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ISOPHOT's list of standard stars

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Motivation

- The "short" wavelength SED of standard stars can be most accurately derived from the Spitzer/MIPS 24 and 70μm measurements.
- Due to the known problems of the MIPS 160μm filter the long wavelength photometry by Spitzer is less reliable.
- There are a very limited availability of far-infrared (>100μm) measurement of standard stars (or in general of "normal stars").
- The ISOPHOT C100 and C200 cameras had a significant improvement in sensitivity over e.g. the IRAS measurements (see the HPDP report by Moór et al., 2006), and provide a relatively large database.
- C200 measurements are available for more multiple wavelengths (120, 160, 180 and 200μm).

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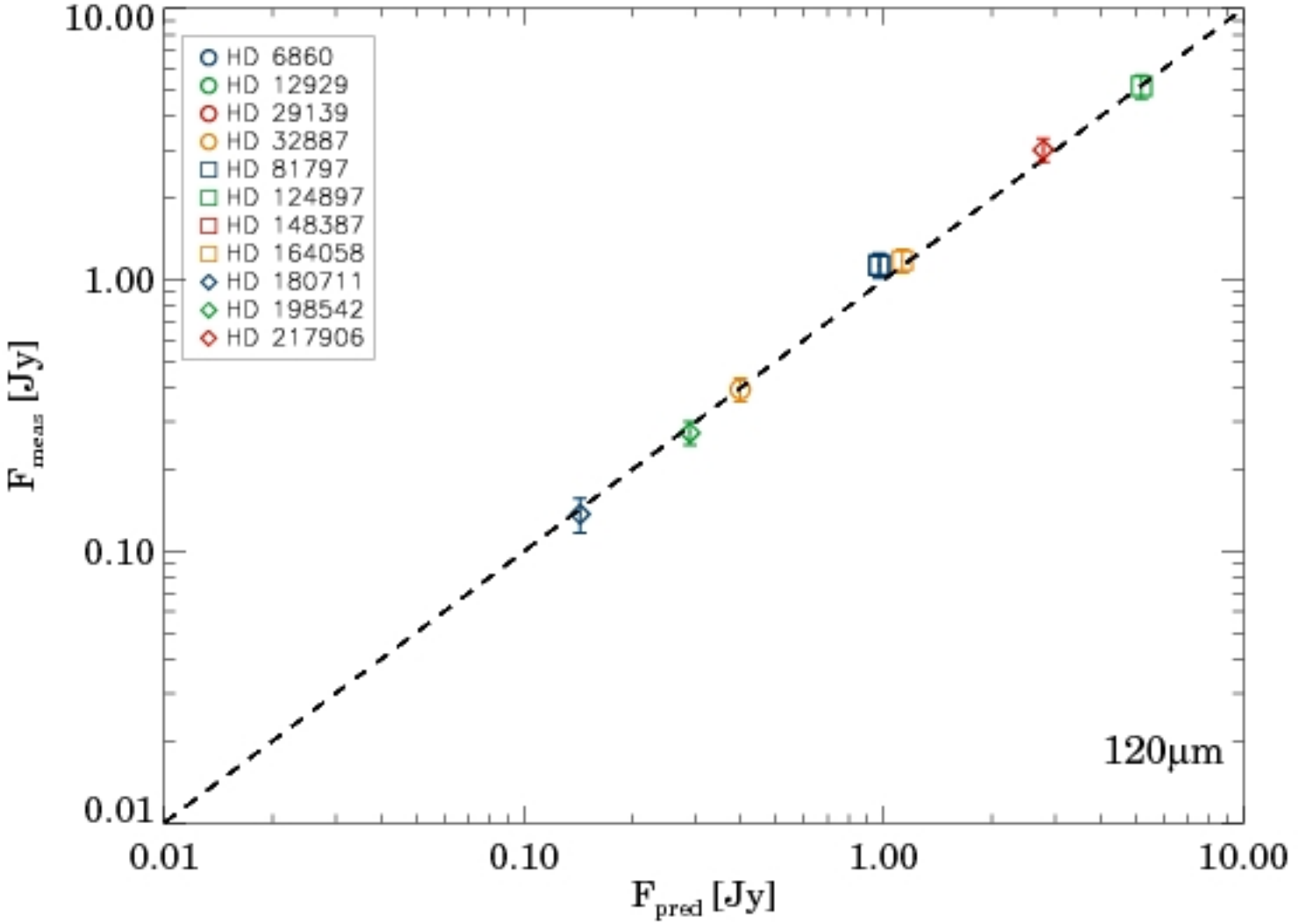

