

Exploring large spectroscopic surveys using t-SNE reduction of spectral information

Gregor Traven

Klemen Čotar
Maruška Žerjal
Angela Kochoska
Danijela Birko
Tomaž Zwitter



University of Ljubljana
Faculty of *Mathematics and Physics*



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What are peculiar objects ?

- Spectroscopic data (Gaia-ESO, RAVE, Galah)
- “Unbiased sample” $\Rightarrow$ **peculiar stars + observational & reduction artefacts** (cosmic rays, weird continuum shapes, ...)
- Plethora of peculiarities: emission stars, chromospherically active stars, multiple systems, ...
- Peculiarity and unexpected issues $\Rightarrow$ imprint on observational data!



How to handle them ?

- People (astronomers) are visual beings $\Rightarrow$ **visual analytics**
- **Analytical reasoning** facilitated by **interactive visual interfaces**



- General unbiased discovery tool: **t-SNE** manifold learner
(**t**-distributed **S**tochastic **N**eighbour **E**mbedding)

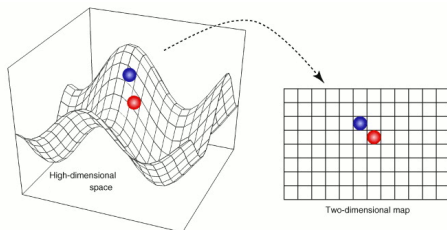
Laurens Van Der Matten $\Rightarrow$ Gal Matijević (RAVE) $\Rightarrow$ Gaia-ESO, Galah

Clustering - dimensionality reduction

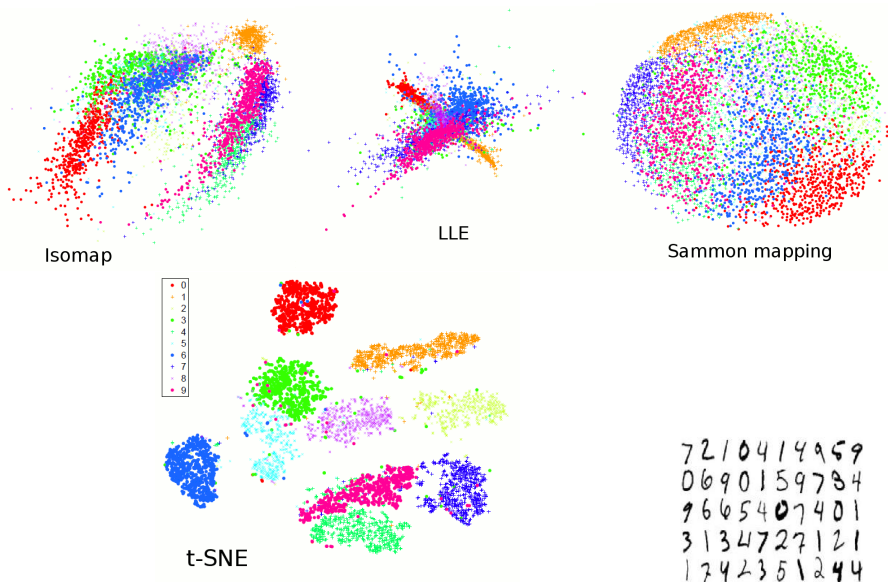
“Essentially, all models are wrong but some are useful”

George E.P. Box

- High dimensional (pixel) space A $\Rightarrow$ low dimensional space B
- Dim. reduction $\Rightarrow$ information loss
- Preserve important information $\Rightarrow$ intrinsic dimensionality of the spectra (Teff, elemental abundances, chromospheric emission, etc.)
- Projection should retain structure of some low-D manifold on which our datapoints lie



MNIST database of 6000 handwritten digits



Math of t-distributed Stochastic Neighbour Embedding

t-SNE objective: minimize divergence between distributions P_i and Q_i of pairwise similarities in A and B

- ❶ Euclidean distances in original space A $\Rightarrow$ pairwise similarities ($p_{j|i}$)

$$p_{j|i} = \frac{\exp(-\|a_i - a_j\|^2 / 2\sigma_i^2)}{\sum_{k \neq i} \exp(-\|a_i - a_k\|^2 / 2\sigma_i^2)}, \quad p_{i|i} = 0, \quad p_{ij} = \frac{p_{j|i} + p_{i|j}}{2N}$$

$$\sigma_i \rightarrow P_i, \quad \text{Perp}(P_i) = 2^{H(P_i)}, \quad H(P_i) = - \sum_j p_{j|i} \log_2 p_{j|i}$$

- ❷ Pairwise similarities in projection space B with heavy-tailed Student-t

$$q_{ij} = \frac{(1 + \|b_i - b_j\|^2)^{-1}}{\sum_{k \neq i} (1 + \|b_k - b_i\|^2)^{-1}}$$

- ❸ Minimize the Kullback-Leibler divergence between the two distributions

$$C = KL(P \| Q) = \sum_i \sum_j p_{ij} \log \frac{p_{ij}}{q_{ij}}$$

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Math of t-distributed Stochastic Neighbour Embedding

$$\text{GRADIENT: } \frac{\partial \mathcal{C}}{\partial b_i} = 4 \sum_j (p_{ij} - q_{ij})(b_i - b_j)(1 + \|b_i - b_j\|^2)^{-1}$$

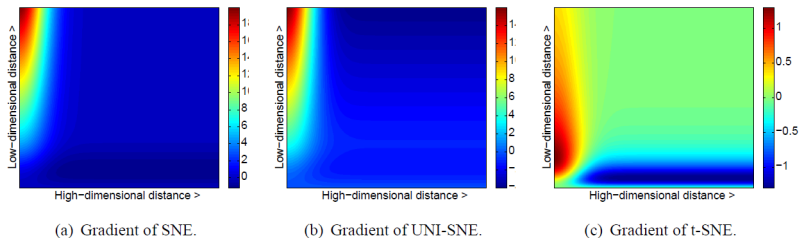


Figure : x: $\|a_i - a_j\|$, y: $\|b_i - b_j\|$, positive gradient: attraction

t-SNE advantage:

- 1 model dissimilar datapoints with large pairwise distances
- 2 model similar datapoints with small pairwise distances



Galah Explorer v1.1

1-SNE projection of 214093 Galah spectra. [README](#)

FLAGS

ALL FLAGS

DBSCAN: ...

