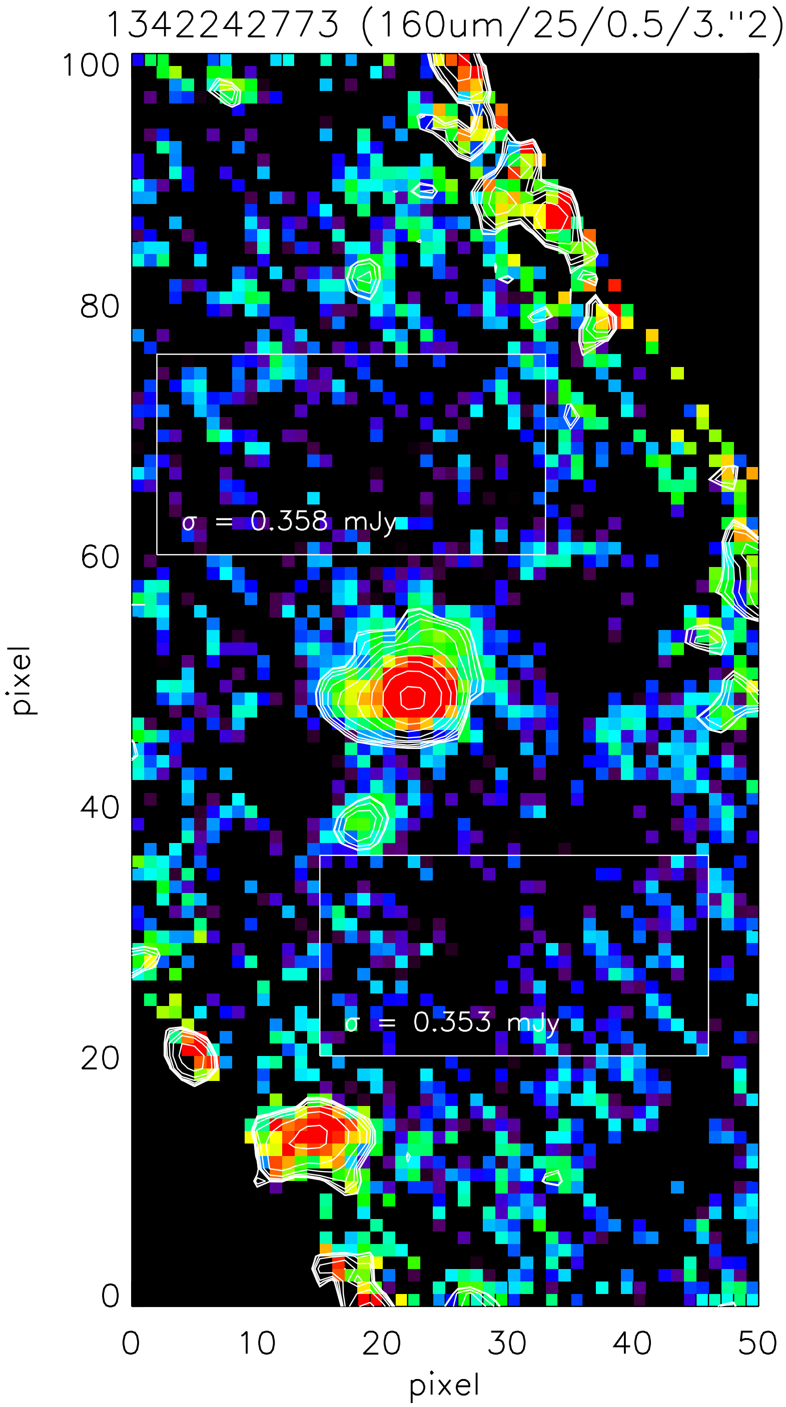

Figure 232: 160 µm L2.0 map for OBSID 1342242773 with HPF radius 25, pixfrac 0.5 and output pixel size of 3.″2. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

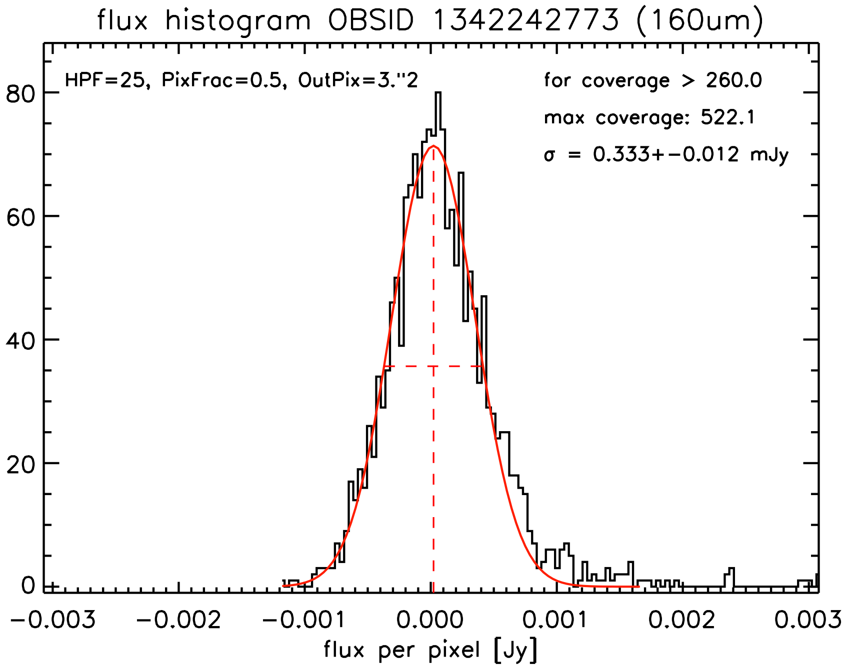

Figure 233: Noise determination for the 160 µm L2.0 map of OBSID 1342242773 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\ \sigma_{\rm hist}$).

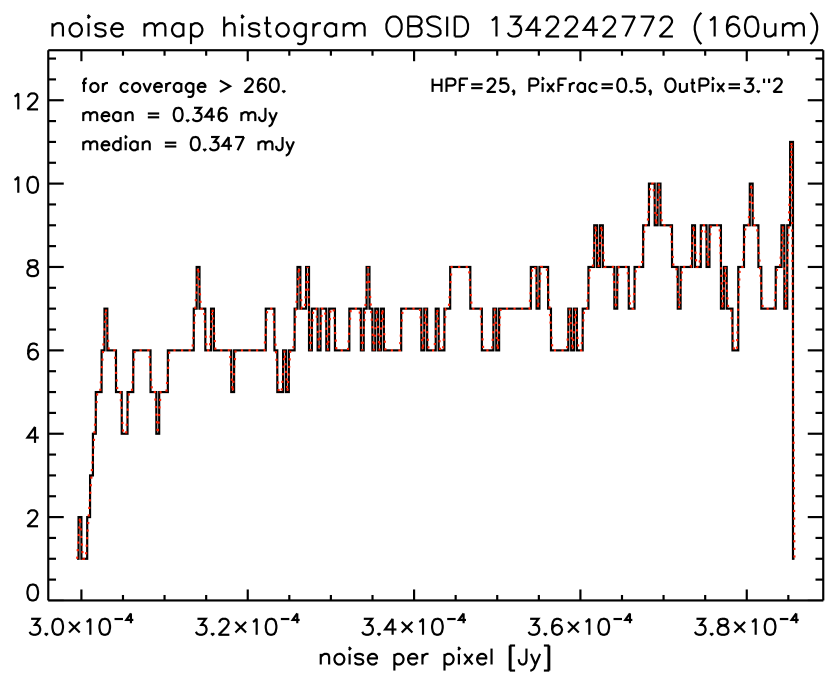

Figure 234: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

5.6.3 L 2.5 OBSIDs 1342242772+1342242773

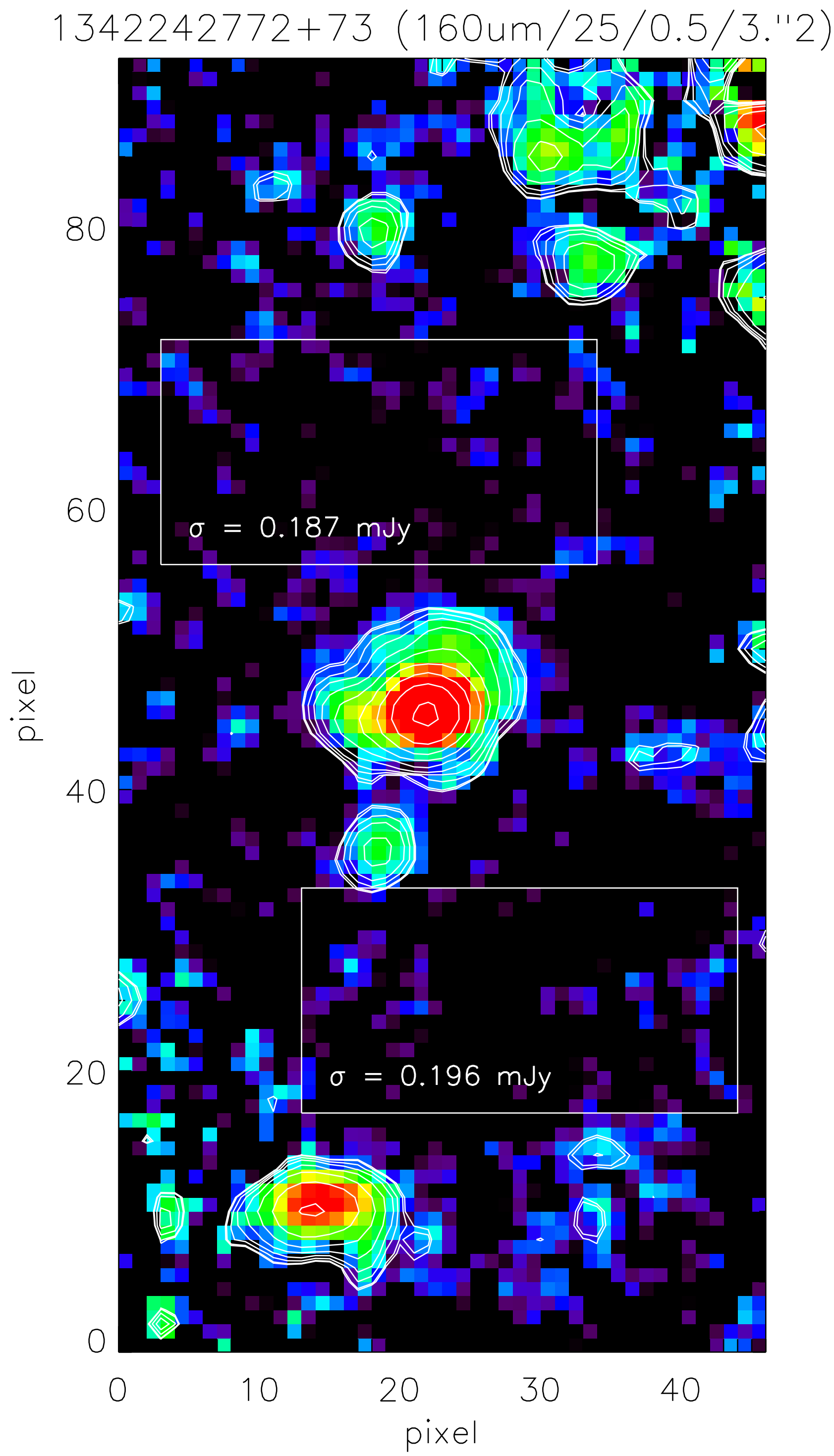

Figure 235: 160 µm L2.5 combined map for OBSIDs 1342242772+73 with HPF radius 25, pixfrac 0.5 and output pixel size of 3.″2. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

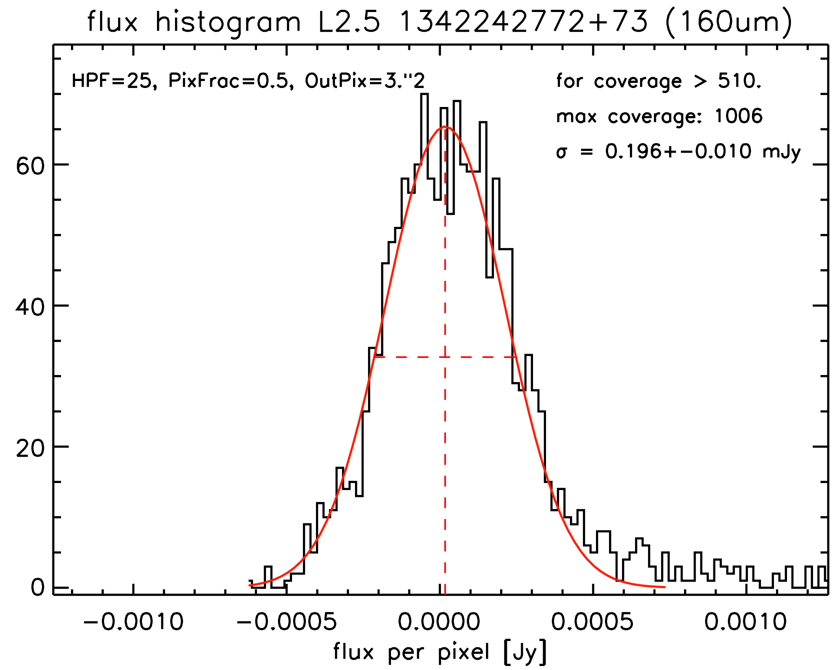

Figure 236: Noise determination for the 160 µm coadded L2.5 map of OBSIDs 1342242772+73 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\,\sigma_{\rm hist}$).

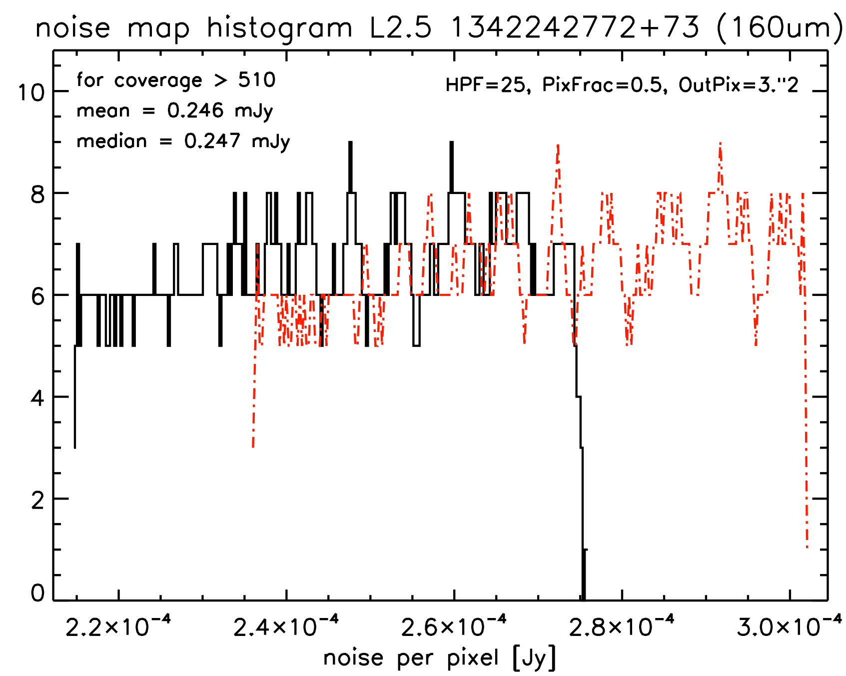

Figure 237: Histogram of the noise value distribution in the L2.5 error map above the coverage threshold indicated in the plot (in black). Mean and median value of the distribution are given. The red dashed-dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

5.7 160 µm: HPF radius 25, Pixfrac 1.0, Pixsize 2.″1

5.7.1 L 2.0 OBSID 1342242772

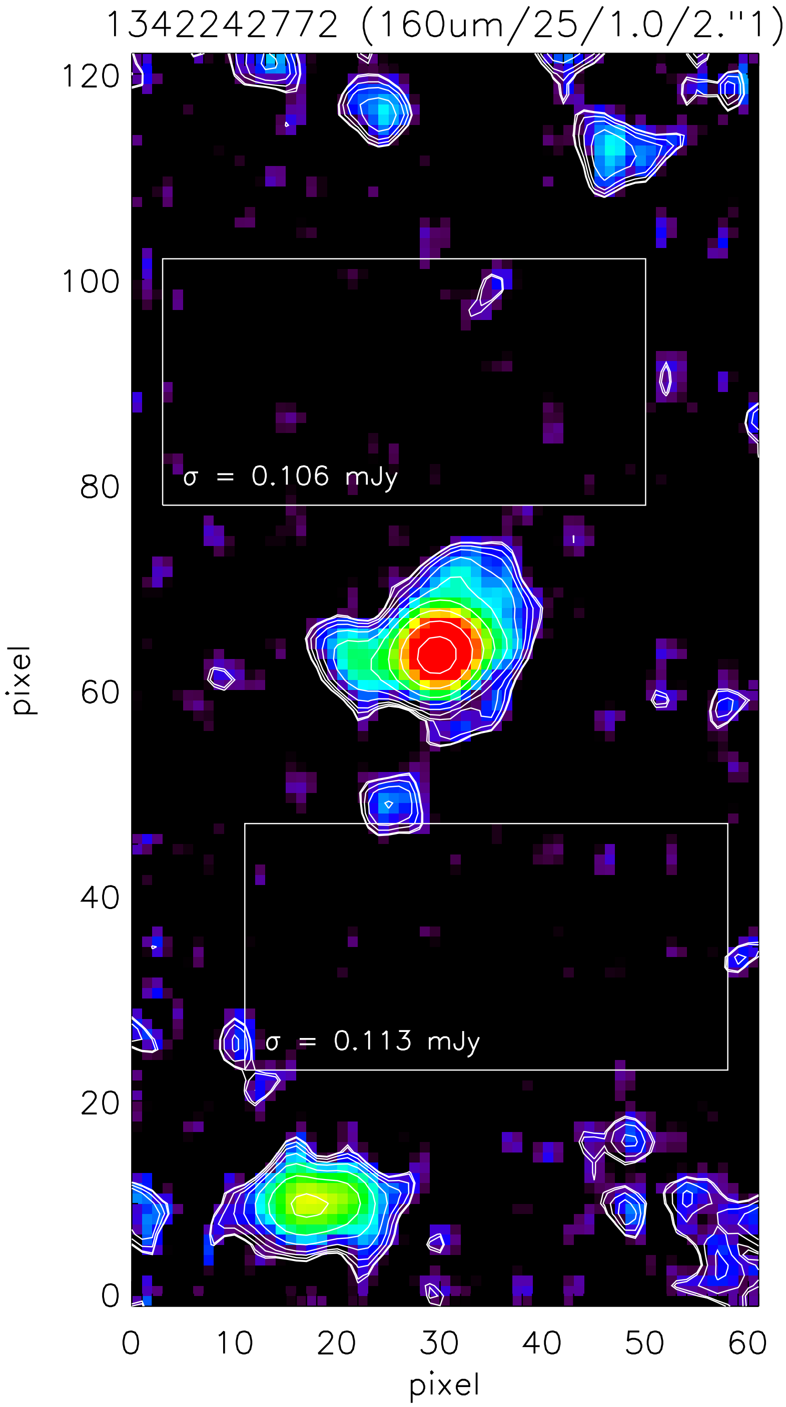

Figure 238: 160 µm L2.0 map for OBSID 1342242772 with HPF radius 25, pixfrac 1.0 and output pixel size of 2.″1 (SPG product parameter set). The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

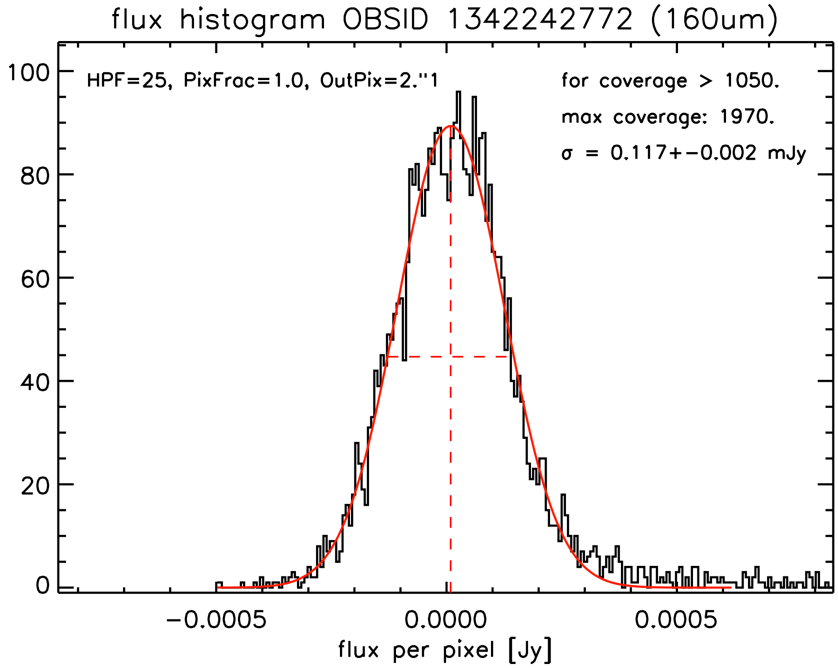

Figure 239: Noise determination for the 160 µm L2.0 map of OBSID 1342242772 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

For this map parameter combination no error map analysis was done.

5.7.2 L 2.0 OBSID 1342242773

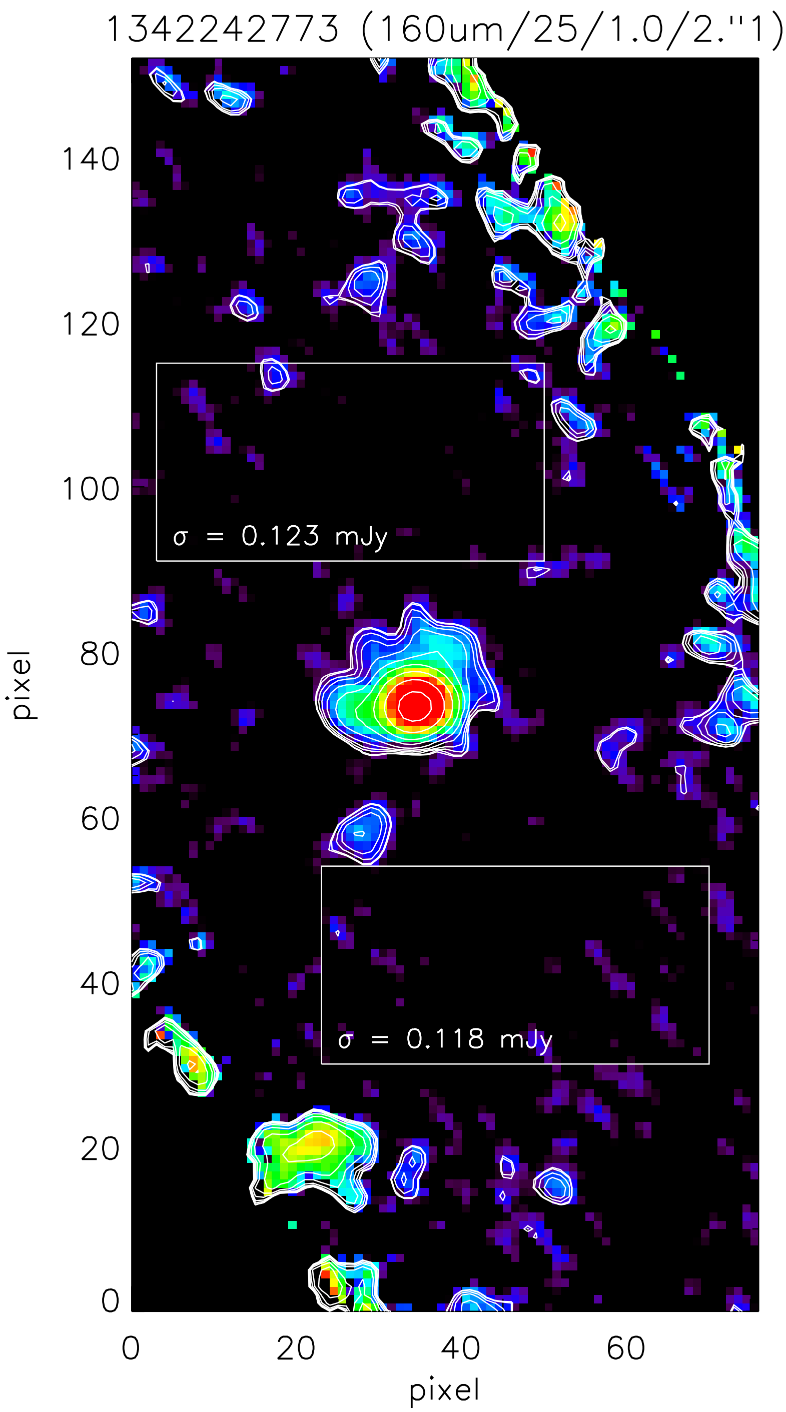

Figure 240: 160 µm L2.0 map for OBSID 1342242773 with HPF radius 25, pixfrac 1.0 and output pixel size of 2.″1. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

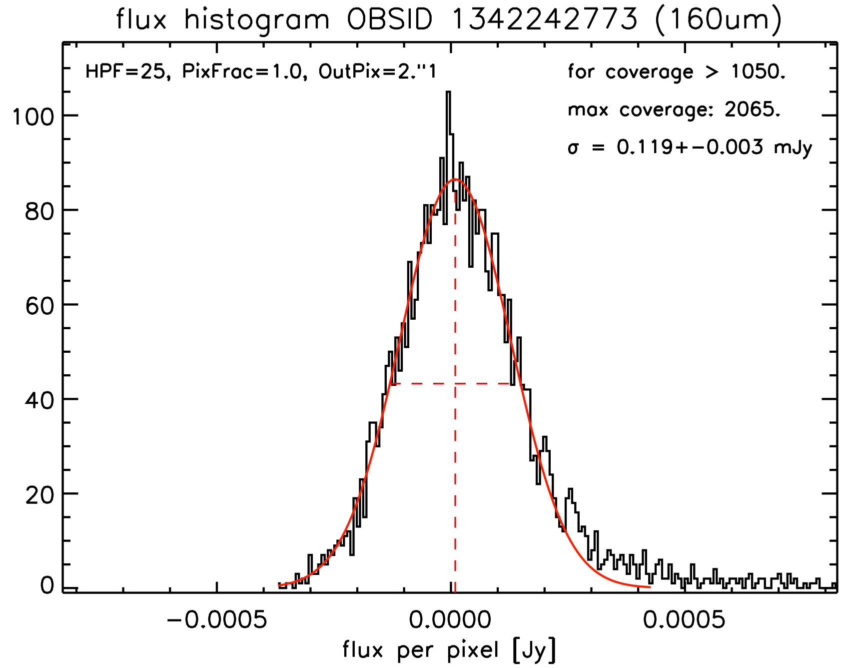

Figure 241: Noise determination for the 160 µm L2.0 map of OBSID 1342242773 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

For this map parameter combination no error map analysis was done.

