

# Optical stellar spectroscopic insights into multi-wavelength astronomy

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GALAH (Galactic Archaeology with HERMES),  
GECKOS, and 4MOST Surveys



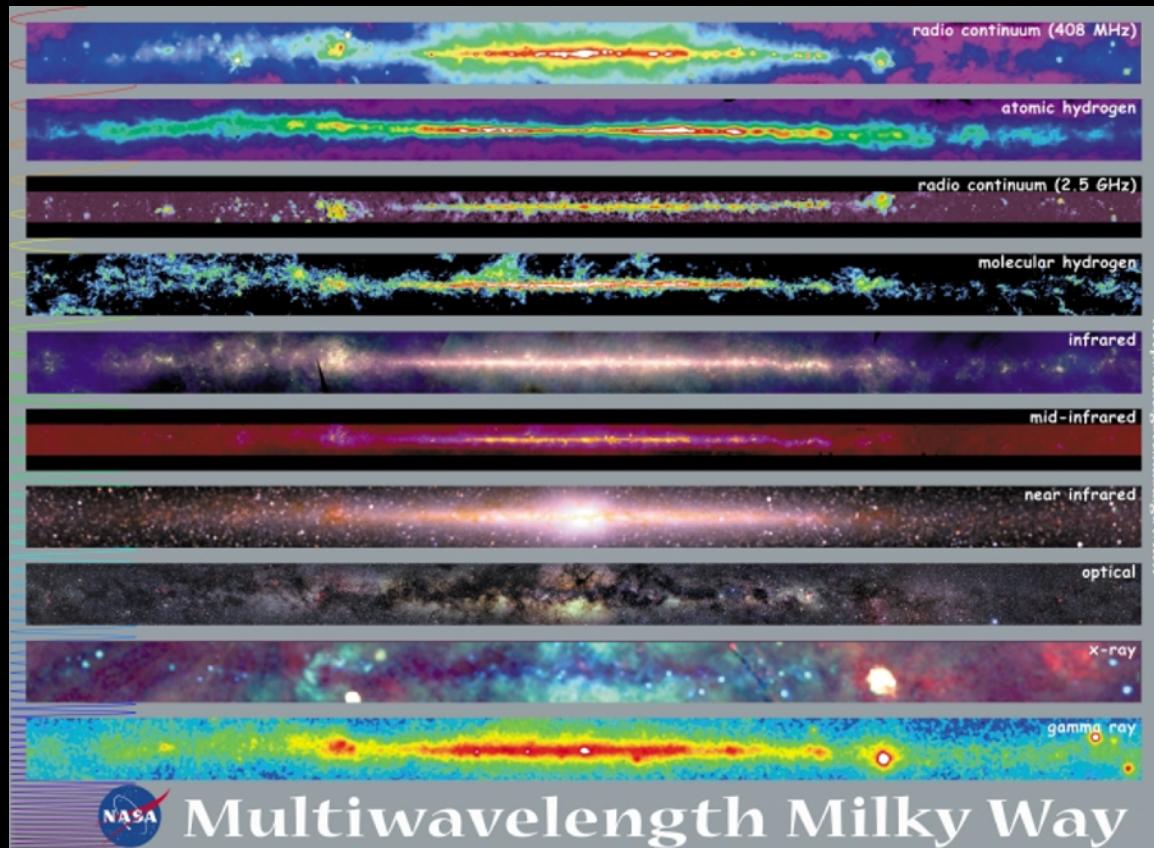
Australian  
National  
University



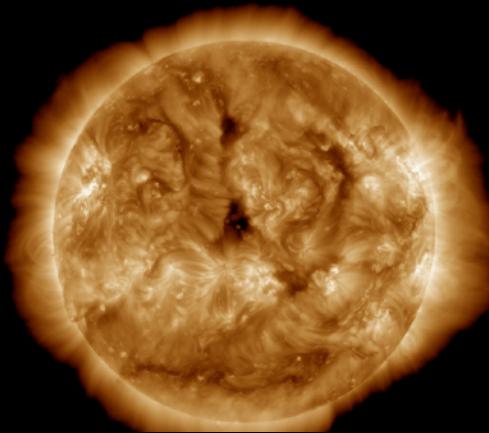
Australian Government  
Australian Research Council



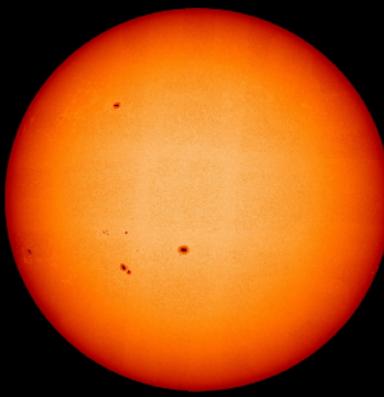
# How You and I see the Milky Way: X-Ray – Optical – Radio



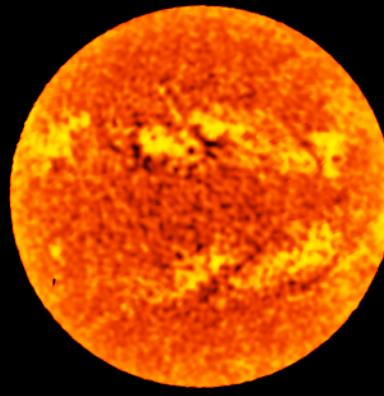
# How You and I see the Stars: X-Ray – Optical – Radio