Comparison of predicted photospheric and measured fluxes of standard stars at 120μm

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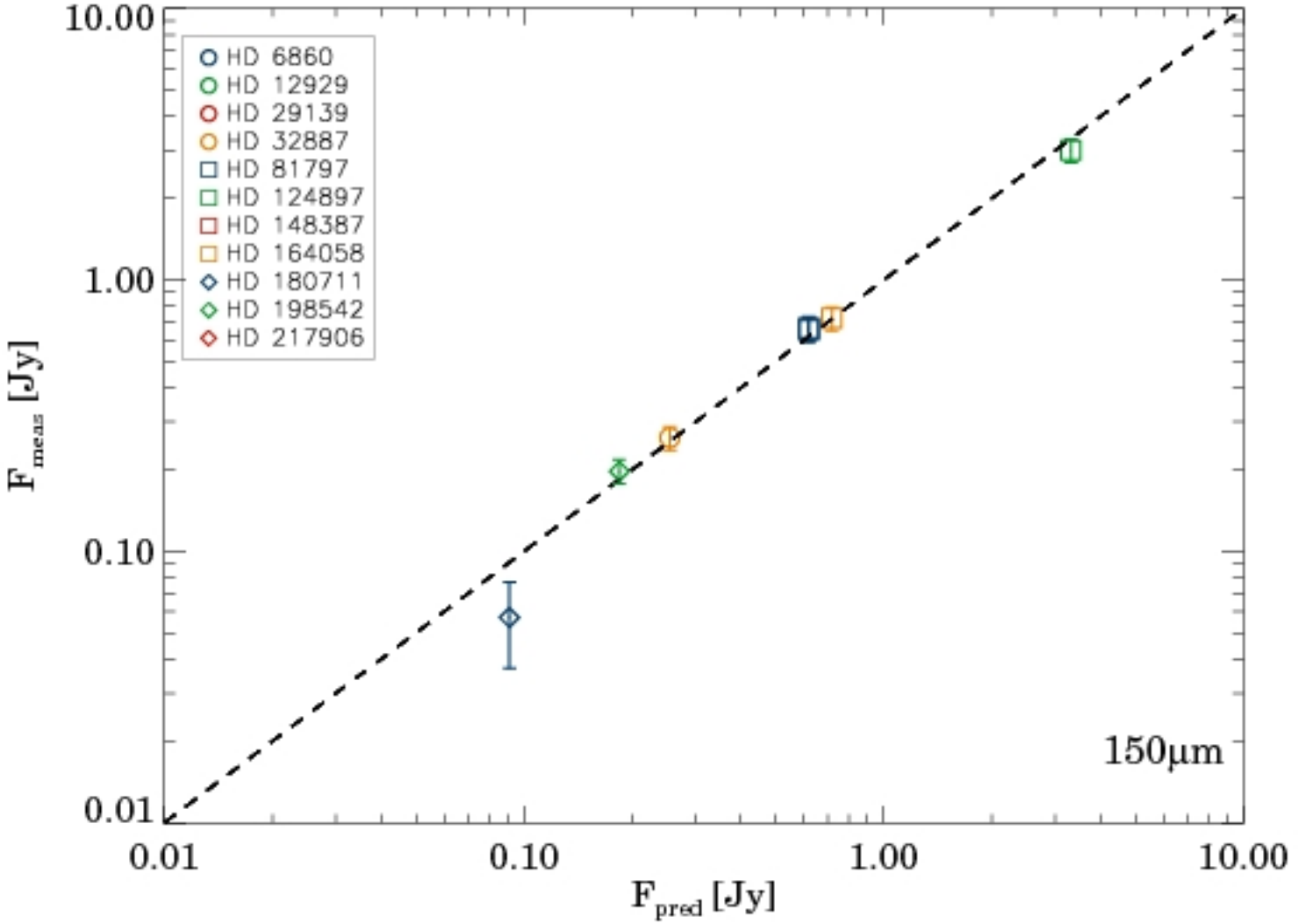

Comparison of predicted photospheric and measured fluxes of standard stars at 150μm

