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Erratum: *Herschel*/SPIRE observations of the TWA brown dwarf disc 2MASSW J1207334–393254★

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ABSTRACT

We have revised our analysis of the SPIRE observations of 2MASSW J1207334–393254 (2M1207). Recent PACS observations show a bright source located ∼25 arcsec east of 2M1207. There are issues in terms of the detection/non-detection of the bright source when comparing the *Spitzer*, *WISE* and PACS observations. The object's detection/non-detection is apparently inconsistent, perhaps due to variability or low signal-to-noise ratio of the data. We have looked into the possible misidentification of the target, and have revised the measured SPIRE fluxes and the disc parameters for 2M1207. We have also reviewed which among the various formation mechanisms of this system would still be valid.

Key words: errata, addenda – brown dwarfs – circumstellar matter – stars: individual: 2MASSW J1207334–393254 – stars: low-mass.

1 OBSERVATIONS AND DATA ANALYSIS

The Letter '*Herschel*/SPIRE observations of the TWA brown dwarf disc 2MASSW J1207334–393254' was published in Mon. Not. R. Astron. Soc. **422**, L6–L10 (2012) (hereafter Riaz et al. 2012). We had reported in Riaz et al. (2012) a detection for 2MASSW J1207334–393254 (2M1207) in the *Herschel*/SPIRE bands of 250 and 350 μm. A parallel study conducted by Harvey et al. (2012) based on PACS 70 and 160 μm observations shows a bright source at RA = $12^{h}07^{m}35\overset{s}{.}183$, Dec. = $-39^{\circ}32'52\overset{''}{.}64$ (120735), located ∼25 arcsec east of 2M1207. This is an unclassified source with no SIMBAD matches (other than 2M1207) within 30 arcsec. There is no detection for this object in the Two-Micron All-Sky Survey (2MASS) bands. It is detected ($>2\sigma$) in the *Spitzer* IRAC 3.6 and 4.5 μm bands, but is undetected in the 5.8 and 8 μm bands. We have also checked the *Wide-field Infrared Survey Explorer* (*WISE*) images and there is a detection ($>2\sigma$) for this source at 3.4 and 4.6 μm, but it is undetected in the 12 and 22 μm bands. It was faintly detected at a 1σ level in the *Spitzer* 24 μm image, but was undetected in the *Spitzer* MIPS 70 and 160 μm bands. The *Spitzer* observations were obtained in 2007, whereas the PACS 70 and 160 μm observations were taken in 2010. The object 120735 is an ∼8 mJy source in the PACS 70 μm observation, whereas the 1σ confusion noise in the *Spitzer* 70 μm image is ∼2 mJy. Therefore a 4σ detection with *Spitzer* would have been possible. The non-detection of this source in the *Spitzer* MIPS data could be due to possible variability or the low signal-to-noise ratio of the data. We do not know the nature of this source. If it is a galaxy then it is unlikely to be variable, but then the non-detection in some of the bands is puzzling.

To check the field in the SPIRE images for 2M1207, we had used the previously available *Spitzer* MIPS observations, since the PACS data were not public at the time the analysis was done. 2M1207 is a prominently bright detection in the 24 μm band, while the source 120735 is a faint detection at a 1σ level (Fig. 1). Comparing the *Spitzer* MIPS and the SPIRE fields, we found no clear source detection at the nominal position for 2M1207, while a bright detection was seen at the location of the source 120735. The separation between 2M1207 and the bright object centroid is comparable to the offset from the nominal position of the target (∼14.3 arcsec or ∼2.4 pixel). The offset is also identical in all three SPIRE bands. Considering the marginal (1σ) detection of the source 120735 in the *Spitzer* 24 μm band, its non-detection at *Spitzer* 70 μm, and the mentioned offset in the SPIRE bands, we had identified the bright object in the SPIRE images as 2M1207. A comparison now with the PACS images indicates this to be a misidentification. There is the possibility of variability for the source 120735 and the possible contamination from it cannot be properly accounted for, but considering how bright the object 120735 is in the PACS images, its emission is likely to dominate the SPIRE photometry. Given these uncertainties, we have revised the SPIRE fluxes for 2M1207 by measuring the emission at its nominal position, without considering the positional offset. All SPIRE measurements are upper

