Discovery of very nearby ultracool dwarfs from DENIS

T.R. Kendall\textsuperscript{1}, X. Delfosse\textsuperscript{1}, E.L. Martín\textsuperscript{2}, and T. Forveille\textsuperscript{3}

\textsuperscript{1} Laboratoire d’Astrophysique de Grenoble, Université Joseph Fourier, 38041 Grenoble Cedex 9, France
e-mail: tkendall@obs.jujf-grenoble.fr, delfosse@obs.jujf-grenoble.fr
\textsuperscript{2} Instituto de Astrofísica de Canarias, Via Láctea, E-38200 La Laguna, Tenerife, Spain
e-mail: ege@ll.iac.es
\textsuperscript{3} CFHT Corporation, 68–1238 Mamalahoa Highway, Kamuela, HI 96743, USA

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Abstract. We report new spectroscopic results, obtained with UKIRT/CGS4, of a sample of 14 candidate ultracool dwarfs selected from the DENIS (Deep Near-Infrared Survey of the Southern Sky) database. A further object, selected from the 2MASS Second Incremental Release, was observed at a later epoch with the same instrument. Six objects are already known in the literature; we re-derive their properties. A further four prove to be very nearby (~10 pc) mid-to-late L-dwarfs, three unknown hitherto, two of which are almost certainly substellar. These findings increase the number of L-dwarfs known within ~10 pc by ~25%. The remainder of the objects discussed here are early L or very late M-type dwarfs lying between ~45 and 15 pc and are also new to the literature. Spectral types have been derived by direct comparison with known template ultracool dwarfs given by Leggett et al.\textsuperscript{1} For the known objects, we generally find agreement to within ~1 subclass with previously derived spectral types. Distances are determined from the most recent M\textsubscript{J} vs. spectral type calibrations, and together with our derived proper motions yield kinematics for most targets consistent with that expected for the disk population; for three probable late M-dwarfs, membership of a dynamically older population is postulated. The very nearby L-type objects discussed here are of great interest for future studies of binarity and parallaxes.

Key words. stars: low mass, brown dwarfs – stars: late-type – stars: kinematics – stars: distances – infrared: stars – surveys

1. Introduction

The analysis of current near-infrared sky surveys such as 2MASS (Two Micron All Sky Survey; Skrutskie et al. 1997), DENIS (Epchtein 1997) and the Sloan Digital Sky Survey (SDSS; York et al. 2000) is rapidly revolutionising our knowledge of the very low-mass dwarf population in the solar neighbourhood. Observations have required the establishment of new spectral classes (L,T) to characterise the very coolest dwarfs (Kirkpatrick et al. 1999; Martin et al. 1999) and very recently Cruz et al. (2003) have increased the number of known M7 – L6 dwarfs by a further 127% (186 new objects), by exploitation of the 2MASS Second Incremental Release. It is the clear goal of current e

2. Observations and Data reduction

Near-infrared spectra were obtained on Jun 25–27, 2001, using CGS4 (Cooled Grating Spectrometer 4) on the United Kingdom Infrared Telescope (UKIRT). Conditions were good and the seeing was ~1.1”. The 40 mm\textsuperscript{-1} grating was employed
Table 1. Basic and derived data for observed targets. The abbreviated name Dnnn will be used throughout this paper. Coordinates are Equinox J2000 and are given in unabbreviated form. Previously known objects are referenced in the final column. IJK magnitudes are from the DENIS database and have typical errors 0.05–0.1 mag. The modified Julian date of the DENIS observation, galactic latitudes, derived spectral types and distances are given in cols. 6, 7, 8 and 9. Spectral types quoted are the mean of those derived from independent K- and H-band derivations, where both are available (see Col. 10). For 2MJ1112, the I-band magnitude is from UKST/SuperCosmos\(^1\); JK from 2MASS.