5.7.3 L 2.5 OBSIDs 1342242772+1342242773

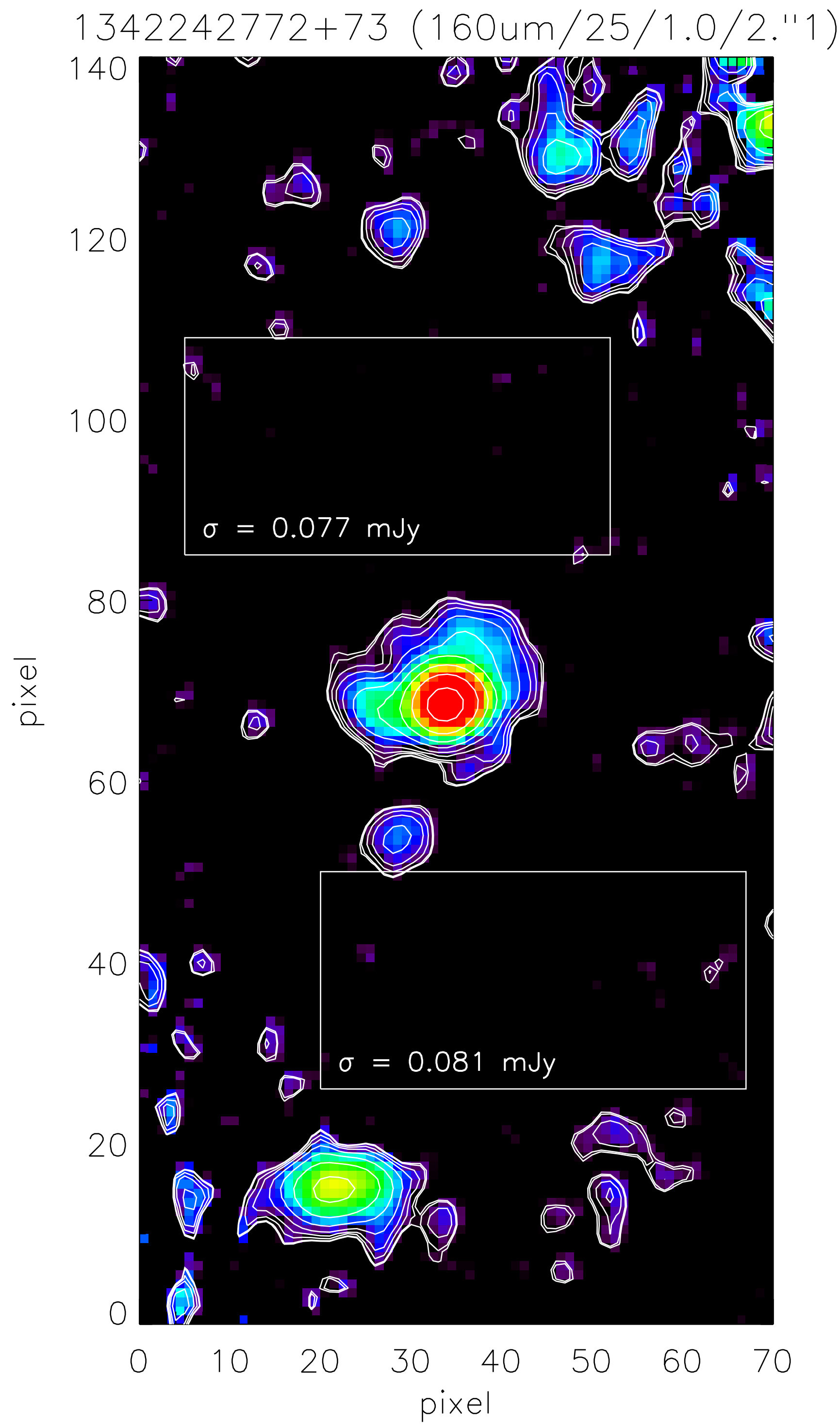

Figure 242: 160 µm L2.5 combined map for OBSIDs 1342242772+73 with HPF radius 25, pixfrac 1.0 and output pixel size of 2.″1 (SPG product parameter set). The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

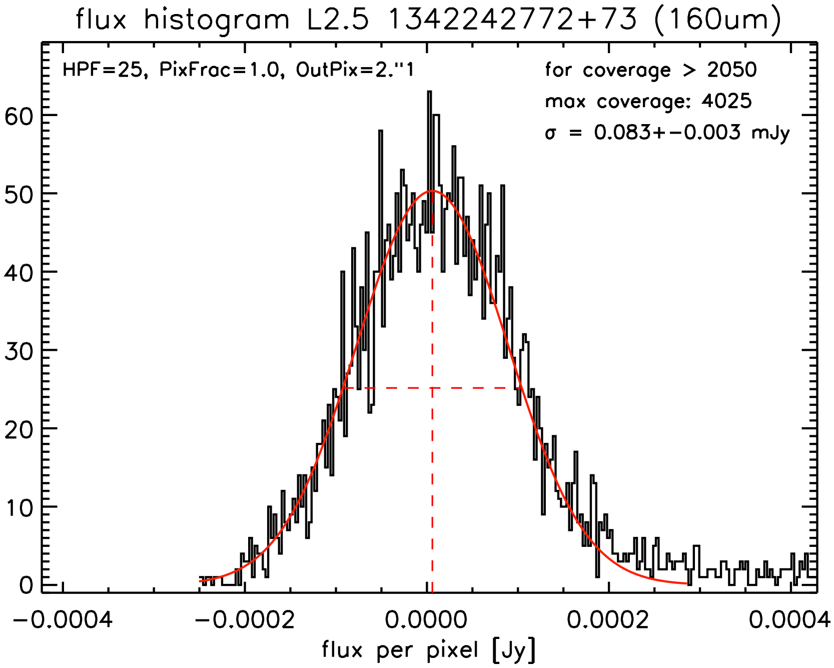

Figure 243: Noise determination for the 160 µm coadded L2.5 map of OBSIDs 1342242772+73 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\text{hist}}$).

For this map parameter combination no error map analysis was done.

5.8 160 µm: HPF radius 25, Pixfrac 1.0, Pixsize 3.″2

5.8.1 L 2.0 OBSID 1342242772

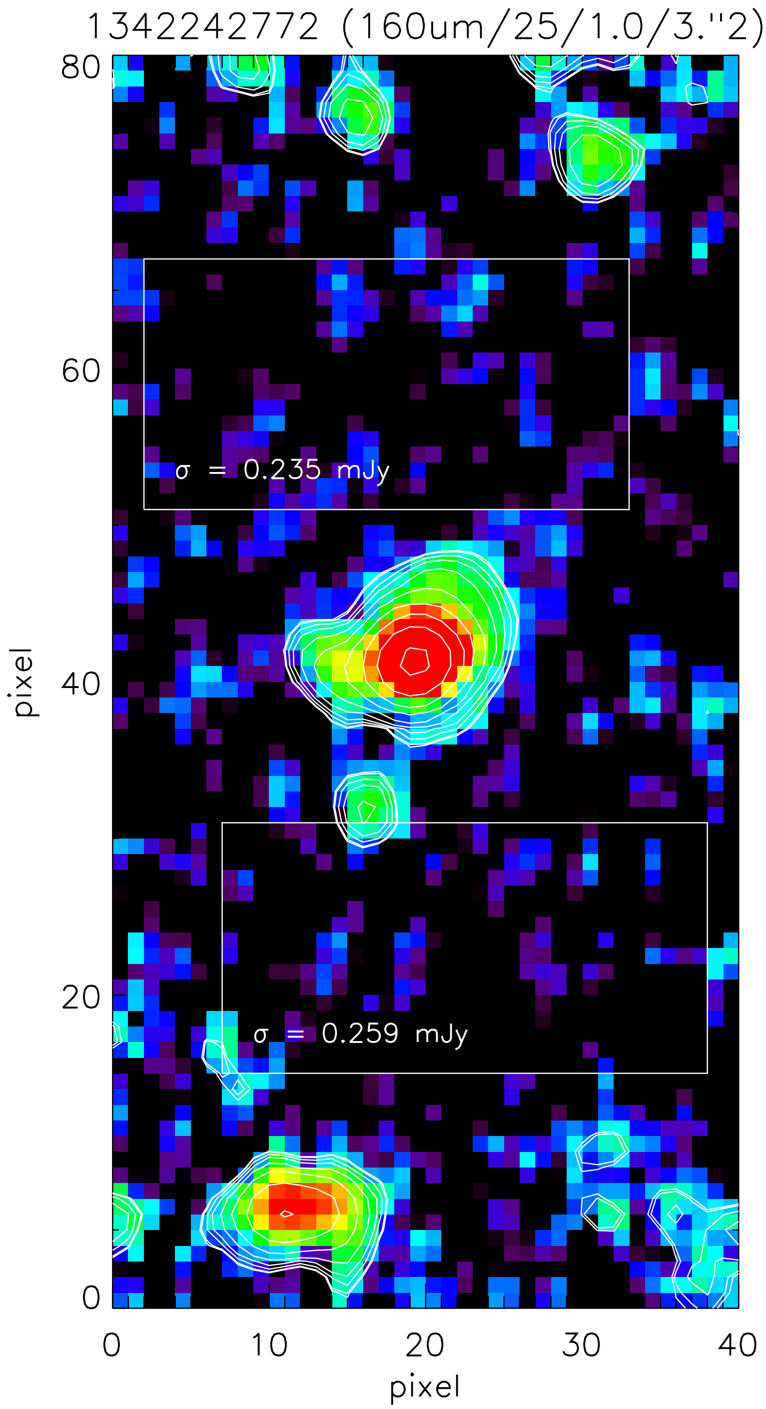

Figure 244: 160 µm L2.0 map for OBSID 1342242772 with HPF radius 25, pixfrac 1.0 and output pixel size of 3.″2. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

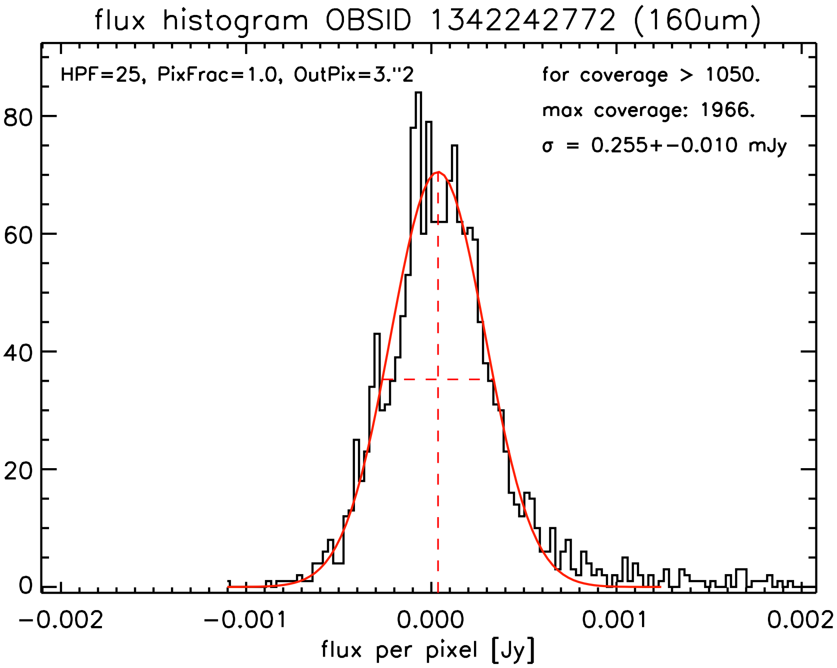

Figure 245: Noise determination for the 160 μm L2.0 map of OBSID 1342242772 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\ \sigma_{\rm hist}$).

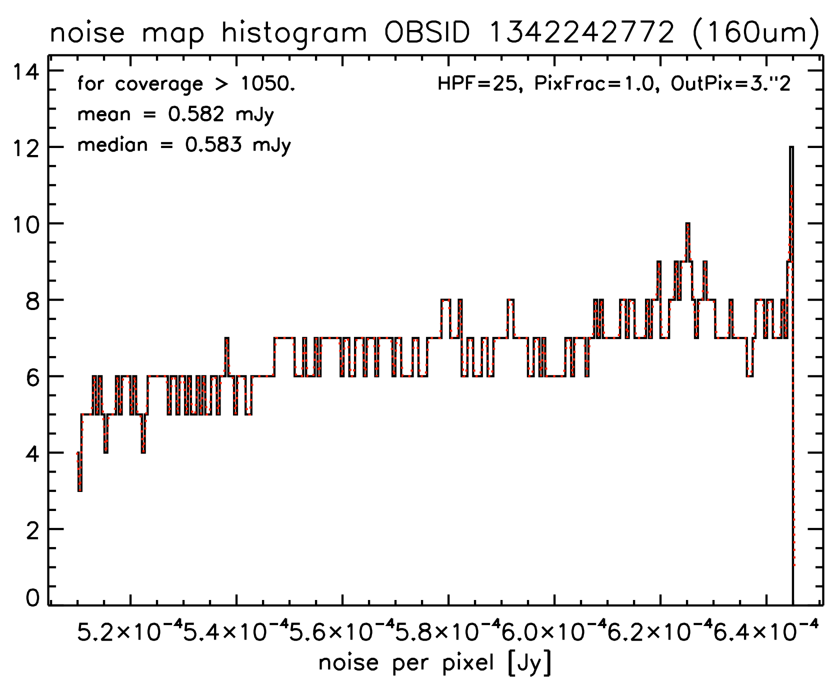

Figure 246: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

5.8.2 L 2.0 OBSID 1342242773

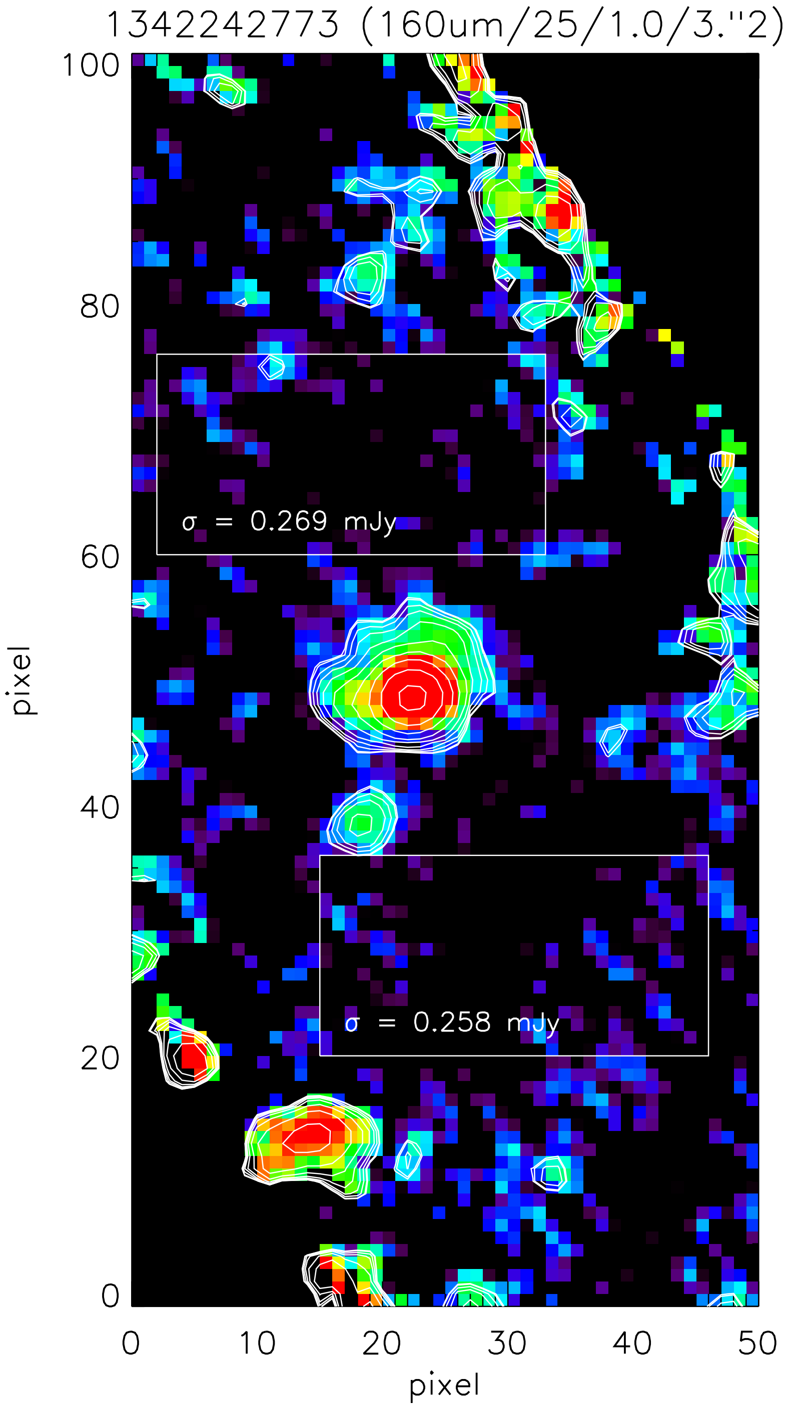

Figure 247: 160 µm L2.0 map for OBSID 1342242773 with HPF radius 25, pixfrac 1.0 and output pixel size of 3.″2. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

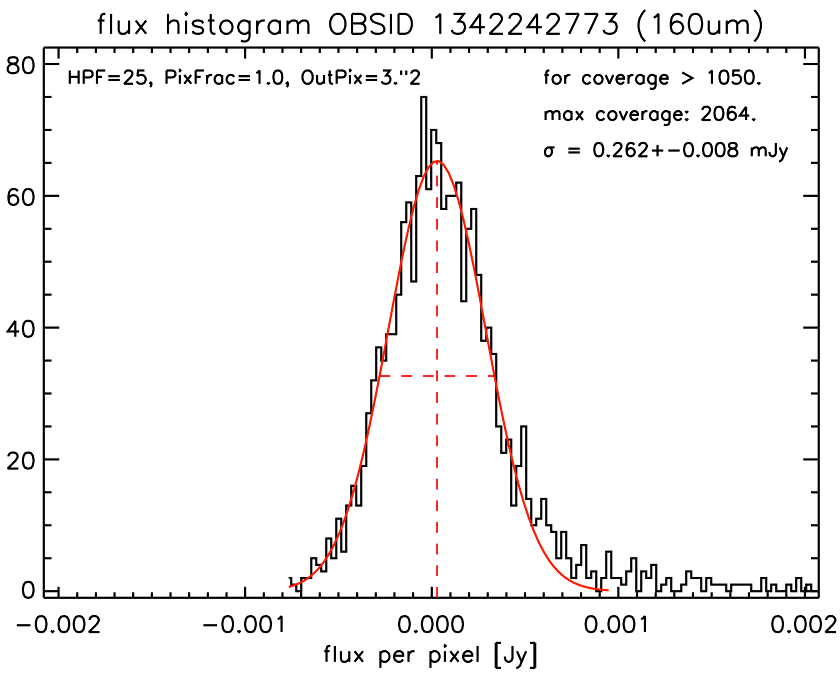

Figure 248: Noise determination for the 160 µm L2.0 map of OBSID 1342242773 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

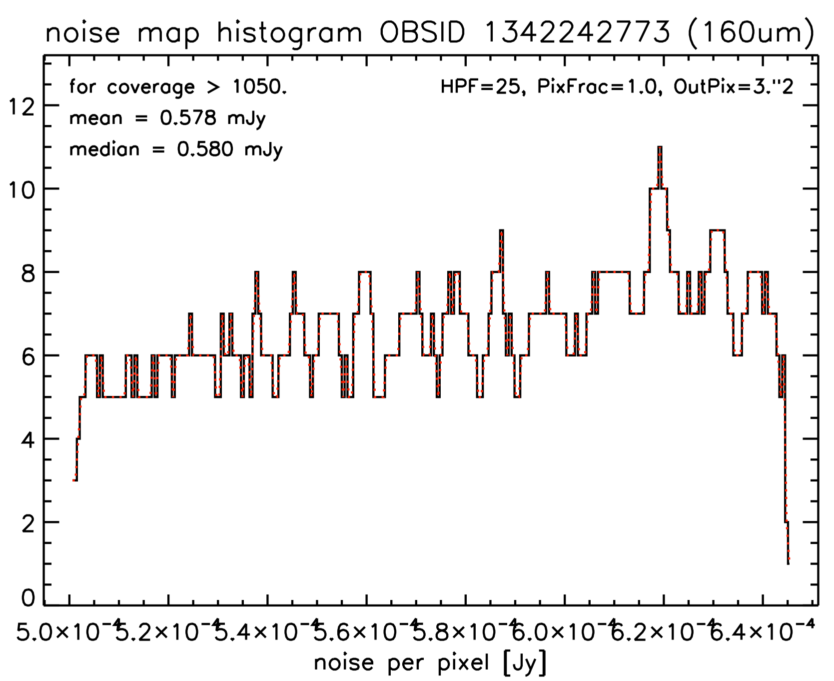

Figure 249: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

5.8.3 L 2.5 OBSIDs 1342242772+1342242773

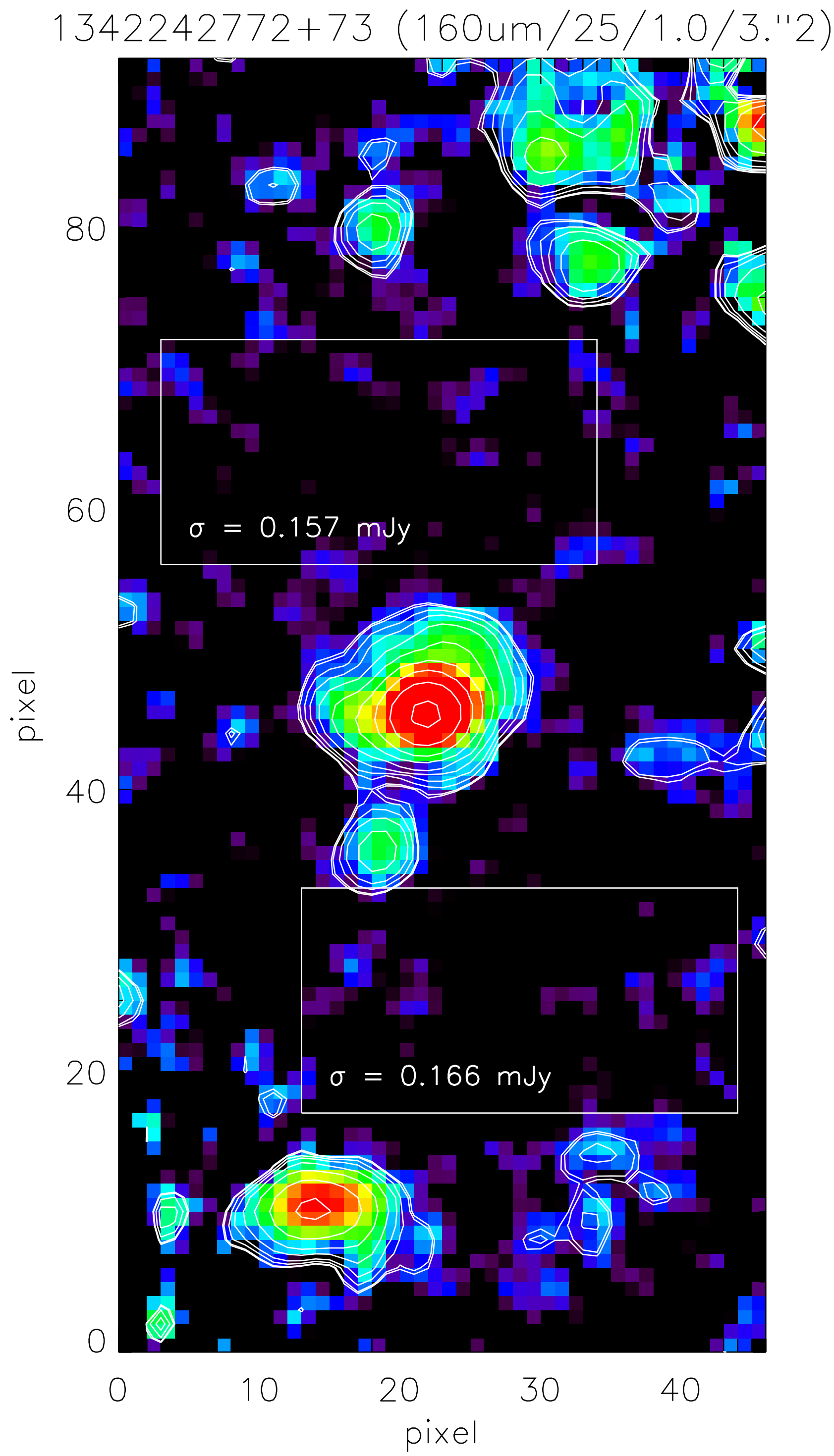

Figure 250: 160 µm L2.5 combined map for OBSIDs 1342242772+73 with HPF radius 25, pixfrac 1.0 and output pixel size of 3.″2. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

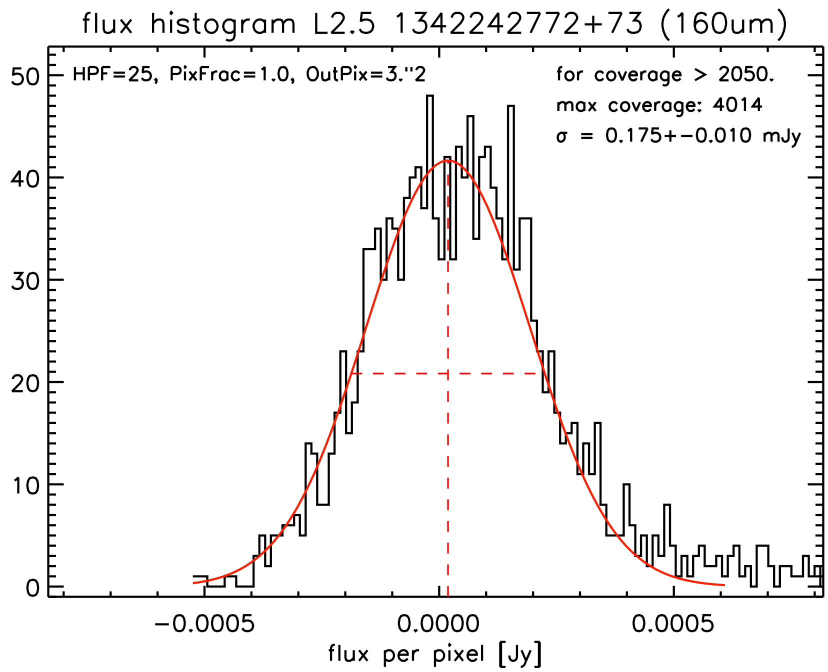

Figure 251: Noise determination for the 160 µm coadded L2.5 map of OBSIDs 1342242772+73 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\,\sigma_{\rm hist}$).

