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Target selection for the SUNS and DEBRIS surveys for debris discs in the solar neighbourhood

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ABSTRACT

Debris discs – analogous to the asteroid and Kuiper–Edgeworth belts in the Solar system – have so far mostly been identified and studied in thermal emission shortward of 100 μm. The *Herschel* space observatory and the Submillimetre Common-User Bolometer Array-2 (SCUBA-2) camera on the James Clerk Maxwell Telescope will allow efficient photometric surveying at 70 to 850 μm, which allows for the detection of cooler discs not yet discovered, and the measurement of disc masses and temperatures when combined with shorter wavelength photometry. The SCUBA-2 Unbiased Nearby Stars survey (SUNS) and the Disc Emission via a Bias-free Reconnaissance in the Infrared/Submillimetre (DEBRIS) *Herschel* Open Time Key Project are complementary legacy surveys observing samples of ∼500 nearby stellar systems. To maximize the legacy value of these surveys, great care has gone into the target selection process. This paper describes the target selection process and presents the target lists of these two surveys.

Key words: surveys – circumstellar matter – stars: distances – stars: statistics – solar neighbourhood.

1 INTRODUCTION

The solar neighbourhood is an ideal testing ground for the study of debris discs and planetary systems. Proximity maximizes dust mass sensitivity and can allow systems to be spatially resolved. Systems near the Sun span a wide range of stellar parameters, for example mass, age, metallicity and multiplicity. Whilst determining these parameters may not be easy, the diversity included in volume-limited samples makes them ideal for legacy surveys where one may wish to investigate trends as a function of many system parameters.

This paper presents five all-sky volume-limited samples of nearby stellar systems with main-sequence primaries of spectral types A, F, G, K, M. These form the basis of the target lists of two complementary surveys for debris discs using the Submillimetre Common-User Bolometer Array-2 (SCUBA-2, Holland et al. 2003; Audley et al. 2004) camera on the James Clerk Maxwell Telescope (JCMT) and the *Herschel* space observatory (Pilbratt 2008).

The SCUBA-2 Unbiased Nearby Stars survey (SUNS, Matthews et al. 2007) is a large flux-limited survey of 500 systems at 850 μm. The target flux rms is 0.7 mJy beam^{-1}, equal to the extragalactic confusion limit of the JCMT at 850 μm. Shallow 450 μm images of varying depth will be obtained simultaneously, and deep images at 450 μm will be proposed to follow up 850 μm detections.

The Disc Emission via a Bias-free Reconnaissance in the Infrared/Submillimetre (DEBRIS) *Herschel* Open Time Key Program will image 446 systems (356 in common with SUNS) at 110 and 170 μm using the Photodetector Array Camera and Spectrometer (PACS, Poglitsch et al. 2008) instrument, with follow-up of around 100 systems at 250, 350 and 500 μm using the Spectral and Photometric Imaging Receiver (SPIRE, Griffin et al. 2008) instrument. This survey is primarily driven by the 110 μm band, which has the highest dust mass sensitivity for cold discs such as the Kuiper–Edgeworth belt of our Solar system. The intended flux rms at 110 μm is 1.2 mJy beam^{-1}, which is twice the predicted extragalactic confusion limit. 170 μm images are taken simultaneously with a predicted rms of 1.7 mJy beam^{-1}, equal to the predicted extragalactic confusion limit in this band.

The primary goals of these surveys are statistical: in general, how do debris disc properties vary with stellar mass, age, metallicity, system morphology (multiplicity, component masses, separations), presence of planets, etc. To be able to answer so many

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questions and to minimize the risk of unforeseen selection effects, large samples and simple, clearly defined target selection criteria are required. Volume-limited samples satisfy these requirements and, as well as maximizing the proximity of the targets, the stars nearest to the Sun are very widely studied. For example, nearby stars are the main targets of radial velocity, astrometry and direct imaging planet searches. The majority of SUNS and DEBRIS targets also have photometry at 24 and 70 μm from the Multiband Imaging Photometer and Spectrometer (MIPS) instrument on the *Spitzer* space telescope, which ceased operation at the end of 2009 March. This large spectral coverage from 24 to 850 μm for over 300 systems will be an incredible resource for detailed spectral energy distribution modelling of systems with debris discs.

Given that we are considering the closest systems to the Sun, substantial effort was required to compile the samples presented here. Late M-type stars within 10 pc are still being discovered (e.g. Henry et al. 2006), and complete homogeneous data sets covering the spectral type and distance ranges we consider do not exist. We have tried to make our sample selection using the most complete and accurate data available at the time of the DEBRIS proposal submission in 2007 October.

2 SELECTION CRITERIA

Our systems all have primaries (defined here as the component with the brightest visible magnitude) which we believe are main-sequence (i.e. hydrogen burning) stars. The sample is split into five volume-limited subsamples based on spectral type: A, F, G, K and M. In the rest of this paper, we use the term 'X-type system' to mean 'system with X-type primary'. Using separate subsamples is necessary due to the steep nature of the stellar mass function, which for example means that a single volume-limited sample would contain over 100 times as many M-type systems as A-type systems. The choice of using spectral types to split the sample, rather than stellar mass, is purely practical as, with the exception of certain binary systems, stellar masses cannot be directly determined observationally. Using spectral types does, however, have the effect that the subsamples cover quite different ranges in logarithmic mass space.

The early type, upper mass, limit of A0 is chosen as stars of earlier type are too rare in the solar neighbourhood to build a suitably large sample. A conservative late-type limit of M7.0 was chosen to avoid the inclusion of any brown dwarfs, and also to improve the completeness of the M-type sample. M-type stars span the largest log M range of any of our spectral classes, so making a cut at M7.0 will not restrict the statistical usefulness of the sample.

We do not discriminate against multiple star systems, and they are included naturally within the volume limits. We consider common proper motion stars (with compatible parallax where available) as members of the same system, with no specific limit on the binary separation. We have not gone so far as to consider stars with common space motion but large ($\gg 1°$) angular separation as systems. This definition of system membership was primarily chosen for convenience of target selection, but fits well with the statistical goals of these surveys. With the exception of stars in moving groups, each system can be considered to represent a different point in age and composition. The fact that several interesting objects [e.g. with known infrared (IR) excess or planets] are considered here as secondaries does not affect the statistical usefulness of the sample, although it has the disadvantage that such objects may not be observed by these surveys (see below).

The number of systems in each subsample was determined by the selection criteria for SUNS, which required 100 systems in each subsample in the declination range $-40° < \delta < +80°$. Hence, the all-sky samples presented here contain roughly 123 [$100 \times 2/(\sin 80° + \sin 40°)$] systems each. The SUNS sample sizes were chosen to allow detection rates for various subsets e.g. planet hosts to be distinguished (see Matthews et al. 2007).

The DEBRIS target list comprises the nearest systems presented here (all-sky), subject to a cut in the predicted 110 μm cirrus confusion level towards each system. The confusion prediction was taken from the Herschel Confusion Noise Estimator, which is part of the Herschel Observation Planning Tool (HSPOT). Systems with total predicted confusion for point-source detections greater than 1.2 mJy beam^{-1}, corresponding to twice the predicted extragalactic confusion limit, were rejected. To maximize the number of systems observed, DEBRIS will not image secondary components in systems where they will not fit in the PACS point-source field of view (FoV) (150 × 50 arcsec with unconstrained orientation) with the primary. This will affect between 20 and 49 systems depending on the actual field orientations.

The SUNS target list is simply the nearest 100 systems in each subsample here which have $-40° < \delta < +80°$ (with this sample, it does not make any difference whether the cut is made in B1950 or J2000/ICRS equinox declination, but J2000/ICRS should be assumed). The large (~600 × 600 arcsec) FoV of SCUBA-2 means that a maximum of 13 systems will have components not observed with the primary star.