| Name     | DENIS-P  | I   | J   | K   | MJD       | b   | Sp. | d(pc) | Band ref. |
|----------|----------|-----|-----|-----|-----------|-----|-----|-------|-----------|
| D1048    | J104842.81+011158.2 | 16.2 | 12.9 | 11.5 | 51828.0   | +50.79 | L4  | 9.1±0.9 | K         | H02       |
| D1411    | J141121.30-211950.6 | 15.5 | 12.5 | 11.3 | 51366.5   | +37.83 | M9  | 16.0±0.9 | H, K      | C03       |
| D1425    | J142527.97-365023.4 | 17.7 | 13.7 | 11.7 | 51828.0   | +22.32 | L5  | 10.6±1.1 | K         | -         |
| D1456    | J145601.39-274736.4 | 16.4 | 13.2 | 12.2 | 51374.5   | +27.89 | M9  | 22.0±1.3 | H, K      | C03       |
| D1510    | J151047.85-281817.4 | 16.0 | 12.8 | 11.4 | 51828.0   | +25.27 | M8  | 21.0±2.0 | H, K      | G02       |
| D1514    | J151450.16-225435.3 | 17.1 | 14.0 | 12.9 | 51828.0   | +29.14 | L7  | 19.7±4.4 | K         | -         |
| D1539    | J153941.96-052042.4 | 17.5 | 13.8 | 12.4 | 51828.0   | +37.98 | L2  | 19.5±5.0 | H         | -         |
| D1705    | J170548.38-051645.7 | 16.6 | 13.2 | 12.1 | 51698.6   | +20.62 | L4  | 10.7±1.0 | H, K      | -         |
| D2036    | J203608.64-130638.3 | 18.2 | 14.7 | 13.5 | 51828.0   | -29.07 | M9.5 | 41.7±5.1 | H, K      | -         |
| D2057    | J205754.10-025229.9 | 16.6 | 13.2 | 11.6 | 51786.7   | -29.26 | L1.5 | 16.2±1.3 | H, K      | C03       |
| D2200    | J220002.05-303832.9 | 16.7 | 13.4 | 12.4 | 51776.7   | -52.74 | L0   | 21.7±4.0 | H, K      | -         |
| D2229    | J222958.15-065043.2 | 18.0 | 14.5 | 13.2 | 51828.0   | -50.80 | M9.5 | 38.0±2.2 | H, K      | -         |
| D2252    | J225210.73-173013.4 | 17.9 | 14.2 | 12.8 | 51435.6   | -60.88 | L7.5 | 8.3±0.7  | H, K      | -         |
| D2254    | J225451.90-284025.4 | 17.4 | 14.1 | 12.8 | 51775.8   | -64.26 | L0.5 | 28.2±1.7 | H         | C03       |
| D2270    | J227016.44+053045.2 | 17.9 | 13.9 | 12.4 | 51828.0   | -52.07 | L0.5 | 28.2±1.7 | H         | C03       |
| 2MJ1112  | 2MASS J11124910-2044315 | 18.3 | 14.9 | 13.5 | 50930.6   | +36.51 | L0.5 | 41.1±4.1 | J         | -         |

1. [http://www-wfau.roe.ac.uk/sss](http://www-wfau.roe.ac.uk/sss)
C03: Cruz et al. (2003)
G02: Gizis et al. (2002)
H02: Hawley et al. (2002)

![Fig. 1. DENIS colour-colour diagram](image)

Fig. 1. DENIS colour-colour diagram. The objects discussed in this Letter are represented by large circles (L-dwarfs) and large squares (M-dwarfs). Small symbols are the previously published DENIS ultracool dwarfs (Delfosse et al. 1999, Martin et al. 1999). The complete sample of DENIS candidate ultracool dwarfs are plotted as crosses. Note that the diagram excludes objects without a DENIS-K magnitude: some such objects are retained in our overall sample on the basis of their (I – J) colour only.

using the long camera yielding complete wavelength coverage of in the H and K passbands at a resolution R ~ 400. The 2MASS object, 2MJ1112, was observed in the J-band on 3 Feb 2003 with a similar instrumental setup.

Data reduction was performed using the ORAC pipeline developed at UKIRT. However, telluric correction, performed using standard (A- and F-type) spectra taken before and after each science exposure, yielded spurious residual features resulting from hydrogen line absorptions in the standard spectra. Such features were fitted and removed and, after division by an appropriate Planck function, the divisor spectra were re-divided into the target spectra. In cases where divisor spectra suffered from fringing, a different standard spectrum (selected to be as close as possible a match in observation time and airmass) was employed. This does not affect the relative flux calibration (i.e. spectral shape) important for spectral typing.

