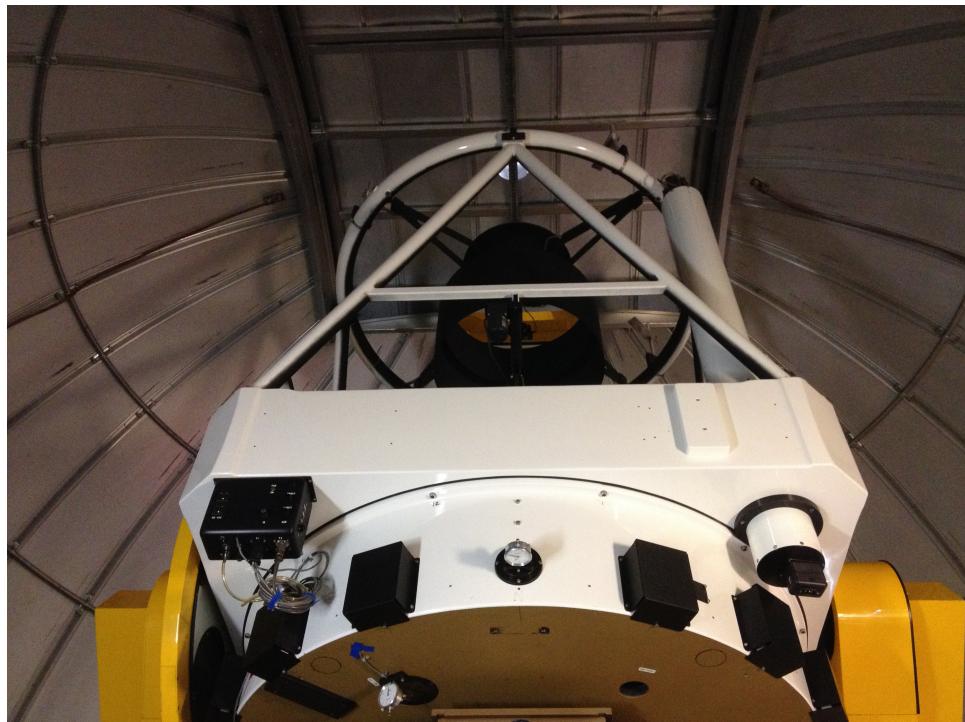


# K Giant Survey with the USNO 1.3m

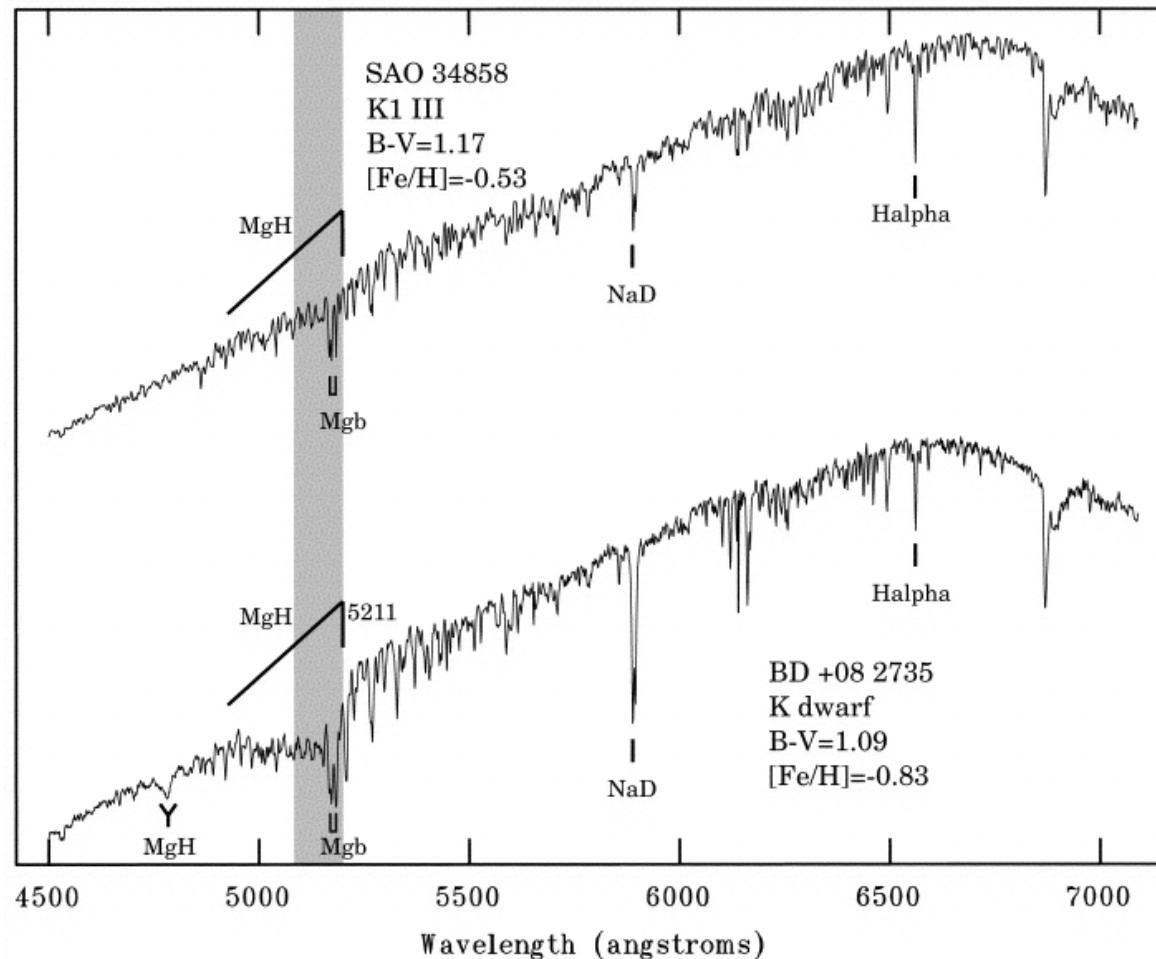
Jeff Munn USNO

## Collaborators

- David Nidever – NOAO
- Steven Majewski – U. Virginia
- Colin Slater – U. Washington
- Eric Bell – U. Michigan

