

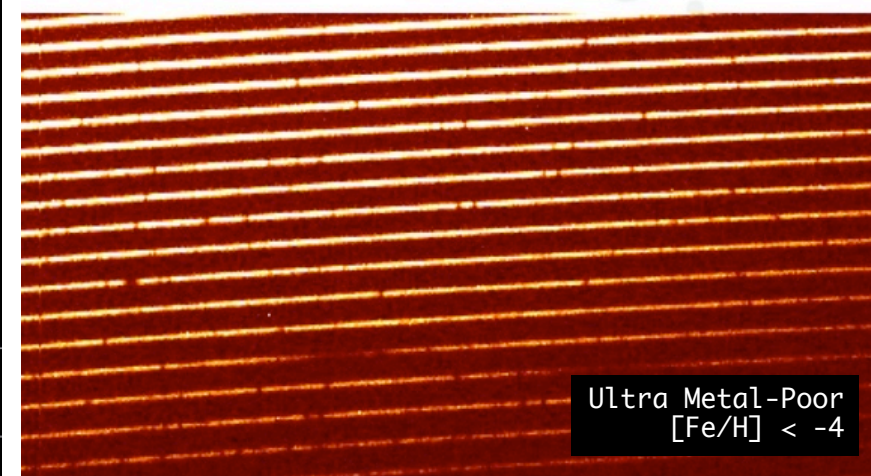
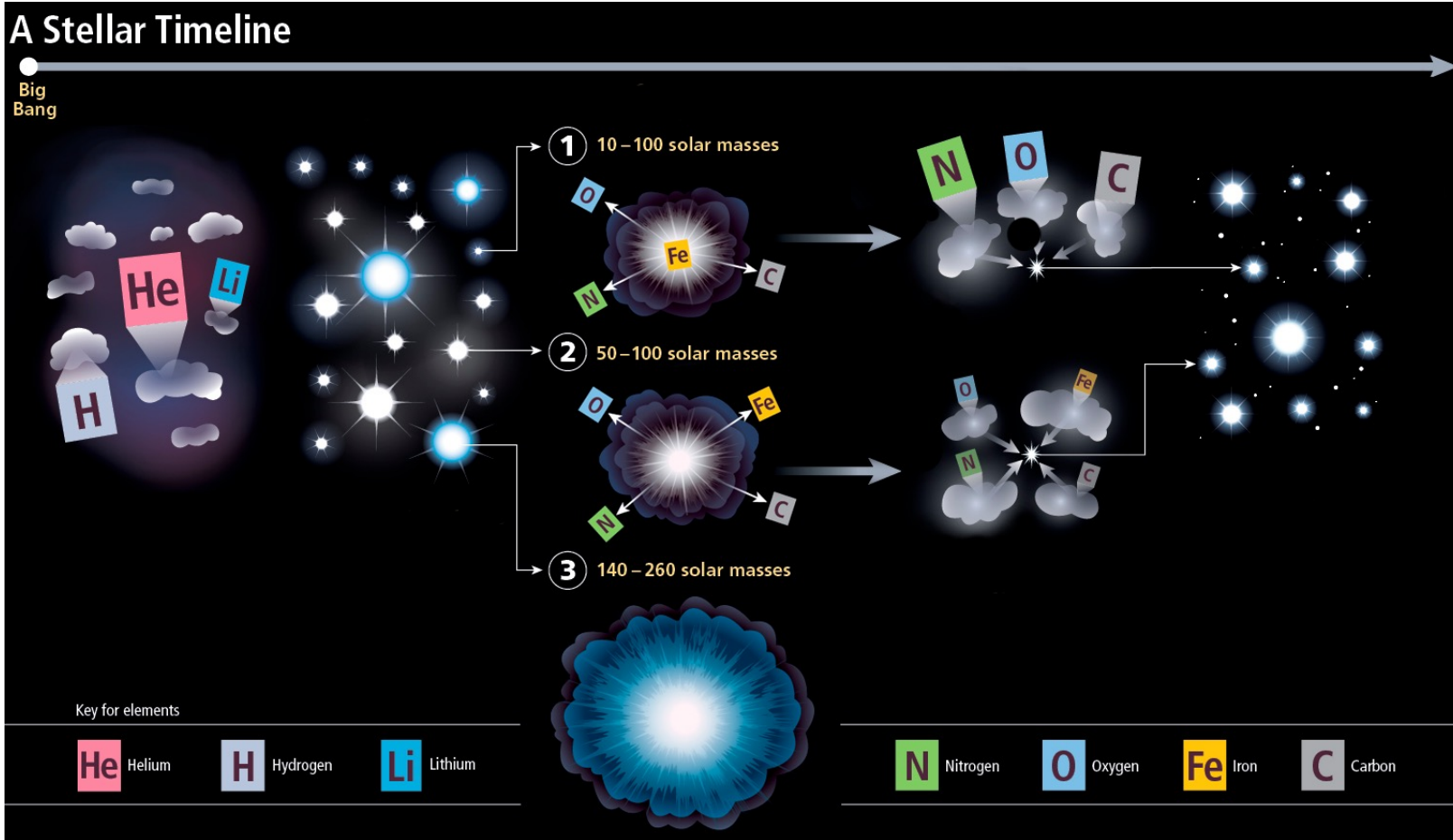