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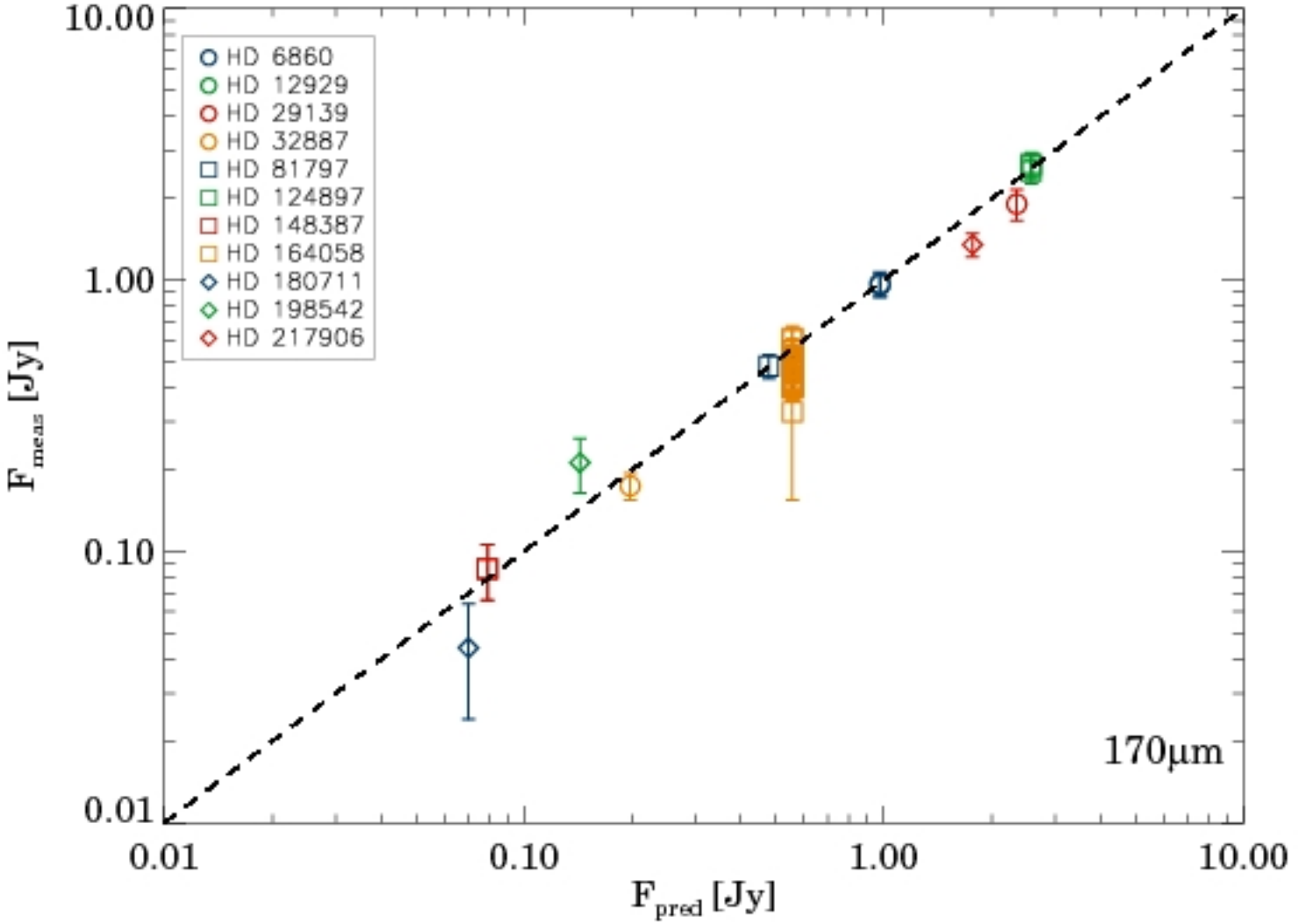

Comparison of predicted photospheric and measured fluxes of standard stars at 170μm

