

Is the Sodium Na D line useful?

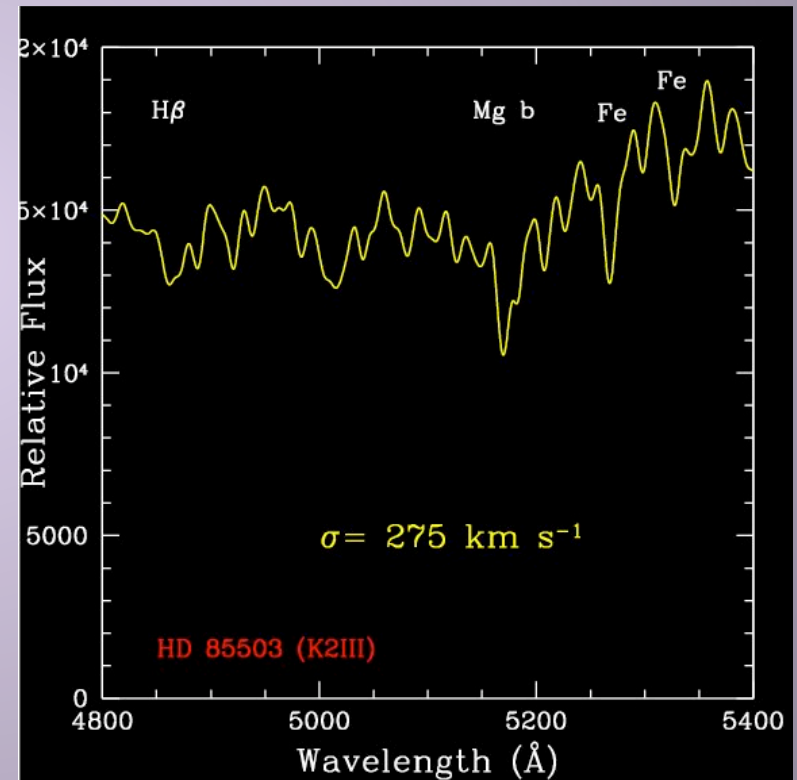
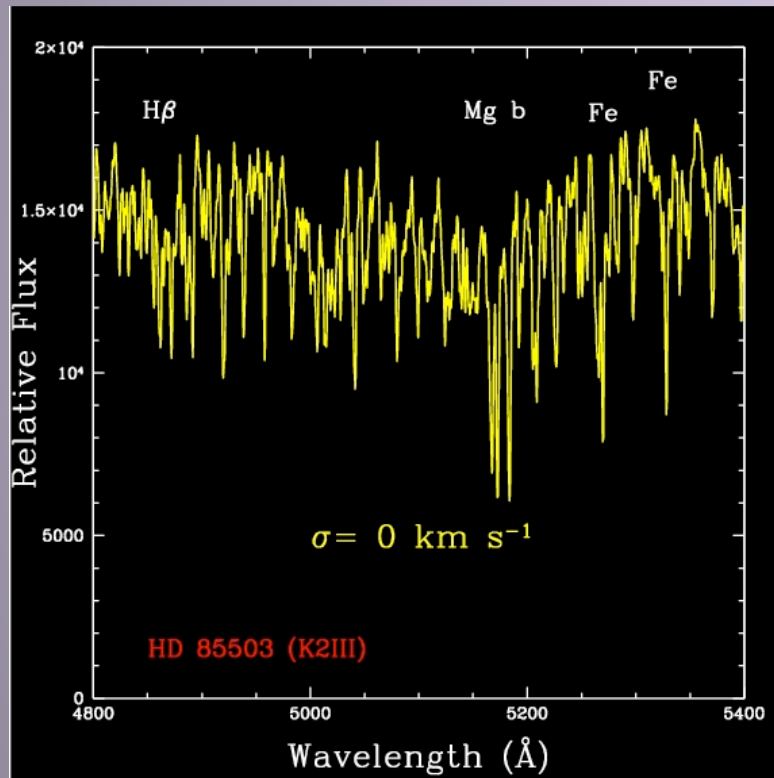
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Background

- Galaxies are full of stars, and sometimes gas and dust too.
- Beyond just images & colors, there is much information to be gained from spectroscopic studies of galaxies. In particular, we would like to know their star formation history, and chemical enrichment history.
- In galaxy studies, we need to use **strong** lines