Initially, it had been proposed to only include systems with primaries of spectroscopic luminosity classes V and IV–V. This criterion was retained for G, K and M classes, but was relaxed for A- and F-type stars, where there is not a simple relationship between luminosity class and evolutionary stage (e.g. Gray, Napier & Winkler 2001a; Gray, Graham & Hoyt 2001b). Candidates for the A and F samples (and other candidates without accurately known luminosity classes) were evaluated using their position on a Johnson B, V absolute colour–magnitude diagram. Figs 1 and 2 show such diagrams for the final sample overlaid with solar composition isochrones and zero-age main sequences (ZAMS) for metallicities

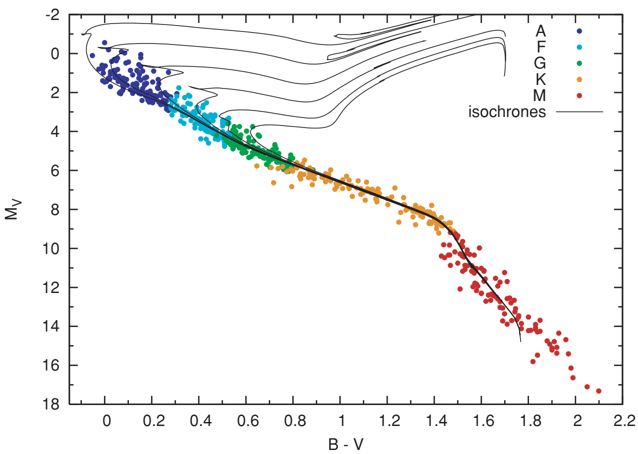

Figure 1. Johnson B, V absolute colour–magnitude diagram for system primaries. Overlaid are [Fe/H] = 0.0, [α/Fe] = 0.0 isochrones from the Dartmouth Stellar Evolution Database (Dotter et al. 2008) with ages of 0.25, 0.5, 1, 2, 4 and 8 Gyr (with turn-offs going from left to right). The photometry is mostly converted from Tycho photometry (Tycho-2 or TDSC) using transformations for unreddened main-sequence stars. For most M-type targets, Johnson B, V photometry from various sources was used (see text). Note that primaries in some close binaries are not individually resolved in this photometry.

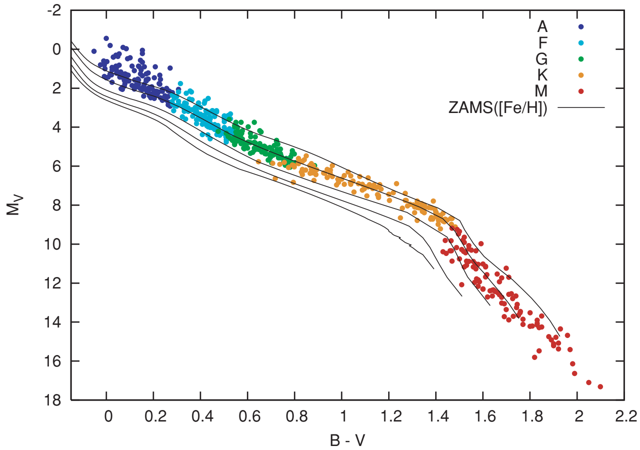

Figure 2. Johnson B, V absolute colour–magnitude diagram for system primaries as in Fig. 1. Overlaid with ZAMS for stars from 0.2 $M_{\odot}$ upwards with [Fe/H] = +0.5, 0.0, −0.5, −1.0, −2.0 (from top to bottom). The ZAMS curves are produced from $[\alpha/\mathrm{Fe}] = 0.0, Y = 0.245 + 1.6Z$ evolutionary tracks from the Dartmouth Stellar Evolution Database (Dotter et al. 2008), with values taken at 2 per cent of the total lifetime of the stars.

from +0.5 to −2.0. A certain amount of leeway had to be allowed for unknown metallicity, and uncertainties in photometry (e.g. unresolved secondaries in close binaries) and parallax.

3 SOURCES OF DATA

3.1 Parallaxes

Hipparcos-based parallaxes were taken from '*Hipparcos*, the New Reduction of the Raw Data' (HIPnr, van Leeuwen 2007) and several papers which applied special analysis to multiple systems [the General Notes issued with the original *Hipparcos* catalogue (HIPgn, Perryman et al. 1997); Falin & Mignard 1999; Söderhjelm 1999; Fabricius & Makarov 2000]. Parallaxes from HIPnr were used unless one of the other resources had a lower uncertainty. In cases where more than one of the other resources provided a parallax for the same *Hipparcos* system, we have taken the parallax from the first resource in the order: Fabricius & Makarov (2000), Söderhjelm (1999), Falin & Mignard (1999), HIPgn. *Hipparcos* parallaxes from multiple resources for the same *Hipparcos* system were not averaged in any way to avoid underestimating the uncertainty in the averaged values, as they have all been reduced from the same data.

The other large parallax resource used was the fourth edition of the Yale General Catalog of Trigonometric Parallaxes [GCTP or Yale Parallax Catalogue (YPC); van Altena et al. 1995], which contains approximately 2300 systems not measured by *Hipparcos* due to the magnitude limit of $V \sim 12$ and the targeted nature of the *Hipparcos* astrometry mission.

In addition, for many M dwarfs, parallaxes from several smaller papers were used (e.g. Hershey & Taff 1998; Ducourant et al. 1998; Benedict et al. 1999; Weis et al. 1999; Costa et al. 2005; Jao et al. 2005; Henry et al. 2006), as well as some unpublished values from the RECONS consortium (Henry, private communication).

Where reliable parallaxes from multiple independent sources, or separate parallaxes for individual components in a system, are available, we take an uncertainty weighted average:

$$\pi_{\mathrm{adopted}} = \frac{\sum_i \pi_i/\sigma_i^2}{\sum_i 1/\sigma_i^2} \quad \text{and} \quad \sigma_{\mathrm{adopted}} = \sqrt{\frac{1}{\sum_i 1/\sigma_i^2}}.$$

Two or more parallaxes were used for 81 per cent of systems and three or more were used for 7 per cent of systems. These cases are mostly due to overlap with *Hipparcos*- and ground-based (e.g. YPC) parallaxes.

3.2 Spectral types

For A–K-type stars, we have used spectral types from Gray et al. (2003, 2006) where they were available. Gray et al. have been obtaining spectra and determining spectral types and stellar parameters (T_{eff}, $[M/\mathrm{H}]$, $\log g$) for stars considered to be within 25 pc and of spectral type earlier than M0 or with no spectral type in the *Hipparcos* catalogue (Perryman et al. 1997). For stars without published Gray et al. types, we have used types from the Michigan Catalogue of HD stars (Houk et al. 1975, 1978, 1982, 1988, 1999), which includes all HD stars south of $\delta_{\mathrm{B1900}} = +05°$. If types from neither Gray et al. nor Houk et al. were available, we have fallen back on types in compilations such as the fifth revised edition of the Bright Star Catalogue (BSC5, Hoffleit & Warren 1991) or the second edition of the Catalog of Components of Double & Multiple stars (CCDM, Dommanget & Nys 2002). These fall-back types are not considered to be accurate, and were largely ignored in the selection process in favour of photometry.

For ∼K5 and later stars, we have generally used spectral types from the Palomar/MSU Nearby-Star Spectroscopic Survey (PMSU, Reid, Hawley & Gizis 1995; Hawley, Gizis & Reid 1996), which provides spectral types for almost all late-type stars in the third Catalogue of Nearby stars (CNS3, Gliese & Jahreiss 1991). A large number of nearby M dwarfs also have measured spectral types in the system or Kirkpatrick, Henry & McCarthy (1991); however, we have chosen to use PMSU types wherever possible for homogeneity. The difference between PMSU and Kirkpatrick et al. types is rarely more than one subtype. For newly discovered nearby M dwarfs not included in the PMSU, types in the Kirkpatrick et al. system (e.g. from Henry et al. 2006) have been adopted.

3.3 Photometry

Whilst distance and spectral type are our primary selection parameters, it was necessary to use photometry both for determining luminosity and when determining spectral class where only low accuracy spectral types were available. As distinguishing between dwarfs and giants for K/M-type stars is very simple and because we had accurate spectral types for almost all candidates later than K5 (see above), photometry was only needed for the selection of systems on the G/K boundary and earlier. All of these candidates are bright enough to have sufficiently accurate photometry in the Tycho-2 catalogue (Høg et al. 2000), the Tycho Double Star Catalogue (TDSC, Fabricius et al. 2002) or the Tycho catalogue (Høg et al. 1997). Where there has been a need to convert between Tycho and Johnson photometry, we have used the relationships in Høg et al. (2000).

3.4 Astrometry

Accurate positions and proper motions were necessary both for matching entries in the various catalogues used and for finding common proper motion companions. Where possible, astrometry from Salim & Gould (2003), Gould & Chanamé (2004), Deacon, Hambly & Cooke (2005), Subasavage et al. (2005a,b), Finch et al. (2007), Henry et al. (2006) and Jao et al. (2005) has been used. For stars not included or not resolved in these, we have used astrometry from the TDSC; Tycho-2; the Tycho Reference Catalogue

(TRC, Høg et al. 1998); Tycho; Bakos, Sahu & Németh (2002), the Positions and Proper Motions catalogue (PPM, Röser et al. 1991, 1993; Röser, Bastian & Kuzmin 1994) or the CCDM (in order of decreasing preference).

