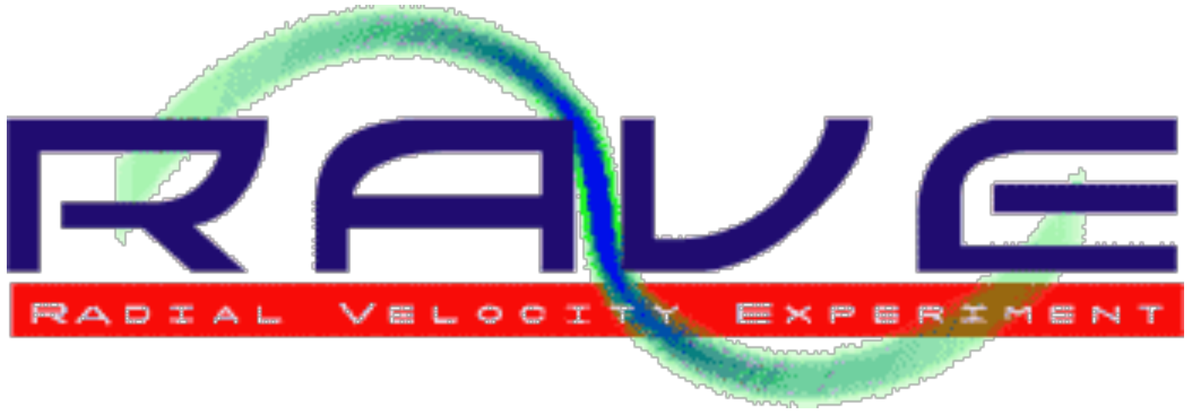
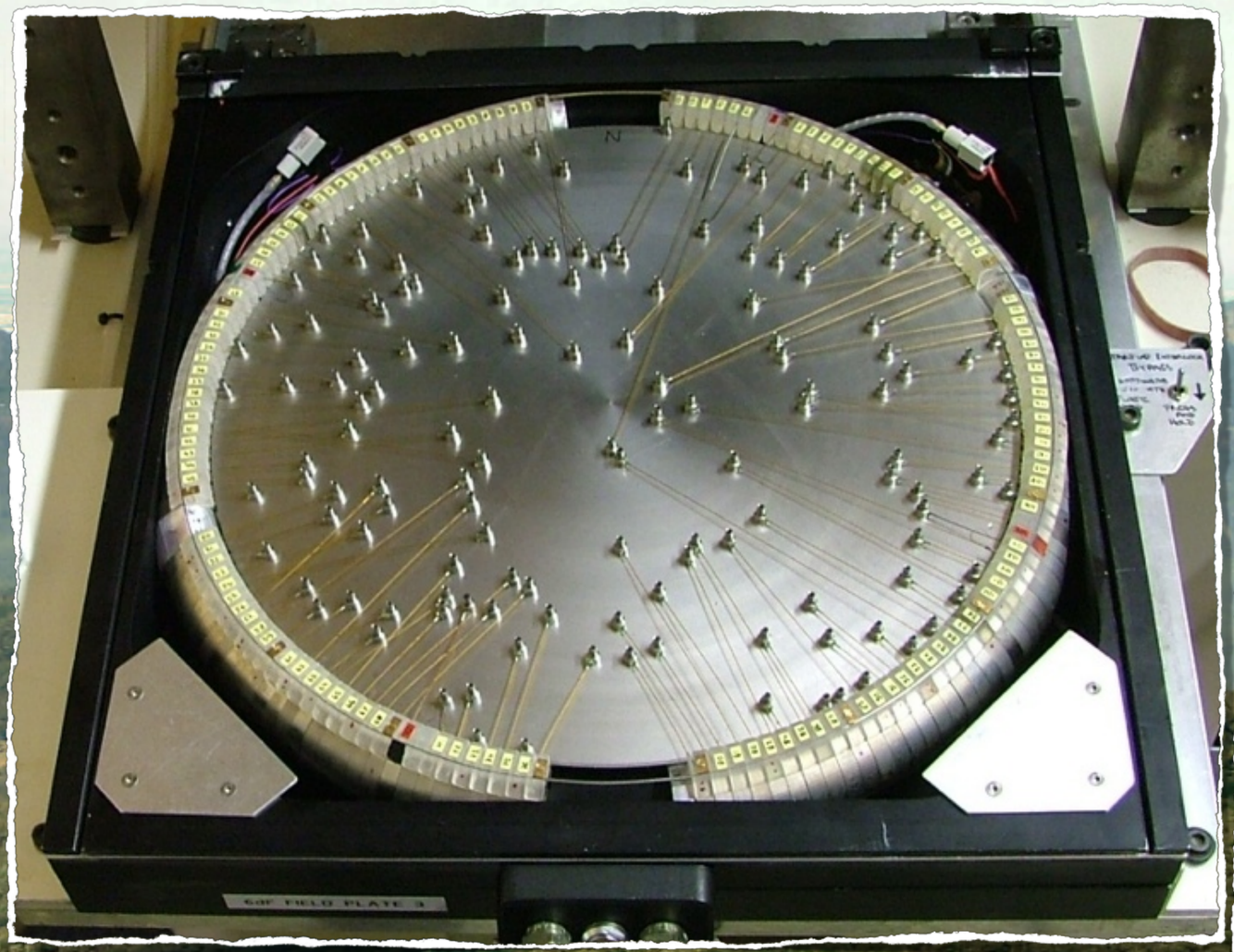


Final Data Release


60F FIELD PLATE 3

A bit of RAVE history

- RAVE is the first systematic (wide field coverage) spectroscopic Galactic Archeology survey
- Motivation: Astrometry mission DIVA (approved in 2001 as a mission in the German national space program DLR)
  - astrometry of some 40M stars
  - complete to V=10.5 (0.3mas, 0.5mas/a)
  - but no RVs
- idea to have a 50 million object spectroscopic survey using an 2000 fibre Echidna-type positioner on the wide-field UK Schmidt Telescope (kickoff May 2002)
- target of opportunity: bright time of 6dF (6dFGRS in dark time) for proof of concept → Ca triplet
- RAVE 1st light in April 2003 (pre 2MASS, pre GCS)
  - there may be more in the data than just RV
  - DIVA was cancelled in 2004 owing to lack of DLR funding
  - continue 25 night per month post 2005 (end of 6dFGRS)

A bit of RAVE history

GAIA Spectroscopy, Science and Technology
ASP Conference Series, Vol. 298, 2003
U. Munari ed.

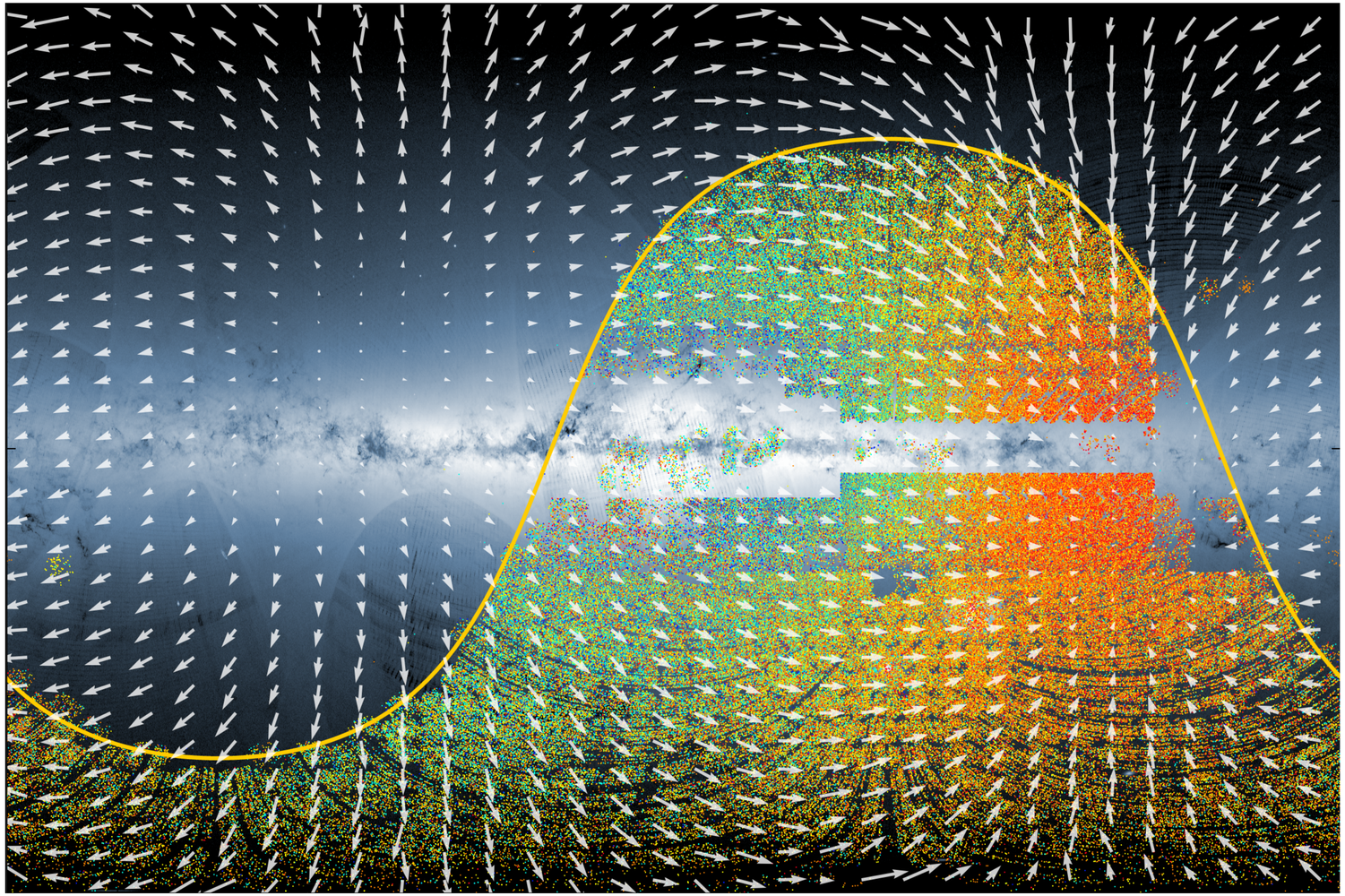
RAVE: the RAdial Velocity Experiment

Matthias Steinmetz[1]

Astrophysikalisches Institut Potsdam, An der Sternwarte 16, 14482 Potsdam, Germany

Abstract. RAVE[2] (RAdial Velocity Experiment) is an ambitious program to conduct an all-sky survey (complete to V=16 mag) to measure the radial velocities, metallicities and abundance ratios of 50 million stars using the 1.2 m UK Schmidt Telescope of the Anglo-Australian Observatory (AAO), together with a northern counterpart, over the period 2006 – 2010. The survey will represent a giant leap forward in our understanding of our own Milky Way galaxy, providing a vast stellar kinematic database three orders of magnitude larger than any other survey proposed for this coming decade. RAVE will offer the first truly representative inventory of stellar radial velocities for all major components of the Galaxy. The survey is made possible by recent technical innovations in multi-fiber spectroscopy, specifically the development of the 'Echidna' concept at the AAO for positioning fibers using piezo-electric ball/spines. A 1 m-class Schmidt telescope equipped with an Echidna fiber-optic positioner and suitable spectrograph would be able to obtain spectra for over 20 000 stars per clear night. Although the main survey cannot begin until 2006, a key component of the RAVE survey is a pilot program of 10^5 stars which may be carried out using the existing 6dF facility in unscheduled bright time over the period 2003–2005.