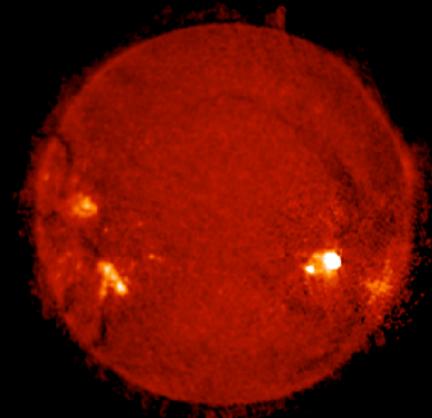
19.3 nm / 15.5 PHz  
SDO (NASA)



617 nm / 486 THz  
PHI (ESA/NASA)



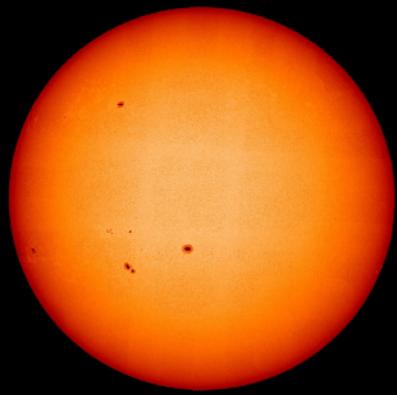
1.25 mm / 240 GHz  
ALMA (ESO/NAOJ/NRAO)



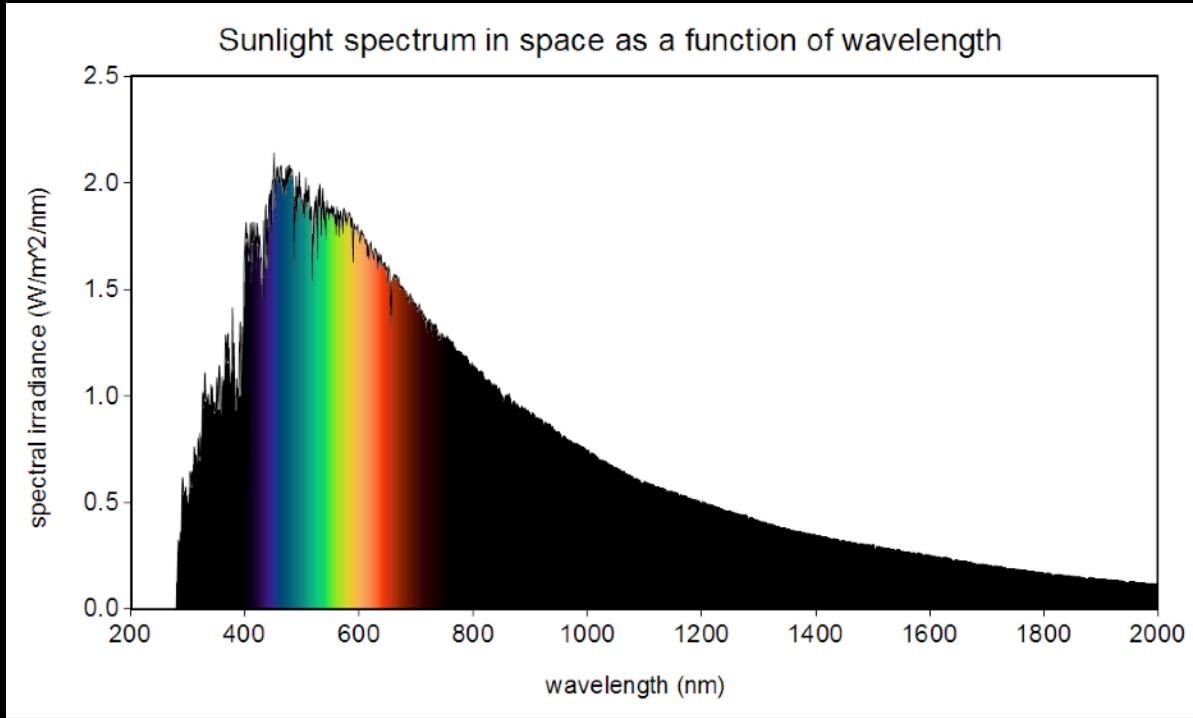
6.5 cm / 4.6 GHz  
VLA (NRAO)



# Optical stellar spectroscopy

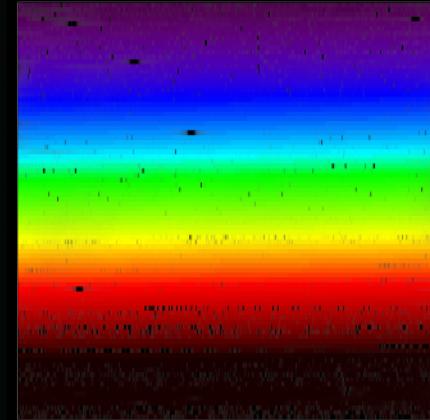


617 nm / 486 THz  
PHI (ESA/NASA)