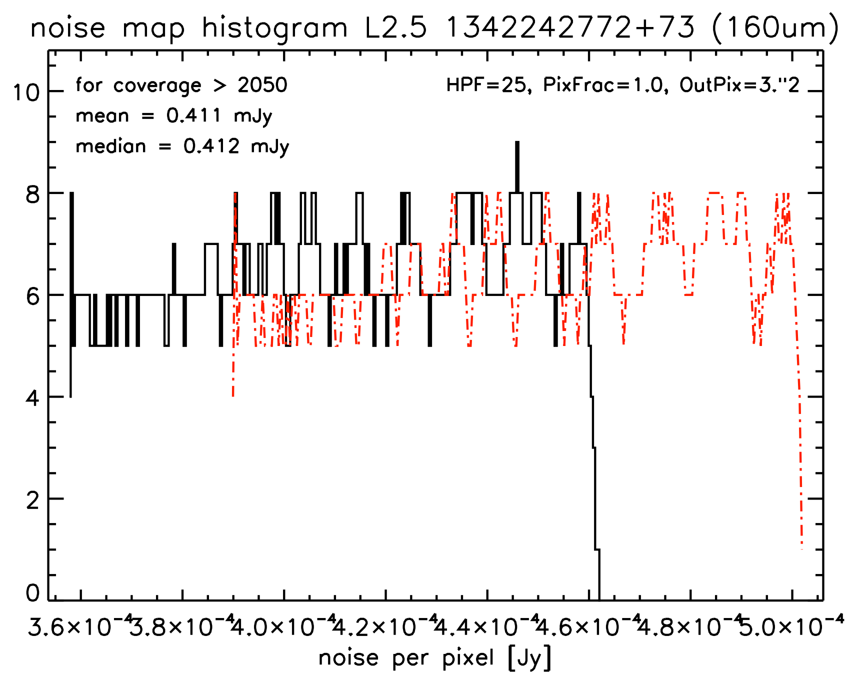

Figure 252: Histogram of the noise value distribution in the L2.5 error map above the coverage threshold indicated in the plot (in black). Mean and median value of the distribution are given. The red dashed-dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

5.9 160 µm: HPF radius 50, Pixfrac 1.0, Pixsize 3.″2

5.9.1 L 2.0 OBSID 1342242772

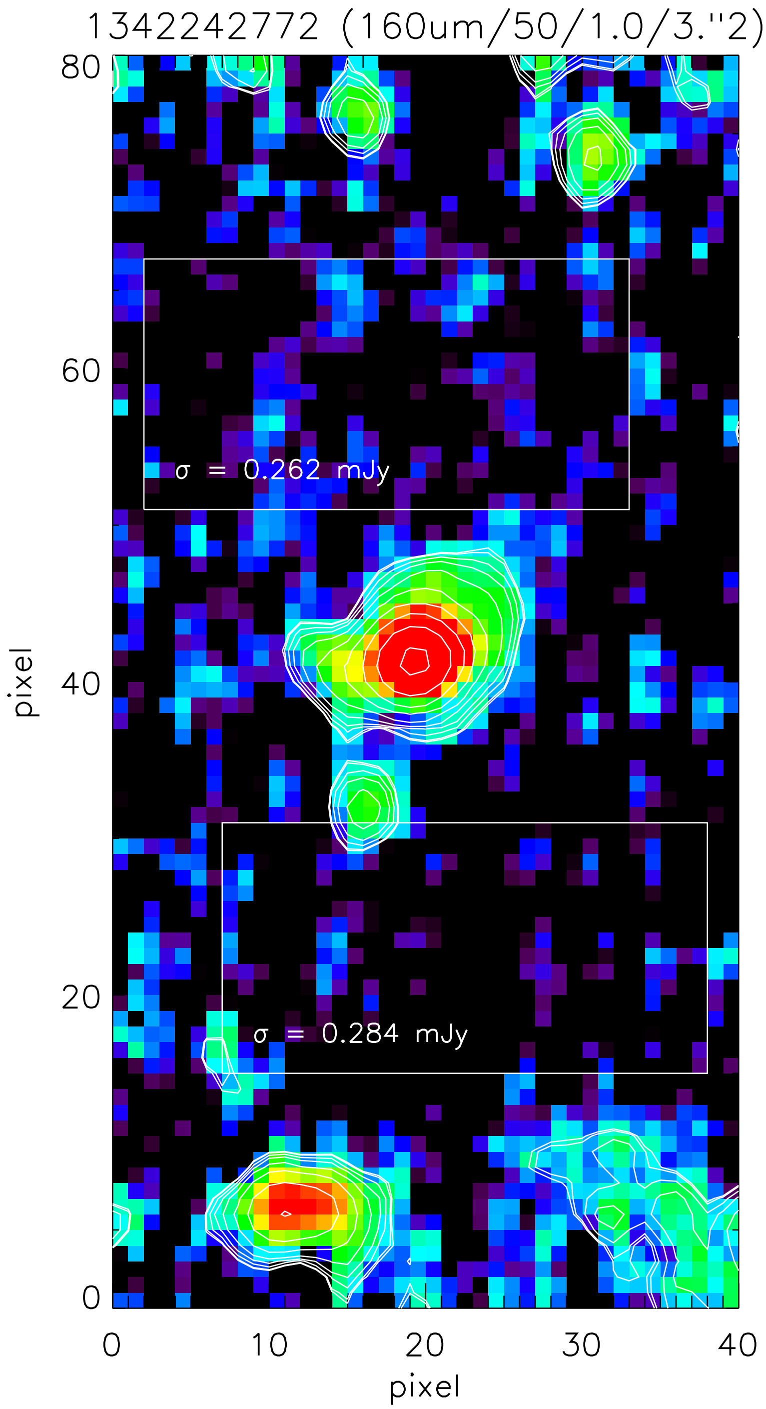

Figure 253: 160 µm L2.0 map for OBSID 1342242772 with HPF radius 50, pixfrac 1.0 and output pixel size of 3.″2. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

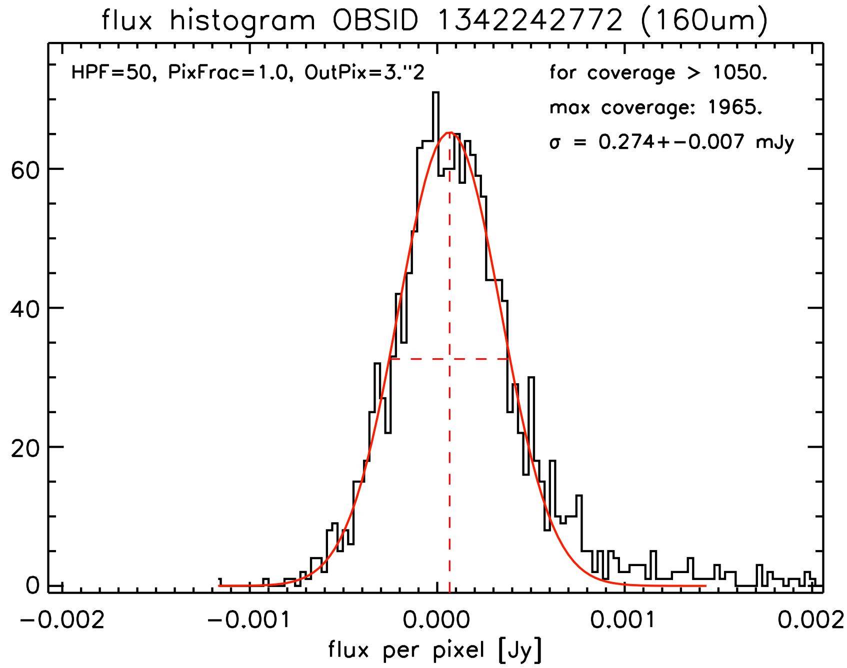

Figure 254: Noise determination for the 160 µm L2.0 map of OBSID 1342242772 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

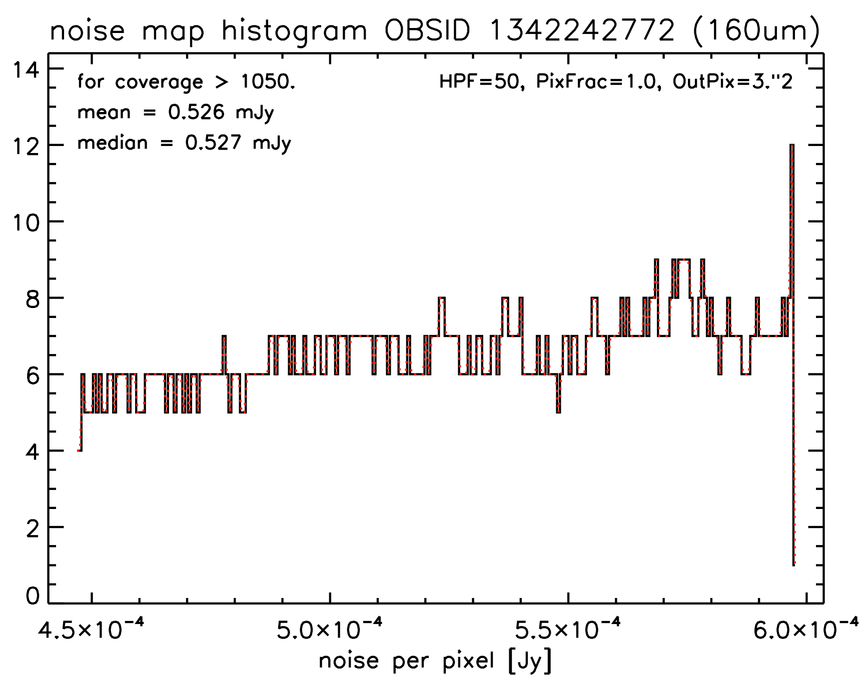

Figure 255: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

5.9.2 L 2.0 OBSID 1342242773

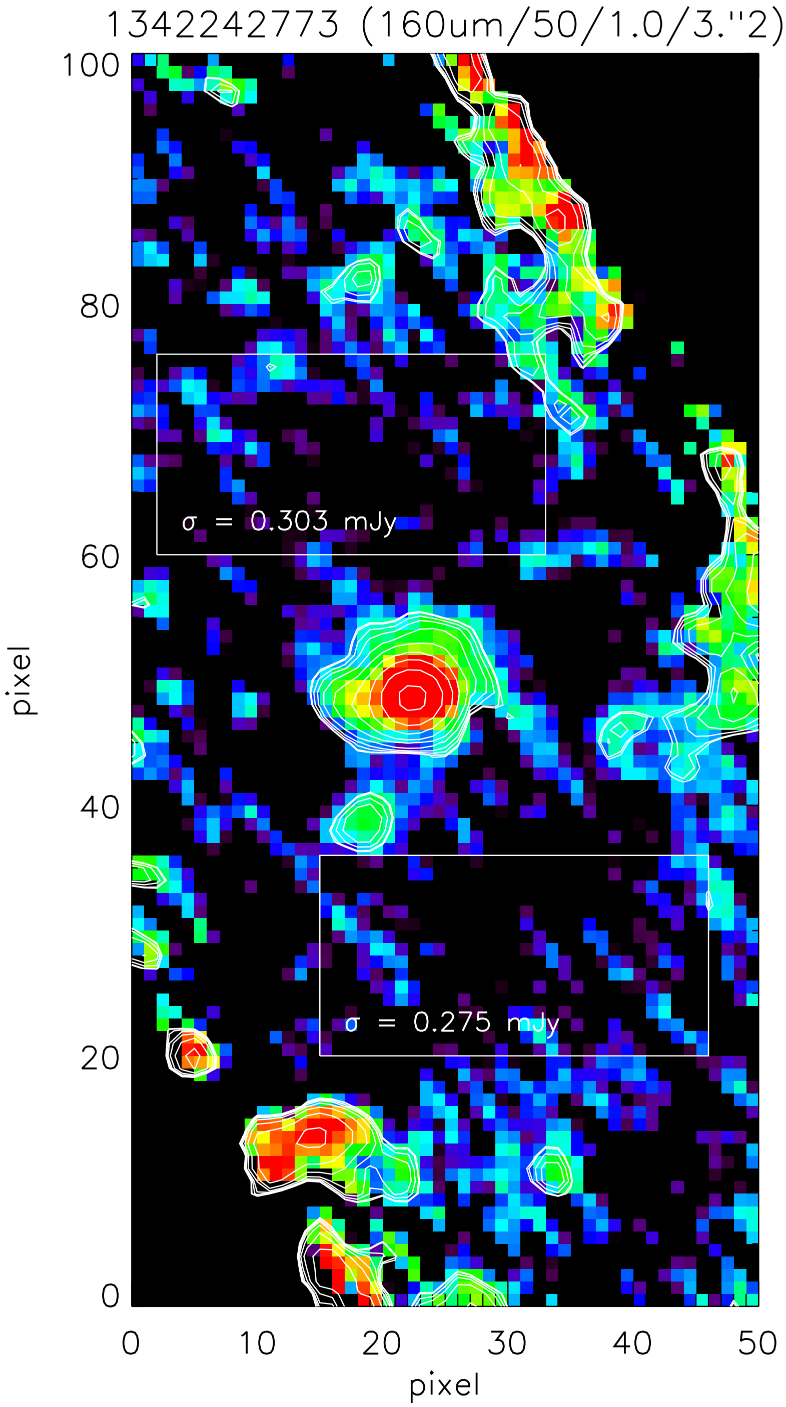

Figure 256: 160 µm L2.0 map for OBSID 1342242773 with HPF radius 50, pixfrac 1.0 and output pixel size of 3.″2. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

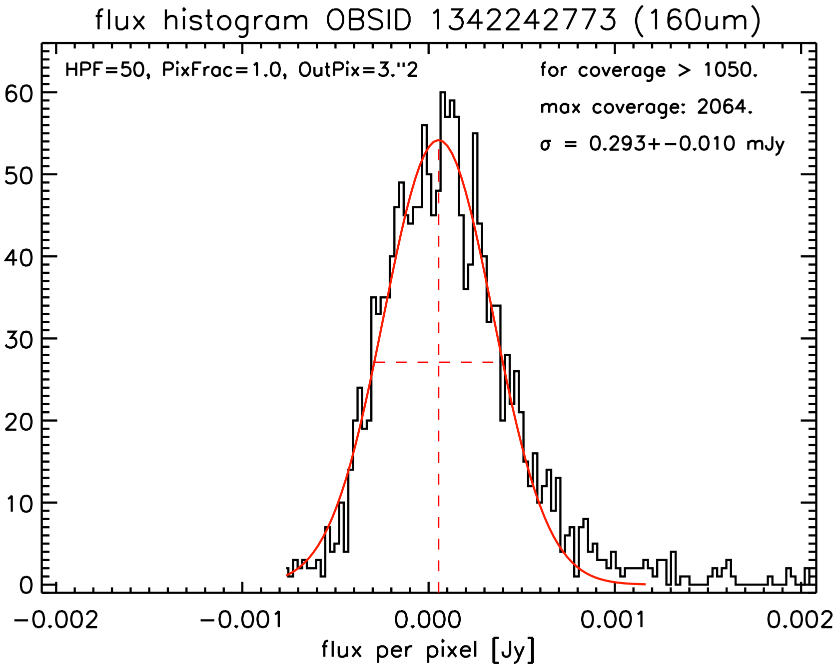

Figure 257: Noise determination for the 160 µm L2.0 map of OBSID 1342242773 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\ \sigma_{\rm hist}$).

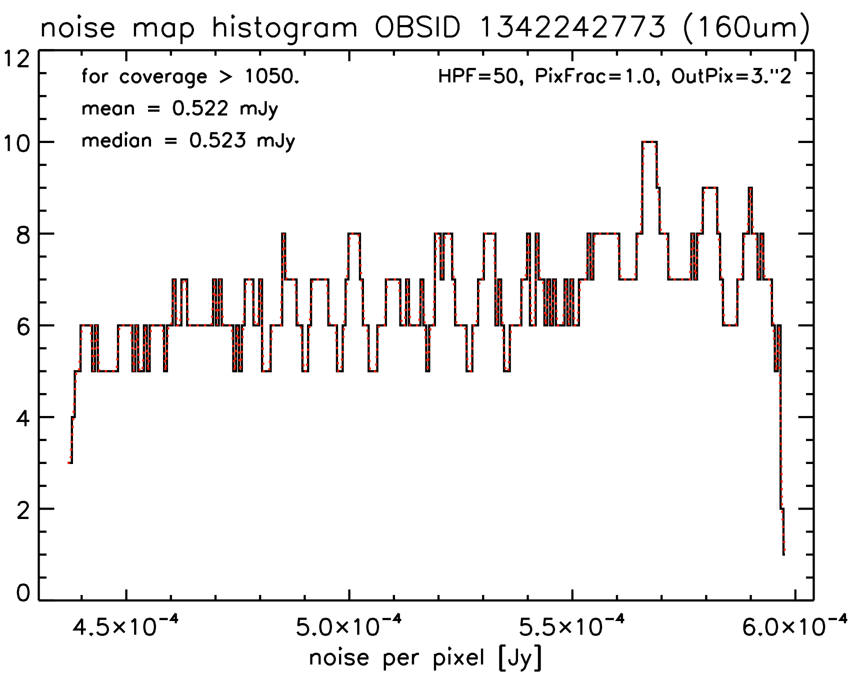

Figure 258: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

5.9.3 L 2.5 OBSIDs 1342242772+1342242773

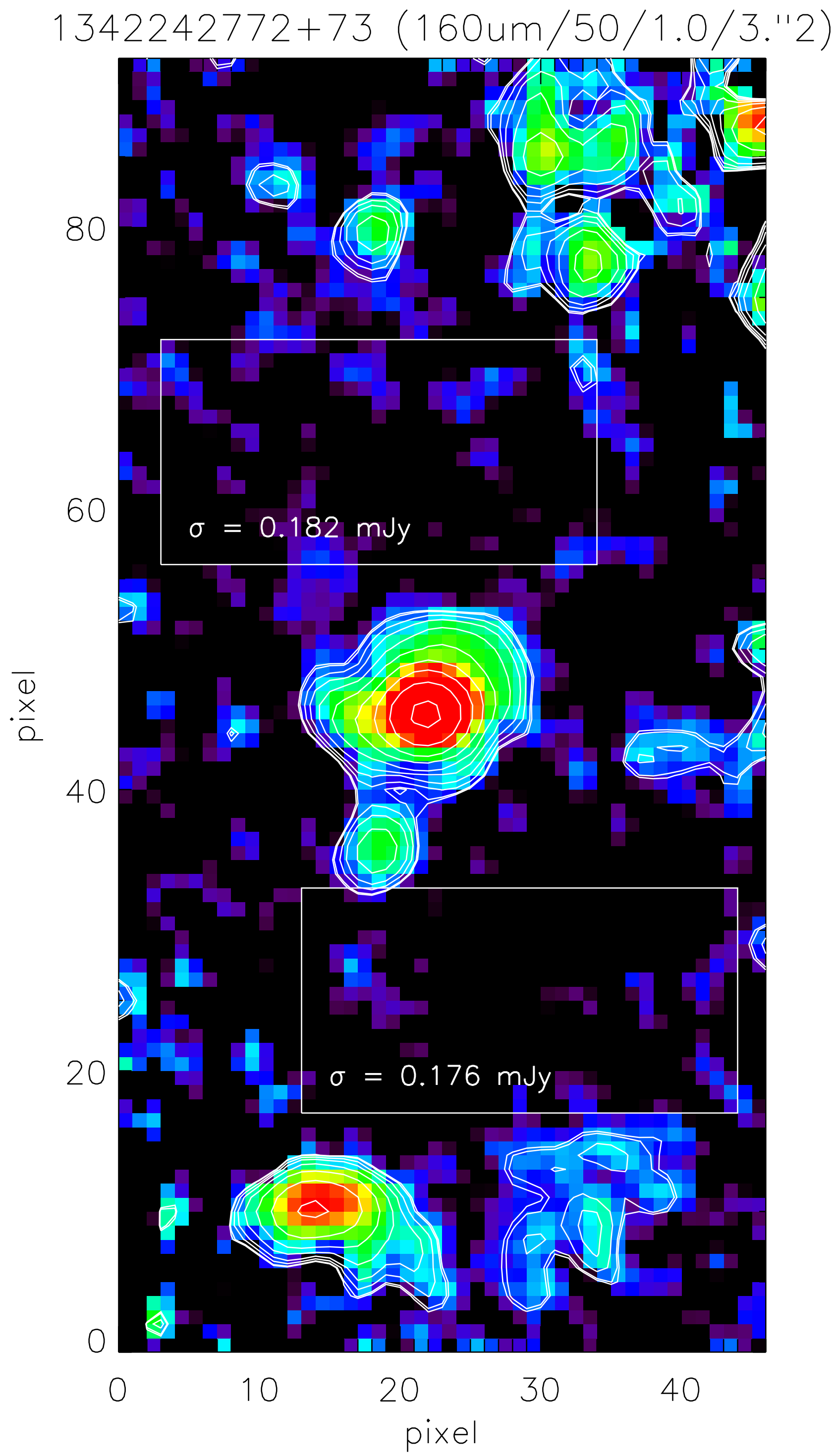

Figure 259: 160 µm L2.5 combined map for OBSIDs 1342242772+73 with HPF radius 50, pixfrac 1.0 and output pixel size of 3.″2. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

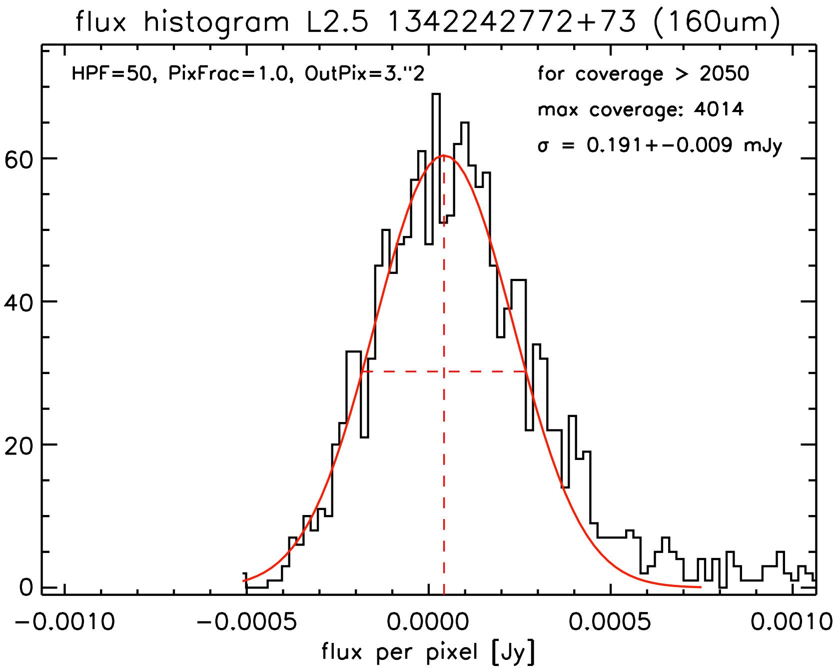

Figure 260: Noise determination for the 160 µm coadded L2.5 map of OBSIDs 1342242772+73 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

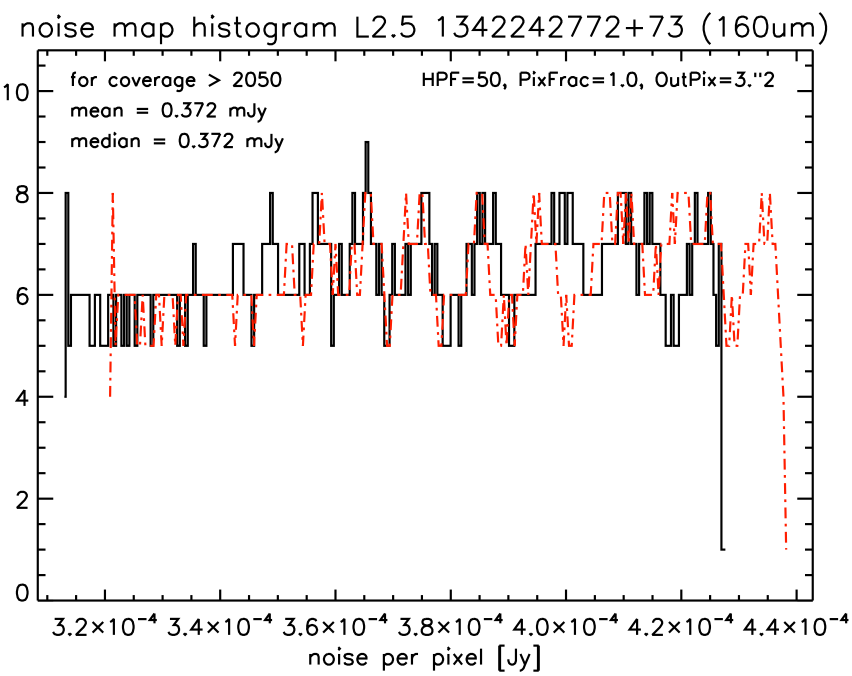

Figure 261: Histogram of the noise value distribution in the L2.5 error map above the coverage threshold indicated in the plot (in black). Mean and median value of the distribution are given. The red dashed-dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

5.10 160 µm: HPF radius 25, Pixfrac 1.0, Pixsize 4.″8

5.10.1 L 2.0 OBSID 1342242772

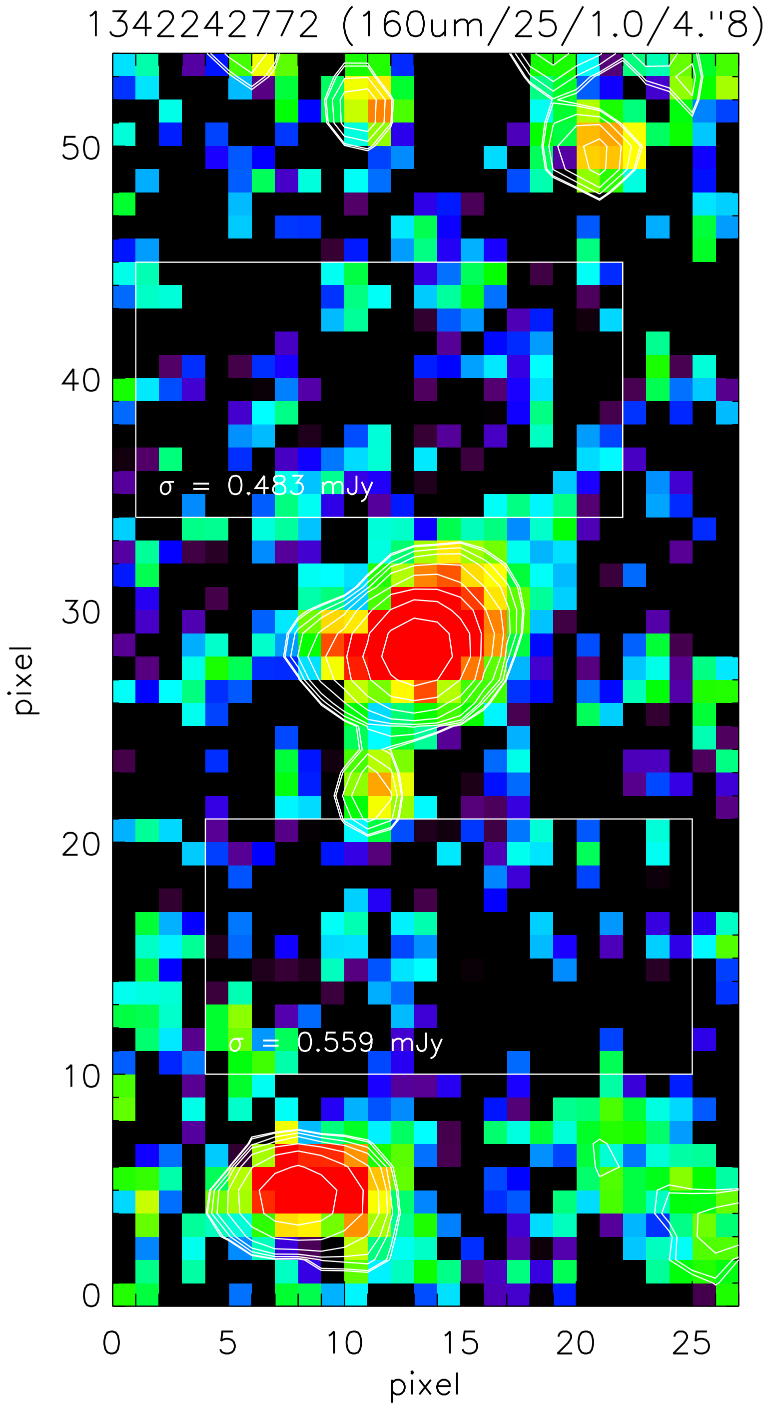

Figure 262: 160 µm L2.0 map for OBSID 1342242772 with HPF radius 25, pixfrac 1.0 and output pixel size of 4.″8. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

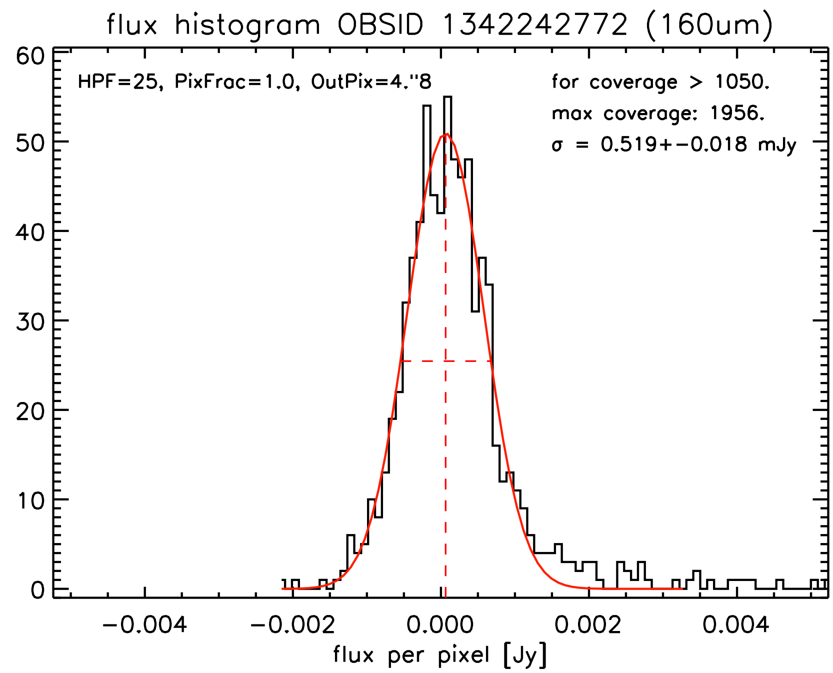

Figure 263: Noise determination for the 160 µm L2.0 map of OBSID 1342242772 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\ \sigma_{\rm hist}$).