DR5

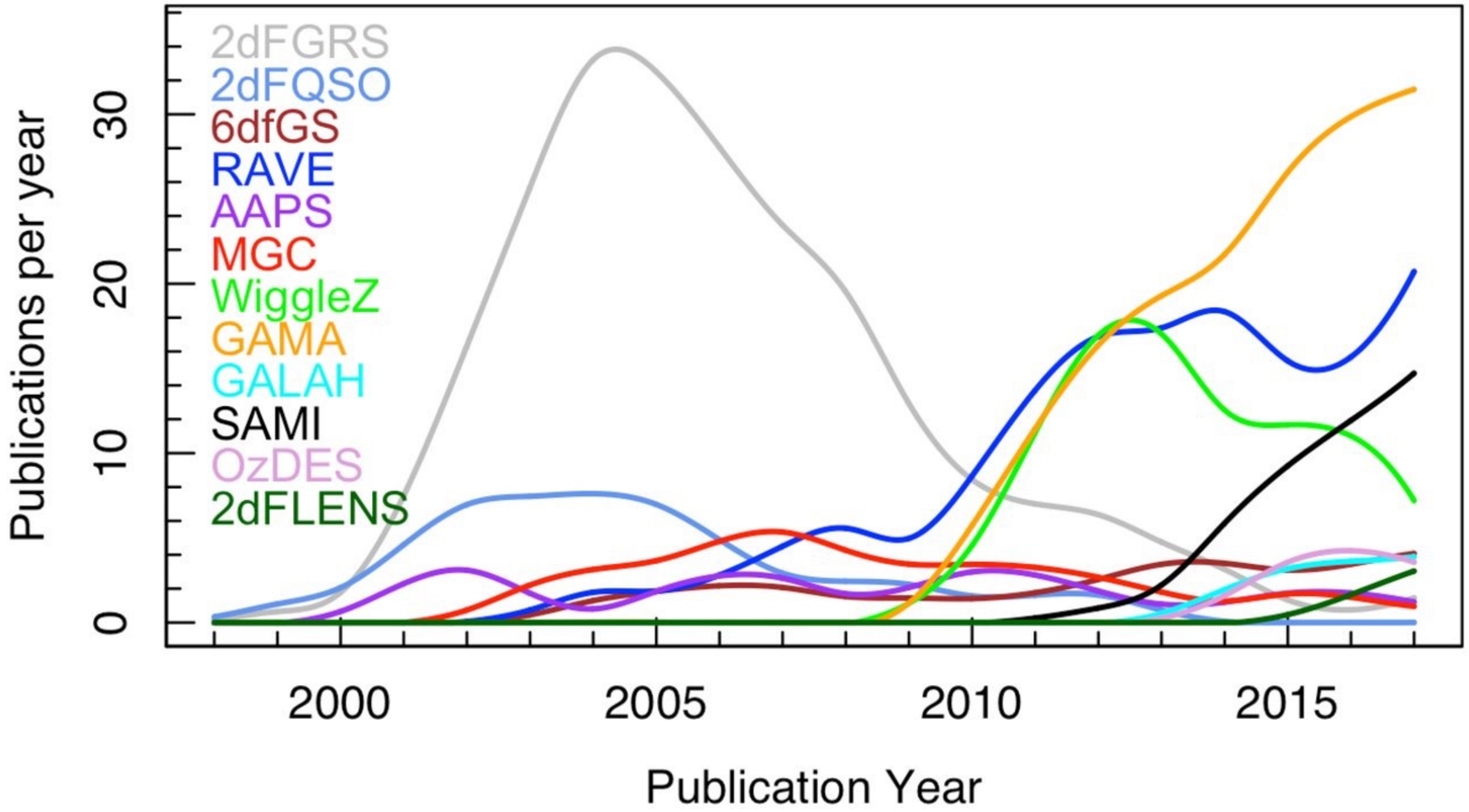


- 520781 spectra of 457588 unique stars
- Selection function: Wojno & RAVE, 2017

- based on DR4 pipeline
  - calibrated to
    - K2 Campaign 1 seismic gravities
    - Gaia benchmark stars
  - Distances based on isochrones
  - Elemental Abundances
- IR flux method $T_{\rm eff}$
- Catalogue of red giant stars calibrated only on K2 astroseismic data

A bit of RAVE statistics

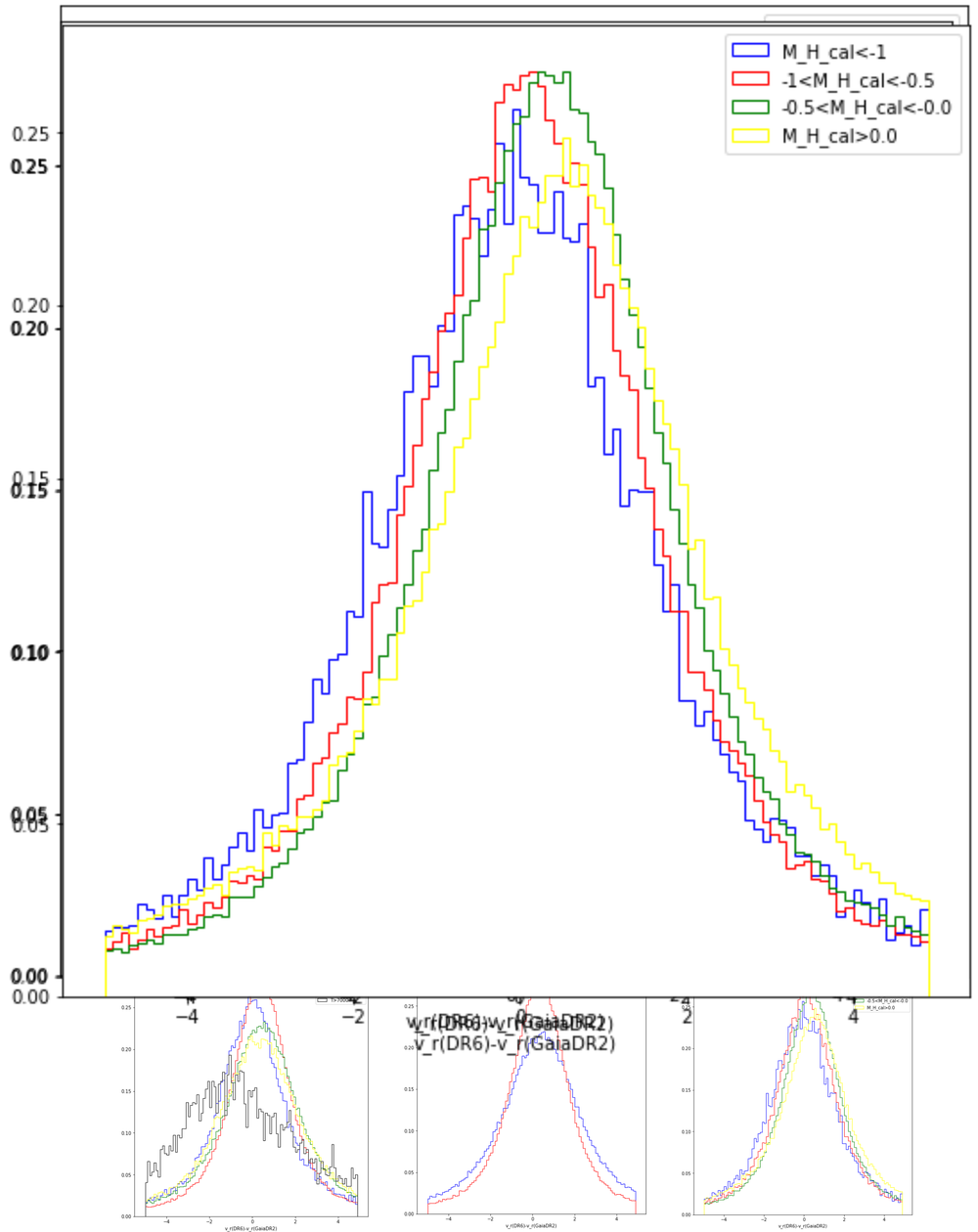
- 165 articles (ADS) with RAVE in the title
  - 5000 citations
- 302 articles (ADS) with RAVE in the abstract
  - 7200 citations
- RAVE DR5 among the 20 most cited refereed papers in 2017



final data release (a.k.a. DR6)

- some book keeping
- spectra + error spectra
- errors from repeat observations
- spectroscopically derived stellar parameters (as in DR5) with MADERA pipeline
- new abundance pipeline GAUGUIN
- stellar parameters using the reverse distance pipeline BDASP + Gaia priors
- temperatures using the infrared flux method
- Crossmatched with other catalogues
- Goal: release DR6 in Q2/2019
- updated astroseismic giant sample (based on ~700 K2 stars)
- Data driven methods (neural networks)

RAVE DR6 vs Gaia DR2 radial velocities

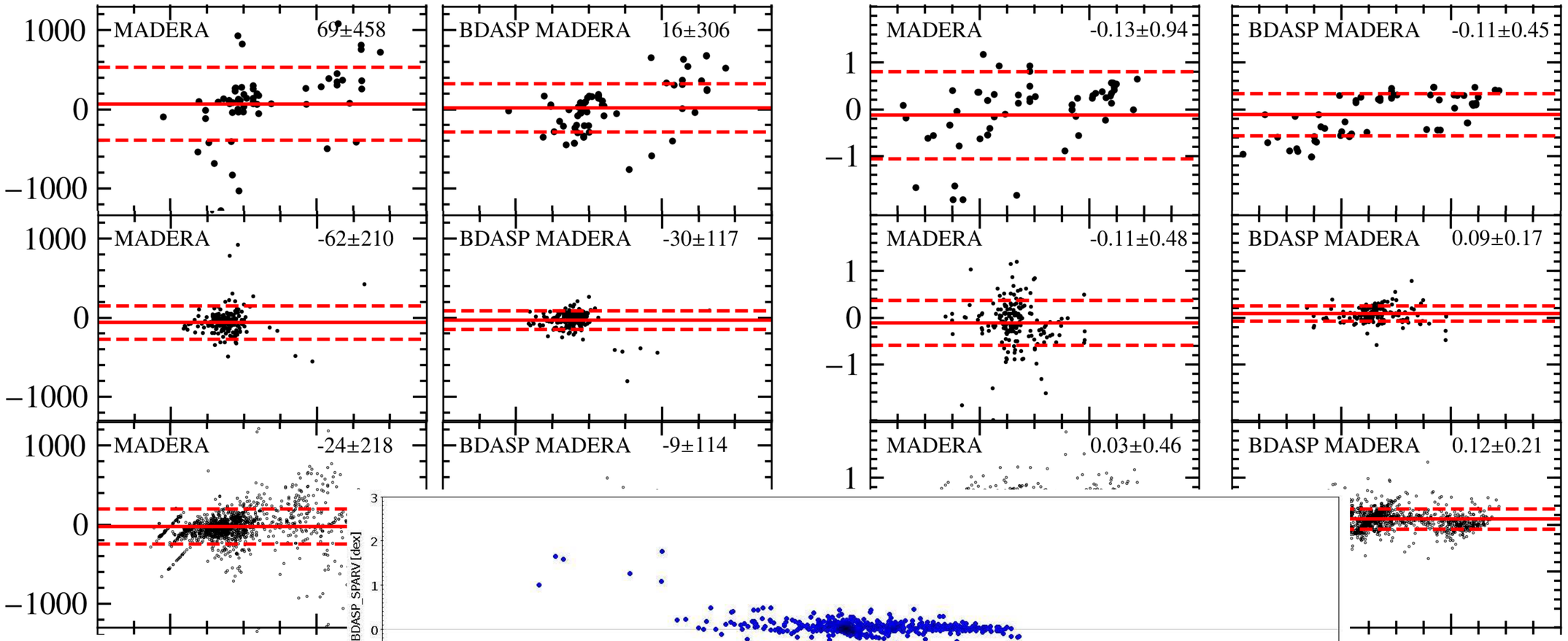


- Velocity difference well fitted by two Gaussians with FWHM of 1.2km/s and 3.6 km/s
- offset of -0.3 km/s, consistent with other spectroscopic surveys
- no clear temperature trend, but increasing uncertainties at the edges of the grid
- giants somewhat better agreement
- very mild metallicity dependence