4 COMPONENTS OF MULTIPLE SYSTEMS

We have undertaken several steps to maximize the accuracy of the selection of components in multiple systems.

Using the database we have constructed for the purposes of the target selection, we have searched for stars with common proper motion to candidate targets. This not only yielded secondary stars which we had not previously identified but also showed some candidates to be secondaries of other stars. In cases where common proper motion companions have independent parallax measurements, these have been checked to be compatible. Other common proper motion companions have been identified from literature, although a systematic literature search for such companions has not been performed.

We have performed a complete check of all components listed in the CCDM as being in the CCDM systems of our targets. In many cases, components listed in the CCDM are not physically associated (e.g. do not have common proper motion) with the target system. Many CCDM components have cross-identifications with other catalogues, so determining whether they have common proper motion is straightforward. For those without cross-identifications, or without accurate astrometry in other catalogues, only the astrometry in the CCDM could be used.

The process for determining system membership of CCDM components consisted of an automated search for components using the 2MASS Point Source Catalogue (Cutri et al. 2003), and the Tycho/Tycho-2 catalogues, followed by manual inspection of 2MASS and Schmidt survey images, as well as comparison with the Washington Double Star catalogue (Mason et al. 2009) in many cases. CCDM components found not to be comoving with the target systems, or not identified at all, are not included in the sample presented here.

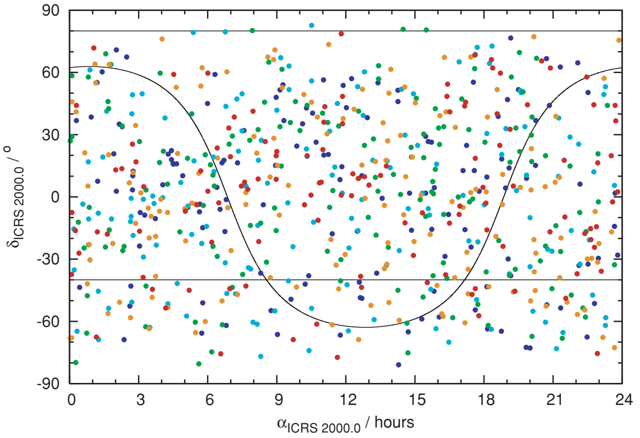

Figure 3. Distribution of all systems in ICRS equatorial coordinates. The SUNS declination limits of +80° and −40°, and the Galactic plane are shown.

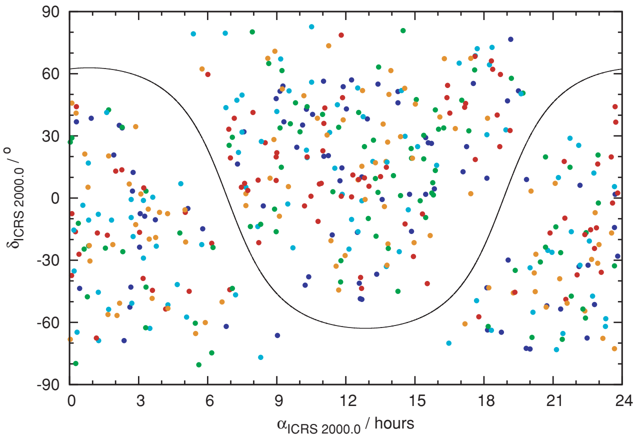

Figure 4. Distribution in ICRS equatorial coordinates of the 446 systems in the DEBRIS survey. The cut in predicted cirrus confusion means that there are few systems near the Galactic plane.

5 SAMPLE PROPERTIES

Overall properties of the subsamples are presented in Table 1, including the numbers of systems containing stars with detected planets and debris discs. Figs 3 and 4 show the distribution of systems on the sky.

5.1 Completeness

In Fig. 5, we show the number of systems as a function of distance for each of our subsamples. The F, G and K subsamples very closely follow a cubic law, indicating that we are justified to assume that they are isotropically and homogeneously distributed in the

Table 1. Summary of subsample properties.

Subsample	d_{max} (pc)	N_{tot}	ρ (pc $^{-3}$)	Med(T_{eff}) (K)	$\sigma_{T_{eff}}$ (K)	N_{planet}	N_{debris}	N_{SUNS}	N_{DEBRIS}
A	45.5	130	0.0014 ± 0.0001	8133	748	2	24	100	83
F	24.1	130	0.0093 ± 0.0008	6360	343	6	21	100	94
G	21.3	125	0.0129 ± 0.0012	5628	249	13	10	100	89
K	15.6	127	0.0335 ± 0.0030	4461	499	5	5	100	91
M	8.58	117	0.1855 ± 0.0171	3175	288	5	1	100	89
Total		629				31	61	500	446

Note. d_{max} and N_{tot} are the maximum distance and number of stars in each subsample. ρ is the volume number density of systems, $\rho = N_{tot}/d_{max}^3 \pm \rho/\sqrt{N_{tot}}$. Med ($T_{eff}$) is the median T_{eff}, and $\sigma_{T_{eff}}$ is the standard deviation of T_{eff} within each subsample. N_{planet} is the number of systems where one or more stars are listed as planet hosts in the exoplanet.eu database (2009 July 27). N_{debris} is the number of systems containing a currently detected debris disc (or other indistinguishable IR excess) as indicated by any of Rhee et al. (2007), Beichman et al. (2006), Su et al. (2006), Trilling et al. (2007). N_{SUNS} and N_{DEBRIS} are the numbers of systems from this paper included in the SUNS and DEBRIS surveys, respectively.

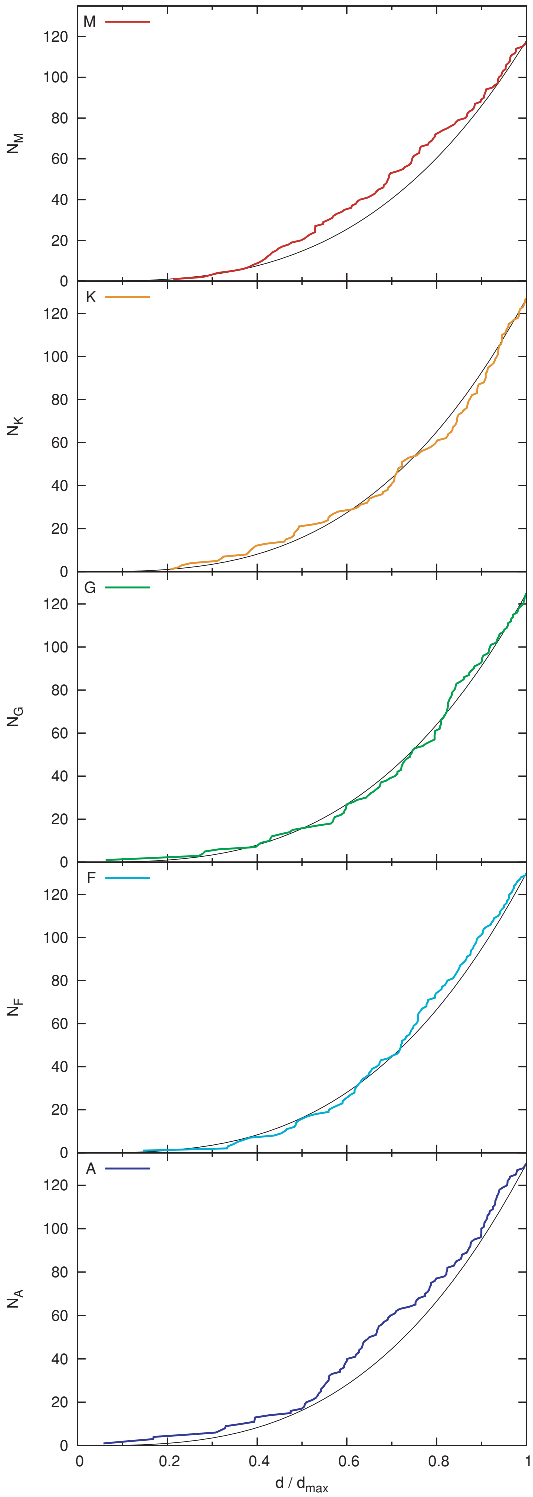

Figure 5. Number of included systems in each subsample as a function of distance ($d_{\max} = 8.58$, 15.6, 21.3, 24.1, 45.5 pc for M, K, G, F, A). For comparison, the line $N = N(d_{\max})(\frac{d}{d_{\max}})^3$ is shown. Note that the F, G, K subsamples fit well indicating no completeness trend with distance. The M subsample is likely incomplete beyond ∼6 pc.