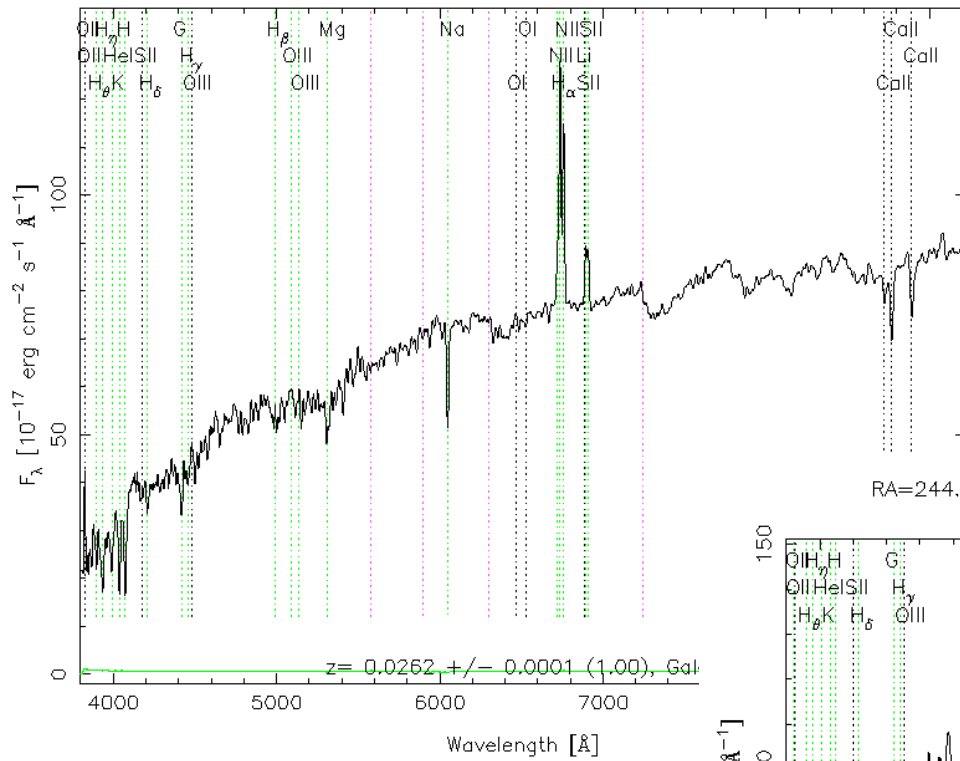
Doppler Broadening



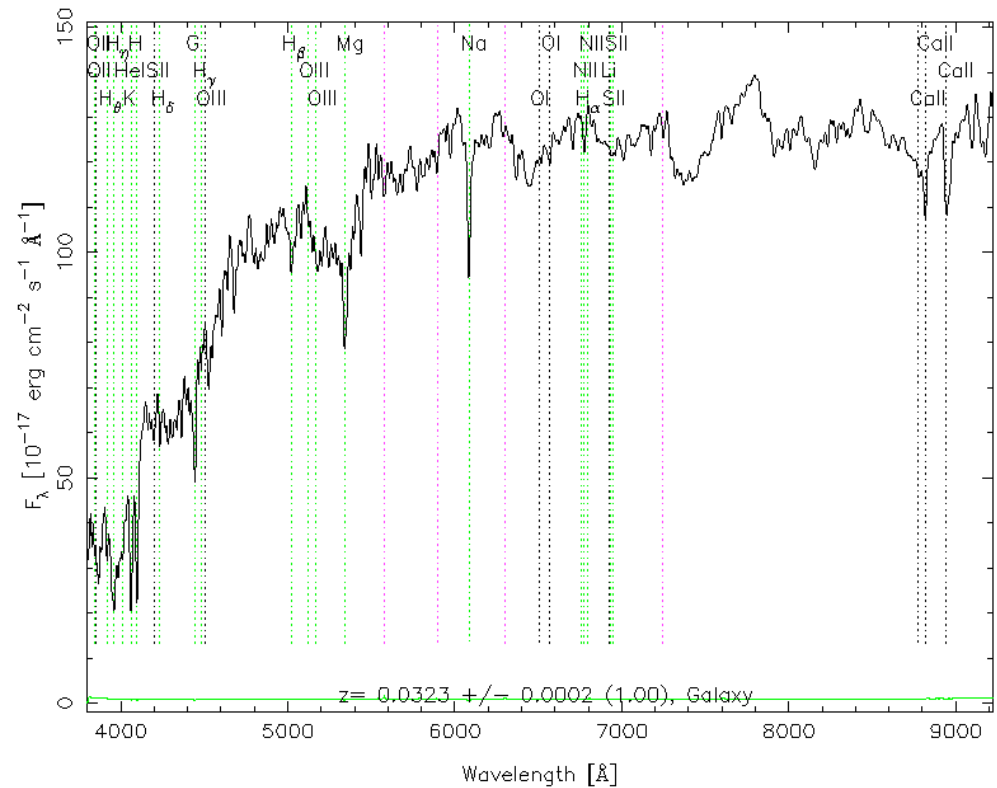
Na D 5895

- The Sodium doublet at 5895 Å is one of the strongest absorption features in stellar spectra.
- Unfortunately, absorption by Sodium in the Interstellar Medium may also affect the line strength and profile.
- Consequently, it has been little used for galaxy studies. Until now... (?)

RA=131.34669, DEC=55.11877, MJD=51900, Plate= 448, Fiber=287



RA=244.39828, DEC=35.13410, MJD=52522, Plate=1057, Fiber=385



Planned work:

- Define three samples:
 - Without ISM: Cluster galaxies
 - With ISM: HI galaxies

late-type spiral galaxies

All galaxies must have SDSS spectra with $S/N > 35$
and velocity dispersions between 100 – 300 km/s

- Look at correlations and scatter for Na D
- Spectral Line Profile Comparison

Sample Selection: Cluster galaxies

- Catalog of Lick indices, and modelled age, metallicity from MPA/JHU catalog, based on SDSS DR4 (Galazzi, Kauffmann et al.)
- C4 cluster catalog (Miller et al.)

