



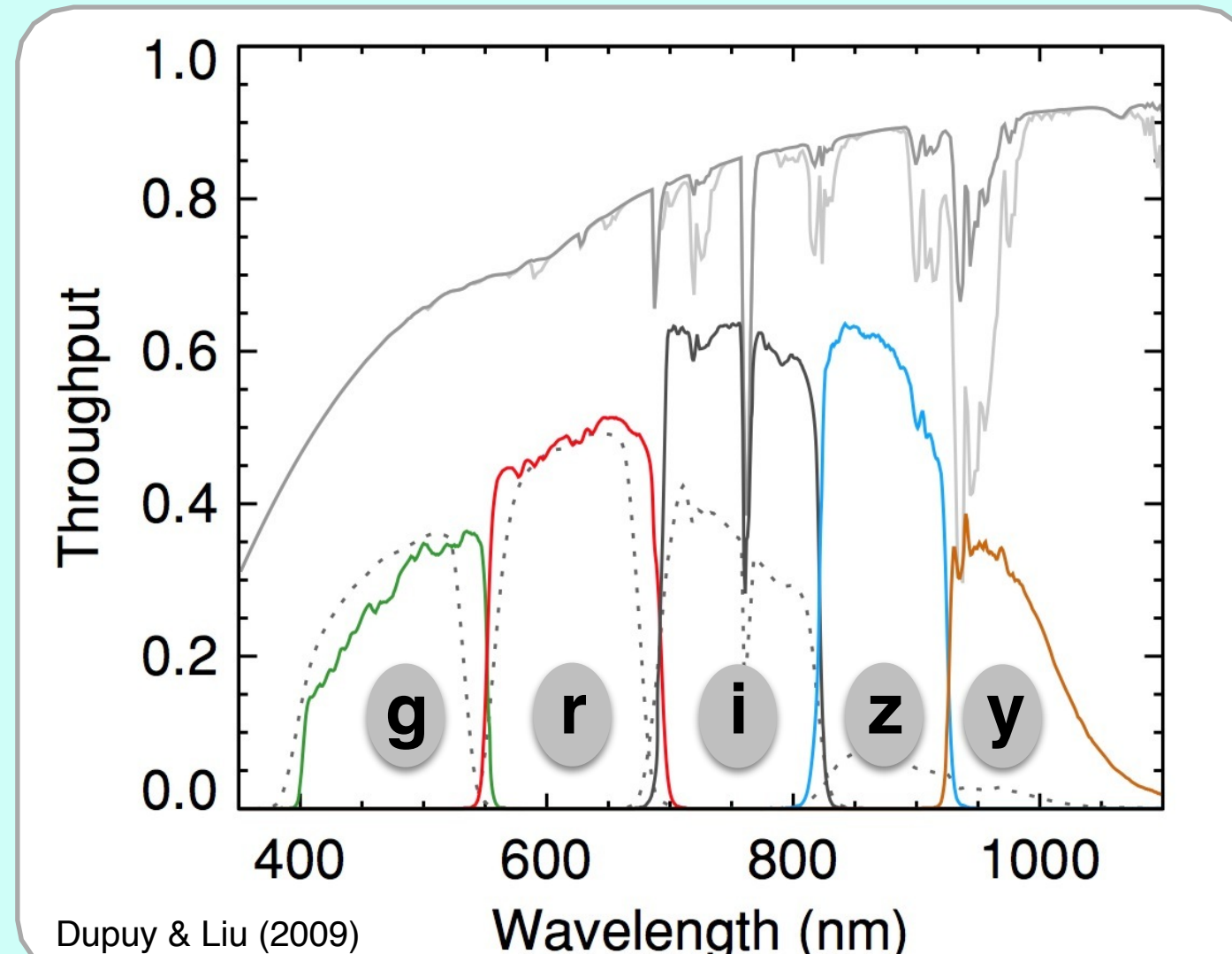
Photometry, Astrometry, and Young Discoveries of L and T Dwarfs in the Pan-STARRS1 3π Survey