relevant volumes and that we have no selection effects as a function of distance. For the M subsample, there is almost certainly incompleteness at distances beyond ∼6 pc (see e.g. Henry, Kirkpatrick & Simons 1994) which will mostly affect the latest-type stars. The

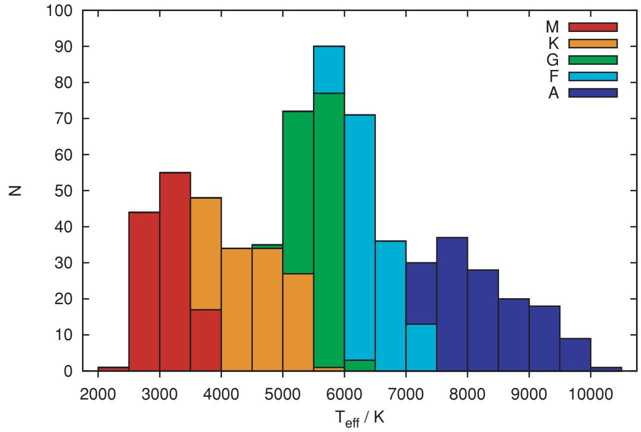

Figure 6. Histogram of number of primaries in 500 K $T_{\rm eff}$ bins. Contributions from each spectral type subsample are shown in colour. For A–K stars, $T_{\rm eff}$ was derived from $(B_{\rm T} - V_{\rm T})$ [or $(B_{\rm J} - V_{\rm J})$ in a few cases where Tycho photometry was not available] using a polynomial fit against $T_{\rm eff}$ values from Gray et al. (2003, 2006) (see Fig. 7). $(B_{\rm T} - V_{\rm T})$ was used in preference to the more accurate temperature indicator $(V - K_{\rm s})$, as components are resolved at very small separations in Tycho-2/TDSC photometry. For M-type stars, $T_{\rm eff}$ was derived from our adopted spectral type using $T_{\rm eff}$ values from Reid & Hawley (2005).

deviation of the A subsample from the cubic law is likely a combination of a slight lack of systems towards the Galactic poles at the largest distances, and correlation between system positions due to the young age of A stars.

5.2 Temperature distribution

As our sample was split into subsamples based on spectral class, we expected to have a good coverage of effective temperature of primary stars from about 2500 to 10 000 K (M7–A0 types). Fig. 6 shows the distribution of $T_{\rm eff}$ for primary stars in our sample in 500 K bins. The colours in the plot indicate the contributions from

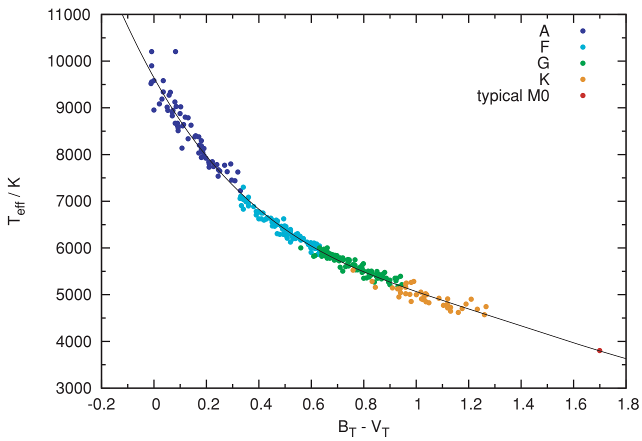

Figure 7. Gray et al. (2003, 2006) $T_{\rm eff}$ versus $(B_{\rm T} - V_{\rm T})$ for primary stars in our sample, with fourth-order polynomial fit. This fit was used to generate $T_{\rm eff}$ values for all A–K primaries for Fig. 6. A point for a typical M0-type star at (1.70, 3800) was added to the fit to make it tie in with $T_{\rm eff}$ values for M-type stars derived from spectral types using relationships in Reid & Hawley (2005).

the five A–M subsamples. For A–K stars, $T_{\rm eff}$ was computed from $(B_{\rm T} - V_{\rm T})$ using a fit to $T_{\rm eff}$ for stars in our sample from Gray et al. (2003, 2006). $(B_{\rm T} - V_{\rm T})$ was chosen as opposed to other photometric colours such as $(B_{\rm J} - V_{\rm J})$ or $(V_{\rm T} - K_{\rm s})$, as accurate homogeneous $B_{\rm T}$ and $V_{\rm T}$ photometry that is resolved down to separations of <0.5 arcsec is available for almost all of our A–K primaries from the Tycho-2 and Tycho Double Star (TDSC) catalogues. The fit of $(B_{\rm T} - V_{\rm T})$ to Gray et al.'s $T_{\rm eff}$ values is shown in Fig. 7. A fourth-order least-squares polynomial fit was obtained:

$$
\begin{aligned}
T_{\rm eff}/{\rm K} = {} & (9646.15 \pm 37.6) \\
& - (10018.4 \pm 354.4)(B_{\rm T} - V_{\rm T}) \\
& + (9056.19 \pm 963.2)(B_{\rm T} - V_{\rm T})^2 \\
& - (4424.10 \pm 950.5)(B_{\rm T} - V_{\rm T})^3 \\
& + (807.378 \pm 302.8)(B_{\rm T} - V_{\rm T})^4.
\end{aligned}
$$

This agrees well with the fit of Ramírez & Meléndez (2005) with $[{\rm Fe/H}] = 0.0$ for their range of validity of $0.344 < (B_{\rm T} - V_{\rm T}) < 1.715$. Our rms of residuals is 150.7 K for 302 stars, which is higher than that of Ramírez & Meléndez (2005) (104 K for 378 stars), as we cover a larger temperature range, have not used [Fe/H] as a fit parameter, and have not accounted for interstellar reddening (although this should be almost negligible for our nearby star sample).

For M-type stars, we determined $T_{\rm eff}$ simply from our adopted spectral type using values from Reid & Hawley (2005). The above photometric fit for A–K stars included a point representative of a typical M0-type star at $(B_{\rm T} - V_{\rm T}) = 1.70$, $T_{\rm eff} = 3800$ K to make the fit consistent with our M star temperatures at the K/M boundary.

The peak in the $T_{\rm eff}$ distribution at about 5700 K is due to the G and F spectral types covering a narrow range in $T_{\rm eff}$. Indeed, in retrospect, there would be justification for treating F and G types as a single spectral-type sample.

Table 2. Reference abbreviations used in the text and tables.