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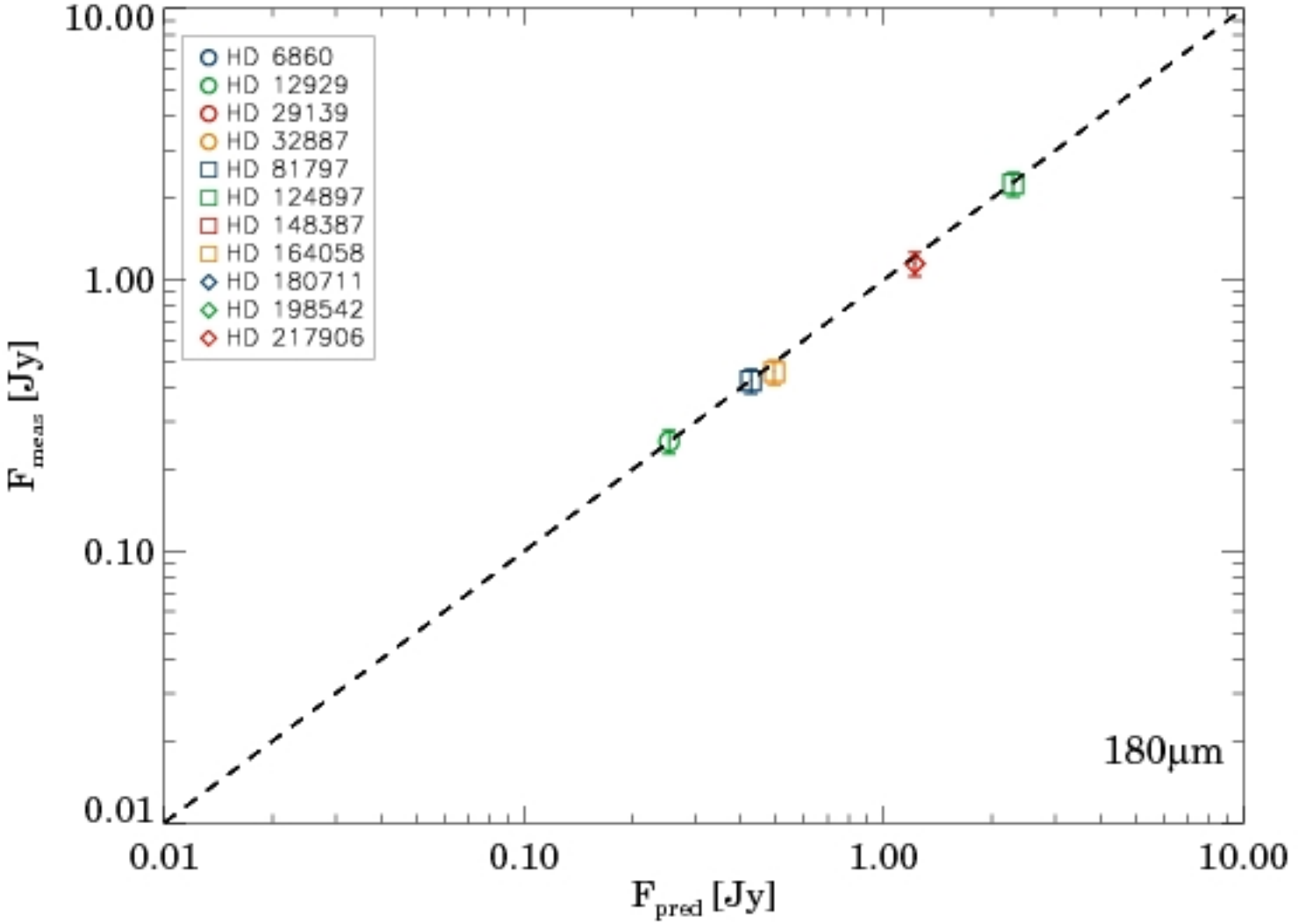

Comparison of predicted photospheric and measured fluxes of standard stars at 180μm