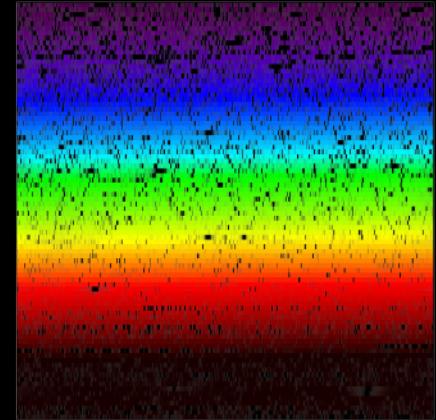
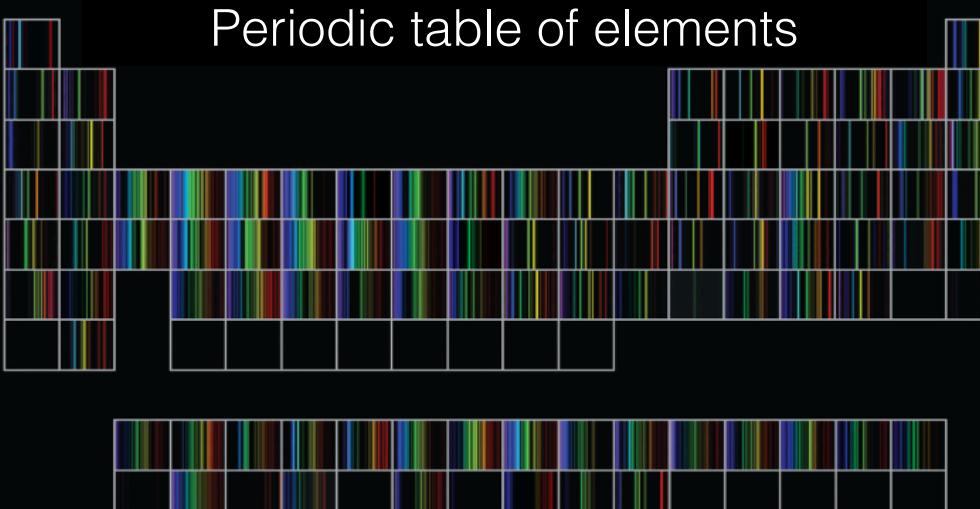


# Optical stellar spectroscopy

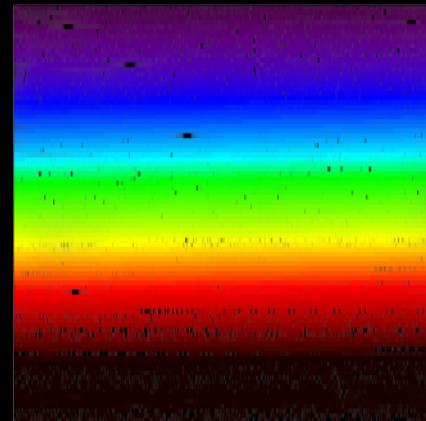
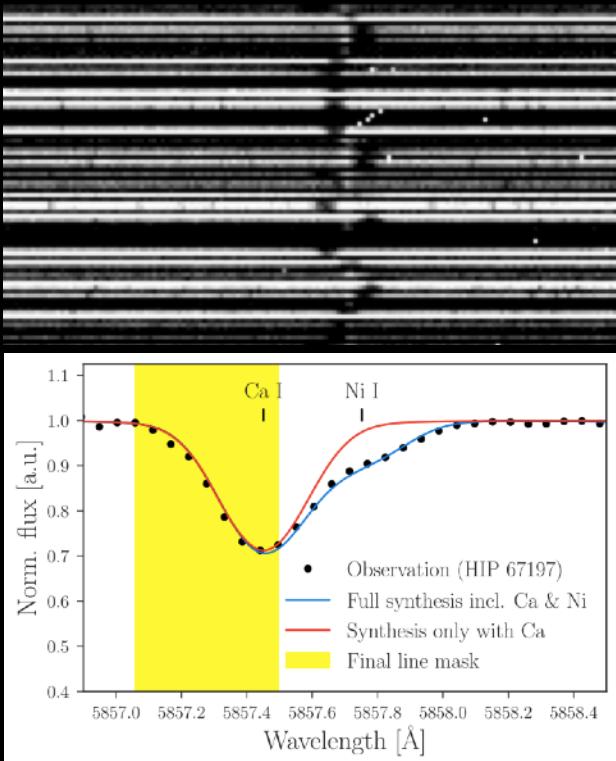
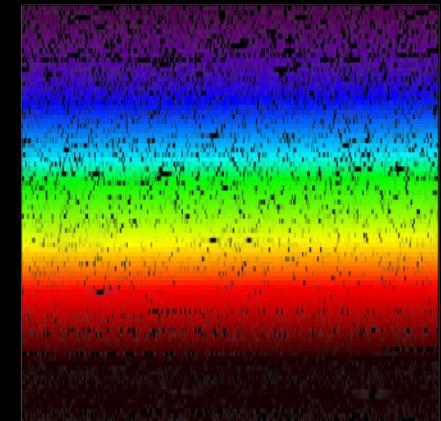
Periodic table of elements