William M. J. Best, Michael C. Liu, Eugene A. Magnier, Kimberly M. Aller

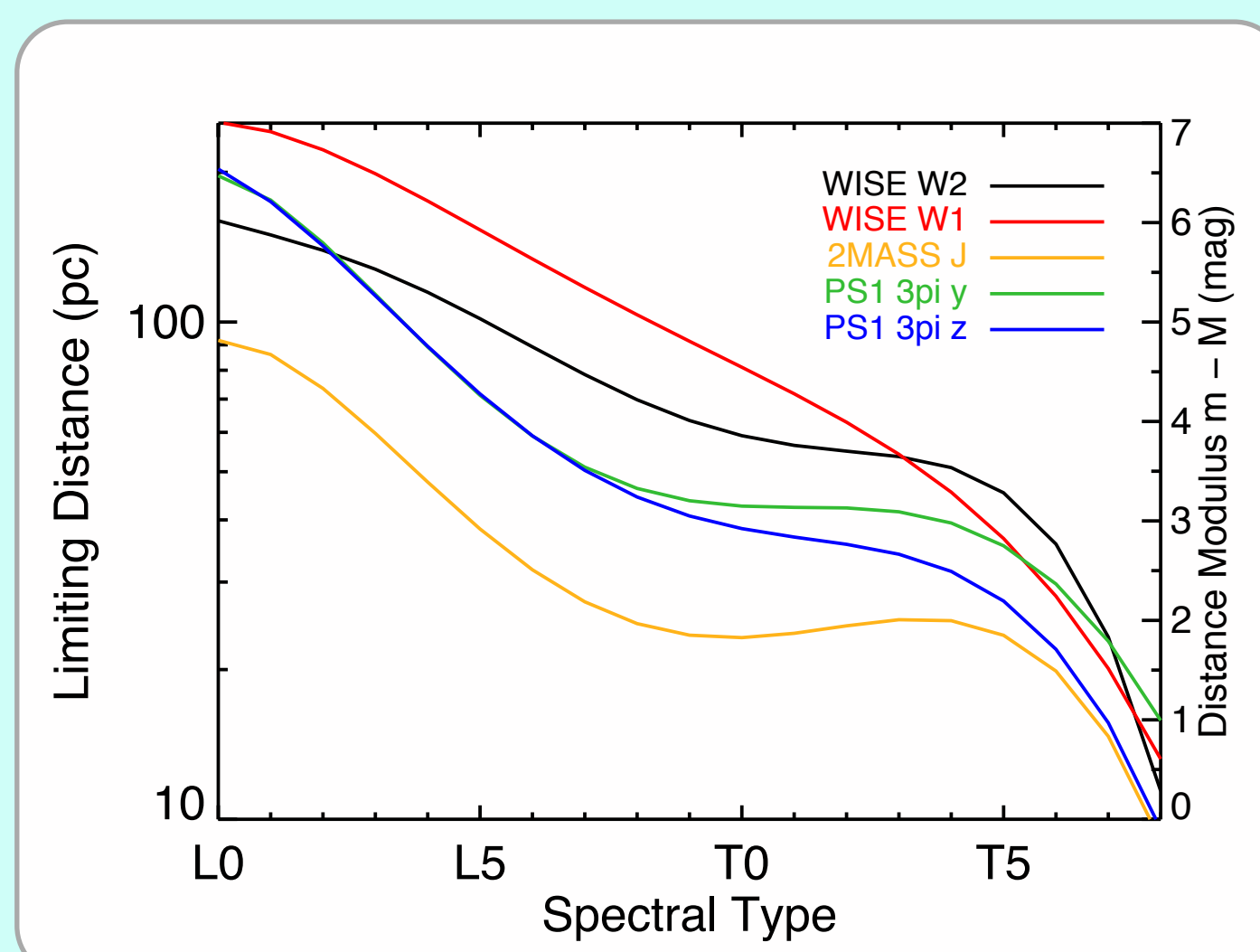
Institute for Astronomy, University of Hawai'i



