Probing Activity and Livable Environments Affecting L-dwarf Exoplanets (PALE ALE)

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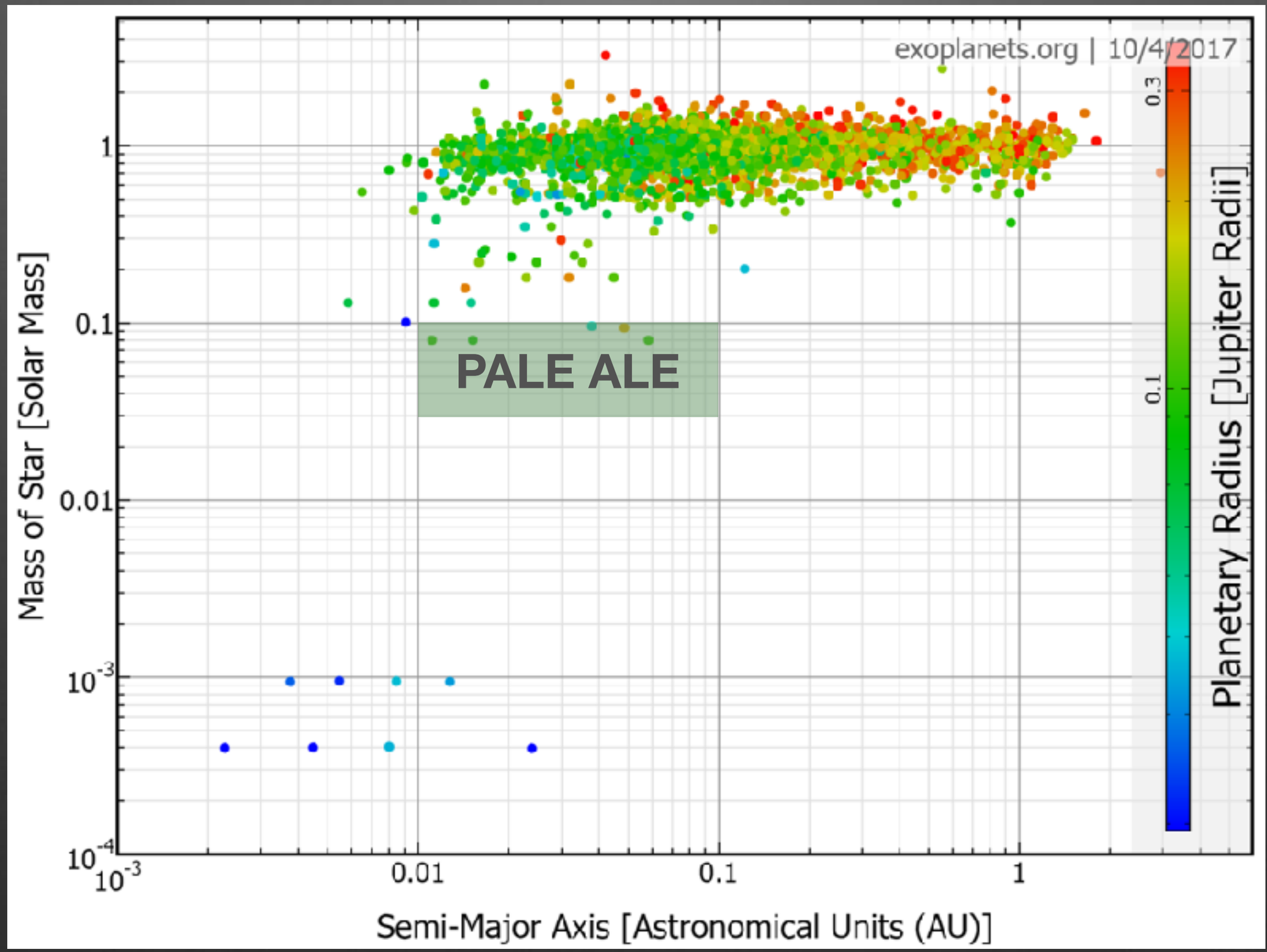
Photo Credit: Olli Wilkman