Abbreviation	CDS catalogue(s)	Reference
2MASS	II/246	2MASS Point Source Catalogue (Cutri et al. 2003)
BSC5	V/50	Bright Star Catalogue, 5th Revised Edition (Hoffleit & Warren 1991)
CCDM	I/274	Catalogue of Components of Double & Multiple stars (Dommanget & Nys 2002)
CNS3	V/70A	Catalogue of Nearby Stars, Preliminary 3rd Version (Gliese & Jahreiss 1991)
HIP	I/239	*Hipparcos* Main Catalogue (Perryman et al. 1997)
HIPgn	I/239	*Hipparcos* General Notes (Perryman et al. 1997)
HIPnr	I/311*	*Hipparcos*, the New Reduction of the Raw Data (van Leeuwen 2007)
LHS	I/279	Revised Luyten Half-Second catalogue (Bakos et al. 2002)
NLTT	J/ApJ/582/1011	Revised NLTT Catalog (Salim & Gould 2003)
PPM	I/{146, 193, 206, 208}	Positions and Proper Motions catalogue (Röser et al. 1991, 1993, 1994)
RECXX		RECONS unpublished parallaxes (Henry, private communication)
SCR	J/AJ/{129/413, 130/1658, 133/2898}	SuperCOSMOS-RECONS (Subasavage et al. 2005a,b; Finch et al. 2007)
TDSC	I/276	Tycho Double Star Catalogue (Fabricius et al. 2002)
TRC	I/250	Tycho Reference Catalogue (Høg et al. 1998)
TYC	I/239	Tycho catalogue (Høg et al. 1997)
TYC2	I/259	Tycho-2 catalogue (Høg et al. 2000)
YPC	I/238A	Yale Parallax Catalogue, 4th ed. (van Altena et al. 1995)
WDS	B/wds	Washington Visual Double Star Catalog (Mason et al. 2009)
ben99		Benedict et al. (1999)
bes90		Bessel (1990)
cos05		Costa et al. (2005)
dea05	J/A+A/435/363	Southern Infrared Proper Motion Survey (SIPS, Deacon et al. 2005)
duc98		Ducourant et al. (1998)
egg74		Eggen (1974)
egg79		Eggen (1979)
egg80		Eggen (1980)
fab00	J/A+AS/144/45	Fabricius & Makarov (2000)
fal99	J/A+AS/135/231	Falin & Mignard (1999)
gou04	J/ApJS/150/455	Gould & Chanamé (2004)
gray03	J/AJ/126/2048	Gray et al. (2003)
gray06	J/AJ/132/161	Gray et al. (2006)
jao05		Jao et al. (2005)
hen06		Henry et al. (2006)
haw95	III/198	Palomar/MSU survey (North) (Reid et al. 1995)
haw96	III/198	Palomar/MSU survey (South) (Hawley et al. 1996)
houk	III/{31B, 51B, 80, 133, 214}	Michigan Catalogue of HD stars (Houk et al. 1975, 1978, 1982, 1988, 1999)
her98		Hershey & Taff (1998)
leg92		Legget (1992)
rod74		Rodgers & Eggen (1974)
sod99	J/A+A/341/121	Söderhjelm (1999)
wei91		Weis (1991)
wei96		Weis (1996)
wei99		Weis et al. (1999)

Note: CDS is Centre de Données astronomiques de Strasbourg. For HIPnr we have used the data on the CDROM published with the book, as it had not been added to the CDS at the time.

Table 3. System information: system ID, primary star name, adopted distance and uncertainty ($d = 1/\pi \pm \sigma_\pi/\pi^2$), number of parallax measures used, parallax references (see Table 2), predicted total confusion noise for point source observed with *Herschel*'s PACS instrument at 110 μm, which surveys system is included in (S: SUNS, D: DEBRIS). Note that distance uncertainty is not shown for the two systems with unpublished RECONS parallaxes. The distance for UNS G001 (α + Proxima Centauri) does not include any contribution from Proxima, as the parallax difference from the primary is significant. This example table contains the first 10 systems in each sample; the full table is available in the electronic version of the article (see Supporting Information).

UNS ID	Primary	d (pc)	N_π	References	$C_{\mathrm{PACS,110}}$ (mJy beam^{-1})	Surveys
M001	HIP 87937	1.833 ± 0.001	3	YPC,HIPnr,ben99	1.29	S
M002	GJ 406	2.386 ± 0.012	1	YPC	0.53	S D
M003	HD 95735	2.543 ± 0.004	2	HIPnr,YPC	0.52	S D
M004	GJ 65 A	2.676 ± 0.019	1	YPC	0.52	S D
M005	HIP 92403	2.965 ± 0.017	2	HIPnr,YPC	6.07	S
M006	GJ 905	3.165 ± 0.011	1	YPC	0.78	S D
M007	HD 217987	3.278 ± 0.007	2	YPC,HIPnr	0.52	S D
M008	HIP 57548	3.354 ± 0.015	2	YPC,HIPnr	0.53	S D
M009	GJ 866 AB	3.454 ± 0.052	1	YPC	0.55	S D
M010	HD 173739	3.524 ± 0.018	3	HIPnr,YPC,HIPnr	0.54	S D
		…				
K001	HD 22049	3.216 ± 0.002	2	HIPnr,YPC	0.53	S
K002	HD 201091	3.495 ± 0.006	3	HIPnr,HIPnr,YPC	4.12	S
K003	HD 209100	3.622 ± 0.004	2	HIPnr,YPC	0.52	D
K004	HD 202560	3.946 ± 0.012	2	HIPnr,YPC	0.55	S D
K005	HD 88230	4.866 ± 0.012	2	HIPnr,YPC	0.52	S D
K006	HD 26965	4.984 ± 0.006	2	HIPnr,YPC	0.70	S D
K007	HD 165341	5.080 ± 0.021	2	HIPnr,YPC	1.75	S
K008	HD 131977	5.861 ± 0.023	3	sod99,HIPnr,YPC	0.78	S D
K009	HD 155886	5.949 ± 0.014	4	YPC,HIPnr,YPC,HIPnr	14.83	S
K010	HD 191408	6.015 ± 0.010	2	YPC,HIPnr	0.63	S D
		…				
G001	HD 128620	1.338 ± 0.002	2	YPC,sod99	95.28	
G002	HD 10700	3.650 ± 0.002	2	HIPnr,YPC	0.52	S
G003	HD 185144	5.754 ± 0.006	2	HIPnr,YPC	1.53	S
G004	HD 4614	5.943 ± 0.016	2	HIPnr,YPC	2.60	S
G005	HD 20794	6.043 ± 0.007	2	HIPnr,YPC	0.52	D
G006	HD 131156	6.708 ± 0.021	2	HIPnr,YPC	0.53	S D
G007	CCDM 12337+4121 A	8.440 ± 0.014	2	HIPnr,YPC	0.52	S D
G008	HD 115617	8.555 ± 0.016	2	HIPnr,YPC	0.62	S D
G009	HD 39587	8.683 ± 0.019	2	HIPnr,YPC	15.04	S
G010	HD 114710	9.132 ± 0.014	2	YPC,HIPnr	0.52	S D
		…				
F001	HD 61421	3.507 ± 0.013	2	YPC,HIPnr	0.57	S D
F002	HD 170153	8.032 ± 0.033	2	YPC,sod99	0.56	S D
F003	HD 30652	8.069 ± 0.011	2	YPC,HIPnr	0.76	S D
F004	HD 98231	8.368 ± 0.055	2	YPC,sod99	0.52	S D
F005	HD 1581	8.586 ± 0.012	2	HIPnr,YPC	0.52	D
F006	HD 38393	8.926 ± 0.014	2	YPC,HIPnr	0.53	S D
F007	HD 203608	9.261 ± 0.016	2	YPC,HIPnr	0.53	D
F008	HD 19373	10.542 ± 0.026	2	YPC,HIPnr	8.04	S
F009	HD 102870	10.928 ± 0.026	2	YPC,HIPnr	0.52	S D
F010	GJ 107 A	11.128 ± 0.028	2	HIPnr,YPC	2.17	S
		…				
A001	HD 48915	2.631 ± 0.009	2	HIPnr,YPC	6.21	S
A002	HD 187642	5.125 ± 0.014	2	YPC,HIPnr	1.24	S D
A003	HD 172167	7.681 ± 0.021	2	YPC,HIPnr	0.59	S
A004	HD 216956	7.701 ± 0.028	2	HIPnr,YPC	0.52	S
A005	HD 102647	11.011 ± 0.063	2	HIPnr,YPC	0.54	S D
A006	HD 60179	14.005 ± 0.408	2	HIPnr,YPC	0.54	S D
A007	HD 76644	14.509 ± 0.034	2	YPC,HIPnr	0.52	S D
A008	HD 159561	14.941 ± 0.230	2	YPC,HIPnr	1.26	S
A009	HD 203280	15.038 ± 0.025	2	HIPnr,YPC	7.42	S
A010	HD 128898	16.568 ± 0.038	2	HIPnr,YPC	6.41	
		…				

6 CATALOGUE

Table 2 lists the reference abbreviations used throughout this paper and in the other tables. Tables 3–6 define the sample and give information used in the selection process. Each system is given an identifier of the form XNNN where X is the spectral class (subsample) and NNN is a zero-padded running number increasing with distance in each subsample. These identifiers are referred to by the acronym UNS, standing for Unbiased Nearby Stars, as in the SUNS survey name.

Table 4. Component names, positions and proper motions. 'Primary' column contains 'P' for primary component; 'References' column gives the reference for position and proper motion; ρ column gives separation of component from primary if larger than 1.0 arcsec. ρ should be considered approximate, and time variable for smaller separations (of the order of 100 au or less). It is advised to check orbital solutions to find relative positions for a particular epoch. This example table contains the first six systems in each sample; the full table is available in the online version of the article (see Supporting Information).

