The GALAH survey: an overview

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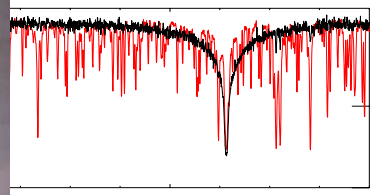
The GALAH survey

- Large observational survey with HERMES @ AAT
- Measuring radial velocity and 29 abundances for **1 million stars** in the Milky Way @ R=30,000 in 4 optical bands
- **Galactic archaeology**: exploring the history of
  - Star formation
  - Chemical evolution
  - Dynamical evolution
  - Minor mergers

  in the Milky Way
- **Near-field cosmology**: use the local environment to get a close-up view of universal processes

Introducing HERMES

- 4-channel high-resolution spectrograph

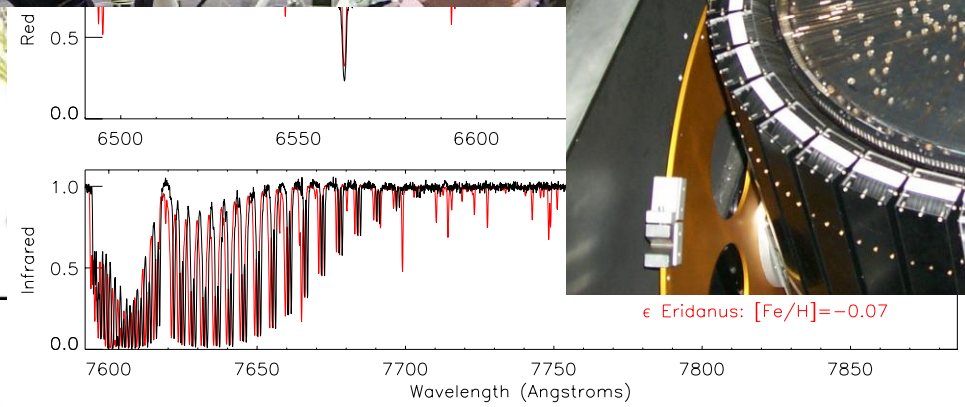


Blue
4718Å-4903Å

Green

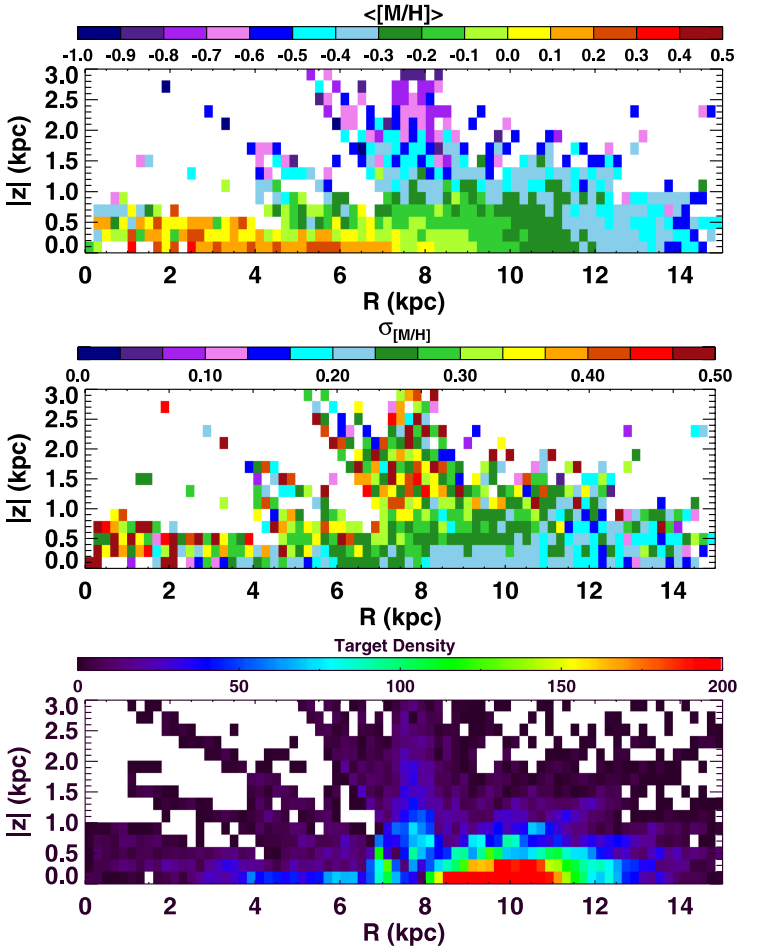
7590Å-7890Å

HERMES
4 channel



GA complementarity

- **Gaia-ESO Survey**
  - Halfway done with observing
  - 100,000 stars
  - Fainter than GALAH
  - R~20,000
  - Targeted selection: thick disk,
- **SDSS-III/APOGEE**