For each C4 cluster, we wanted to find all the SDSS galaxies with good spectra within the virial radius: Repetitive Cone Search

-didn't work because we didn't have the catalog in a cone service, and couldn't get the IDL VOTools working.

-instead we used STILTS and cross-matched with a fixed radius of ~ 1 Mpc for all the clusters.

Total Sample contains ~ 700 galaxies

Sample Selection: galaxies with HI

- Start with same MPA/JHU table
- Used openskyquery.net to cross-match with the FIRST HI survey.
 - small hiccup because the table we uploaded included the SDSS photoobjid (a string array) and we at first got no matches.
- Total sample ~700 galaxies

Sample Selection: Spiral galaxies

- Start with MPA/JHU catalog
- Tried to use openskyquery to get SDSS photparams, but we had 9000 objects to start.
- Used SDSS CASJobs instead.
- Calculated Concentration Index ($R50 / R90$) using TOPCAT, and selected galaxies with $C > 0.4$ (late-type spirals)
- Total of ~ 500 galaxies

Bench has 15 sources: below is from 1 to 15

sources_RA	sources_DEC	sources_VIM_SOURCE_ID	skyview_537_SDSSr	skyview_537_SDSSu	skyview_537_2MASSK	skyview_537_NVSS
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131.34670 08h 45m 23.21s	55.11877 +55d 07m 7.6s	2				
114.01433 07h 38m 3.44s	31.47951 +31d 28m 46.2s	3				
218.14577 14h 32m 34.98s	59.56543 +59d 33m 55.5s	4				
130.44278 08h 41m 46.27s	44.30792 +44d 18m 28.5s	5				
17.37004 01h 09m 28.81s	14.36313 +14d 21m 47.3s	6				
136.37021 09h 05m 28.85s	51.41359 +51d 24m 48.9s	7				
196.90398 13h 07m 36.96s	62.21593 +62d 12m 57.3s	8				
119.48537 07h 57m 56.49s	25.16086 +25d 09m 39.1s	9				
157.24570 10h 28m 58.97s	12.45085 +12d 27m 3.1s	10				
244.39828 16h 17m 35.59s	35.13410 +35d 08m 2.8s	11				
24.34648 01h 37m 23.16s	-9.27058 -09d 16m 14.1s	12				

Done



[Home] [Help] [Chart] [Navi] [Explore] |
Use query to fill form

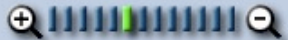
12	24.346481	-9
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14	214.37772	0.
15	182.2308	56