NASA NSF RESEARCH CORPORATION for SCIENCE ADVANCEMENT

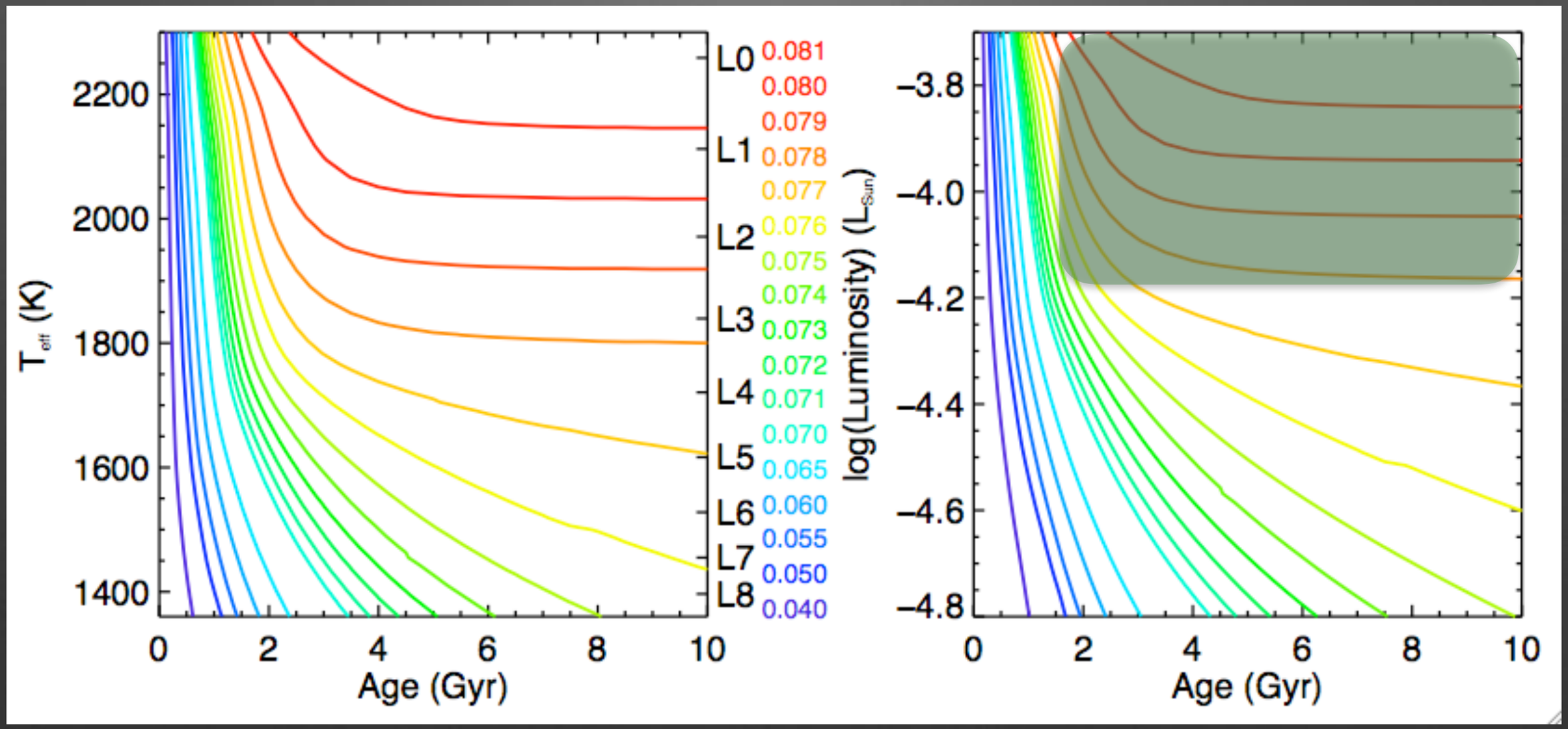
Hunting Planets Around L Dwarfs



Courtesy Patrick Tamburo

Most Early L dwarfs are Stars!

