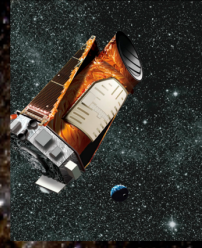


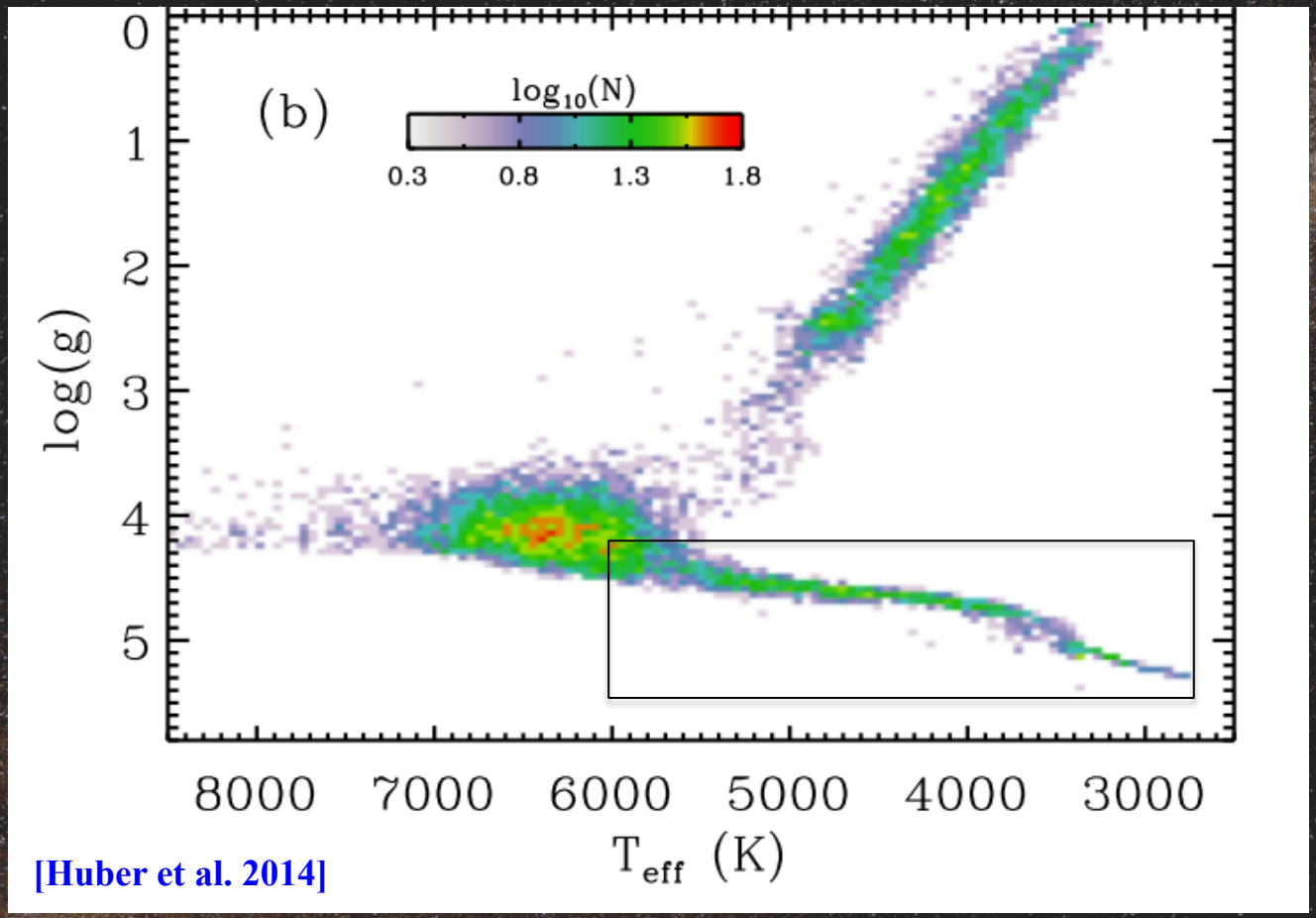
Probing the Deep End of the Milky Way with New Oscillating *Kepler* Giants

Savita Mathur

Space Science Institute

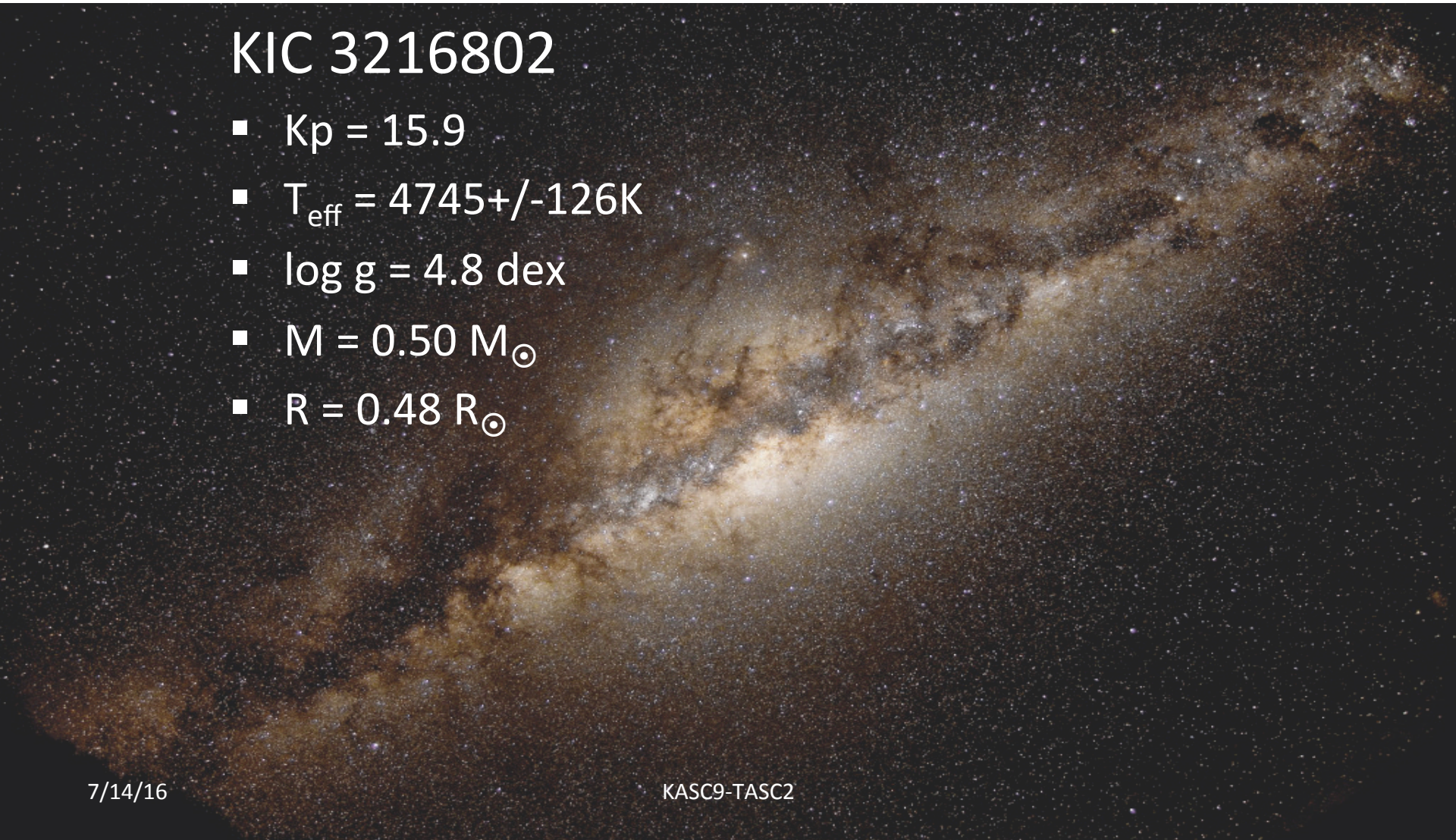
In collaboration with: R. A. Garcia, D. Huber, C. Regulo, D. Stello, P. G. Beck, K. Houmani, D. Salabert, A. Miglio, J. Johnson, M. Pinsonneault