  - Observing complete (3 years)
  - 100,000 stars
  - R~22,500, H-band (1.5-1.7μ)
  - Targeted selection: red giants,



GALAH and Gaia

Gaia is a major element of the GALAH survey

Gaia (2014-19) will provide precision astrometry for about 10^9 stars

For V < 14, $\sigma_\pi = 10$ μas, $\sigma_\mu = 10$ μas yr $^{-1}$ -- **Gaia at its best!**

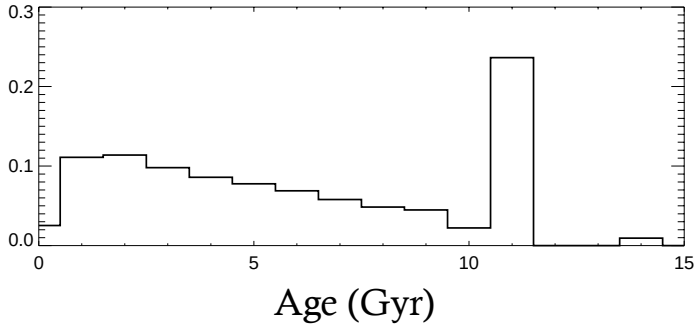
- 1% distance errors at 1 kpc, 0.7 km s $^{-1}$ velocity errors at 15 kpc)

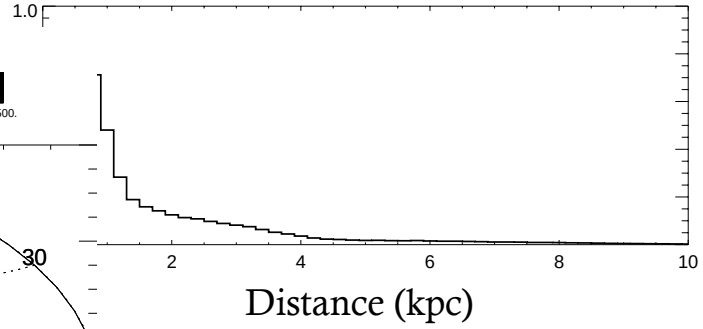
⇒ accurate transverse velocities for all stars in GALAH
⇒ accurate distances for same
⇒ therefore accurate color-(absolute magnitude) diagram:
independent check that chemically tagged groups have common age

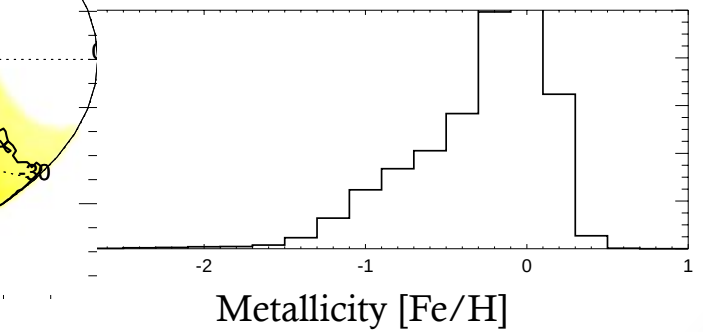
- **major implications for stellar astrophysics <u>before</u> Galactic archaeology,** e.g. correctness of 3D atmospheres, much improved abundance scale, seismic parameters, ages…