UNS ID	Primary	Name	Position ICRS 2000.0		$\mu_\alpha \cos\delta$ (mas yr^{-1})	μ_δ (mas yr^{-1})	References	ρ (arcsec)
M001	P	HIP 87937	17 57 48.50	+04 41 35.8	−798.8	10277.3	NLTT	
M002	P	GJ 406	10 56 28.99	+07 00 52.0	−3841.6	−2725.1	LHS	
M003	P	HD 95735	11 03 20.20	+35 58 11.6	−577.0	−4761.8	NLTT	
M004	P	GJ 65 A	01 39 01.54	−17 57 01.8	3296.2	563.9	NLTT	
M004		GJ 65 B	01 39 01.54	−17 57 01.8	3296.2	563.9	NLTT	
M005	P	HIP 92403	18 49 49.37	−23 50 10.4	644.2	−192.9	NLTT	
M006	P	GJ 905	23 41 55.00	+44 10 38.9	100.0	−1594.1	NLTT	
			...					
K001	P	HD 22049	03 32 55.84	−09 27 29.7	−976.1	18.1	NLTT	
K002	P	HD 201091	21 06 53.94	+38 44 57.9	4155.1	3258.9	NLTT	
K002		HD 201092	21 06 55.27	+38 44 31.3	4117.1	3128.0	NLTT	30.8
K003	P	HD 209100	22 03 21.66	−56 47 09.5	3959.1	−2538.3	NLTT	
K003		2MASS 22041052-5646577	22 04 10.59	−56 46 58.1	4157.4	−2478.3	dea05	402.2
K004	P	HD 202560	21 17 15.27	−38 52 02.5	−3259.0	−1147.0	NLTT	
K005	P	HD 88230	10 11 22.14	+49 27 15.2	−1359.8	−505.7	NLTT	
K006	P	HD 26965	04 15 16.32	−07 39 10.3	−2239.3	−3419.9	NLTT	
K006		HD 26976	04 15 21.50	−07 39 22.3	−2239.3	−3419.9	NLTT	77.9
K006		GJ 166 C	04 15 21.50	−07 39 22.3	−2239.3	−3419.9	NLTT	77.9
			...					
G001	P	HD 128620	14 39 36.50	−60 50 02.3	−3678.2	481.8	NLTT	
G001		HD 128621	14 39 35.08	−60 50 13.8	−3600.4	952.1	NLTT	15.4
G001		HIP 70890	14 29 43.02	−62 40 46.7	−3777.2	775.4	jao05	7866.0
G002	P	HD 10700	01 44 04.08	−15 56 15.9	−1721.8	854.1	NLTT	
G003	P	HD 185144	19 32 21.59	+69 39 40.3	599.2	−1734.7	NLTT	
G004	P	HD 4614	00 49 06.29	+57 48 54.7	1087.1	−559.7	NLTT	
G004		GJ 34 B	00 49 05.17	+57 49 03.8	1104.7	−493.2	TDSC	12.8
G005	P	HD 20794	03 19 55.65	−43 04 11.2	3038.2	728.3	NLTT	
G006	P	HD 131156	14 51 23.39	+19 06 01.7	165.0	−68.6	TYC	
G006		GJ 566 B	14 51 23.05	+19 06 06.8	89.7	−147.3	TDSC	6.9
			...					
F001	P	HD 61421	07 39 18.12	+05 13 30.0	−716.6	−1034.6	NLTT	
F001		GJ 280 B	07 39 18.12	+05 13 30.0	−716.6	−1034.6	NLTT	
F002	P	HD 170153	18 21 03.38	+72 43 58.2	531.1	−351.6	NLTT	
F003	P	HD 30652	04 49 50.41	+06 57 40.6	462.9	11.8	NLTT	
F004	P	HD 98231	11 18 10.90	+31 31 44.9	−453.7	−591.4	NLTT	
F004		HD 98230	11 18 10.95	+31 31 45.7	−453.7	−591.4	NLTT	
F005	P	HD 1581	00 20 04.26	−64 52 29.3	1708.4	1164.8	NLTT	
F006	P	HD 38393	05 44 27.79	−22 26 54.2	−292.4	−368.5	NLTT	
F006		HD 38392	05 44 26.54	−22 25 18.6	−304.4	−352.2	NLTT	97.1
			...					
A001	P	HD 48915	06 45 08.92	−16 42 58.0	−546.0	−1223.1	NLTT	
A001		GJ 244 B	06 45 08.92	−16 42 58.0	−546.0	−1223.1	NLTT	
A002	P	HD 187642	19 50 47.00	+08 52 06.0	536.8	385.5	NLTT	
A003	P	HD 172167	18 36 56.34	+38 47 01.3	201.0	287.5	NLTT	
A004	P	HD 216956	22 57 39.05	−29 37 20.1	329.2	−164.2	NLTT	
A005	P	HD 102647	11 49 03.58	+14 34 19.4	−499.0	−113.8	NLTT	
A006	P	HD 60179	07 34 35.86	+31 53 17.8	−206.3	−148.2	NLTT	
A006		HD 60178	07 34 36.10	+31 53 18.6	−206.3	−148.2	NLTT	3.1
A006		GJ 278 C	07 34 37.45	+31 52 10.2	−206.3	−148.2	NLTT	70.6
			...					

Table 5. A–K primary spectral types, Tycho photometry and effective temperatures: spectral type and reference; Tycho B_T, V_T magnitudes with standard errors and reference; T_{eff} from Gray et al. (2003) or Gray et al. (2006); T_{eff} computed from Tycho photometry (see text). Where TYC2 and TDSC give the same B_T, V_T and uncertainties we use TYC2 as the reference here. In six cases Tycho photometry is not available, so we give values converted from Johnson B, V magnitudes using $V_T = V_J + \frac{0.090}{0.850}(B_J - V_J)$, $B_T = V_J + \frac{1.090}{0.850}(B_J - V_J)$. This example table contains the first eight systems in each sample; the full table is available in the online version of the article – see Supporting Information.

UNS ID	Primary name	SpT	Reference	V_T (mag)	B_T (mag)	Reference	$T_{eff,G}$ (K)	$T_{eff,T}$ (K)
K001	HD 22049	K2 V (k)	gray06	3.814 ± 0.009	4.846 ± 0.014	TYC2	4999	5005
K002	HD 201091	K5 V	gray03	5.349 ± 0.009	6.711 ± 0.014	TYC2		4401
K003	HD 209100	K4 V (k)	gray06	4.826 ± 0.009	6.048 ± 0.014	TYC2		4654
K004	HD 202560	K7.0	haw96	6.845 ± 0.011	8.476 ± 0.017	TYC2		3915
K005	HD 88230	K5	haw95	6.751 ± 0.010	8.340 ± 0.016	TYC2		3990
K006	HD 26965	K0.5 V	gray06	4.506 ± 0.009	5.440 ± 0.014	TYC2	5124	5199
K007	HD 165341	K0- V	gray03	4.217 ± 0.009	5.180 ± 0.014	TYC2	5019	5140
K008	HD 131977	K4 V	gray06	5.880 ± 0.010	7.163 ± 0.016	TYC2		4544
			...					
G001	HD 128620	G2 V	gray06	−0.065 ±	0.707 ±	bes90		5560
G002	HD 10700	G8.5 V	gray06	3.572 ± 0.009	4.380 ± 0.014	TYC2	5358	5474
G003	HD 185144	G9 V	gray03	4.757 ± 0.009	5.657 ± 0.014	TYC2	5210	5270
G004	HD 4614	G0V SB	HIP	3.518 ± 0.009	4.142 ± 0.014	TYC2		5968
G005	HD 20794	G8 V	gray06	4.336 ± 0.009	5.130 ± 0.014	TYC2	5478	5507
G006	HD 131156	G7 V	gray03	4.757 ± 0.009	5.575 ± 0.014	TYC2	5380	5451
G007	CCDM 12337+4121 A	G0 V	gray03	4.309 ± 0.009	4.955 ± 0.014	TYC2	5818	5901
G008	HD 115617	G7 V	gray06	4.810 ± 0.009	5.612 ± 0.014	TYC2	5503	5488
			...					
F001	HD 61421	F5 IV-V	gray03	0.414 ±	0.909 ±	bes90	6629	6421
F002	HD 170153	F7Vvar	HIP	3.614 ± 0.009	4.150 ± 0.014	TYC2		6263
F003	HD 30652	F6V	BSC5	3.222 ± 0.009	3.723 ± 0.014	TYC2		6395
F004	HD 98231	G0V	BSC5	4.310 ± 0.010	4.910 ± 0.010	TDSC		6044
F005	HD 1581	F9.5 V	gray06	4.286 ± 0.009	4.900 ± 0.014	TYC2	5991	6000
F006	HD 38393	F6.5 V	gray06	3.638 ± 0.009	4.162 ± 0.014	TYC2	6372	6307
F007	HD 203608	F9 V Fe-1.4 CH-0.7	gray06	4.276 ± 0.009	4.783 ± 0.014	TYC2	6205	6371
F008	HD 19373	F9.5 V	gray03	4.107 ± 0.009	4.759 ± 0.014	TYC2	5899	5884
			...					
A001	HD 48915	A0mA1 Va	gray03	−1.430 ±	−1.430±	bes90	9580	9646
A002	HD 187642	A7 Vn	gray03	0.955 ± 0.010	1.248 ± 0.012	TYC	7800	7383
A003	HD 172167	A0 Va	gray03	0.029 ±	0.017 ±	bes90	9519	9765
A004	HD 216956	A4 V	gray06	1.248 ± 0.007	1.407 ± 0.009	TYC	8399	8265
A005	HD 102647	A3 Va	gray03	2.143 ± 0.004	2.300 ± 0.003	TYC	8378	8280
A006	HD 60179	A1.5 IV+	gray03	1.944 ±	1.991 ±	CNS3		9194
A007	HD 76644	A7 V(n)	gray03	3.128 ± 0.009	3.358 ± 0.014	TYC2	7769	7769
A008	HD 159561	A5III	BSC5	2.106 ± 0.003	2.315 ± 0.003	TYC		7909
			...					

