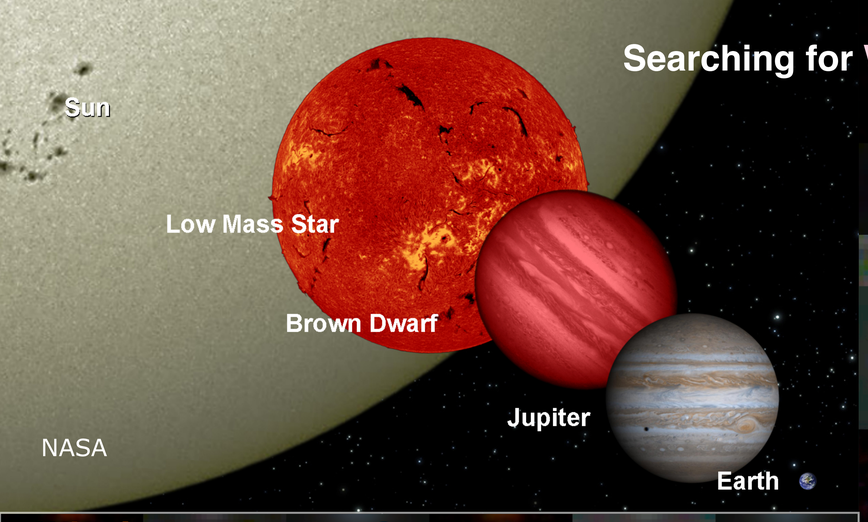
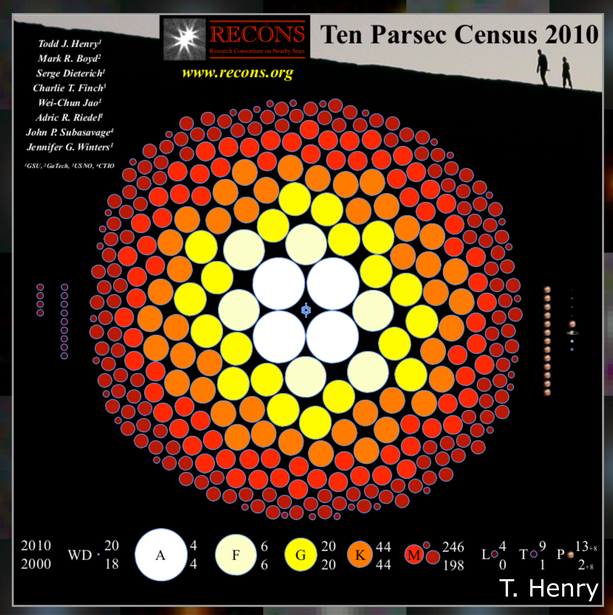
Searching for Warm Dust around Cool Stars from the Sloan Digital Sky Survey

Boston University
Christopher A. Theissen, Andrew A. West
Department of Astronomy



Why low-mass stars?

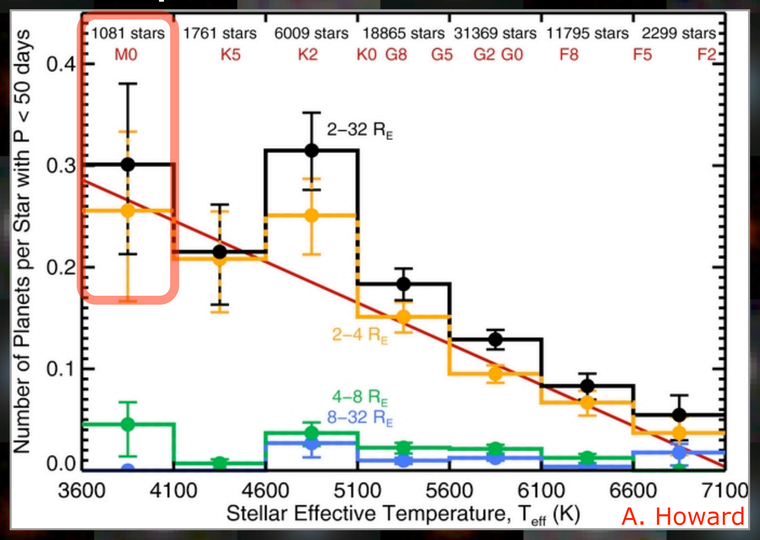
What is in a star's size?



Large and small censuses of stars indicate that low mass stars are easier to form than high mass stars.

Low-mass stars make up ~70% of the stellar population[1].