Temperature

Hex ID: 4048 (45 objects)

3500 K 8200 K



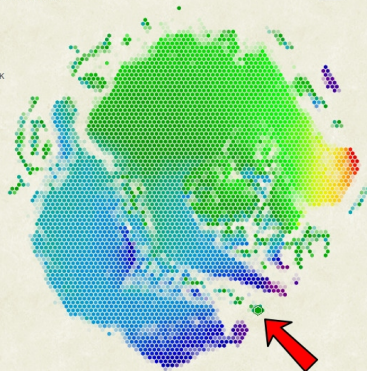
● Gravity ● S/N

- Temperature (GUESS)
- Gravity (GUESS)
- Metallicity (GUESS)
- S/N (GUESS)
- S/N (IraF dr5.1)
- S/N 2 (IraF dr5.1)
- Radial vel. (GUESS)
- Gal. long. l
- Gal. lat. b
- Class. cat.

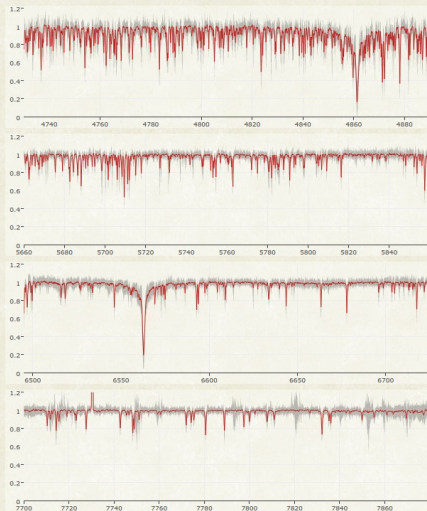
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1 344



SETUP: 1 pass short range P 30





Galah Explorer v1.1

1-SNE projection of 214093 Galah spectra. [README](#)

FLAGS

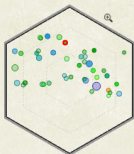
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DBSCAN: ...

Temperature

Hex ID: 4048 (45 objects)

3500 K 8200 K



● Gravity ● S/N

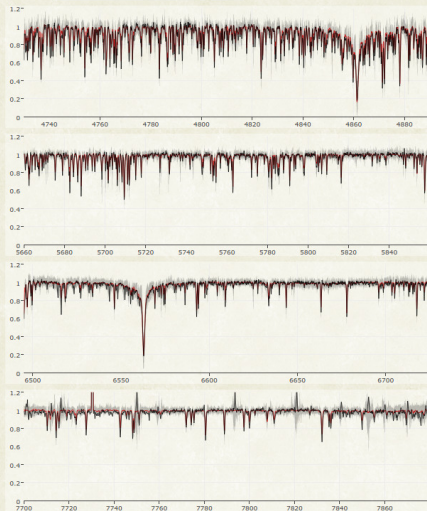
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- Gravity (GUESS) 4.116
- Metallicity (GUESS) 0.196
- S/N (GUESS) 44.3
- S/N (Ira dr5.1) 56.869
- S/N 2 (Ira dr5.1) 46.869
- Radial vel. (GUESS) 4.344
- Gal. long. l 220.778
- Gal. lat. b 30.81
- Class. cat.

date (Ira dr5.1) 140310
subject_id (Ira dr5.1) 140310003301364

links [Vizier](#) [Simbad](#)

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SETUP: 1 pass short range P 30





Galah Explorer v1.1

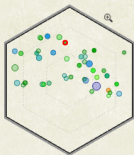
1-SNE projection of 214093 Galah spectra. [README](#)

FLAGS ALL FLAGS DBSCAN: ...

Temperature (GUESS)

Hex ID: 4048 (45 objects)

3500 K 8200 K



Gravity S/N

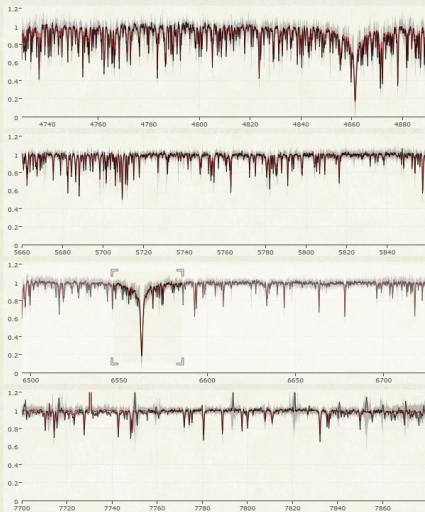
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Galah Explorer v1.1

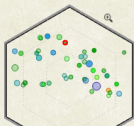
1-SNE projection of 214093 Galah spectra. [README](#)

FLAGS ALL FLAGS DBSCAN: ...

Temperature (GUESS)

Hex ID: 4048 (45 objects)

3500 K 8200 K



Gravity S/N

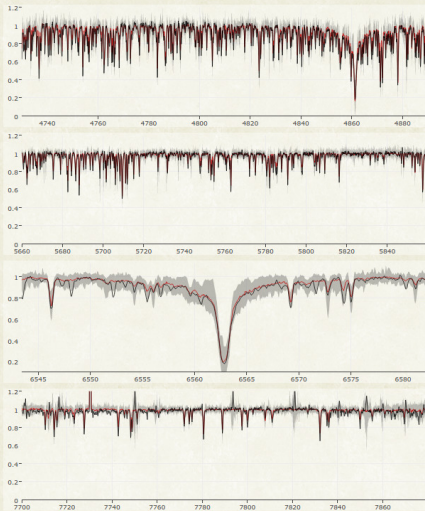
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SETUP: 1 pass short range P 30





Galah Explorer v1.1

1-SNE projection of 214093 Galah spectra. [README](#)

FLAGS

ALL FLAGS

DBSCAN: ...

Gravity (GUESS)

Hex ID: 4048 (45 objects)

0.0 dex 5.0 dex



● Gravity ● S/N

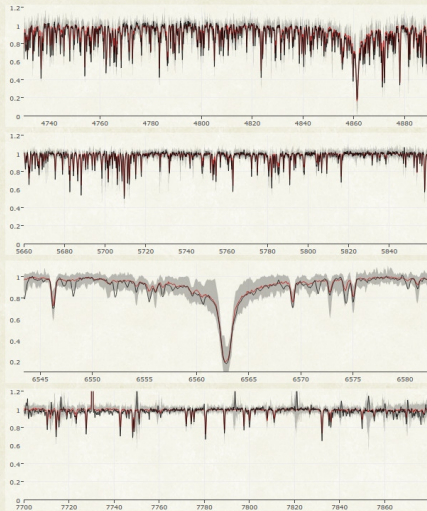
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- S/N (GUESS) 44.3
- S/N (dr5.1) 56.869
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- Gal. lat. b 30.81
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links [Vizier](#) [Simbad](#)

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SETUP: 1 pass short range P 30





Galah Explorer v1.1

1-SNE projection of 214093 Galah spectra. [README](#)

FLAGS ALL FLAGS DBSCAN: ...