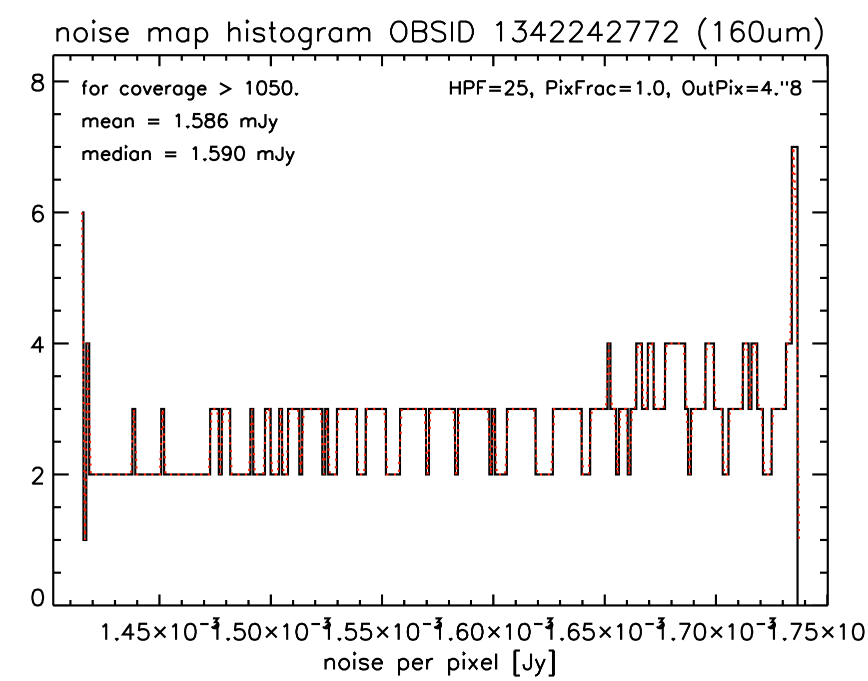

Figure 264: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

5.10.2 L 2.0 OBSID 1342242773

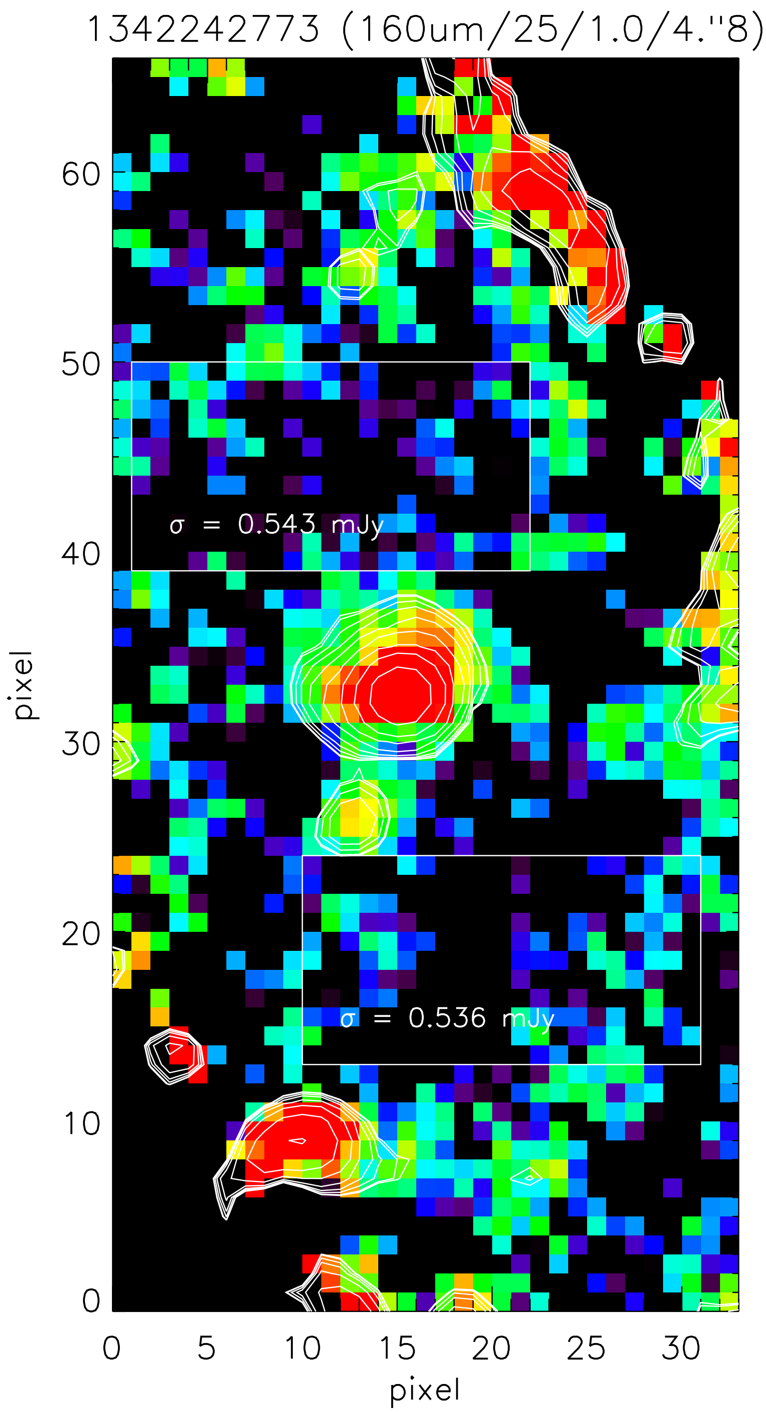

Figure 265: 160 μm L2.0 map for OBSID 1342242773 with HPF radius 25, pixfrac 1.0 and output pixel size of 4.″8. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

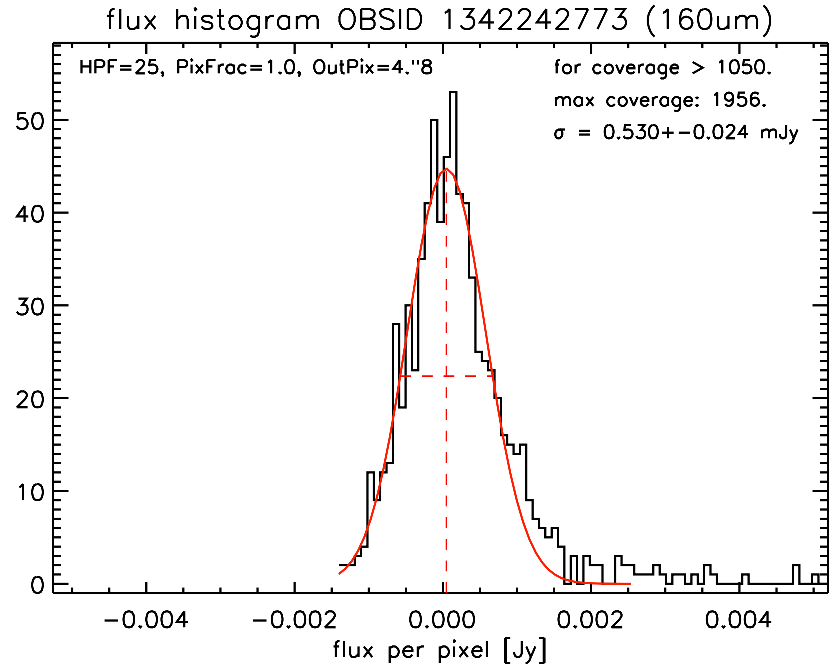

Figure 266: Noise determination for the 160 µm L2.0 map of OBSID 1342242773 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

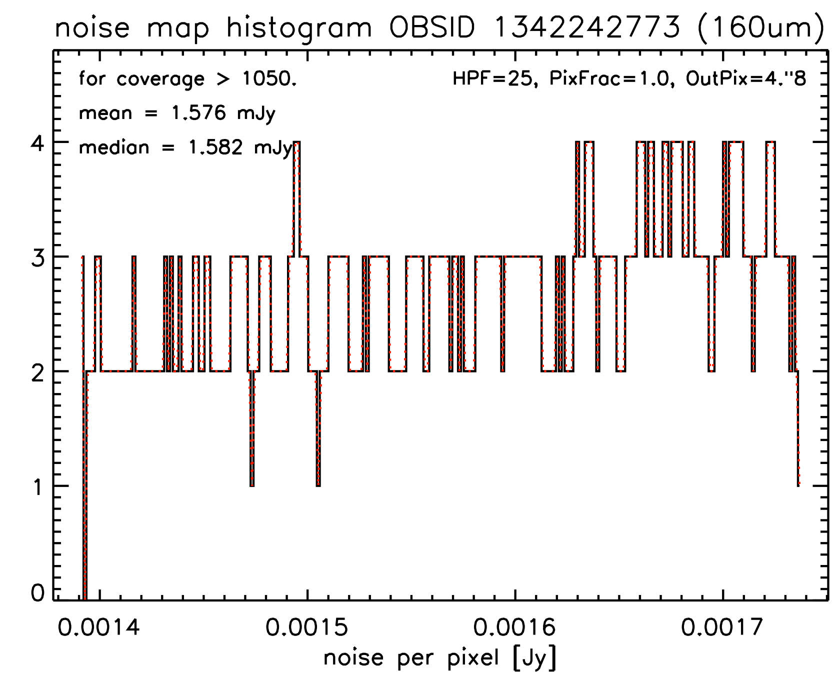

Figure 267: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

5.10.3 L 2.5 OBSIDs 1342242772+1342242773

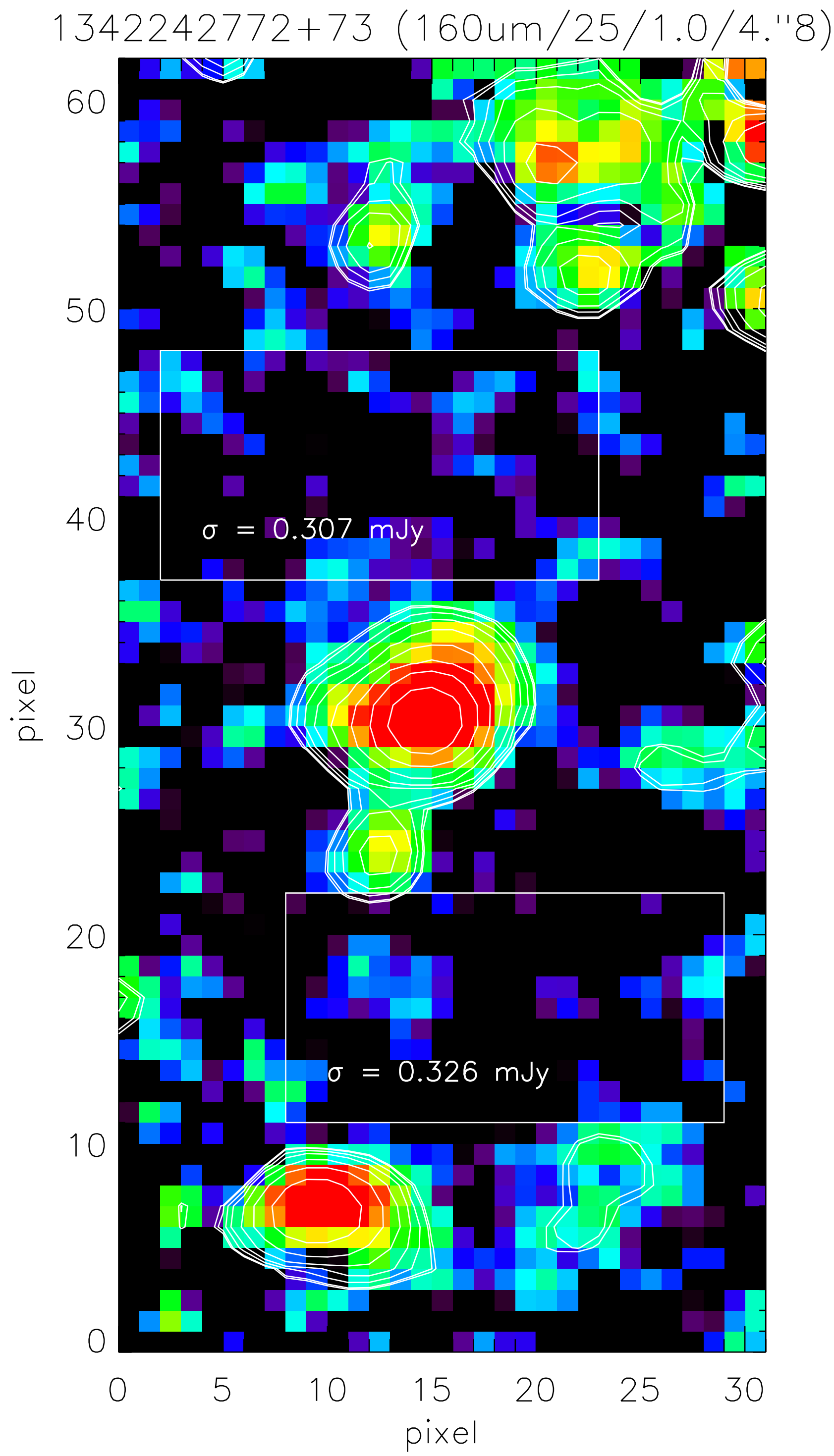

Figure 268: 160 µm L2.5 combined map for OBSIDs 1342242772+73 with HPF radius 25, pixfrac 1.0 and output pixel size of 4.″8. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

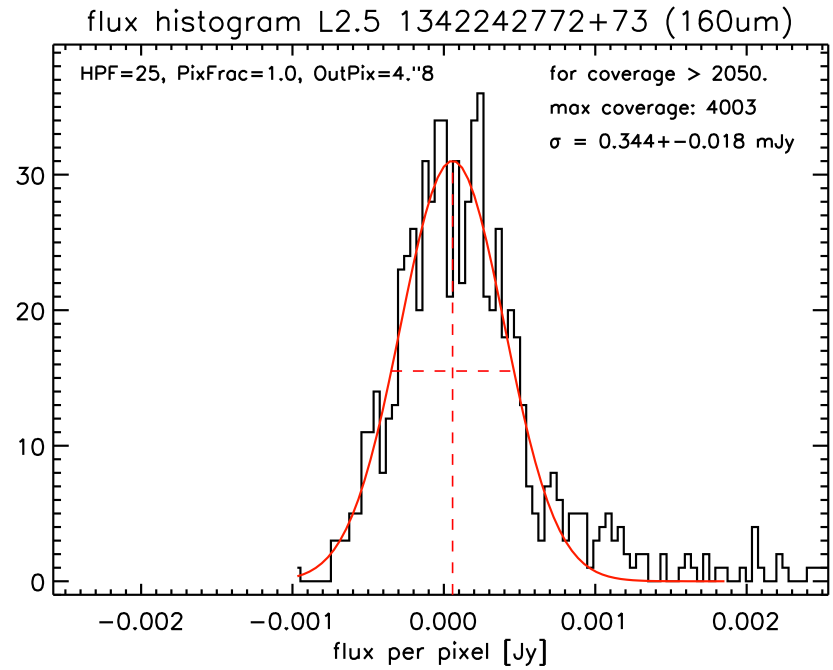

Figure 269: Noise determination for the 160 µm coadded L2.5 map of OBSIDs 1342242772+73 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\,\sigma_{\rm hist}$).

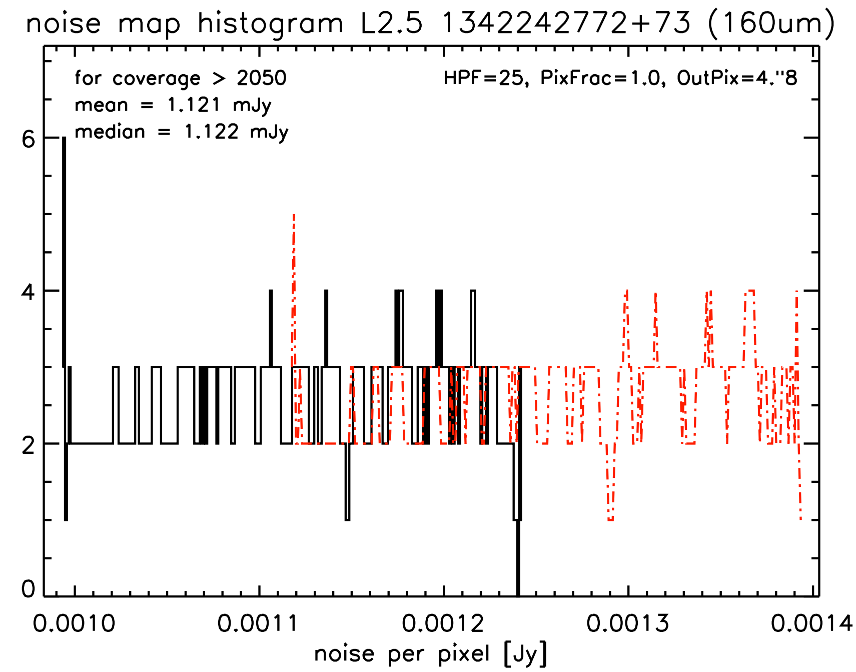

Figure 270: Histogram of the noise value distribution in the L2.5 error map above the coverage threshold indicated in the plot (in black). Mean and median value of the distribution are given. The red dashed-dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

5.11 160 µm: HPF radius 25, Pixfrac 1.0, Pixsize 6.″4

5.11.1 L 2.0 OBSID 1342242772

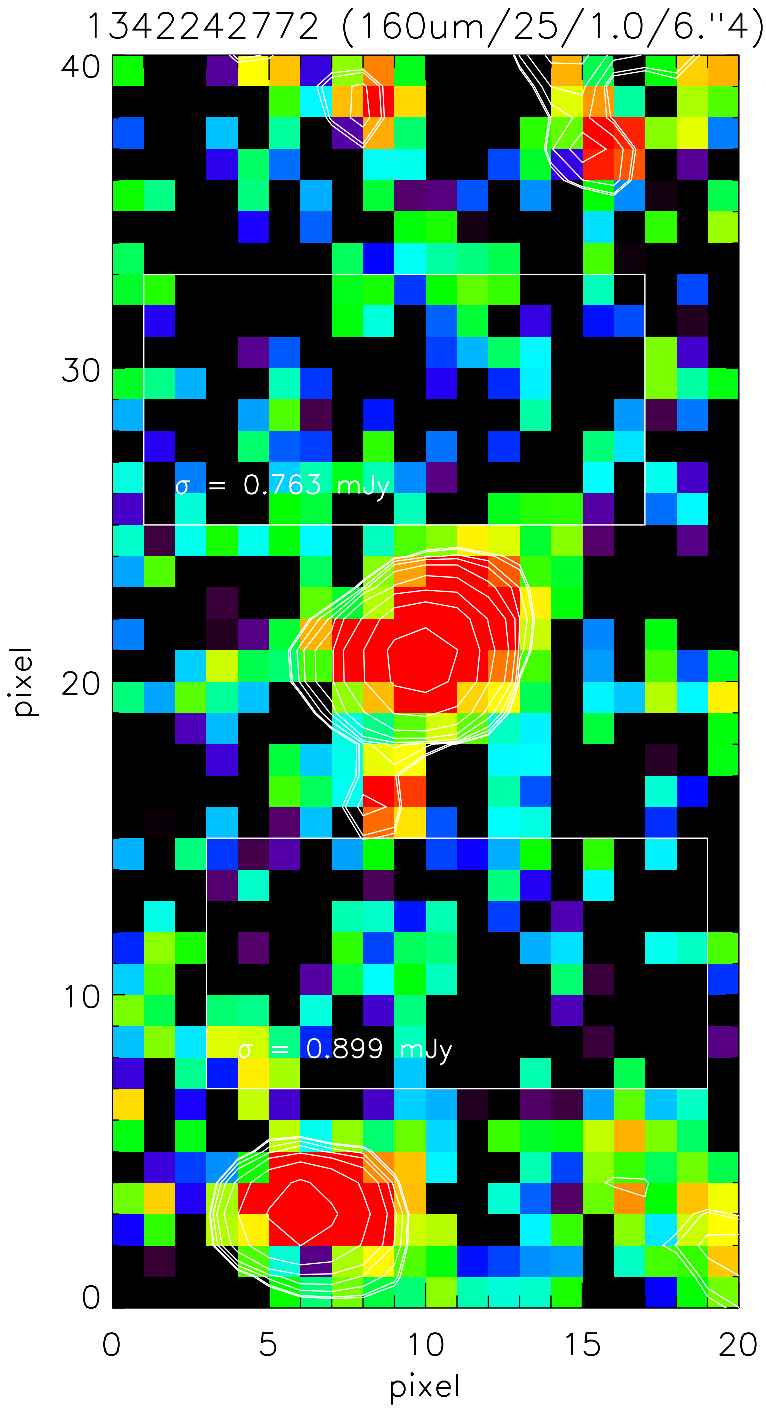

Figure 271: 160 µm L2.0 map for OBSID 1342242772 with HPF radius 25, pixfrac 1.0 and output pixel size of 6.″4. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

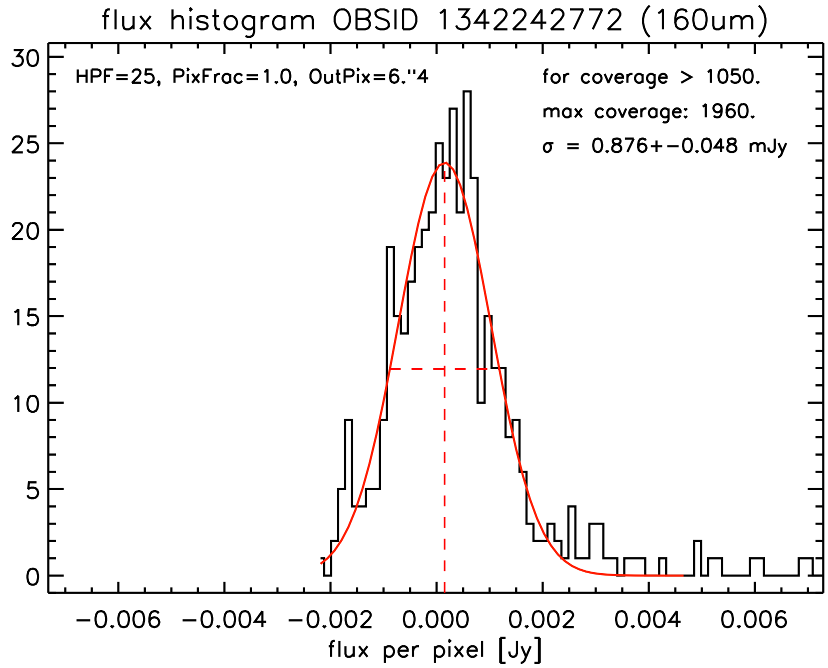

Figure 272: Noise determination for the 160 µm L2.0 map of OBSID 1342242772 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

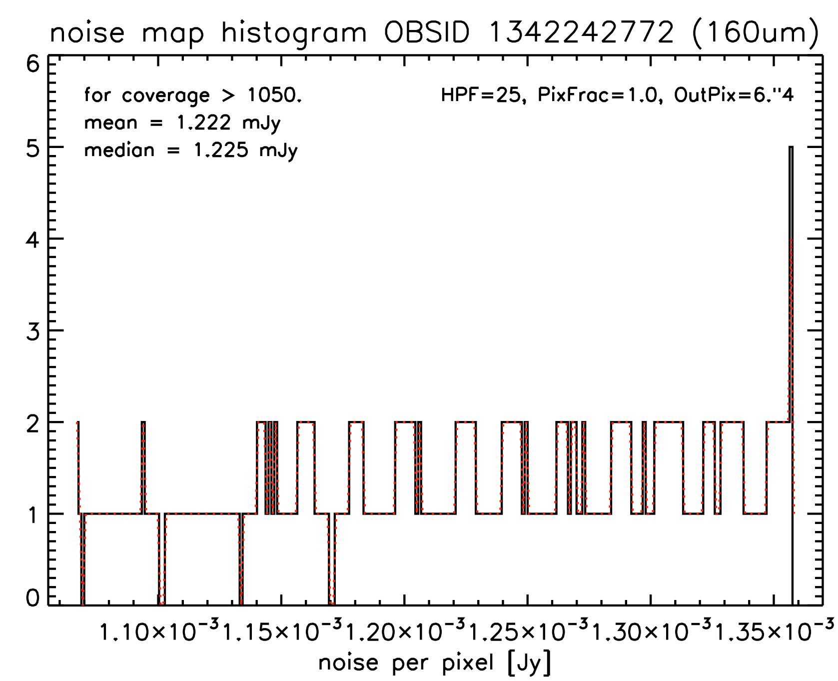

Figure 273: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

5.11.2 L 2.0 OBSID 1342242773

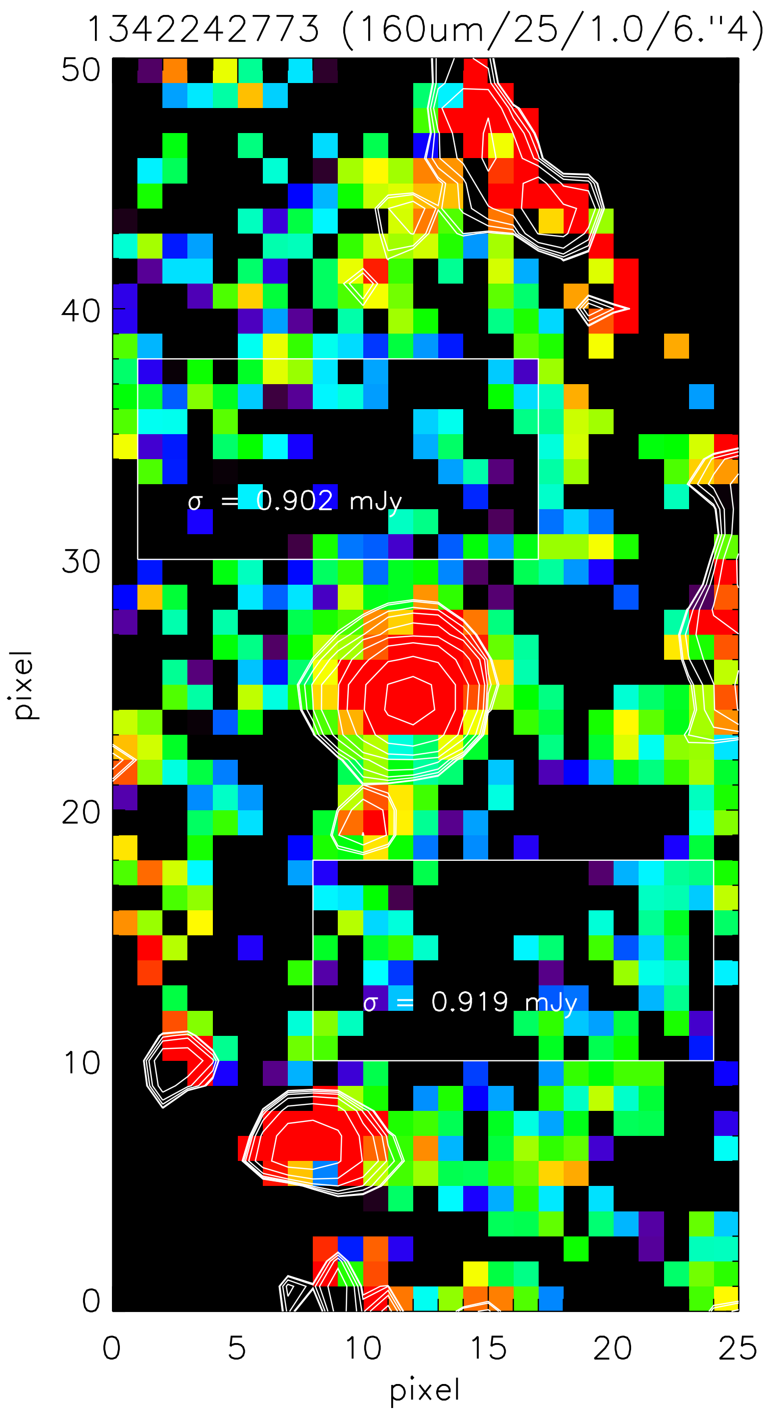

Figure 274: 160 µm L2.0 map for OBSID 1342242773 with HPF radius 25, pixfrac 1.0 and output pixel size of 6.″4. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

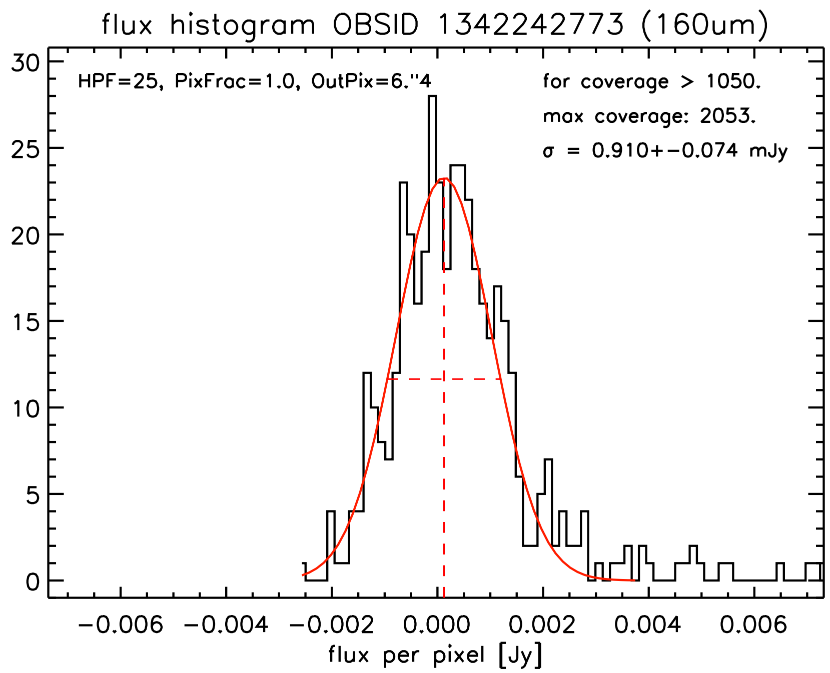

Figure 275: Noise determination for the 160 µm L2.0 map of OBSID 1342242773 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\;\sigma_{\rm hist}$).