Searching for Chemically Pristine Stars with Narrowband Photometry

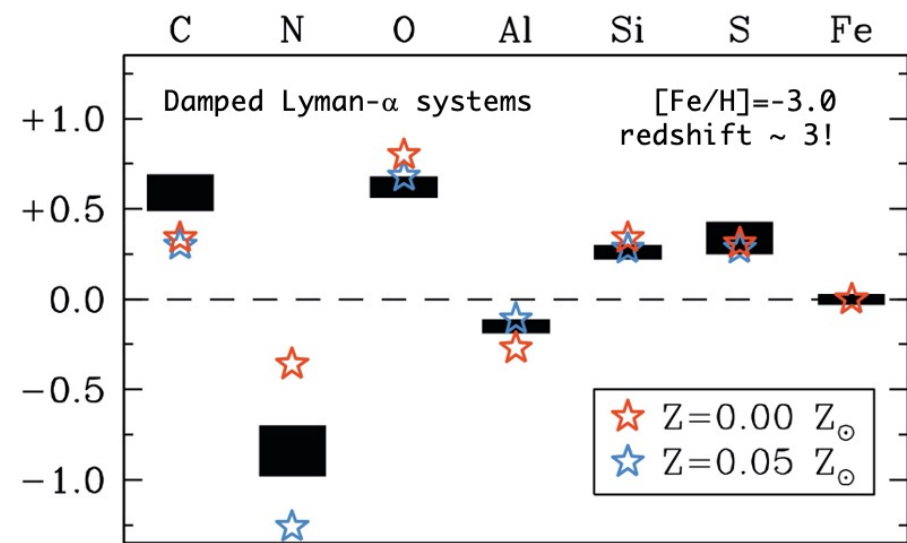
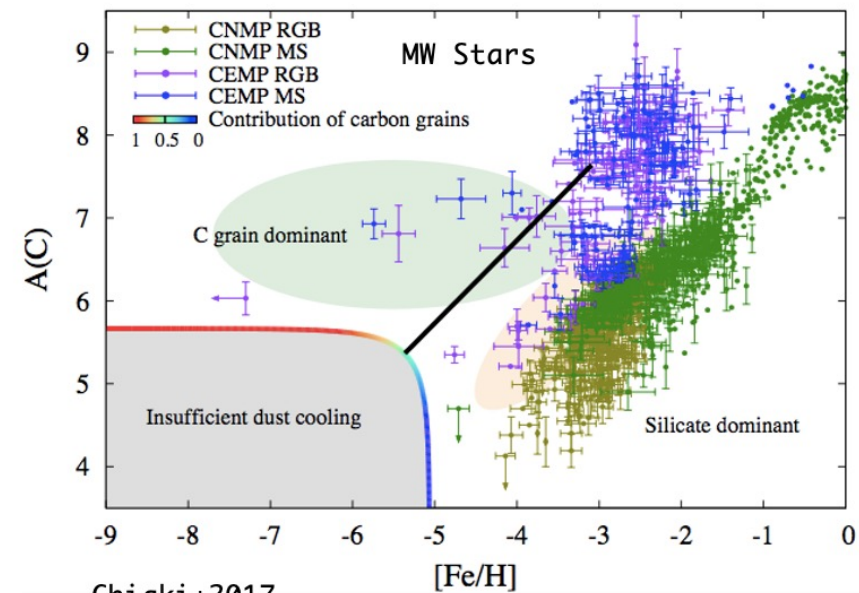
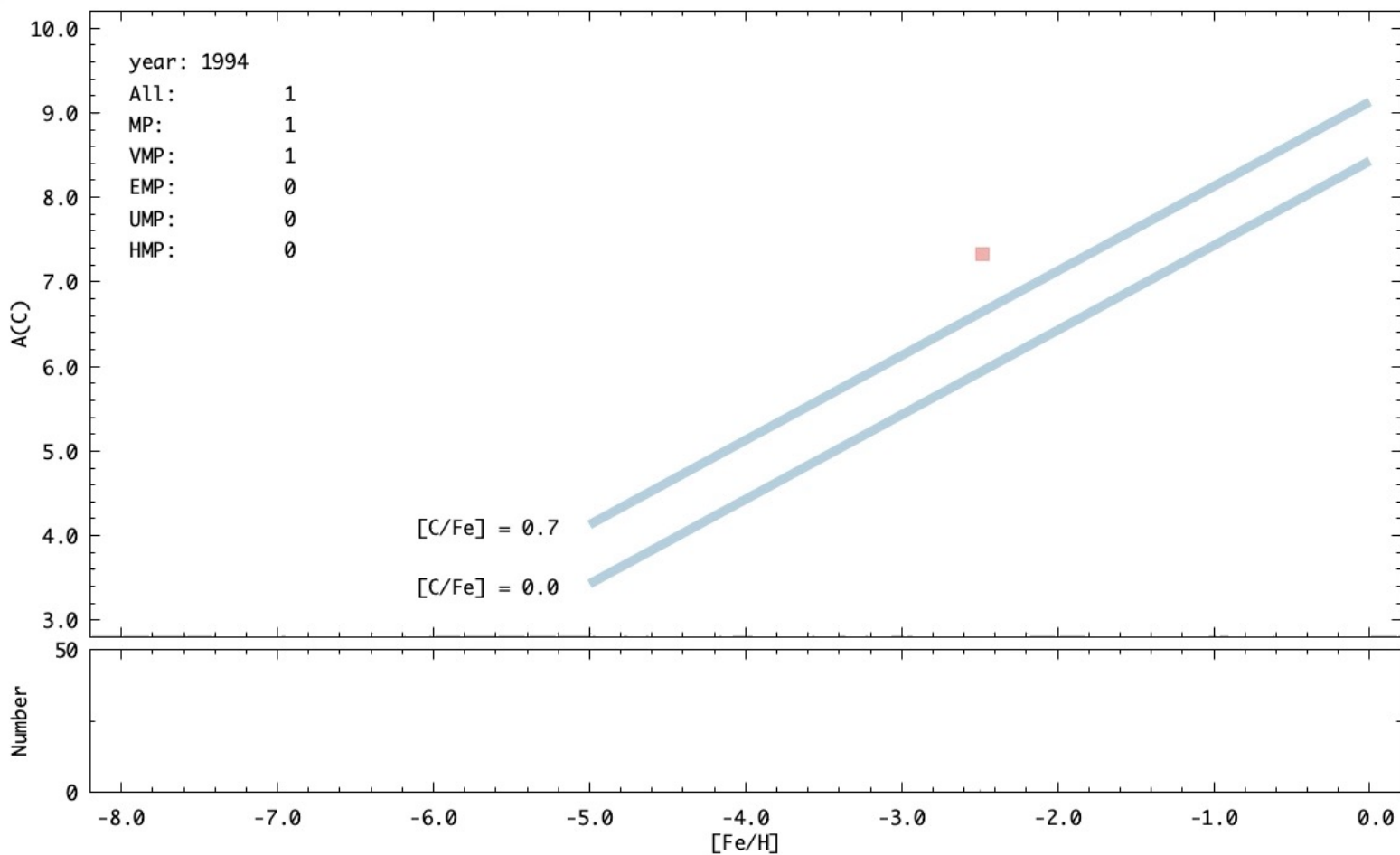
Vinicius Placco
NSF's NOIRLab