3. Spectral types, distances and kinematics

Spectral types have been estimated by direct comparison with known template objects. In Fig. 2 these results are shown over the whole wavelength range so employed. The ranges are constrained by the presence of telluric water vapour absorptions: we used K: 1.95–2.42\(\mu\)m and H: 1.45–1.8\(\mu\)m. The templates used have the following sources: Geballe et al. (2002) 2M1632 L8, SDSS 2249 L5, SDSS 0236 L6, Kelu-1 L2; Reid et al. 2001 2MA036 L3.5, 2M0746 L0.5; Leggett et al. (2001) BRI 0012 M9.5, LP 944 M9, LHS 429 (=GL464C) M9, t513 (=TVLM 513–4656) M8.5. All have been allocated spectral types on a common system (Kirkpatrick et al. 1999); hence our derived types are also on this system. While as many templates as possible were compared to the data, the grid of templates is not uniform in terms of wavelength or spectral type coverage: we have plotted the best fits to the data and adopted the spectral types so suggested (Fig. 2). In some cases it was found necessary to create a new template by averaging two template spectra, whose types differ by no more than 1.5 subclasses, to yield a satisfactory fit
which our near-infrared data require a later type of L4, and the which Hawley et al. (2002) give L1 from far-red data, but for
discrepancy in the former case might suggest binarity, with the this case we adopt M9, as indicated by the
almost all cases we find good agreement, to the data. Where possible, independent types have been de-
to the data. Where possible, independent types have been de-

tions from parallaxes in the given references.
1. Martín et al. (1999) 2. Cruz et al. (2003) 3. Bouy et al. (2003) 4. Dahn et al. (2002) 5. This Letter 6. Reid et al. (2000) 7. van Altena et al. (1995) 8. Goldman et al. (1999) 9. Salim et al. (2003) 10. Wilson et al. (2003)

### Table 2. The nearest L-dwarfs to the Sun, ordered by distance.

Where distances are measured from a parallax determination, this is indicated. Otherwise, distances are based on current calibrations and have been obtained from the literature. Rather few L-dwarfs have been found within ~10 pc and this work increases the known database of such objects by ~25%.

| Name          | Survey id.& ref. | Sp. | d(pc) | Ref. |
|---------------|------------------|-----|-------|------|
| DENIS-P J025503.5–470050 | L8 | 4.9±0.3 | 1,2 |
| 2MASSW J1438082+640836 | L6 | 7.2 | 3 |
| 2MASSI J1507476–162738 | L5 | 7.33±0.03’ | 2,4 |
| D2252 | DENIS-P J225210.7–170313.4 | L7.5 | 8.3±0.6 | 5 |
| 2MASSI J0835425–081923 | L5 | 8.3±0.9 | 2 |
| 2MASSW J2306292+154905 | L4 | 8.6 | 3 |
| 2MASSI J0036159+182110 | L3.5 | 8.76±0.06’ | 3,6 |
| D1048 | DENIS-P J104842.8+011582.2 | L4 | 9.1±1.0 | 5 |
| 2MASSI J1515009+484739 | L6.5 | 9.2±1.8 | 2 |
| GJ 1001B (LHS 1028) | L5 | 9.6±1.2’ | 7,8 |
| 2MASSW J0045214+163445 | L3.5 | 10.4 | 9,10 |
| LSRO6024+3910 | L1 | 10.6±0.8 | 9 |
| D1425 | DENIS-P J142528.0–365023.4 | L5 | 10.6±1.1 | 5 |
| D1705 | DENIS-P J170548.4–051645.7 | L4 | 10.7±1.0 | 5 |
| 2MASSW J0825196+211552 | L7.5 | 10.7 | 3 |
| 2MASSI J0439010–235308 | L6.5 | 10.8±1.1 | 2 |

* Distances from parallaxes in the given references.

Fig. 2. Spectral typing results at R ~ 400. Derived types are
given on the right hand side of each panel. Previously known
types are given in parentheses. In all cases, K-band spectra have
been normalised to the mean flux at ~2.29 μm, and H-band
spectra to the highest point of the spectrum. Template spectral
types are on the Kirkpatrick et al. (1999) system (see Sect. 3).
For clarity, each spectrum is offset from its neighbours by 0.5
continuum units.

L0.5 ± 2 subclasses. Distances have been derived using the M_1
vs. spectral type calibration of [Cruz et al. (2003)] errors on the
distance corresponding to ± 0.5 subclasses in spectral type are
given in Table 1. Of the known objects - apart from D1048
which may be rather later and closer than previously cited, dis-
tances have been derived using the previously published spec-
tral types, with errors also representing ± 0.5 subclasses.