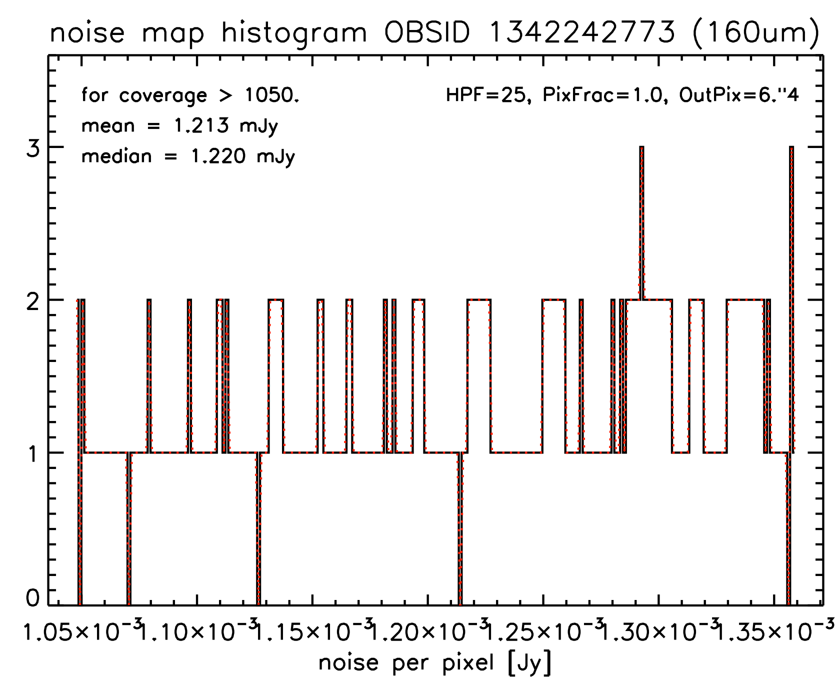

Figure 276: Histogram of the noise value distribution in the error map above the coverage threshold indicated in the plot. Mean and median value of the distribution are given. The red dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

5.11.3 L 2.5 OBSIDs 1342242772+1342242773

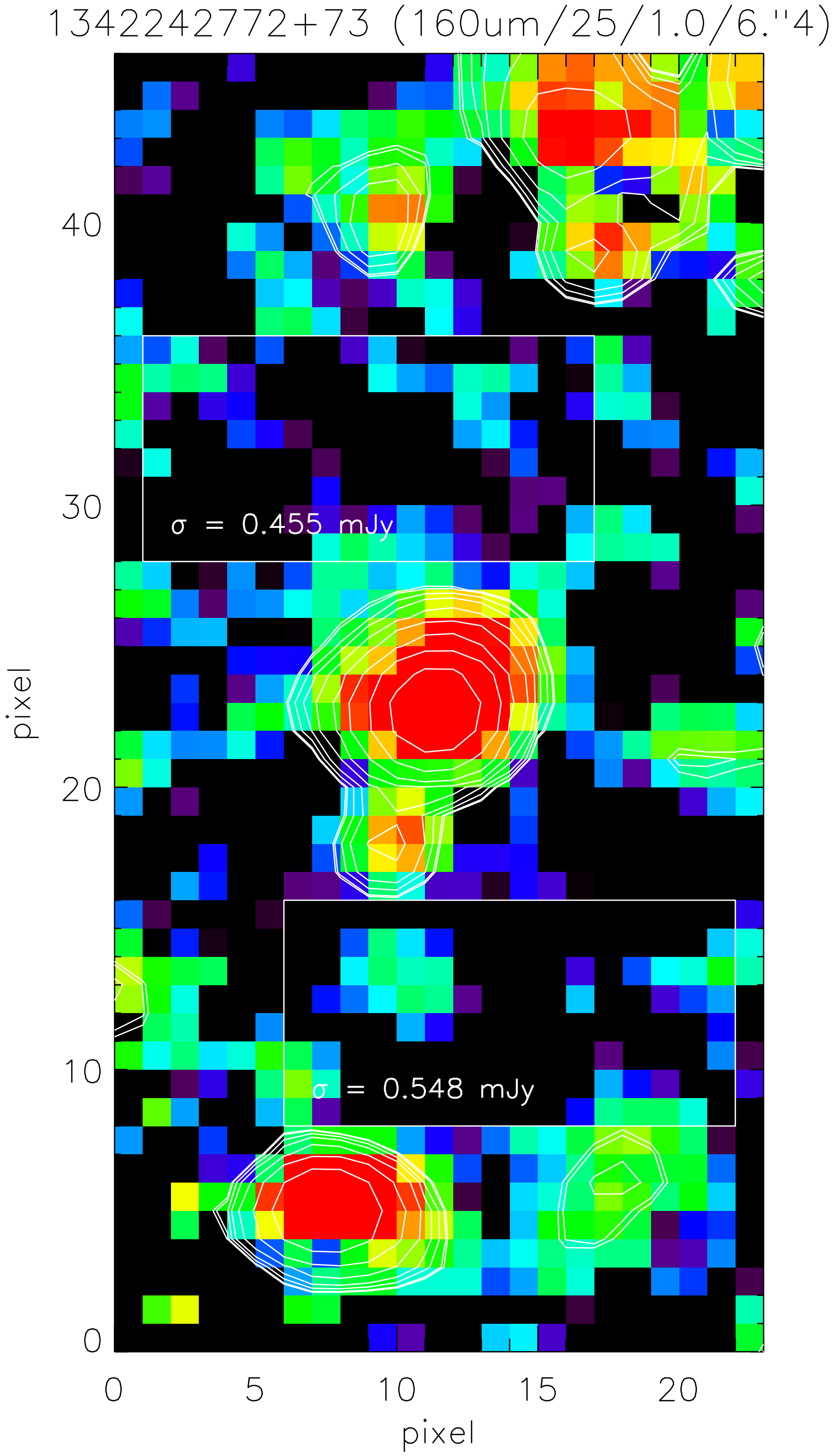

Figure 277: 160 µm L2.5 combined map for OBSIDs 1342242772+73 with HPF radius 25, pixfrac 1.0 and output pixel size of 6.″4. The two background fields for noise determination are outlined by the white boxes and the respective σ is indicated.

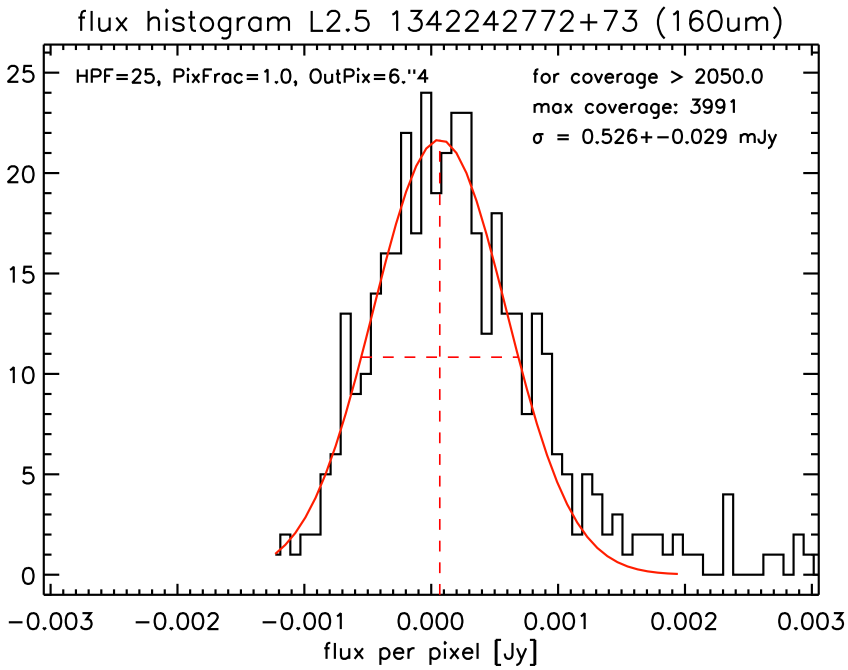

Figure 278: Noise determination for the 160 µm coadded L2.5 map of OBSIDs 1342242772+73 with the histogram method (only the flux distribution around the background level is shown). The red curve represents the Gauss fit. The vertical red dashed line indicates the position of the average background level. The horizontal red dotted line indicates the FWHM ($= 2\sqrt{2\,ln\,2}\,\sigma_{\rm hist}$).

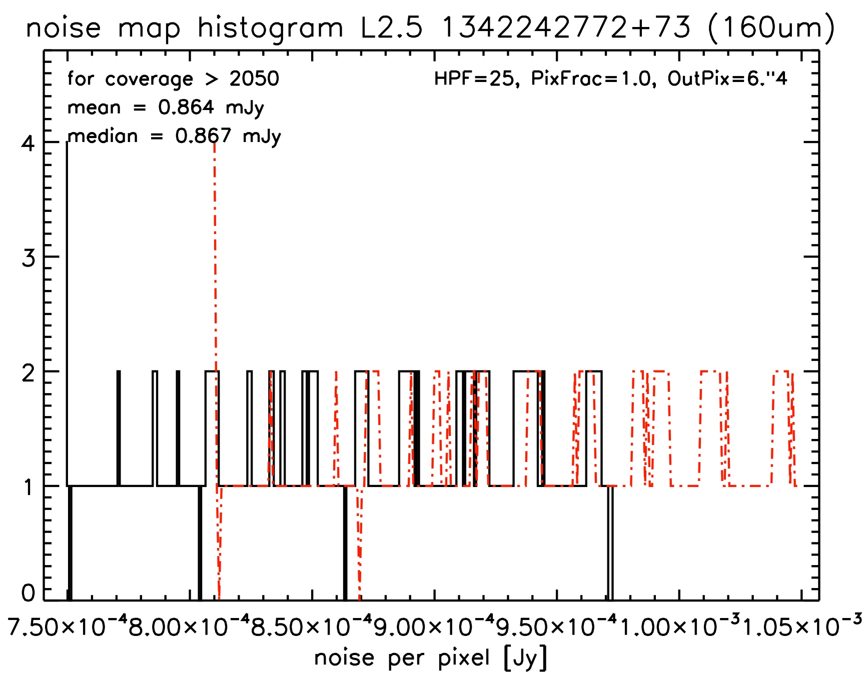

Figure 279: Histogram of the noise value distribution in the L2.5 error map above the coverage threshold indicated in the plot (in black). Mean and median value of the distribution are given. The red dashed-dotted line shows a reference histogram of the noise value distribution computed from the coverage map via Eqns. 3 and 2.

6 Results for 70 µm maps

6.1 Measurement of flux standard deviation in source-free areas

Table 4 lists the measured noise of the background as determined in two source-free areas per map.

Table 4: Measurement of flux standard deviation at 70 µm in source-free areas for the L2.0 products, IDs 1342242772 and 1342242773 and the co-added L2.5 product. The position of the boxes is indicated in Figs. 7 through 73. Note, that the cut levels for all 70µm map displays are identical. The map parameter combination high-lighted in bold face is used in the Standard Product Generation (SPG). The map parameter combination in italics was typical for the PACS photometric flux calibration analysis.

HPF/pixfrac/outpix	box size	L2.0 ID 1342242772			L2.0 ID 1342242773			L2.5 ID 1342242772+73		
		σ_{box1}	σ_{box2}	σ_{mean}	σ_{box1}	σ_{box2}	σ_{mean}	σ_{box1}	σ_{box2}	σ_{mean}
	(pixels)	(mJy)	(mJy)	(mJy)	(mJy)	(mJy)	(mJy)	(mJy)	(mJy)	(mJy)
15 / 0.1 / 1.″1	88×44	0.120	0.124	0.122	0.122	0.120	0.121	0.064	0.068	0.066
15 / 0.1 / 1.″6	61×31	0.186	0.189	0.188	0.183	0.184	0.184	0.106	0.109	0.107
30 / 0.1 / 1.″6	61×31	0.200	0.200	0.200	0.192	0.192	0.192	0.111	0.116	0.114
15 / 0.1 / 2.″4	41×21	0.296	0.317	0.306	0.301	0.320	0.310	0.175	0.190	0.183
15 / 0.1 / 3.″2	31×16	0.441	0.465	0.453	0.431	0.466	0.449	0.230	0.253	0.241
15 / 0.5 / 1.″6	61×31	0.146	0.152	0.149	0.145	0.147	0.146	0.089	0.093	0.091
15 / 1.0 / 1.″1	88×44	0.054	0.057	0.056	0.054	0.054	0.054	0.036	0.039	0.038
15 / 1.0 / 1.″6	61×31	0.109	0.116	0.112	0.107	0.110	0.109	0.072	0.076	0.074
30 / 1.0 / 1.″6	61×31	0.120	0.122	0.121	0.117	0.116	0.116	0.076	0.082	0.079
15 / 1.0 / 2.″4	41×21	0.224	0.238	0.231	0.222	0.233	0.227	0.147	0.154	0.149
15 / 1.0 / 3.″2	31×16	0.356	0.385	0.371	0.360	0.383	0.371	0.212	0.232	0.222

There is a systematic variation of the measured noise in the image maps depending on the selection of the mapping parameters:

1) For identical *pixfrac* and *outpix* the noise increases with increasing *HPF* due to less good suppression of the 1/f-noise.

2) For identical *HPF* and *outpix* the noise decreases with increasing *pixfrac*, which is due to the drop size covering more output pixels and hence correlating the noise in a pixel cluster.

3) The noise increases with increasing *outpix* size, because there is more flux in each output pixel and hence also the amplitude increases. However, if the noise inside a standard photometry measurement aperture is considered ($\sigma_{aperture} = \sqrt{N_{outpixinaper}} \times \sigma_{pix}$), then these noise values are much more similar for the same HPF/pixfrac combination, as shown in Table 5. But there is the trend, that they are larger the larger the *outpix* sizes. This is, however, an effect of not yet corrected correlated noise, cf. Sect. 6.7.

Table 5: Noise per measurement aperture $\sigma_{\mathrm{aperture}}$ at 70 µm derived from the noise per pixel σ_{pix} according to $\sigma_{\mathrm{aperture}} = \sqrt{N_{\mathrm{outpixinaper}}} \times \sigma_{\mathrm{pix}}$). $\mathrm{N}_{\mathrm{outpixinaper}}$ has been calculated for an aperture radius of 5.″6. Note, these noise values are not yet corrected for correlated noise effects (cf. Table 11).

HPF/pixfrac/outpix	σ_{pix} (mJy/pix)	$\mathrm{N}_{\mathrm{outpixinaper}}$	$\sigma_{\mathrm{aperture}}$ (mJy)
15 / 0.1 / 1.″1	0.122	81.4	1.10
15 / 0.1 / 1.″6	0.186	38.5	1.15
30 / 0.1 / 1.″6	0.196	38.5	1.22
15 / 0.1 / 2.″4	0.308	17.1	1.27
15 / 0.1 / 3.″2	0.451	9.6	1.40
15 / 0.5 / 1.″6	0.148	38.5	0.92
15 / 1.0 / 1.″1	0.055	81.4	0.50
15 / 1.0 / 1.″6	0.111	38.5	0.69
30 / 1.0 / 1.″6	0.119	38.5	0.74
15 / 1.0 / 2.″4	0.229	17.1	0.95
15 / 1.0 / 3.″2	0.371	9.6	1.15

6.2 Measurement of flux standard deviation by histogram method

Table 6 lists the noise values in the image maps determined with the histogram and Gauss fit method, including the uncertainty of the fit.

Table 6: Measurement of flux standard deviation at 70 µm with the histogram method for the L2.0 products, IDs 1342242772 and 1342242773 and the co-added L2.5 product. The coverage threshold used to determine $\sigma_{\rm hist}$ and the maximum coverage for each map are listed. The map parameter combination high-lighted in bold face is used in the Standard Product Generation (SPG). The map parameter combination in italics was typical for the PACS photometric flux calibration analysis.

HPF/pixfrac/outpix	L2.0 ID 1342242772			L2.0 ID 1342242773			L2.5 ID 1342242772+73		
	$\sigma_{\rm hist}$ (mJy)	coverage >	$\rm cover_{max}$	$\sigma_{\rm hist}$ (mJy)	coverage >	$\rm cover_{max}$	$\sigma_{\rm hist}$ (mJy)	coverage >	$\rm cover_{max}$
15 / 0.1 / 1″1	0.123 ±0.003	10	19.96	0.122 ±0.002	10	20.70	0.066 ±0.001	20	39.41
15 / 0.1 / 1″6	0.185 ±0.003	10	19.84	0.185 ±0.004	10	19.36	0.109 ±0.002	20	39.02
30 / 0.1 / 1″6	0.194 ±0.005	10	19.84	0.186 ±0.004	10	19.36	0.117 ±0.002	20	38.63
15 / 0.1 / 2″4	0.306 ±0.007	10	19.42	0.306 ±0.007	10	19.78	0.178 ±0.003	20	38.37
15 / 0.1 / 3″2	0.448 ±0.013	10	19.02	0.441 ±0.013	10	19.07	0.228 ±0.006	20	37.85
15 / 0.5 / 1″6	0.153 ±0.003	240	476.7	0.147 ±0.003	240	476.6	0.091 ±0.002	480	948.6
15 / 0.1 / 1″1	0.056 ±0.001	950	1897	0.055 ±0.001	950	1901	0.038 ±0.001	1900	3787
15 / 1.0 / 1″6	0.112 ±0.002	950	1894	0.107 ±0.002	950	1894	0.074 ±0.001	1900	3782
30 / 1.0 / 1″6	0.123 ±0.002	950	1894	0.109 ±0.002	950	1894	0.078 ±0.002	1900	3782
15 / 1.0 / 2″4	0.234 ±0.006	950	1893	0.229 ±0.005	950	1892	0.145 ±0.004	1900	3778
15 / 1.0 / 3″2	0.363 ±0.018	950	1891	0.374 ±0.014	950	1889	0.216 ±0.007	1900	3775

The derived noise values in Table 6 are quite similar to the values found for the source free areas, cf. Table 4, which indicates that the coverage range of the source free areas is above the threshold used for the histogram method. This is indeed the case as exemplarily shown in Fig. 280 for the SPG mapping parameter combination 15 / 0.1 / 1″6. Therefore, a consistent behaviour as described in Sect. 6.1 is found.

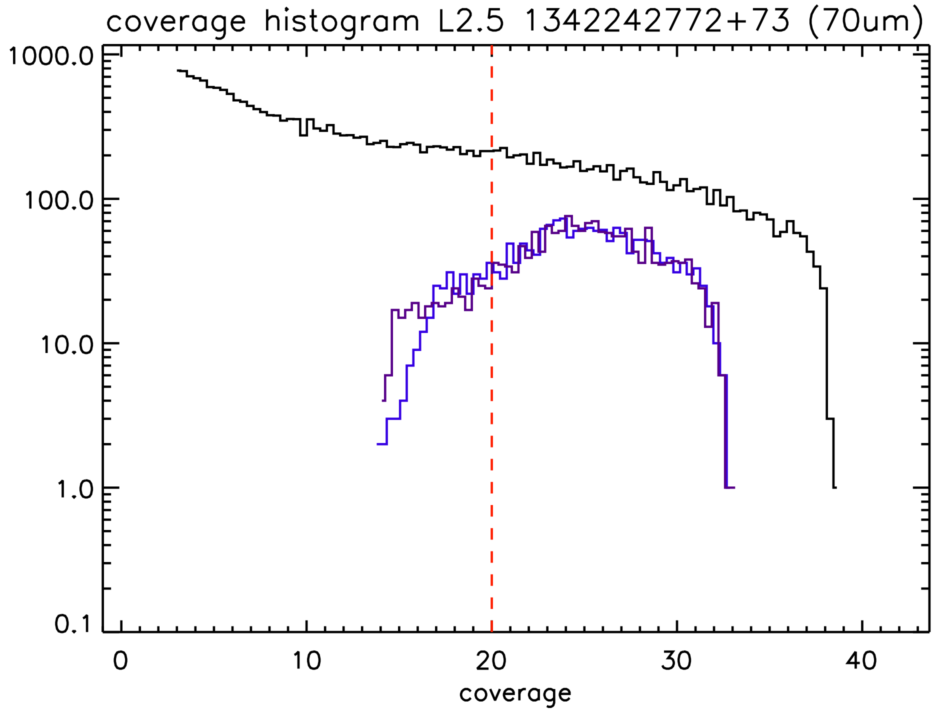

Figure 280: Histogram of the distribution of coverage for the L2.5 product with the SPG mapping parameter combination 15 / 0.1 / 1.″6 (black, all values below a coverage value of 3.0 are cut). The red dashed line indicates the coverage threshold used in the noise analysis. The dark blue and violet histograms give the coverage distribution inside the source-free noise measurement areas 1 and 2, respectively. The corresponding image map is shown in Fig. 13.

6.3 Ratio of L2.5 to L2.0 noise

Table 7 lists the noise ratio $\frac{\sigma_{\mathrm{histL2.5}}}{\sigma_{\mathrm{histL2}}}$ derived from Table 6. For a perfect square root scaling with time a ratio of 0.707 ($\frac{1}{\sqrt{2}}$) would be expected. The results show that the noise of the L2.5 product can be better by 5 – 27%. This indicates that the "mosaic" task, which generates the L2.5 product out of the two L2.0 products, introduces some additional noise correlation, depending on the map parameter combination: The largest noise reduction in L2.5 maps relative to the L2 maps is for the small pixfrac 0.1. Maps with drop sizes equal to the native pixel size (pixfrac = 1.0) and small output pixel size are close to the expected ratio of 0.707. Fig. 281 provides an overview.

Table 7: Noise ratio of $\sigma_{\mathrm{histL2.5}}$ to σ_{histL2} . The expected ratio for square root scaling of time would be 0.707. The map parameter combination high-lighted in bold face is used in the Standard Product Generation (SPG). The map parameter combination in italics was typical for the PACS photometric flux calibration analysis.

HPF/pixfrac/outpix	$\frac{\sigma_{\mathrm{histL2.5}}}{\sigma_{\mathrm{histL2}}}$
15 / 0.1 / 1.″1	0.539
15 / 0.1 / 1.″6	0.589
30 / 0.1 / 1.″6	0.616
15 / 0.1 / 2.″4	0.582
15 / 0.1 / 3.″2	0.513
15 / 0.5 / 1.″6	0.607
15 / 0.1 / 1.″1	0.685
15 / 1.0 / 1.″6	0.676
30 / 1.0 / 1.″6	0.672
15 / 1.0 / 2.″4	0.626
15 / 1.0 / 3.″2	0.586

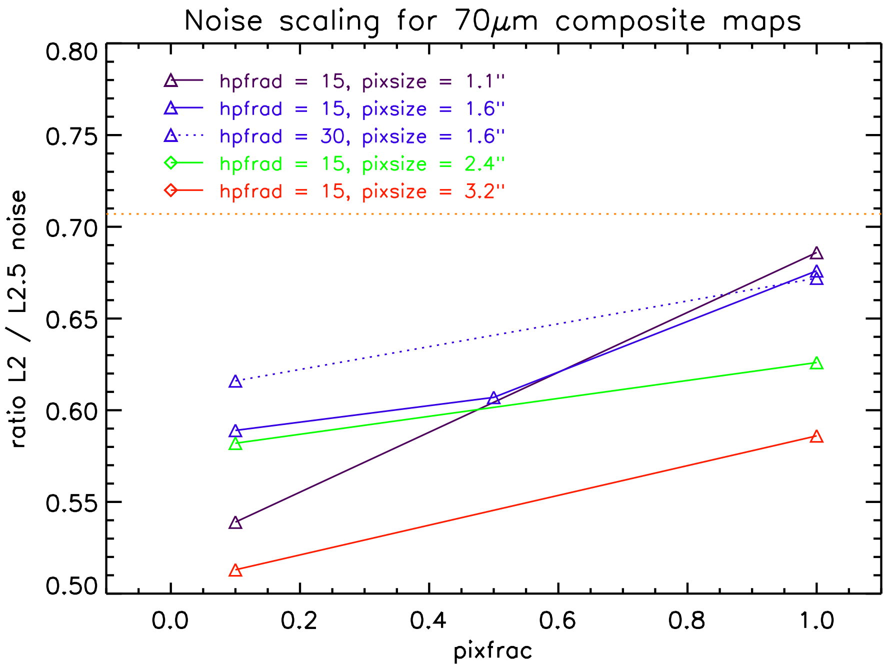

Figure 281: Ratio of L2 to L2.5 (composite of two L2 maps, hence double integration time) noise depending on the mapping parameters. The dotted orange line is the $\frac{1}{\sqrt{2}}$-ratio.