Kepler dwarfs



[Huber et al. 2014]

A dwarf according to DR24



KIC 3216802

- Kp = 15.9
- T_{eff} = 4745+/-126K
- log g = 4.8 dex
- M = 0.50 $M_{\odot}$
- R = 0.48 $R_{\odot}$

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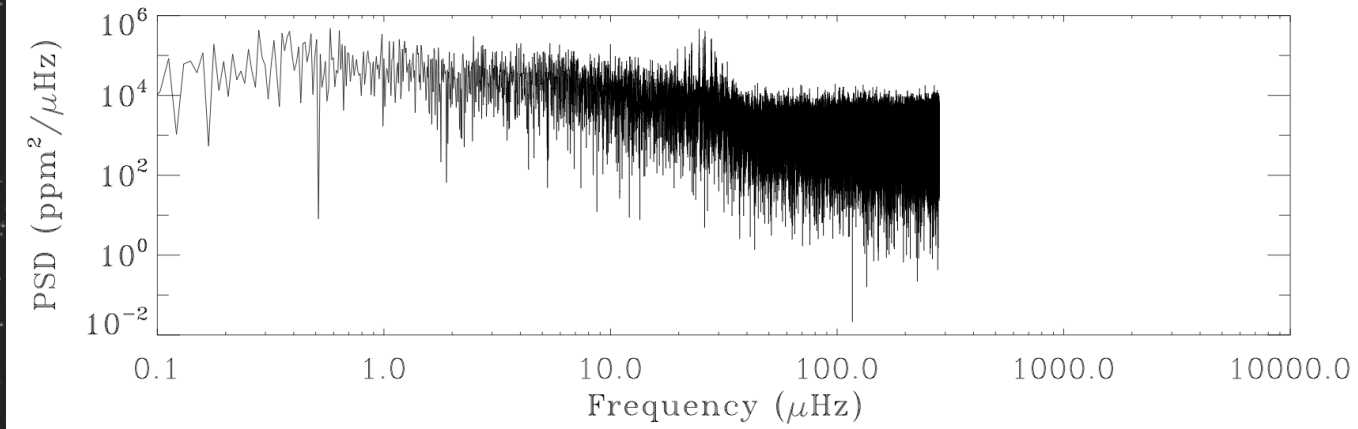
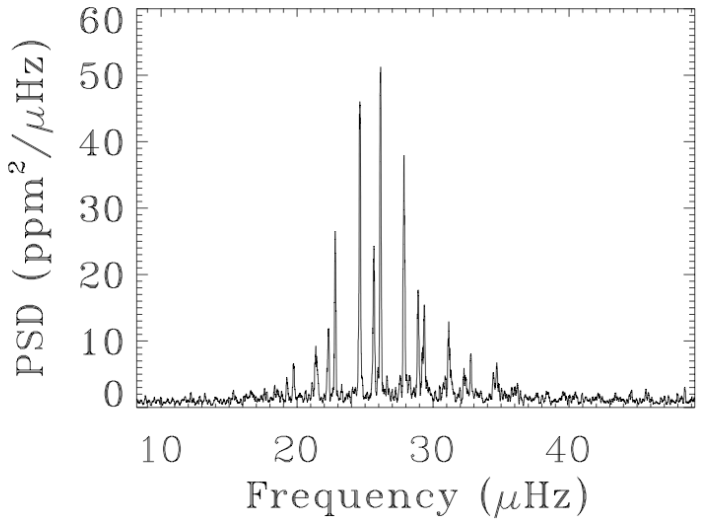


log g~2.38 dex
M=0.73+/-0.34$M_\odot$
R=9.07+/-2.96$R_\odot$



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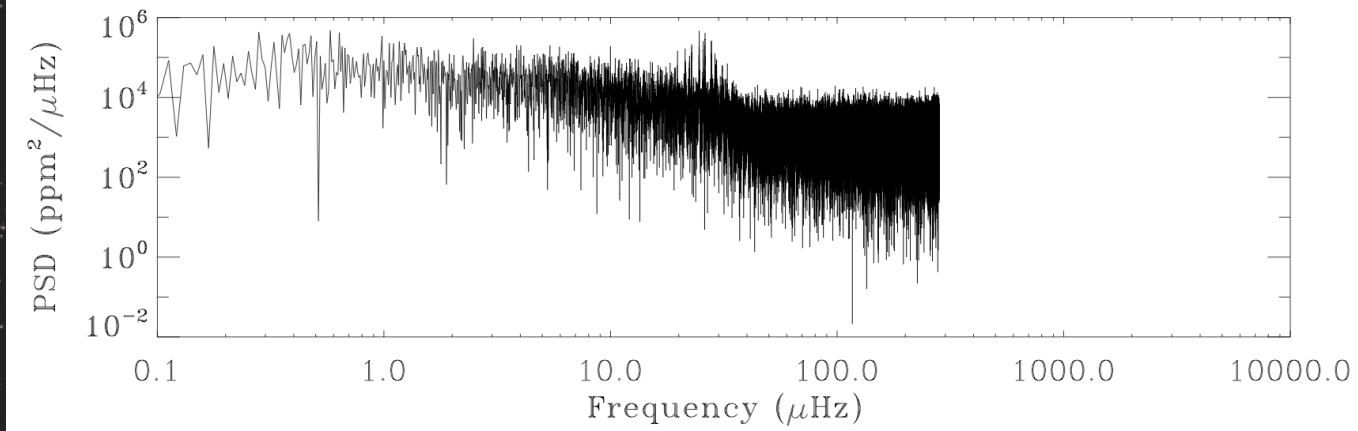