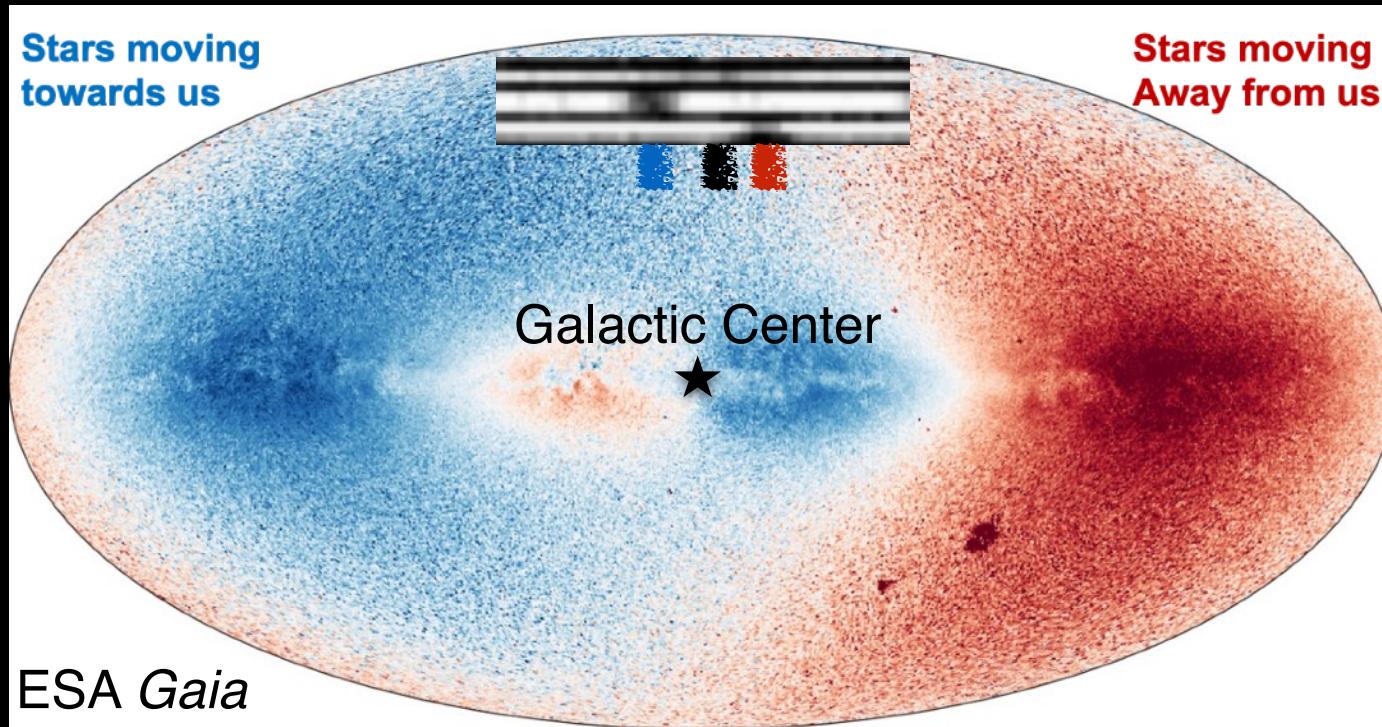
[fieldtestedsystems.com](http://fieldtestedsystems.com)