GA complementarity

- GALAH's goals are broad –
  - High resolution
    - R~28,000
  - Large, diverse sample
    - All stars 12<V<14, -80° <δ







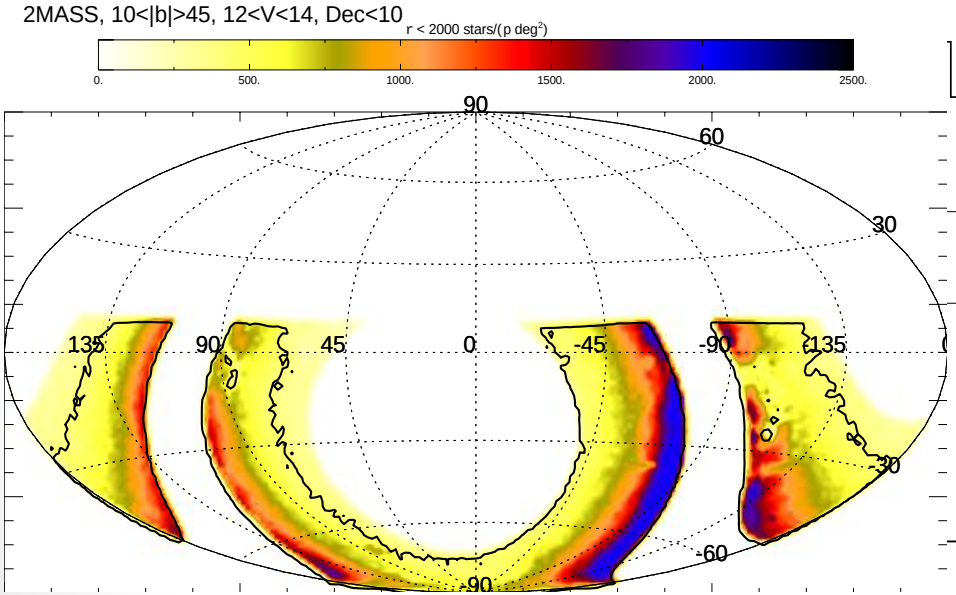
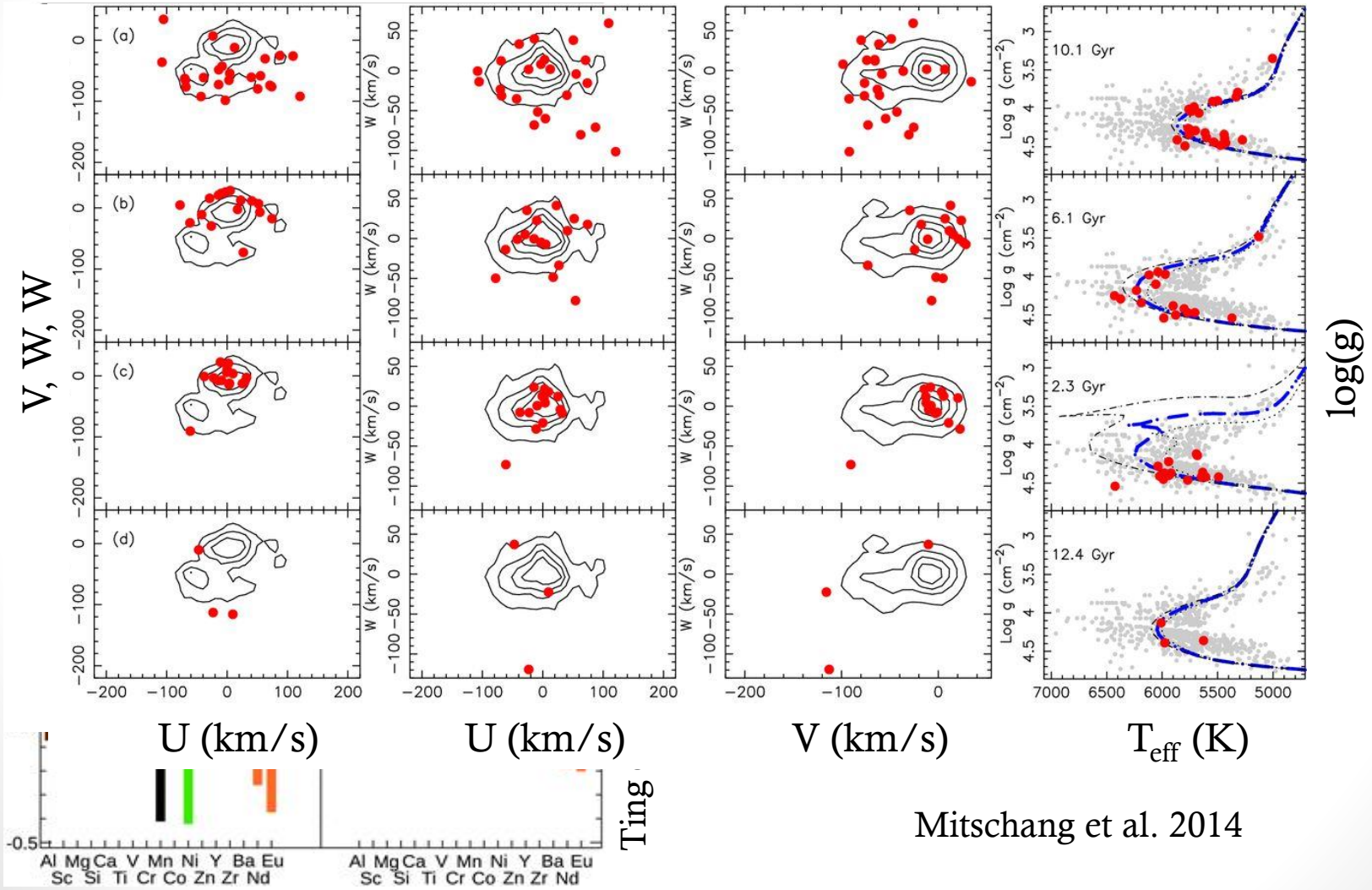