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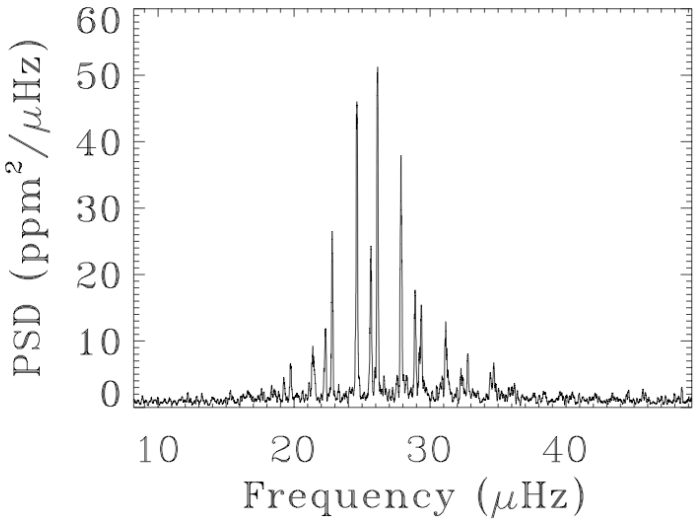
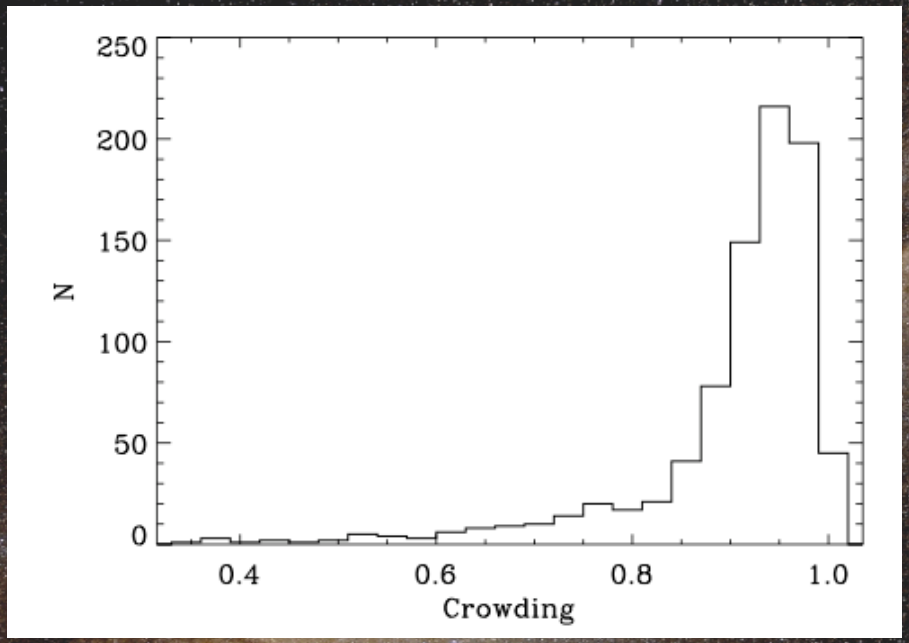


Check for pollution

- Crowding= target flux /total flux in the optimal aperture



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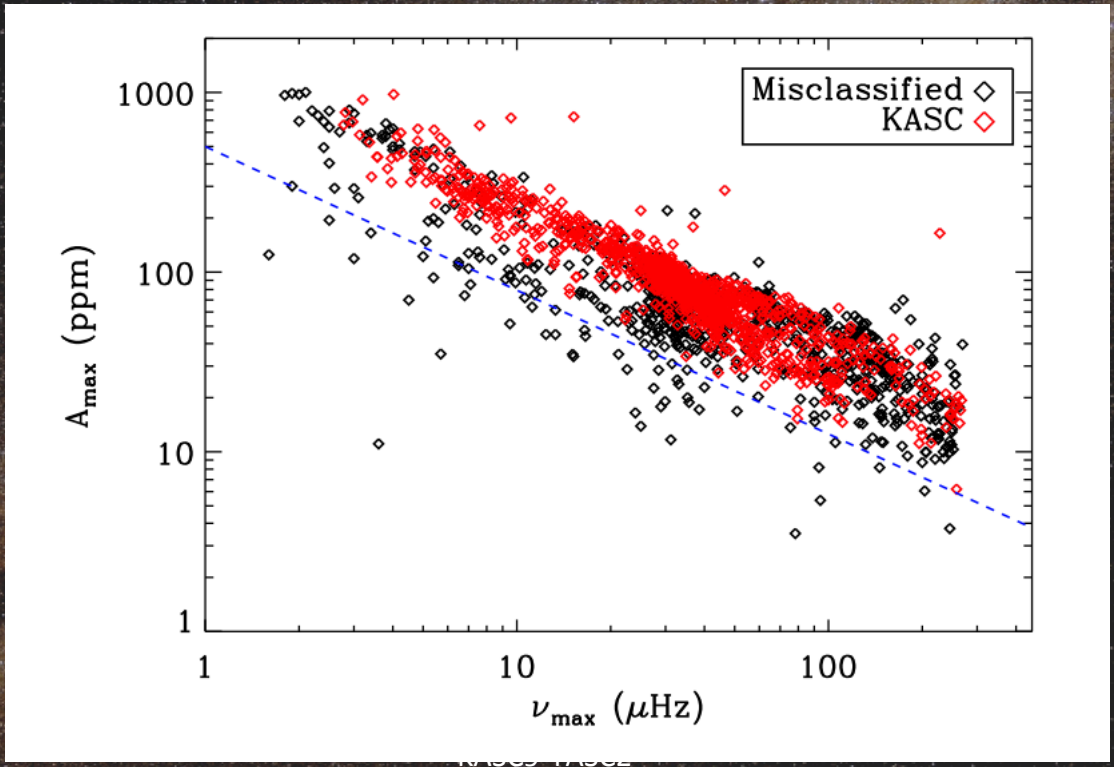
- Amplitude of the modes
- J-band images from UKIRT