Stellar Archaeology (a.k.a. the universe at $z=0$)



Carbon: “near-field” meets “far-field” cosmology

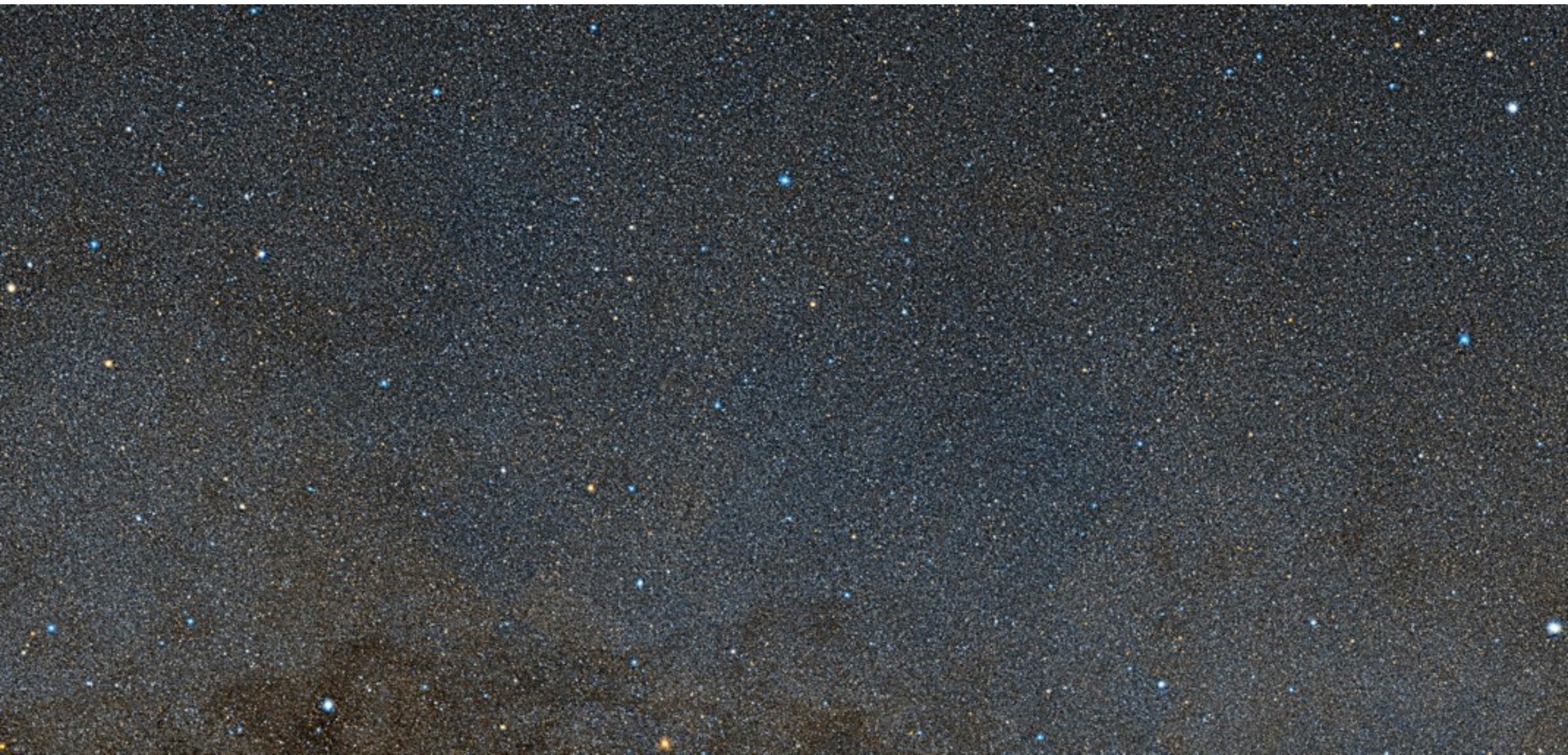


Cooke+2011

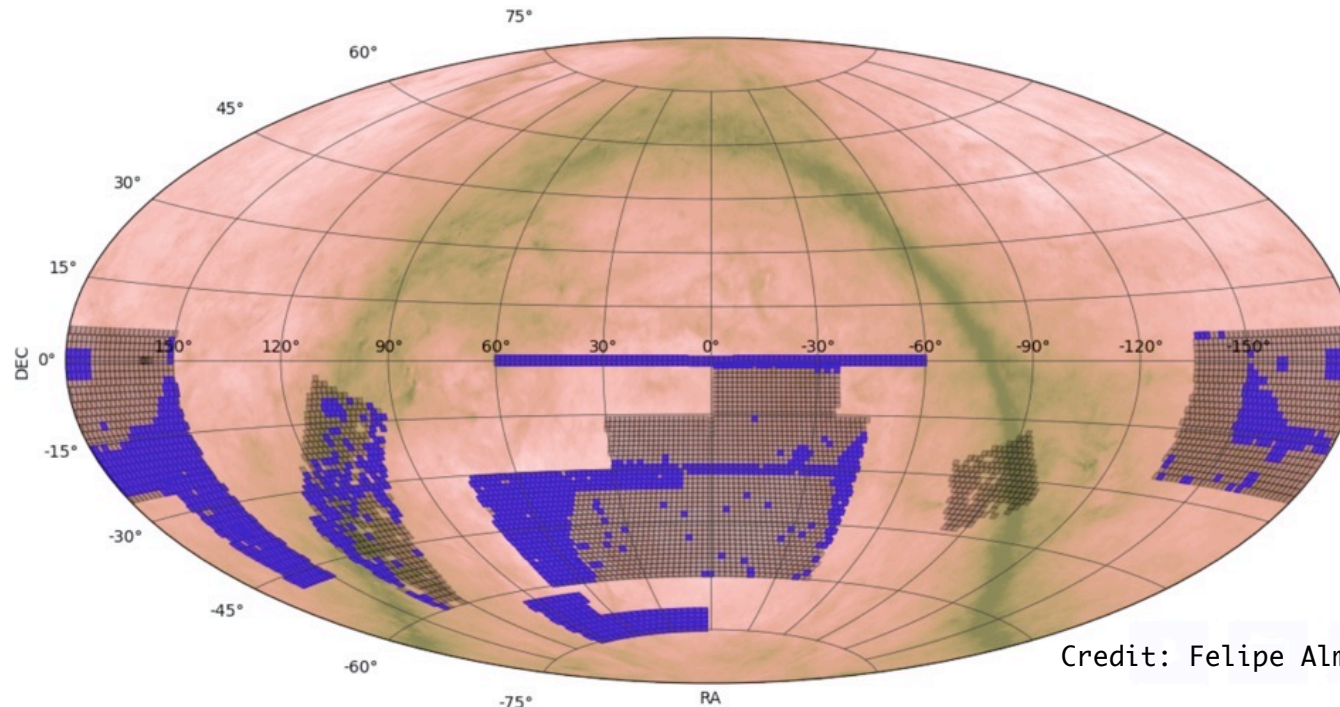