30% change in Habitable Zone

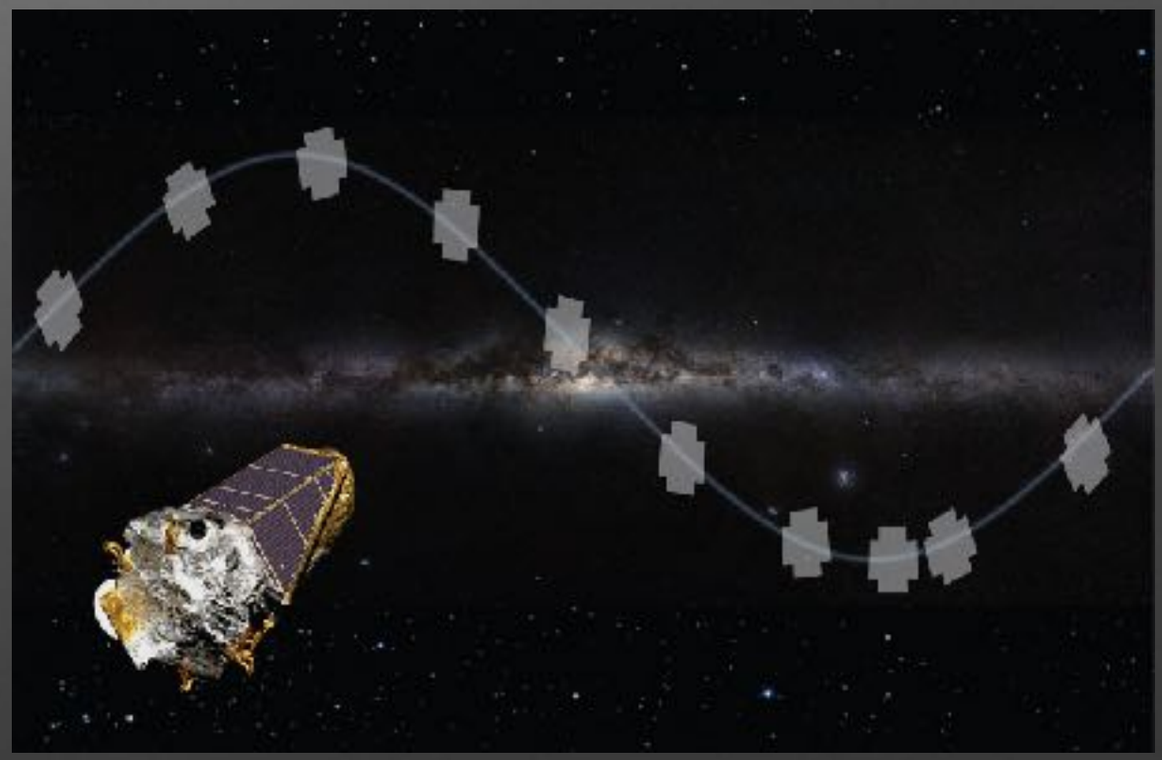


S. Schmidt (priv. comm.) based on Burrows+ 2006

PALE ALE

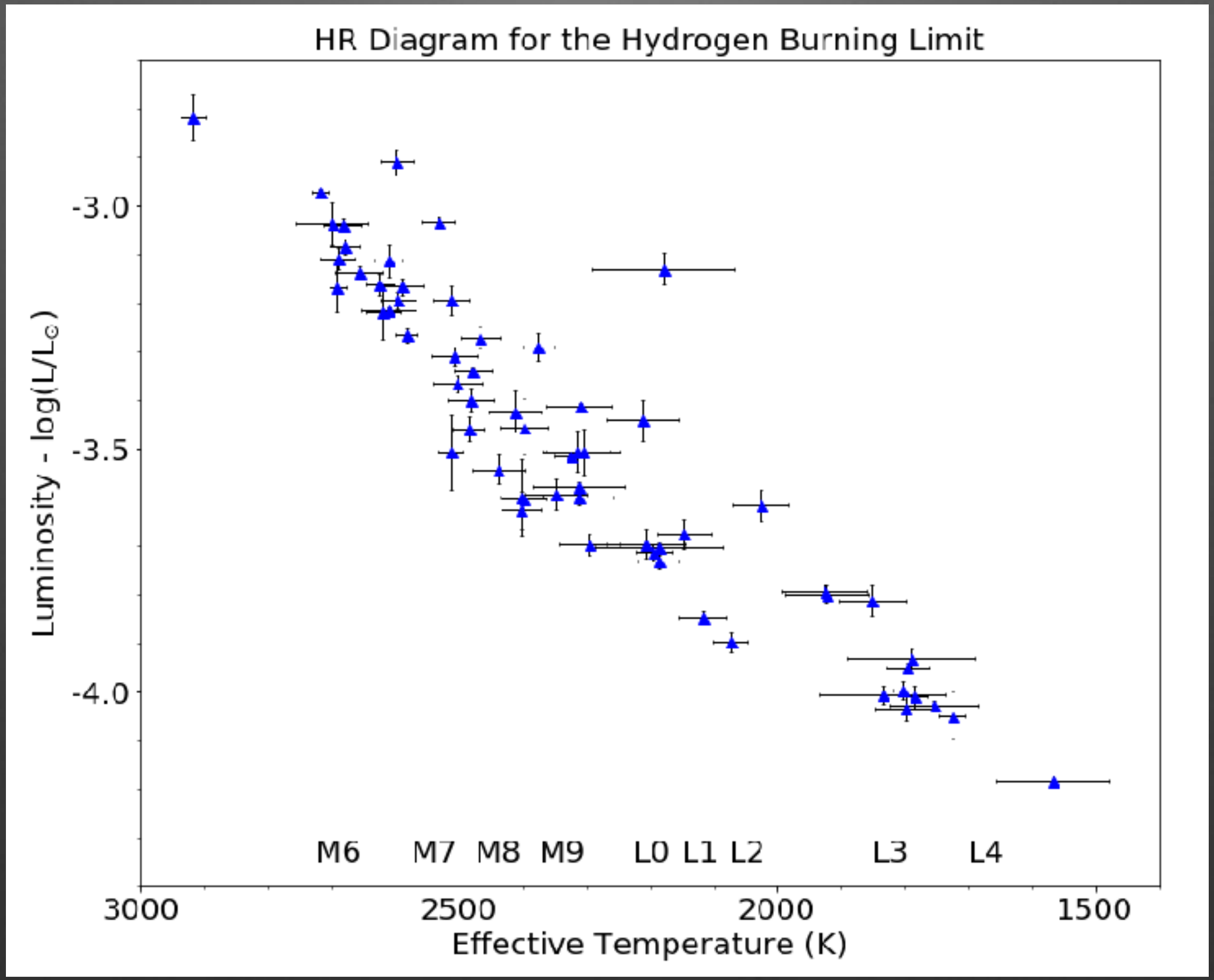
Fundamental Parameters with 4.3m Discovery Channel Telescope