Figure: S. Sharma

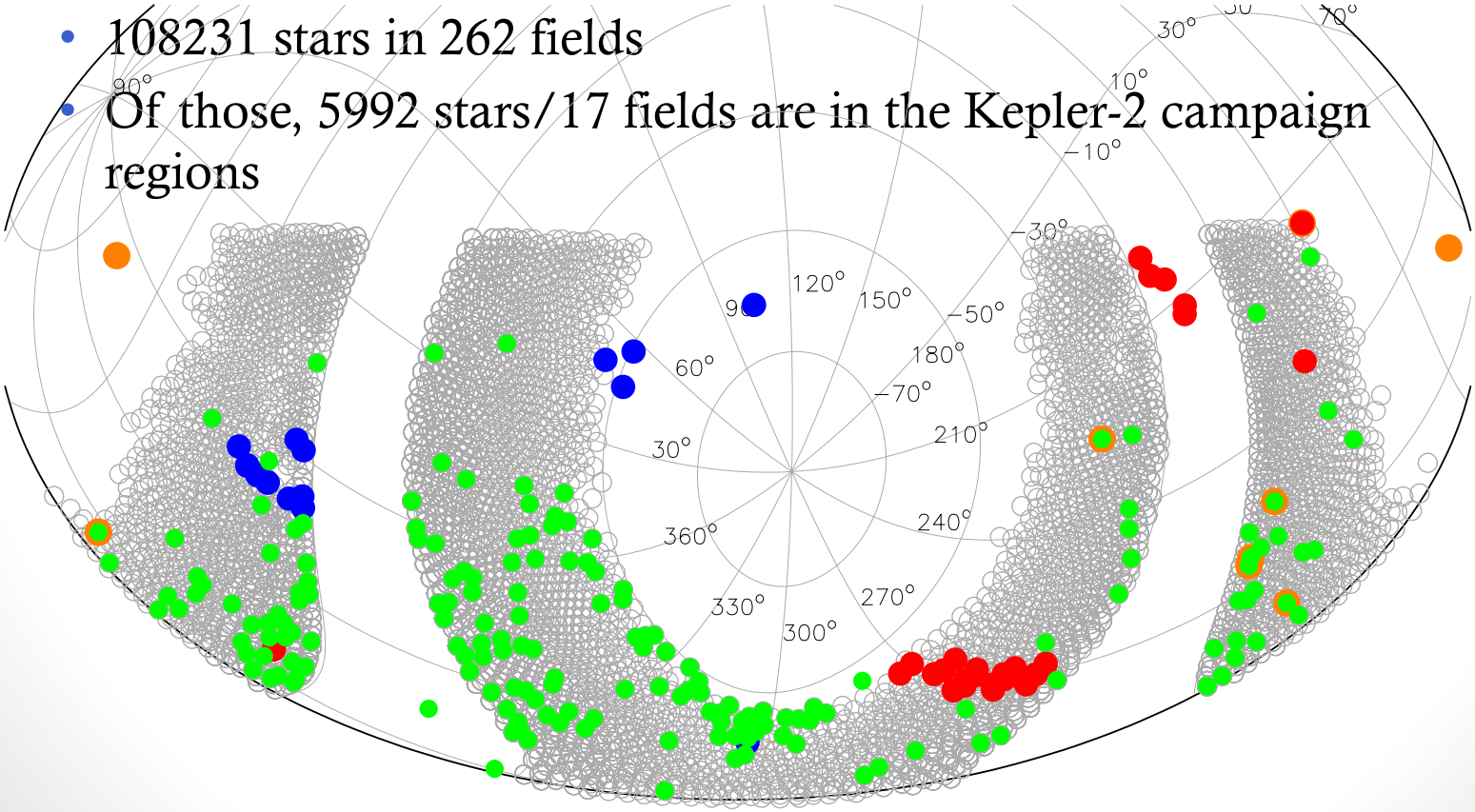
Galactic archaeology



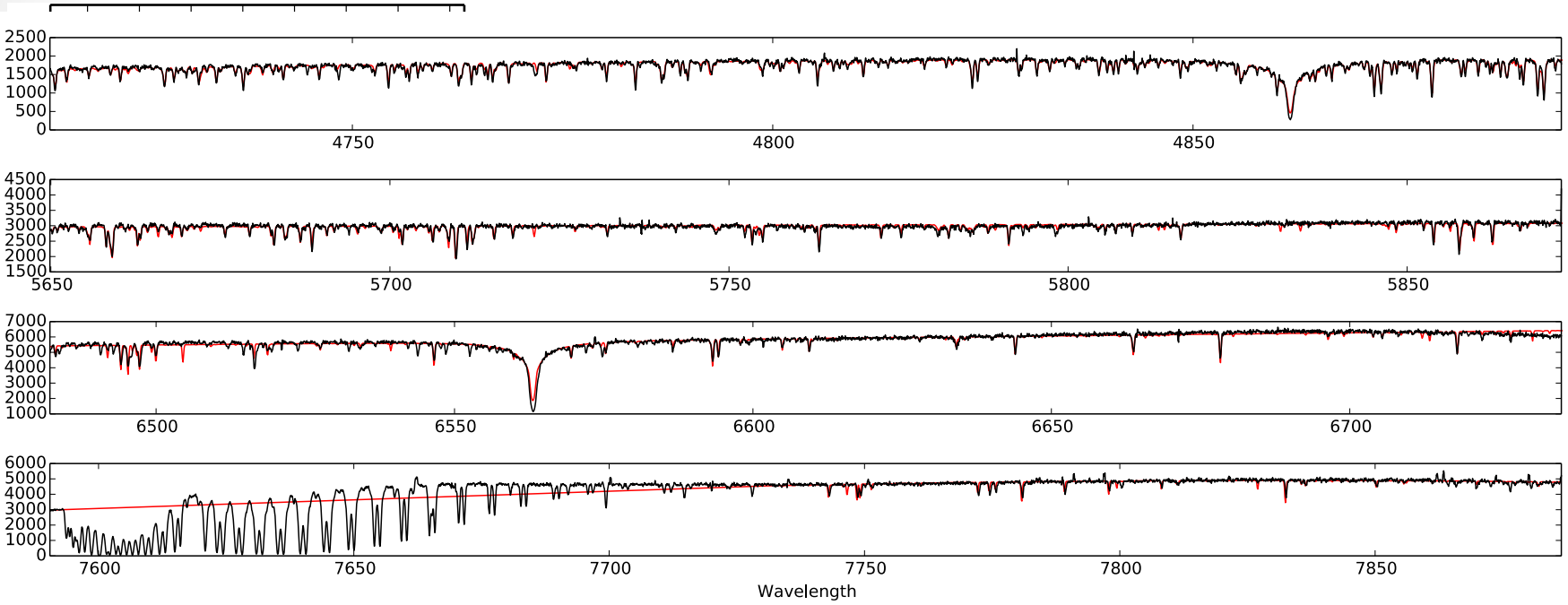
Mitschang et al. 2014

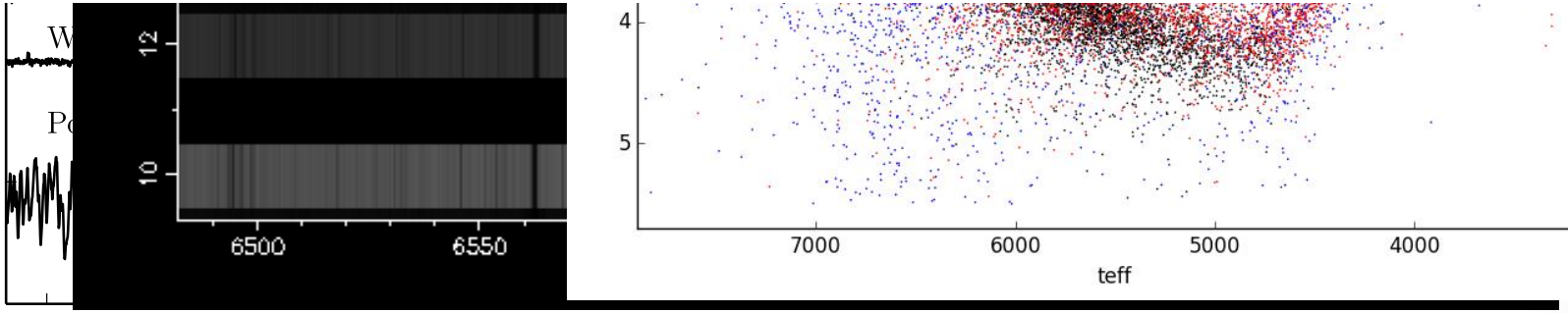
Survey progress

- Main survey: 78 nights Feb 2014 – Jan 2015, 140 more granted through Jan 2017
- In 86 nights so far
  - 108231 stars in 262 fields
  - Of those, 5992 stars/17 fields are in the Kepler-2 campaign regions