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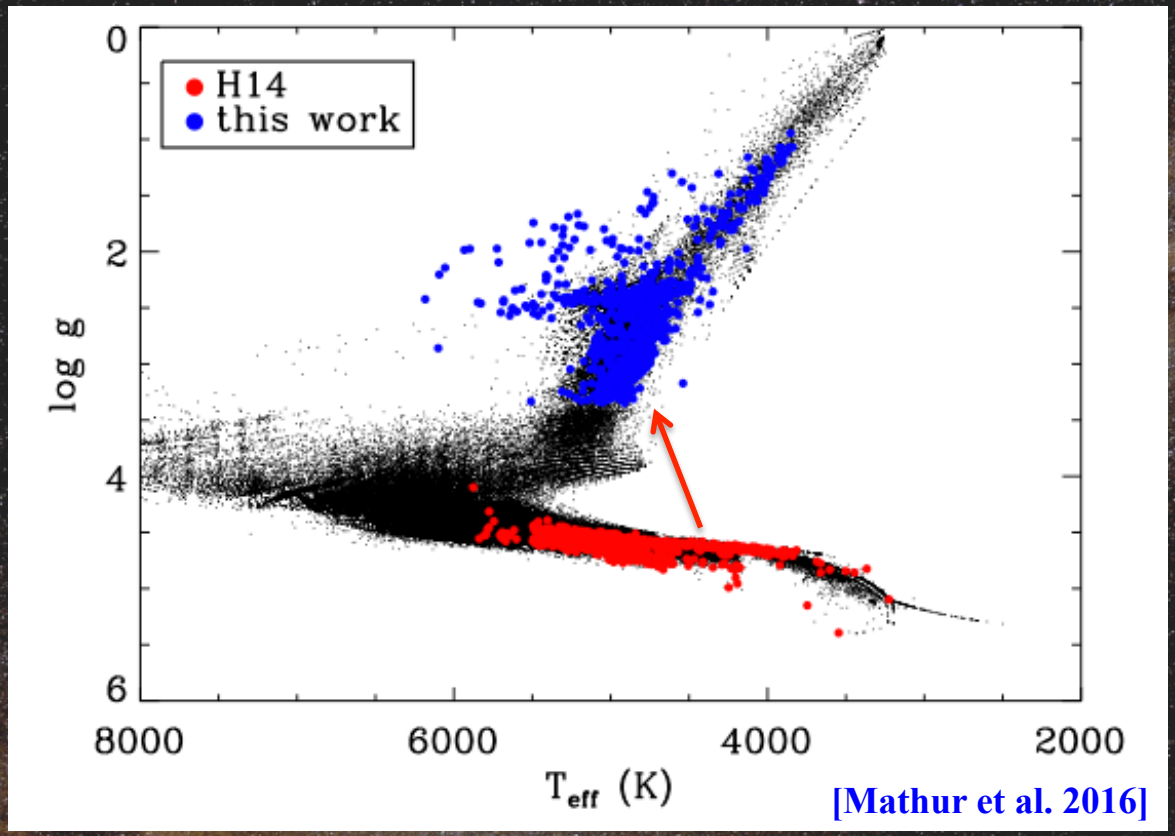
854 dwarfs are actually oscillating red giants!!

Re-determining T_{eff}

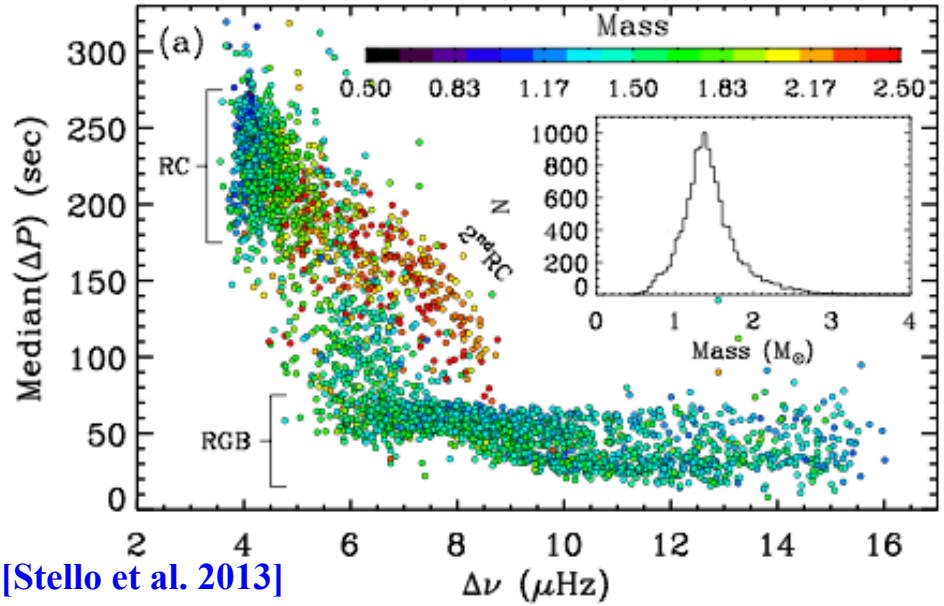
- Determined $\Delta\nu$, ν_{max} with A2Z and SYD pipelines
- Grid of Parsec isochrones [Bressan et al. 2012]
- Fit:
  - 2MASS *J*−*H* and *H*−*K* (with AAA flag)
  - $\Delta\nu$, ν_{max}
- Priors:
  - Flat prior on age and mass
  - Metallicity prior derived from the Geneva Copenhagen survey [Casagrande et al. 2011]

Misclassified red giants



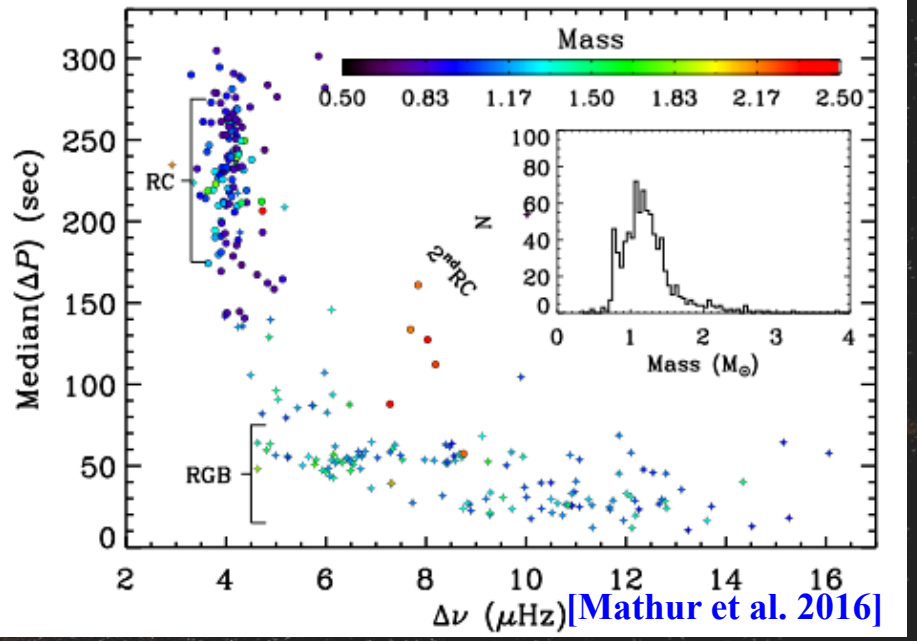
- ✓ T_{eff} from isochrone fitting
- ✓ log g from scaling relations (M and R)

Evolutionary stage



[Stello et al. 2013]