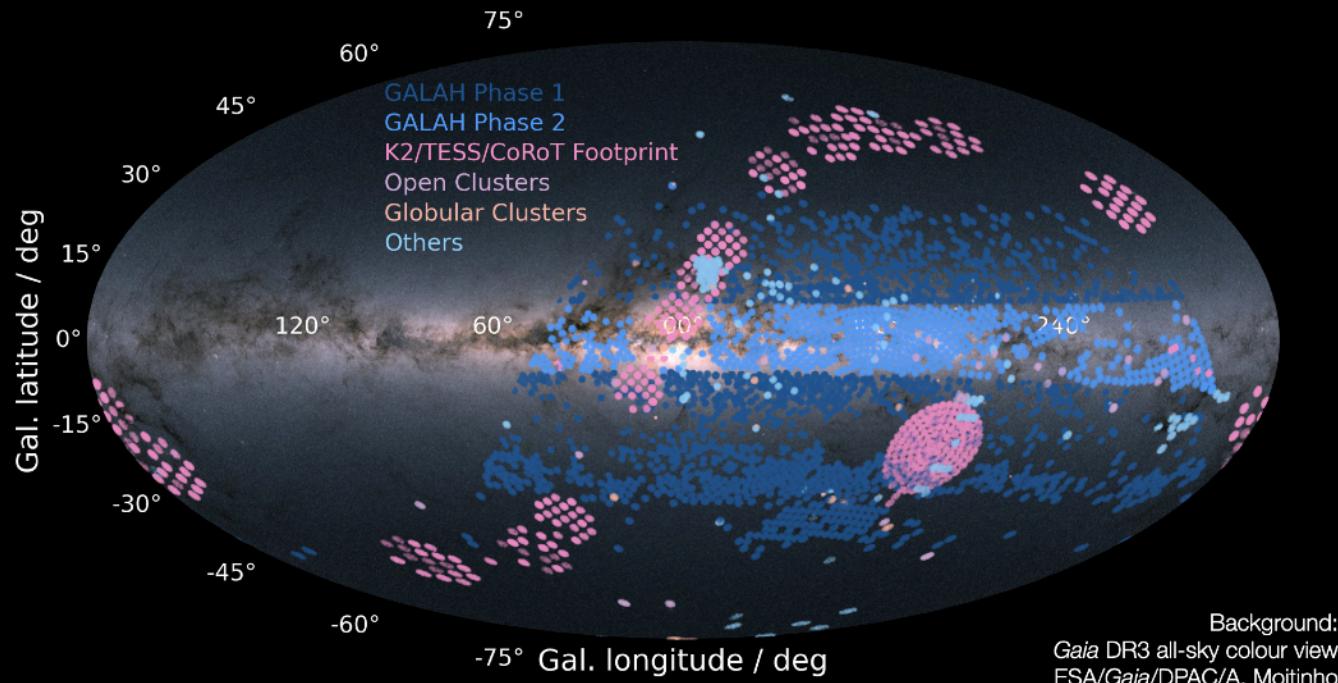
# Optical stellar spectroscopy



# Optical stellar spectroscopy: Radial Velocities



# Galactic Archaeology with HERMES (GALAH)

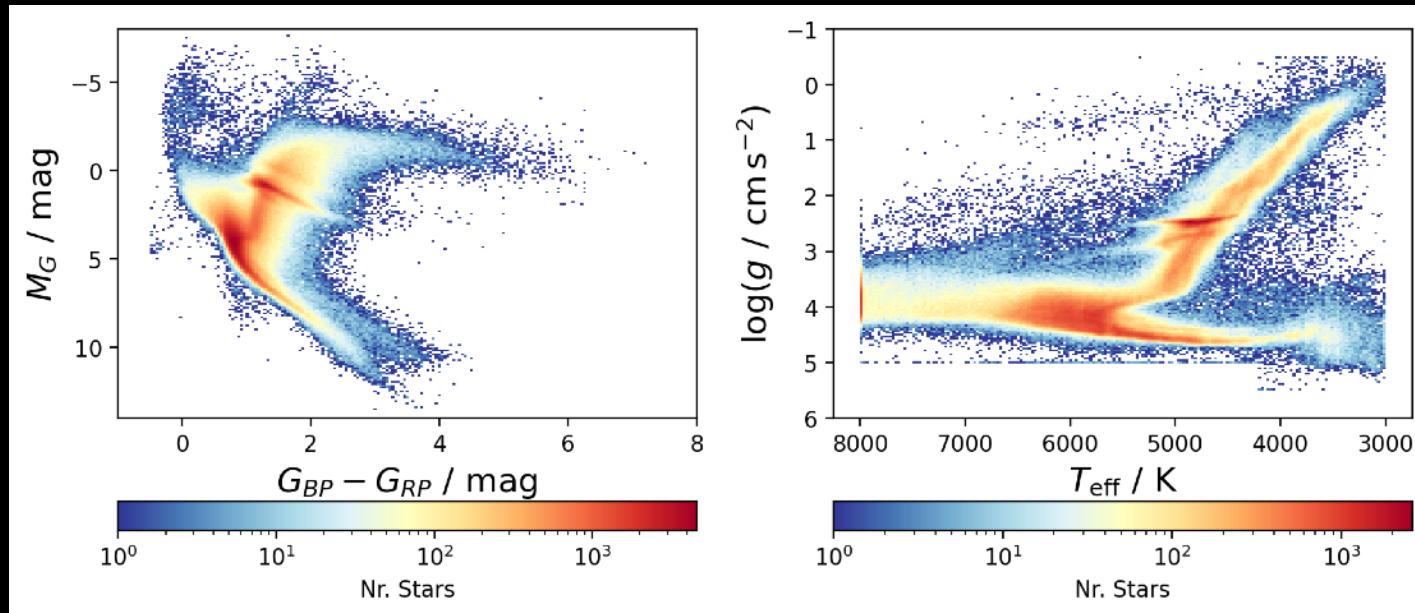


GALAH DR4: Buder et al. (2025)