Metallicity (GUESS)

Hex ID: 4048 (45 objects)

-2.0 dex 0.3 dex



Gravity S/N

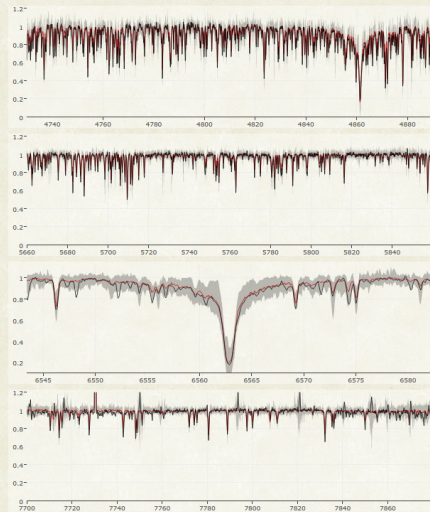
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links [Vizier](#) [Simbad](#)

Search by GALAH ID Search by COB ID Search by subject_id
6224678 1403100033 140310003301364
1 336

SETUP: 1 pass short range P 30





Galah Explorer v1.1

1-SNE projection of 214093 Galah spectra. [README](#)

FLAGS ALL FLAGS DBSCAN: ...

Radial vel. (GUESS)

Hex ID: 4048 (45 objects)

-75 km/s 75 km/s



Gravity S/N

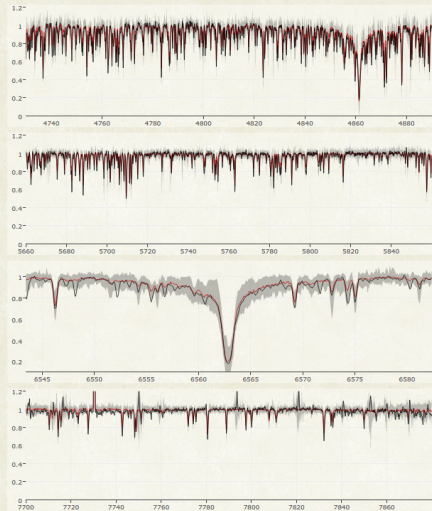
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date (Ira dr5.1) 140310
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links [Vizier](#) [Simbad](#)

Search by GALAH ID Search by COB ID Search by subject_id
6224678 1403100033 140310003301364
1 336

SETUP: 1 pass short range P 30





Galah Explorer v1.1

1-SNE projection of 76938 Galah spectra [README](#)

FLAGS

ALL FLAGS

DBSCAN:

...

SETUP:

2 pass full range P 30

Temperature

3500 K 8200 K



● Gravity ● S/N

- Temperature (GUESS)
- Gravity (GUESS)
- Metallicity (GUESS)
- S/N (GUESS)
- S/N 1 (Ira dr5.1)
- S/N 2 (Ira dr5.1)
- Radial vel. (GUESS)
- Gal. long. l
- Gal. lat. b
- Class. cat.

date (Ira dr5.1)
subject_id (Ira dr5.1)
links

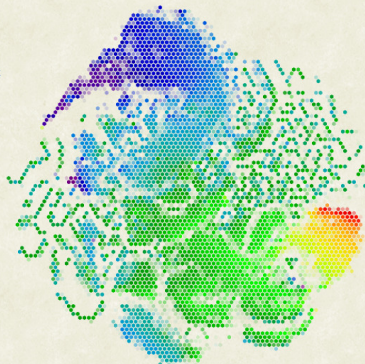
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Search by subject_id

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Galah Explorer v1.1

1-SNE projection of 76938 Galah spectra [README](#)

FLAGS

ALL FLAGS

DBSCAN: ...

SETUP: 2 pass full range P 30

- cool metal-poor giants [3532]
- emission spikes - ccd3 [6873]
- oscillating continuum - ccd3 [3009]
- binary [2229]
- emission spike(s) - ccd4 [12946]
- reduction issue - ccd4 [54]
- negative flux [3369]
- mol. absorption bands [1728]
- H α H β emission [348]
- hot stars [5101]



● Gravity ● S/N

- ☐ Temperature (GUESS)
- ☐ Gravity (GUESS)
- ☐ Metallicity (GUESS)
- ☐ S/N (GUESS)
- ☐ S/N 1 (IraF dr5.1)
- ☐ S/N 2 (IraF dr5.1)
- ☐ Radial vel. (GUESS)
- ☐ Gal. long. l
- ☐ Gal. lat. b
- ☒ Class. cat.

date (IraF dr5.1)
subject_id (IraF dr5.1)
links

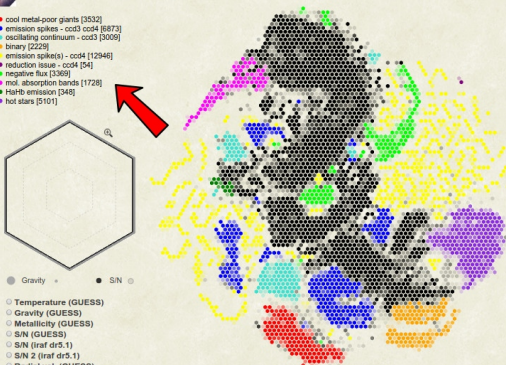
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Galah Explorer v1.1

1-SNE projection of 76938 Galah spectra [README](#)

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- Temperature (GUESS)
- Gravity (GUESS)
- Metallicity (GUESS)
- S/N (GUESS)
- S/N (IraF dr5.1)
- S/N 2 (IraF dr5.1)
- Radial vel. (GUESS)
- Gal. long. I
- Gal. lat. b
- Class. cat.