Planet Hunting & Stellar Activity with K2



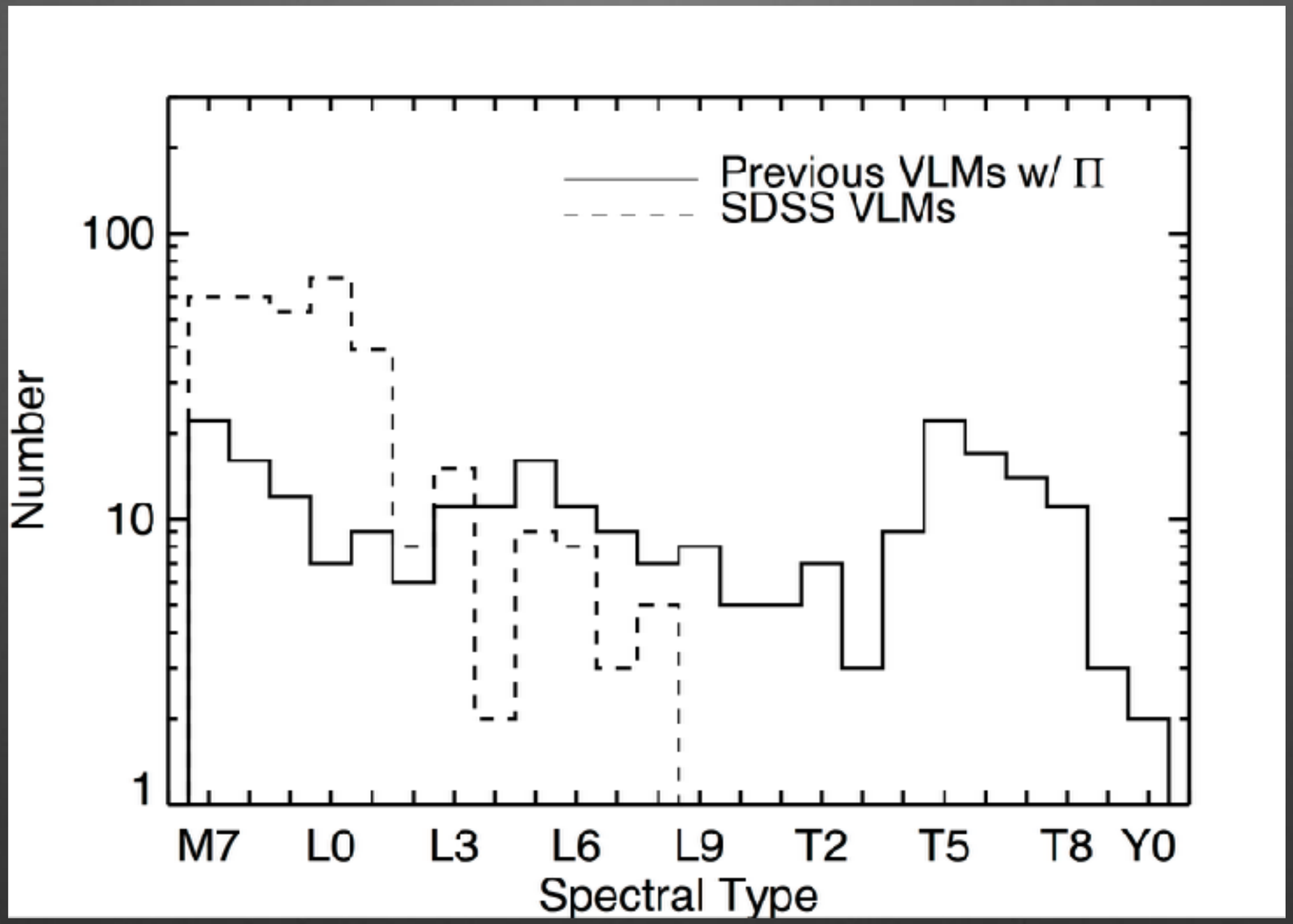
Follow-up with DCT & 1.8m Perkins

Improving Completeness at Hydrogen Burning Limit



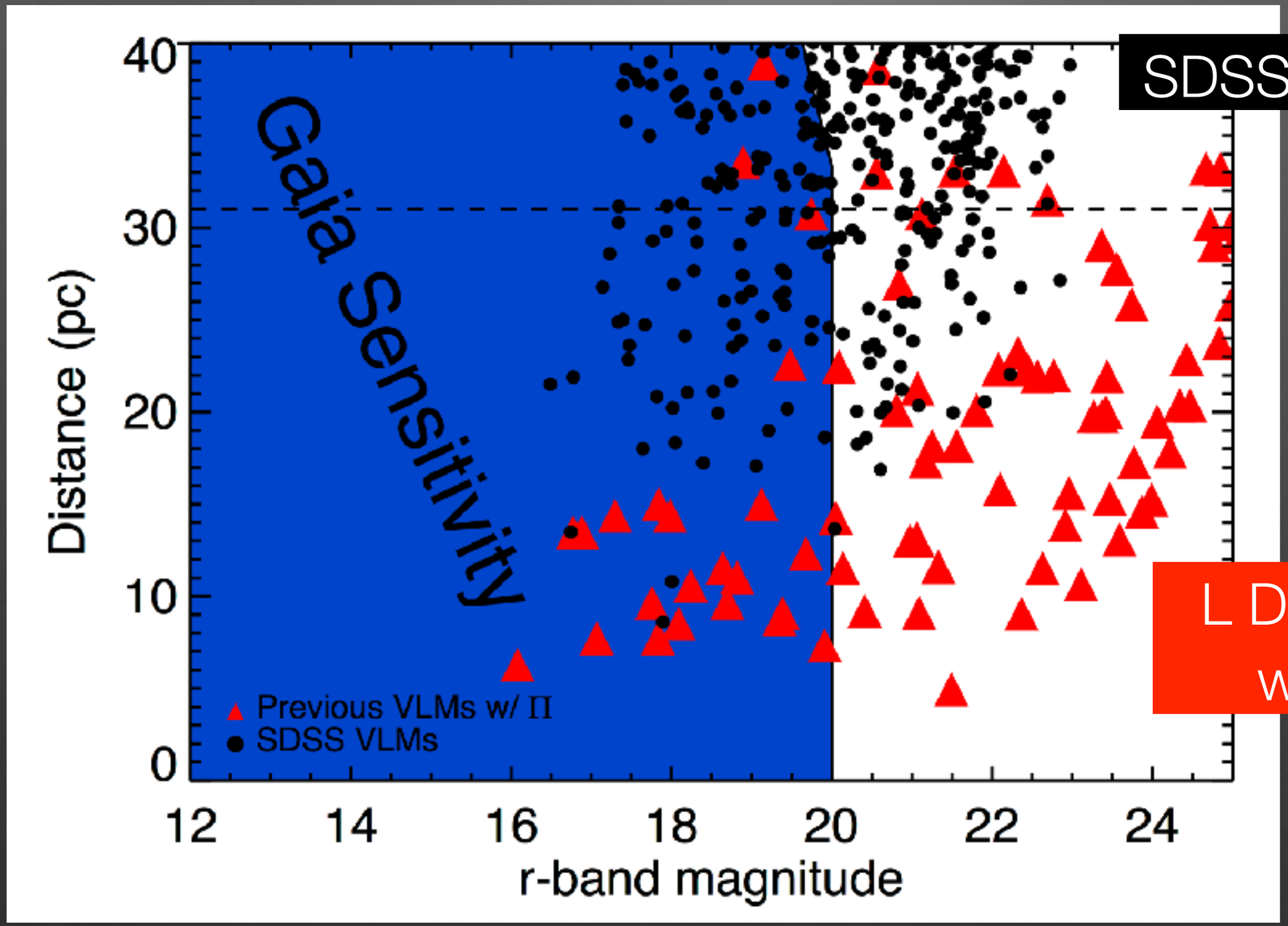
Adapted from Dieterich+ (2014)