# Galactic Archaeology with HERMES (GALAH)

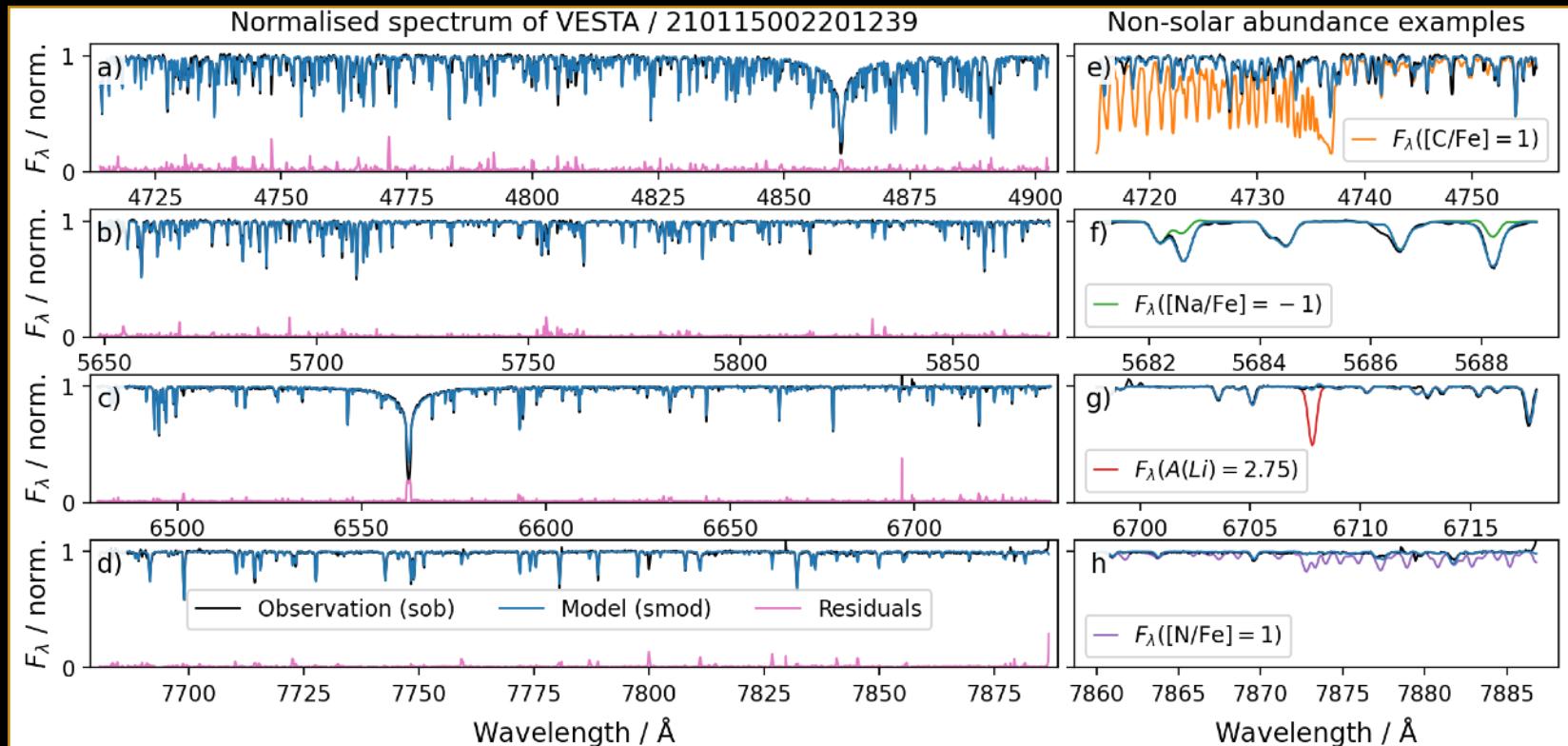
~ 1 million stars with  $V < 14$  mag in the Solar neighbourhood



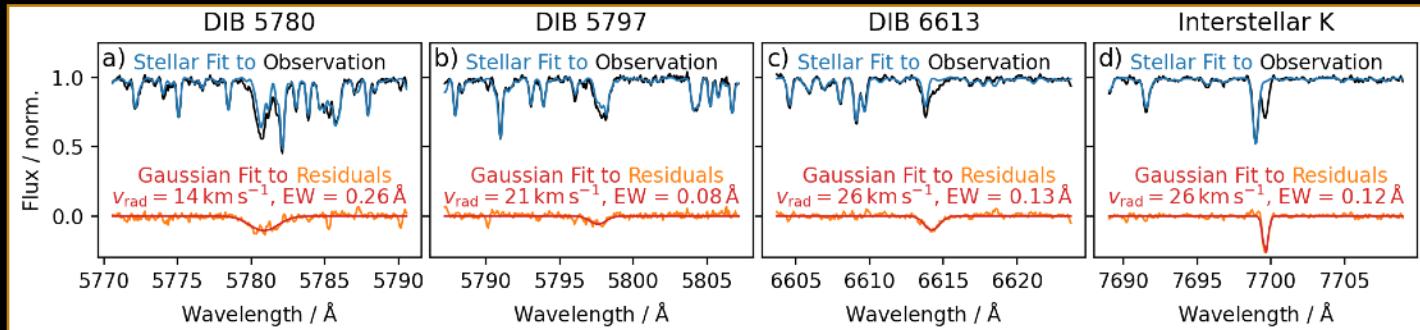
\*ALL\* with Gaia DR3 source\_id & great photo- and astrometry



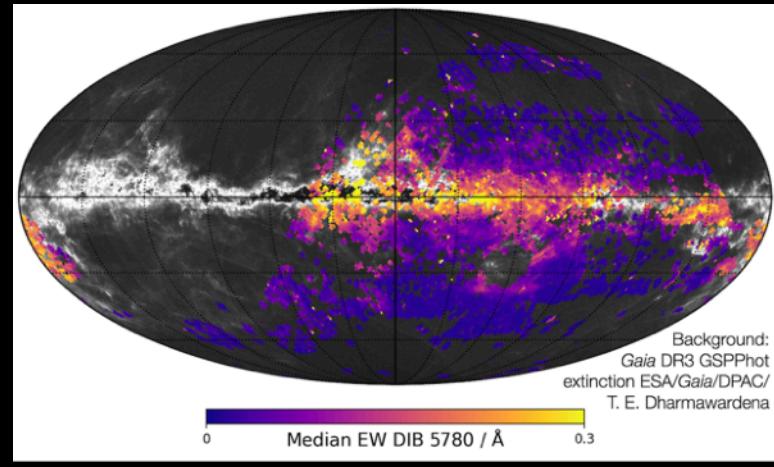
# We measure elemental abundances of 32 elements