In Table 2, we present our findings in the context of the
currently known L-dwarf population in the immediate solar
neighbourhood. It is clear that four mid-to-late L-type dwarfs
presented here, D1048, D1425, D1705, and D2252, have prop-
erties which strongly imply that they lie at distances of no
more than ~10 pc, if single. For D1048, our spectral type
derivation of L4 brings this object newly into the ≤ 10 pc sam-
ple. Together, these objects represent a signiﬁcant addition to
the known sample of such dwarfs close to the Sun. We cau-
tion that, as is the case for many ultracool dwarfs, distances
based on parallaxes are unknown and the distances we de-
termines rely on calibrations derived from larger samples of
field objects. We note also that the known object 2MASSI
J074642.5+200032 has a spectral type and photometry which
suggest a distance of only 9.5 pc, which would place it in
Table 2; yet, further study has revealed this object as a binary
[Reid et al. 2001][Bouy et al. 2003], with d = 12.2 pc (Dahn et
al. 2002). Moreover, we note that 2MASSI J0423485–041403,
recently reclassified to T0 and with π = 65.9 mas (G.R. Knapp et
Table 3. Proper motions for the target objects derived from SuperCosmos and 2MASS positions with the epoch difference indicated. For typical positional errors \( \sim 0.3'' \), uncertainties on the proper motions are therefore \( \sim 100 \text{mas yr}^{-1} \), for \( \Delta \text{epoch} = 4 \text{yr} \). Transverse velocities are derived using the distances in Table 1 and the proper motion values, added in quadrature.

| Name  | Sp. | \( \mu_\alpha \cos \delta \) mas yr\(^{-1} \) | \( \mu_\delta \) mas yr\(^{-1} \) | \( \Delta \text{epoch} \) yr | \( v_{\text{trans}} \) km s\(^{-1} \) |
|-------|-----|---------------------------------|----------------|----------------|----------------|
| D1048 | L4  | 210                             | 190            | 4.916          | 12             |
| D1411 | M9  | 30                              | 90             | 1.929          | 7              |
| D1425 | L5  | 260                             | 470            | 8.063          | 27             |
| D1456 | M9  | 280                             | 740            | 3.648          | 83             |
| D1510 | M8  | 80                              | 50             | 1.877          | 9              |
| D1514 | M7  |                                |                |                |                |
| D1539 | L2  | 640                             | 80             | 6.708          | 60             |
| D1705 | L4  | 100                             | 120            | 6.741          | 8              |
| D2036 | M9.5| 400                             | 290            | 3.605          | 98             |
| D2057 | L1.5| 60                              | 210            | 3.211          | 17             |
| D2200 | L0  | 250                             | 80             | 4.916          | 27             |
| D2229 | M9.5| 170                             | 30             | 4.251          | 32             |
| D2252 | L7.5| 400                             | 100            | 4.864          | 16             |
| D2254 | L0.5| 0                               | 30             | 5.909          | 3              |

2MJ1112 L0.5: –450 \( \sim 0 \) 7.066 88

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a. \( \Delta \text{epoch} \) Small b. Uncertain

4. Conclusions

We present spectroscopic and kinematic data for 15 late M and L-dwarfs, all but one taken from the DENIS catalogue. Spectral types have been determined by direct comparison to known L-type templates, in both H- and K-bands. Proper motions derived by comparison of 2MASS and SuperCosmos positions yield transverse velocities consistent with membership of the disk population, at least for all confirmed L-type objects. Three probable very late M-type objects have high transverse velocities (\( \sim 100 \text{ km s}^{-1} \)) and are likely to belong to a dynamically older thick disk population. Nine objects in the sample are hitherto unpublished; three of these, and one further object, are shown to have have spectral types in the range L4–L7.5 and are relatively bright (17.9 < \( I < 16.2 \)); hence, if single objects, they are extremely close, \( \lesssim 10 \text{ pc} \). This last finding represents an increase in the number of known L-dwarfs likely to be within \( \sim 10 \text{ pc} \) of the Sun from 12 to 16.