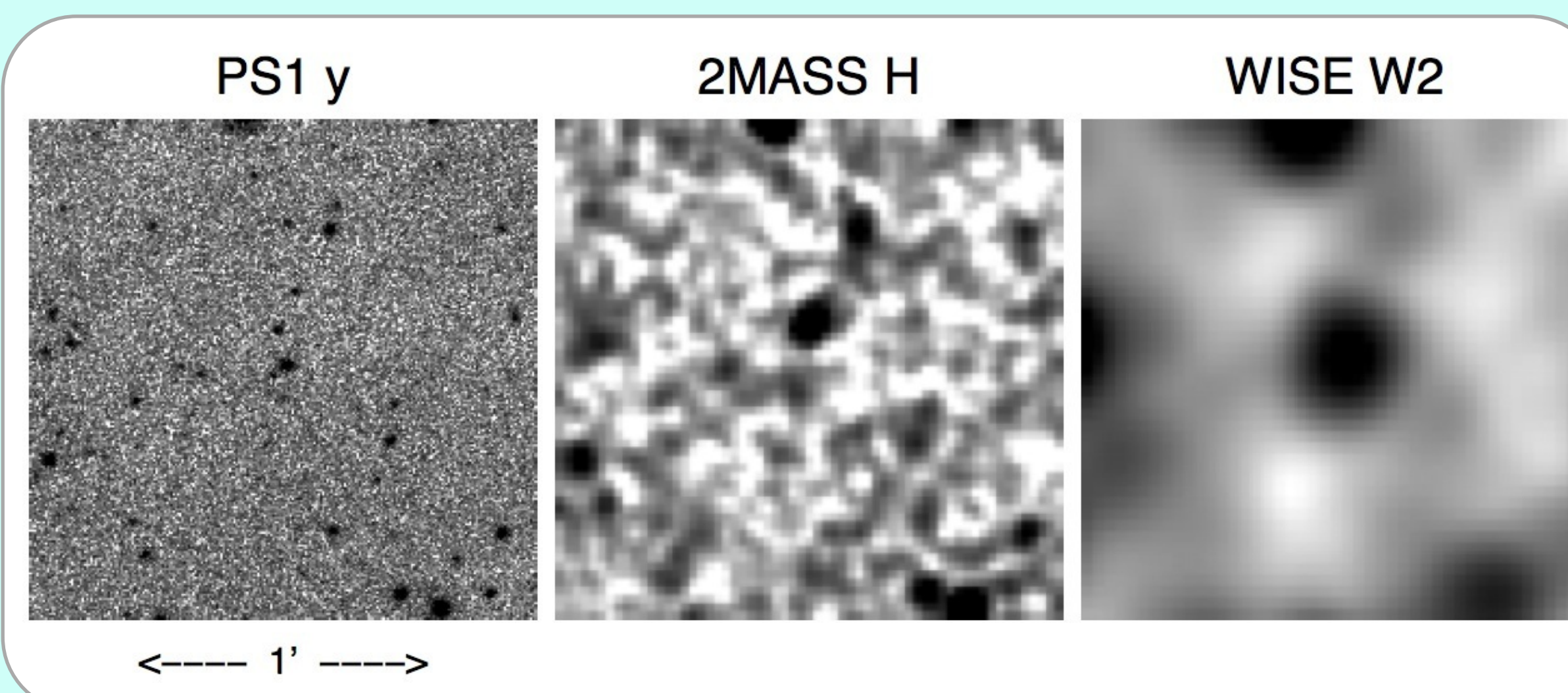
The Pan-STARRS1 3π Advantages



- **Depth:** ≈ 1 mag deeper than SDSS (z-band).
- **Coverage:** 3/4 of the sky ($\approx 31,000$ deg²).
- **Multi-band:** 5 optical *grizy* filters (left — dotted gray lines = SDSS *griz* bands).
- **Multi-epoch:** 12 epochs per band over 4 years \rightarrow proper motions + parallaxes.