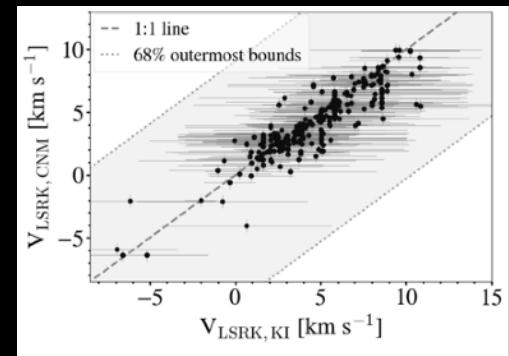
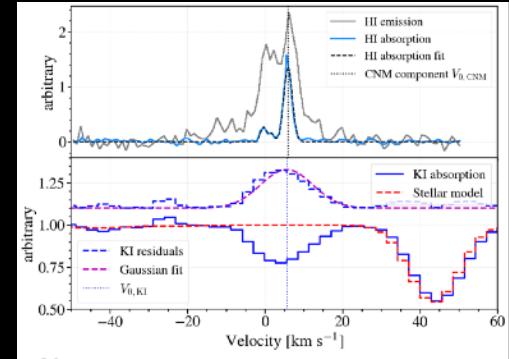
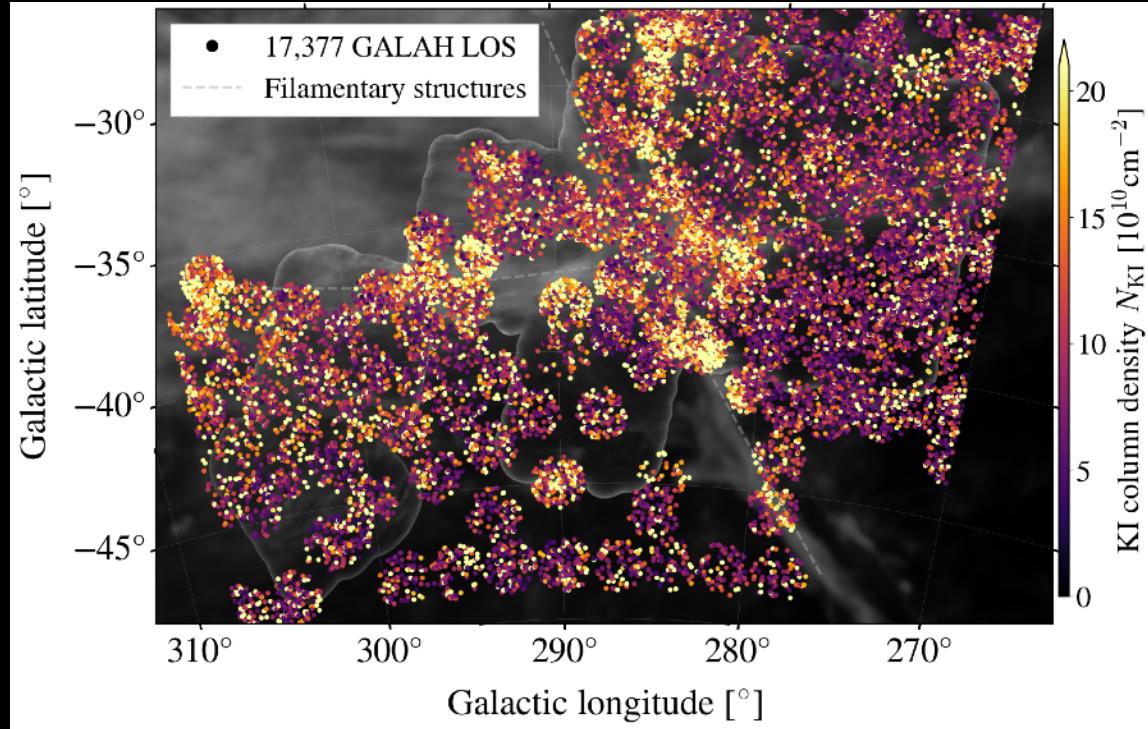
# ... and interstellar absorption



From diffuse media and Potassium:  
Equivalent Width  $\rightarrow$  column density  
line-of-sight velocity  
velocity dispersion



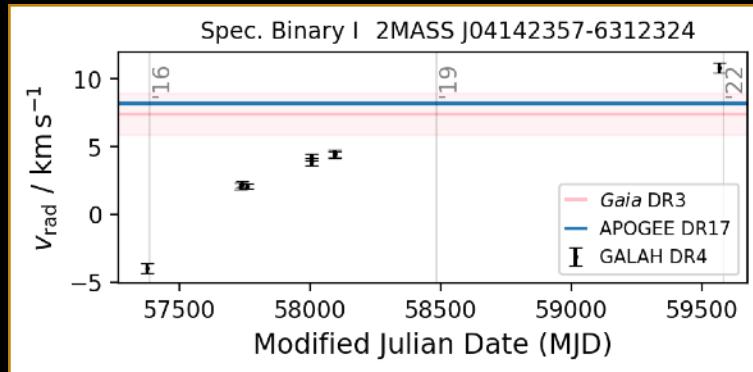
# GASKAP (Radio HI) & GALAH (Optical KI)



Hiep Nguyen, Sven Buder, Juan D. Soler, Naomi M. McClure-Griffiths et al. (in prep.).