mol. absorption bands

date (IraF dr5.1)
subject_id (IraF dr5.1)
links

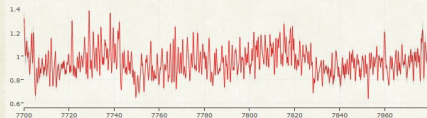
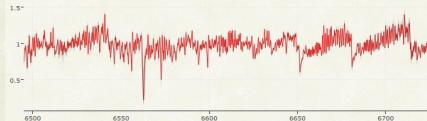
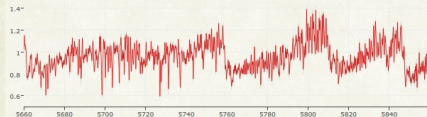
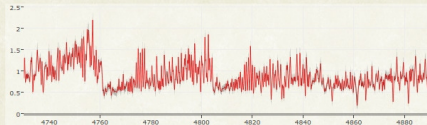
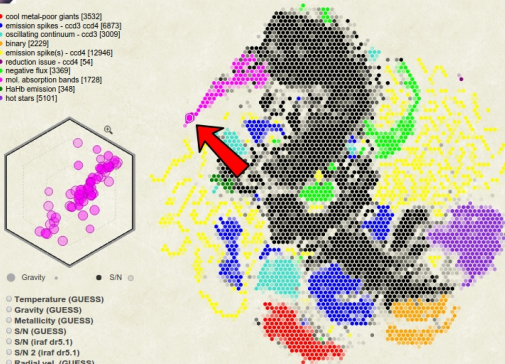
Search by GALAH ID

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Search by subject_id

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Go





Galah Explorer v1.1

1-SNE projection of 76938 Galah spectra [README](#)

FLAGS

ALL FLAGS

DBSCAN: ...

SETUP: 2 pass full range P 30

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● Gravity ● S/N

- ☐ Temperature (GUESS)
- ☐ Gravity (GUESS)
- ☐ Metallicity (GUESS)
- ☐ S/N (GUESS)
- ☐ S/N (IraF dr5.1)
- ☐ S/N 2 (IraF dr5.1)
- ☐ Radial vel. (GUESS)
- ☐ Gal. long. l
- ☐ Gal. lat. b
- ☐ Class. cat.

emission spike(s) - ccd4

date (IraF dr5.1)
subject_id (IraF dr5.1)
links

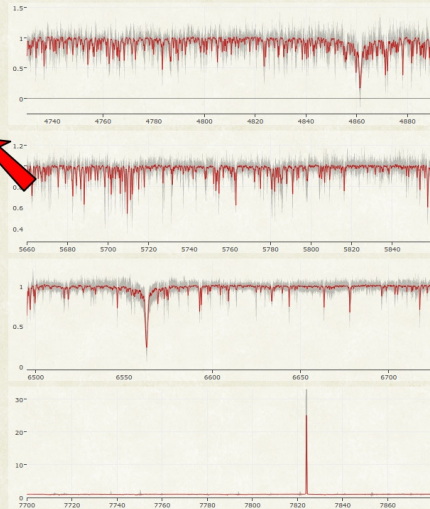
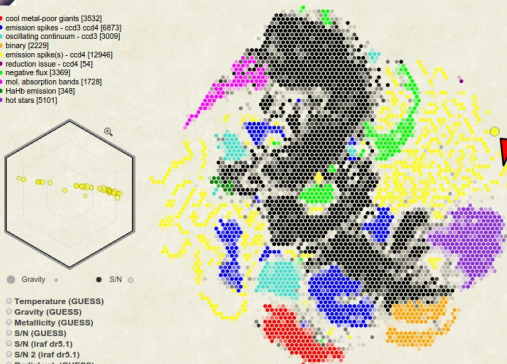
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Search by subject_id

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Galah Explorer v1.1

1-SNE projection of 76938 Galah spectra [README](#)

FLAGS

ALL FLAGS

DBSCAN:

...

SETUP: 2 pass full range P 30

- cool metal-poor giants [3532]
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- Temperature (GUESS)
- Gravity (GUESS)
- Metallicity (GUESS)
- S/N (GUESS)
- S/N (Ira dr5.1)
- S/N 2 (Ira dr5.1)
- Radial vel. (GUESS)
- Gal. long. I
- Gal. lat. b
- Class. cat.

oscillating continuum - ccd3

date (Ira dr5.1)
subject_id (Ira dr5.1)
links

Search by GALAH ID

3373675

Search by COB ID

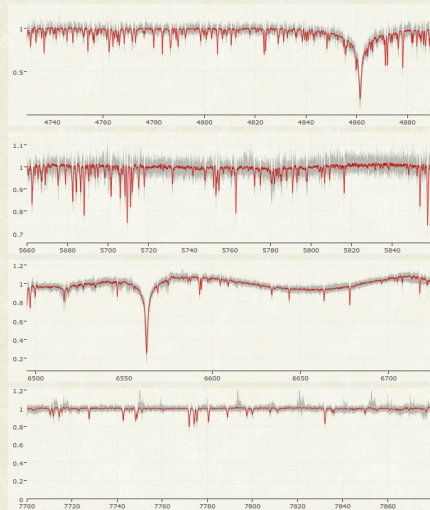
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Search by subject_id

150105002801017

1

87





Galah Explorer v1.1

1-SNE projection of 76938 Galah spectra [README](#)

FLAGS

ALL FLAGS

DBSCAN:

...

SETUP: 2 pass full range P 30

Temperature (GUESS)

Hex ID: 4136 (14 objects)

3500 K 8200 K



Gravity S/N

- ☒ Temperature (GUESS)
- ☐ Gravity (GUESS)
- ☐ Metallicity (GUESS)
- ☐ S/N (GUESS)
- ☐ S/N (IraF dr5.1)
- ☐ S/N 2 (IraF dr5.1)
- ☐ Radial vel. (GUESS)
- ☐ Gal. long. l
- ☐ Gal. lat. b
- ☐ Class. cat.

hot stars

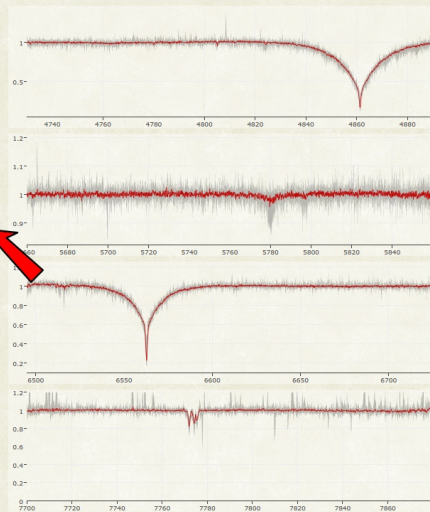
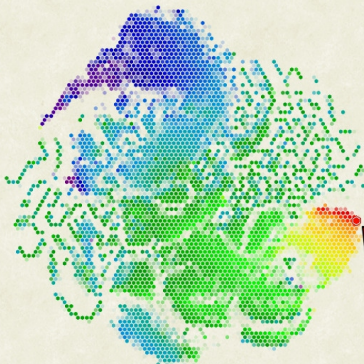
date (IraF dr5.1)
subject_id (IraF dr5.1)
links

Search by GALAH ID
3373675

Search by COB ID
1501050028

Search by subject_id
150105002801017

1 87





Galah Explorer v1.1

1-SNE projection of 76938 Galah spectra [README](#)

FLAGS

ALL FLAGS

DBSCAN:

...