Cut and paste ra/dec list

Parameters

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opt		

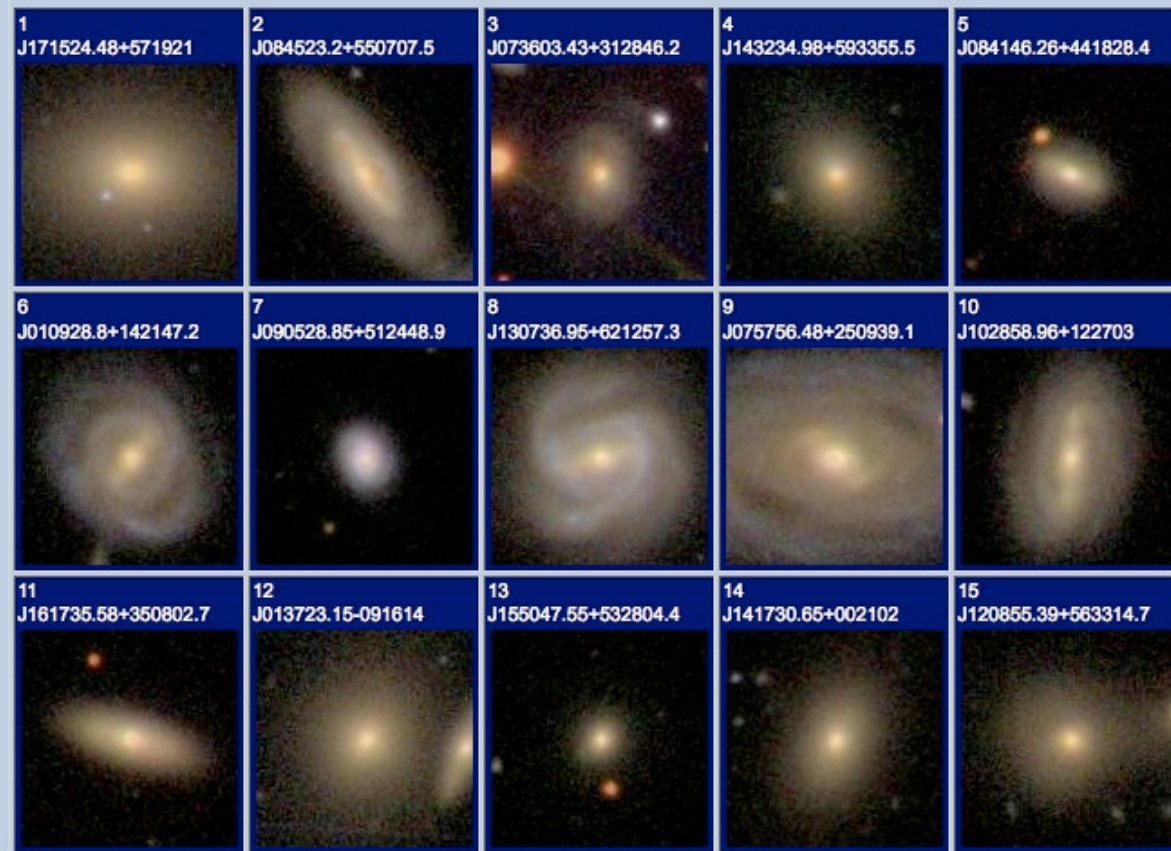
Get Image



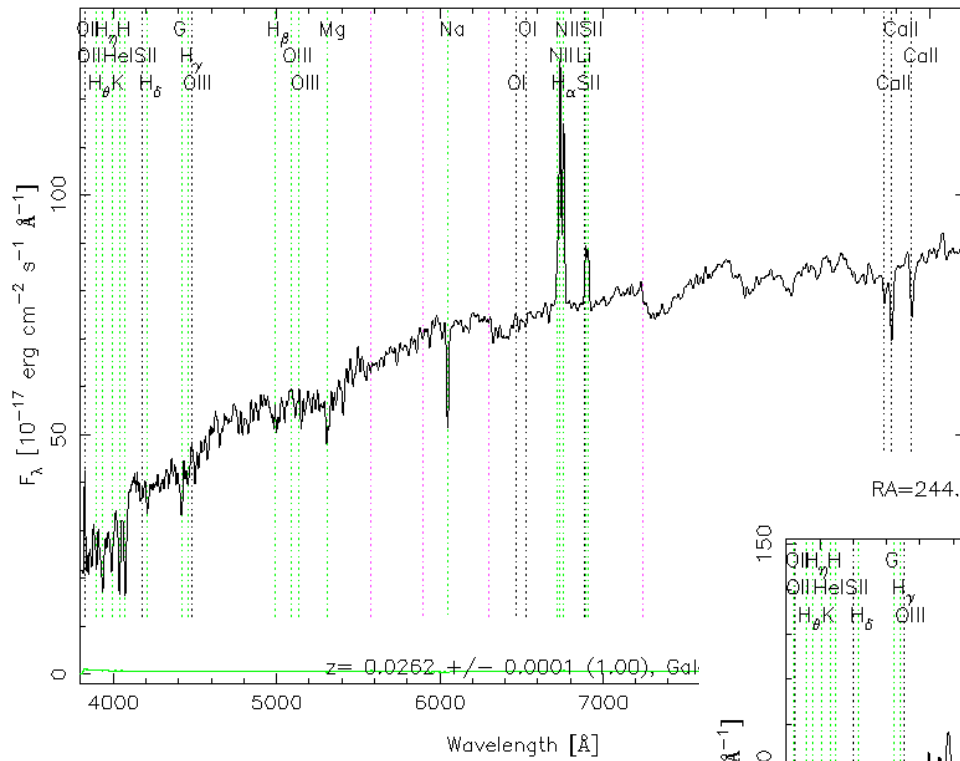
Drawing options

- Grid
- Label
- Photometric objects
- Objects with spectra
- Invert Image
- Advanced options
 - Spectroscopic Targets
 - Outlines
 - Bounding Boxes
 - Fields
 - Masks