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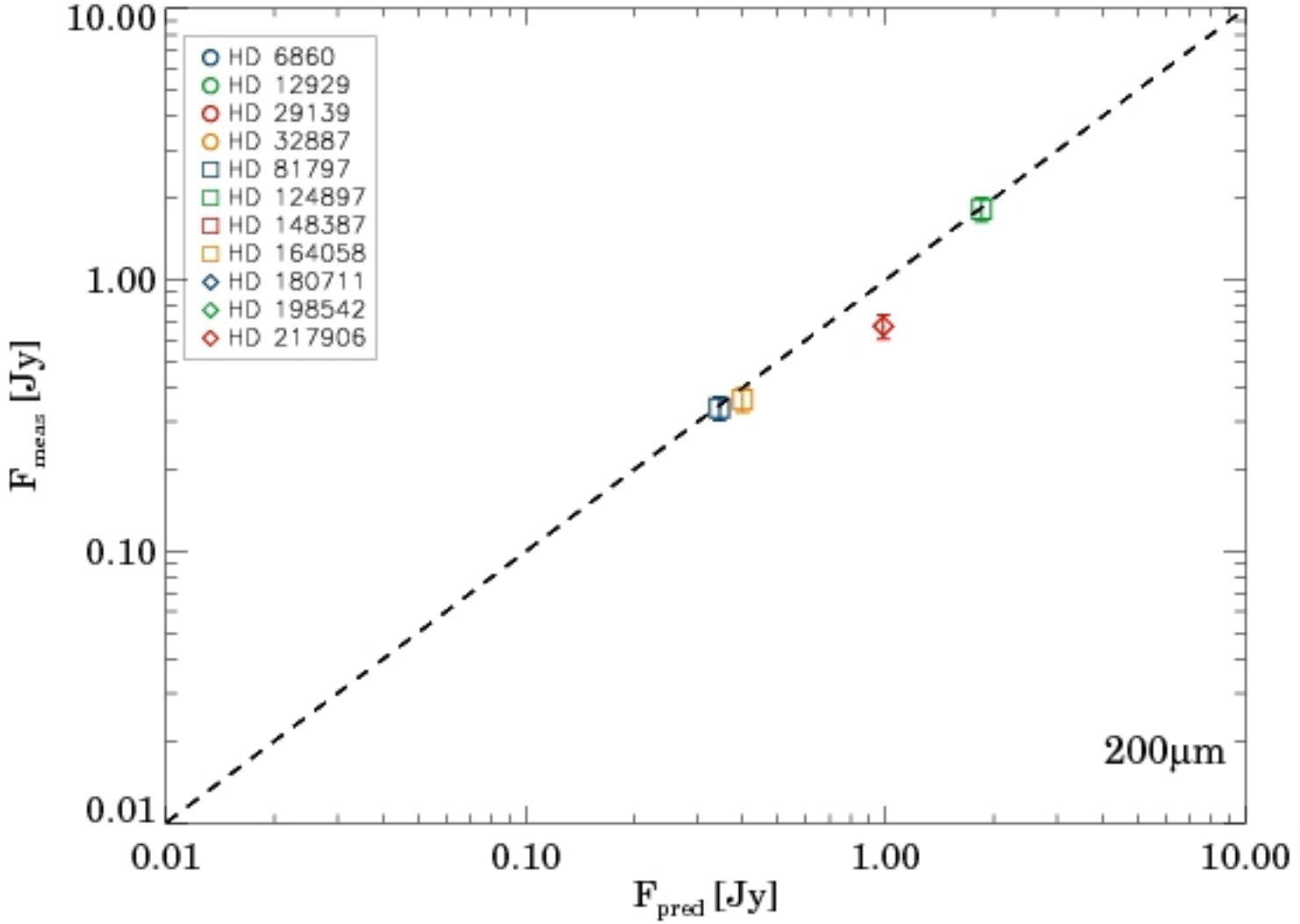

Comparison of predicted photospheric and measured fluxes of standard stars at 200μm