SETUP: 2 pass full range P 30

Metallicity (GUESS)

Hex ID: 1931 (16 objects)

-2.0 dex 0.3 dex



Gravity S/N

- Temperature (GUESS)
- Gravity (GUESS)
- Metallicity (GUESS)
- S/N (GUESS)
- S/N 1 (Ira dr5.1)
- S/N 2 (Ira dr5.1)
- Radial vel. (GUESS)
- Gal. long. l
- Gal. lat. b
- Class. cat.

hot stars

date (Ira dr5.1)
subject_id (Ira dr5.1)
links

Search by GALAH ID

3373675

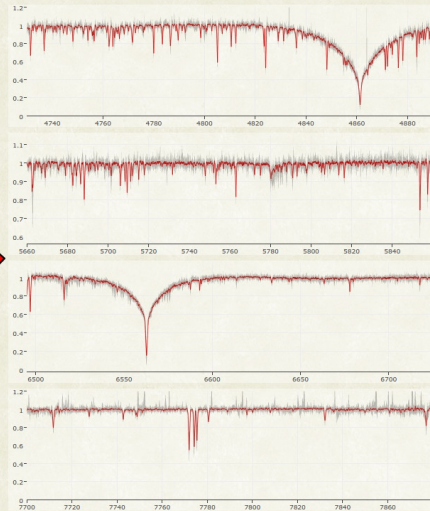
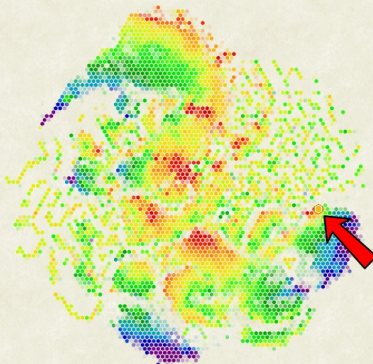
Search by COB ID

1501050028

Search by subject_id

150105002801017

1 87





Galah Explorer v1.1

1-SNE projection of 76938 Galah spectra [README](#)

FLAGS

ALL FLAGS

DBSCAN: ...

SETUP: 2 pass full range P 30

- cool metal-poor giants [3532]
- emission spikes - ccd3 ccd4 [6873]
- oscillating continuum - ccd3 [3009]
- binary [2229]
- emission spike(s) - ccd4 [12946]
- reduction issue - ccd4 [34]
- negative flux [3369]
- mol. absorption bands [1728]
- H&Hb emission [348]
- hot stars [5101]



● Gravity ● S/N

- ☐ Temperature (GUESS)
- ☐ Gravity (GUESS)
- ☐ Metallicity (GUESS)
- ☐ S/N (GUESS)
- ☐ S/N (IraF dr5.1)
- ☐ S/N 2 (IraF dr5.1)
- ☐ Radial vel. (GUESS)
- ☐ Gal. long. l
- ☐ Gal. lat. b
- ☐ Class. cat.

binary

date (IraF dr5.1)
subject_id (IraF dr5.1)
links

Search by GALAH ID

3373675

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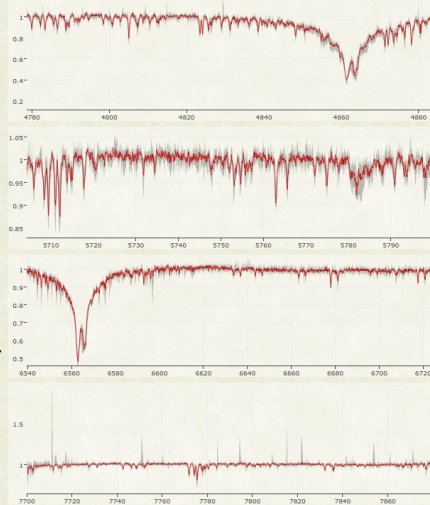
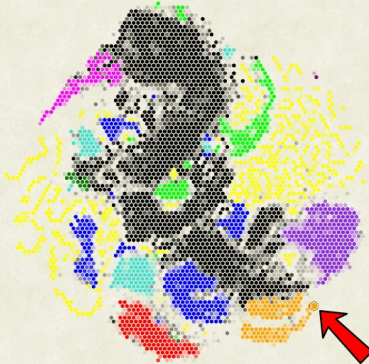
Search by COB ID

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Search by subject_id

150105002801017





Galah Explorer v1.1

1-SNE projection of 76938 Galah spectra [README](#)

FLAGS

ALL FLAGS

DBSCAN: ...

SETUP: 2 pass full range P 30

- cool metal-poor giants [3532]
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- mol. absorption bands [1728]
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- hot stars [5101]



● Gravity ● S/N

- ☐ Temperature (GUESS)
- ☐ Gravity (GUESS)
- ☐ Metallicity (GUESS)
- ☐ S/N (GUESS)
- ☐ S/N (IraF dr5.1)
- ☐ S/N 2 (IraF dr5.1)
- ☐ Radial vel. (GUESS)
- ☐ Gal. long. l
- ☐ Gal. lat. b
- ☐ Class. cat.

binary

date (IraF dr5.1)
subject_id (IraF dr5.1)
links

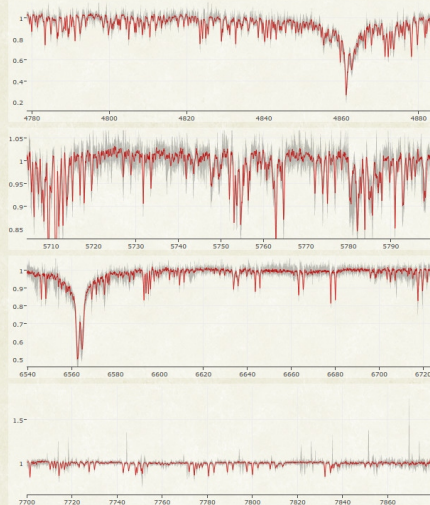
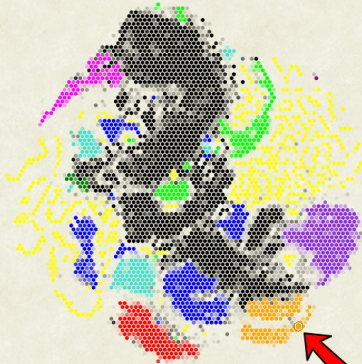
Search by GALAH ID
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Search by subject_id
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Galah Explorer v1.1

1-SNE projection of 76938 Galah spectra [README](#)

FLAGS

ALL FLAGS

DBSCAN: ...