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Discovery of very nearby ultracool dwarfs from DENIS

T.R. Kendall¹, X. Delfosse¹, E.L. Martín², and T. Forveille³

¹ Laboratoire d’Astrophysique de Grenoble, Université Joseph Fourier, 38041 Grenoble Cedex 9, France
e-mail: tkendall@obs.ujf-grenoble.fr, delfosse@obs.ujf-grenoble.fr
² Instituto de Astrofísica de Canarias, Via Láctea, E-38200 La Laguna, Tenerife, Spain
e-mail: ege@iac.es
³ CFHT Corporation, 68–1238 Mamalahoa Highway, Kamuela, HI 96743, USA

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Abstract. We report new spectroscopic results, obtained with UKIRT/CGS4, of a sample of 14 candidate ultracool dwarfs selected from the DENIS (Deep Near-Infrared Survey of the Southern Sky) database. A further object, selected from the 2MASS Second Incremental Release, was observed at a later epoch with the same instrument. Six objects are already known in the literature; we re-derive their properties. A further four prove to be very nearby (< 10 pc) mid-to-late L-dwarfs, three unknown hitherto, two of which are almost certainly substellar. These findings increase the number of L-dwarfs known within ∼10 pc by ∼25%. The remainder of the objects discussed here are early L or very late M-type dwarfs lying between ∼45 and 15 pc and are new to the literature. Spectral types have been derived by direct comparison with J-, H- and K-band spectra of known template ultracool dwarfs given by Leggett et al. For the known objects, we generally find agreement to within ∼1 subclass with previously derived spectral types. Distances are determined from the most recent M_J vs. spectral type calibrations, and together with our derived proper motions yield kinematics for most targets consistent with that expected for the disk population; for three probable late M-dwarfs, membership of a dynamically older population is postulated. The very nearby L-type objects discussed here are of great interest for future studies of binarity and parallaxes.

Key words. stars: low mass, brown dwarfs – stars: late-type – stars: kinematics – stars: distances – infrared: stars – surveys

1. Introduction

The analysis of current near-infrared sky surveys such as 2MASS (Two Micron All Sky Survey; Skrutskie et al. 1997), DENIS (Epchtein 1997) and the Sloan Digital Sky Survey (SDSS; York et al. 2000) is rapidly revolutionising our knowledge of the very low-mass dwarf population in the solar neighbourhood. Observations have required the establishment of new spectral classes (L,T) to characterise the very coolest dwarfs (Kirkpatrick et al. 1999; Martín et al. 1999) and very recently Cruz et al. (2003) have increased the number of known M7 – L6 dwarfs by a further 127% (186 new objects), by exploitation of the 2MASS Second Incremental Release. It is the clear goal of current efforts, using existing data, to produce a complete, volume-limited sample of ultracool dwarfs, over the whole sky.

Such dwarfs (of spectral types M7 and later) are likely to have ages of a few Gyr and, with reference to theoretical models (e.g. Baraffe et al. 2003 and references therein) are likely to be substellar. Indeed, as pointed out by Leggett et al. (2001) any object later than L5 has to be substellar; i.e. incapable of sustaining core hydrogen fusion at any point in its lifetime. The field population of L- and T-dwarfs thus represents an important link to even less massive, younger objects known in nearby star-forming regions.

The DENIS survey has demonstrated its ability to detect very cool stellar objects with the detection of the first L-dwarf populations (Delfosse et al. 1997). To date, 5700 deg² of survey data have been explored, yielding a sample of 300 ultracool dwarf candidates selected to have (I−J) > 3.0, complete to I ∼ 18 and reaching I = 19.0. These objects are plotted in Fig. 1 (crosses). Optical spectroscopy of the complete sample is underway and will be published in a future paper. In this Letter, we discuss near-infrared spectroscopy obtained for selected relatively bright (I ∼ 15–17.5) objects with 3.0 < (I−J) < 4.0. The previously published DENIS L-dwarfs (Delfosse et al. 1999; Martín et al. 1999) have (I−J) > 3.1.