Stellar parameters with BDASP pipeline & Gaia priors

$T_{eff,\ hires} - T_{eff,\ BDASP}$

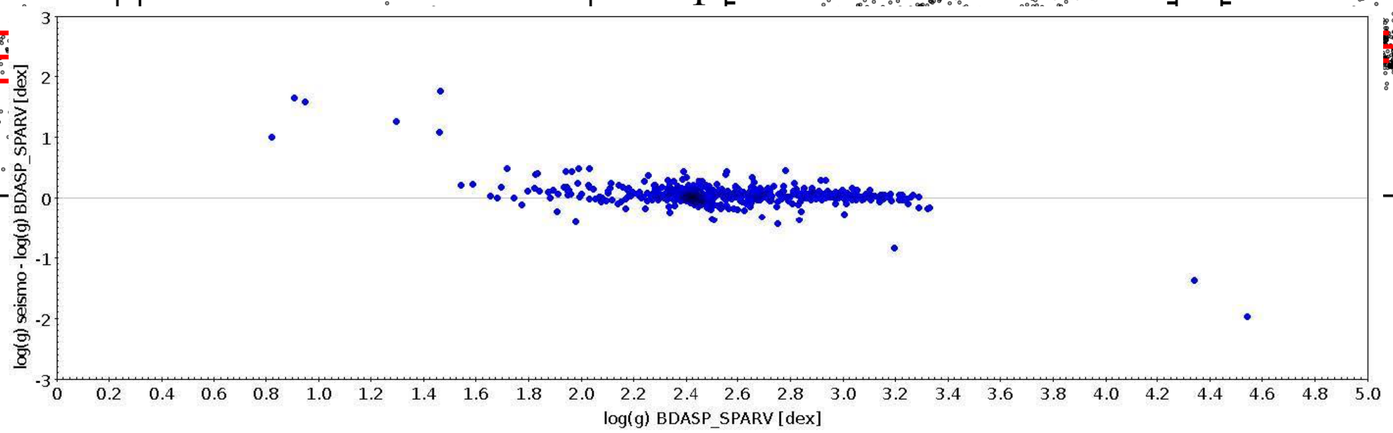
$\log g_{hires} - \log g_{BDASP}$



Calibrators

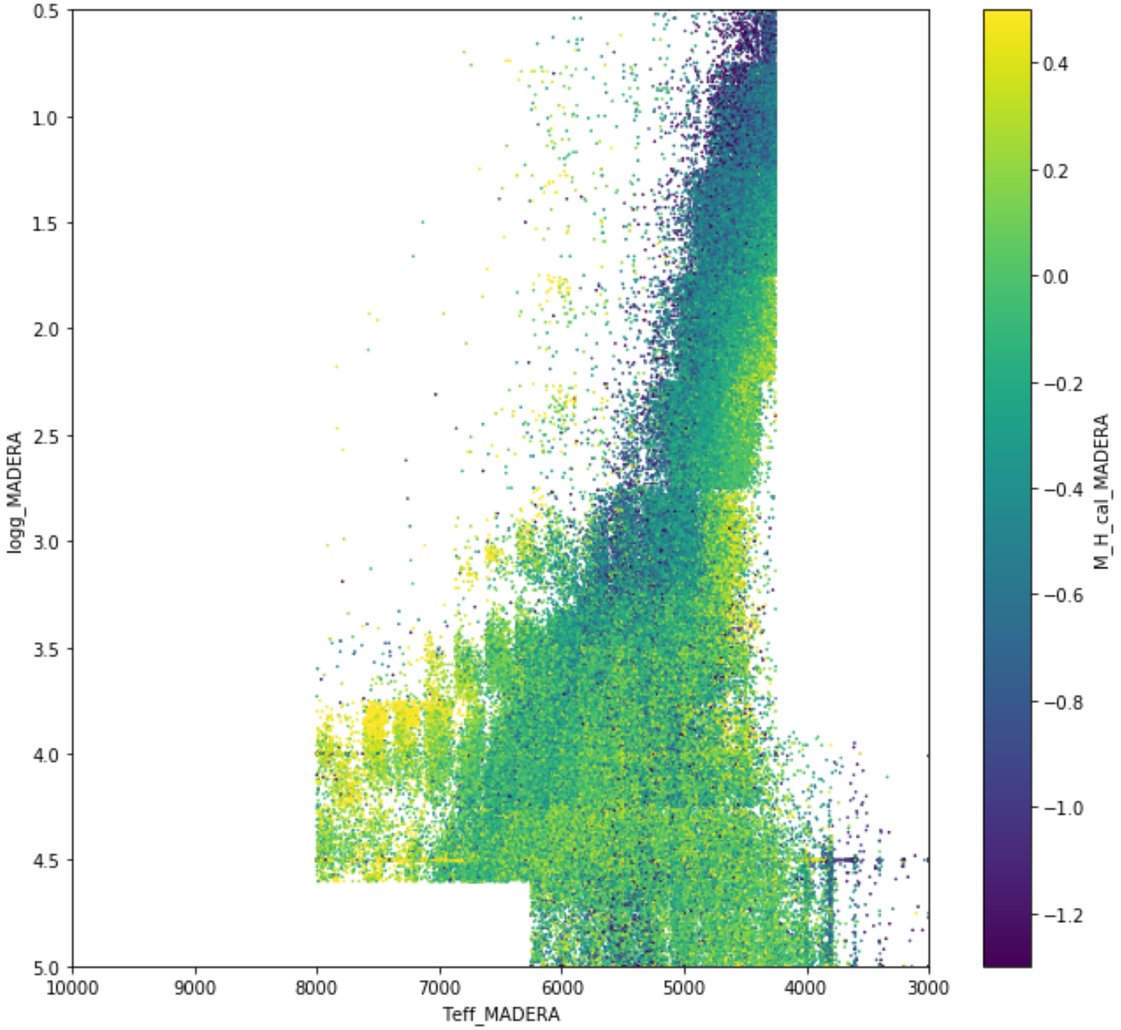
APOGEE

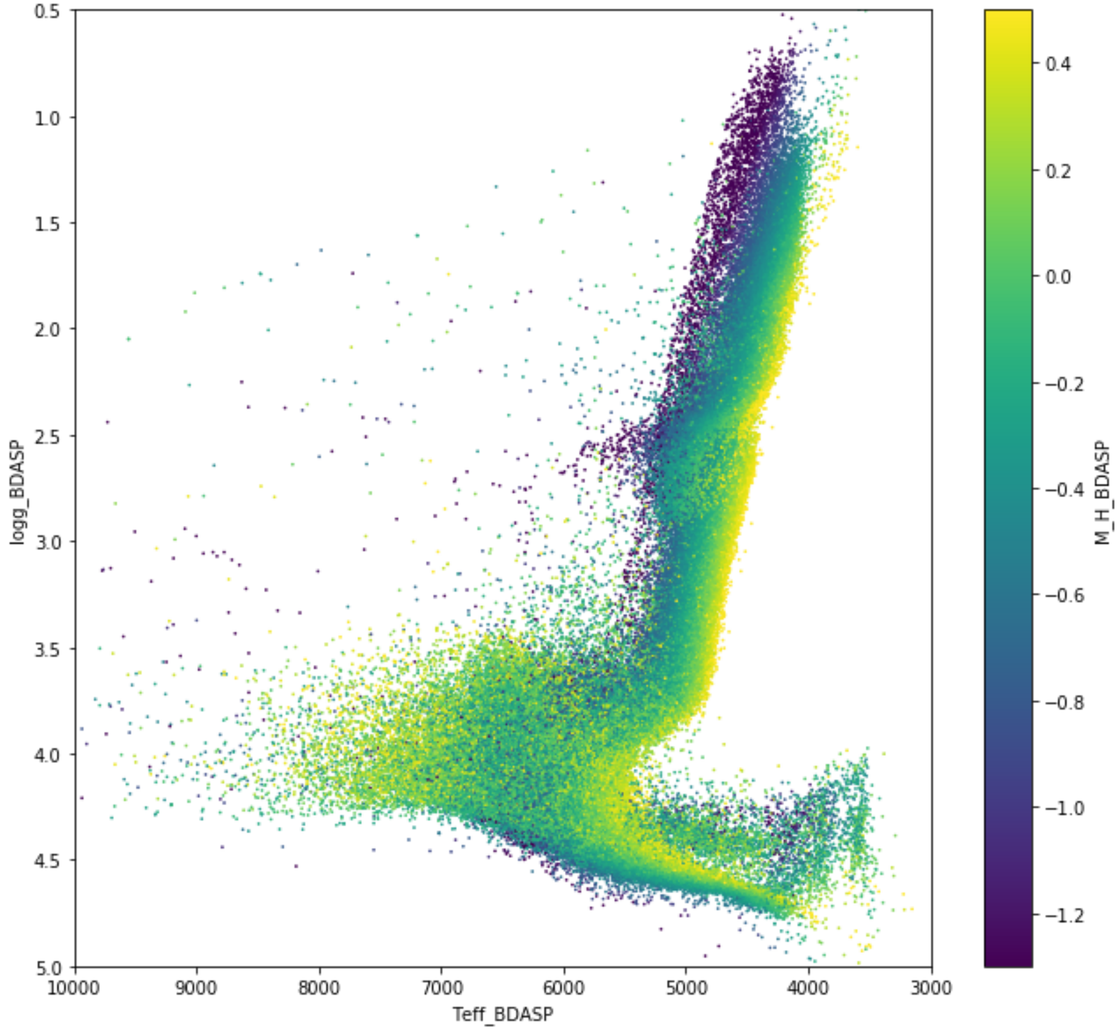
Galah DR2



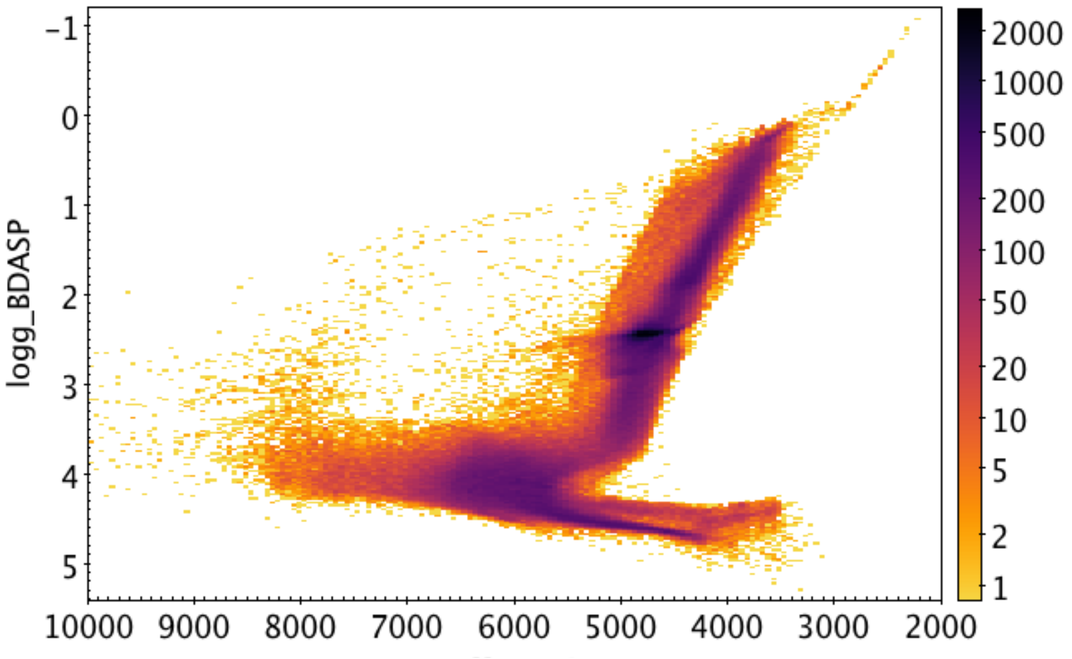
K2 vs RAVE+Gaia

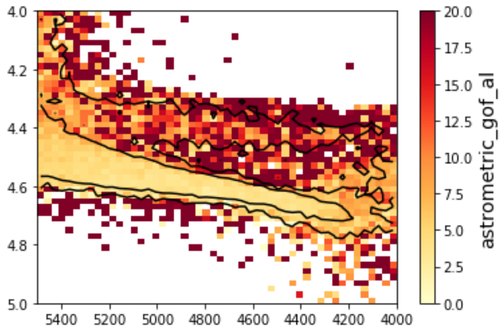
Kiel diagram for MADERA and BDASP (all stars)