SETUP: 2 pass full range P 30

- cool metal-poor giants [3532]
- emission spikes - ccd3 [6873]
- oscillating continuum - ccd3 [3009]
- binary [2229]
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- negative flux [3369]
- mol. absorption bands [1728]
- H α H β emission [348]
- hot stars [5101]



● Gravity ● S/N

- Temperature (GUESS)
- Gravity (GUESS)
- Metallicity (GUESS)
- S/N (GUESS)
- S/N (IraF dr5.1)
- S/N 2 (IraF dr5.1)
- Radial vel. (GUESS)
- Gal. long. l
- Gal. lat. b
- Class. cat.

binary

date (IraF dr5.1)
subject_id (IraF dr5.1)
links

Search by GALAH ID

3373675

Search by COB ID

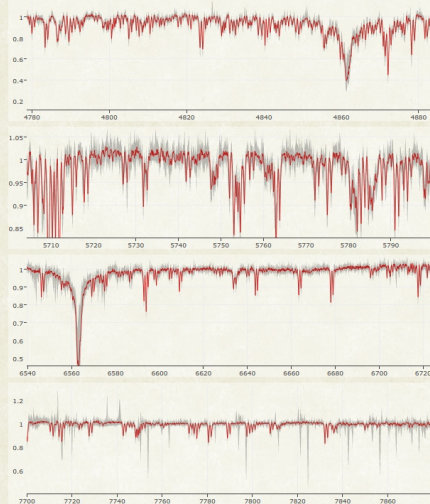
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Search by subject_id

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Galah Explorer v1.1

1-SNE projection of 76938 Galah spectra [README](#)

FLAGS

ALL FLAGS

DBSCAN: ...

SETUP: 2 pass full range P 30

- cool metal-poor giants [3532]
- emission spikes - ccd3 ccd4 [8873]
- oscillating continuum - ccd3 [3009]
- binary [2229]
- emission spike(s) - ccd4 [12946]
- reduction issue - ccd4 [54]
- negative flux [3369]
- mol. absorption bands [1728]
- H α H β emission [348]
- hot stars [5101]



● Gravity ● S/N

- Temperature (GUESS)
- Gravity (GUESS)
- Metallicity (GUESS)
- S/N (GUESS)
- S/N 1 (IraF dr5.1)
- S/N 2 (IraF dr5.1)
- Radial vel. (GUESS)
- Gal. long. I
- Gal. lat. b
- Class. cat.

binary

date (IraF dr5.1)
subject_id (IraF dr5.1)
links

Search by GALAH ID

4369422

Search by COB ID

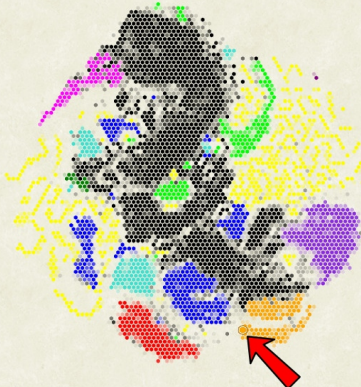
1503300017

Search by subject_id

150330001701026

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Galah Explorer v1.1

1-SNE projection of 45028 Galah spectra [README](#)

FLAGS

ALL FLAGS

DBSCAN:

...

SETUP:

2 pass HaHbLi 2AA P 15

•

- oscillating continuum - cod3 [2767]
- binary [1730]
- Li abs. - shallow [593]
- Ha emission in abs. [549]
- Hb negative flux [512]
- HaHb emission [214]
- HaHb inv. p-cygni [412]
- Hb negative flux [94]
- Li abs. - strong [276]
- HaHb p-cygni [85]



● Gravity ● S/N

- Temperature (GUESS)
- Gravity (GUESS)
- Metallicity (GUESS)
- S/N (GUESS)
- S/N (IraF dr5.1)
- S/N 2 (IraF dr5.1)
- Radial vel. (GUESS)
- Gal. long. I
- Gal. lat. b
- Class. cat.

Li abs. - strong

date (IraF dr5.1)
subject_id (IraF dr5.1)
links

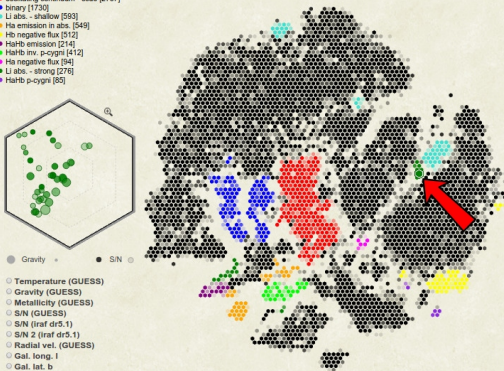
Search by GALAH ID

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Search by subject_id

Go

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Galah Explorer v1.1

1-SNE projection of 45028 Galah spectra [README](#)

FLAGS

ALL FLAGS

DBSCAN:

...