Table 6. M-type primary spectral types, effective temperatures and Johnson B, V photometry: spectral type and reference; T_{eff} determined from spectral type; Johnson V magnitude and references; Johnson $(B - V)$ colour and references. Where multiple references are given for the photometry, the value given here is the mean of the referenced values. This example table contains the first eight systems; the full table is available in the online version of the article – see Supporting Information.

UNS ID	Name	SpT	SpT ref	T_{eff}(SpT) (K)	V_J (mag)	V_J ref	$(B - V)_J$ (mag)	$(B - V)_J$ ref
M001	HIP 87937	M4	haw95	3100	9.55	wei96,bes90	1.75	wei96,bes90
M002	GJ 406	M5.5	haw95	2700	13.48	wei96,bes90	2.00	wei96,bes90
M003	HD 95735	M2	haw95	3400	7.50	egg74	1.51	egg74
M004	GJ 65 A	M5.5	haw95	2700	12.57	CNS3	1.85	CNS3
M005	HIP 92403	M3.5	haw95	3175	10.43	wei96,bes90	1.75	wei96,bes90
M006	GJ 905	M5	haw95	2800	12.29	wei96	1.91	wei96
M007	HD 217987	M0.5	haw96	3700	7.37	egg74	1.48	egg74
M008	HIP 57548	M4	haw95	3100	11.14	wei96,bes90	1.76	wei96,bes90
				...				

Table 7. Component cross-identifications with common catalogues: system ID, CCDM ID and component, Henry Draper (HD/HDE) ID, Gleise & Jahreiss (CNS3) ID, Luyten Half Second ID, New Luyten Two Tenths ID (record number in original NLTT), Harvard Revised (BSC5) ID, Positions and Proper Motions ID, *Hipparcos* ID, Tycho ID, Tycho Double Star Catalogue ID and component, Bonner Durchmusterung ID, Cordoba Durchmusterung ID, Cape Photographic Durchmusterung ID, Yale Parallax Catalogue (PLX) ID, 2MASS Point Source Catalogue ID (these are determined by simple cone search and may not be reliable in some cases). This example table contains the first six systems in each sample; the full table is available in the online version of the article – see Supporting Information.

UNS	CCDM	HD	GJ	LHS	NLTT	HR	PPM	HIP	TYC	TDSC	BD	CoD	CPD	PLX	2MASS
M001			699	57	45718			87937	425-2502-1		+04 3561a			4098.00	17574849+0441405
M002			406	36										2553.00	10562886+0700527
M003	11033+3558 A	95735	411	37	26105		75640	54035	2521-2279-1		+36 2147			2576.00	11032027+3558203
M004			65 A	9	5504									343.10	01390120-1757026
M004			65 B	10	5505									343.10	01390120-1757026
M005			729	3414	47045		734465	92403	6859-1332-1			−23 14742		4338.00	18494929-2350101
M006			905	549	57692									5736.00	23415498+4410407
									...						
K001	03329-0927 A	22049	144	1557	11207	1084	185905	16537	5296-1533-1	7579 A	−09 697			742.00	03325591-0927298
K002	21069+3844 A	201091	820 A	62	50559	8085	86045	104214	3168-2800-1	57584 A	+38 4343			5077.00	21065341+3844529
K002	21069+3844 B	201092	820 B	63	50560	8086	86049	104217	3168-2798-1	57584 B	+38 4344			5077.00	21065473+3844265
K003		209100	845	67	52724	8387	349918	108870	8817-984-1				−57 10015	5314.00	22032156-5647093
K003															22041052-5646577
K004		202560	825	66	50917		301208	105090	7966-1201-1			−39 14192	−39 8920	5117.00	21171534-3852022
K005	10114+4927 A	88230	380	280	23613		51736	49908	3437-811-1	28452 A	+50 1725			2390.00	10112218+4927153
K006	04153-0739 A	26965	166 A	23	12863	1325	400061	19849	5312-2325-1	8980 A	−07 780			945.00	04151651-0739068
K006	04153-0739 B	26976	166 B	24	12868						−07 781			945.00	04152173-0739173
K006	04153-0739 C		166 C	25	12869									945.00	04152173-0739173
									...						
G001	14396-6050 A	128620	559 A	50	37984	5459	360911	71683	9007-5849-1	38060 A			−60 5483	3309.00	
G001	14396-6050 B	128621	559 B	51	37985	5460		71681	9007-5848-1	38060 B				3309.00	
G001	14396-6050 C		551	49	37460			70890						3278.00	14294291-6240465
G002	01441-1557 A	10700	71	146	5787	509	210580	8102	5855-2292-1	3967 A	−16 295			365.00	01440402-1556141
G003	19322+6941 A	185144	764	477	47961	7462	21580	96100	4448-2481-1	51348 A	+69 1053			4607.00	19322153+6939413
G004	00491+5749 A	4614	34 A	123	2690	219	25718	3821	3663-2669-1	1998 A	+57 150			155.00	00490622+5748545
G004	00491+5749 B		34 B	122				3821	3663-2669-2	1998 B				155.00	00490516+5749037
G005		20794	139	19	10637	1008	307533	15510	7567-1183-1			−43 1028	−43 354	703.00	03195563-4304112
G006	14513+1906 A	131156	566 A			5544	130930	72659	1481-722-1	38468 A	+19 2870			3360.00	14512328+1906034
G006	14513+1906 B		566 B					72659	1481-722-2	38468 B				3360.00	14512328+1906034
									...						
F001	07393+0514 A	61421	280 A	233	18229	2943	153068	37279	187-2184-1	20391 A	+05 1739			1805.00	07391805+0513298
F001	07393+0514 B		280 B	233	18229		153068	37279	187-2184-1	20391 A				1805.00	07391805+0513298
F002	18211+7245 A	170153	713 AB	3379	46426	6927	9830	89937	4437-1491-1	47207 A	+72 839			4245.00	18210342+7243582
F003	04499+0657 A	30652	178		14011	1543	148020	22449	96-1462-1	10147 A	+06 762			1077.00	04495040+0657409
F004	11182+3132 A	98231	423 A	2390	26920	4375	400161	55203	2520-2634-1	31184 A	+32 2132			2625.00	11181100+3131464
F004	11182+3132 B	98230	423 B	2391	26921	4374	400161	55203	2520-2634-2	31184 B				2625.00	11181100+3131464
F005		1581	17	5	1045	77	351761	1599	8843-1706-1				−65 13	54.00	00200446-6452282
F006	05445-2226 A	38393	216 A		15560	1983	249307	27072	5930-2197-1	12638 A	−22 1211	−22 2438	−22 886	1316.00	05442780-2226538
F006	05445-2226 B	38392	216 B		15558	1982	249306		5930-2196-1	12638 B	−22 1210	−22 2437	−22 885	1316.00	05442655-2225184
									...						
A001	06451-1643 A	48915	244 A	219	16953	2491	217626	32349	5949-2777-1	16356 A	−16 1591			1577.00	06450887-1642566
A001	06451-1643 B		244 B	219	16953		217626	32349	5949-2777-1	16356 A				1577.00	06450887-1642566
A002	19508+0852 A	187642	768	3490	48314	7557	168779	97649	1058-3399-1	52618 A	+08 4236			4665.00	19504698+0852060
A003	18369+3847 A	172167	721		46746	7001	81558	91262	3105-2070-1	48054 A	+38 3238			4293.00	18365633+3847012
A004		216956	881		55380	8728	274426	113368	6977-1267-1			−30 19370	−30 6685	5565.00	22573901-2937193
A005	11490+1433 A	102647	448	2462	28642	4534	128576	57632	870-988-1	32248 A	+15 2383			2738.00	11490366+1434197
A006	07346+3153 A	60179	278 A		18087	2891	72938	36850	2457-2407-1	20046 A	+32 1581			1785.00	07343598+3153184
A006	07346+3153 B	60178	278 B		18087	2890	72938	36850	2457-2407-2	20046 B	+32 1581			1785.00	07343598+3153184
A006	07346+3153 C		278 C		18088		72940		2453-1918-1	20046 C	+32 1582			1785.00	07343745+3152102
									...						