obj list page 1

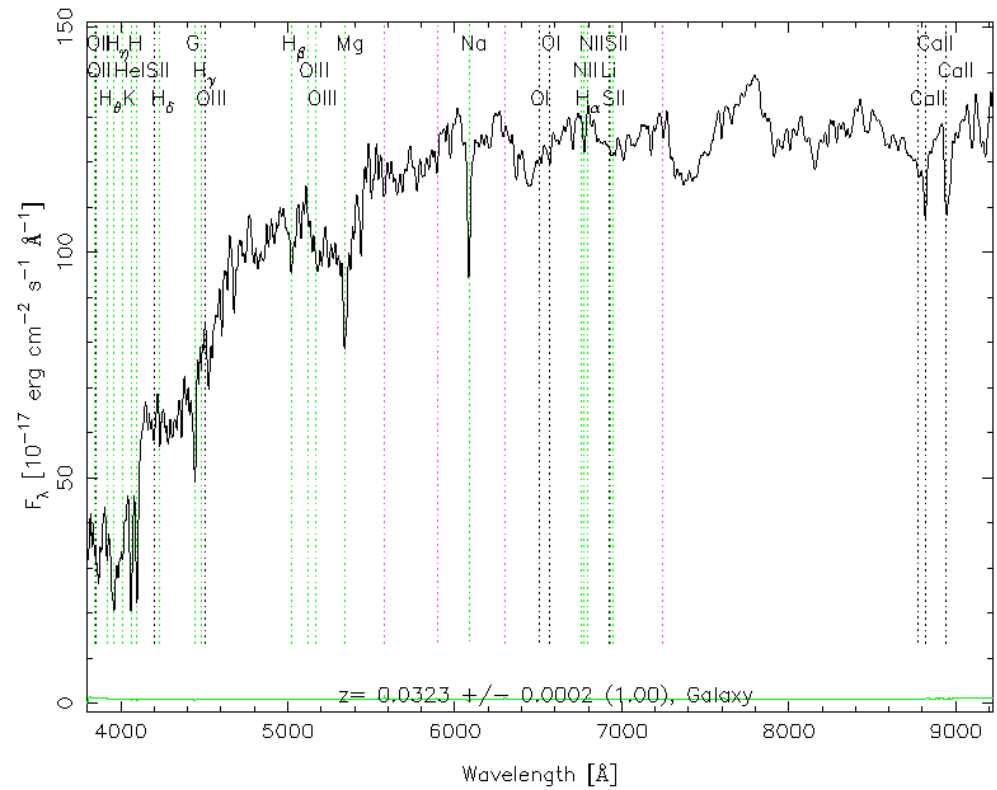


RA=131.34669, DEC=55.11877, MJD=51900, Plate= 448, Fiber=287



HI Galaxy

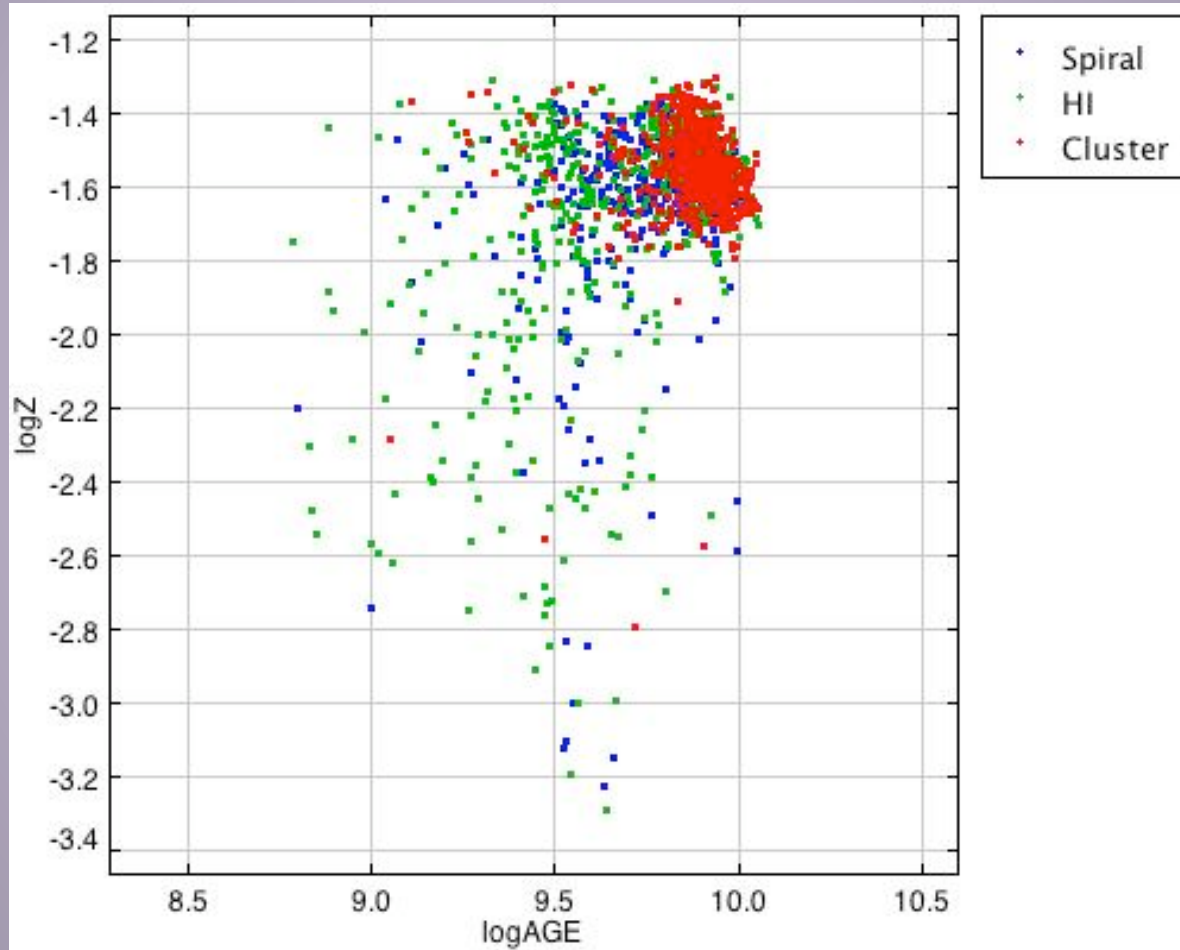
RA=244.39828, DEC=35.13410, MJD=52522, Plate=1057, Fiber=385