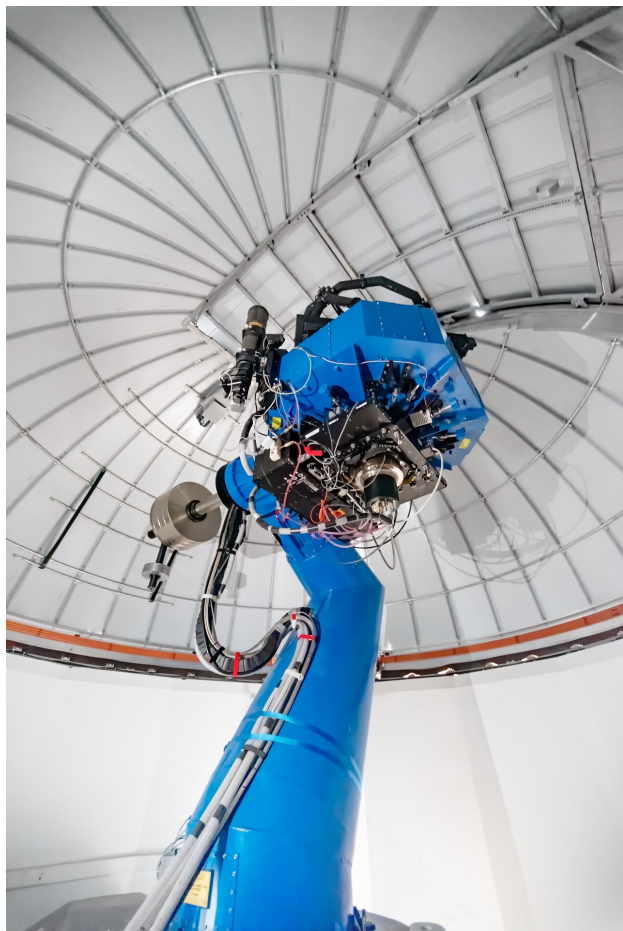
SAGA database



[Fe/H]<-4 is hard to find → *one* V<18 for every 100² degrees



S-PLUS (Southern Photometric Local Universe Survey)