Improving Completeness at Hydrogen Burning Limit



Database of Ultracool Parallaxes (Dupuy+ 2012), Weinberger+ 2016

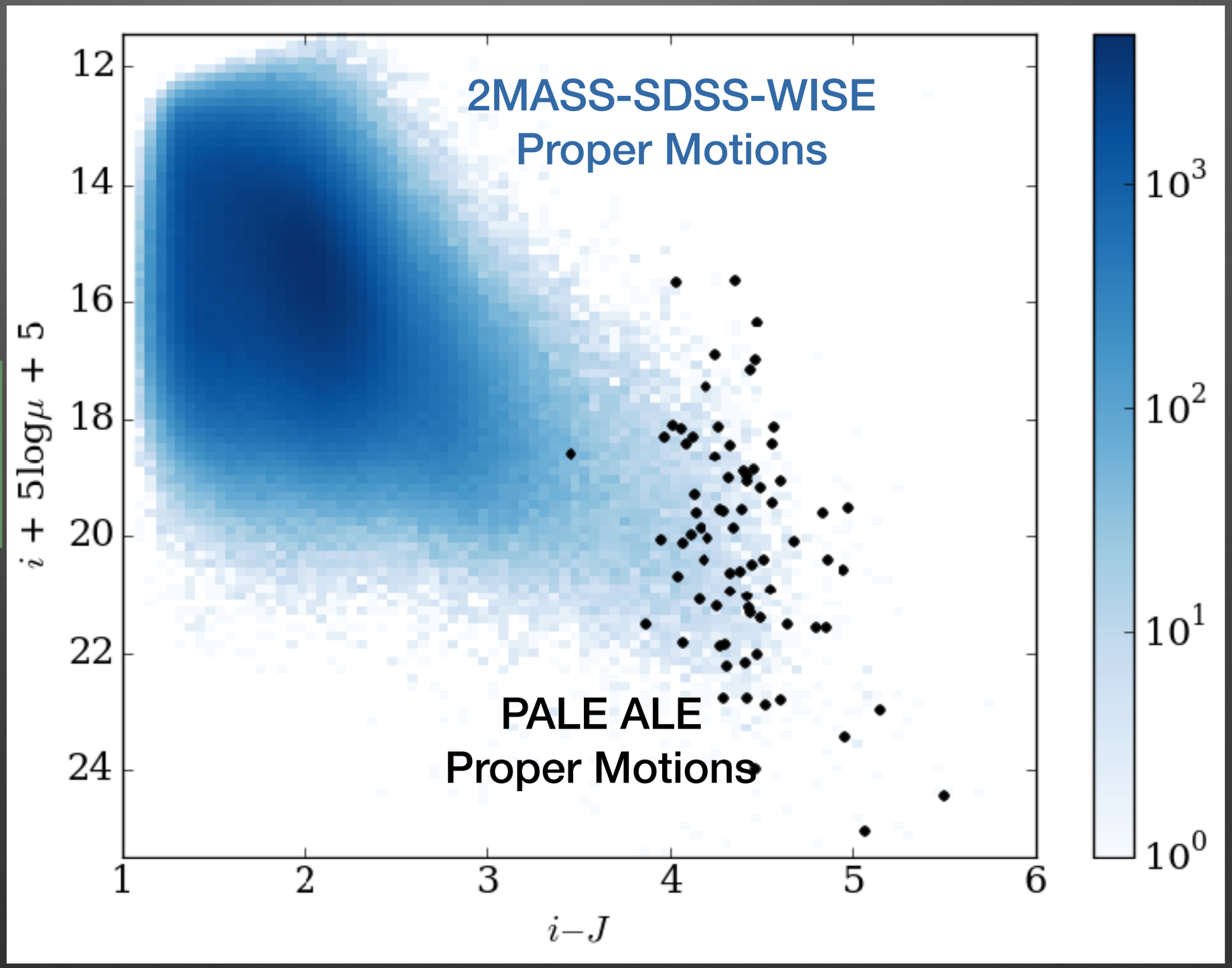
Only 37 SDSS L Dwarfs in Gaia DR1 Input Catalog