Cluster Galaxy

Compare the three samples:

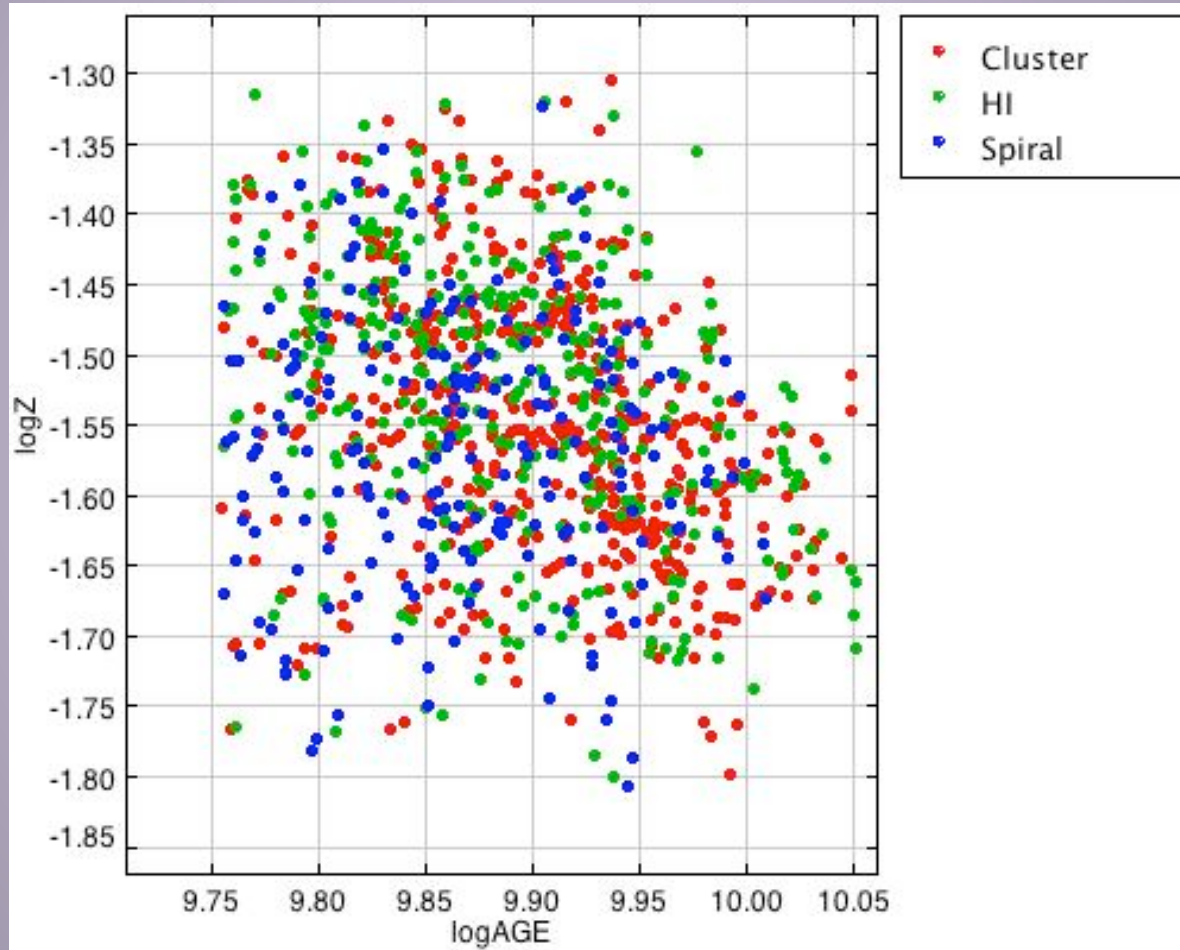
Metallicity



AGE

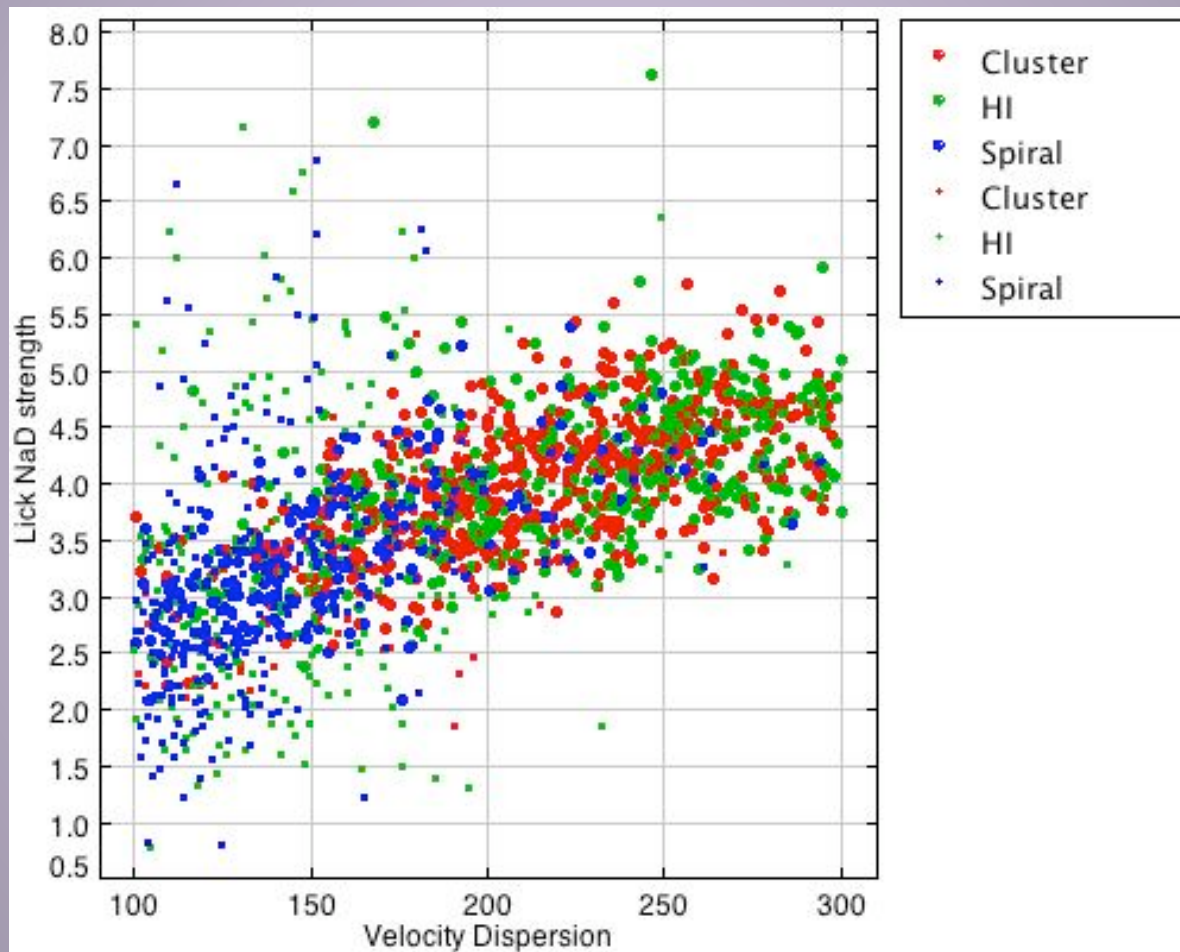
Compare the three samples:

Metallicity



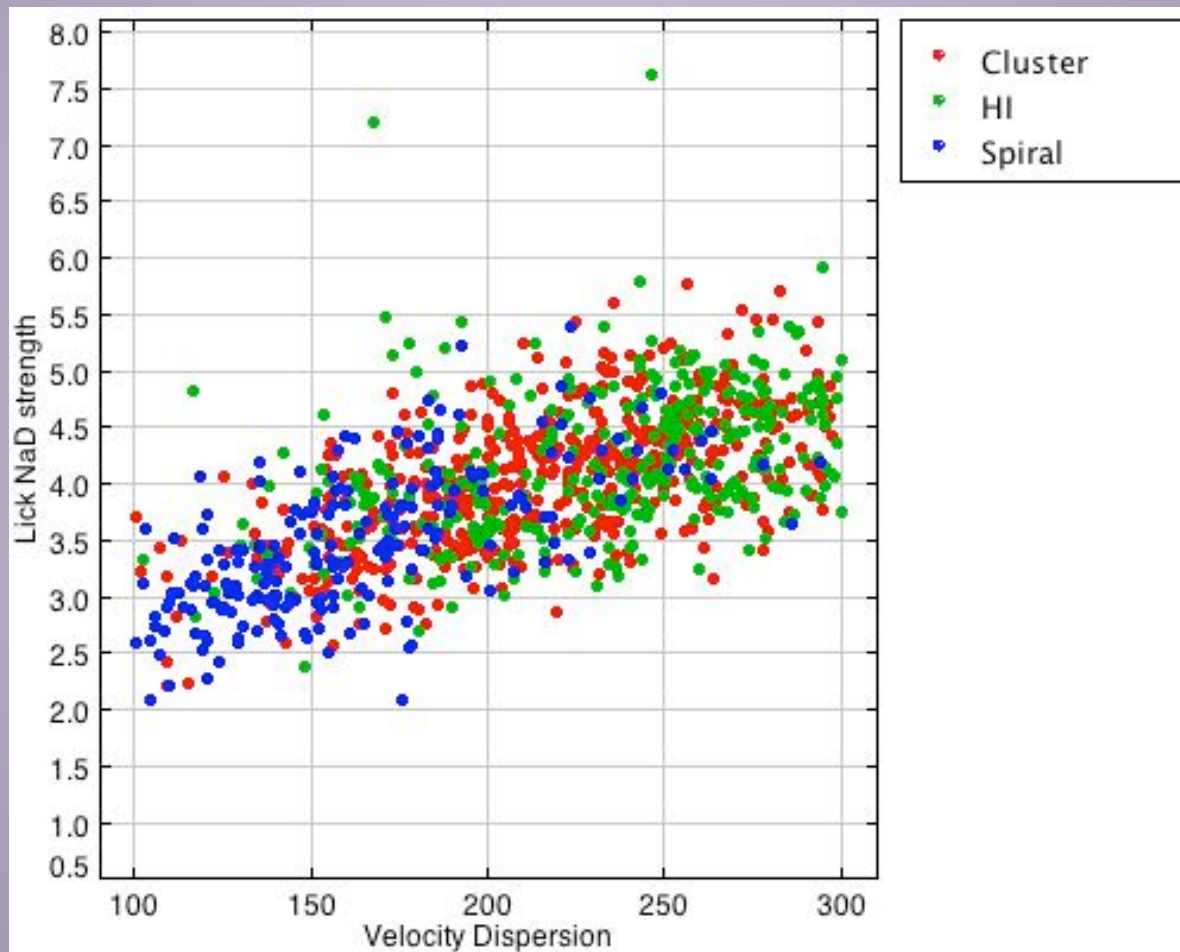
AGE

Na D



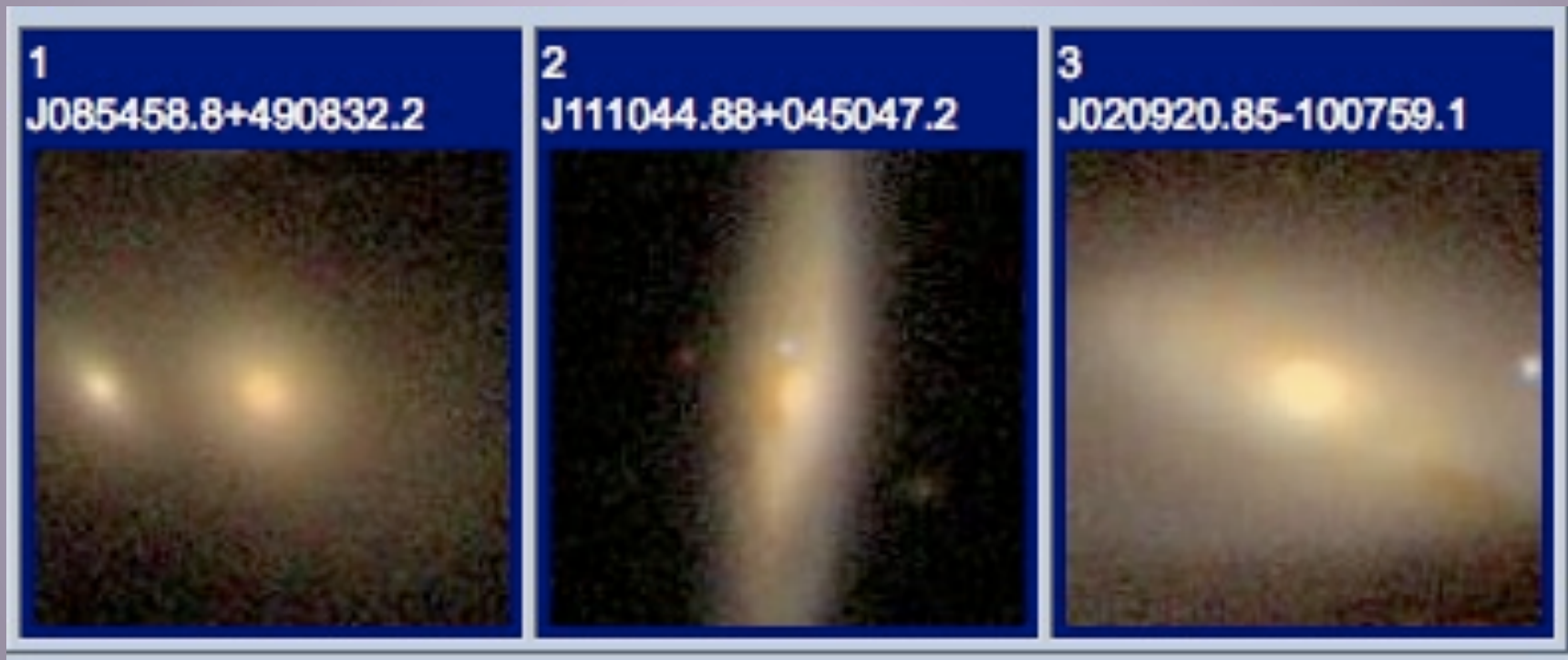
Velocity Dispersion

Na D



Velocity Dispersion

Three obvious outliers:



Three obvious outliers:



Intermediate Conclusions

- For older populations, the NaD vs. velocity dispersion relation is not significantly affected by the presence of some ISM.
- So, YES! The Na D line is useful.
- Outliers from the relationship show clear signs of ISM absorption (not surprising given their appearances). Good test cases for effects of ISM absorption on kinematic measurements (Future work!).

Thanks!