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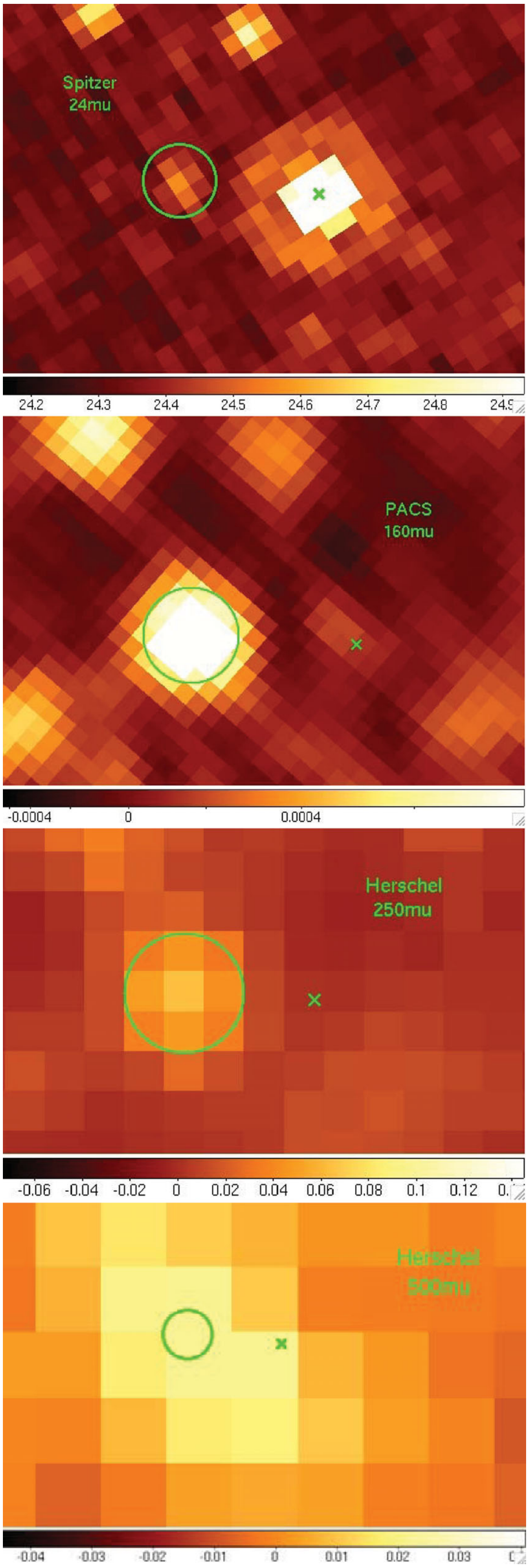

Figure 1. 2M1207 images: (top) *Spitzer* 24 μm; (second) PACS 160 μm; (third) SPIRE 250 μm; (bottom) SPIRE 500 μm. 2M1207 is marked by a cross; source 120735 is marked by a circle. The pixel scale is 2.4 arcsec pixel^{-1} in the *Spitzer* 24 μm band, 0.4 arcsec pixel^{-1} in PACS, 6 arcsec pixel^{-1} in the SPIRE 250 μm band, and 14 arcsec pixel^{-1} in the 500 μm band. In all images, north is up and east is to the left.

Table 1. 2M1207 observations.

Band	Flux (mJy)[a]
I	1.13 ± 0.1
J	10.10 ± 0.89
H	11.35 ± 1.0
K	11.12 ± 0.98
3.6 μm	8.49 ± 0.32
4.5 μm	7.15 ± 0.26
5.8 μm	6.36 ± 0.06
8 μm	5.74 ± 0.21
24 μm	4.32 ± 0.03
70 μm	9 ± 4
250 μm	<5.2
350 μm	<5
500 μm	<16

[a] From Riaz & Gizis (2007) and references therein.

limits (Table 1). The 500 μm upper limit is the same as estimated in the original paper. Both objects lie in a confusion noise dominated region in the 500 μm image (Fig. 1, bottom panel), and the flux values at the nominal position of 2M1207 and at the location of object 120735 are the same. The flux value at 500 μm is higher than at 250 or 350 μm because of the higher confusion noise in this band.