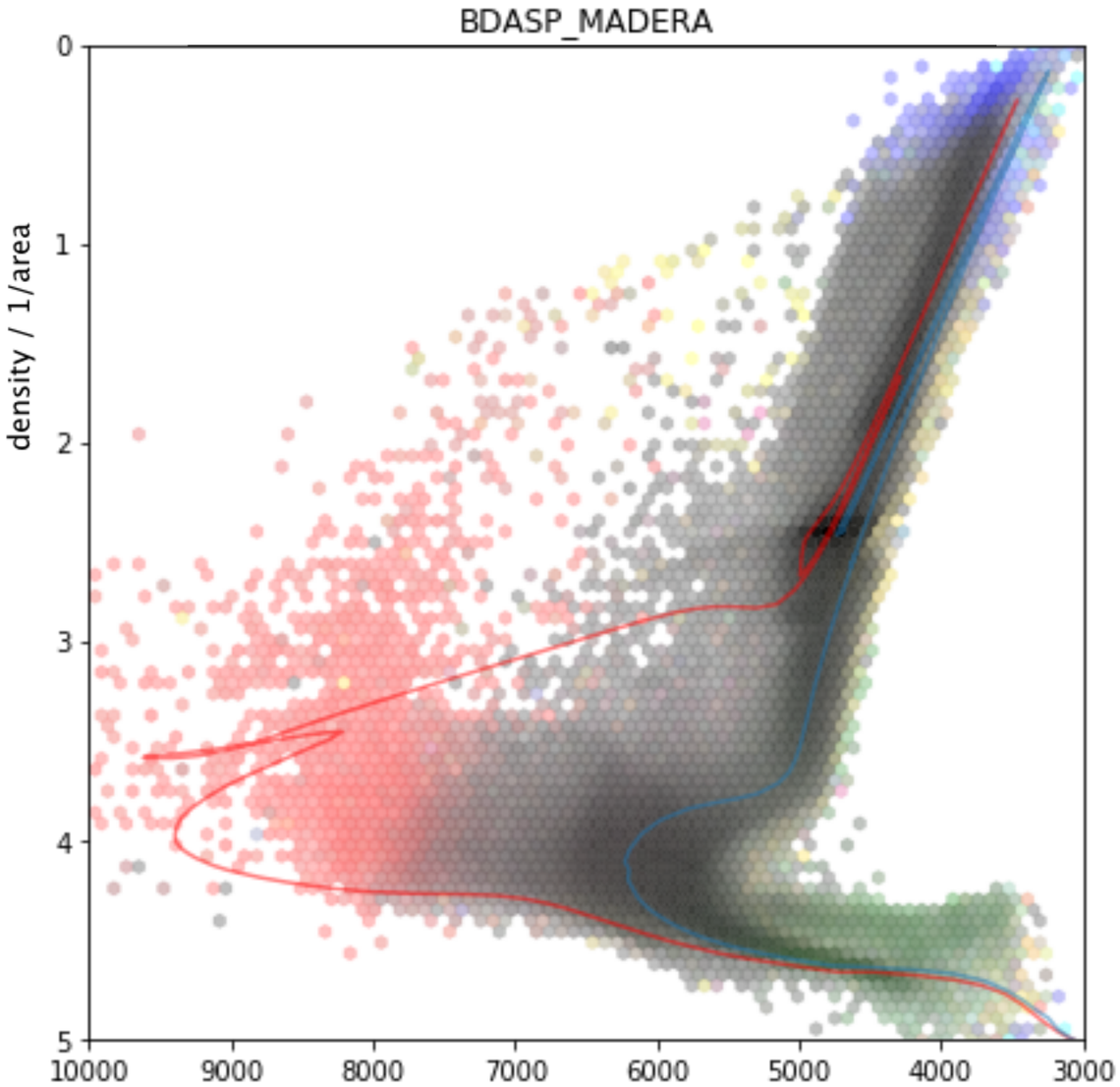




Kiel diagram for BDASP

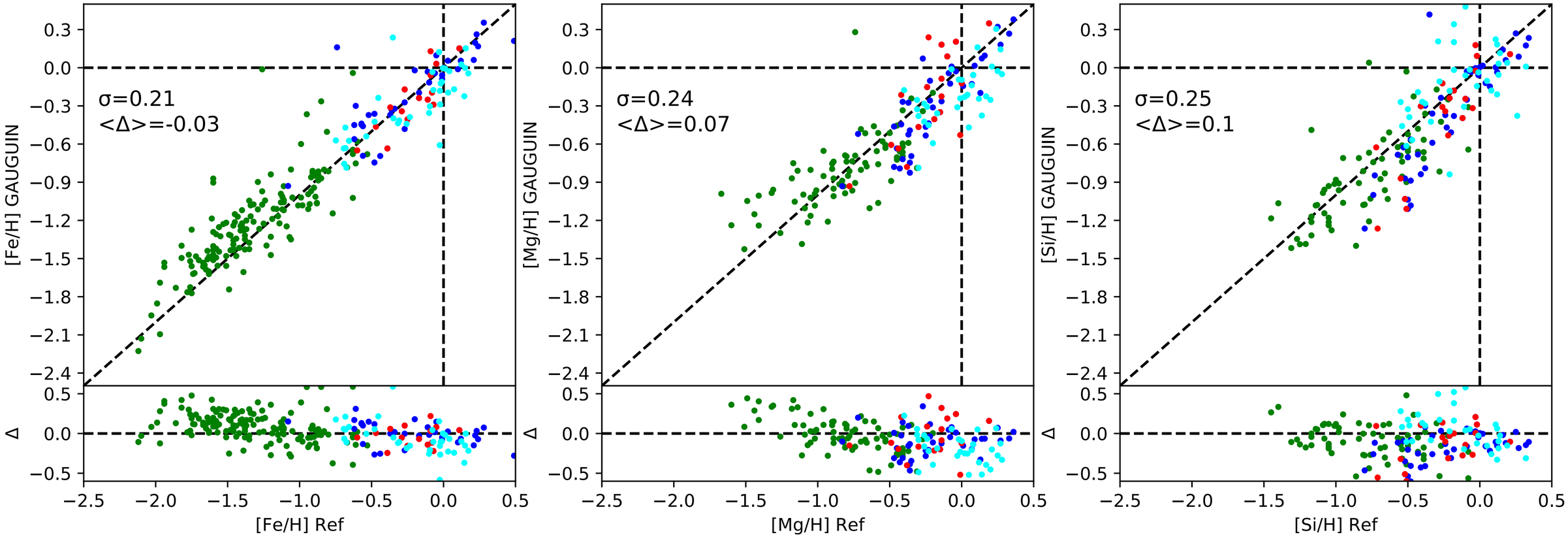




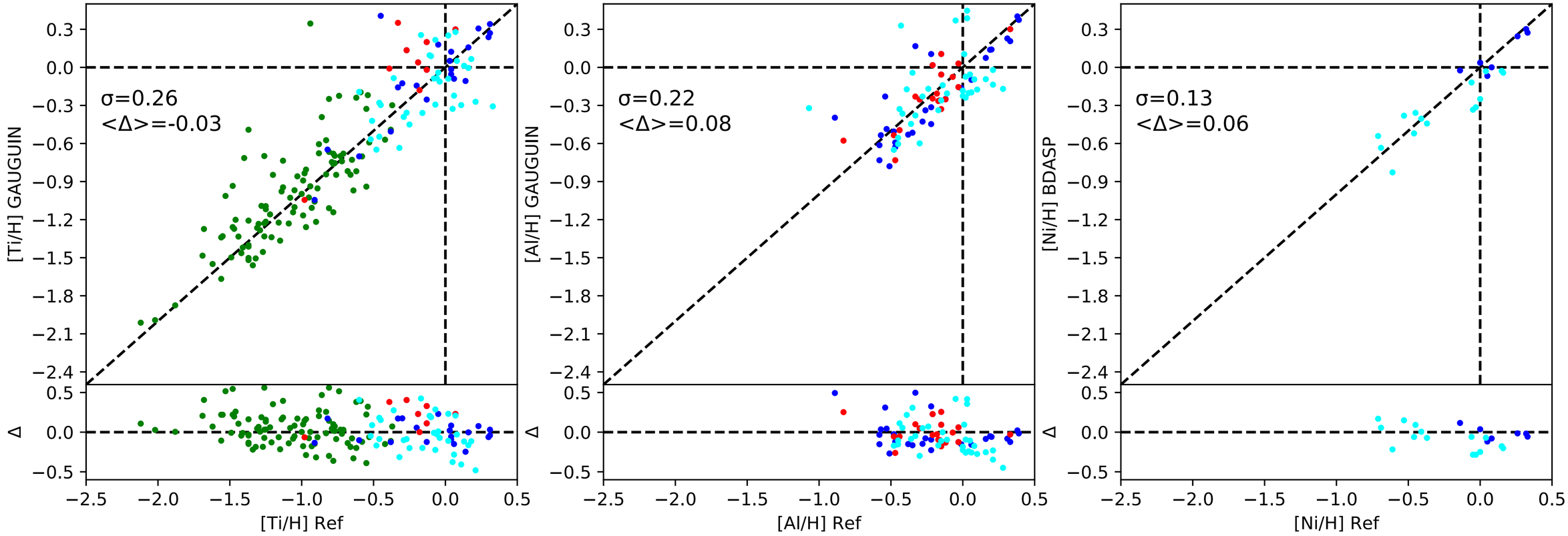


Peculiar Cold Binary Carbon Continuum Emission Hot Normal Wavelength

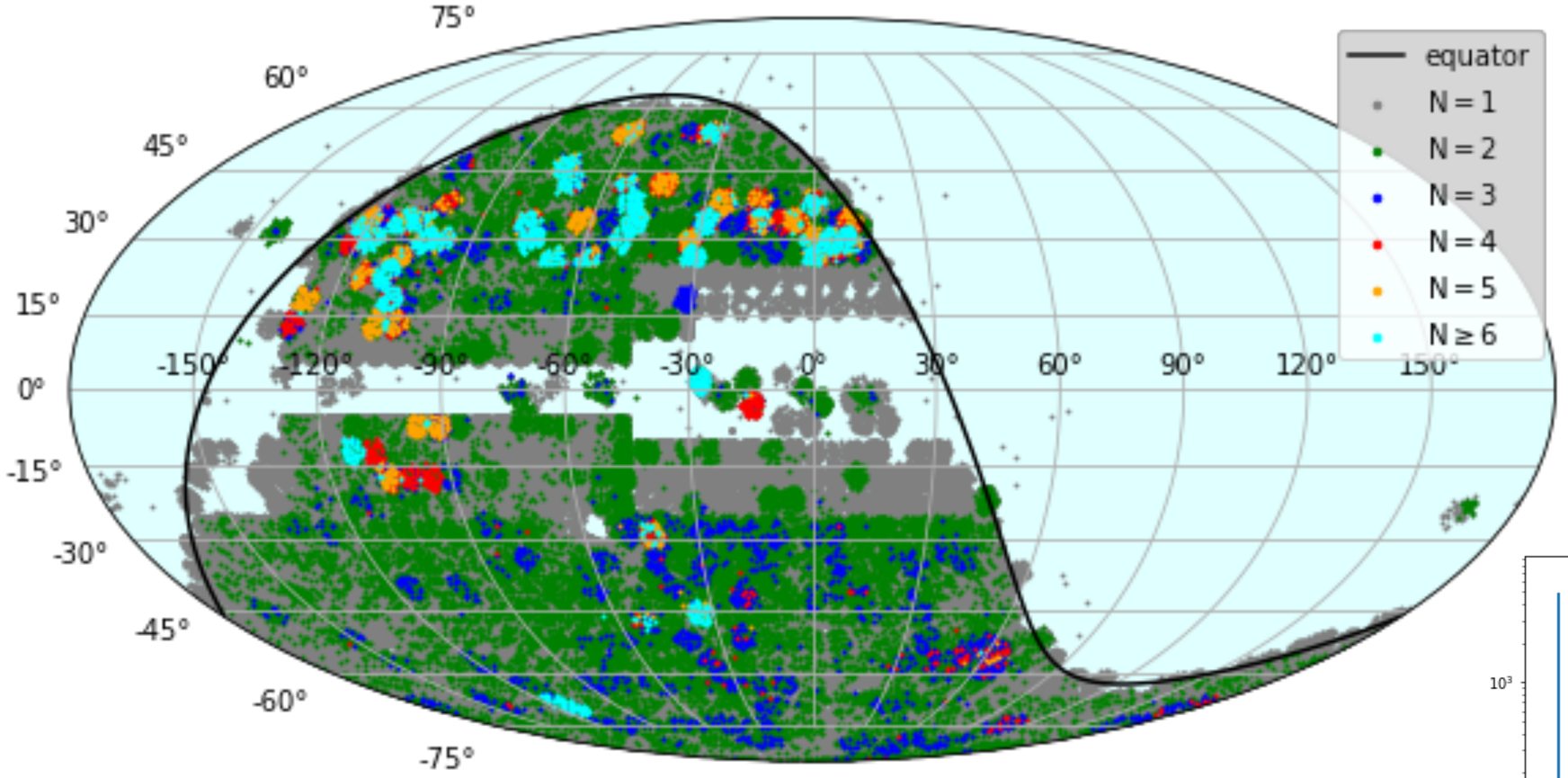
New chemical pipeline GAUGUIN

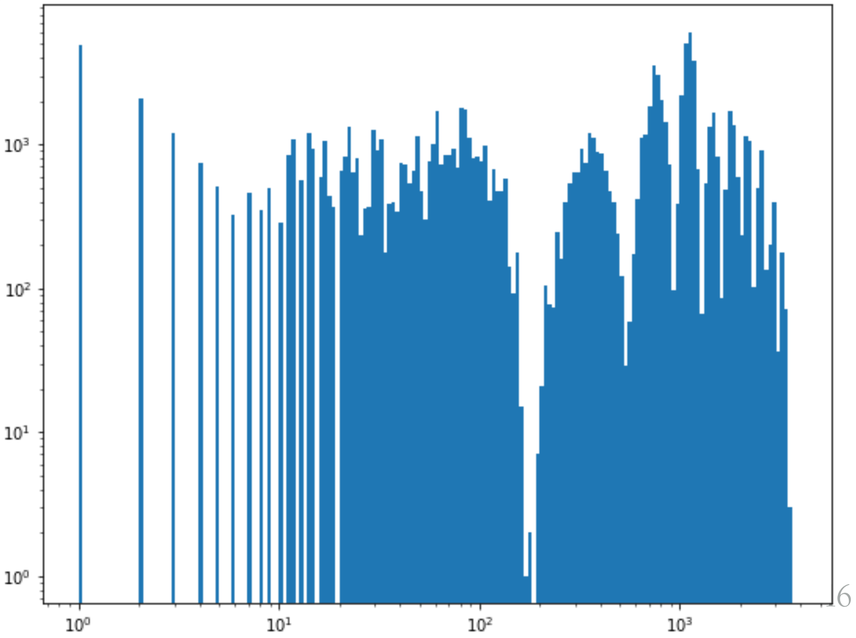