~300 misclassified red giants:
Less massive in the RC

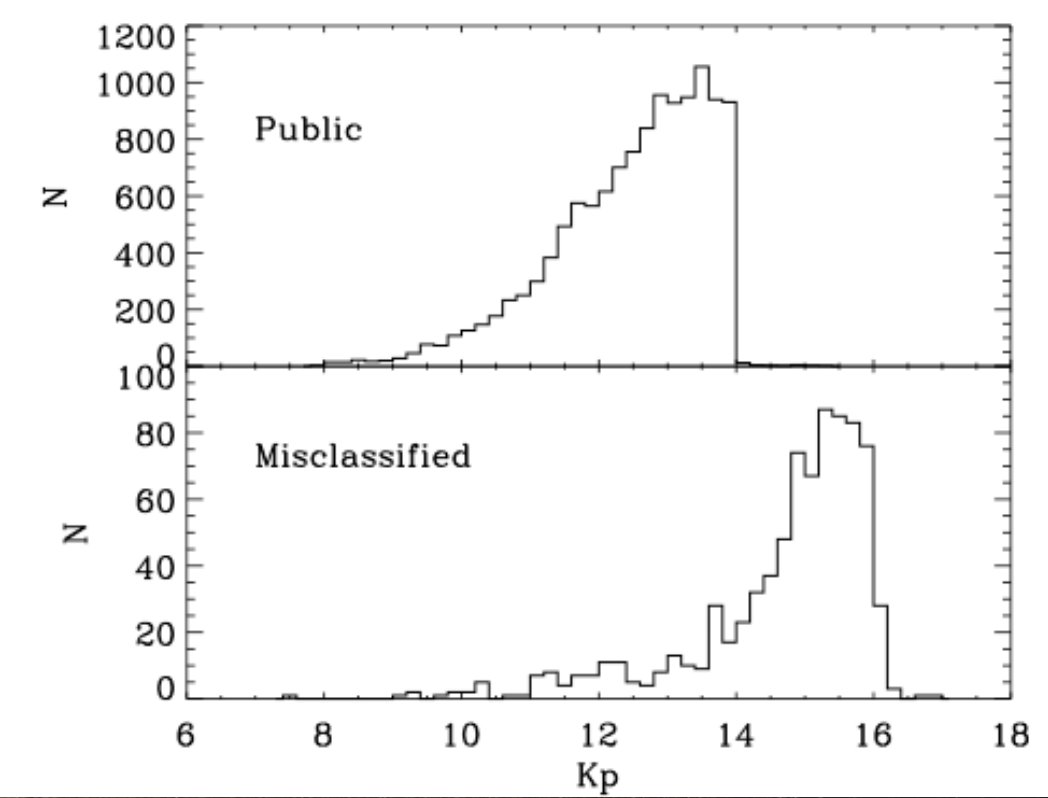


[Mathur et al. 2016]