6.4 Noise of the associated error maps

In Figs. 9 through 75 the noise histograms of the error maps above the identical coverage threshold as used for the histogram method on the image maps are shown (Note: No error map analysis was done for the map parameter combinations 15 / 0.1 / 1.″1 and 15 / 1.0 / 1.″1). Note, that these noise values contain already the correction of correlated noise.

For a verification of the implementation, the histogram was also derived using the coverage map information and applying Eqns. 3 and 2 (displayed by red dotted lines for L2.0 or dashed-dotted lines for L2.5 maps). For the L2.0 products, there is hardly any difference between the two distributions, while for the L2.5 products some small shift can occur. The modifications of the errors are negligible.

Table 8 lists the mean values of the noise above the coverage threshold as given by the associated error maps. Note, that these values contain already the correction for correlated noise. The ratios $\frac{\sigma^{\rm error}_{\rm meanL2.5}}{\sigma^{\rm error}_{\rm meanL2.0}}$ are all very close to $\frac{1}{\sqrt{2}}$.

Table 8: Mean $\sigma^{\rm error}_{\rm mean}$ of the error maps at 70 µm associated with the L2.0 products, IDs 1342242772 and 1342242773, and the L2.5 product. Note that these values contain already the correction of correlated noise. The respective coverage thresholds used for each map are listed. The map parameter combination high-lighted in bold face is used in the Standard Product Generation (SPG).

HPF/pixfrac/outpix	coverage >	L2.0 ID 1342242772 $\sigma^{\rm error}_{\rm mean}$ (mJy)	L2.0 ID 1342242773 $\sigma^{\rm error}_{\rm mean}$ (mJy)	coverage >	L2.5 1342242772+73 $\sigma^{\rm error}_{\rm mean}$ (mJy)
15 / 0.1 / 1.″6	10	0.290	0.290	20	0.205
30 / 0.1 / 1.″6	10	0.342	0.341	20	0.241
15 / 0.1 / 2.″4	10	0.387	0.386	20	0.273
15 / 0.1 / 3.″2	10	0.556	0.556	20	0.393
15 / 0.5 / 1.″6	240	0.259	0.259	480	0.183
15 / 1.0 / 1.″6	950	0.249	0.249	1900	0.176
30 / 1.0 / 1.″6	950	0.299	0.299	1900	0.211
15 / 1.0 / 2.″4	950	0.339	0.339	1900	0.239
15 / 1.0 / 3.″2	950	0.469	0.469	1900	0.331

6.5 Comparison of the L2.0 product image noise with the noise of the associated error maps

Table 9 provides the noise values based on the histogram method and the Gauss fit and derives the noise corrected for correlated noise effects, σ_{corr}, by multiplying with the f-factor (Eq. 2). These noise values are compared with the corresponding mean values from the associated error maps. The ratio $\frac{\sigma_{\mathrm{mean}}^{\mathrm{error}}}{\sigma_{\mathrm{corr}}}$ scatters around 1 within <20%. Hence the error maps, building on a statistical knowledge of the noise behaviour in homogeneous deep field maps, are an adequate overall representation of noise in 70 µm PACS maps, in particular also for the mini-maps analysed in this study.

Table 9: Comparison of the mean flux standard deviation at 70 µm for the L2.0 products, IDs 1342242772 and 1342242773, from Table 6 and corrected for correlated noise effects, with the mean of the error maps associated with the product. The correlated noise factor f and the coverage thresholds used for each map are listed. The map parameter combination high-lighted in bold face is used in the Standard Product Generation (SPG).

HPF/pixfrac/outpix	coverage >	f	L2.0 ID 1342242772 σ_{hist} (mJy)	σ_{corr} (mJy)	$\sigma_{\mathrm{mean}}^{\mathrm{error}}$ (mJy)	$\frac{\sigma_{\mathrm{mean}}^{\mathrm{error}}}{\sigma_{\mathrm{hist}}}$	L2.0 ID 1342242773 σ_{hist} (mJy)	σ_{corr} (mJy)	$\sigma_{\mathrm{mean}}^{\mathrm{error}}$ (mJy)	$\frac{\sigma_{\mathrm{mean}}^{\mathrm{error}}}{\sigma_{\mathrm{corr}}}$
15 / 0.1 / 1.″6	10	1.386	0.185	0.256	0.290	1.13	0.185	0.256	0.290	1.13
30 / 0.1 / 1.″6	10	1.536	0.194	0.298	0.341	1.14	0.186	0.286	0.341	1.19
15 / 0.1 / 2.″4	10	1.304	0.306	0.399	0.387	0.97	0.306	0.399	0.386	0.97
15 / 0.1 / 3.″2	10	1.176	0.448	0.527	0.556	1.06	0.441	0.519	0.556	1.07
15 / 0.5 / 1.″6	240	1.897	0.153	0.290	0.259	0.89	0.147	0.279	0.259	0.93
15 / 1.0 / 1.″6	950	2.342	0.112	0.264	0.249	0.94	0.107	0.251	0.249	0.99
30 / 1.0 / 1.″6	950	2.600	0.123	0.320	0.299	0.93	0.109	0.283	0.299	1.06
15 / 1.0 / 2.″4	950	1.641	0.234	0.384	0.339	0.88	0.229	0.376	0.339	0.90
15 / 1.0 / 3.″2	950	1.512	0.363	0.549	0.469	0.85	0.374	0.566	0.469	0.83

Fig. 282 presents a graphical overview of the results in Table 9. The error map noise tends to be similar or larger wrt. the image noise for small pixfracs (0.1), and similar or smaller wrt. the image noise for large pixfracs (1.0).

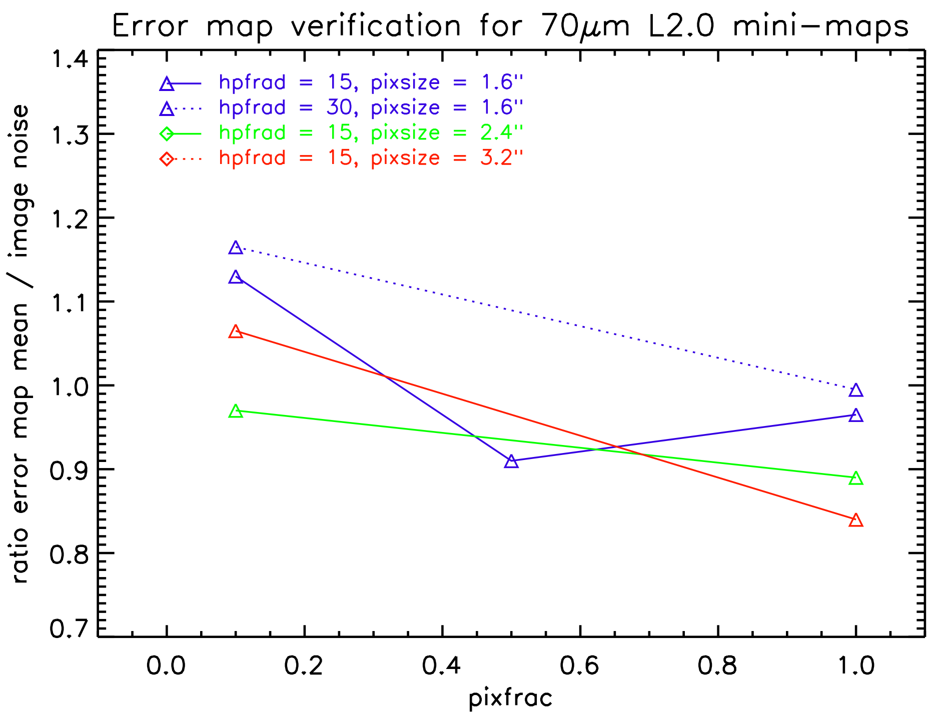

Figure 282: Ratio of mean noise determined from the error maps and image noise derived by the histogram method depending on pixfrac, hpfrad and output pixel size.

6.6 Comparison of the L2.5 product image noise with the noise of the associated error maps

Table 10 provides the corresponding information for the L2.5 products. Since we noted in Sect. 6.3 that the "mosaic" task introduces additional noise correlation, we define an additional correlated noise correction factor

$$f_{\text{mosaicL2.5}} = \frac{0.707}{\frac{\sigma_{\text{histL2.5}}}{\sigma_{\text{histL2}}}},$$

with the ratios $\frac{\sigma_{\text{histL2.5}}}{\sigma_{\text{histL2}}}$ from Table 7. Again the ratio $\frac{\sigma^{\text{error}}_{\text{mean}}}{\sigma_{\text{corr}}}$ scatters around 1 within <20% and the ratios for a certain map parameter combination are quite similar for the L2.5 and L2.0 products when comparing with Table 9. If we omitted the correction factor $f_{\text{mosaicL2.5}}$, then there would be a systematic shift by about +20%-30% for the ratio.

Table 10: Comparison of the mean flux standard deviation at 70 µm for the co-added L2.5 products, IDs 1342242772+73, from Table 6 and corrected for correlated noise effects, with the mean of the error maps associated with the product. The correlated noise factor f, the "mosaic" task correlated noise factor $f_{\text{mosaicL2.5}}$ and the coverage thresholds used for each map are listed. The map parameter combination high-lighted in bold face is used in the Standard Product Generation (SPG).

HPF/pixfrac/outpix	coverage >	f	L2.5 ID 1342242772+73 $f_{\text{mosaicL2.5}}$	σ_{hist} (mJy)	σ_{corr} (mJy)	$\sigma^{\text{error}}_{\text{mean}}$ (mJy)	$\frac{\sigma^{\text{error}}_{\text{mean}}}{\sigma_{\text{corr}}}$
15 / 0.1 / 1.″6	20	1.386	1.200	0.109	0.181	0.205	1.13
30 / 0.1 / 1.″6	20	1.536	1.148	0.117	0.206	0.241	1.17
15 / 0.1 / 2.″4	20	1.304	1.215	0.178	0.282	0.273	0.97
15 / 0.1 / 3.″2	20	1.176	1.378	0.228	0.370	0.393	1.06
15 / 0.5 / 1.″6	480	1.897	1.165	0.091	0.201	0.183	0.91
15 / 1.0 / 1.″6	1900	2.342	1.046	0.074	0.181	0.176	0.97
30 / 1.0 / 1.″6	1900	2.600	1.052	0.078	0.213	0.211	0.99
15 / 1.0 / 2.″4	1900	1.641	1.129	0.145	0.269	0.239	0.89
15 / 1.0 / 3.″2	1900	1.512	1.207	0.216	0.394	0.331	0.84

6.7 Final photometric noise values of L2.0 products corrected for correlation effects

In Table 11 the final photometric noise values corrected for correlation effects have been calculated for the different mapping parameters. Input values as $\sigma_{\rm pix}$ were the averaged $\sigma_{\rm hist}$ values of the two L2.0 products for OBSIDs 1342242772 and 1342242773. After calculating the noise inside the photometric aperture and correcting it for correlated noise effects, the final noise values are quite homogeneous for the same high pass filter width: weighted mean values (uncertainties with 3 decimal places were used as weight) are 1.63±0.02 mJy for HPF = 15 and 1.85±0.03 mJy for HPF = 30, whereby the softer high pass filter width (30) gives a slightly higher final noise.

Table 11: Noise per measurement aperture $\sigma_{\rm aperture,corr}$ at 70 µm (aperture radius of 5.″6) corrected for noise correlation effects by the f-factor. The map parameter combination high-lighted in bold face is used in the Standard Product Generation (SPG). The map parameter combination in italics was typical for the PACS photometric flux calibration analysis.

HPF/pixfrac/outpix	$\sigma_{\rm pix}$ (mJy/pix)	$N_{\rm outpixinaper}$	$\sigma_{\rm aperture}$ (mJy)	f	$\sigma_{\rm aperture,corr}$ (mJy)
15 / 0.1 / 1.″1	0.123±0.001	81.4	1.11±0.01	1.470	1.63±0.01
15 / 0.1 / 1.″6	0.185±0.004	38.5	1.15±0.02	1.386	1.59±0.03
30 / 0.1 / 1.″6	0.190±0.005	38.5	1.18±0.03	1.536	1.81±0.05
15 / 0.1 / 2.″4	0.306±0.007	17.1	1.27±0.03	1.304	1.66±0.04
15 / 0.1 / 3.″2	0.445±0.013	9.6	1.38±0.04	1.176	1.62±0.05
15 / 0.5 / 1.″6	0.150±0.003	38.5	0.93±0.02	1.897	1.76±0.04
15 / 1.0 / 1.″1	0.056±0.001	81.4	0.51±0.01	3.127	1.58±0.03
15 / 1.0 / 1.″6	0.110±0.002	38.5	0.68±0.01	2.342	1.59±0.03
30 / 1.0 / 1.″6	0.116±0.002	38.5	0.72±0.01	2.600	1.87±0.03
15 / 1.0 / 2.″4	0.232±0.006	17.1	0.96±0.02	1.641	1.57±0.04
15 / 1.0 / 3.″2	0.369±0.016	9.6	1.14±0.05	1.512	1.72±0.08

6.8 Final photometric noise values of L2.5 products corrected for correlation effects

In Table 12 the final photometric noise corrected for correlation effects of the co-added maps has been calculated for the different mapping parameters. We have used an adapted correction factor $f_{L2.5} = f \times f_{mosaicL2.5}$, with f being the standard correlated noise correction factor from Table 3 and $f_{mosaicL2.5}$ as defined in Sect. 6.6. Input values as σ_{pix} were the σ_{hist} values of the L2.5 products for OBSIDs 1342242772+73. After calculating the noise inside the photometric aperture and correcting it for correlated noise effects, the final noise values are quite homogeneous for the same high pass filter width: weighted mean values (uncertainties with 3 decimal places were used as weight) are 1.17±0.02 mJy for HPF = 15 and 1.29±0.02 mJy for HPF = 30, whereby the softer high pass filter width (30) gives a slightly higher final noise.

Table 12: Noise per measurement aperture $\sigma_{aperture,corr}$ at 70 µm (aperture radius of 5.″6) corrected for noise correlation effects by the $f_{L2.5}$-factor for the co-added maps. The map parameter combination high-lighted in bold face is used in the Standard Product Generation (SPG). The map parameter combination in italics was typical for the PACS photometric flux calibration analysis.

HPF/pixfrac/outpix	σ_{pix} (mJy/pix)	$N_{outpixinaper}$	$\sigma_{aperture}$ (mJy)	$f_{L2.5}$	$\sigma_{aperture,corr}$ (mJy)
15 / 0.1 / 1.″1	0.066±0.001	81.4	0.60±0.01	1.929	1.15±0.02
15 / 0.1 / 1.″6	0.109±0.002	38.5	0.68±0.01	1.663	1.12±0.02
30 / 0.1 / 1.″6	0.117±0.002	38.5	0.73±0.01	1.763	1.28±0.02
15 / 0.1 / 2.″4	0.178±0.003	17.1	0.74±0.01	1.584	1.17±0.02
15 / 0.1 / 3.″2	0.228±0.006	9.6	0.71±0.02	1.621	1.15±0.03
15 / 0.5 / 1.″6	0.091±0.002	38.5	0.56±0.01	2.210	1.25±0.03
15 / 1.0 / 1.″1	0.038±0.001	81.4	0.34±0.01	3.227	1.11±0.03
15 / 1.0 / 1.″6	0.074±0.001	38.5	0.46±0.01	2.728	1.25±0.02
30 / 1.0 / 1.″6	0.078±0.002	38.5	0.48±0.01	2.735	1.32±0.03
15 / 1.0 / 2.″4	0.145±0.004	17.1	0.60±0.02	1.853	1.11±0.03
15 / 1.0 / 3.″2	0.216±0.007	9.6	0.67±0.02	1.825	1.22±0.04

7 Results for 100 µm maps

7.1 Measurement of flux standard deviation in source-free areas

Table 13 lists the measured noise of the background as determined in two source-free areas per map.

Table 13: Measurement of flux standard deviation at 100 µm in source-free areas for the L2.0 products, IDs 1342242770 and 1342242771 and the co-added L2.5 product. The position of the boxes is indicated in Figs. 100 through 166. Note, that the cut levels for all 100µm map displays are identical. The map parameter combination high-lighted in bold face is used in the Standard Product Generation (SPG). The map parameter combination in italics was typical for the PACS photometric flux calibration analysis.

HPF/pixfrac/outpix	box size	L2.0 ID 1342242770			L2.0 ID 1342242771			L2.5 ID 1342242770+71		
	(pixels)	σ_{box1} (mJy)	σ_{box2} (mJy)	σ_{mean} (mJy)	σ_{box1} (mJy)	σ_{box2} (mJy)	σ_{mean} (mJy)	σ_{box1} (mJy)	σ_{box2} (mJy)	σ_{mean} (mJy)
15 / 0.1 / 1."4	70×35	0.150	0.160	0.155	0.153	0.152	0.153	0.071	0.076	0.074
15 / 0.1 / 1."6	61×31	0.172	0.187	0.179	0.177	0.178	0.178	0.091	0.099	0.095
30 / 0.1 / 1."6	61×31	0.184	0.199	0.192	0.189	0.190	0.190	0.097	0.105	0.101
15 / 0.1 / 2."4	41×21	0.293	0.293	0.293	0.287	0.291	0.289	0.154	0.166	0.160
15 / 0.1 / 3."2	31×16	0.420	0.428	0.424	0.422	0.411	0.417	0.212	0.214	0.216
15 / 0.5 / 1."6	61×31	0.136	0.144	0.140	0.138	0.139	0.138	0.077	0.082	0.079
15 / 1.0 / 1."4	70×35	0.079	0.081	0.080	0.079	0.080	0.079	0.049	0.050	0.049
15 / 1.0 / 1."6	61×31	0.101	0.103	0.102	0.101	0.102	0.101	0.062	0.064	0.063
30 / 1.0 / 1."6	61×31	0.109	0.114	0.111	0.109	0.109	0.109	0.067	0.068	0.068
15 / 1.0 / 2."4	41×21	0.208	0.209	0.208	0.207	0.210	0.208	0.121	0.125	0.123
15 / 1.0 / 3."2	31×16	0.330	0.337	0.334	0.336	0.326	0.331	0.178	0.180	0.179

There is a systematic variation of the measured noise in the image maps depending on the selection of the mapping parameters:

1) For identical *pixfrac* and *outpix* the noise increases with increasing *HPF* due to less good suppression of the 1/f-noise.

2) For identical *HPF* and *outpix* the noise decreases with increasing *pixfrac*, which is due to the drop size covering more output pixels and hence correlating the noise in a pixel cluster.

3) The noise increases with increasing *outpix* size, because there is more flux in each output pixel and hence also the amplitude increases. However, if the noise inside a standard photometry measurement aperture is considered ($\sigma_{aperture} = \sqrt{N_{outpixinaper}} \times \sigma_{pix}$), then these noise values are much more similar for the same HPF/pixfrac combination, as shown in Table 14. But there is the trend, that they are larger the larger the *outpix* sizes. This is, however, an effect of not yet corrected correlated noise, cf. Sect. 7.7.

Table 14: Noise per measurement aperture $\sigma_{\mathrm{aperture}}$ at 100 µm derived from the noise per pixel σ_{pix} according to $\sigma_{\mathrm{aperture}} = \sqrt{N_{\mathrm{outpixinaper}}} \times \sigma_{\mathrm{pix}}$). $\mathrm{N_{outpixinaper}}$ has been calculated for an aperture radius of 6.″8. Note, these noise values are not yet corrected for correlated noise effects (cf. Table 20).

HPF/pixfrac/outpix	σ_{pix} (mJy/pix)	$\mathrm{N_{outpixinaper}}$	$\sigma_{\mathrm{aperture}}$ (mJy)
15 / 0.1 / 1.″4	0.154	74.1	1.33
15 / 0.1 / 1.″6	0.179	56.7	1.35
30 / 0.1 / 1.″6	0.191	56.7	1.44
15 / 0.1 / 2.″4	0.291	25.2	1.46
15 / 0.1 / 3.″2	0.421	14.2	1.59
15 / 0.5 / 1.″6	0.139	56.7	1.05
15 / 1.0 / 1.″4	0.080	74.1	0.69
15 / 1.0 / 1.″6	0.102	56.7	0.77
30 / 1.0 / 1.″6	0.110	56.7	0.83
15 / 1.0 / 2.″4	0.208	25.2	1.04
15 / 1.0 / 3.″2	0.333	14.2	1.25

7.2 Measurement of flux standard deviation by histogram method

Table 15 lists the noise values in the image maps determined with the histogram and Gauss fit method, including the uncertainty of the fit.

Table 15: Measurement of flux standard deviation at 100 µm with the histogram method for the L2.0 products, IDs 1342242770 and 1342242771 and the co-added L2.5 product. The coverage threshold used to determine σ_{hist} and the maximum coverage for each map are listed. The map parameter combination high-lighted in bold face is used in the Standard Product Generation (SPG). The map parameter combination in italics was typical for the PACS photometric flux calibration analysis.

HPF/pixfrac/outpix	L2.0 ID 1342242770			L2.0 ID 1342242771			L2.5 ID 1342242770+71		
	σ_{hist} (mJy)	coverage >	$cover_{max}$	σ_{hist} (mJy)	coverage >	$cover_{max}$	σ_{hist} (mJy)	coverage >	$cover_{max}$
15 / 0.1 / 1″.4	0.152 ±0.008	10	20.10	0.145 ±0.003	10	19.29	0.072 ±0.002	20	38.68
15 / 0.1 / 1″.6	0.178 ±0.005	10	19.89	0.172 ±0.007	10	19.38	0.091 ±0.003	20	38.79
30 / 0.1 / 1″.6	0.186 ±0.005	10	19.89	0.184 ±0.005	10	19.38	0.100 ±0.002	20	38.79
15 / 0.1 / 2″.4	0.284 ±0.007	10	19.39	0.285 ±0.007	10	19.32	0.155 ±0.005	20	38.16
15 / 0.1 / 3″.2	0.433 ±0.012	10	19.07	0.416 ±0.012	10	19.05	0.208 ±0.008	20	37.88
15 / 0.5 / 1″.6	0.141 ±0.004	240	476.7	0.131 ±0.005	240	476.7	0.075 ±0.001	480	948.3
15 / 1.0 / 1″.4	0.081 ±0.002	950	1895	0.074 ±0.002	950	1898	0.048 ±0.001	1900	3780
15 / 1.0 / 1″.6	0.104 ±0.003	950	1893	0.094 ±0.003	950	1897	0.063 ±0.002	1900	3781
30 / 1.0 / 1″.6	0.113 ±0.004	950	1893	0.104 ±0.002	950	1897	0.066 ±0.002	1900	3781
15 / 1.0 / 2″.4	0.208 ±0.008	950	1892	0.197 ±0.005	950	1896	0.122 ±0.003	1900	3777
15 / 1.0 / 3″.2	0.328 ±0.012	950	1890	0.332 ±0.009	950	1892	0.182 ±0.004	1900	3775

The derived noise values in Table 15 are quite similar to the values found for the source free areas, cf. Table 13, which indicates that the coverage range of the source free areas is above the threshold used for the histogram method. This is indeed the case as exemplary shown in Fig. 283 for the SPG mapping parameter combination 15 / 0.1 / 1″.6. Therefore, a consistent behaviour as described in Sect. 7.1 is found.

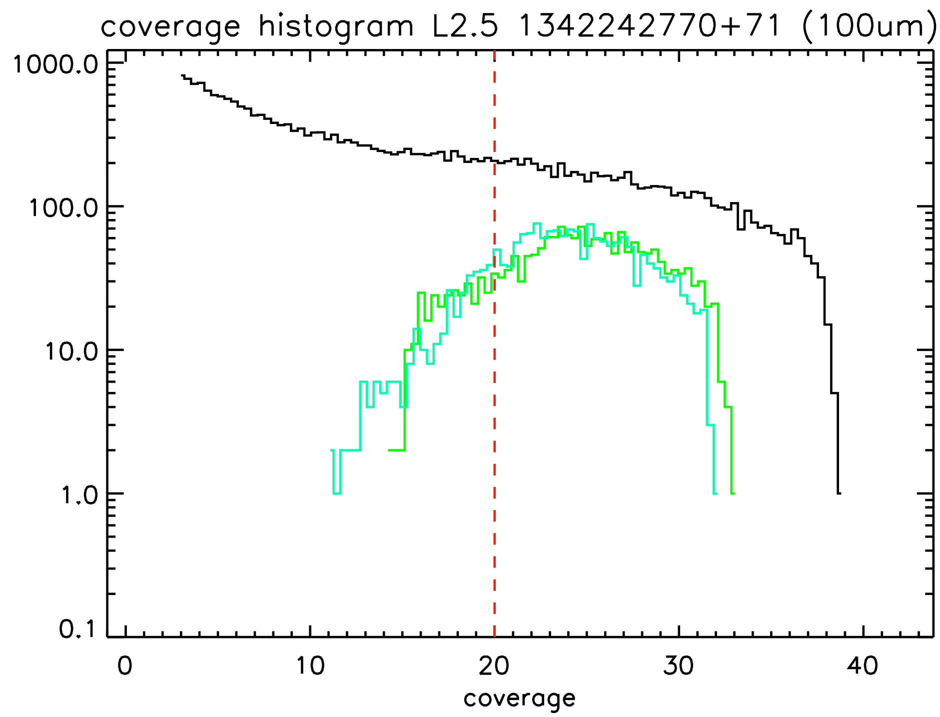

Figure 283: Histogram of the distribution of coverage for the L2.5 product with the SPG mapping parameter combination 15 / 0.1 / 1.″6 (black, all values below a coverage value of 3.0 are cut). The red dashed line indicates the coverage threshold used in the noise analysis. The dark and light green histograms give the coverage distribution inside the source-free noise measurement areas 1 and 2, respectively. The corresponding image map is shown in Fig. 106.

7.3 Ratio of L2.5 to L2.0 noise

Table 16 lists the noise ratio $\frac{\sigma_{\mathrm{histL2.5}}}{\sigma_{\mathrm{histL2}}}$ derived from Table 15. For a perfect square root scaling with time a ratio of 0.707 ($\frac{1}{\sqrt{2}}$) would be expected. The results show that the noise of the L2.5 product can be better by 5 – 31%. This indicates that the "mosaic" task, which generates the L2.5 product out of the two L2.0 products, introduces some additional noise correlation, depending on the map parameter combination: The largest noise reduction in L2.5 maps relative to the L2 maps is for the small pixfrac 0.1. Maps with drop sizes equal to the native pixel size (pixfrac = 1.0) and small output pixel size are closer to the expected value. Fig. 284 provides an overview.

Table 16: Noise ratio of $\sigma_{\mathrm{histL2.5}}$ to σ_{histL2} . The expected ratio for square root scaling of time would be 0.707. The map parameter combination high-lighted in bold face is used in the Standard Product Generation (SPG). The map parameter combination in italics was typical for the PACS photometric flux calibration analysis.