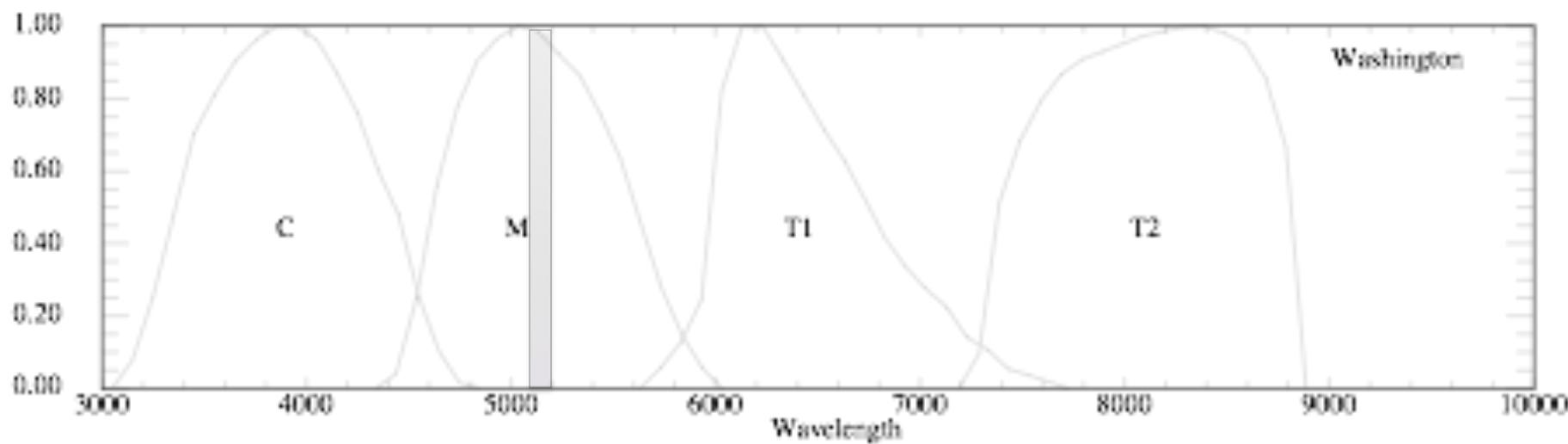


# MgH+Mg b as dwarf/giant discriminator



Majewski et al. 2000, AJ, 120, 2550

# Washington Photometric System



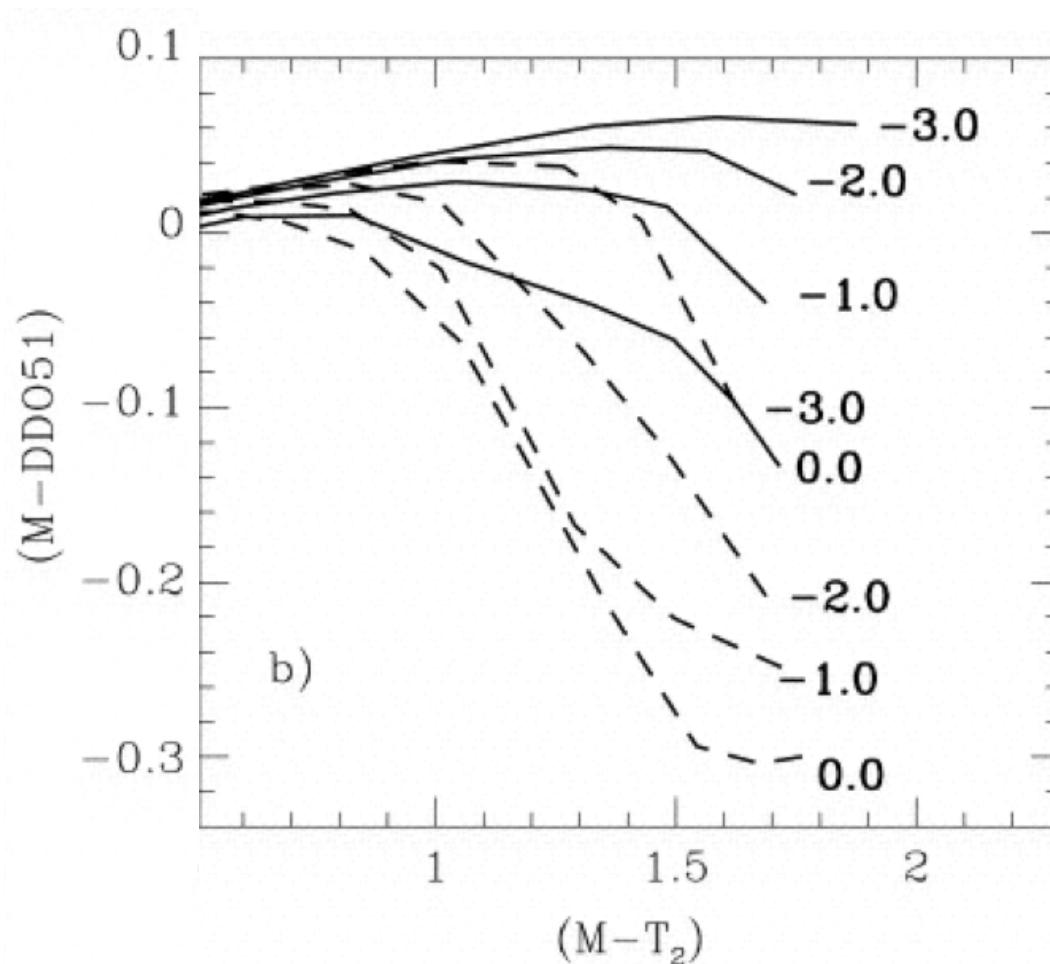