13,000 public red giants

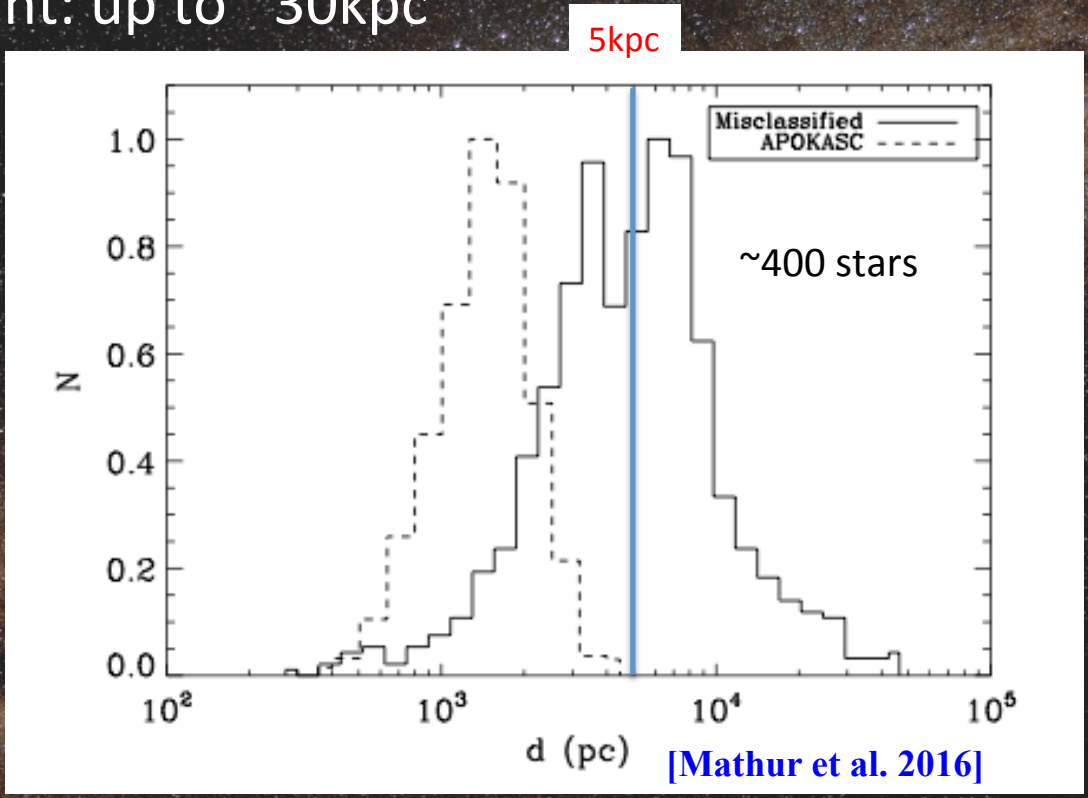
Faint red giants

- Fainter than the known *Kepler* red giants



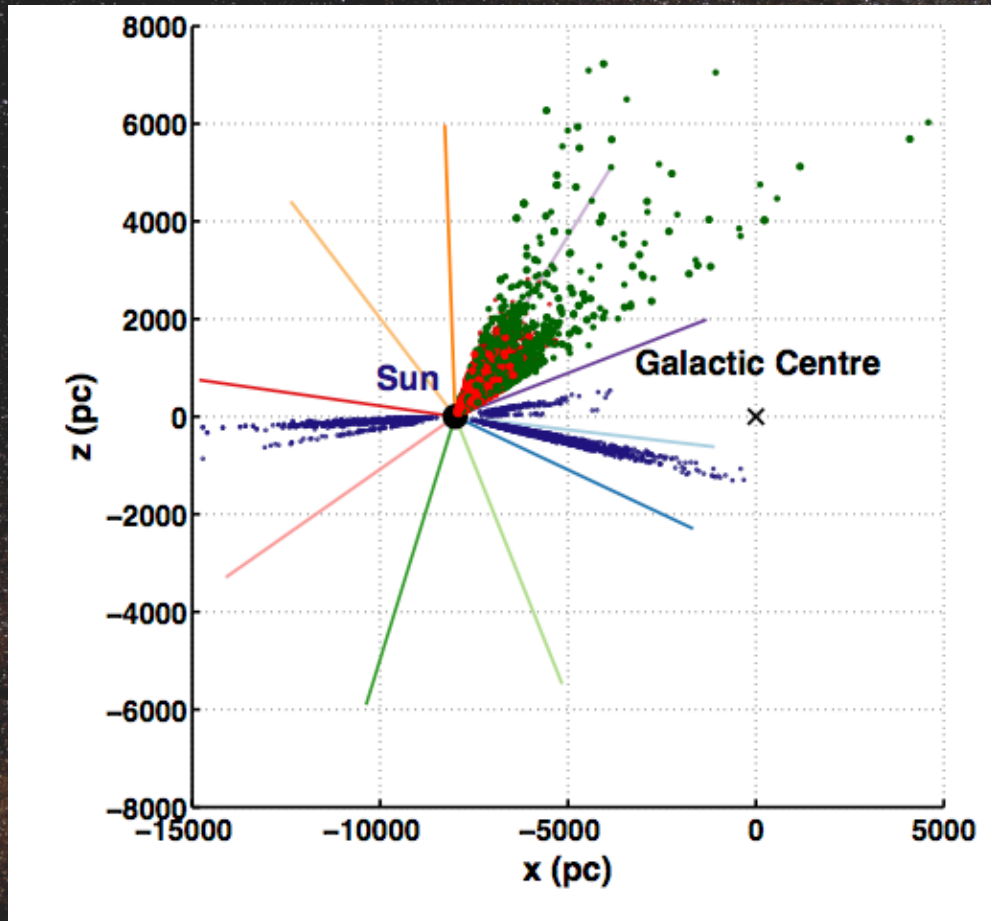
Distances

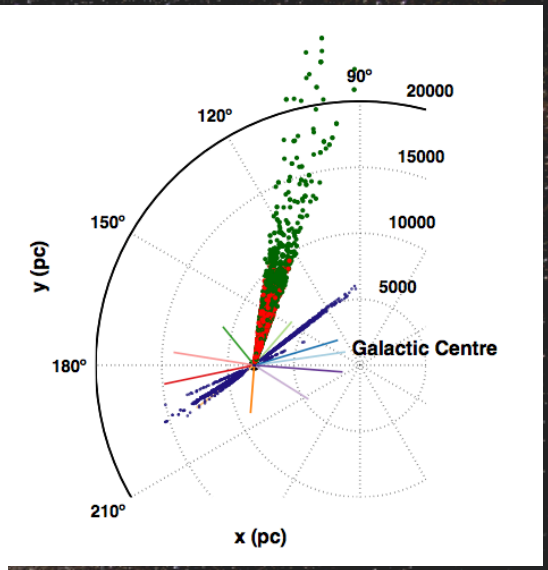
- Redenning from Amores & Lepine (2005) to estimate distances
- Comparison with APOKASC distances [Rodrigues et al. 2014]
- More distant: up to ~30kpc



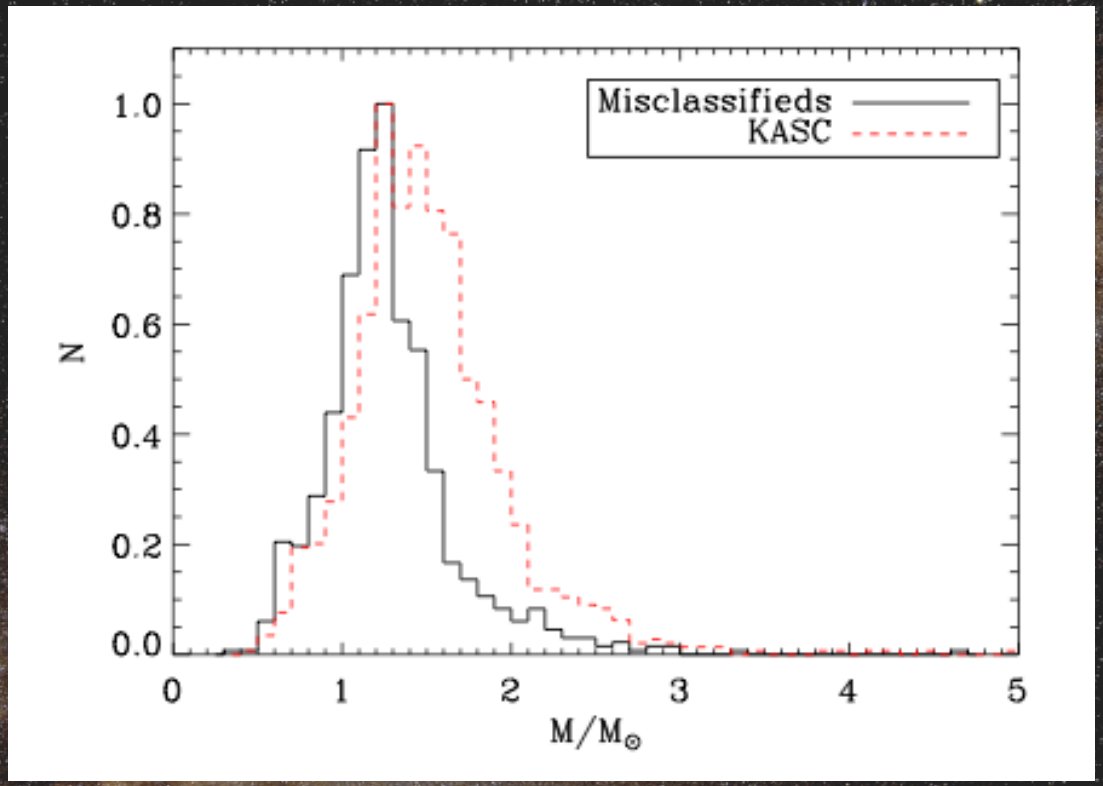
Misclassified red giants

Asteroseismic View of the Milky Way



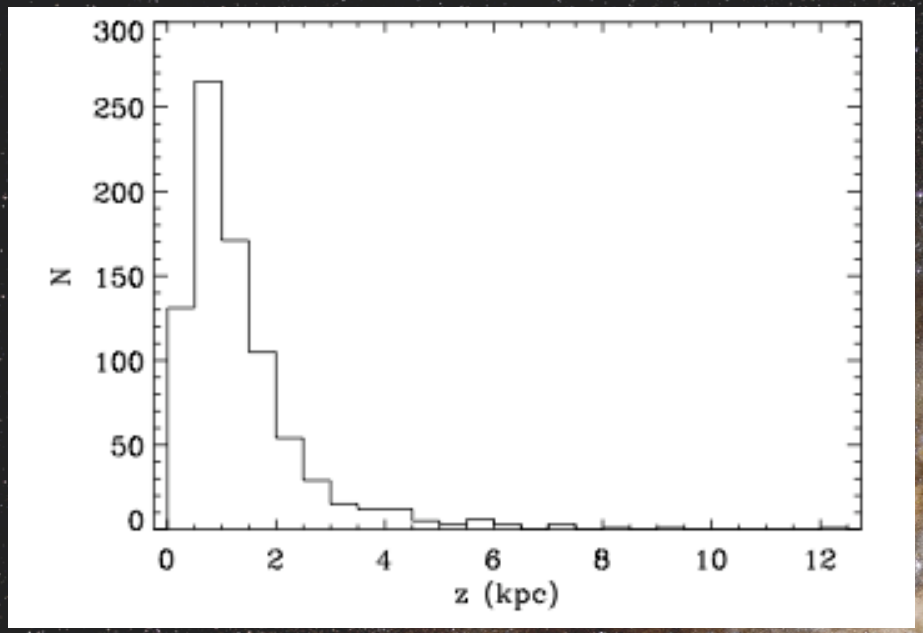


Halo stars?