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HD-number	HR-number	wvl. (μm)	TDT-num.	F_P (Jy)	F_M (Jy)	δF_M (Jy)	B_λ (MJysr^{-1})	Orb.ph.
HD 6860	HR 337	170	46304403	0.976	0.970	0.097	9.2	0.84
HD 6860	HR 337	170	46304606	0.976	0.958	0.096	9.5	0.85
HD 12929	HR 617	180	79001902	0.253	0.254	0.026	10.5	0.59
HD 29139	HR 1457	170	86002102	2.341	1.903	0.247	30.8	0.57
HD 32887	HR 1654	120	65002709	0.399	0.395	0.039	4.8	0.73
HD 32887	HR 1654	150	65002103	0.254	0.262	0.026	6.4	0.65
HD 32887	HR 1654	170	65002406	0.197	0.174	0.020	5.4	0.68
HD 81797	HR 3748	120	17600302	0.971	1.128	0.113	6.7	0.20
HD 81797	HR 3748	120	20300302	0.971	1.138	0.114	6.9	0.19
HD 81797	HR 3748	150	17600702	0.618	0.654	0.065	7.0	0.22
HD 81797	HR 3748	150	20300702	0.618	0.665	0.067	7.2	0.21
HD 81797	HR 3748	170	20301102	0.479	0.481	0.048	7.3	0.23
HD 81797	HR 3748	180	21000302	0.427	0.425	0.043	6.0	0.19
HD 81797	HR 3748	200	17601902	0.345	0.337	0.034	5.2	0.28
HD 124897	HR 5340	120	27603008	5.207	5.169	0.517	6.6	0.38
HD 124897	HR 5340	150	27603311	3.313	3.001	0.300	6.5	0.40
HD 124897	HR 5340	170	27603614	2.569	2.630	0.263	6.7	0.42
HD 124897	HR 5340	170	46300903	2.569	2.517	0.252	6.0	0.28
HD 124897	HR 5340	170	46301106	2.569	2.677	0.268	6.8	0.29
HD 124897	HR 5340	180	27602705	2.288	2.254	0.225	6.4	0.37
HD 124897	HR 5340	200	27602402	1.847	1.822	0.182	4.3	0.35
HD 148387	HR 6132	170	30900612	0.079	0.086	0.020	3.9	0.52
HD 148387	HR 6132	170	35800601	0.079	0.086	0.020	3.8	0.29
HD 164058	HR 6705	120	12601902	1.127	1.179	0.118	6.1	0.42
HD 164058	HR 6705	150	12602302	0.717	0.722	0.072	6.8	0.44
HD 164058	HR 6705	170	10002203	0.557	0.612	0.084	7.3	0.53
HD 164058	HR 6705	170	12602702	0.557	0.550	0.055	7.5	0.46
HD 164058	HR 6705	170	42600602	0.557	0.508	0.051	6.6	0.32
HD 164058	HR 6705	170	44002602	0.557	0.602	0.060	7.2	0.54
HD 164058	HR 6705	170	46302802	0.557	0.544	0.054	6.7	0.56
HD 164058	HR 6705	170	46802202	0.557	0.549	0.055	6.0	0.63
HD 164058	HR 6705	170	47603802	0.557	0.509	0.051	6.3	0.75
HD 164058	HR 6705	170	48902602	0.557	0.520	0.052	6.5	0.63
HD 164058	HR 6705	170	50303906	0.557	0.401	0.040	6.0	0.75
HD 164058	HR 6705	170	51702606	0.557	0.408	0.051	6.1	0.45
HD 164058	HR 6705	170	52401606	0.557	0.409	0.041	6.6	0.33
HD 164058	HR 6705	170	53102006	0.557	0.473	0.049	6.6	0.47
HD 164058	HR 6705	170	53803706	0.557	0.413	0.043	6.1	0.82
HD 164058	HR 6705	170	55206106	0.557	0.407	0.041	6.4	0.72
HD 164058	HR 6705	170	56601806	0.557	0.428	0.043	6.0	0.67
HD 164058	HR 6705	170	57903106	0.557	0.418	0.042	6.1	0.66
HD 164058	HR 6705	170	59403106	0.557	0.432	0.043	6.0	0.62
HD 164058	HR 6705	170	60801206	0.557	0.483	0.048	6.1	0.46
HD 164058	HR 6705	170	62201306	0.557	0.477	0.048	6.0	0.47
HD 164058	HR 6705	170	63601606	0.557	0.468	0.047	6.0	0.64
HD 164058	HR 6705	170	65001006	0.557	0.326	0.172	5.6	0.43
HD 164058	HR 6705	170	66101501	0.557	0.479	0.048	5.6	0.67
HD 164058	HR 6705	170	66101702	0.557	0.398	0.040	6.0	0.80
HD 164058	HR 6705	170	66400906	0.557	0.488	0.049	6.2	0.29
HD 164058	HR 6705	170	67800706	0.557	0.492	0.049	6.4	0.26
HD 164058	HR 6705	170	69301006	0.557	0.483	0.048	5.8	0.33
HD 164058	HR 6705	170	70801006	0.557	0.483	0.048	5.8	0.31
HD 164058	HR 6705	170	72000306	0.557	0.493	0.049	6.6	0.20
HD 164058	HR 6705	170	74801306	0.557	0.461	0.046	6.7	0.32
HD 164058	HR 6705	170	77602206	0.557	0.424	0.042	6.2	0.39
HD 164058	HR 6705	170	80400906	0.557	0.457	0.046	6.0	0.38
HD 164058	HR 6705	170	83200606	0.557	0.519	0.056	6.5	0.31
HD 164058	HR 6705	170	86000606	0.557	0.405	0.043	6.5	0.28
HD 164058	HR 6705	180	16404102	0.496	0.458	0.046	6.3	0.77
HD 164058	HR 6705	200	16404602	0.400	0.362	0.036	5.9	0.79
HD 180711	HR 7310	120	60100803	0.143	0.137	0.020	6.5	0.37
HD 180711	HR 7310	150	60101009	0.091	0.057	0.020	7.0	0.42
HD 180711	HR 7310	170	60100906	0.070	0.044	0.020	6.3	0.40
HD 198542	HR 7980	120	73401709	0.289	0.273	0.027	10.9	0.68
HD 198542	HR 7980	150	73401603	0.184	0.197	0.020	11.5	0.63
HD 198542	HR 7980	170	73401706	0.143	0.212	0.048	11.4	0.65
HD 217906	HR 8775	120	18903402	2.774	3.015	0.301	9.4	0.76
HD 217906	HR 8775	170	18904202	1.764	1.349	0.135	11.2	0.80
HD 217906	HR 8775	180	18904602	1.219	1.148	0.115	9.8	0.81
HD 217906	HR 8775	200	18906002	0.985	0.875	0.088	9.5	0.83