Bessell 2005

# Surface Gravity and Metallicity Discrimination

Solid lines: giants

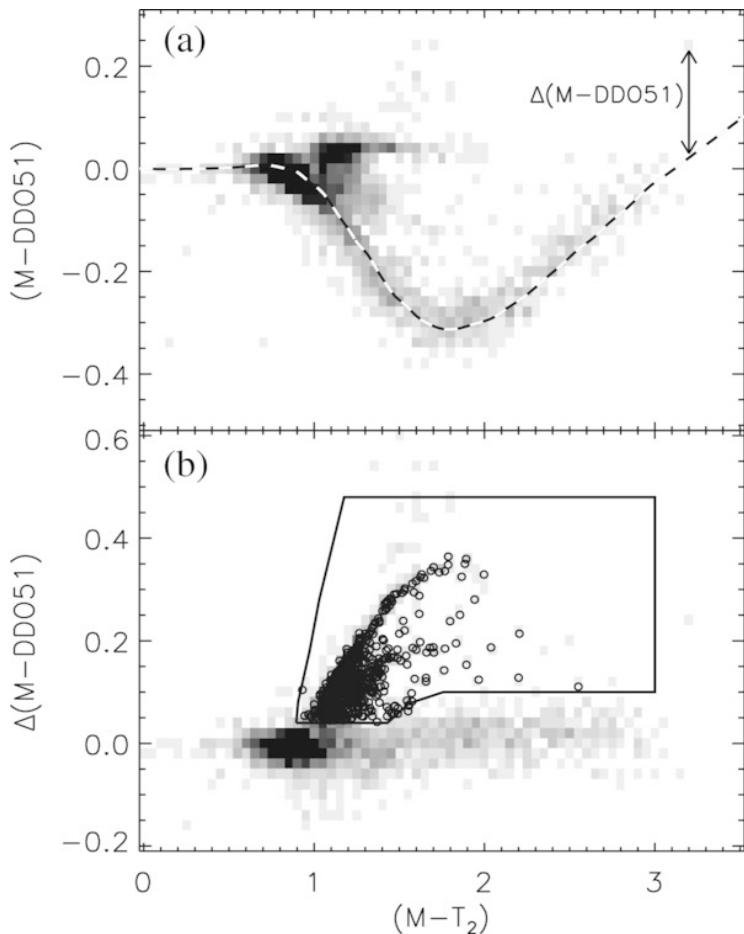
Dashed lines: dwarfs

Labels: [Fe/H]