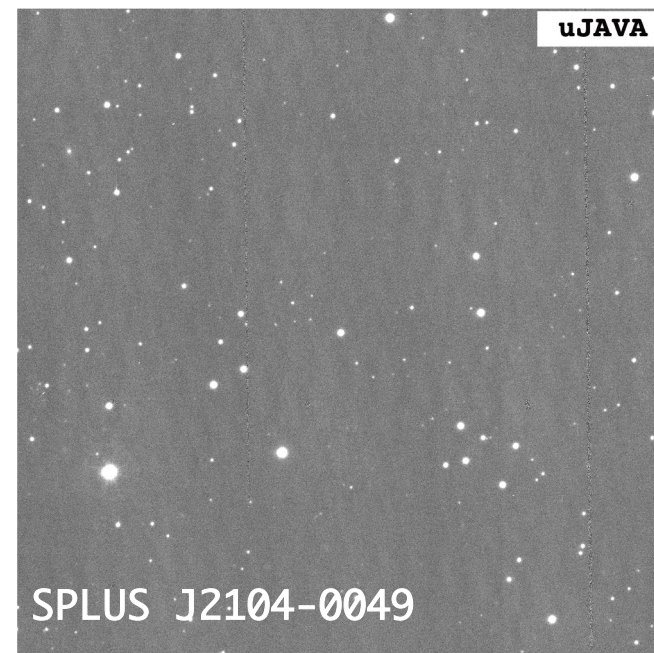
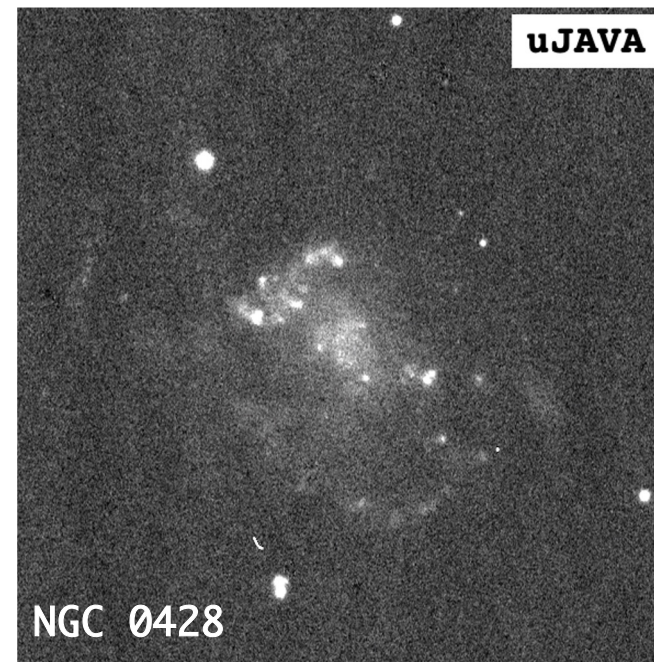
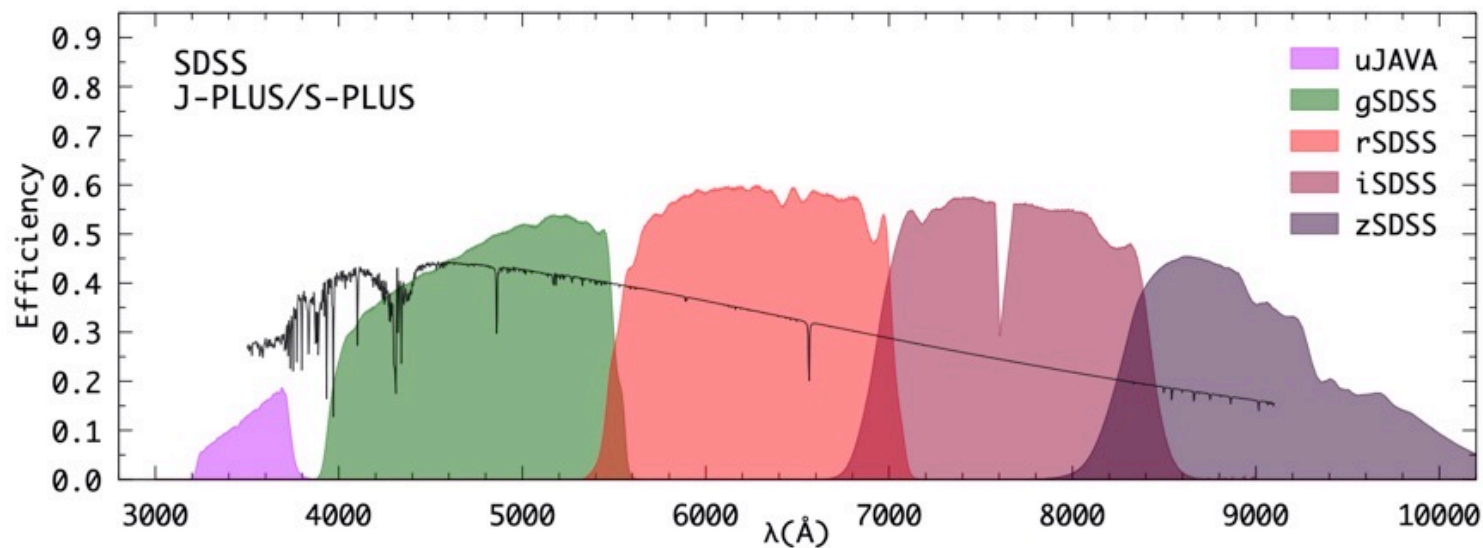
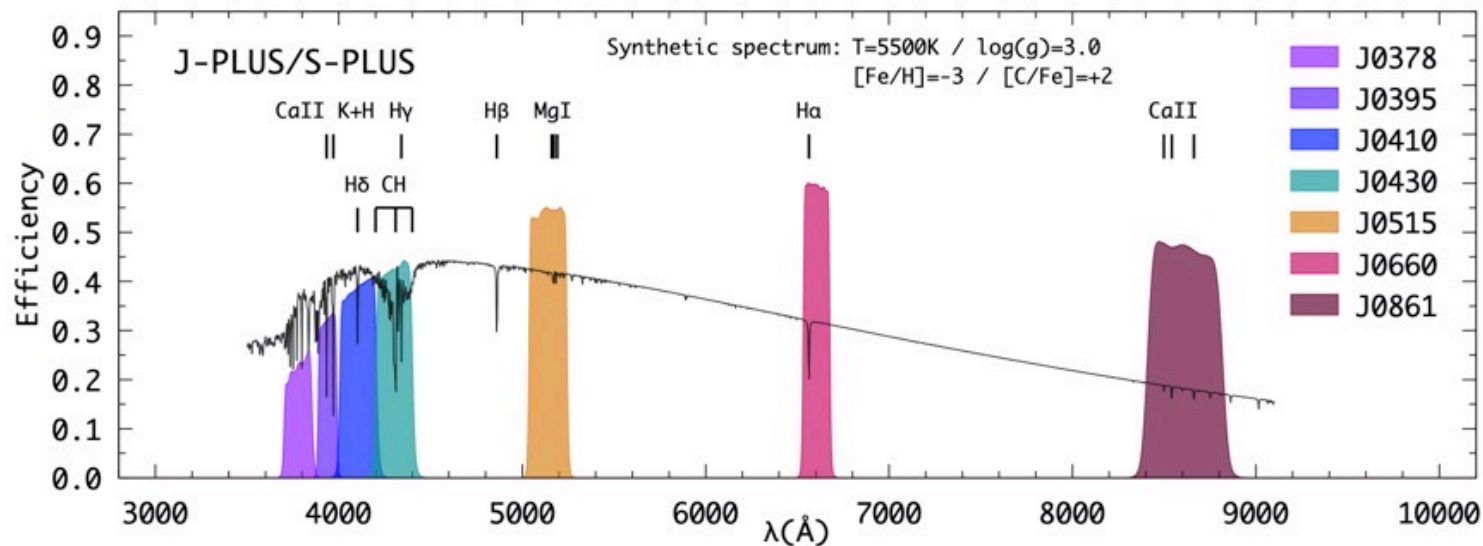


