Updates for UltracoolSheet v2.0
(2024 February)

We have made multiple significant updates to the UltracoolSheet since its initial release in November 2020. The main highlights are:

ADDITIONS
- We added ~1000 objects in total.
- We provide age estimates for all objects.
- We provide measurements of physical properties of >1000 M6-T9 dwarfs from Sanghi et al. (2023).
- We now include L'-band and M'-band MKO photometry, and we made substantial additions for YJKH bands.
- We added more binaries from Gaia and the literature, intending for UltracoolSheet to be complete for binaries and triples with a >=M7 primary.
- We added more directly imaged companions with photometry/spectra indicating spectral types >=M7.
- We provide a more homogeneous selection of radial velocities from Gaia DR3 and the literature.
- We include links to the [SIMPLE](#) database for objects appearing there.

UPDATES
- We replaced Gaia DR2 with DR3.
- We replaced AllWISE with CatWISE2020, but retained AllWISE data that CatWISE did not update (e.g., W3 and W4 bands).
- We added substantially to Spitzer photometry from the literature.
- We updated the SIMBAD and BANYAN Sigma data.
- Some columns have changed names (see below).

TWO VARIANTS OF THE MAIN SHEET
We are releasing two variants of the main tab in UltracoolSheet:
- **Main** contains 3,890 objects for which the UltracoolSheet data is complete. (Including companions for binaries and triples, this grows to 4,076 objects.)
- **Main - In Progress** contains everything in **Main** plus 67 additional objects (all in the Pleiades) for which the UltracoolSheet data is incomplete, for a total of 3,957 objects.

Here is a more comprehensive summary of the changes made for UltracoolSheet v2.0.

NEW OBJECTS
We added ~1000 new objects – see plots below. These are primarily:
- The complete SIMP survey (Robert et al. 2016)

- The volume-limited sample of Kirkpatrick et al. (2021)
- Late-M dwarfs from Bardalez Gagliuffi et al. (2019)
- Late-M wide companions from Mann et al. (2014)
- Objects from the Schneider et al. (2023) UHS DR2 catalog
- Recent exoplanet & brown dwarf companions
- Young late-M binaries
- Candidate late-type brown dwarfs (T6-Y0+) that only have photometry and no spectra, largely from Meisner et al. (2020)
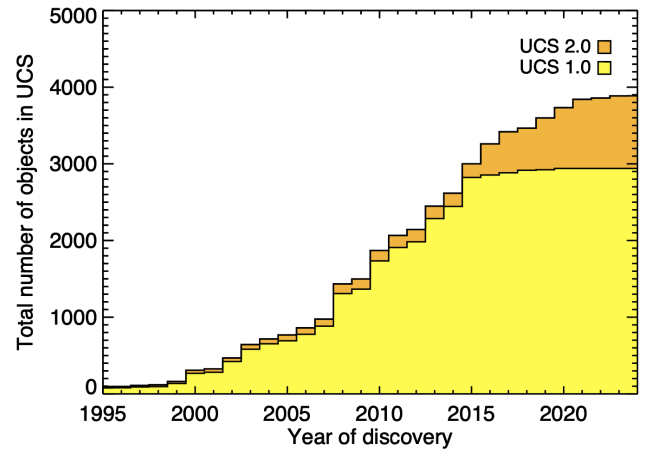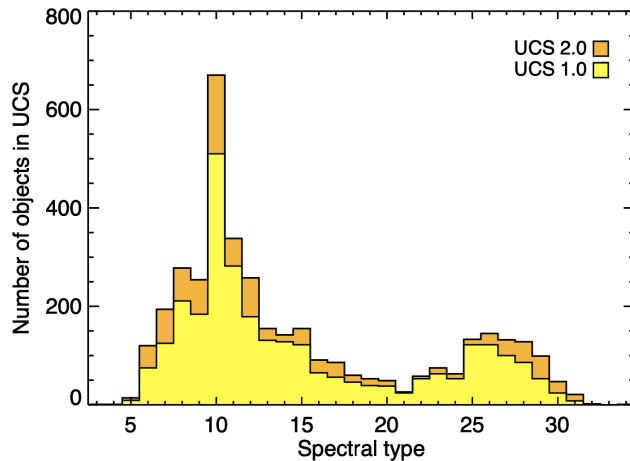
(The spike in objects at L0 is an artifact of our efforts to assemble a catalog complete for nearby L, T, and Y dwarfs, but not for M dwarfs which are in fact much more numerous.)

UPDATED DATA
- MKO photometry: We updated or added YJHK photometry (**Y_MKO**, etc) for more than 1,000 objects with data from UHS DR2, VHS, and synthetic photometry.
- Spitzer/IRAC photometry (columns **ch1**, **ch2**, etc.): We added data from Leggett et al. (2010, 2013) and Filippazzo et al. (2015).
- Spectral-type-based polynomials used to calculate photometric distances (in columns **dist_J_2MASS_formula**, etc.): We now use Sanghi et al. (2023, revised) for young objects, and Feeser & Best (2022b) for field objects with CatWISE W2 photometry.
- **flag** column: We added many new flags, in particular for moving groups and star-forming regions.
- SIMBAD columns (**name_simbad**, etc.): We updated these for all objects in August 2023.
- BANYAN Sigma columns (**banyan_sigma_results**, etc.): We updated these for all objects in November 2023, using the updated and new data in this release of UltracoolSheet.