- **Red sensitivity:** Greater depth for L and T dwarfs (bottom left) than 2MASS and SDSS.
- **Angular resolution:** Median PS1 $\approx 1.1''$ (below, compare 2MASS $\approx 2.5''$, WISE $\approx 6''$).



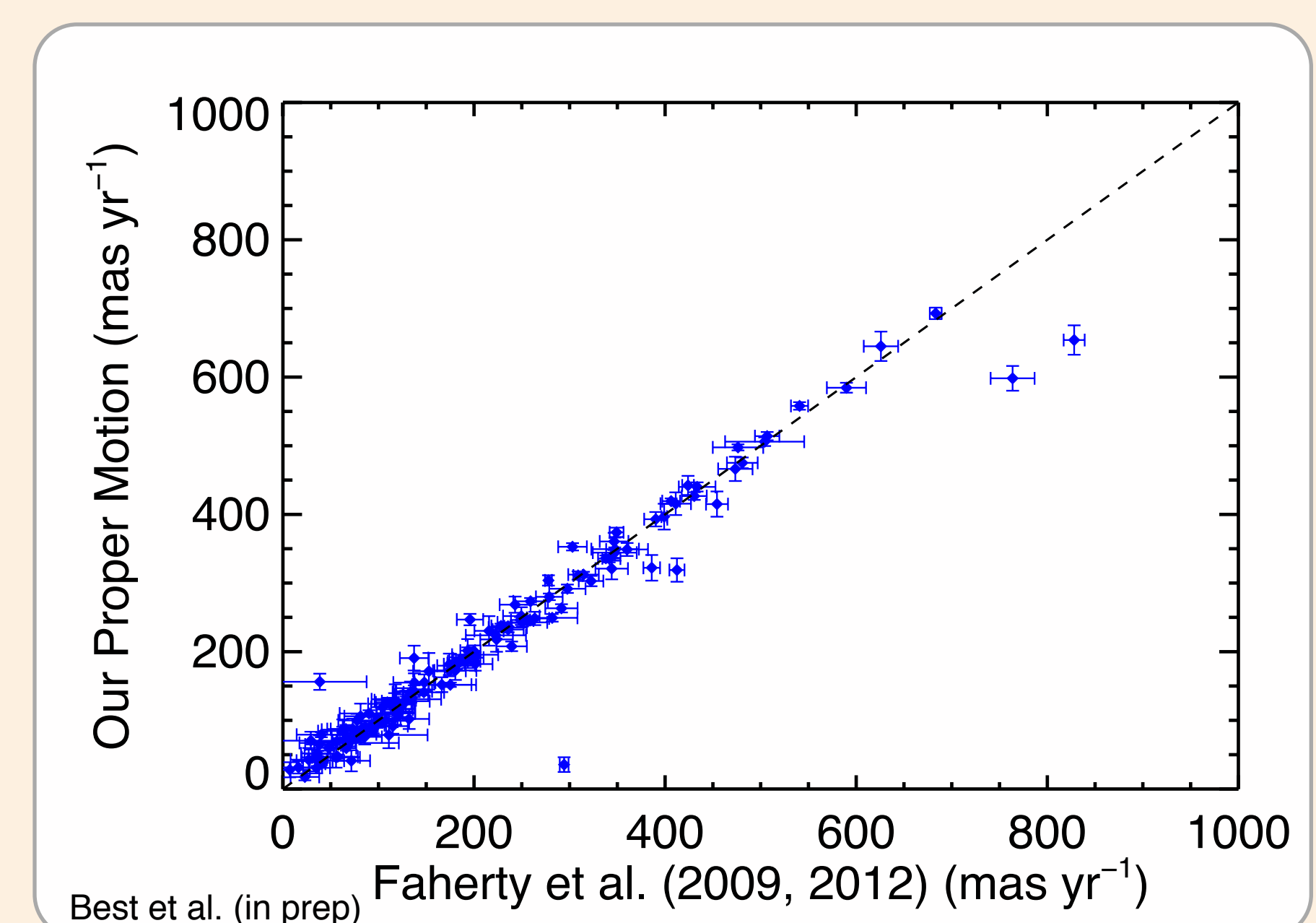
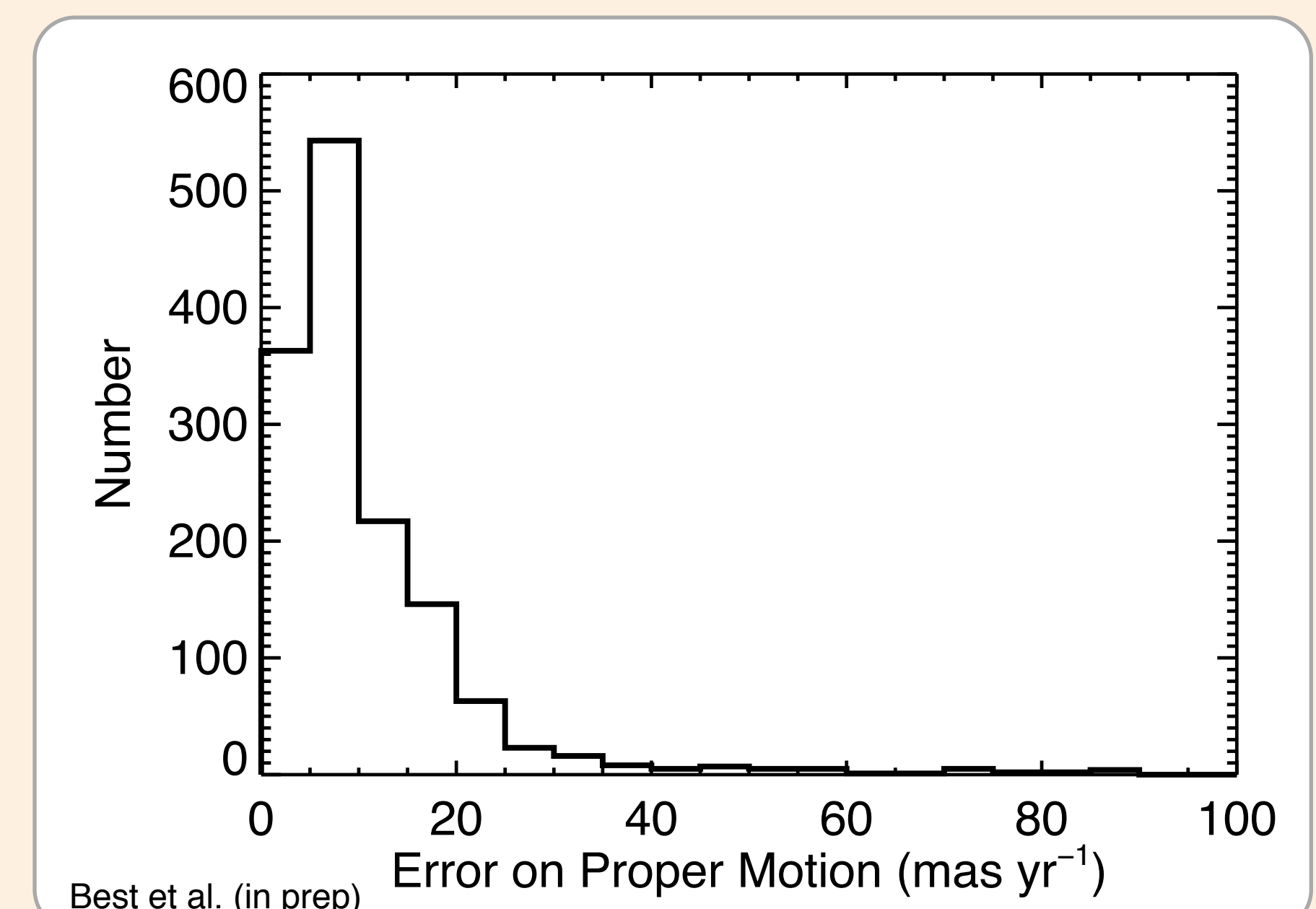
PS1 is deeper than 2MASS for L and T dwarfs.