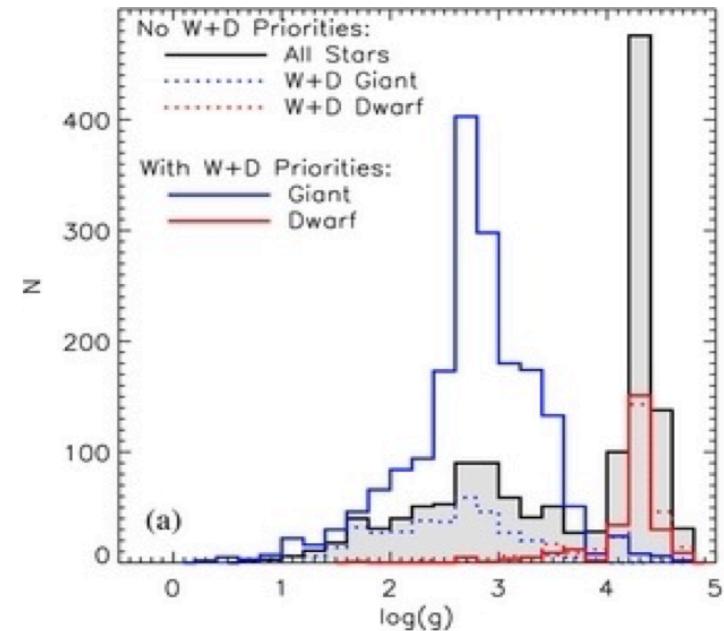


Majewski et al. 2000, AJ, 120, 2550

# APOGEE Giant Star Selection



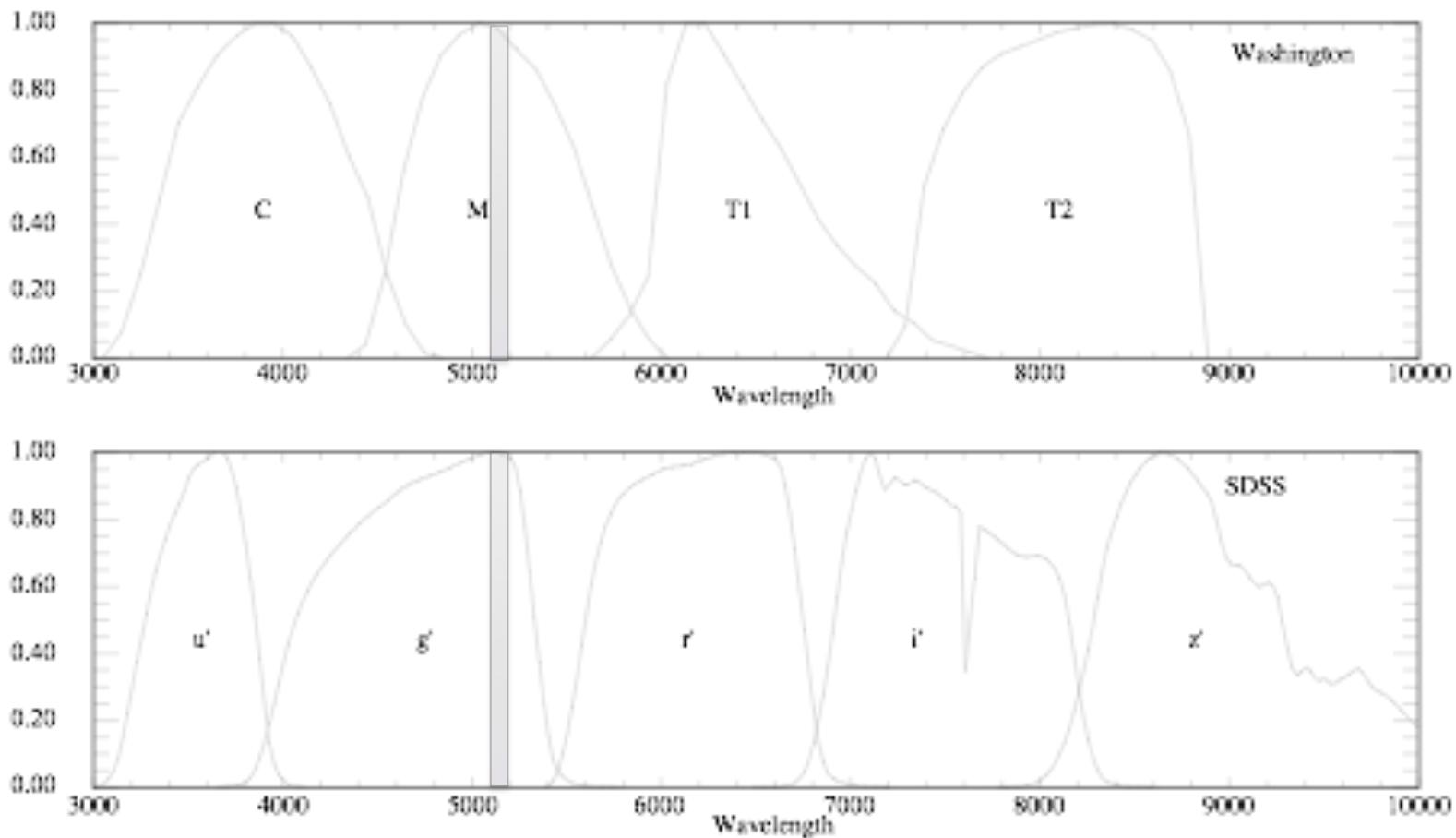
- 55 photometric nights on 1.3m
- 17045 K giants with spectra in APOGEE-I, more coming in APOGEE-II