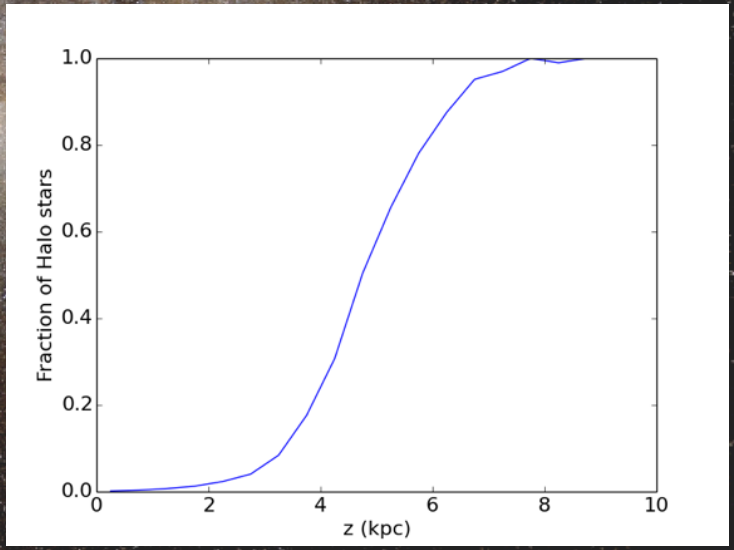
Less massive stars than known KASC sample
Possible halo stars

Halo stars?



Comparison of height distribution with a synthetic population of halo stars in the *Kepler* field with $J < 16$ generated using Galaxia (Sharma et al. 2011)

>60% of stars above 5 kpc are halo stars

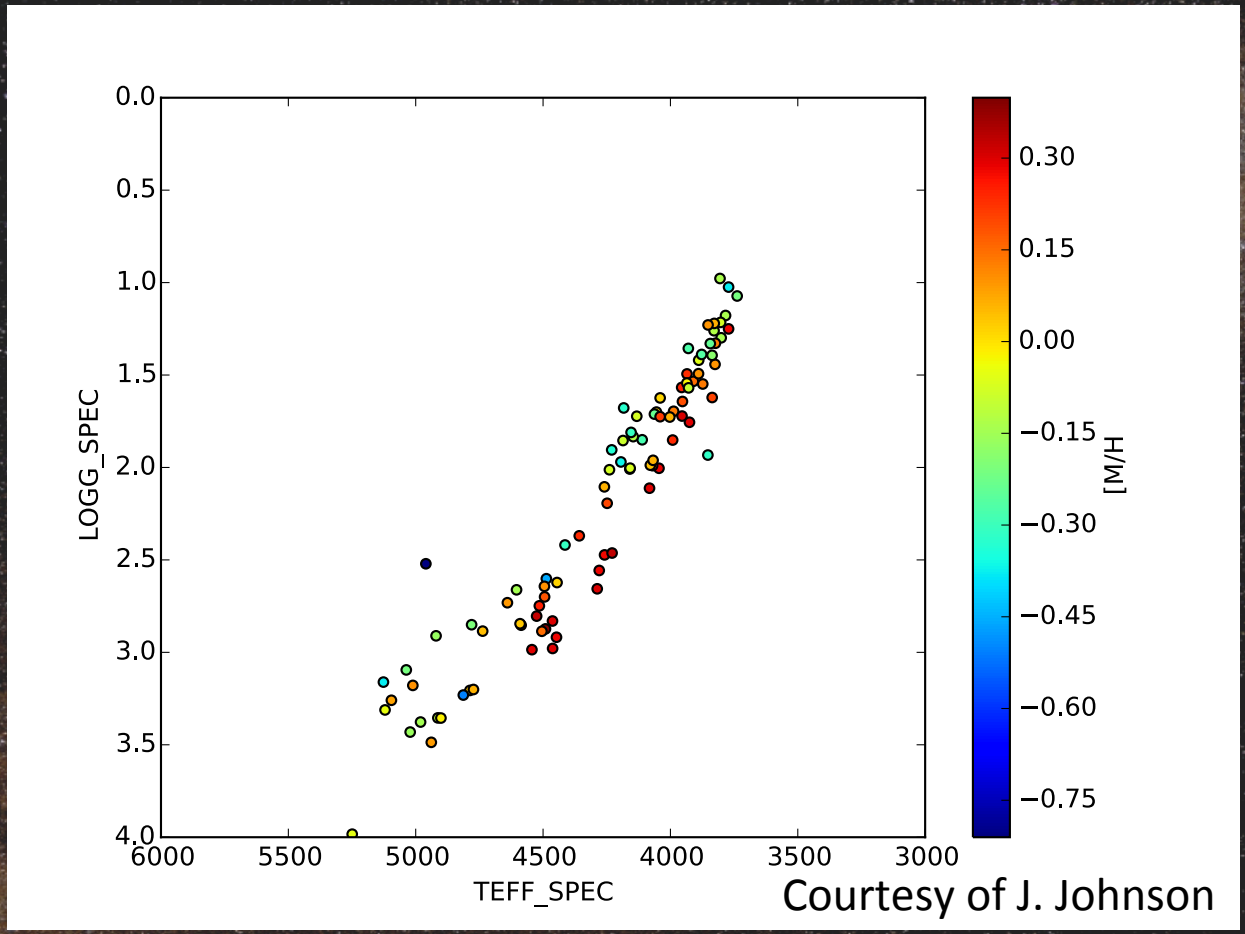


~40 stars of our sample could be halo stars

Summary

- More red giants!!
  - Found 854 red giants according to the detection of oscillations
  - See Poster PB.S10.53 for ~1500 additional red giants…
- Faint stars: Kp up to ~16
  - Good news for K2 and TESS: we can detect oscillations in such faint stars!
- Distant stars (~400 stars further than 5 kpc away)
- Less massive than known sample of KASC red giants
  - ~40 potential halo stars
- Goldmine for galactic archeology
  - Proposal accepted by APOGEE to obtain their spectra

