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Transient dust in warm debris disks

Detection of Fe-rich olivine grains

(Corrigendum)

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In Olofsson et al. (2012) the number density distribution n (a quantity not explicitly described in the article), was not properly computed. For a given dust species, at a given distance r from the star, we sampled the grain size distribution over several bins equally spaced in log scale, between the minimum and maximum grain sizes ($s_{\min}$ and $s_{\max}$, respectively). For computational purposes, we originally assumed the width of the bins, $\Delta \log s$, to be the same for all dust species, therefore avoiding several multiplications of $n(r, s)$ by $\Delta \log s$. However, because we used different maximum grain sizes for the amorphous (1 mm) and crystalline grains (1 μm) while we kept the number of bins the same, this assumption was no longer valid. We corrected the DEBRA code so that the bin width is now taken into account when computing $n(r, s)$ for dust species with different $s_{\max}$. Additionally, the first and last bin sizes are now half as wide to ensure the minimum and maximum grain sizes match the input $s_{\min}$ and $s_{\max}$.

In the fitting process, the thermal emission of a single dust grain of size s, at a distance r ($F_{\mathrm{emis}}(r, \lambda, s)$, see Eq. (2) in Olofsson et al. 2012) is then multiplied by the number density $n(r, s)$. The observed spectrum is fitted by a linear combination of the thermal flux emitted by the individual dust species. Therefore the bin width $\Delta \log s$, by which we now multiply $n(r, s)$, is propagated only to the relative abundances. We used $s_{\max}$ of 1 μm and 1 mm for crystalline and amorphous grains, respectively. Therefore, $\Delta \log s$ (and thus n) being smaller for crystalline species, their relative abundances increase with respect to amorphous grains. The trends between different crystalline (or amorphous) grains however remain the same (e.g., Fe-rich versus Mg-rich crystalline olivine grains), since they have the same $\Delta \log s$. Consequently, the best fit parameters remain the same, as well as the best fit models, only the final relative abundances of the dust species required to fit the observed spectrum are modified.

Table 1 shows the correct abundances as well as the newly estimated uncertainties for the dust composition. The crystallinity fractions with respect to the amorphous phases are different (higher crystallinity fractions), but the observed trends between crystalline (or amorphous) grains are still valid. All the results and conclusions discussed in the rest of the study therefore remain unchanged.

References

Olofsson, J., Juhász, A., Henning, T., et al. 2012, A&A, 542, A90

Table 1. Relative abundances (%) and corresponding uncertainties for the best fits.

Star	$MgFeSiO_4$ amorphous	$MgFeSi_2O_6$ amorphous	$MgSiO_3$ amorphous	Mg_2SiO_4 amorphous	Fe-rich olivine	Mg-rich olivine	Enstatite	β-cristobalite	C
HD 113766 A	$0 + 0.7$	31.9 ± 2.0	$0 + 0.7$	20.0 ± 3.6	25.5 ± 3.0	6.4 ± 3.4	$3.2^{+3.3}_{-3.2}$	$0 + 0.7$	12.9 ± 1.4
HD 69830	16.8 ± 3.7	20.0 ± 0.9	$0 + 0.7$	$1.9^{+9.0}_{-1.9}$	20.9 ± 5.1	4.6 ± 0.7	8.1 ± 1.9	7.0 ± 4.2	20.8 ± 4.1
BD+20 307	48.2 ± 1.0	10.5 ± 0.9	$0 + 0.7$	8.7 ± 0.7	14.0 ± 1.6	2.7 ± 1.0	15.9 ± 0.7	$0 + 0.7$	$0 + 0.7$
HD 15407 A	$0 + 0.7$	13.5 ± 5.8	14.7 ± 5.0	$0 + 0.7$	$0 + 0.7$	$0 + 0.9$	$0 + 0.8$	51.9 ± 1.6	19.8 ± 10.2
HD 169666	$0 + 0.8$	$0 + 0.7$	$0 + 0.7$	35.8 ± 0.9	$0 + 0.9$	20.0 ± 7.9	22.2 ± 0.9	10.3 ± 0.7	11.6 ± 4.6
HD 98800 B	15.3 ± 0.7	43.0 ± 0.7	$0 + 0.7$	7.4 ± 1.2	$0 + 0.8$	0.8 ± 0.7	15.7 ± 5.2	$0 + 0.7$	17.8 ± 5.3
ID 8	27.8 ± 8.2	$0 + 0.7$	$0 + 0.7$	51.2 ± 11.7	7.5 ± 2.7	$1.7^{+1.8}_{-1.7}$	$0 + 0.7$	$0 + 0.7$	11.8 ± 2.0