Standard stars

- 11 stars: HD 6080, 12929, 29139, 32887, 81797, 124897, 148387, 164058, 180711, 198542, 217906
- General accuracy ~6% for C200, if we exclude the "problematic" stars
- "Problematic" stars:
  - γ Dra and δ Dra (HD 164058 and HD 180711): the 150 and 170 μm measurements of these stars show deviations from the predicted fluxes. Likely reason: Draco is a peculiar region with very high confusion noise, despite the very low surface brightness (see e.g. Kiss et al., 2003) → these measurements should be handled with care.
  - α CMa: Located in a high confusion noise region, for C200_170 the confusion noise level was ~1Jy.

Secondary standards

- Selection criteria:
  - 1) Signal-to-noise ratio > 5 for the measurements
  - 2) $|F_{meas} - F_{pred}| < 2\ \delta F_{meas}$
- Sample: 17 stars in the 60-100μm range
- Problematic stars:
  - HD 203280 (α Cep): close to the Galactic plane and is much affected by confusion noise
  - HD (ε Ind): multiple system, primary is a K4.5V stars, B and C are brown dwarfs (T1 and T6). This may make the photometric prediction less reliable.

Secondary standards

HD-number	Name	λ (deg)	β (deg)	V (mag)	B–V (mag)	Sp.type	FPBand	Mult	MIPS-ID
HD9826	υ And	38.550	28.980	4.10	0.536	F8V	K	1	4033280
HD19373	ι Per	59.270	30.632	4.05	0.595	G0V	K	1	4036608
HD26965	DY Eri	60.183	-28.422	4.43	0.820	K1V	K	1	4206336
HD34411	λ Aur	81.847	16.948	4.69	0.630	G0V	K	1	4038656
HD38393	γ Lep	84.846	-45.818	3.59	0.481	F7V	K	1	0
HD43834	α Men	265.295	-81.766	5.08	0.714	G5V	V	0	4039936
HD126660	θ Boo	182.610	60.109	4.04	0.497	F7V	K	1	4006912
HD142373	χ Her	218.239	60.300	4.60	0.563	F9V	K	0	4050944
HD142860	γ Ser	232.781	35.196	3.85	0.478	F6V	K	1	4051200
HD173667	110 Her	284.779	43.402	4.19	0.483	F6V	K	1	4052992
HD185144	σ Dra	30.294	80.917	4.67	0.786	K0V	K	1	4053760
HD197692	ψ Cap	307.159	-7.029	4.13	0.426	F5V	K	0	4056320
HD203280	α Cep	12.778	68.914	2.45	0.257	A7IV-V	K	1	6037504
HD203608	γ Pav	298.607	-46.972	4.21	0.494	F6V	K	0	4056576
HD209100	ϵ Ind	309.627	-41.409	4.69	1.056	K5V	K	1	4057344
HD222368	ι Psc	357.645	7.154	4.13	0.507	F7V	K	1	4060160
HD224617	ω Psc	2.584	6.363	4.03	0.419	F4IV	K	1	0