APOGEE spectra

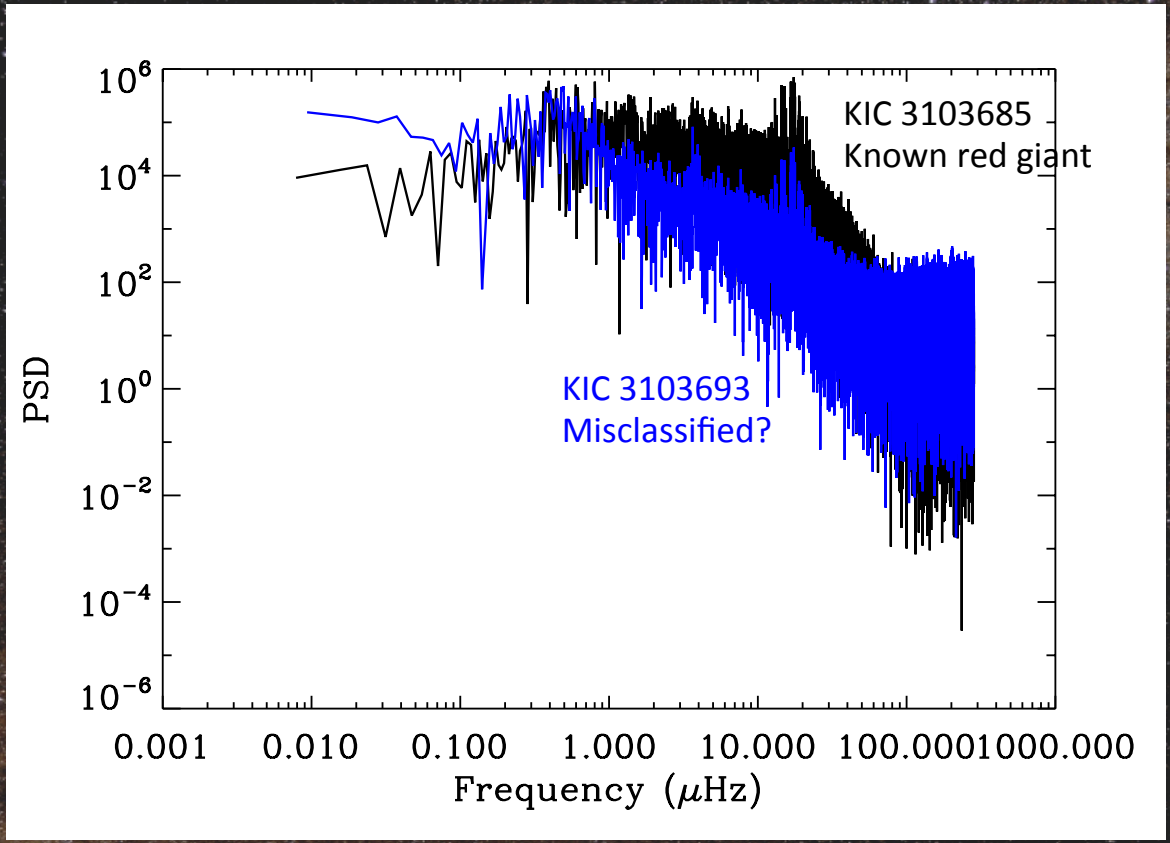


Courtesy of J. Johnson

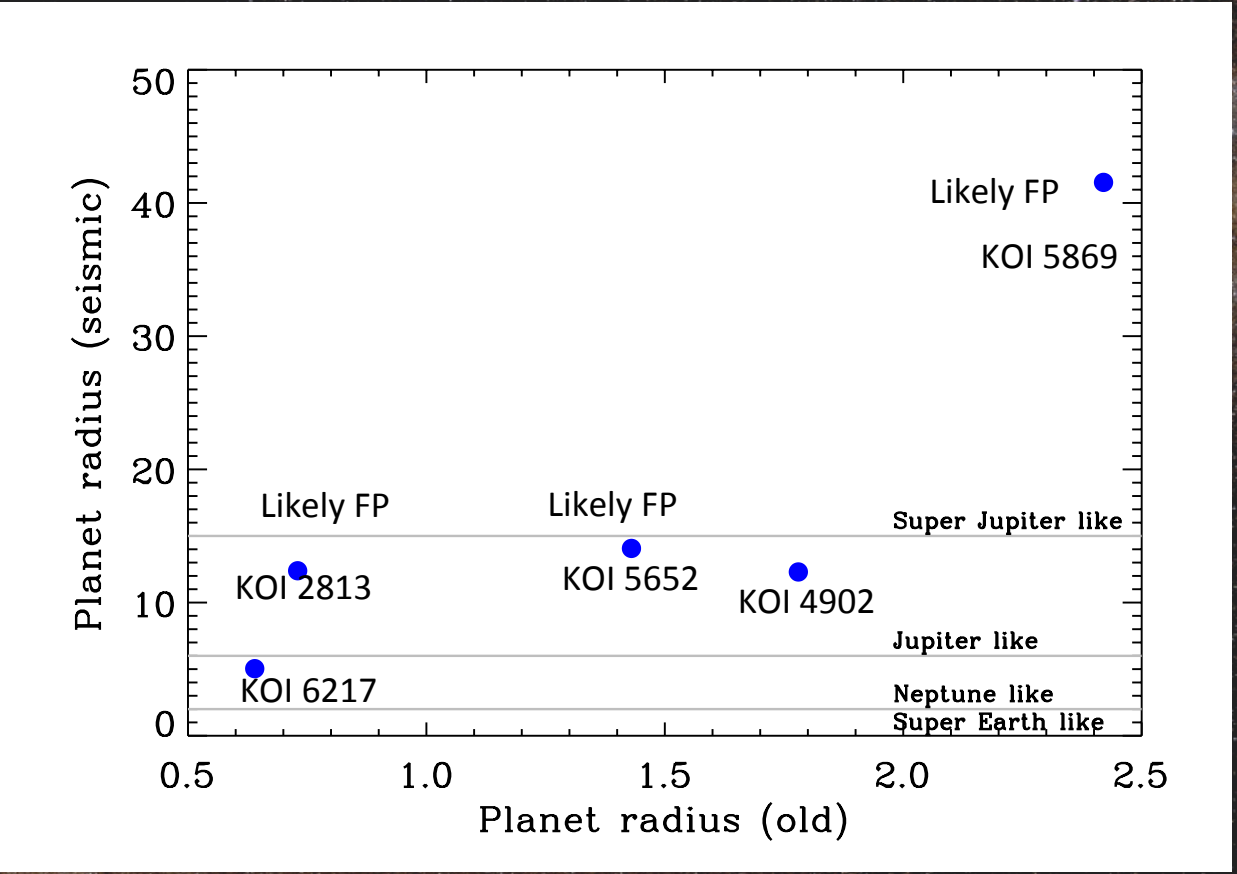

Thank You

Check for pollution

Comparing power spectrum with nearby known red giant



Impact on planet candidates



Why misclassifieds?

- Parameters determined mostly from photometric observations (KIC, Huber et al. 2014)

- Distinction between dwarf and red giant
  - Discrepancies between different photometric temperature indicators (Pinsonneault et al. 2012) for 4% of stars close to rate of blends (3.8%).
  - Still small number of misclassifieds (<0.5% of the Kepler targets)