Early analysis





6530 6540 6550 6560 6570 6580 6590 6600

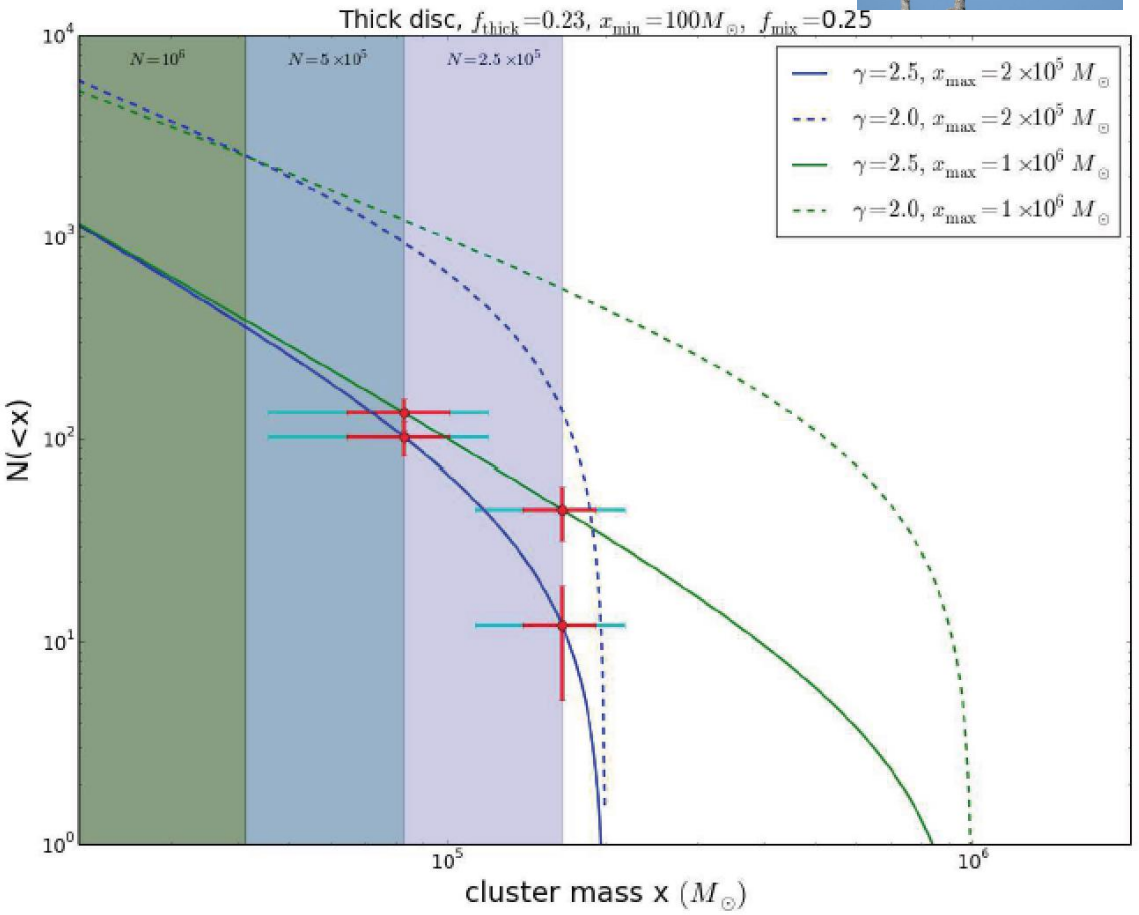
Wavelength (A)