Credit: Felipe Almeida-Fernandes



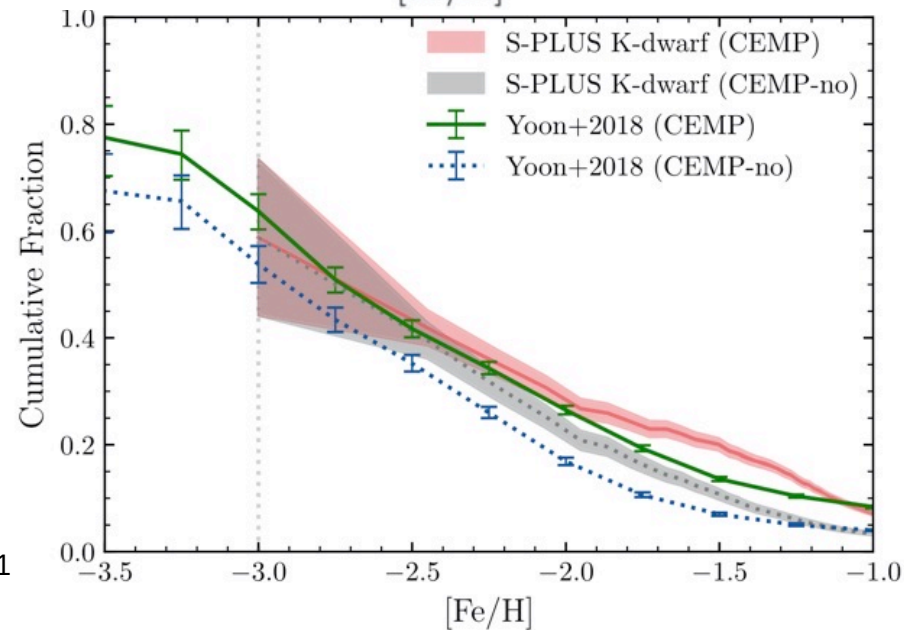
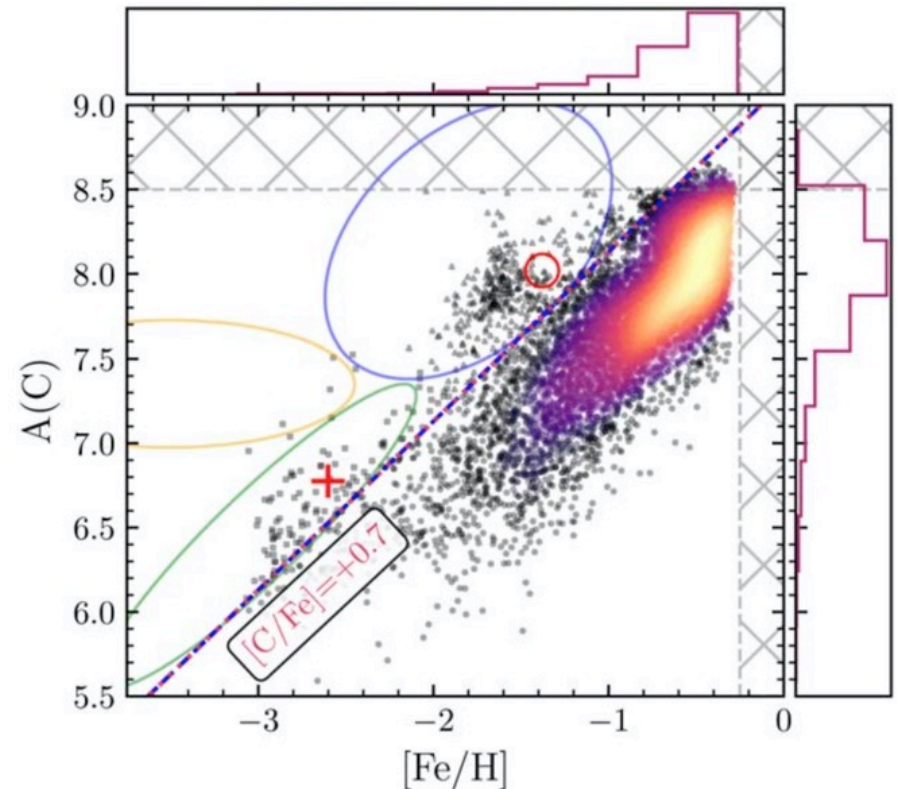
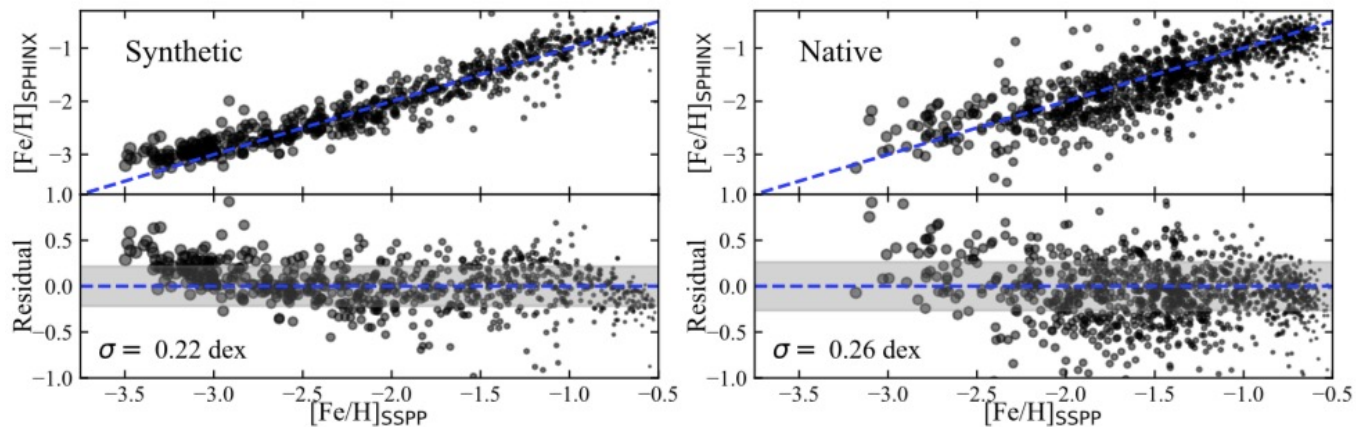