Zasowski et al. 2013, AJ, 146, 81

# 1.3m DDO51 Survey

## *Filters*

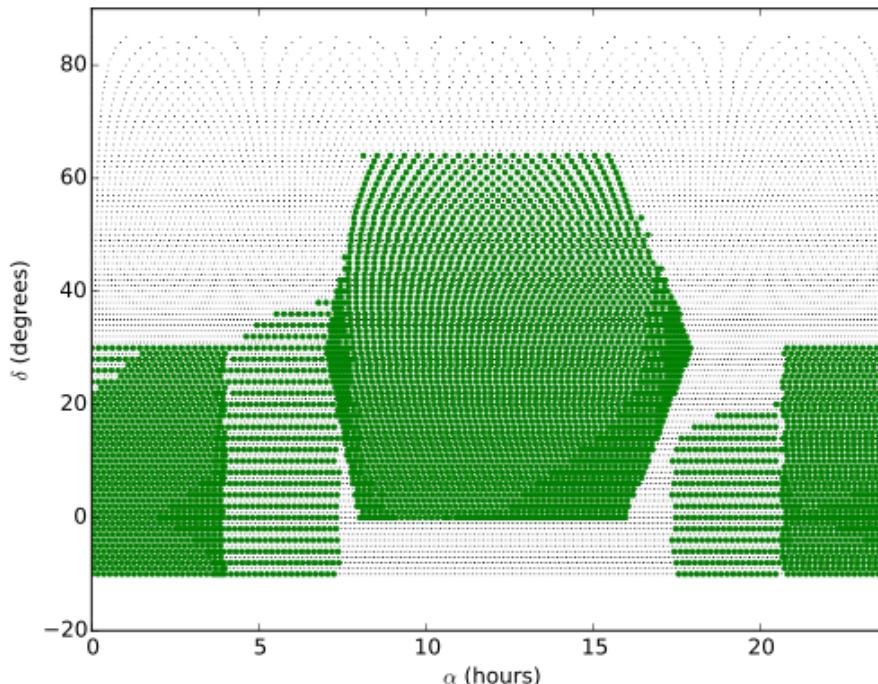


Bessell 2005

# 1.3m DDO51 Survey

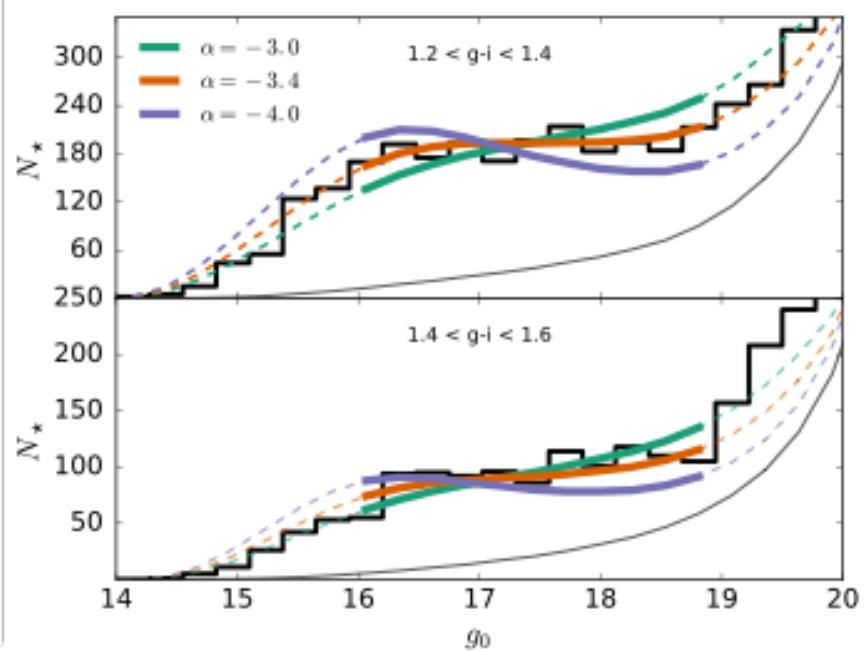
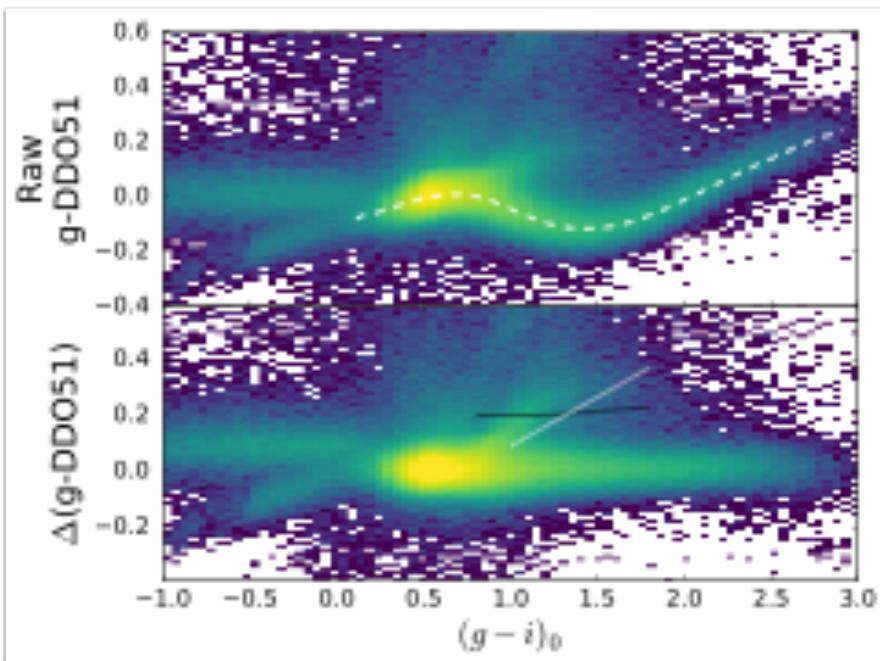
## *Observations*

- 267 (mostly non-photometric) nights from 2011 to June 2016 (more since)
- Array Camera –  $1.4 \times 1.1$  deg FOV
- One 20 minutes exposure per field, in DDO51
- Sparsely sampled entire SDSS footprint — 25% coverage
- 5508 fields to date — 7700 square degrees



# Outer Galactic Halo Density Profile

- Slater, Nidever, Munn, Bell, & Majewski 2016, ApJ, 832, 206
- 4000 K giants over 5000 square deg (data through June 2014)
- $30 \text{ kpc} < d < 80 \text{ kpc}$
- $\rho \sim r^\alpha$      $\alpha = -3.4 \pm 0.2$



Slater, Nidever, Munn et al. 2016

# Outer Galactic Halo Density Profile

Source	Sample	Coverage	Slope
Slater et al. 2016	4000 K Giants	4000 deg <sup>2</sup>	-3.4
Watkins et a. 2009	407 RR Lyrae	290 deg <sup>2</sup>	-4.5
De Propis et al. 2010	666 BHB	750 deg <sup>2</sup>	-2.5
Pila-Deiz et al. 2015	F stars	23 deg <sup>2</sup>	-4.85
Deason et al. 2014	10,000 BHB and BS	14,000 deg <sup>2</sup>	-6

# Future Work

- Publish K giant catalog
- Look for structure
- DDO51 metallicity calibration using APOGEE data?