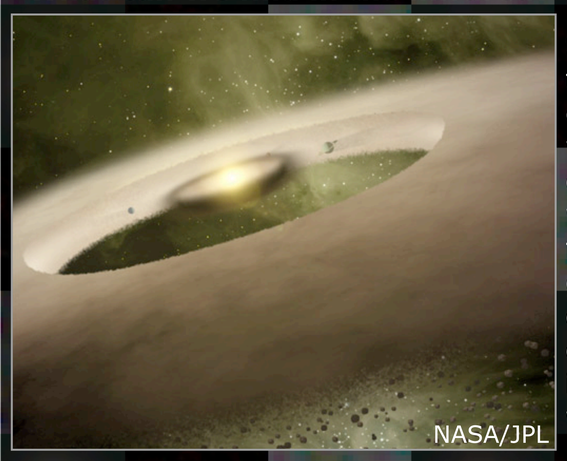
Do we see planets around them?



Low-mass stars have a high likelihood for hosting Earth sized planets[3].

What are we looking for?

What can we find in the infrared?

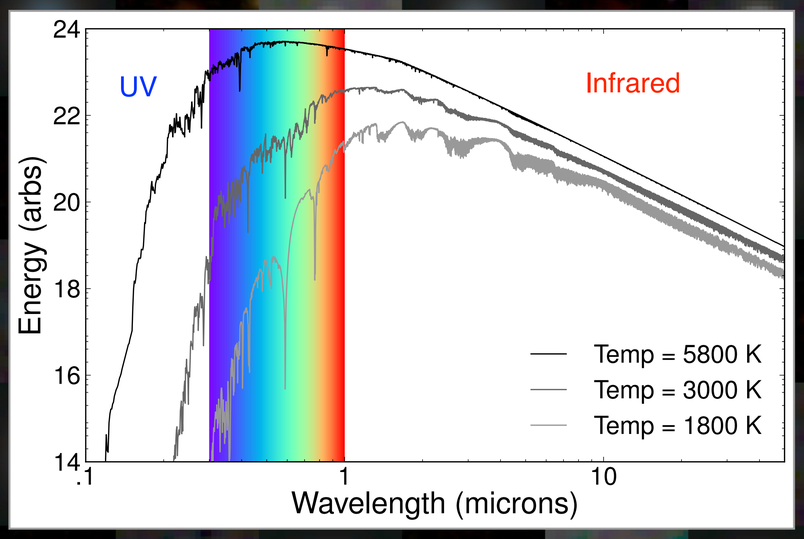


Stars form from the collapse of a cloud of gas, which in turn creates a disk where planets form. Disks, and gaps within the disk, can be observed at infrared wavelengths.

Planet formation signatures exist within the infrared wavelength regime.

Where do we look?

Observational differences between stars?

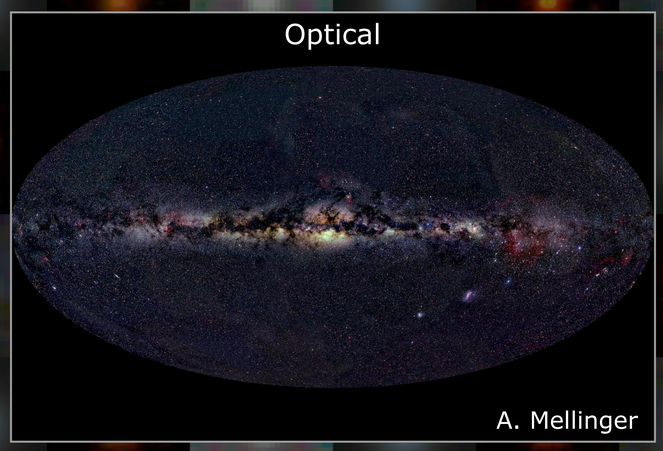


Model stellar photospheres[2]. Photospheres are the part of the stellar atmosphere from which light we observe is produced. Temperature primarily defines the shape of the spectrum.

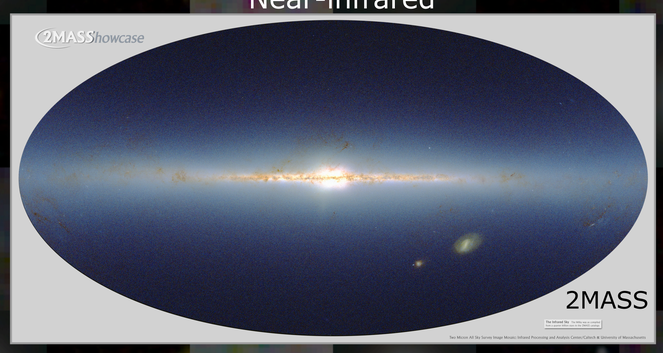
M dwarfs are so cool that molecules begin forming in their atmospheres. This is extremely noticeable in the regime of visible light.