New chemical pipeline GAUGUIN

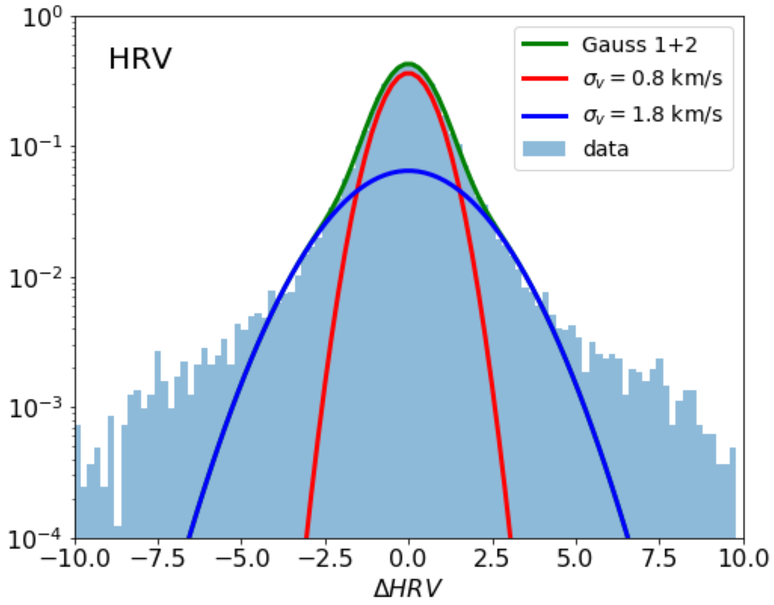


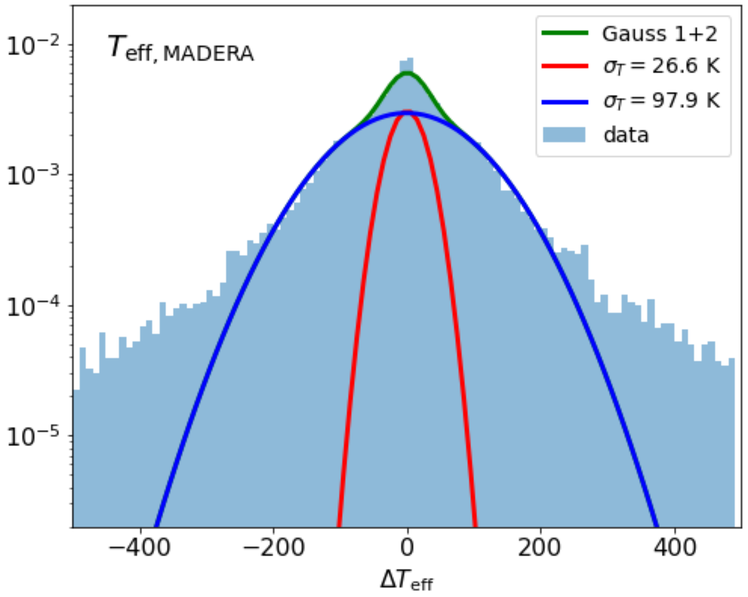
Repeats

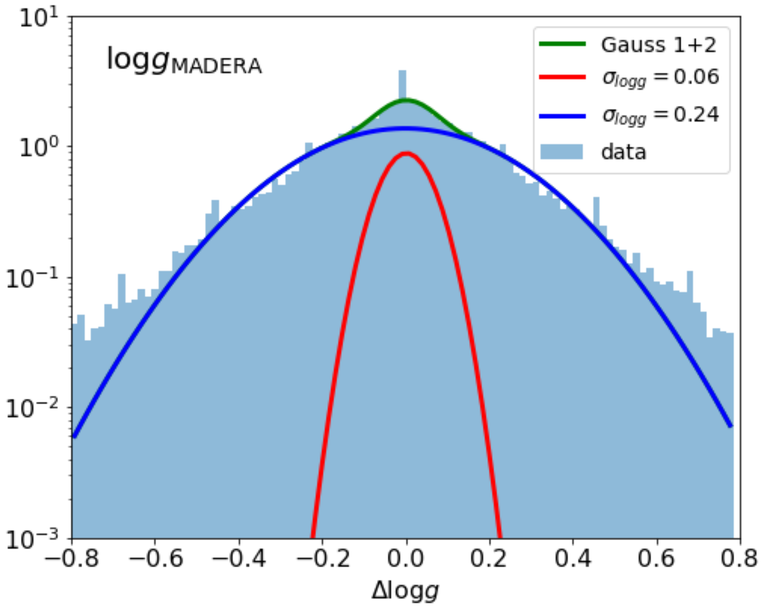

equator
N = 1
N = 2
N = 3
N = 4
N = 5
N ≥ 6
75°
60°
45°
30°
15°
0°
-15°
-30°
-45°
-60°
-75°
-150°
-120°
-90°
-60°
-30°
0°
30°
60°
90°
120°
150°