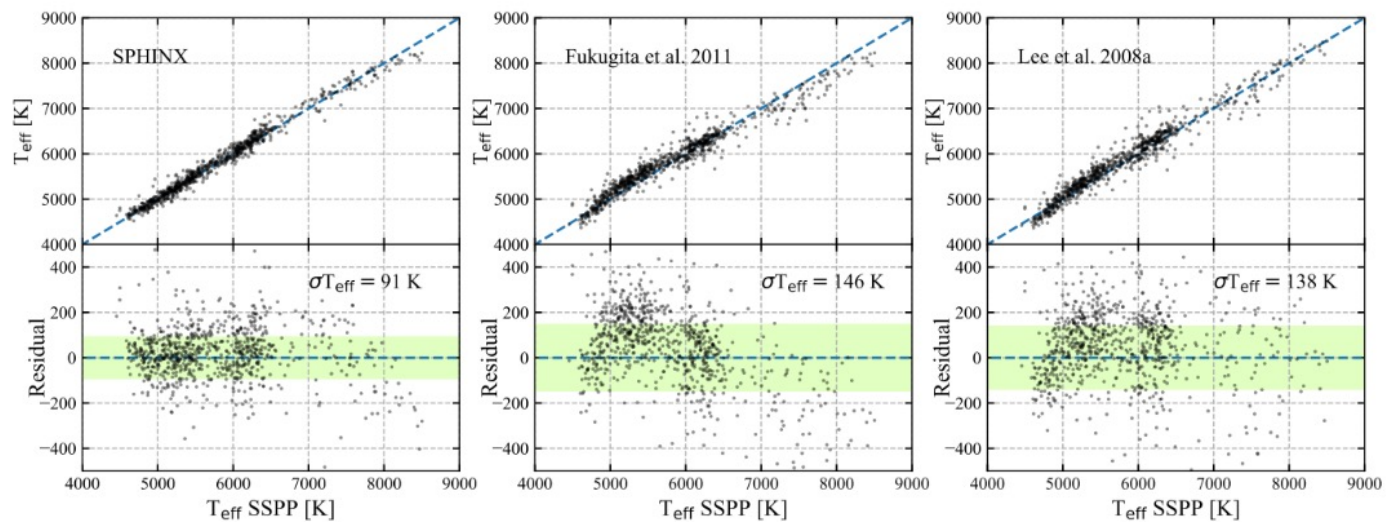
T80 South: 80cm
FOV: 2 deg²
Footprint: 8,500 deg²

S-PLUS (filter system)