1.1 Revision to section 3 of Riaz et al. (2012): 'Disc modelling'

Using the submillimetre upper limits, the best model fit is for an outer disc radius of 50 au and a disc mass of 0.1 M_{Jup} (Fig. 2). The present model fit is the same as presented in Riaz & Gizis (2008). We refer the readers to that paper for details on the rest of the fitting parameters.

1.2 Revision to section 4.1 of Riaz et al. (2012): 'A massive brown dwarf disc'

A disc mass of ∼0.1 M_{Jup} places 2M1207 among the weaker discs in Taurus. The relative disc mass for 2M1207 [$\log(M_{\mathrm{disc}}/M_*) = -2.4$] is comparable to the weakly accreting systems in the TW Hydrae Association (TWA), such as Hen 3-600.

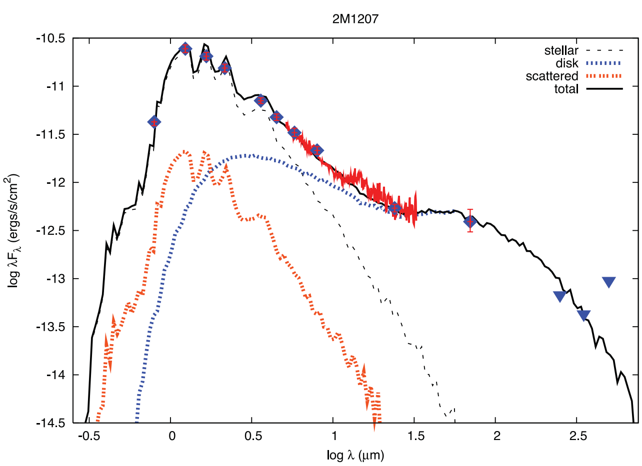

Figure 2. The best model fit for the 2M1207A disc (black line). Also shown is the contribution from the disc (blue) and the stellar photosphere (grey). The *Spitzer*/IRS spectrum is shown in red.

1.3 Revision to section 4.2 of Riaz et al. (2012): 'Formation mechanism of 2M1207A and 2M1207B'

The core accretion mechanism is still unlikely for the same reasons as discussed in section 4.2.1 of Riaz et al. (2012). For disc fragmentation (section 4.2.2), our argument was that even a very low-mass disc could produce a fragment of $\sim$0.035 $M_{\rm Jup}$, which can then grow over time to form a 5 $M_{\rm Jup}$ mass object. The main requirement for such a case is for the initial mass of the disc to be higher than its current estimate (at least 10–20 $M_{\rm Jup}$). An upper limit on the disc mass of $\sim$0.1 $M_{\rm Jup}$ thus still does not rule out disc fragmentation, since the system is relatively old and we have not observed it during its early stages when fragmentation could have occurred ($<$0.1 Myr). The alternative mechanisms, as discussed in section 4.2.3 of Riaz et al. (2012), would still be applicable.

1.4 Revision to section 4.3 of Riaz et al. (2012): 'A largely extended disc'

We had estimated in Riaz et al. (2012) an outer disc radius of 50–100 au. Our current model fit for $R_{\rm max}$ of 50 au is consistent with the previous estimate, and thus the possibility of the planetary mass companion truncating the disc is still applicable. We refer the readers to the discussion in section 4.3 of Riaz et al. (2012).

2 SUMMARY

We have revised the SPIRE fluxes for 2M1207 due to a misidentification of the target. We estimate an upper limit to the disc mass of 0.1 $M_{\rm Jup}$. The applicability of the formation mechanisms discussed in section 4 of our original paper Riaz et al. (2012) has been reviewed.

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