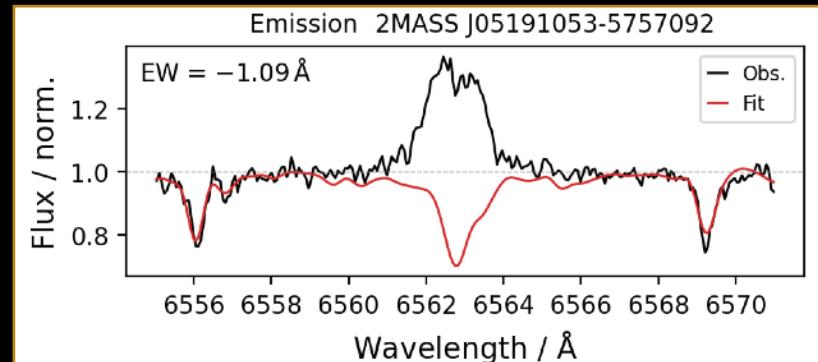
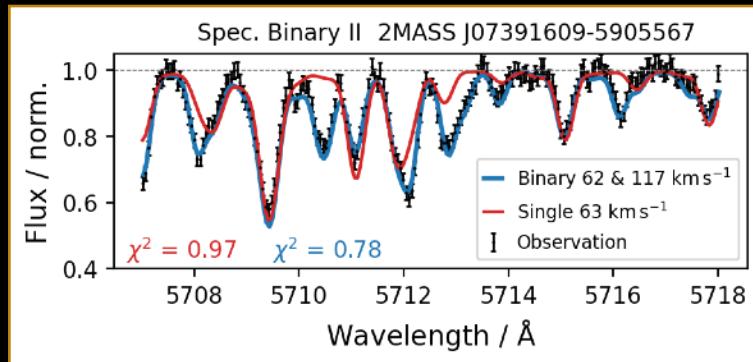
# Peculiar stars with binary signals and emission in the optical ...



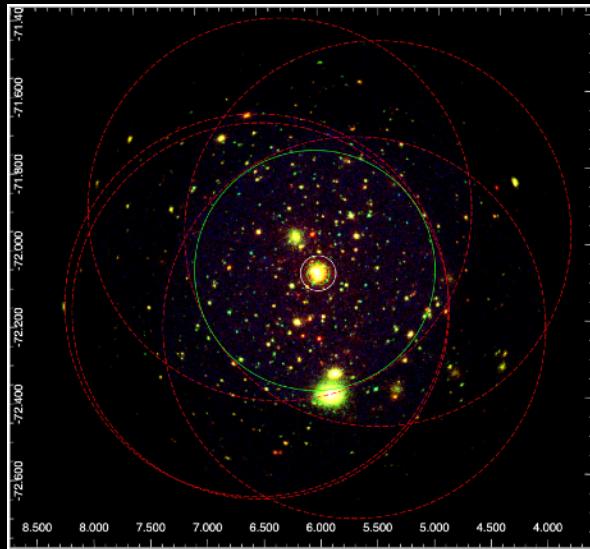
Spectroscopic (close) binaries!

Stars with hydrogen emission!

There are "quality" flags available  
(read the manuscript or contact me)



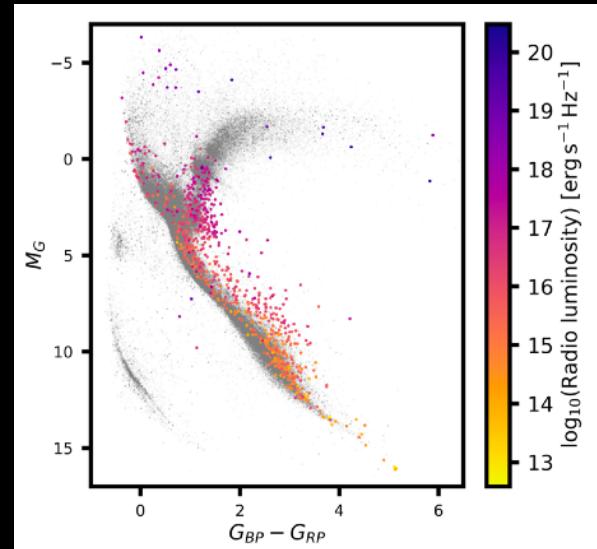
# ... and any overlap of GALAH with X-ray or Radio?



X-Ray sources in the Globular Cluster 47 Tuc (Saeedi et al. 2022)?

eROSITA coronal content (Freund+, 2024)?

Cataclysmic variables in eROSITA (Freund+, 2024)?



Stars with Radio signals?  
(Driessen et al. 2024)

Interstellar absorption similar/dissimilar to HI?