HPF/pixfrac/outpix	$\frac{\sigma_{\mathrm{histL2.5}}}{\sigma_{\mathrm{histL2}}}$
15 / 0.1 / 1.″4	0.485
15 / 0.1 / 1.″6	0.520
30 / 0.1 / 1.″6	0.541
15 / 0.1 / 2.″4	0.545
15 / 0.1 / 3.″2	0.490
15 / 0.5 / 1.″6	0.552
15 / 1.0 / 1.″4	0.619
15 / 1.0 / 1.″6	0.636
30 / 1.0 / 1.″6	0.608
15 / 1.0 / 2.″4	0.603
15 / 1.0 / 3.″2	0.552

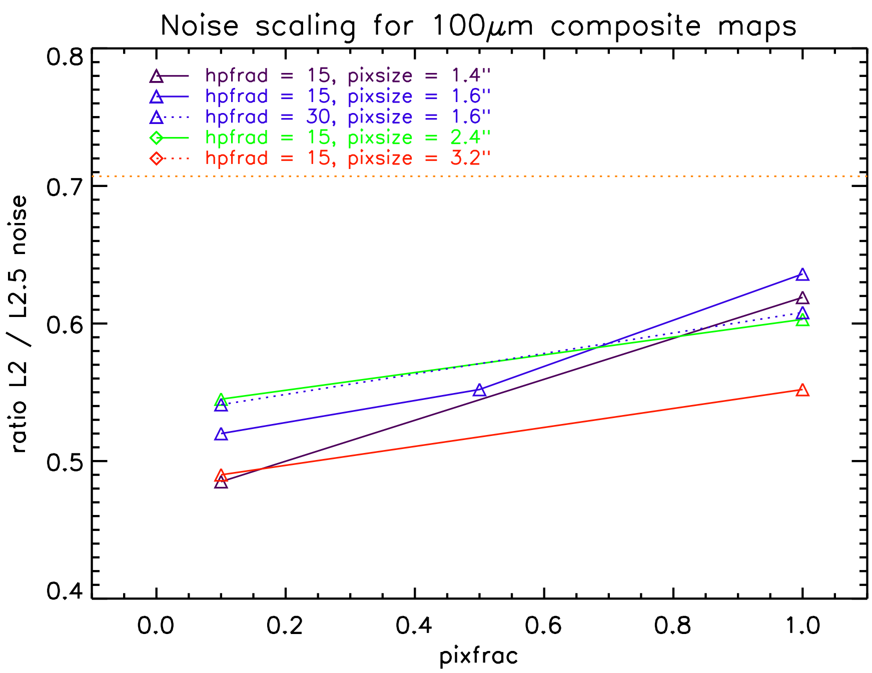

Figure 284: Ratio of L2 to L2.5 (composite of two L2 maps, hence double integration time) noise depending on the mapping parameters. The dotted orange line is the $\frac{1}{\sqrt{2}}$-ratio.

7.4 Noise of the associated error maps

In Figs. 102 through 168 the noise histograms of the error maps above the identical coverage threshold as used for the histogram method on the image maps are shown (Note: No error map analysis was done for the map parameter combinations 15 / 0.1 / 1.″4 and 15 / 1.0 / 1.″4). Note, that these noise values contain already the correction of correlated noise.

For a verification of the implementation, the histogram was also derived using the coverage map information and applying Eqns. 3 and 2 (displayed by red dotted lines for L2.0 or dashed-dotted lines for L2.5 maps). For the L2.0 products, there is hardly any difference between the two histograms, while for the L2.5 products a systematic shift of the histograms occurs. The agreement between the two histograms for the L2.0 products is to be expected, since the underlying calculation is the same. In the case of the L2.5 maps, the error map is produced by the "mosaic" task from the two individual error maps of the L2.0 products rather than doing the calculation with the Popesso et al. algorithm starting from the coverage map. The values derived with the Popesso et al. algorithm from the coverage map are 6 − 8% higher than the ones of the error maps.

Table 17 lists the mean values of the noise above the coverage threshold derived from the associated error maps. The ratios $\frac{\sigma^{error}_{meanL2.5}}{\sigma^{error}_{meanL2.0}}$ are all very close to $\frac{1}{\sqrt{2}}$. The explanation for the higher L2.5 noise values derived with the Popesso et al. algorithm is explained by the fact, that the α-parameters in Eqn. 3 are different from −0.5. Only in the case of $\alpha = -0.5$, the noise scales with $\frac{1}{\sqrt{2}}$. Since $\alpha = -0.42 - -0.40$ (Table 3), the noise scales as $10^{-0.41\,log(2)} = 0.753$, which is about 6% higher than $\frac{1}{\sqrt{2}}$. For all 70 µm map parameter combinations α is close to −0.5 (see Table 3), therefore only small shifts between the two L2.5 histograms occur for these cases.

Table 17: Mean σ^{error}_{mean} of the error maps at 100 µm associated with the L2.0 products, IDs 1342242770 and 1342242771, and the L2.5 product. Note that these values contain already the correction of correlated noise. The respective coverage thresholds used for each map are listed. The map paramater combination high-lighted in bold face is used in the Standard Product Generation (SPG).

HPF/pixfrac/outpix	coverage >	L2.0 ID 1342242770 σ^{error}_{mean} (mJy)	L2.0 ID 1342242771 σ^{error}_{mean} (mJy)	coverage >	L2.5 1342242770+71 σ^{error}_{mean} (mJy)
15 / 0.1 / 1.″6	10	0.247	0.247	20	0.175
30 / 0.1 / 1.″6	10	0.282	0.282	20	0.199
15 / 0.1 / 2.″4	10	0.344	0.344	20	0.243
15 / 0.1 / 3.″2	10	0.484	0.483	20	0.341
15 / 0.5 / 1.″6	240	0.210	0.210	480	0.148
15 / 1.0 / 1.″6	950	0.205	0.205	1900	0.145
30 / 1.0 / 1.″6	950	0.241	0.241	1900	0.170
15 / 1.0 / 2.″4	950	0.288	0.288	1900	0.203
15 / 1.0 / 3.″2	950	0.411	0.411	1900	0.290

7.5 Comparison of the L2.0 product image noise with the noise of the associated error maps

Table 18 provides the noise values based on the histogram method and the Gauss fit and derives the noise corrected for correlated noise effects, σ_{corr}, by multiplying with the f-factor (Eq. 2). These noise values are compared with the corresponding mean values from the associated error maps. The ratio ranges from around 1 for map parameter combinations pixfrac = 0.1 to around 0.8–0.9 for map parameter combinations with pixfrac = 1.0. Hence the error maps, building on a statistical knowledge of the noise behaviour in homogeneous deep field maps, are an adequate overall representation of noise in 100 µm PACS maps, in particular also for the mini-maps analysed in this study.

Table 18: Comparison of the mean flux standard deviation at 100 µm for the L2.0 products, IDs 1342242770 and 1342242771, from Table 15 and corrected for correlated noise effects, with the mean of the error maps associated with the product. The correlated noise factor f and the coverage thresholds used for each map are listed. The map parameter combination high-lighted in bold face is used in the Standard Product Generation (SPG).

HPF/pixfrac/outpix			L2.0 ID 1342242770				L2.0 ID 1342242771			
	coverage >	f	σ_{hist} (mJy)	σ_{corr} (mJy)	$\sigma^{\mathrm{error}}_{\mathrm{mean}}$ (mJy)	$\frac{\sigma^{\mathrm{error}}_{\mathrm{mean}}}{\sigma_{\mathrm{hist}}}$	σ_{hist} (mJy)	σ_{corr} (mJy)	$\sigma^{\mathrm{error}}_{\mathrm{mean}}$ (mJy)	$\frac{\sigma^{\mathrm{error}}_{\mathrm{mean}}}{\sigma_{\mathrm{corr}}}$
15 / 0.1 / 1.″6	10	1.412	0.178	0.251	0.247	0.98	0.172	0.243	0.247	1.02
30 / 0.1 / 1.″6	10	1.537	0.186	0.286	0.282	0.99	0.184	0.283	0.282	1.00
15 / 0.1 / 2.″4	10	1.333	0.284	0.379	0.344	0.91	0.285	0.380	0.344	0.91
15 / 0.1 / 3.″2	10	1.188	0.433	0.514	0.484	0.94	0.416	0.494	0.483	0.98
15 / 0.5 / 1.″6	240	1.909	0.141	0.269	0.210	0.78	0.131	0.250	0.210	0.84
15 / 1.0 / 1.″6	950	2.370	0.104	0.247	0.205	0.83	0.094	0.223	0.205	0.92
30 / 1.0 / 1.″6	950	2.603	0.113	0.294	0.241	0.82	0.104	0.270	0.241	0.89
15 / 1.0 / 2.″4	950	1.664	0.208	0.346	0.288	0.83	0.197	0.328	0.288	0.88
15 / 1.0 / 3.″2	950	1.518	0.328	0.498	0.411	0.83	0.332	0.504	0.411	0.82

Fig. 282 presents a graphical overview of the results in Table 18. The error map noise tends to be similar or larger wrt. the image noise for small pixfracs (0.1), and similar or smaller wrt. the image noise for large pixfracs (1.0).

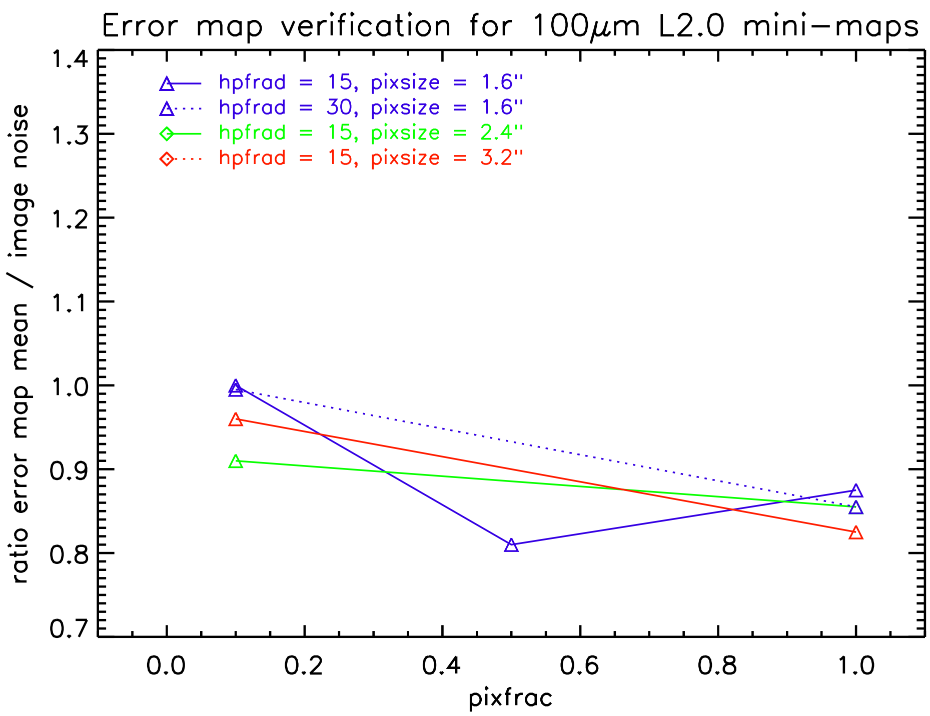

Figure 285: Ratio of mean noise determined from the error maps and image noise derived by the histogram method depending on pixfrac, hpfrad and output pixel size.

7.6 Comparison of the L2.5 product image noise with the noise of the associated error maps

Table 19 provides the corresponding information for the L2.5 products. Since we noted in Sect. 7.3 that the "mosaic" task introduces additional noise correlation, we define an additional correlated noise correction factor

$$f_{\mathrm{mosaicL2.5}} = \frac{0.707}{\frac{\sigma_{\mathrm{histL2.5}}}{\sigma_{\mathrm{histL2}}}},$$

with the ratios $\frac{\sigma_{\mathrm{histL2.5}}}{\sigma_{\mathrm{histL2}}}$ from Table 16. Again the ratio ranges from around 1 for map parameter combinations pixfrac = 0.1 to around 0.8–0.9 for map parameter combinations with pixfrac = 1.0. The ratios for a certain map parameter combination are quite similar for the L2.5 and L2.0 products when comparing with Table 18. If we omitted the correction factor $f_{\mathrm{mosaicL2.5}}$, then there would be a systematic shift by about +20%–+40% for the ratio.

Table 19: Comparison of the mean flux standard deviation at 100 µm for the co-added L2.5 products, IDs 1342242770+71, from Table 15 and corrected for correlated noise effects, with the mean of the error maps associated with the product. The correlated noise factor f, the "mosaic" task correlated noise factor $\mathrm{f}_{\mathrm{mosaicL2.5}}$ and the coverage thresholds used for each map are listed. The map parameter combination high-lighted in bold face is used in the Standard Product Generation (SPG).

HPF/pixfrac/outpix	coverage >	f	L2.5 ID 1342242770+71				
			$f_{\mathrm{mosaicL2.5}}$	σ_{hist} (mJy)	σ_{corr} (mJy)	$\sigma^{\mathrm{error}}_{\mathrm{mean}}$ (mJy)	$\frac{\sigma^{\mathrm{error}}_{\mathrm{mean}}}{\sigma_{\mathrm{corr}}}$
15 / 0.1 / 1.″6	20	1.412	1.360	0.091	0.175	0.175	1.00
30 / 0.1 / 1.″6	20	1.537	1.307	0.100	0.201	0.199	0.99
15 / 0.1 / 2.″4	20	1.333	1.297	0.155	0.268	0.243	0.91
15 / 0.1 / 3.″2	20	1.188	1.443	0.208	0.357	0.341	0.96
15 / 0.5 / 1.″6	480	1.909	1.281	0.075	0.183	0.148	0.81
15 / 1.0 / 1.″6	1900	2.370	1.112	0.063	0.166	0.145	0.87
30 / 1.0 / 1.″6	1900	2.603	1.163	0.066	0.200	0.170	0.85
15 / 1.0 / 2.″4	1900	1.664	1.173	0.122	0.238	0.203	0.85
15 / 1.0 / 3.″2	1900	1.518	1.281	0.182	0.354	0.290	0.82

7.7 Final photometric noise values of L2.0 products corrected for correlation effects

In Table 20 the final photometric noise values corrected for correlation effects have been calculated for the different mapping parameters. Input values as σ_{pix} were the averaged σ_{hist} values of the two L2.0 products for OBSIDs 1342242770 and 1342242771. After calculating the noise inside the photometric aperture and correcting it for correlated noise effects, the final noise values are quite homogeneous for the same high pass filter width: weighted mean values (uncertainties with 3 decimal places were used as weight) are 1.90±0.01 mJy for HPF = 15 and 2.14 mJy for HPF = 30, whereby the softer high pass filter width (30) gives a slightly higher final noise.

Table 20: Noise per measurement aperture $\sigma_{\mathrm{aperture,corr}}$ at 100 µm (aperture radius of 6.″8) corrected for noise correlation effects by the f-factor. The map parameter combination high-lighted in bold face is used in the Standard Product Generation (SPG). The map parameter combination in italics was typical for the PACS photometric flux calibration analysis.

HPF/pixfrac/outpix	σ_{pix} (mJy/pix)	$N_{\mathrm{outpixinaper}}$	$\sigma_{\mathrm{aperture}}$ (mJy)	f	$\sigma_{\mathrm{aperture,corr}}$ (mJy)
15 / 0.1 / 1.″4	0.149±0.005	74.1	1.28±0.04	1.436	1.84±0.06
15 / 0.1 / 1.″6	0.175±0.004	56.7	1.32±0.03	1.412	1.86±0.04
30 / 0.1 / 1.″6	0.185±0.001	56.7	1.39±0.01	1.537	2.14±0.01
15 / 0.1 / 2.″4	0.285±0.001	25.2	1.43±0.01	1.333	1.91±0.01
15 / 0.1 / 3.″2	0.425±0.012	14.2	1.60±0.05	1.188	1.90±0.05
15 / 0.5 / 1.″6	0.136±0.007	56.7	1.02±0.05	1.909	1.96±0.10
15 / 1.0 / 1.″4	0.078±0.005	74.1	0.67±0.04	2.650	1.78±0.11
15 / 1.0 / 1.″6	0.099±0.007	56.7	0.75±0.05	2.370	1.77±0.12
30 / 1.0 / 1.″6	0.109±0.006	56.7	0.82±0.05	2.603	2.14±0.12
15 / 1.0 / 2.″4	0.203±0.008	25.2	1.02±0.04	1.664	1.70±0.07
15 / 1.0 / 3.″2	0.330±0.003	14.2	1.24±0.01	1.518	1.89±0.02

7.8 Final photometric noise values of L2.5 products corrected for correlation effects

In Table 21 the final photometric noise corrected for correlation effects of the co-added maps has been calculated for the different mapping parameters. We have used an adapted correction factor $f_{L2.5} = f \times f_{mosaicL2.5}$, with f being the standard correlated noise correction factor from Table 3 and $f_{mosaicL2.5}$ as defined in Sect. 7.6. Input values as σ_{pix} were the σ_{hist} values of the L2.5 products for OBSIDs 1342242770+71. After calculating the noise inside the photometric aperture and correcting it for correlated noise effects, the final noise values are quite homogeneous for the same high pass filter width: weighted mean values (uncertainties with 3 decimal places were used as weight) are 1.31±0.02 mJy for HPF = 15 and 1.51±0.005 mJy for HPF = 30, whereby the softer high pass filter width (30) gives a slightly higher final noise.

Table 21: Noise per measurement aperture $\sigma_{aperture,corr}$ at 100 µm (aperture radius of 6.″8) corrected for noise correlation effects by the $f_{L2.5}$-factor for the co-added maps. The map parameter combination high-lighted in bold face is used in the Standard Product Generation (SPG). The map parameter combination in italics was typical for the PACS photometric flux calibration analysis.

HPF/pixfrac/outpix	σ_{pix} (mJy/pix)	$N_{outpixinaper}$	$\sigma_{aperture}$ (mJy)	$f_{L2.5}$	$\sigma_{aperture,corr}$ (mJy)
15 / 0.1 / 1.″4	0.072±0.002	74.1	0.62±0.02	2.094	1.30±0.04
15 / 0.1 / 1.″6	0.091±0.003	56.7	0.68±0.02	1.920	1.32±0.04
30 / 0.1 / 1.″6	0.100±0.002	56.7	0.75±0.02	2.009	1.51±0.03
15 / 0.1 / 2.″4	0.155±0.005	25.2	0.78±0.03	1.729	1.35±0.04
15 / 0.1 / 3.″2	0.208±0.008	14.2	0.78±0.03	1.714	1.34±0.05
15 / 0.5 / 1.″6	0.075±0.001	56.7	0.56±0.01	2.445	1.38±0.02
15 / 1.0 / 1.″4	0.048±0.001	74.1	0.41±0.01	3.026	1.25±0.03
15 / 1.0 / 1.″6	0.063±0.002	56.7	0.47±0.02	2.635	1.25±0.04
30 / 1.0 / 1.″6	0.066±0.002	56.7	0.50±0.02	3.027	1.50±0.05
15 / 1.0 / 2.″4	0.122±0.003	25.2	0.61±0.02	1.952	1.18±0.03
15 / 1.0 / 3.″2	0.182±0.004	14.2	0.69±0.02	1.945	1.33±0.03

8 Results for 160 μm maps

8.1 Measurement of flux standard deviation in source-free areas

Table 22 lists the measured noise of the background as determined in two source-free areas per map.

Table 22: Measurement of flux standard deviation at 160 μm in source-free areas for the L2.0 products, IDs 1342242772 and 1342242773 and the co-added L2.5 product. The position of the boxes is indicated in Figs. 193 through 259. Note, that the cut levels for all 160μm map displays are identical. The map parameter combination high-lighted in bold face is used in the Standard Product Generation (SPG). The map parameter combination in italics was typical for the PACS photometric flux calibration analysis.

HPF/pixfrac/outpix	box size	L2.0 ID 1342242772			L2.0 ID 1342242773			L2.5 ID 1342242772+73		
	(pixels)	$\sigma_{\rm box1}$ (mJy)	$\sigma_{\rm box2}$ (mJy)	$\sigma_{\rm mean}$ (mJy)	$\sigma_{\rm box1}$ (mJy)	$\sigma_{\rm box2}$ (mJy)	$\sigma_{\rm mean}$ (mJy)	$\sigma_{\rm box1}$ (mJy)	$\sigma_{\rm box2}$ (mJy)	$\sigma_{\rm mean}$ (mJy)
25 / 0.1 / 2.″1	47×24	0.229	0.245	0.237	0.248	0.256	0.252	0.137	0.140	0.139
25 / 0.1 / 3.″2	31×16	0.407	0.447	0.426	0.431	0.440	0.435	0.210	0.219	0.214
50 / 0.1 / 3.″2	31×16	0.450	0.474	0.462	0.486	0.475	0.481	0.238	0.232	0.235
25 / 0.1 / 4.″8	21×11	0.660	0.810	0.735	0.732	0.715	0.723	0.372	0.387	0.379
25 / 0.1 / 6.″4	16×8	0.946	1.124	1.035	1.080	1.141	1.110	0.497	0.600	0.548
25 / 0.5 / 3.″2	31×16	0.317	0.365	0.341	0.358	0.353	0.355	0.187	0.196	0.192
25 / 1.0 / 2.″1	47×24	0.106	0.113	0.109	0.123	0.118	0.120	0.077	0.081	0.079
25 / 1.0 / 3.″2	31×16	0.235	0.259	0.247	0.269	0.258	0.263	0.157	0.166	0.161
50 / 1.0 / 3.″2	31×16	0.262	0.284	0.273	0.303	0.275	0.289	0.182	0.176	0.179
25 / 1.0 / 4.″8	21×11	0.483	0.559	0.521	0.543	0.536	0.540	0.307	0.326	0.317
25 / 1.0 / 6.″4	16×8	0.763	0.899	0.831	0.902	0.919	0.910	0.455	0.548	0.501

There is a systematic variation of the measured noise in the image maps depending on the selection of the mapping parameters:

1) For identical *pixfrac* and *outpix* the noise increases with increasing *HPF* due to less good suppression of the 1/f-noise.

2) For identical *HPF* and *outpix* the noise decreases with increasing *pixfrac*, which is due to the drop size covering more output pixels and hence correlating the noise in a pixel cluster.

3) The noise increases with increasing *outpix* size, because there is more flux in each output pixel and hence also the amplitude increases. However, if the noise inside a standard photometry measurement aperture is considered ($\sigma_{\rm aperture} = \sqrt{N_{\rm outpixinaper}} \times \sigma_{\rm pix}$), then these noise values are much more similar for the same HPF/pixfrac combination, as shown in Table 23. But there is the trend, that they are larger the larger the *outpix* sizes. This is, however, an effect of not yet corrected correlated noise, cf. Sect. 8.7.

Table 23: Noise per measurement aperture $\sigma_{\mathrm{aperture}}$ at 160 µm derived from the noise per pixel σ_{pix} according to $\sigma_{\mathrm{aperture}} = \sqrt{N_{\mathrm{outpixinaper}}} \times \sigma_{\mathrm{pix}}$). $\mathrm{N_{outpixinaper}}$ has been calculated for an aperture radius of 10.″7. Note, these noise values are not yet corrected for correlated noise effects (cf. Table 29).

HPF/pixfrac/outpix	σ_{pix} (mJy/pix)	$\mathrm{N_{outpixinaper}}$	$\sigma_{\mathrm{aperture}}$ (mJy)
25 / 0.1 / 2.″1	0.245	81.6	2.21
25 / 0.1 / 3.″2	0.431	35.1	2.55
50 / 0.1 / 3.″2	0.472	35.1	2.79
25 / 0.1 / 4.″8	0.729	15.6	2.88
25 / 0.1 / 6.″4	1.073	8.8	3.18
25 / 0.5 / 3.″2	0.348	35.1	2.06
25 / 1.0 / 2.″1	0.115	81.6	1.04
25 / 1.0 / 3.″2	0.255	35.1	1.51
50 / 1.0 / 3.″2	0.289	35.1	1.71
25 / 1.0 / 4.″8	0.531	15.6	2.10
25 / 1.0 / 6.″4	0.905	8.8	2.68

8.2 Measurement of flux standard deviation by histogram method

Table 24 lists the noise values in the image maps determined with the histogram and Gauss fit method, including the uncertainty of the fit.

Table 24: Measurement of flux standard deviation at 160 µm with the histogram method for the L2.0 products, IDs 1342242772 and 1342242773 and the co-added L2.5 product. The coverage threshold used to determine $\sigma_{\rm hist}$ and the maximum coverage for each map are listed. The map parameter combination high-lighted in bold face is used in the Standard Product Generation (SPG). The map parameter combination in italics was typical for the PACS photometric flux calibration analysis.

HPF/pixfrac/outpix	L2.0 ID 1342242772			L2.0 ID 1342242773			L2.5 ID 1342242772+73		
	$\sigma_{\rm hist}$ (mJy)	coverage >	$\rm cover_{max}$	$\sigma_{\rm hist}$ (mJy)	coverage >	$\rm cover_{max}$	$\sigma_{\rm hist}$ (mJy)	coverage >	$\rm cover_{max}$
25 / 0.1 / 2.″1	0.238 ±0.006	10.5	20.52	0.240 ±0.006	10.5	21.64	0.134 ±0.005	20.5	40.94
25 / 0.1 / 3.″2	0.416 ±0.013	10.5	20.29	0.399 ±0.018	10.5	21.24	0.217 ±0.010	20.5	40.33
50 / 0.1 / 3.″2	0.456 ±0.026	10.5	20.26	0.457 ±0.024	10.5	21.24	0.240 ±0.015	20.5	40.33
25 / 0.1 / 4.″8	0.695 ±0.021	10.5	19.73	0.727 ±0.027	10.5	20.75	0.389 ±0.025	20.5	40.11
25 / 0.1 / 6.″4	1.092 ±0.063	10.5	19.71	1.120 ±0.082	10.5	20.59	0.600 ±0.036	20.5	40.01
25 / 0.5 / 3.″2	0.347 ±0.010	260	493.8	0.333 ±0.012	260	522.1	0.196 ±0.010	510	1006
25 / 1.0 / 2.″1	0.117 ±0.002	1050	1970	0.119 ±0.003	1050	2065	0.083 ±0.003	2050	4025
25 / 1.0 / 3.″2	0.255 ±0.010	1050	1966	0.262 ±0.008	1050	2064	0.175 ±0.010	2050	4014
50 / 1.0 / 3.″2	0.274 ±0.007	1050	1965	0.293 ±0.010	1050	2064	0.191 ±0.009	2050	4014
25 / 1.0 / 4.″8	0.519 ±0.018	1050	1956	0.530 ±0.024	1050	2059	0.344 ±0.018	2050	4003
25 / 1.0 / 6.″4	0.876 ±0.048	1050	1960	0.910 ±0.074	1050	2053	0.526 ±0.029	2050	3991

The derived noise values in Table 24 are quite similar to the values found for the source free areas, cf. Table 22, which indicates that the coverage range of the source free areas is above the threshold used for the histogram method. This is indeed the case as exemplary shown in Fig. 286 for the SPG mapping parameter combination 25 / 0.1 / 3.″2. Therefore, a consistent behaviour as described in Sect. 8.1 is found.

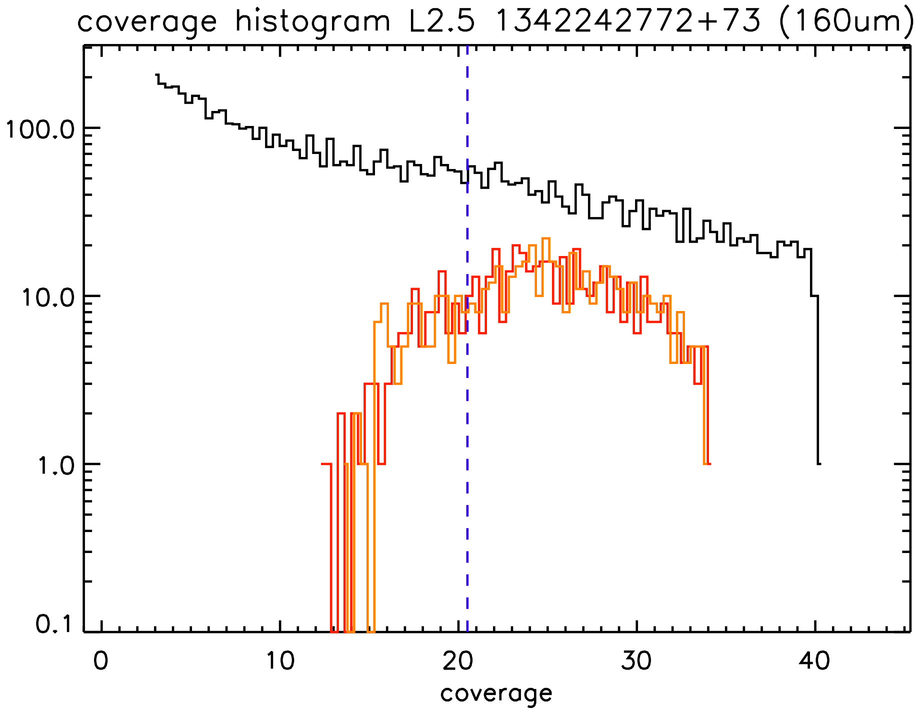

Figure 286: Histogram of the distribution of coverage for the L2.5 product with the SPG mapping parameter combination 25 / 0.1 / 3.″2 (black, all values below a coverage value of 3.0 are cut). The blue dashed line indicates the coverage threshold used in the noise analysis. The red and orange histograms give the coverage distribution inside the source-free noise measurement areas 1 and 2, respectively. The corresponding image map is shown in Fig. 199.