Images of the T1.5 dwarf PSO J272.0887-04.9943 in PS1, 2MASS, and WISE, demonstrating the superior angular resolution of Pan-STARRS.

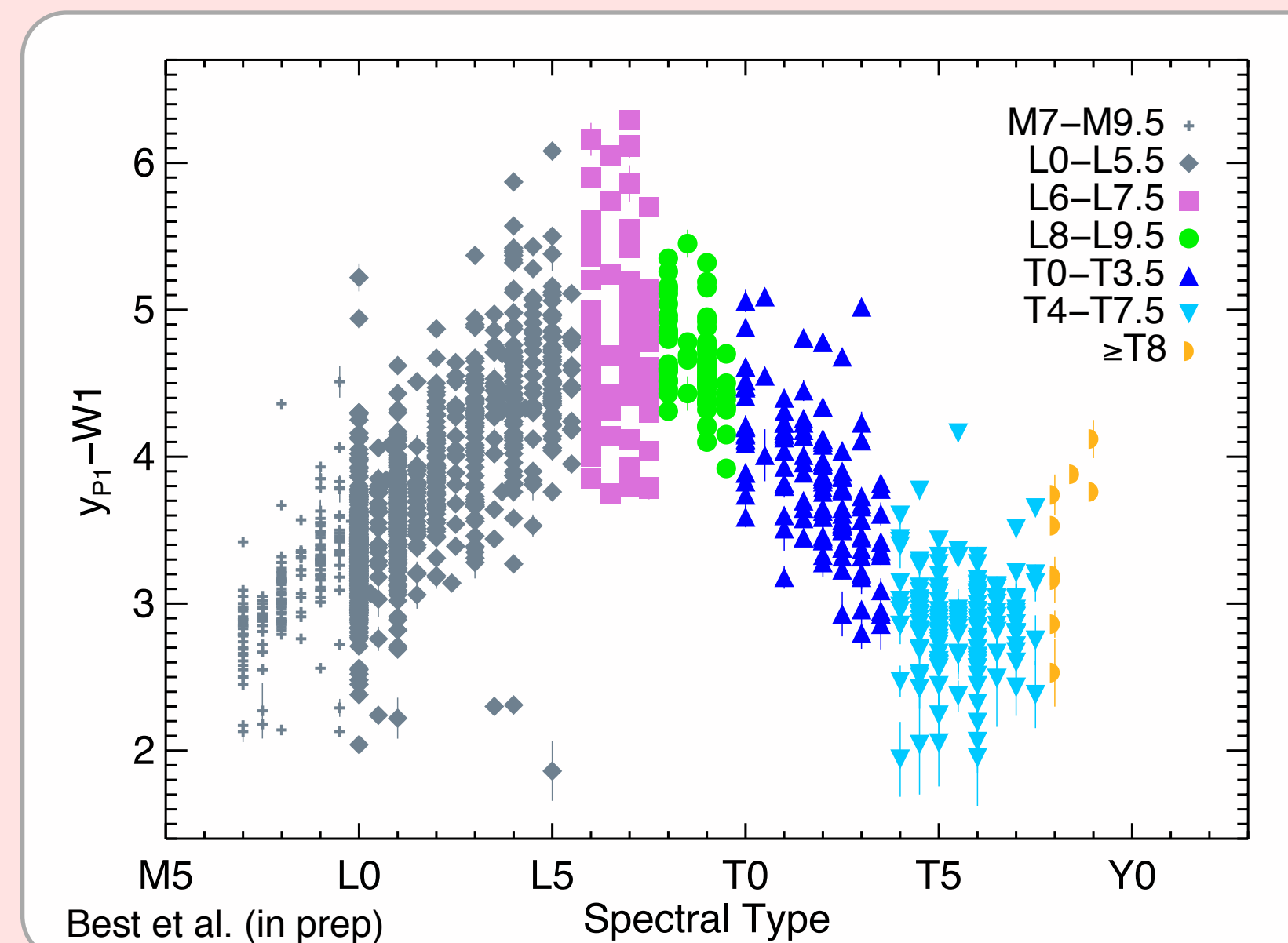
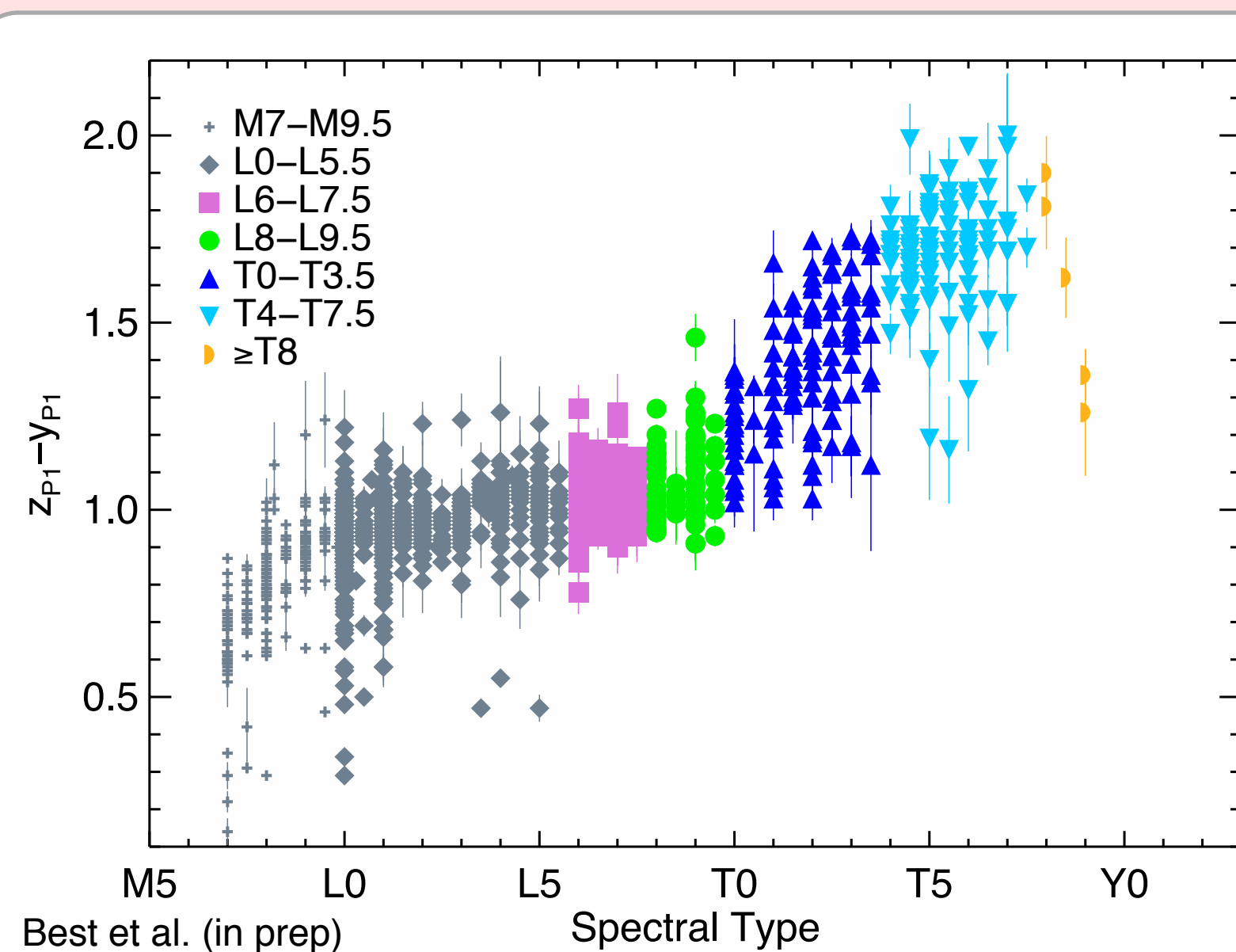