2. Observations and Data reduction

Near-infrared spectra were obtained on Jun 25–27, 2001, using CGS4 (Cooled Grating Spectrometer 4) on the United Kingdom Infrared Telescope (UKIRT). Conditions were good and the seeing was ∼1.1″. The 40 mm−1 grating was employed...
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| Name | DENIS-P | $I$ | $J$ | $K$ | MJD | $b$ | Sp. | d/pc | Band | ref. |
|------|---------|----|----|----|-----|----|-----|------|------|-----|
| D1048 | J104823.81+011158.2 | 16.2 | 12.9 | 11.5 | 51280.0 | +50.79 | L4 | 9.1 | $K$ | H02 |
| D1411 | J141112.30–211950.6 | 15.5 | 12.5 | 11.3 | 51366.5 | +37.83 | M9 | 16.0 | $H, K$ | C03 |
| D1425 | J142527.97–365023.4 | 17.7 | 13.7 | 11.7 | 51280.0 | +22.32 | L5 | 10.6 | $K$ | - |
| D1456 | J145601.39–274736.4 | 16.4 | 13.2 | 12.2 | 51374.5 | +27.89 | M9 | 22.0 | $H, K$ | C03 |
| D1510 | J151047.85–281817.4 | 16.0 | 12.8 | 11.4 | 51828.0 | +25.27 | M8 | 21.0 | $K$ | G02 |
| D1514 | J151450.16–225435.3 | 17.1 | 14.0 | 12.9 | 51828.0 | +29.14 | M7 | 44.1 | $K$ | - |
| D1539 | J153941.96–052042.4 | 17.5 | 13.8 | 12.4 | 51828.0 | +37.98 | L2 | 19.5 | $H$ | - |
| D1705 | J170548.38–051645.7 | 16.6 | 13.2 | 12.1 | 51698.6 | +20.62 | L4 | 10.7 | $K$ | - |
| D2036 | J203608.64–130638.3 | 18.2 | 14.7 | 13.5 | 51828.0 | –29.07 | M9.5 | 41.7 | $J$ | - |
| D2254 | J225451.90–284025.4 | 17.4 | 14.1 | 12.8 | 51775.8 | –64.26 | L0.5 | 28.2 | $H$ | C03 |

1. http://www-wfau.roe.ac.uk/sss; C03: Cruz et al. (2003); G02: Gizis et al. (2002); H02: Hawley et al. (2002)

Fig. 1. DENIS colour-colour diagram. The objects discussed in this Letter are represented by large circles (L-dwarfs) and large squares (M-dwarfs). Small symbols are the previously published DENIS ultracool dwarfs (Delfosse et al. 1999; Martín et al. 1999). The complete sample of DENIS candidate ultracool dwarfs are plotted as crosses. Note that the diagram excludes objects without a DENIS-$K$ magnitude: some such objects are retained in our overall sample on the basis of their $(I - J)$ colour only.

Such features were fitted and removed and, after division by an appropriate Planck function, the divisor spectra were re-divided into the target spectra. In cases where divisor spectra suffered from fringing, a different standard spectrum (selected to be as close as possible a match in observation time and airmass) was employed. This does not affect the relative flux calibration (i.e. spectral shape) important for spectral typing.

3. Spectral types, distances and kinematics

Spectral types have been estimated by direct comparison with known template objects. In Fig. 2, these results are shown over the whole wavelength range so employed. The ranges are constrained by the presence of telluric water vapour absorptions: we used $K$: 1.95–2.42 $\mu$m and $H$: 1.45–1.8 $\mu$m. The templates used have the following sources: Geballe et al. 2002: 2M 1632 L8, SDSS 2249 L5, SDSS 0236 L3.5, 2MASS 0036 L3.5, 2MASS 1632 L8, SDSS 2249 L5, LHS 429 (TVLM 513–46546) M9, t513 (TVLM 513–46546) M8.5. All have been allocated spectral types on a common system (Kirkpatrick et al. 1999); hence our derived types are also on this system. While as many templates as possible were compared to the data, the grid of templates is not uniform in terms of wavelength or spectral type coverage: we have plotted the best fits to the data and adopted the spectral types so suggested (Fig. 2). In some cases it was found necessary to create a new template by averaging two template spectra, whose type differs by no more than 1.5 subclasses, to yield a satisfactory fit to the data. Where possible, independent types have been derived from $K$- and $H$-band spectra, in which cases the spectral type quoted in Table 1 is a mean of the two estimates. Separate derivations from the $K$- and $H$-bands are shown in Fig. 2.
which may be rather later and closer than previously cited, dis-
given in Table 1. Of the known objects - apart from D1048
L0.5 strained to be later than M8.5 and earlier than L3.5. We adopt
for previously characterised objects. Exceptions are D1048, for
level of agreement between our spectral types and those given
in parentheses. In all cases, K-band spectra have been normalised to
the mean flux at \( \sim 2.29 \mu \text{m} \), and \( H \)-band spectra to the highest point
of the spectrum. Template spectral types are on the Kirkpatrick et al.
(1999) system (see Sect. 3). For clarity, each spectrum is offset from
its neighbours by 0.5 continuum units.