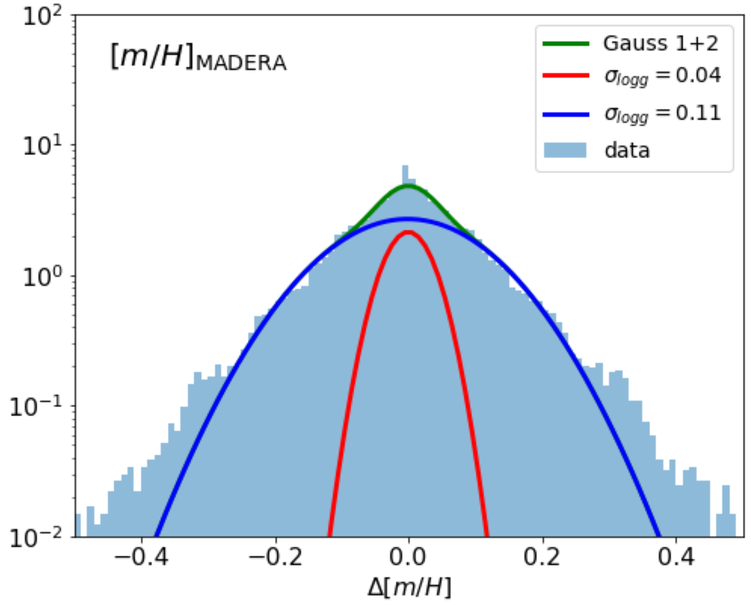

10^3
10^2
10^1
10^0
10^0
10^1
10^2
10^3

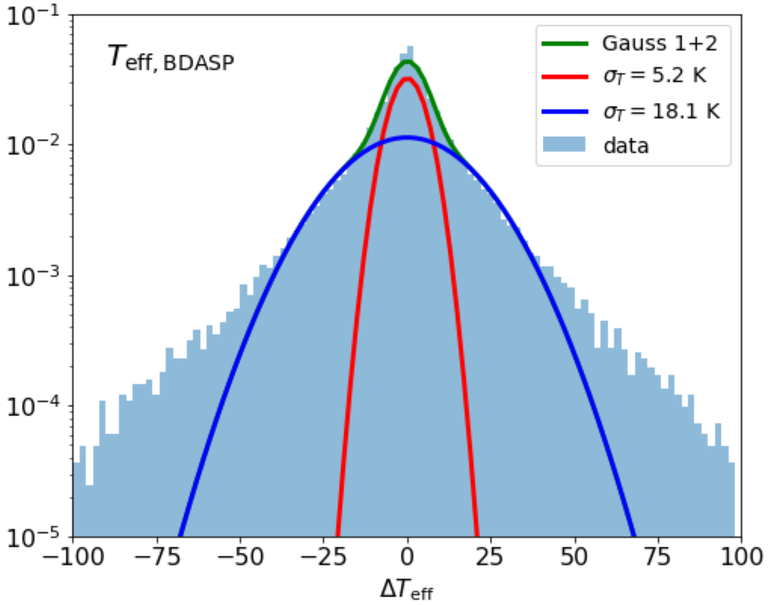
Repeats - atmospheric parameters

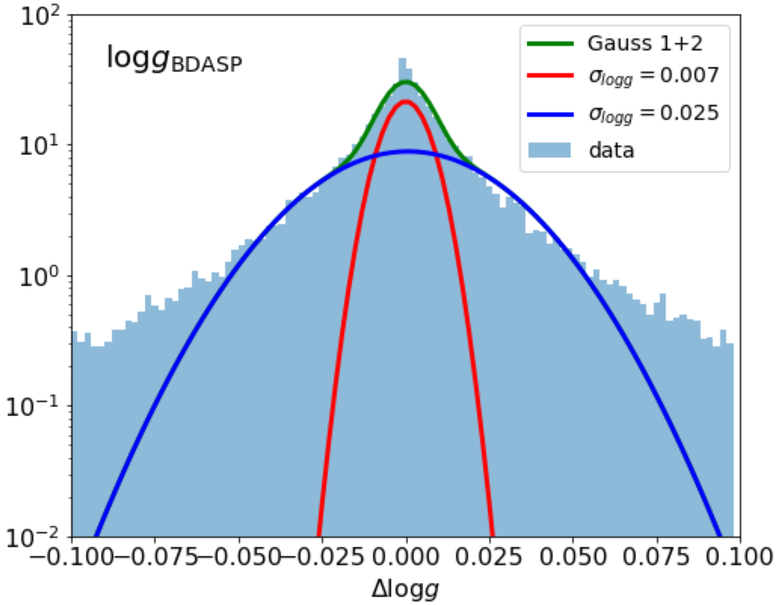




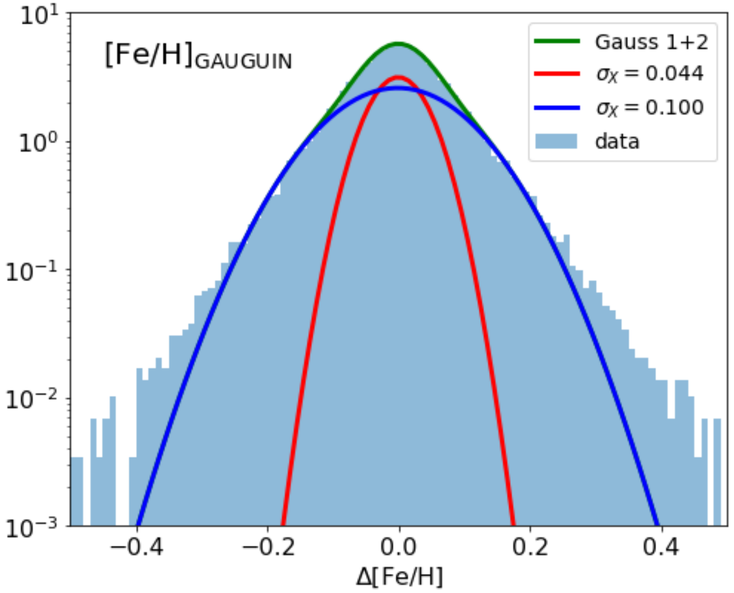


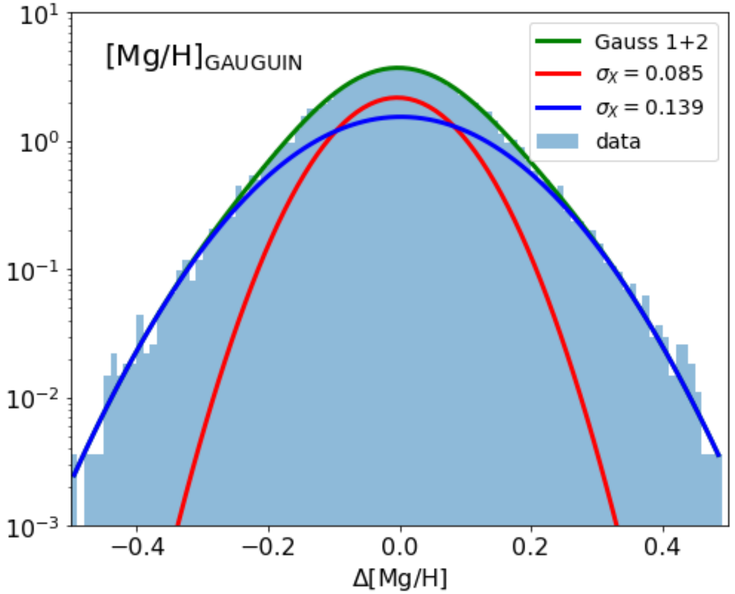