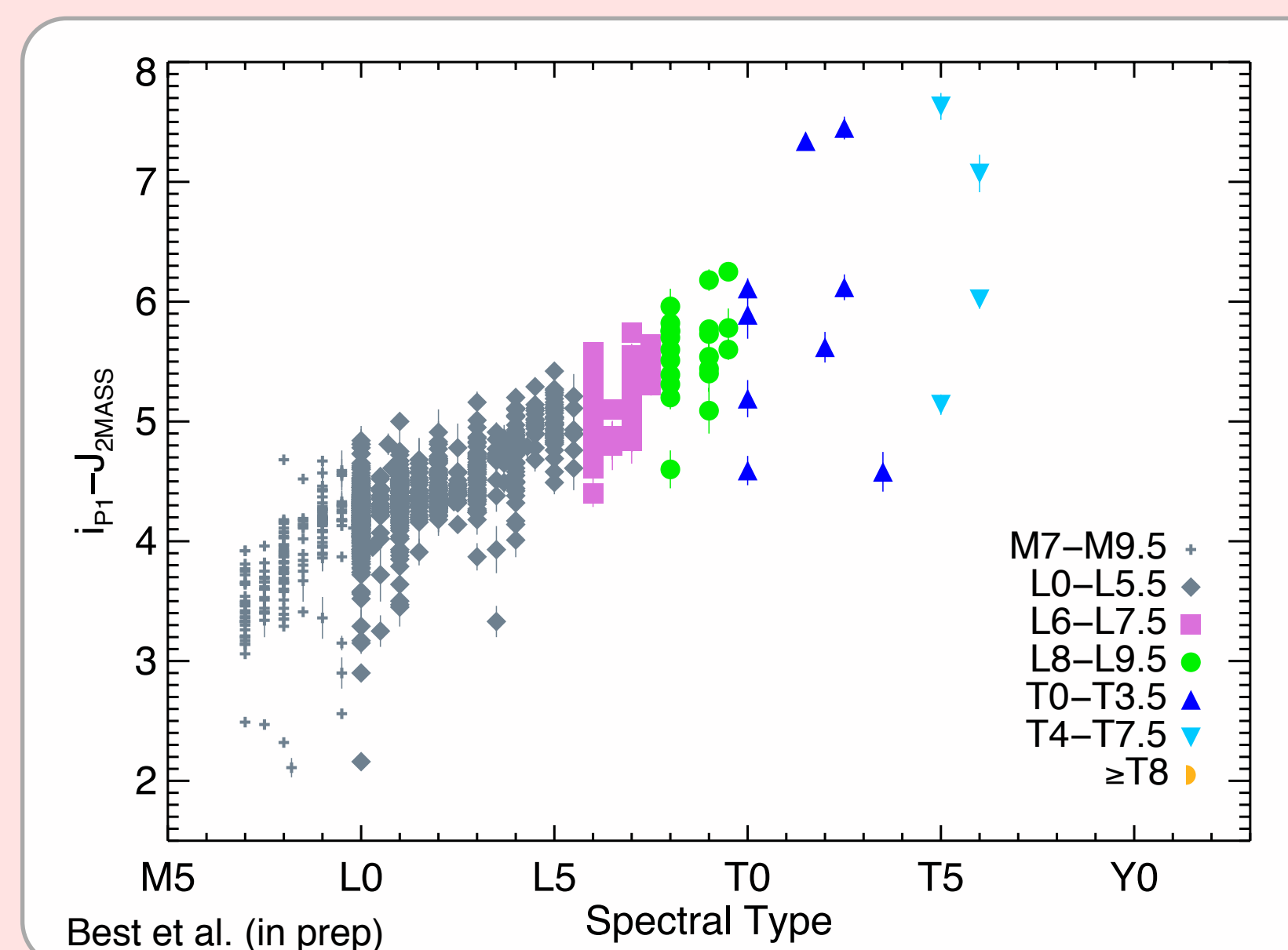
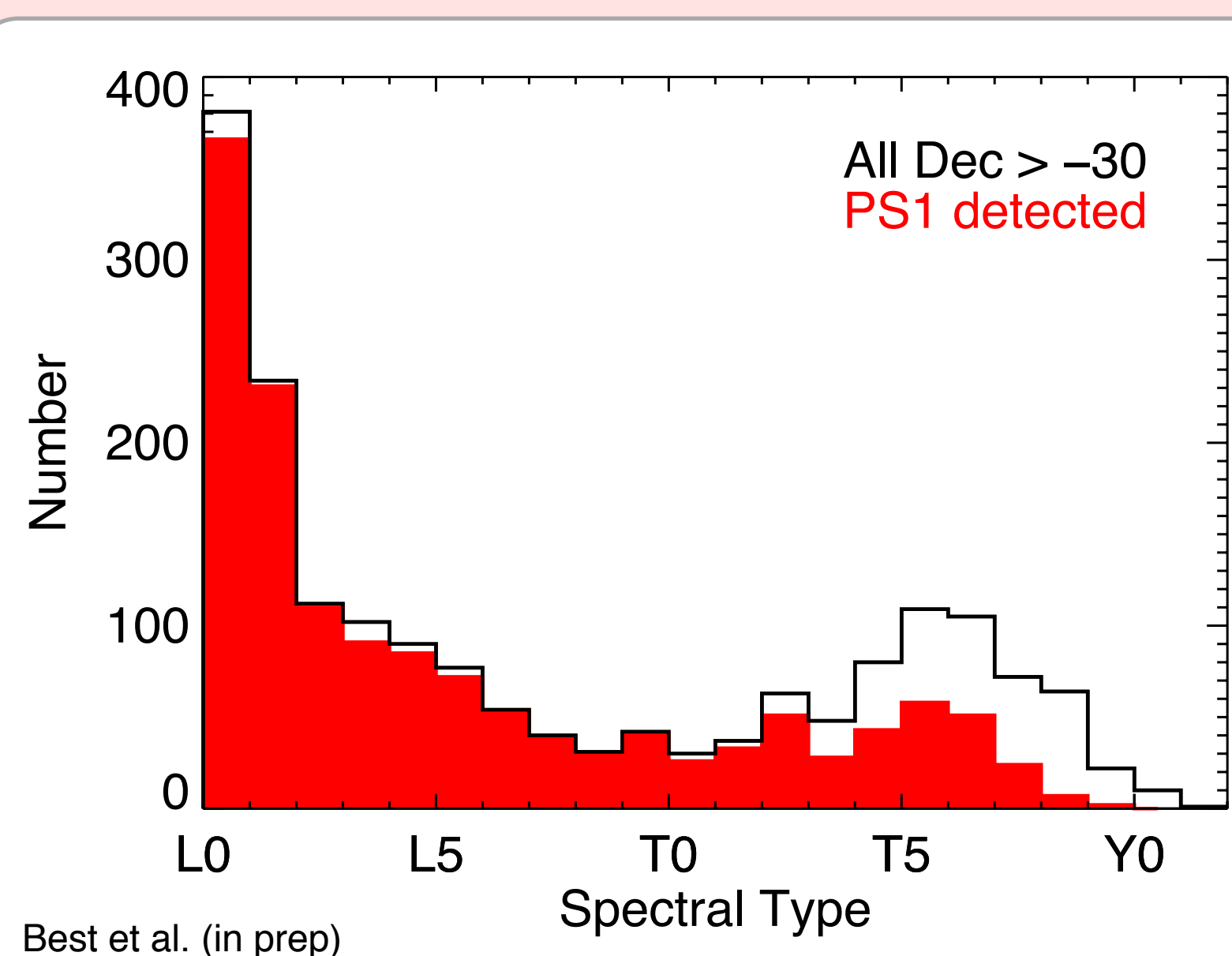
Proper Motions of L and T Dwarfs