Table 2. The nearest L-dwarfs to the Sun, ordered by distance. Where
distances are measured from a parallax determination, this is indi-
cated. Otherwise, distances are based on current calibrations and have
been obtained from the literature. Rather few L-dwarfs have been
found within \( \sim 10 \text{ pc} \) and this work increases the known database of
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such objects by \( \sim 25\% \).

| Name                  | Survey id.& ref. | Sp. | d(pc) | Ref. |
|-----------------------|------------------|-----|-------|------|
| -                     | DENIS-P J025503.5–470050 | L8  | 4.9±0.3 | 1,2  |
| -                     | 2MASSW J1438082+640386 | L6  | 7.2   | 3    |
| -                     | 2MASSI J1507476–162738 | L5  | 7.33±0.03’ | 2,4  |
| D2252                 | DENIS-P J225210.7–173013.4 | L7.5 | 8.3±0.6 | 5    |
| -                     | 2MASSI J0835425–081923 | L5  | 8.3±0.9 | 2    |
| -                     | 2MASSW J2306292+154905 | L4  | 8.6   | 3    |
| -                     | 2MASSI J0036159+182110 | L3.5 | 8.76±0.06’ | 3,6  |
| D1048                 | DENIS-P J104842.8+011158.2 | L4  | 9.1±1.0 | 5    |
| -                     | 2MASSI J1515009+484739 | L6.5 | 9.2±1.8 | 2    |
| -                     | GJ 1001B (=LHS 1028) | L5  | 9.6±1.2’ | 7,8  |
| -                     | 2MASSW J0045214+163445 | L3.5 | 10.4   | 9,10  |
| -                     | LSR0602+3910 | L1  | 10.6±0.8 | 9    |
| D1425                 | DENIS-P J142528.0–365023.4 | L5  | 10.6±1.1 | 5    |
| D1705                 | DENIS-P J170548.4–051645.7 | L4  | 10.7±1.0 | 5    |
| -                     | 2MASSW J0825196+211552 | L7.5 | 10.7   | 3    |
| -                     | 2MASSI J0439010–235308 | L6.5 | 10.8±1.1 | 2    |

* Distances from parallaxes in the given references.
1. Martín et al. (1999) 2. Cruz et al. (2003) 3. Bouy et al. (2003) 4. Dahn et al. (2002) 5. This Letter 6. Reid et al. (2001) 7. van Altena et al. (1995) 8. Goldman et al. (1999) 9. Salim et al. (2003) 10. Wilson et al. (2003)

Fig 2. Spectral typing results at \( \sim 400 \). Derived types are given on
the right hand side of each panel. Previously known types are given
in parentheses. In all cases, \( K \)-band spectra have been normalised to
the mean flux at \( \sim 2.29 \mu \text{m} \), and \( H \)-band spectra to the highest point
of the spectrum. Template spectral types are on the Kirkpatrick et al.
(1999) system (see Sect. 3). For clarity, each spectrum is offset from
its neighbours by 0.5 continuum units.

almost all cases we find good agreement, to \( \pm 1 \) subclass, for
objects which have both \( K \)- and \( H \)-band spectra, and a similar
level of agreement between our spectral types and those given
for previously characterised objects. Exceptions are D1048, for
which Hawley et al. (2002) give L1 from far-red data, but for
which our near-infrared data require a later type of L4, and the
M9 object D1456, for which the \( H \)-band data suggest M7; in
this case we adopt M9, as indicated by the \( K \)-band data. The
discrepancy in the former case might suggest binarity, with the
later-type component having a larger relative contribution to the
\( K \)-band flux. A special case is the object 2MJ1112 typed
in the \( J \)-band; for this star, the spectral type can only be con-
strained to be later than M8.5 and earlier than L3.5. We adopt
L0.5 \( \pm 2 \) subclasses. Distances have been derived using the \( M \)
v. spectral type calibration of Cruz et al. (2003); errors on the
distance corresponding to \( \pm 0.5 \) subclasses in spectral type are
given in Table 1. Of the known objects - apart from D1048
which may be rather later and closer than previously cited, dis-
ances have been derived using the previously published spec-
tral types, with errors also representing \( \pm 0.5 \) subclasses.