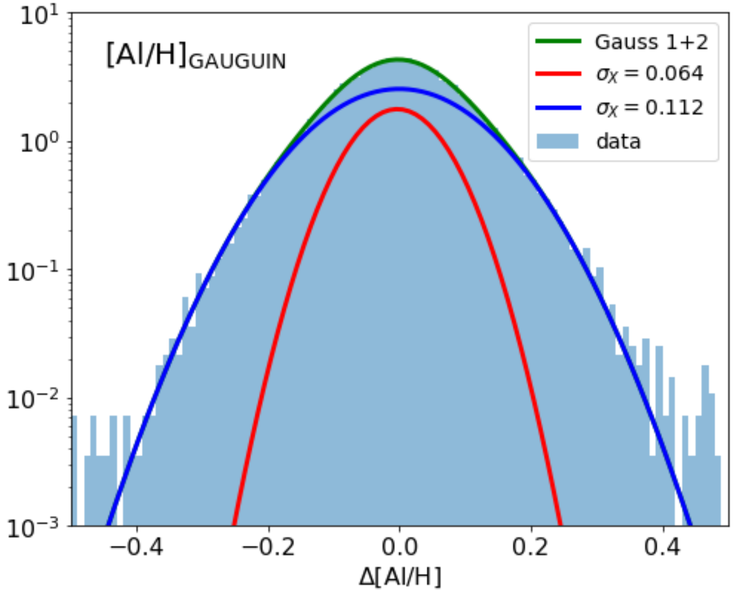


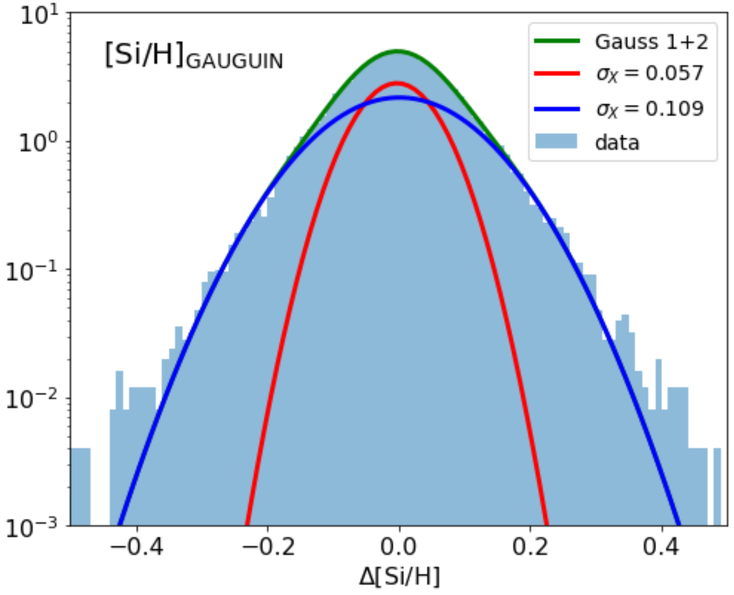


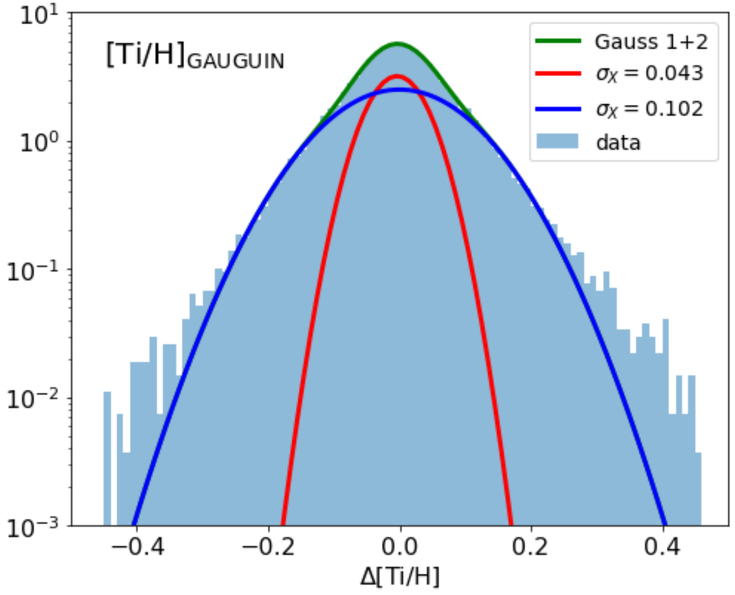
Repeats - abundances

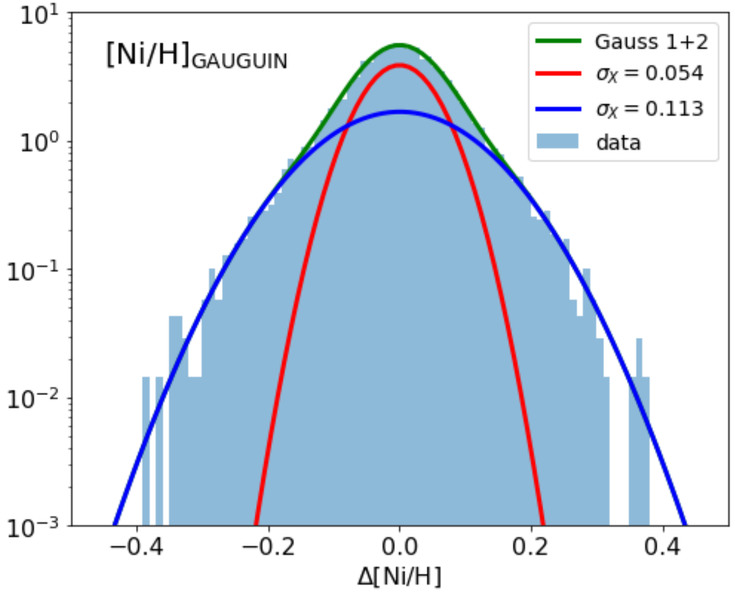




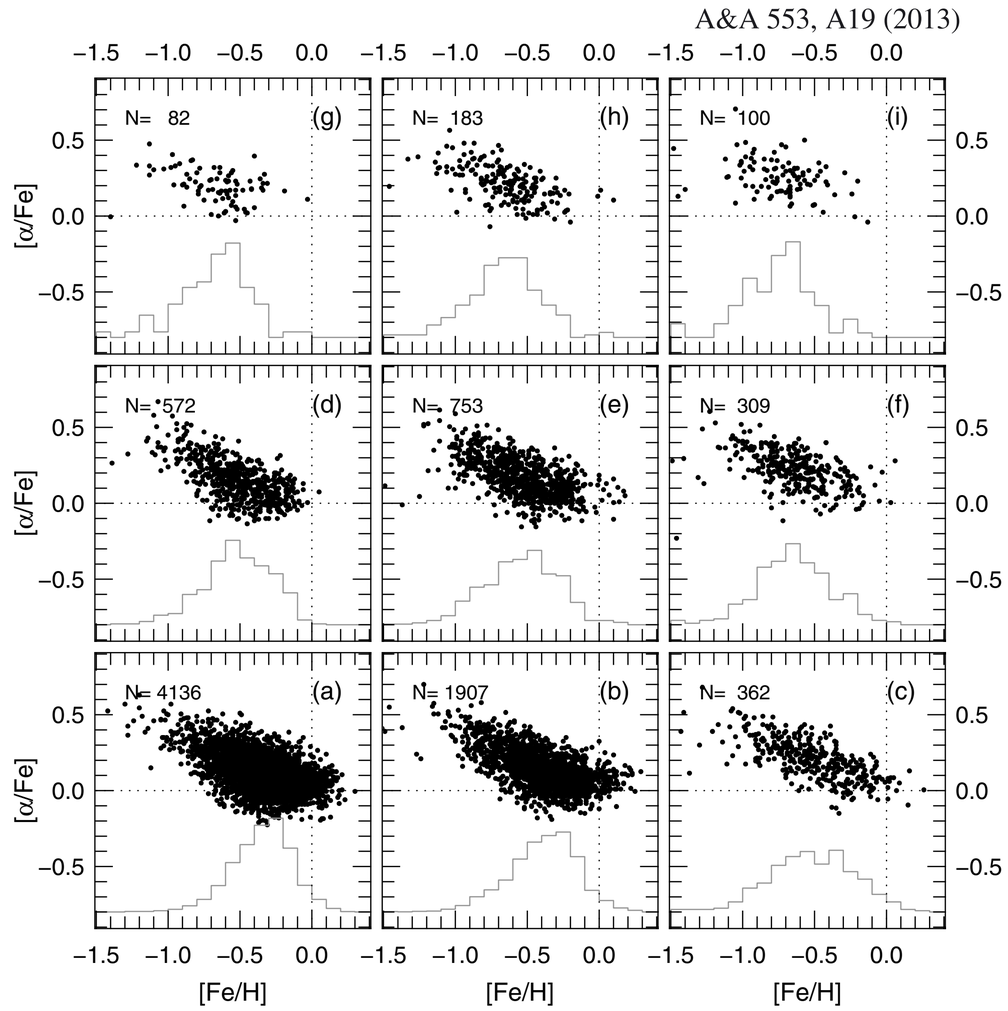




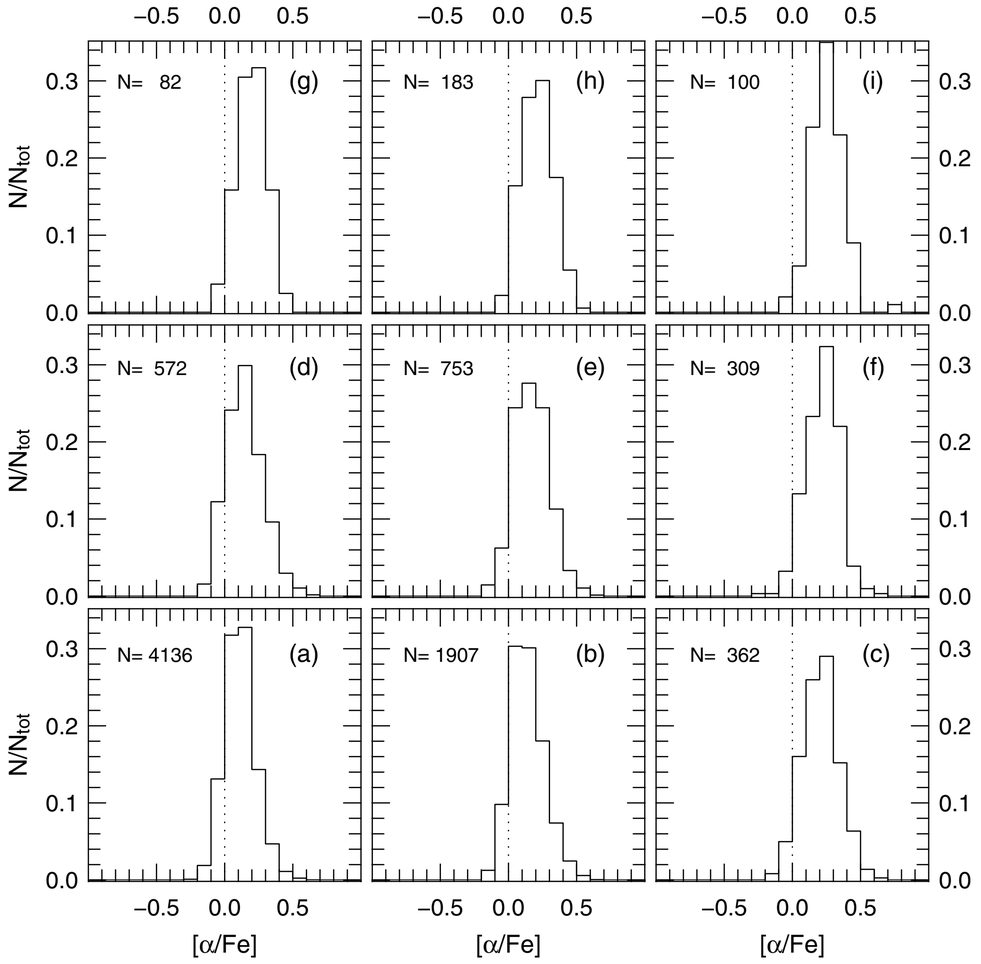




Composition vs Dynamics (from RAVE DR3)