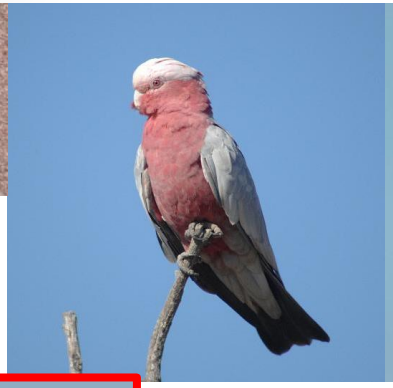

@galahsurvey

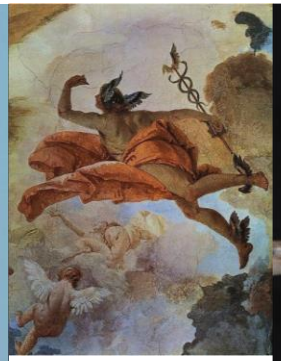
Radial migration

Number, mass of recovered clusters tells us about

- ICMF
- SFR vs time
- Radial mixing

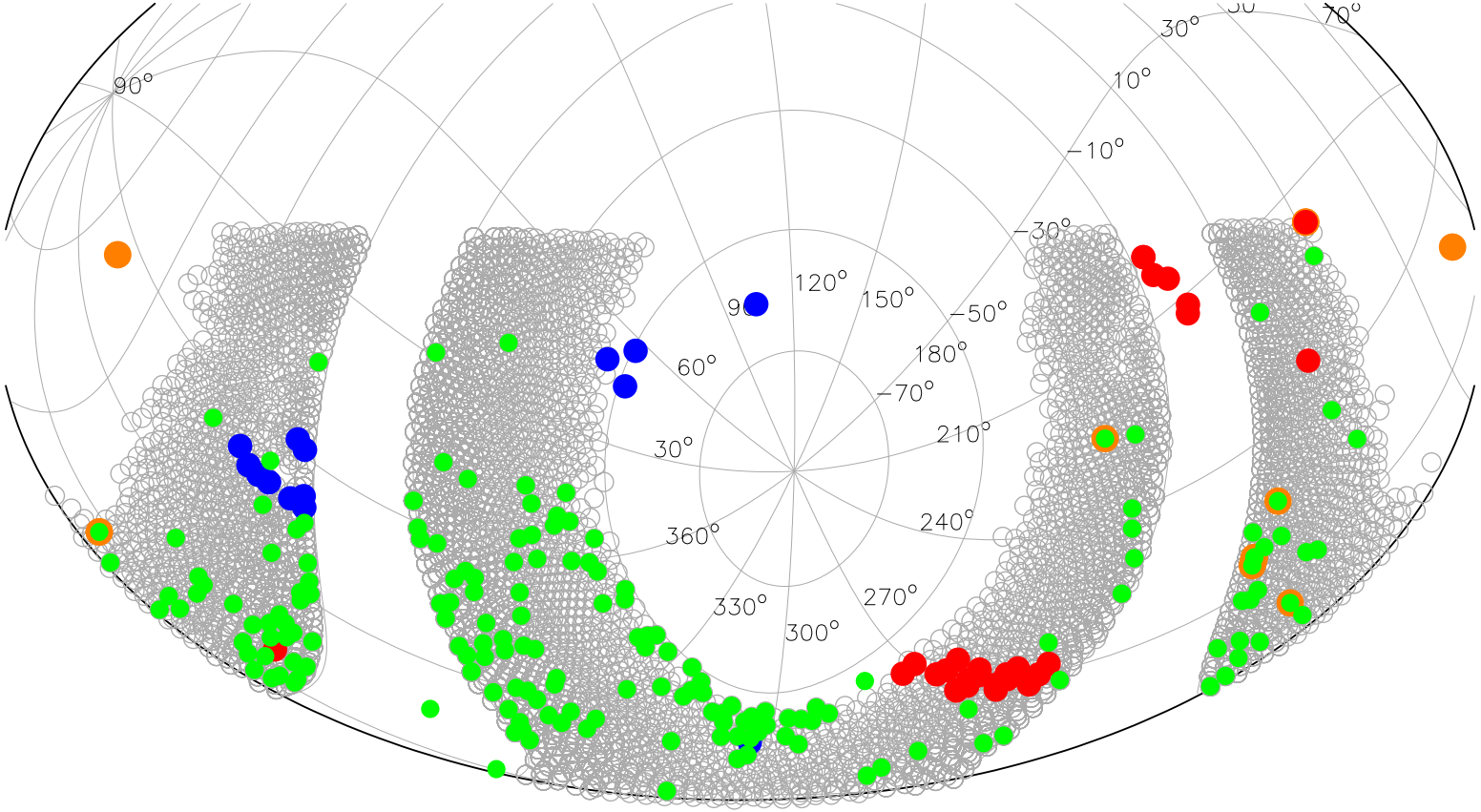




gress so far

eb 2014 – Jan 2015, 140 more
7



Survey progress

- Main survey, Feb 2014 –
- 36 nights in 2014A + 10 windfall, 31 nights in 2014B