SDSS L Dwarfs from Schmidt+ 2010

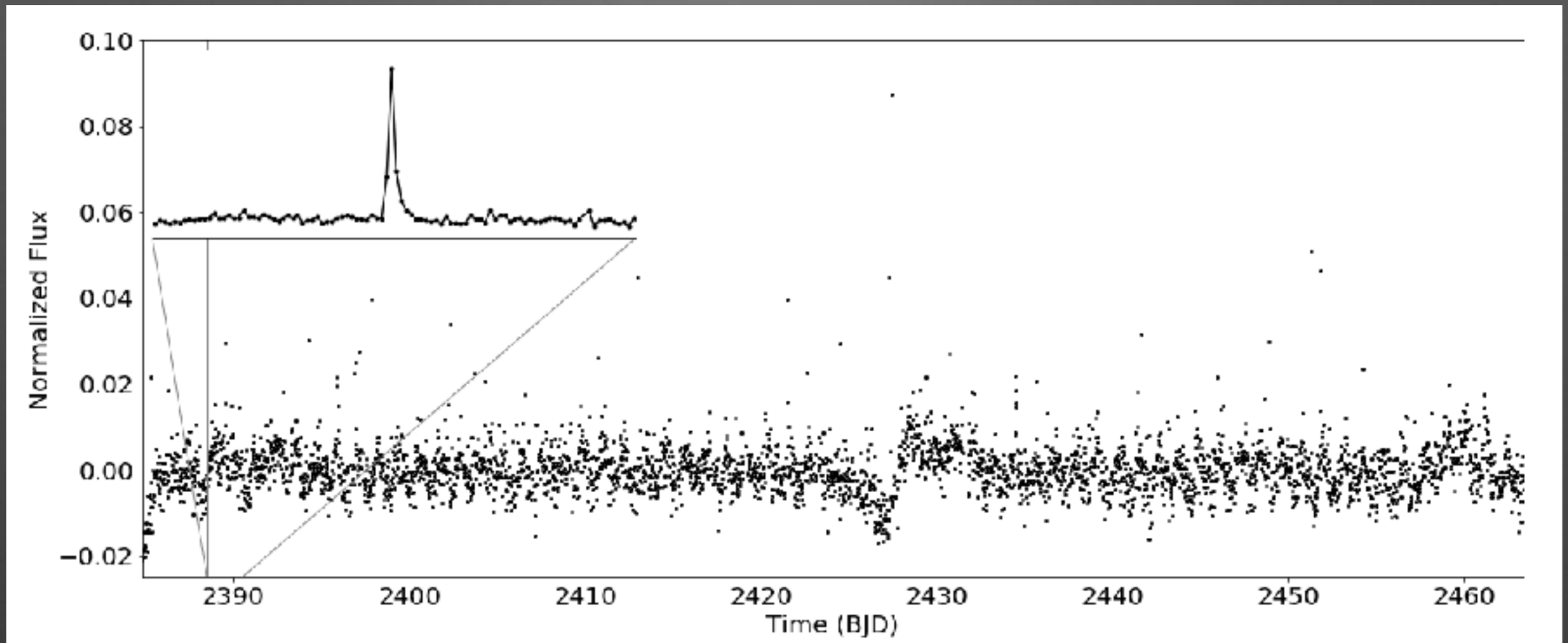
DCT Proper Motions & Parallaxes ~75 L Dwarfs