In Table 2, we present our findings in the context of the
currently known L-dwarf population in the immediate solar
neighbourhood. It is clear that four mid-to-late L-type dwarfs
presented here, D1048, D1425, D1705, and D2252, have prop-
erties which strongly imply that they lie at distances of no
more than \( \sim 10 \text{ pc} \), if single. For D1048, our spectral type
derivation of L4 brings this object newly into the \( \sim 10 \text{ pc} \) sam-
ple. Together, these objects represent a significant addition to
the known sample of such dwarfs close to the Sun. We cau-
tion that, as is the case for many ultracool dwarfs, distances
based on parallaxes are unknown and the distances we de-
terminate rely on calibrations derived from larger samples of
field objects. We note also that the known object 2MASSI
J0746425–041403, recently reclassified T0 and with
planet companions.

65.9 mas (G.R. Knapp et
Additionally, in Table 3, we have calculated proper motions using positional differences in \( \alpha \) and \( \delta \) between 2MASS Final Release and SuperCosmos images taken at different epochs. \( \Delta \text{epoch} \) represents the timeline over which the proper motions have been derived. Where this quantity is small (\( < 2 \) yr) we do not consider the proper motions to be accurate. For one object, D1514, the SuperCosmos position is uncertain; no stellar object exists in that database with a similar \( I \)-magnitude to that in the DENIS catalogue, within \( \sim 10'' \). Lastly, we have derived transverse velocities using the spectroscopic distances given in Table 1 and the proper motion measurements. We find velocities broadly consistent with the kinematics of disk stars. However, two late-M objects, D1456 and D2036, have rather high velocities. For D1456, a proper motion estimate of \( \mu_{\alpha}\cos\delta = -340 \text{ mas yr}^{-1} \) and \( \mu_{\delta} = -650 \text{ mas yr}^{-1} \) is given in the SuperCosmos data, in agreement with our values to \( \sim 20\% \). Of the four very nearby objects, D1425 has the largest proper motion, again in good agreement with SuperCosmos, which gives \( \mu_{\alpha}\cos\delta = -310 \text{ mas yr}^{-1} \) and \( \mu_{\delta} = -440 \text{ mas yr}^{-1} \). While the current data are not suitable for computing radial velocities, it is clear from our transverse velocities that D1456 and D2036 are likely to belong to the dynamically old M-dwarf population, typified by the template such object, Barnard’s Star (G1211, \( M4V, v_{\text{trans}} = 89.5 \text{ km s}^{-1} \)). 2MJ1112 has a similarly high \( v_{\text{trans}} \), but we caution that its spectral type is not well enough constrained to yet claim it as an L-dwarf member of this population.

### Table 3

| Name     | Sp.  | \( \mu_{\alpha}\cos\delta \) mas yr\(^{-1} \) | \( \mu_{\delta} \) mas yr\(^{-1} \) | \( \Delta \text{epoch} \) yr | \( v_{\text{trans}} \) km s\(^{-1} \) |
|----------|------|---------------------------------|---------------------------------|-----------------------------|-------------------------------|
| D1048    | L4   | -210                           | -190                            | 4.916                       | 12                            |
| D1441\(^a\) | M9    | -30                            | +90                             | 1.929                       | 7                             |
| D1425    | L5   | -260                           | -470                            | 8.063                       | 27                            |
| D1456    | M9   | -280                           | -740                            | 3.648                       | 83                            |
| D1510\(^a\) | M8    | +80                            | +50                             | 1.877                       | 9                             |
| D1514\(^b\) | M7    | -                              | -                               | -                           | -                             |
| D1539    | L2   | +640                           | +80                             | 6.708                       | 60                            |
| D1705    | L4   | +100                           | -130                            | 6.741                       | 8                             |
| D2036    | M9.5 | +400                           | -290                            | 3.365                       | 98                            |
| D2057    | L1.5 | +60                            | -210                            | 3.211                       | 17                            |
| D2200    | L0   | +250                           | -80                             | 4.916                       | 27                            |
| D2229    | M9.5 | +170                           | -30                             | 4.251                       | 32                            |
| D2252    | L7.5 | +400                           | +100                            | 4.864                       | 16                            |
| D2254    | L0.5 | -                              | -30                             | 5.909                       | 3                             |
| 2MJ1112  | L0.5 | -450                           | ~0                              | 7.066                       | 88                            |

\( a \) \( \Delta \text{epoch} \) small \( b \) uncertain

### 4. Conclusions

We present spectroscopic and kinematic data for 15 late M and L-dwarfs, all but one taken from the DENIS catalogue.

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