8.3 Ratio of L2.5 to L2.0 noise

Table 25 lists the noise ratio $\frac{\sigma_{\mathrm{histL2.5}}}{\sigma_{\mathrm{histL2}}}$ derived from Table 24. For a perfect square root scaling with time a ratio of 0.707 ($\frac{1}{\sqrt{2}}$) would be expected. The results show that the noise of the L2.5 product can be better by 0.5 – 26%. This indicates that the "mosaic" task, which generates the L2.5 product out of the two L2.0 products, introduces some additional noise correlation, depending on the map parameter combination: The largest noise reduction in L2.5 maps relative to the L2 maps is for the small pixfrac 0.1. Maps with drop sizes equal to the native pixel size (pixfrac = 1.0) and small output pixel size are close to the expected value. Fig. 287 provides an overview.

Table 25: Noise ratio of $\sigma_{\mathrm{histL2.5}}$ to σ_{histL2} . The expected ratio for square root scaling of time would be 0.707. The map parameter combination high-lighted in bold face is used in the Standard Product Generation (SPG). The map parameter combination in italics was typical for the PACS photometric flux calibration analysis.

HPF/pixfrac/outpix	$\frac{\sigma_{\mathrm{histL2.5}}}{\sigma_{\mathrm{histL2}}}$
25 / 0.1 / 2.″1	0.560
25 / 0.1 / 3.″2	0.534
50 / 0.1 / 3.″2	0.526
25 / 0.1 / 4.″8	0.547
25 / 0.1 / 6.″4	0.544
25 / 0.5 / 3.″2	0.577
25 / 1.0 / 2.″1	0.704
25 / 1.0 / 3.″2	0.675
50 / 1.0 / 3.″2	0.673
25 / 1.0 / 4.″8	0.656
25 / 1.0 / 6.″4	0.591

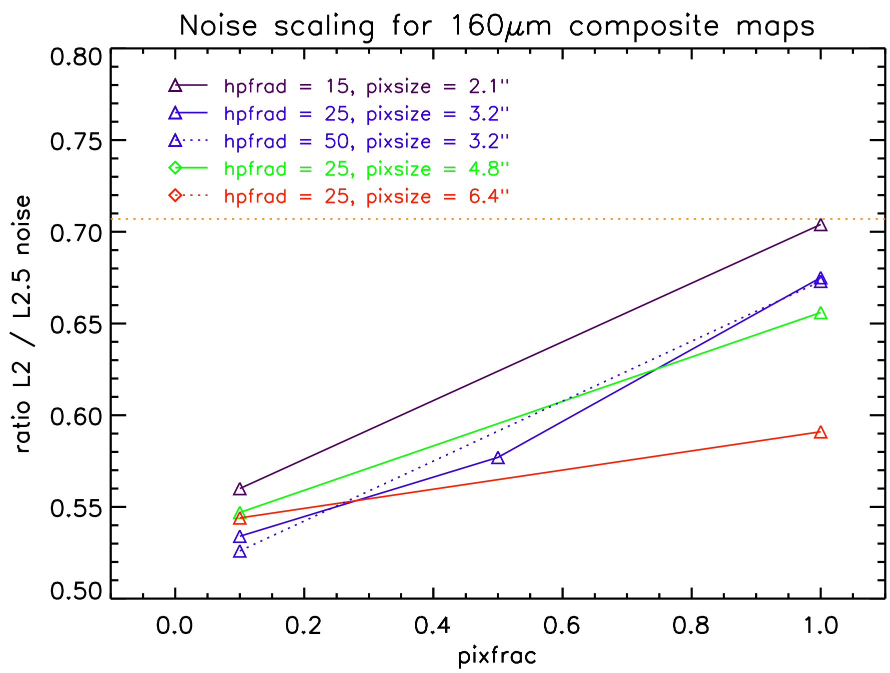

Figure 287: Ratio of L2 to L2.5 (composite of two L2 maps, hence double integration time) noise depending on the mapping parameters. The dotted orange line is the $\frac{1}{\sqrt{2}}$-ratio.

8.4 Noise of the associated error maps

In Figs. 195 through 261 the noise histograms of the error maps above the identical coverage threshold as used for the histogram method on the image maps are shown (Note: No error map analyis was done for map parameter combinations 25 / 0.1 / 2.″1 and 25 / 1.0 / 2.″1). Note that these values contain already the correction of correlated noise.

For a verification of the implementation, the histogram was also derived using the coverage map information and applying Eqns. 3 and 2 (displayed by red dotted lines for L2.0 or dashed-dotted lines for L2.5 maps). For the L2.0 products, there is hardly any difference between the two histograms, while for the L2.5 products a systematic shift of the histograms occurs. The agreement between the two histograms for the L2.0 products is to be expected, since the underlying calculation is the same. In the case of the L2.5 maps, the error map is produced by the "mosaic" task from the two individual error maps of the L2.0 products rather than doing the calculation with the Popesso et al. algorithm starting from the coverage map. The values derived with the Popesso et al. algorithm from the coverage map are 5 – 14% higher than the ones of the error maps.

Table 26 lists the mean values of the noise above the coverage threshold as given by the associated error maps. The ratios $\frac{\sigma^{\rm error}_{\rm meanL2.5}}{\sigma^{\rm error}_{\rm meanL2.0}}$ are all very close to $\frac{1}{\sqrt{2}}$. The explanation for the higher L2.5 noise values derived with the Popesso et al. algorithm is explained by the fact, that the α-parameters in Eqn. 3 are different from -0.5. Only in the case of $\alpha = -0.5$, the noise scales with $\frac{1}{\sqrt{2}}$. Since $\alpha = -0.46 - -0.28$ (Table 3), the noise scales as $10^{-0.37\,log(2)} = 0.774$, which is about 9% higher than $\frac{1}{\sqrt{2}}$. This is a similar behaviour as was found for the 100 µm map parameter combinations (Sect. 7.4), while for all 70 µm map parameter combinations α is close to -0.5 (see Table 3), therefore only small shifts between the two L2.5 histograms occur for these cases (Sect. 6.4).

Table 26: Mean $\sigma^{\rm error}_{\rm mean}$ of the error maps at 160 µm associated with the L2.0 products, IDs 1342242772 and 1342242773, and the co-added L2.5 product. Note that these values contain already the correction of correlated noise. The respective coverage thresholds used for each map are listed. The map parameter combination high-lighted in bold face is used in the Standard Product Generation (SPG).

HPF/pixfrac/outpix	coverage >	L2.0 ID 1342242772 $\sigma^{\rm error}_{\rm mean}$ (mJy)	L2.0 ID 1342242773 $\sigma^{\rm error}_{\rm mean}$ (mJy)	coverage >	L2.5 1342242772+73 $\sigma^{\rm error}_{\rm mean}$ (mJy)
25 / 0.1 / 3.″2	10.5	0.307	0.304	20.5	0.216
50 / 0.1 / 3.″2	10.5	10.7	10.6	20.5	7.54
25 / 0.1 / 4.″8	10.5	0.761	0.756	20.5	0.538
25 / 0.1 / 6.″4	10.5	1.088	1.078	20.5	0.769
25 / 0.5 / 3.″2	260	0.348	0.346	510	0.246
25 / 1.0 / 3.″2	1050	0.582	0.578	2050	0.411
50 / 1.0 / 3.″2	1050	0.526	0.532	2050	0.372
25 / 1.0 / 4.″8	1050	1.586	1.576	2050	1.121
25 / 1.0 / 6.″4	1050	1.222	1.213	2050	0.864

8.5 Comparison of L2.0 product image noise with noise of associated error maps

Table 27 provides the noise values based on the histogram method and the Gauss fit and derives the noise corrected for correlated noise effects, σ_{corr}, by multiplying with the f-factor. These noise values are compared with the corresponding mean values from the associated error maps. For 7 out of 9 combinations we find a reasonable consistency in that respect that the error map noise is on the ≈50 − 90% level of the image noise. The SPG combination has the smallest ratio with 47%.

For the combination 50 / 0.1 / 3.″2 the noise of the error map is more than ten times higher than measured in the image map. This is likely due to non-adequate α and β factors, as can be seen from Table 3 by comparing in particular with the α and β factors for the 25 / 0.1 / 3.″2 combination. As can be seen from Table 3 of Popesso et al. (2012), the HPF range used in the fitting of the 20 parameters goes only up to 40 readouts, so that the extrapolation to 50 readouts likely fails in this case.

Also for the combination 25 / 1.0 / 4.″8 a larger discrepancy is found with the noise of the error map being a factor 2 larger than the corrected noise of the image map. Here the parameter combination is inside the parameter space used for fitting, so that the fitting result of the parameters does not well represent the real α and β values (as we will see in Sect. 8.7 also the f-factor for this map parameter combination is off, however since it is also applied in the error map calculation, it cannot be responsible for the discrepancy reported here).

Table 27: Comparison of the mean flux standard deviation at 160 µm for the L2.0 products, IDs 1342242772 and 1342242773, from Table 24 and corrected for correlated noise effects, with the mean of the error maps associated with the product. The correlated noise factor f and the coverage thresholds used for each map are listed. The map parameter combination high-lighted in bold face is used in the Standard Product Generation (SPG).

HPF/pixfrac/outpix	coverage >	f	L2.0 ID 1342242772 σ_{hist} (mJy)	σ_{corr} (mJy)	$\sigma^{\mathrm{error}}_{\mathrm{mean}}$ (mJy)	$\frac{\sigma^{\mathrm{error}}_{\mathrm{mean}}}{\sigma_{\mathrm{hist}}}$	L2.0 ID 1342242773 σ_{hist} (mJy)	σ_{corr} (mJy)	$\sigma^{\mathrm{error}}_{\mathrm{mean}}$ (mJy)	$\frac{\sigma^{\mathrm{error}}_{\mathrm{mean}}}{\sigma_{\mathrm{corr}}}$
25 / 0.1 / 3.″2	10.5	1.545	0.416	0.643	0.307	0.48	0.399	0.646	0.304	0.47
50 / 0.1 / 3.″2	10.5	1.748	0.456	0.797	10.7	13.4	0.457	0.811	10.6	13.1
25 / 0.1 / 4.″8	10.5	1.439	0.695	1.001	0.768	0.77	0.727	1.042	0.756	0.73
25 / 0.1 / 6.″4	10.5	1.251	1.092	1.366	1.100	0.81	1.120	1.394	1.078	0.77
25 / 0.5 / 3.″2	260	1.934	0.347	0.671	0.354	0.53	0.333	0.669	0.346	0.52
25 / 1.0 / 3.″2	1050	2.510	0.255	0.640	0.590	0.92	0.262	0.658	0.578	0.88
50 / 1.0 / 3.″2	1050	2.728	0.274	0.748	0.536	0.72	0.293	0.805	0.532	0.66
25 / 1.0 / 4.″8	1050	1.515	0.519	0.786	1.606	2.04	0.530	0.780	1.576	2.02
25 / 1.0 / 6.″4	1050	1.542	0.876	1.351	1.240	0.92	0.910	1.442	1.213	0.84

Fig. 288 presents a graphical overview of the results in Table 27. The error map noise is only on the 50% level for the small pixfrac (0.1,0.5) and output pixel size (3.″2) combinations, whereas for the large pixfrac (1.0) and larger output pixel sizes in combination with the small pixfrac the consistency with the noise measured in the image is better than 35%.

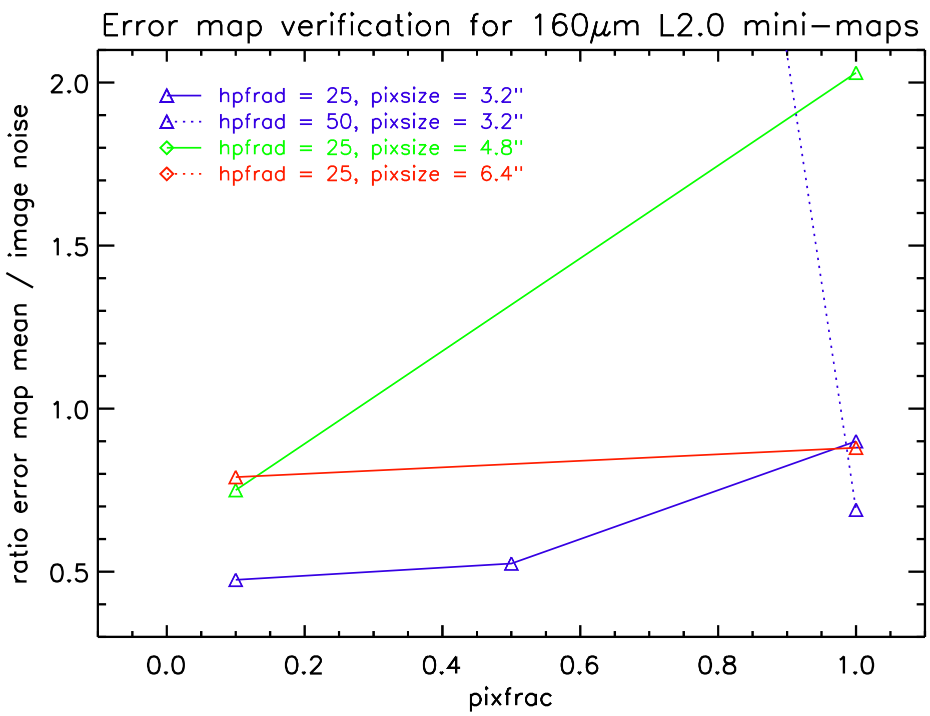

Figure 288: Ratio of mean noise determined from the error maps and image noise derived by the histogram method depending on pixfrac, hpfrad and output pixel size.

8.6 Comparison of L2.5 product image noise with noise of associated error maps

Table 28 provides the corresponding information for the L2.5 products. Since we noted in Sect. 8.3 that the "mosaic" task introduces additional noise correlation, we define an additional correlated noise correction factor

$$f_{\mathrm{mosaicL2.5}} = \frac{0.707}{\frac{\sigma_{\mathrm{histL2.5}}}{\sigma_{\mathrm{histL2}}}},$$

with the ratios $\frac{\sigma_{\mathrm{histL2.5}}}{\sigma_{\mathrm{histL2}}}$ from Table 25.

Again, for 7 out of 9 combinations we find a reasonable consistency in that respect that the error map noise is on the ≈50 − 90% level of the image noise. The SPG combination has the smallest ratio with 49%. The ratios for a certain map parameter combination are quite similar for the L2.5 and L2.0 products when comparing with Table 18. If we omitted the correction factor $f_{\mathrm{mosaicL2.5}}$, then there would be a systematic shift by about +15% for the ratio. The map parameter combinations 50 / 0.1 / 3.″2 and 25 / 1.0 / 4.″8 show the same deviations as were found for the L2 products. This is to expected, since the error map of the L2.5 product is constructed from the two conspicous L2 products.

Table 28: Comparison of the mean flux standard deviation at 160 µm for the co-added L2.5 products, IDs 1342242772+73, from Table 24 and corrected for correlated noise effects, with the mean of the error maps associated with the product. The correlated noise factor f, the "mosaic" task correlated noise factor $f_{\mathrm{mosaicL2.5}}$ and the coverage thresholds used for each map are listed. The map parameter combination high-lighted in bold face is used in the Standard Product Generation (SPG).

HPF/pixfrac/outpix	coverage >	f	L2.5 ID 1342242772+73				
			$f_{\mathrm{mosaicL2.5}}$	σ_{hist} (mJy)	σ_{corr} (mJy)	$\sigma^{\mathrm{error}}_{\mathrm{mean}}$ (mJy)	$\frac{\sigma^{\mathrm{error}}_{\mathrm{mean}}}{\sigma_{\mathrm{corr}}}$
25 / 0.1 / 3.″2	20.5	1.545	1.324	0.217	0.444	0.216	0.49
50 / 0.1 / 3.″2	20.5	1.748	1.344	0.240	0.564	7.54	13.4
25 / 0.1 / 4.″8	20.5	1.439	1.293	0.389	0.724	0.538	0.74
25 / 0.1 / 6.″4	20.5	1.251	1.300	0.600	0.976	0.769	0.79
25 / 0.5 / 3.″2	510	1.934	1.225	0.196	0.464	0.246	0.53
25 / 1.0 / 3.″2	2050	2.510	1.047	0.175	0.460	0.411	0.89
50 / 1.0 / 3.″2	2050	2.728	1.051	0.191	0.548	0.372	0.68
25 / 1.0 / 4.″8	2050	1.515	1.078	0.344	0.562	1.121	2.00
25 / 1.0 / 6.″4	2050	1.542	1.196	0.526	0.970	0.864	0.89

8.7 Final photometric noise values of L2.0 products corrected for correlation effects

In Table 29 the final photometric noise values corrected for correlation effects have been calculated for the different mapping parameters. Input values as $\sigma_{\rm pix}$ were the averaged $\sigma_{\rm hist}$ values of the two L2.0 products for OBSIDs 1342242772 and 1342242773. After calculating the noise inside the photometric aperture and correcting it for correlated noise effects, the final noise values are quite homogeneous for the same high pass filter width: weighted mean values (uncertainties with 3 decimal places were used as weight) are 3.93±0.07 mJy for HPF = 25 (8 combinations) and 4.62±0.06 mJy for HPF = 50, whereby the softer high pass filter width (30) gives a slightly higher final noise.

The only exception is the combination 25 / 1.0 / 4.″8, which was already conspicious wrt. the α and β-factors in Sect. 8.5. From Table 7 in Popesso et al. (2012), column 10" aperture and section HPF with 26 readouts (closest parameter combination to the one used in our study), which gives the values used as input for the parameter fitting, we see that for pixfrac equal 1 the f-factor values for output pixel size equal 1.0, 2.0, 3.0, 4.0 and 6.″4 are 7.05, 3.66, 2.53, 2.12, and 1.52, respectively, hence steadily decreasing. For an output pixel size of 4.″8, the interpolated value would be rather 1.92 than the derived (from the parameter set) 1.515. This would give a $\sigma_{\rm aperture,corr} = 3.97$, well in accordance with the other parameter combinations and the average value given above.

Table 29: Noise per measurement aperture $\sigma_{\rm aperture,corr}$ at 160 µm (aperture radius of 10.″7) corrected for noise correlation effects by the f-factor. The map parameter combination high-lighted in bold face is used in the Standard Product Generation (SPG). The map parameter combination in italics was typical for the PACS photometric flux calibration analysis.

HPF/pixfrac/outpix	$\sigma_{\rm pix}$ (mJy/pix)	$N_{\rm outpixinaper}$	$\sigma_{\rm aperture}$ (mJy)	f	$\sigma_{\rm aperture,corr}$ (mJy)
25 / 0.1 / 2.″1	0.239±0.006	81.6	2.16±0.05	1.746	3.77±0.09
25 / 0.1 / 3.″2	0.408±0.016	35.1	2.42±0.09	1.545	3.73±0.15
50 / 0.1 / 3.″2	0.457±0.025	35.1	2.71±0.15	1.748	4.73±0.26
25 / 0.1 / 4.″8	0.711±0.024	15.6	2.81±0.09	1.439	4.04±0.14
25 / 0.1 / 6.″4	1.106±0.073	8.8	3.28±0.22	1.251	4.10±0.27
25 / 0.5 / 3.″2	0.340±0.011	35.1	2.01±0.07	1.934	3.90±0.13
25 / 1.0 / 2.″1	0.118±0.003	81.6	1.07±0.03	3.963	4.22±0.11
25 / 1.0 / 3.″2	0.259±0.009	35.1	1.53±0.05	2.510	3.85±0.13
50 / 1.0 / 3.″2	0.284±0.009	35.1	1.68±0.05	2.728	4.59±0.15
25 / 1.0 / 4.″8	0.525±0.021	15.6	2.07±0.08	1.515	3.14±0.13
25 / 1.0 / 6.″4	0.893±0.061	8.8	2.65±0.18	1.542	4.08±0.28

8.8 Final photometric noise values of L2.5 products corrected for correlation effects

In Table 30 the final photometric noise corrected for correlation effects of the co-added maps has been calculated for the different mapping parameters. We have used an adapted correction factor $f_{L2.5} = f \times f_{mosaicL2.5}$, with f being the standard correlated noise correction factor from Table 3 and $f_{mosaicL2.5}$ as defined in Sect. 8.6. Input values as σ_{pix} were the σ_{hist} values of the L2.5 products for OBSIDs 1342242772+73. After calculating the noise inside the photometric aperture and correcting it for correlated noise effects, the final noise values are quite homogeneous for the same high pass filter width: weighted mean values (uncertainties with 3 decimal places were used as weight) are 2.78±0.05 mJy for HPF = 25 (8 combinations) and 3.27±0.05 mJy for HPF = 50, whereby the softer high pass filter width (30) gives a slightly higher final noise.

The combination 25 / 1.0 / 4.″8 was excluded from the weighted mean calculation, since in the previous Section 8.7 the f-factor was found inadequate for the correlated noise correction.

Table 30: Noise per measurement aperture $\sigma_{aperture,corr}$ at 160 µm (aperture radius of 10.″7) corrected for noise correlation effects by the $f_{L2.5}$-factor for the co-added maps. The map parameter combination high-lighted in bold face is used in the Standard Product Generation (SPG). The map parameter combination in italics was typical for the PACS photometric flux calibration analysis.

HPF/pixfrac/outpix	σ_{pix} (mJy/pix)	$N_{outpixinaper}$	$\sigma_{aperture}$ (mJy)	$f_{L2.5}$	$\sigma_{aperture,corr}$ (mJy)
25 / 0.1 / 2.″1	0.134±0.005	81.6	1.21±0.05	2.204	2.67±0.10
25 / 0.1 / 3.″2	0.217±0.010	35.1	1.29±0.06	2.046	2.63±0.12
50 / 0.1 / 3.″2	0.240±0.015	35.1	1.42±0.09	2.349	3.34±0.21
25 / 0.1 / 4.″8	0.389±0.025	15.6	1.54±0.10	1.861	2.86±0.18
25 / 0.1 / 6.″4	0.600±0.036	8.8	1.78±0.11	1.626	2.89±0.17
25 / 0.5 / 3.″2	0.196±0.010	35.1	1.16±0.06	2.369	2.75±0.14
25 / 1.0 / 2.″1	0.083±0.003	81.6	0.75±0.03	3.980	2.98±0.11
25 / 1.0 / 3.″2	0.175±0.010	35.1	1.04±0.06	2.628	2.72±0.16
50 / 1.0 / 3.″2	0.191±0.009	35.1	1.13±0.05	2.867	3.24±0.15
25 / 1.0 / 4.″8	0.344±0.018	15.6	1.36±0.07	1.633	2.22±0.12
25 / 1.0 / 6.″4	0.526±0.029	8.8	1.56±0.09	1.844	2.88±0.16

9 Conclusions

The systematic study (with different mapping parameters HPF radius, pixfrac and output pixel size) of two L2.0 HPF mini-maps per filter and their respective L2.5 composite gave the following results:

For 70µm maps:

1) The error maps using the Popesso et al. algorithm are correctly implemented and give consistent results with the noise measured directly in the image map and corrected for correlated noise effects. This is in particular true for the map parameter combination used in Standard product Generation (SPG).

2) The mosaic task produces consistent error maps for the L2.5 in Hipe 14.2.0

3) The noise values for a standard photometry aperture including correction for correlated noise effects with the f-factors by Popesso et al. are quite similar independent of the pixfrac and output pixel size combination showing the consistent derivation of the f-factors (for larger HPF radius the noise values are systematically slightly higher).

4) For some mapping parameter combinations the noise of the L2.5 product can be considerably smaller (by up to 27%) wrt. the L2 products than the $\frac{1}{\sqrt{2}}$ scaling expected from the integration time ratio. We interprete this behaviour as another correlated noise effect introduced by the "mosaic" task. We have therefore derived special $f_{L2.5}$ correlated noise correction factors for the L2.5 maps which are listed in Table 12. Applying these $f_{L2.5}$ correction factors instead of the ones from Table 3, results in similar consistent final noise values for a standard photometry aperture as found for the L2.0 maps.

For 100µm maps:

1) The error maps using the Popesso et al. algorithm are correctly implemented and give consistent results with the noise measured directly in the image map and corrected for correlated noise effects. This is in particular true for the map parameter combination used in Standard product Generation (SPG).

2) The mosaic task produces consistent error maps for the L2.5 in Hipe 14.2.0

3) The noise values for a standard photometry aperture including correction for correlated noise effects with the f-factors by Popesso et al. are quite similar independent of the pixfrac and output pixel size combination showing the consistent derivation of the f-factors (for larger HPF radius the noise values are systematically slightly higher).

4) For some mapping parameter combinations the noise of the L2.5 product can be considerably smaller (by up to 31%) wrt. the L2 products than the $\frac{1}{\sqrt{2}}$ scaling expected from the integration time ratio. We interprete this behaviour as another correlated noise effect introduced by the "mosaic" task. We have therefore derived special $f_{L2.5}$ correlated noise correction factors for the L2.5 maps which are listed in Table 21. Applying these $f_{L2.5}$ correction factors instead of the ones from Table 3, results in similar consistent final noise values for a standard photometry aperture as found for the L2.0 maps.

For 160µm maps:

1) The error maps using the Popesso et al. algorithm are correctly implemented. For 7 out of 9 combinations they give reasonably consistent results (within the 50 – 90% level of the noise measured in the image directly). For two combinations the α and β parameters used in the error calculation turned out to be non-adequate, one because of bad extrapolation with the HPF parameter value being outside the fitted range and one with the fitting result of the parameter space not well representing the real values.

2) The mosaic task produces consistent error maps for the L2.5 in Hipe 14.2.0 However, the noise pattern is systematically shifted to 5 – 14% lower values than the ones derived directly with the Popesso et al. algorithm from the coverage maps.

3) With one exception (due to non-adequate f-parameter), the noise values for a standard photometry aperture including correction for correlated noise effects with the f-factors by Popesso et al. are quite similar independent of the pixfrac and output pixel size combination showing the consistent derivation of the f-factors (for larger HPF radius the noise values are systematically slightly higher).

4) For some mapping parameter combinations the noise of the L2.5 product can be considerably smaller (by up to 25%) wrt. the L2 products than the $\frac{1}{\sqrt{2}}$ scaling expected from the integration time ratio. We interprete this behaviour as another correlated noise effect introduced by the "mosaic" task. We have therefore derived special $f_{L2.5}$ correlated noise correction factors for the L2.5 maps which are listed in Table 30. Applying these $f_{L2.5}$ correction factors instead of the ones from Table 3, results in similar consistent final noise values for a standard photometry aperture as found for the L2.0 maps.

From this study we found a solid procedure to determine consistent and homogeneous noise values via a Gauss fit to the flux distribution histogram which can be adjusted to the map coverage for the source area of interest.