Reduced Proper Motion



Skinner+ (in prep.), Comparison to Theissen+ 2015, 2016

Planet Hunting at the M/L Transition with K2

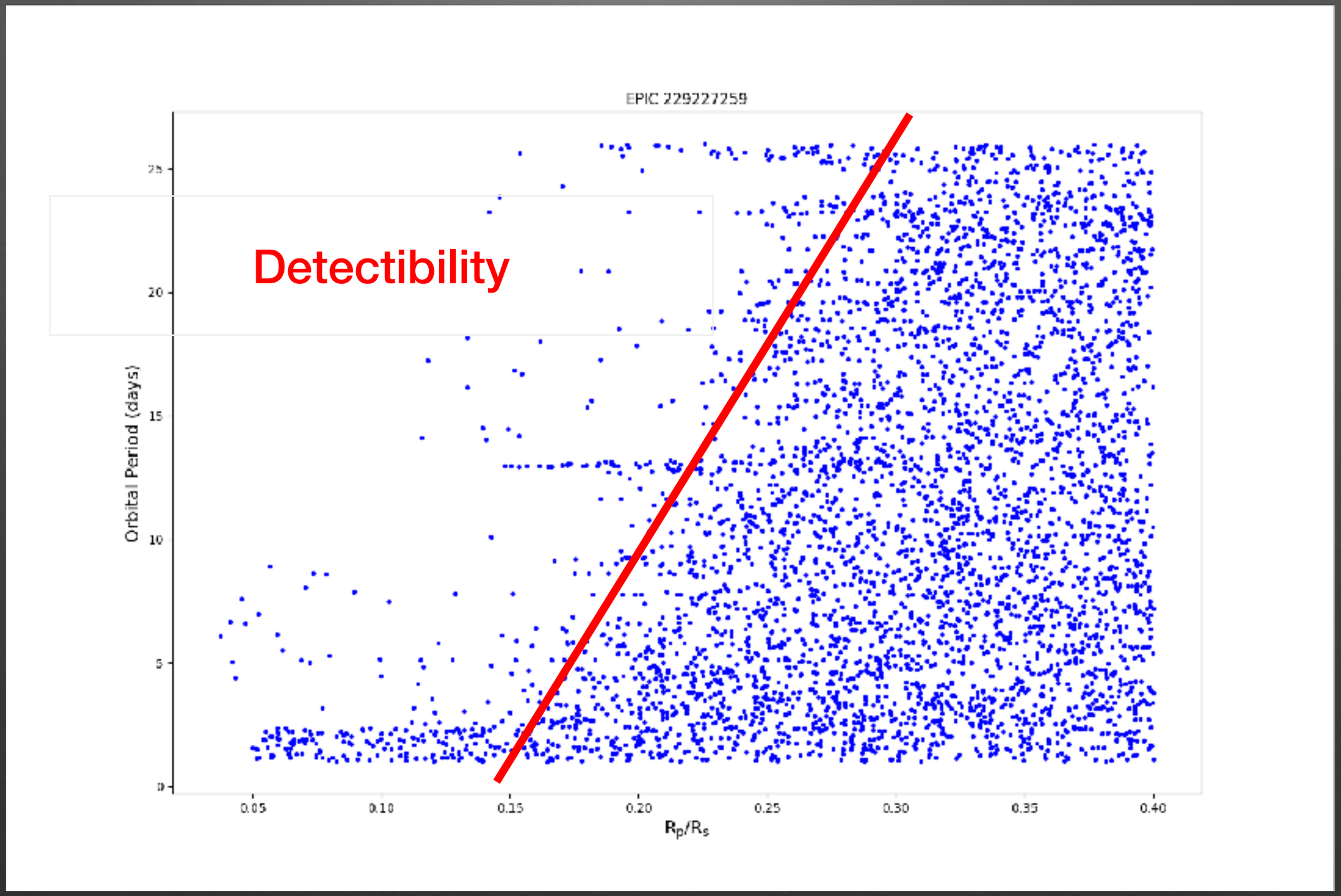


~550 M6-L6 Long Cadence Targets

Data for 137 Targets

No planets yet, but stellar activity & rotation

Transit injection and recovery (BU undergrad Sheila Sagear): Sensitive to >1.5Re planets



Summary

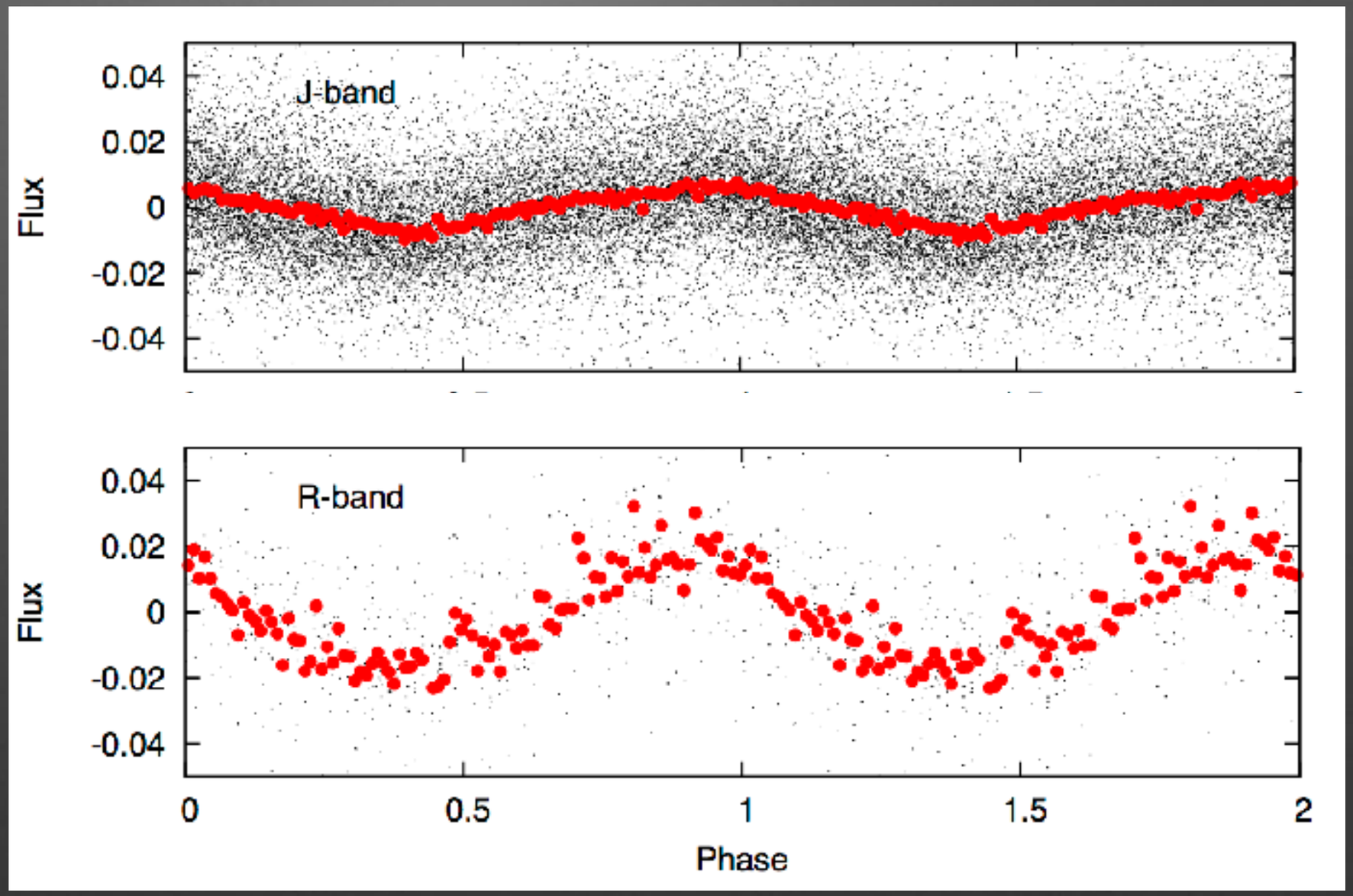
- Parallaxes of SDSS L dwarfs out soon
- With that, we can spectroscopically calibrate luminosity relationships
- Appear to be sensitive to >1.5 Re planets with K2
- Assuming a successful Cycle 6 proposals, we will have K2 light curves for 1000 late M and L dwarfs