SETUP:

2 pass HaHbLi 2AA P 15

•

- oscillating continuum - cod3 [2767]
- binary [1730]
- Li abs. - shallow [593]
- Ha emission in abs. [549]
- Hb negative flux [512]
- HaHb emission [214]
- HaHb inv. p-cygni [412]
- Ha negative flux [94]
- Li abs. - strong [276]
- HaHb p-cygni [85]



● Gravity ● S/N ●

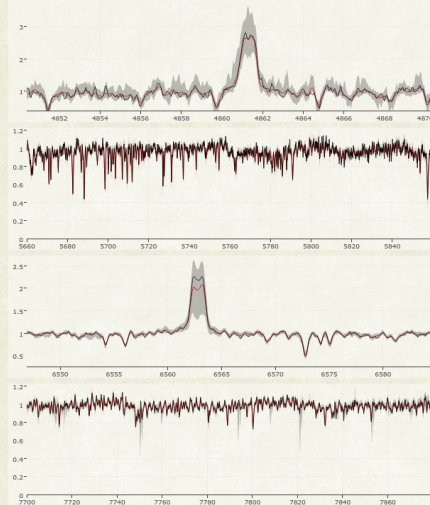
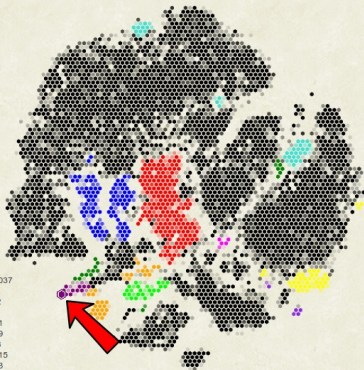
- Temperature (GUESS) 3170.037
- Gravity (GUESS) 3.695
- Metallicity (GUESS) -0.592
- S/N (GUESS) 18
- S/N (IraF dr5.1) 18.411
- S/N 2 (IraF dr5.1) 12.389
- Radial vel. (GUESS) -7.378
- Gal. long. l 352.615
- Gal. lat. b 24.418
- Class. cat. HaHb emission

date (IraF dr5.1) 140707
subject_id (IraF dr5.1) 140707000601365

links [Vizier](#) [Simbad](#)

Search by GALAH ID 4233894
Search by COB ID 1407070006
Search by subject_id 140707000601365

1 83





Galah Explorer v1.1

1-SNE projection of 76938 Galah spectra [README](#)

FLAGS

ALL FLAGS

DBSCAN:

0.4,10

SETUP: 2 pass full range P 30

-1

231



Gravity S/N

- ☐ Temperature (GUESS)
- ☐ Gravity (GUESS)
- ☐ Metallicity (GUESS)
- ☐ S/N (GUESS)
- ☐ S/N (IraF dr5.1)
- ☐ S/N 2 (IraF dr5.1)
- ☐ Radial vel. (GUESS)
- ☐ Gal. long. l
- ☐ Gal. lat. b
- ☐ Class. cat.

date (IraF dr5.1)
subject_id (IraF dr5.1)
links

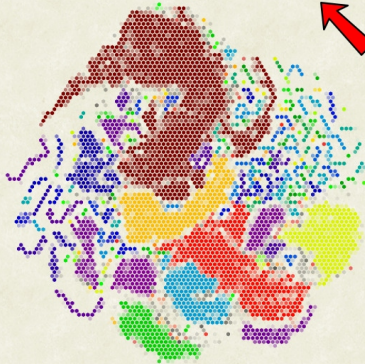
Search by GALAH ID

Search by COB ID

Search by subject_id

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Galah Explorer v1.1

1-SNE projection of 76938 Galah spectra [README](#)

FLAGS

ALL FLAGS

DBSCAN:

0.8,50

SETUP: 2 pass full range P 30

-1 105



Gravity S/N

- Temperature (GUESS)
- Gravity (GUESS)
- Metallicity (GUESS)
- S/N (GUESS)
- S/N 1 (Ira dr5.1)
- S/N 2 (Ira dr5.1)
- Radial vel. (GUESS)
- Gal. long. l
- Gal. lat. b
- Class. cat.

date (Ira dr5.1)
subject_id (Ira dr5.1)
links

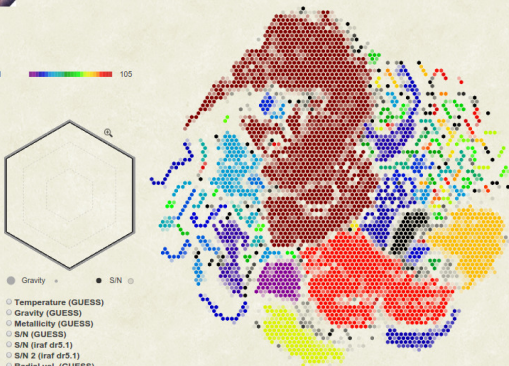
Search by GALAH ID

Search by COB ID

Search by subject_id

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Galah Explorer v1.1

1-SNE projection of 76938 Galah spectra [README](#)

FLAGS

ALL FLAGS

DBSCAN:

...

SETUP: 2 pass full range P 30

Temperature

Hex ID: 2058 (34 objects)

3500 K 8200 K



Gravity S/N

- Temperature (GUESS)
- Gravity (GUESS)
- Metallicity (GUESS)
- S/N (GUESS)
- S/N (Ira dr5.1)
- S/N 2 (Ira dr5.1)
- Radial vel. (GUESS)
- Gal. long. l
- Gal. lat. b
- Class. cat.

emission spike(s) - ccd4

date (Ira dr5.1)
subject_id (Ira dr5.1)
links

Search by GALAH ID

Search by COB ID

Search by subject_id

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Galah Explorer v1.1

1-SNE projection of 76938 Galah spectra [README](#)

FLAGS

ALL FLAGS

DBSCAN:

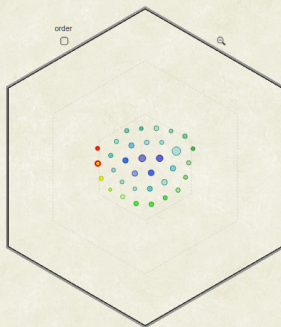
...

SETUP: 2 pass full range P 30

Temperature

Hex ID: 2058 (34 objects)

3500 K 8200 K



Gravity S/N

Temperature (GUESS) 6880.265
Gravity (GUESS) 3
Metallicity (GUESS) -1.761
S/N (GUESS) 154.2
S/N (IraF dr5.1) 82.661
S/N 2 (IraF dr5.1) 69.642
Radial vel. (GUESS) 386.97
Gal. long. l 15.232
Gal. lat. b -17.27
Class. cat. emission spike(s) - ccd4

date (IraF dr5.1) 151009
subject_id (IraF dr5.1) 151009002101074

links [Vizier](#) [Simbad](#)

Search by GALAH ID 3950937
Search by COB ID 1510090021
Search by subject_id 151009002101074





Galah Explorer v1.1

1-SNE projection of 76938 Galah spectra [README](#)

FLAGS

ALL FLAGS

DBSCAN:

...