NEW AND REVISED COLUMNS

- Ages: New **age_category**, etc. columns present our categorization for all objects, based on our systematic analysis that considers BANYAN Sigma calculations using the astrometry presented in UltracoolSheet v2.0, spectroscopic gravity classes, and other indicators from the literature. See [Sanghi et al. 2023](#) for full details of our methodology. See also the new **AgeValues** tab for the corresponding age information for stellar associations, individual objects, etc.
- Gaia: We updated Gaia DR2 data with Gaia DR3. Columns are now named **ra_j2000_Gaia**, etc., rather than ra_j2000_dr2. We added new columns **rv_Gaia**, **rverr_Gaia**, and **flags_Gaia**. We removed the excess noise columns as they are largely redundant with RUWE. We also marked any objects that appear in the non-single-star Gaia lists. We removed the **excessNoise_DR2** and **excessNoise_DR2** columns.
- CatWISE: We updated AllWISE astrometry and W1 and W2 photometry with data from CatWISE2020 wherever possible. The astrometry columns are now named **ra_j2000_WISE**, etc., rather than **ra_j2000_allwise**, and we added a **ref_astrom_WISE** column to indicate which survey values come from. We also added **chi2_W1** and **ref_W1**, etc. columns for the WISE photometry. Matches of CatWISE2020 to AllWISE sources were carefully vetted for accuracy using multiple techniques including checks for consistency between ALLWISE and CatWISE2020 W1 and W2 photometry, checks for consistency between literature and CatWISE2020 proper motions, a comparison of the CatWISE2020 matches' W1-W2 color to empirical relationships as a function of spectral type, and visual vetting of matches using the unWISE and WiseView images. We retained AllWISE data that CatWISE did not update (e.g., W3 and W4 bands).
- CatWISE proper motions: We added new columns with CatWISE2020 proper motions in **pmra_catwise**, etc.
- MKO photometry: We added new columns with MKO L' and M' band photometry in **Lp_MKO**, etc.
- Young objects: The new **youth_evidence** replaces the previous **youth** column (which was simply "Y" or "N") and contains information as to why an object is considered as young (e.g. YMG membership, low-gravity spectra, etc.).
- Best24 sample: We added a new **Best24 _vollim_sample** column indicating objects that are in the volume-limited 25 pc sample of Best et al. (2023, submitted)
- Absolute magnitudes: We removed the M*_formula columns, e.g., **MJ_2MASS_formula**, which gave polynomial-based (not parallax-based) absolute magnitudes.
- Galactic coordinates: We added **glon_j2000** and **glat_j2000** columns.
- Radial velocities from the literature: We added **rv_lit**, **rverr_lit**, and **ref_rv_lit** columns containing radial velocities from the literature (generally from SIMBAD or Gaia).
- Radial velocities: We added **rv_formula**, etc. columns which choose the lowest-error RV from available Gaia and literature RVs in UltracoolSheet.
- SIMPLE: For objects in UltracoolSheet that also have entries in the [SIMPLE](#) database, we include a direct link to the SIMPLE entry in column **url_simpleDB**.
- Completion: We added a **UCS_done** column to the new **Main - In Progress** tab indicating whether an object has all UltracoolSheet columns filled in with available data.

"yes" means the object also appears in the **Main** tab; "no" means the object does not appear in the **Main** tab.

- Columns that have changed names:

Main tab:

flag	→ literature_flag
ref_flag	→ ref_literature_flag
multiple_resolved_in_this_table	→ multiplesystem_resolved_in_this_table
G_BP_DR2	→ BP_Gaia
G_BPerr_DR2	→ BPerr_Gaia
G_DR2	→ G_Gaia
G_RP_DR2	→ RP_Gaia
G_RPerr_DR2	→ RPerr_Gaia
*_DR2	→ *_Gaia
designation_ukidss	→ designation_MKO
ra_j2000_allwise	→ ra_j2000_WISE
dec_j2000_allwise	→ dec_j2000_WISE
ra_epoch_allwise	→ ra_epoch_WISE
dec_epoch_allwise	→ dec_epoch_WISE
cc_flg_WISE	→ flag_WISE
nb_WISE	→ nb_AllWISE
neigh_WISE	→ neigh_AllWISE
GaiaDetect_DR2	→ astrom_Gaia
sourceID_DR2	→ sourceID_Gaia_DR2
Best20b_vollim_sample	→ Best21_vollim_sample

Main, Binaries, Triples+ tabs

multiple_unresolved_in_this_table	→ multiplesystem_unresolved_in_this_table
*_today_formula	→ *_[YYYY-MM-DD]_formula

NEW AND REVISED TABS

- **Main:** Contains 3,890 objects for which all UltracoolSheet columns are filled in with available data, i.e., if a cell contains "Null" or "NaN", then no data was found in our literature or catalog searches.
- **Main - In Progress:** Contains everything in **Main** plus 67 additional objects for which the UltracoolSheet data is incomplete, for a total of 3,957 objects. These incomplete objects will have J2000 coordinates at minimum.
- **AgeValues:** Contains age estimates for many individual objects, star clusters, moving groups, gravity classes, and other categories, referred to in the **age_category**, etc. columns. The estimates are based on literature values and our analysis.
- **Triples+:** Revised so that its columns are fully analogous to those in the **Binaries** tab
- **Fundamental Properties:** UltracoolSheet data and physical properties for the >1000 member sample of young and field-age M6-T9 dwarfs from Sanghi et al. (2023).
- **References:** Contains many additions, and a standardized format of references for unpublished data