Future Work: Ground-Based Precision Photometry

1% Photometry with 1.8m Perkins Telescope

Multi-wavelength photometry with DCT & Perkins

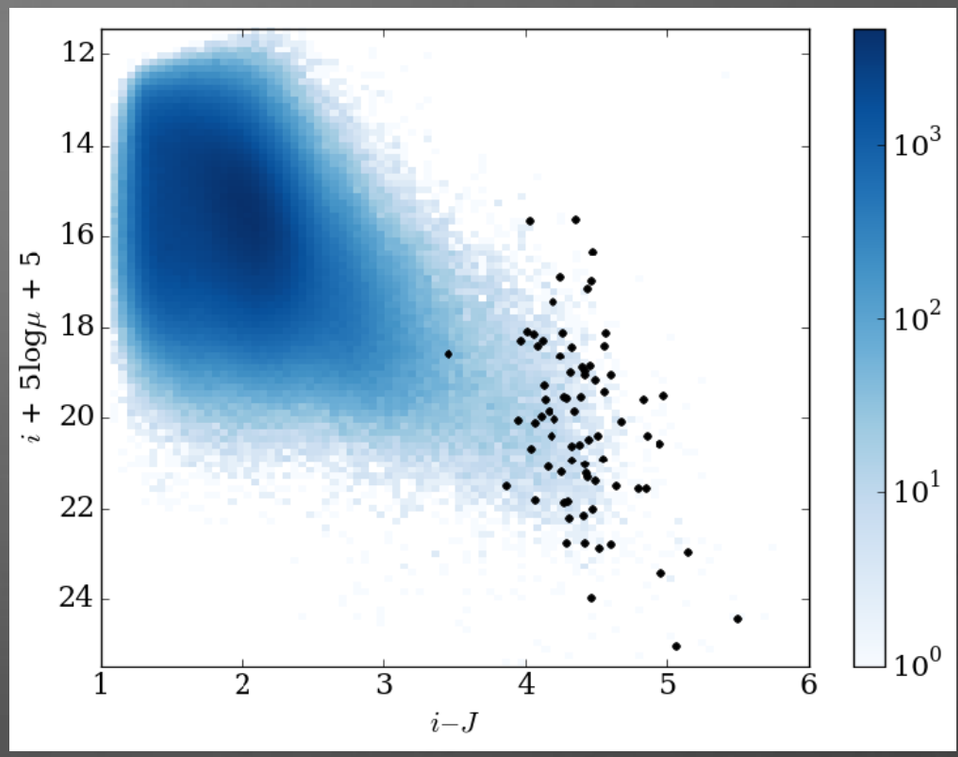
L3.5 Dwarf - 2MASS 0036+18

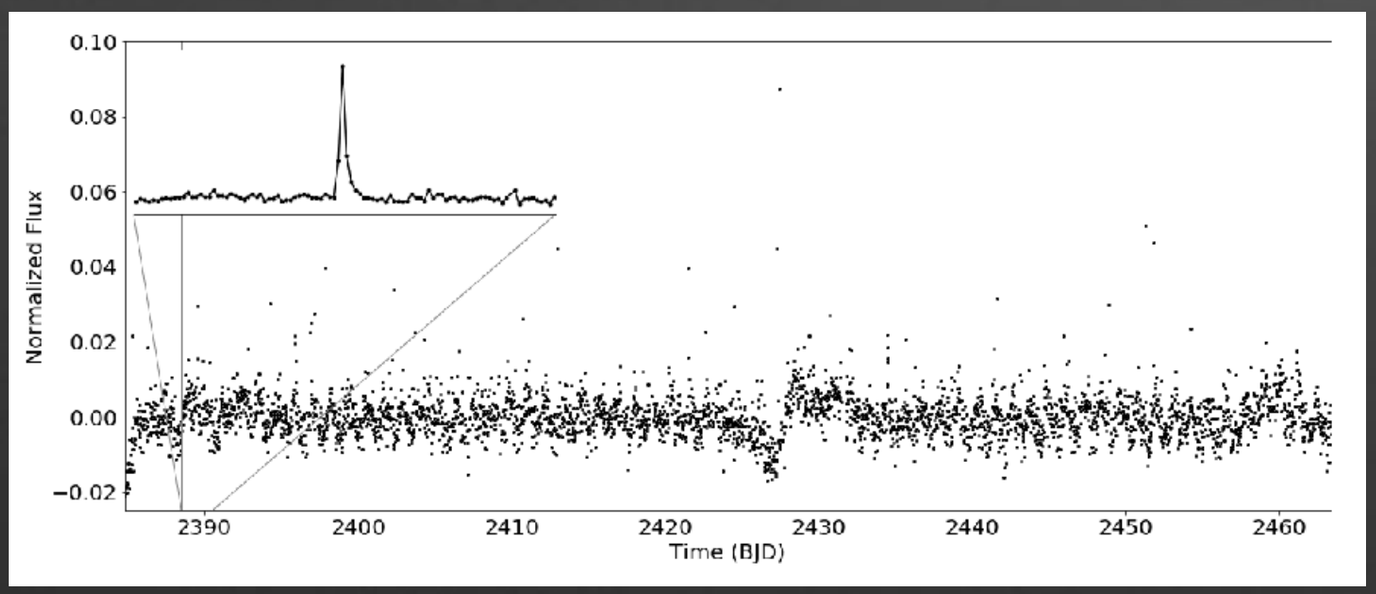


Croll+ 2016

Exciting L Dwarf Science with PALE ALE

Fundamental Parameters with 4.3m Discovery Channel Telescope





Planet Hunting & Stellar Activity with K2

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