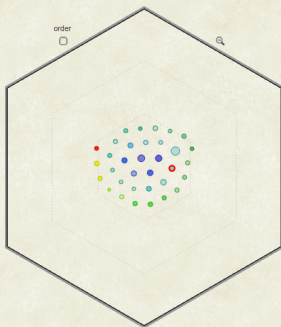
SETUP: 2 pass full range P 30

Temperature

Hex ID: 2058 (34 objects)

3500 K 8200 K

order



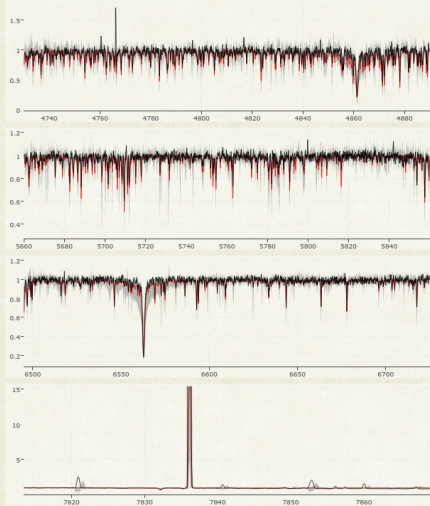
Gravity S/N

- Temperature (GUESS) 5023.015
- Gravity (GUESS) 2.316
- Metallicity (GUESS) -0.977
- S/N (GUESS) 33.9
- S/N (IraF dr5.1) 36.903
- S/N 2 (IraF dr5.1) 38.224
- Radial vel. (GUESS) 11.857
- Gal. long. l 26.315
- Gal. lat. b -47.157
- Class. cat. emission spike(s) - ccd4

date (IraF dr5.1) 150901
subject_id (IraF dr5.1) 150901001101084

links [Vizier](#) [Simbad](#)

Search by GALAH ID 7707043
Search by COB ID 1509010011
Search by subject_id 150901001101084





Galah Explorer v1.1

1-SNE projection of 76938 Galah spectra [README](#)

FLAGS

ALL FLAGS

DBSCAN:

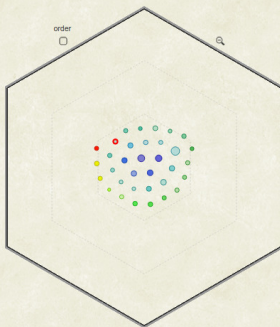
...

SETUP: 2 pass full range P 30

Temperature

Hex ID: 2058 (34 objects)

3500 K 8200 K



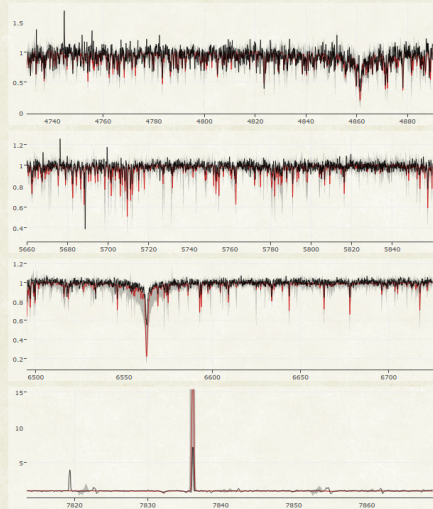
Gravity S/N

Temperature (GUESS) 5234.117
Gravity (GUESS) 3.472
Metallicity (GUESS) -0.672
S/N (GUESS) 16.5
S/N (Ira dr5.1) 19.993
S/N 2 (Ira dr5.1) 15.709
Radial vel. (GUESS) -32.488
Gal. long. l 351.29
Gal. lat. b 62.114
Class. cat. emission spike(s) - ccd4

date (Ira dr5.1) 140309
subject_id (Ira dr5.1) 140309004101249

links [Vizier](#) [Simbad](#)

Search by GALAH ID 0
Search by COB ID 1403090041
Search by subject_id 140309004101249





Galax Explorer v1.1

t-SNE projection of 76938 Galax spectra [README](#)

FLAGS

ALL FLAGS

DBSCAN:

...

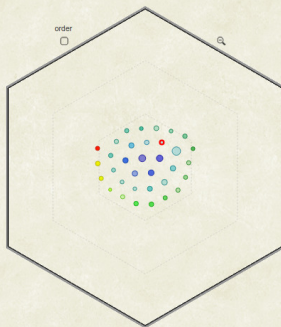
SETUP:

2 pass full range P 30

Temperature

Hex ID: 2058 (34 objects)

3500 K 8200 K



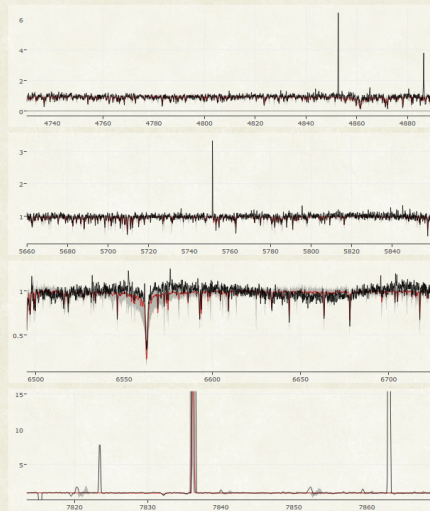
Gravity S/N

- Temperature (GUESS) 4948.801
- Gravity (GUESS) 3.843
- Metallicity (GUESS) -0.551
- S/N (GUESS) 14.4
- S/N (IraF dr5.1) 22.308
- S/N 2 (IraF dr5.1) 15.56
- Radial vel. (GUESS) 38.396
- Gal. long. l 261.707
- Gal. lat. b -39.963
- Class. cat. emission spike(s) - ccd4

date (IraF dr5.1) 151228
subject_id (IraF dr5.1) 151228002601062

links [Vizier](#) [Simbad](#)

Search by GALAH ID 1365067
Search by COB ID 1512280026
Search by subject_id 151228002601062



Summary

- Visualisation/discovery/diagnostic tool $\Rightarrow$ t-SNE Explorer
- Detect outliers / homogenous groups
- Focus on special objects of interest / general overview and classification
- Any kind of survey / input dataset – RAVE, Gaia-ESO, Galah (Traven et al. 2017), Kepler (Kochoska et al. 2017), ...