Table 8. Notes for specific systems. The full table is available in the online version of the article – see Supporting Information.

UNS ID	Note
M009	Triple system. A,C components are very close binary, B component orbits AC (Delfosse et al. 1999)
M011	CCDM lists a third component (CCDM 00184+4401 C), but this is not associated, CCDM 00184+4401 C is TYC 2794-1389-1
M018	CCDM lists seven other components (CCDM 22281+5741 C,D,E,F,G,H,I), but these are not associated, CCDM 22281+5741 C is TYC 3991-30-1, CCDM 22281+5741 D is clearly visible in 2MASS images (22 28 10.42 +57 42 44.9), but is not in the PSC, CCDM 22281+5741 E is 2MASS 22281788+5742148, CCDM 22281+5741 F is 2MASS 22280456+5742284, identification of CCDM 22281+5741 G,H uncertain, CCDM 22281+5741 I is HD 213209
M024	CCDM lists a secondary (CCDM 17366+6822 A, HD 160861), but this is not associated
	...
K001	ϵ Eridani is not included in DEBRIS, as it is being observed by a Guaranteed Time project
K002	PPM 86047 = FK5 793 is not a component but is the system photocentre , CCDM lists four other components (CCDM 21069+3844 C,D,E,P), but these are not associated, CCDM 21069+3844 C is BD +38 4345, CCDM 21069+3844 D is BD +38 4342, CCDM 21069+3844 E is BD +38 4349, CCDM 21069+3844 P is TYC 3168-1076-1
K003	ϵ Indi B is a brown dwarf binary
K005	CCDM lists two other components (CCDM 10114+4927 B,C), but these are not associated, CCDM 10114+4927 B is HD 233714, CCDM 10114+4927 C is HD 233713
K006	CCDM lists two other components (CCDM 04153-0739 D,E), but these are not associated, CCDM 04153-0739 D is TYC 5313-183-1, CCDM 04153-0739 E is 2MASS 04153228-0730274
	...
G001	Proxima distance: 1.301±0.001 pc (YPC,HIPnr,ben99)
G002	τ Ceti is not included in DEBRIS, as it is being observed by a Guaranteed Time project CCDM lists a secondary (CCDM 01441-1557 B), but this is not associated, CCDM 01441-1557 B is 2MASS 01440770-1558204
G003	CCDM lists a secondary (CCDM 19322+6941 B), but this is not associated, CCDM 19322+6941 B is TYC 4448-2117-1
G004	CCDM lists six other components (CCDM 00491+5749 C,D,E,F,G,H), but these are not associated, CCDM 00491+5749 C is 2MASS 00483853+5748135, CCDM 00491+5749 D is 2MASS 00490544+5751559, CCDM 00491+5749 E is BD +57 155, CCDM 00491+5749 F is TYC 3663-1484-1, CCDM 00491+5749 G is BD +56 129, CCDM 00491+5749 H is HD 236533
G006	CCDM lists two other components (CCDM 14513+1906 C,D), but these are not associated, CCDM 14513+1906 C is 2MASS 14512179+1907087, CCDM 14513+1906 D is 2MASS 14511264+1906463, TYC proper motion is likely inaccurate
	...
F001	Procyon has DA white dwarf secondary (GJ 280 B), CCDM 07393+0514 C,D,E are not associated, CCDM 07393+0514 C is 2MASS 07392181+0516077, CCDM 07393+0514 D is not in 2MASS PSC, but has three entries in 2MASS Survey Point Source Reject Table , CCDM 07393+0514 E is TYC 187-804-1
F002	Spectroscopic binary (SBC9 1058). CCDM lists two wide secondaries (CCDM 18211+7245 B,C), but these are not associated, CCDM 18211+7245 B is TYC 4437-465-1, CCDM 18211+7245 C is 2MASS 18210058+7246592,
F003	CCDM lists a secondary (CCDM 04499+0657 B), but this is not associated CCDM 04499+0657 B is TYC 96-137-1
F006	CCDM lists a third component (CCDM 05445-2226 C) but this is not associated CCDM 05445-2226 C is CPD -22 883, 2MASS 05442769-2223272, ρ, θ in CCDM are suspect
	...
A001	CCDM and WDS list a third component (CCDM 06451-1643 C) orbiting Sirius B, but this is not well confirmed, and is not included here. CCDM lists a wide secondary (CCDM 06451-1643 D), but this is not associated, CCDM 06451-1643 D is visible in 2MASS images (06 45 11.72 -16 41 48.7) but is not in the PSC
A002	Altair is included in DEBRIS despite just missing confusion cut (1.24 versus 1.20 mJy beam^{-1}), CCDM lists two other components (CCDM 19508+0852 B,C), but these are not associated, CCDM 19508+0852 B is 2MASS 19503473+0853019, CCDM 19508+0852 C is 2MASS 19505953+0851129 (ρ in CCDM is slightly too large)
A003	Vega is not included in DEBRIS, as it is being observed by a Guaranteed Time project, CCDM lists four other components (CCDM 18369+3847 B,C,D,E), but these are not associated, CCDM 18369+3847 B is PPM 81557 and is visible in 2MASS images, but is flagged as a persistence artefact, CCDM 18369+3847 C is clearly visible in 2MASS images (18 36 50.24 +38 46 44.6), but is not in the PSC, CCDM 18369+3847 D is clearly visible in 2MASS images (18 36 51.52 +38 47 10.7), but is not in the PSC, CCDM 18369+3847 E is 2MASS 18370125+3848126
	...

The choice of name for components is generally in the order of preference: HD, HIP, GJ, LHS, NLTT, TYC, PPM, CCDM, other catalogue name, 2MASS. For systems with multiple stars, the first identifier in that order which uniquely identifies the component is used. Where components are not resolved in any catalogues we have used, we just give a single entry.

Table 3 lists system properties, including the name of the primary star, our adopted distance and whether the system is included in the SUNS and DEBRIS surveys.

Table 4 lists the components of systems which are resolved in at least one of the catalogues that we have used, and gives positions and proper motions, as well as approximate separation from the primary where this is larger than 1 arcsec. Where two references are listed for a component, the proper motion has been copied from another component in the system, and in several cases the position is computed using a relative position from the CCDM combined with the position of another component.

Tables 5 and 6 list the properties of primary stars in systems, which were used for selection in spectral type and luminosity (spectral type, photometry), and/or in the plots in this paper (photometry, effective temperatures). Table 5 contains the A–K-type primaries with Tycho photometry, and effective temperatures from Gray et al. (2003, 2006) and computed from ($B_T - V_T$). For the few very bright stars where Tycho photometry is saturated, we give values converted from Johnson B, V photometry. Table 6 contains the M-type primaries with spectral types, Johnson B, V photometry and effective temperatures computed from the spectral type.

Table 7 gives cross-identifications for system components in several common catalogues, and Table 8 gives comments on various specific systems. Table 8 includes notes for systems where there are unresolved components, or there are components listed in catalogues which we do not consider physically associated with the system.

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SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article:

Table 3. System information.
Table 4. Component names, positions and proper motions.
Table 5. A–K primary spectral types, Tycho photometry and effective temperatures.
Table 6. M-type primary spectral types, effective temperatures and Johnson *B*, *V* photometry.
Table 7. Component cross-identifications with common catalogues.
Table 8. Notes for specific systems.

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