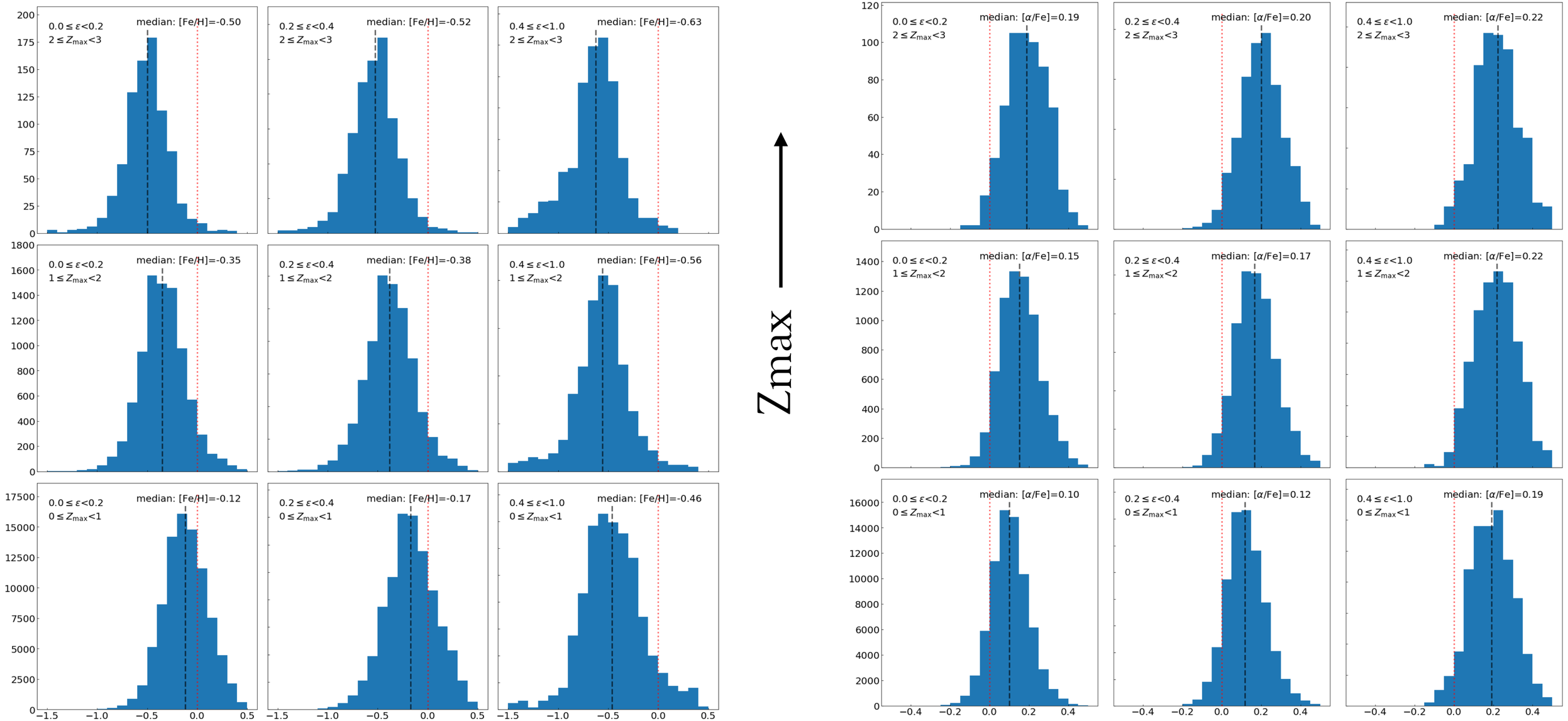


Zmax



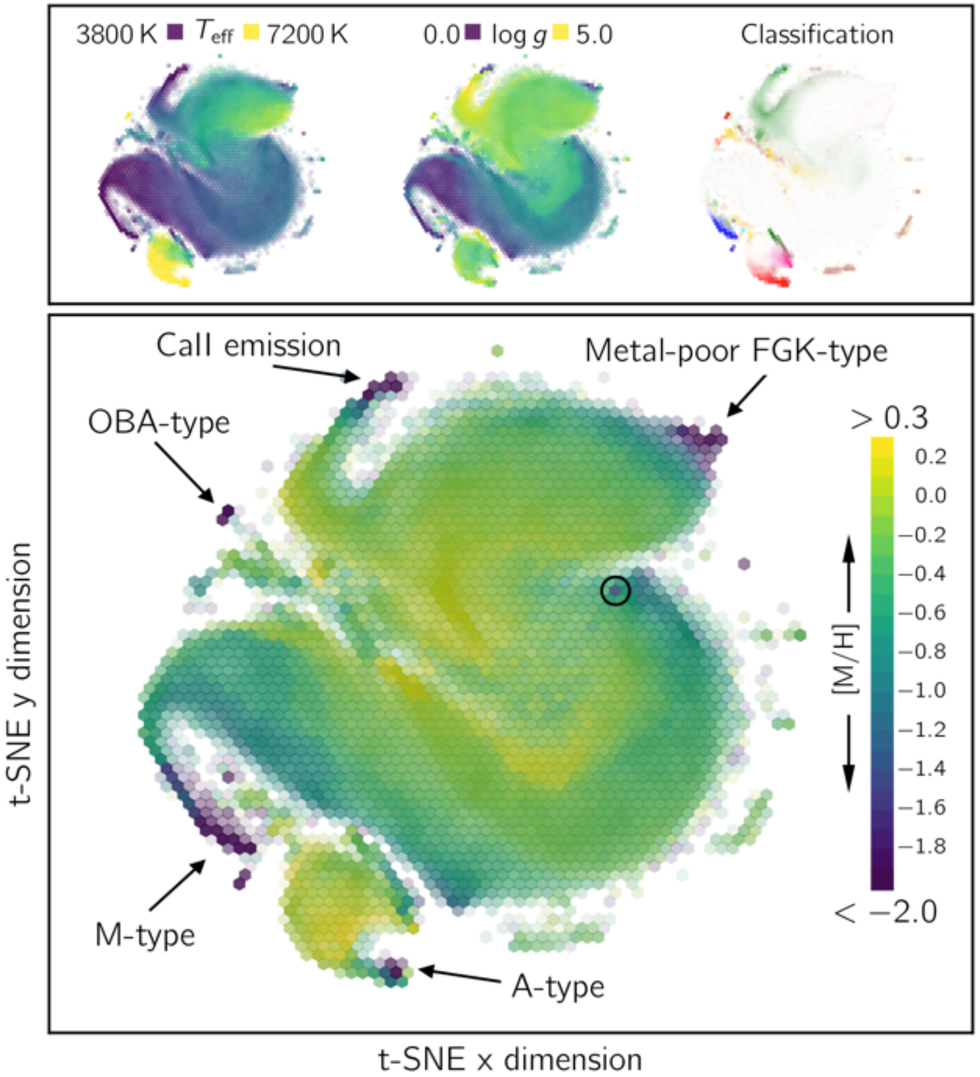
[Fe/H] eccentricity ⟶ [α/Fe]

Composition vs Dynamics (DR6)

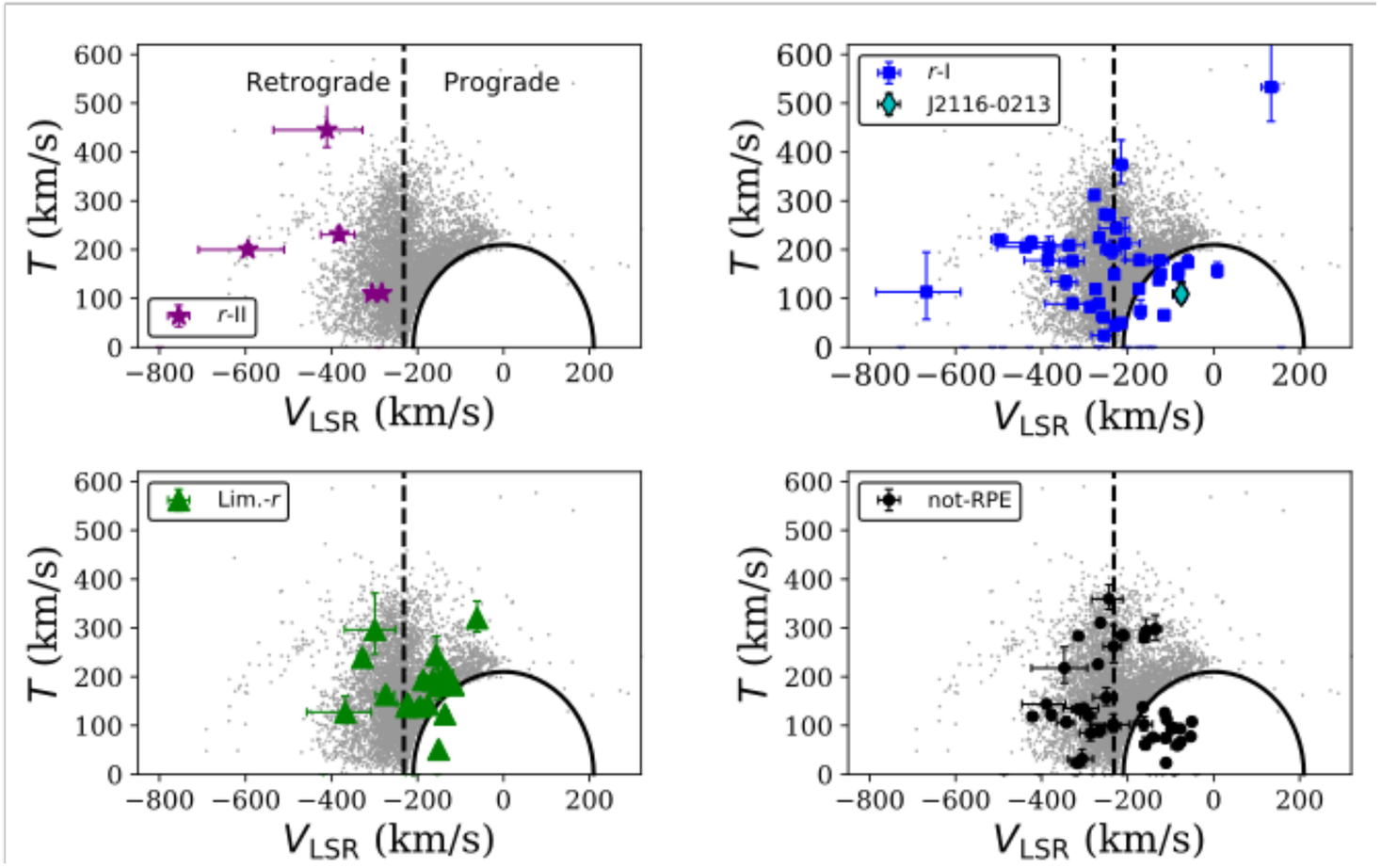


Hunting for low Z stars in RAVE with t-SNE

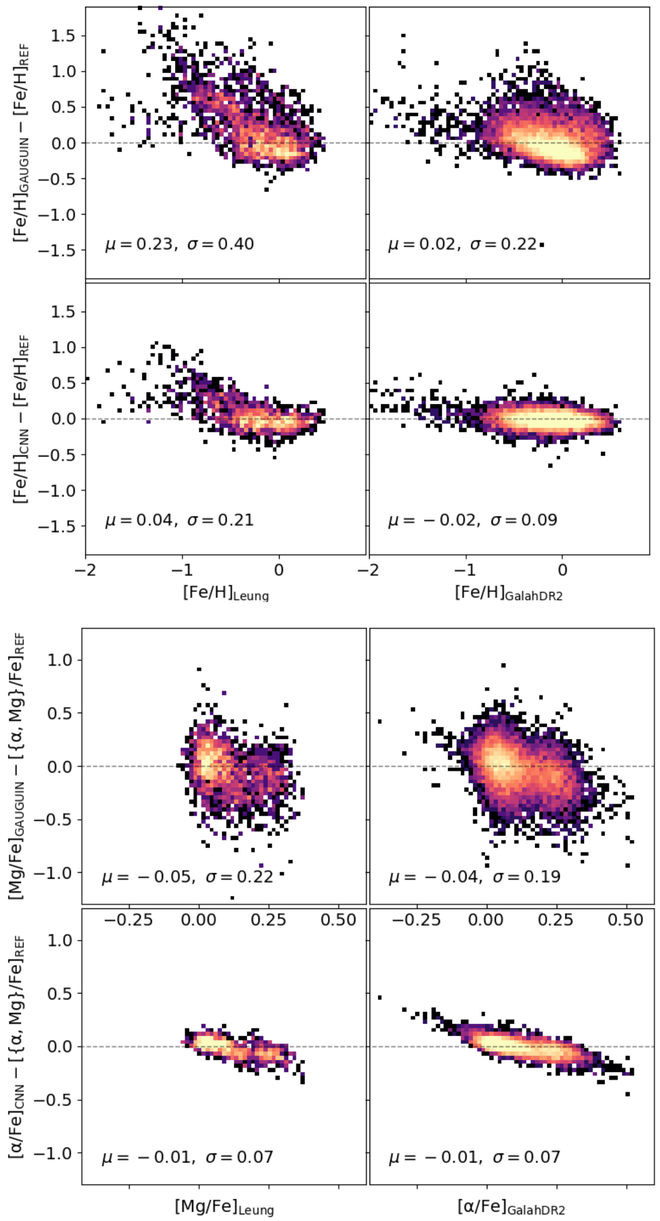
Matijevic et al, 2017



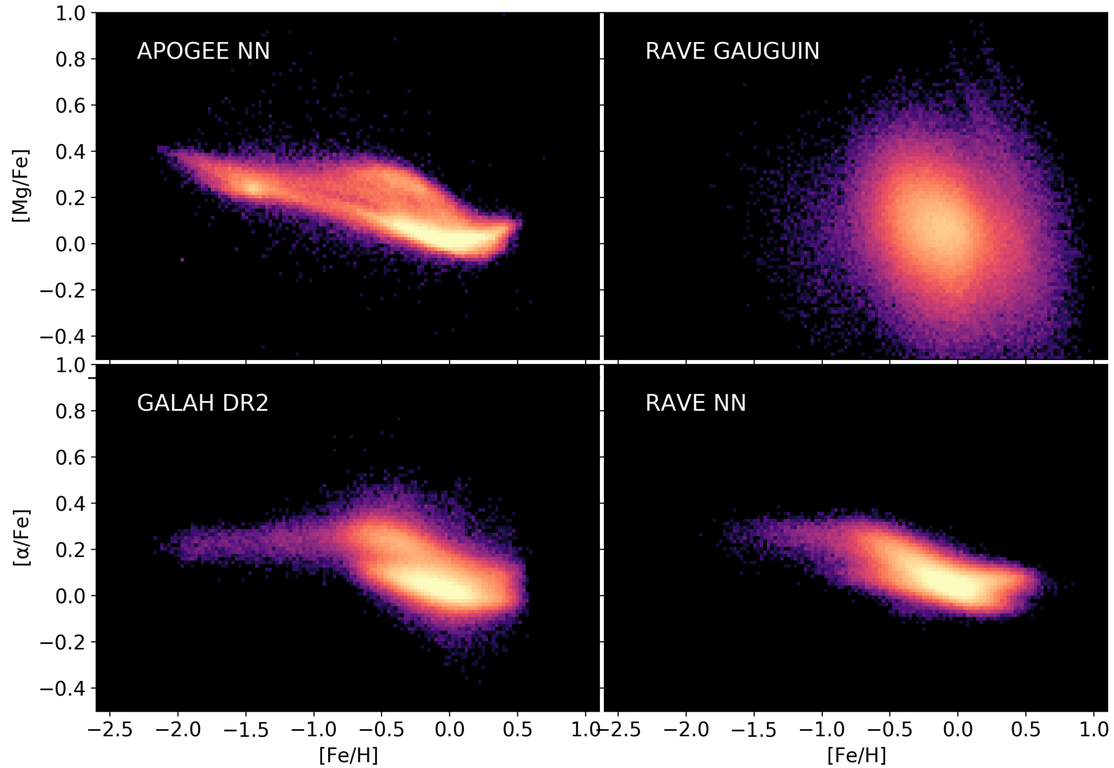
Sakari et al (r-process alliance), 2018



Improving RAVE chemistry with deep learning



- Convolutional neural network trained with RAVE spectra and Galah DR2 labels



- preview of what can be done with Gaia DR3 spectra?

final data release (a.k.a. DR6)

- some book keeping
- spectra + error spectra
- errors from repeat observations
- spectroscopically derived stellar parameters with MADERA pipeline (as in DR5)
- new abundance pipeline GAUGUIN
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