What data is available to Astronomers?

Optical



Near-infrared

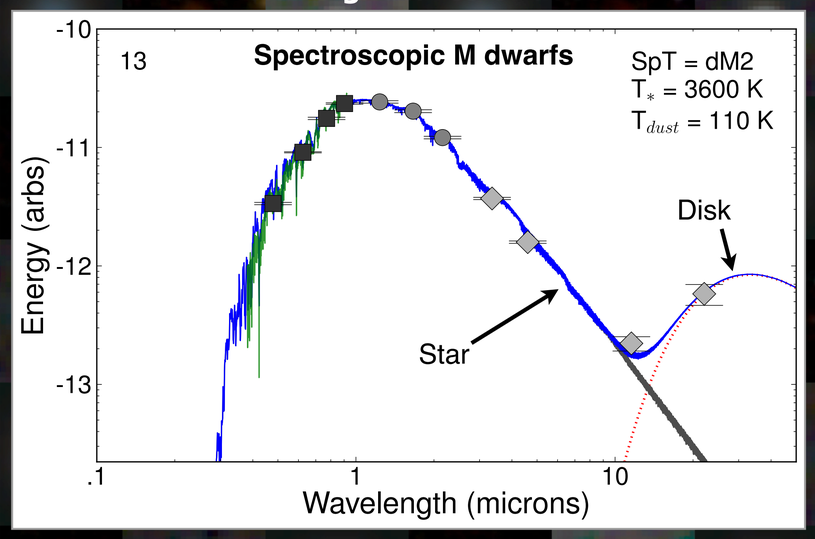


Mid-infrared

There is an abundance of data coming from all-sky surveys, both from space, and the northern and southern hemispheres of Earth.

What have we found?

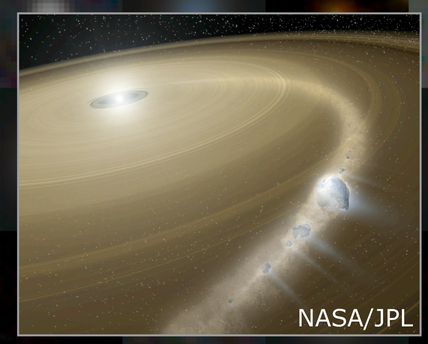
446 M dwarfs with signatures of dust



These stars are mostly older stars (>1 billion years) that should not have disks.

What is the interpretation?

Possible scenarios include:

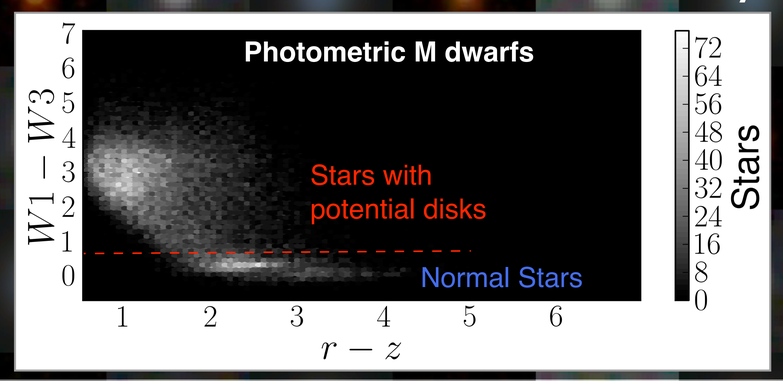


1) **Planets or asteroids may stray too close to their host star and be ripped apart by the force of gravity, creating a disk of material similar to that found around young stars.**
2) **Failed planet formation, similar to our own Asteroid and Kuiper belt.**
3) **A second onset of planet formation.**

Some of these ideas are supported by the fact that low-mass stars have lifetimes longer than the current age of the Universe (~13.7 billion years).

What is the next step?

There are still countless stars out there to study.



References

[1] Bochanski, J. J., Hawley, S. L., Covey, K. R., et al. 2010, AJ, 139, 2679
[2] Allard, F., Homeier, D., & Freytag, B. 2012, Royal Society of London Philosophical Transactions Series A, 370, 2765
[3] Howard, A. W., Marcy, G. W., Bryson, S. T., et al. 2012, ApJS, 201, 15

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