- Using all PS1 epochs (min. 8) + 2MASS positions (if detected).
- Robust linear fits for RA and Dec vs. time.
- Median error ≈ 12 mas/year.
- Highly consistent with those of Faherty et al. (2009, 2012) and other literature sources.



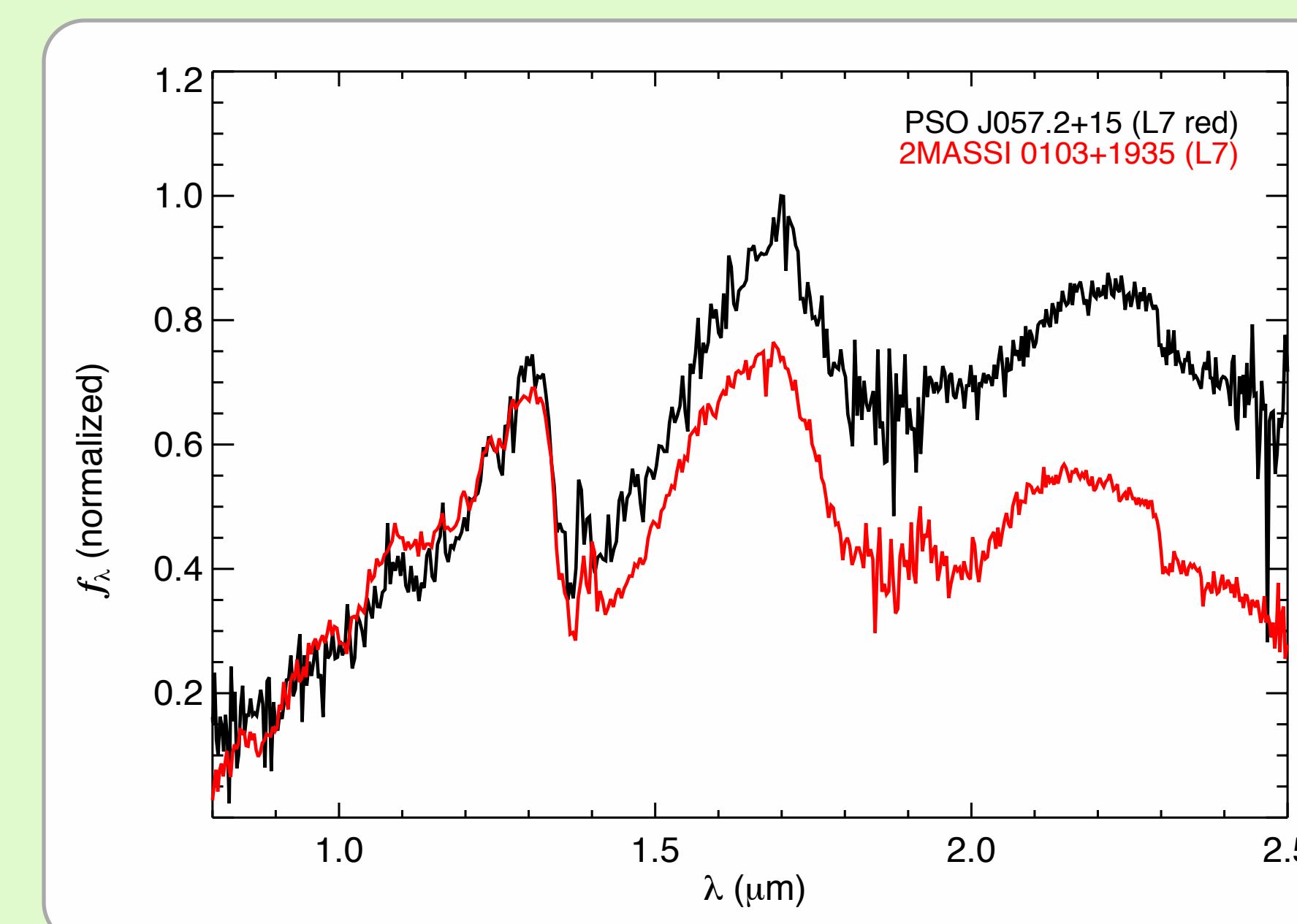
Photometry of L and T Dwarfs

PS1 colors have already helped to discover over 150 L and T dwarfs.

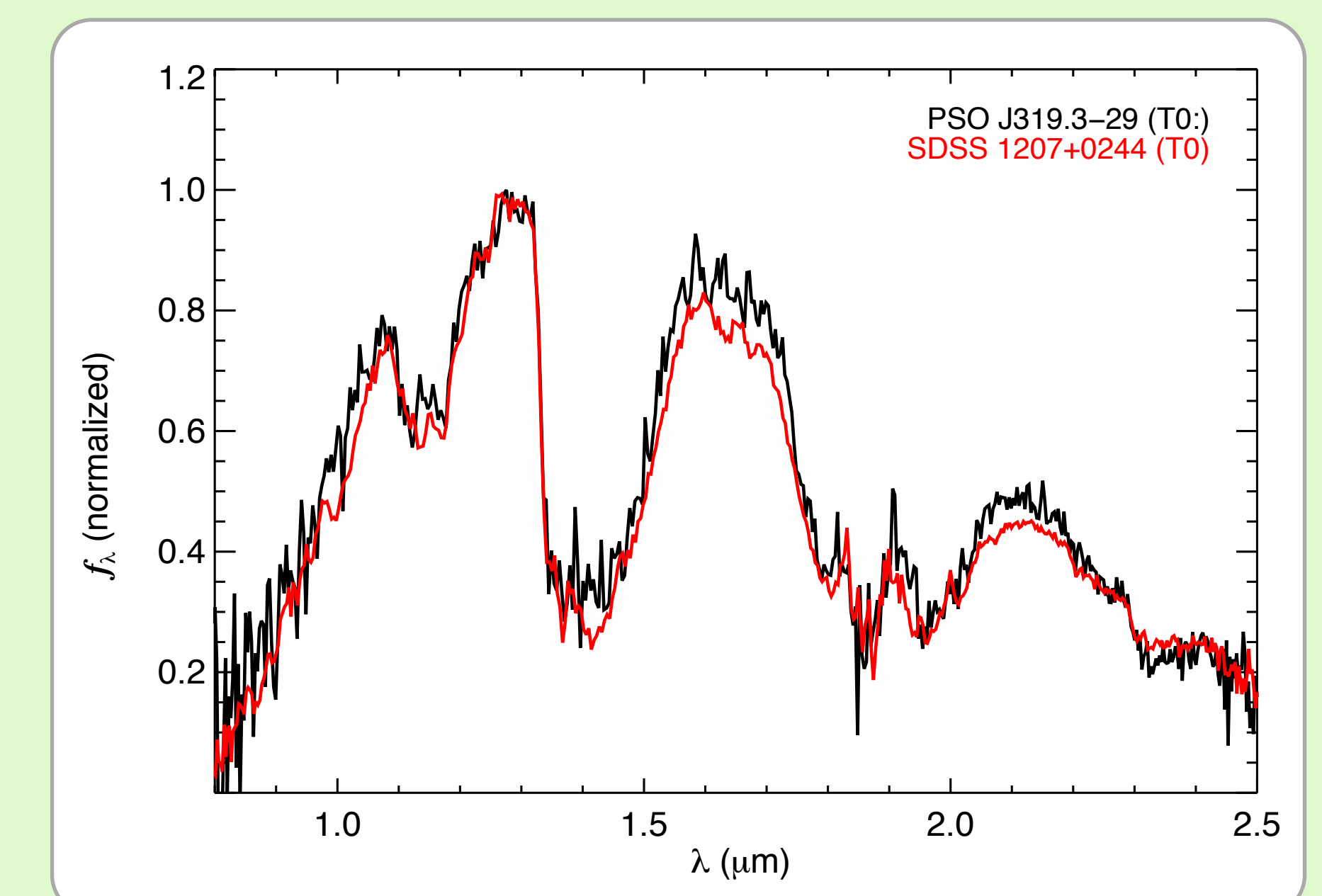


Candidate Young Moving Group Discoveries

In Best et al. (2015), we used PS1+WISE photometry and our proper motions to identify 10 L7–T4.5 dwarfs with $>70\%$ probability of membership in nearby young moving groups from BANYAN II (Malo+ 2013; Gagné+ 2014). Here we show two candidate ≈ 6 – 8 M_{Jup} members of the β Pictoris Moving Group (β PMG), age ≈ 24 Myr (Bell+ 2015).



PSO J057.2893+15.2433 has a 92% probability of β PMG membership, and is notably redder than the L7 field standard 2MASS 0103+1935.



PSO J319.3102-29.6682 has a 97% probability of β PMG membership. Its SpeX prism ($R \approx 100$) spectrum appears similar to the T0 field standard SDSS 1207+0244.