Young and RED

What we can learn from Young Brown Dwarfs

BDNYC

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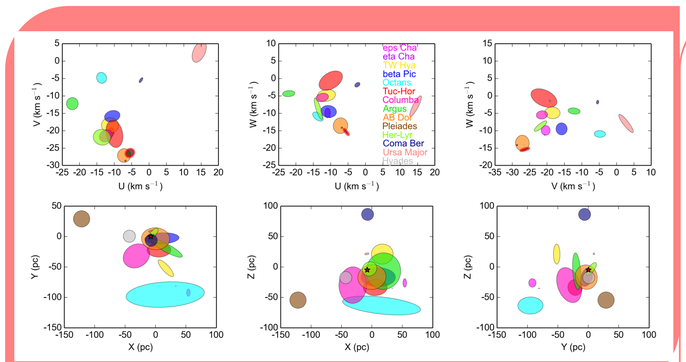
To understand brown dwarfs, we must know their ages.

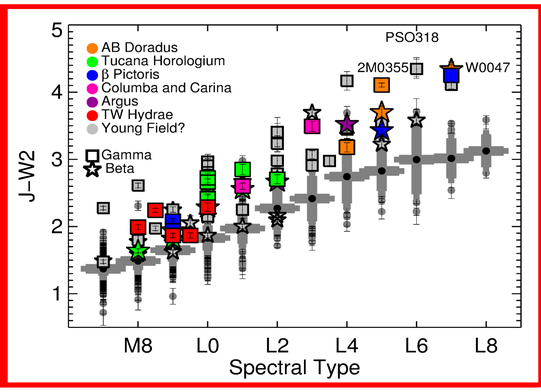
Brown dwarfs continually change in radius, temperature, and luminosity over time. A young, planetary mass object has the same temperature as an old, higher-mass brown dwarf.

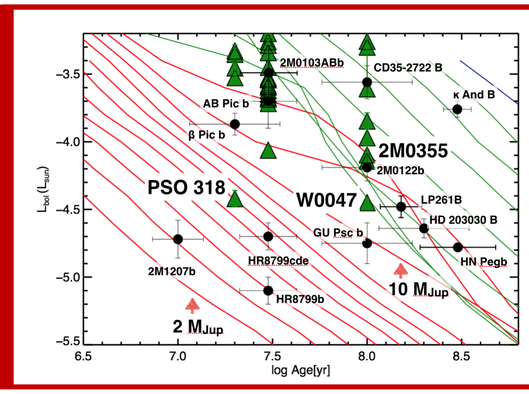
Our targets are nearby "red" L dwarfs: brown dwarfs that exhibit signs of low surface gravity indicative of youth. To calibrate our understanding of their ages and atmospheric properties, we are using membership in nearby young moving groups, for which ages can be inferred from more massive stellar members.



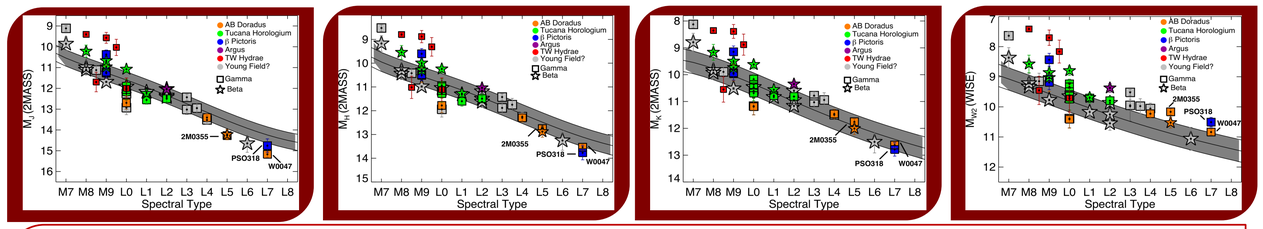
We have carefully re-analyzed moving group memberships. **Most are not members of any nearby young moving group**, which implies a young field population or a long low-gravity period. Pictured at left are the UVW and XYZ diagrams for 2M0355+1133, which demonstrate that it is a definitive AB Doradus member.

All of our brown dwarfs have redder NIR colors (here, J-W2) than normal brown dwarfs. **The beta and gamma gravity classifications do not correlate with redness or the age of the moving group.**





With ages, we can derive masses. As shown on the evolutionary tracks from Saumon & Marley (2008), our compilation of **red L dwarfs spans the entire range from stellar to planetary masses, at multiple ages.** For more information on our luminosity measurements, see poster 138.34

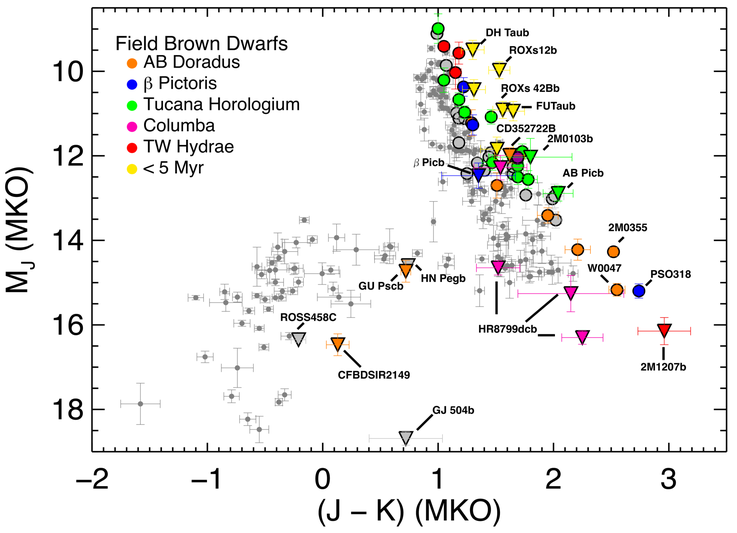


Young brown dwarfs are dimmer than field objects at near-infrared wavelengths and brighter at longer wavelengths due to flux redistribution from dust. Overall, young brown dwarfs are not significantly more luminous than older brown dwarfs, yet they are expected to have larger radii. Therefore, **young brown dwarfs are cooler than field objects at the same spectral types.** For more on BDNYC studies of dust, see talk 130.04D

THE PROJECT

The BDNYC group has made a thorough study of all currently known red L dwarfs.

With new **spectroscopy**, **trigonometric parallaxes**, and **radial velocity** measurements to add to already-published results, we have completely re-analyzed the moving group memberships of over 100 red L dwarfs.



The red L dwarfs considered here form a continuous sequence with known giant exoplanets.

REFERENCES

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