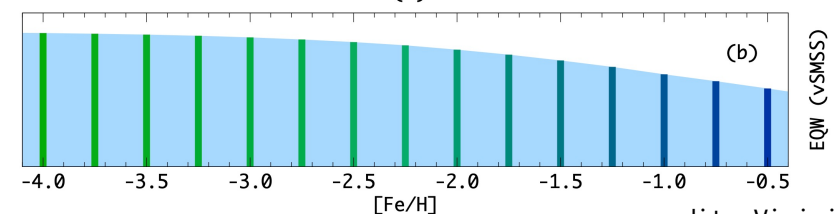
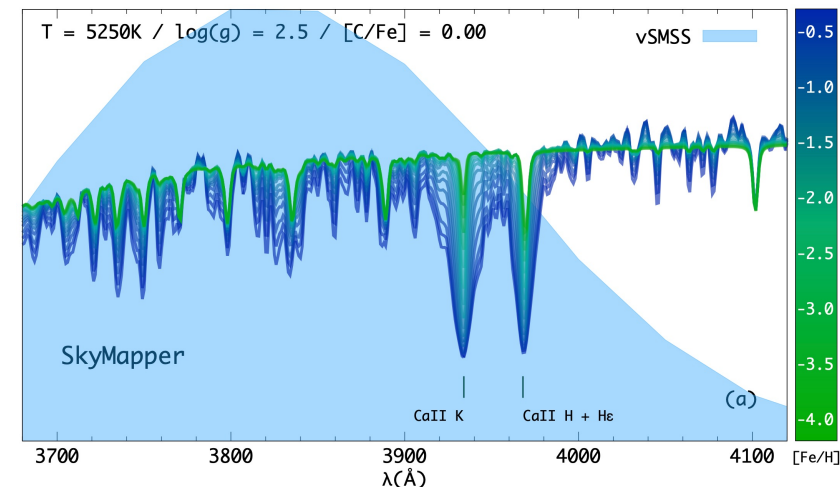
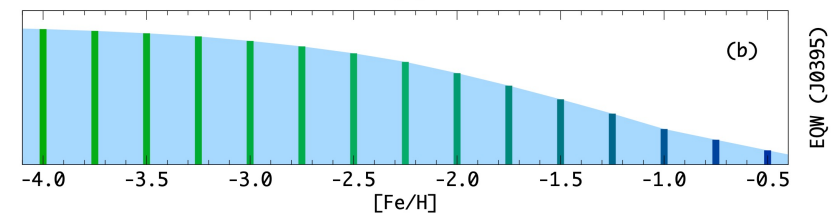
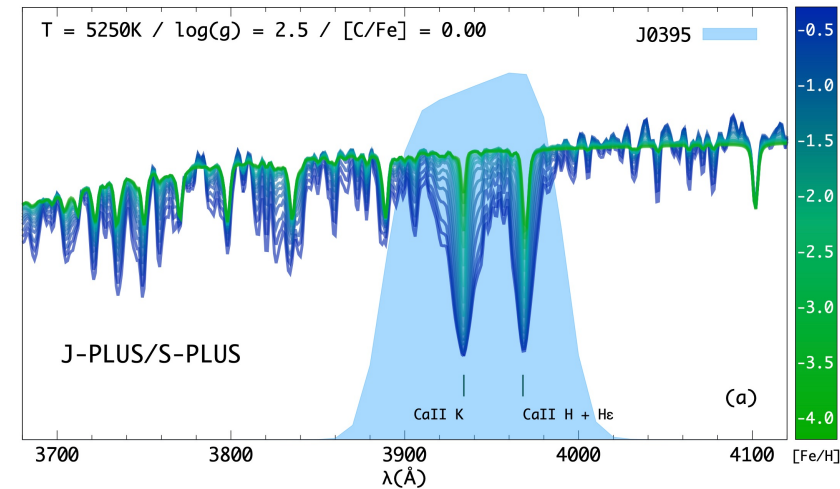
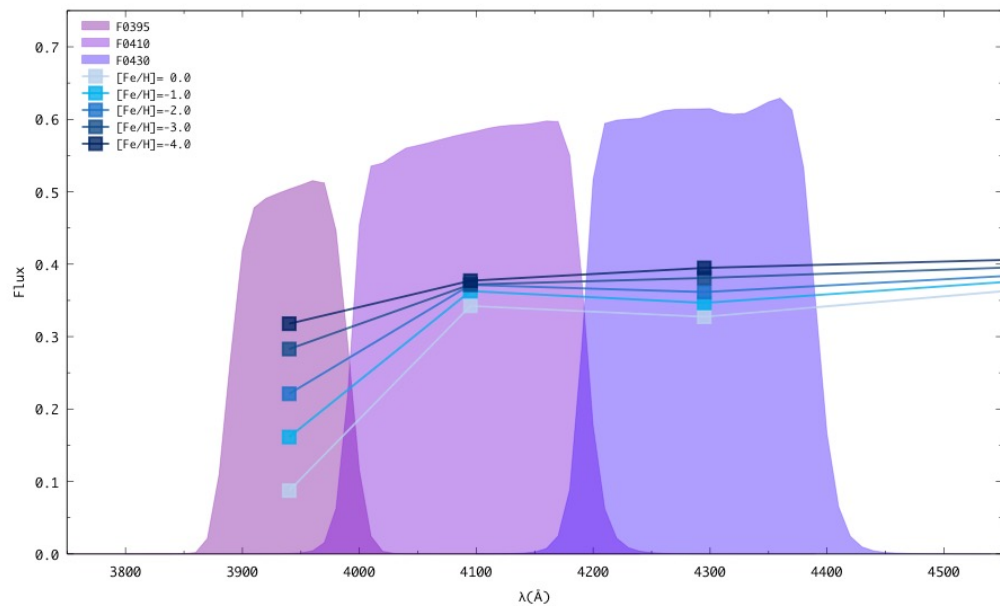
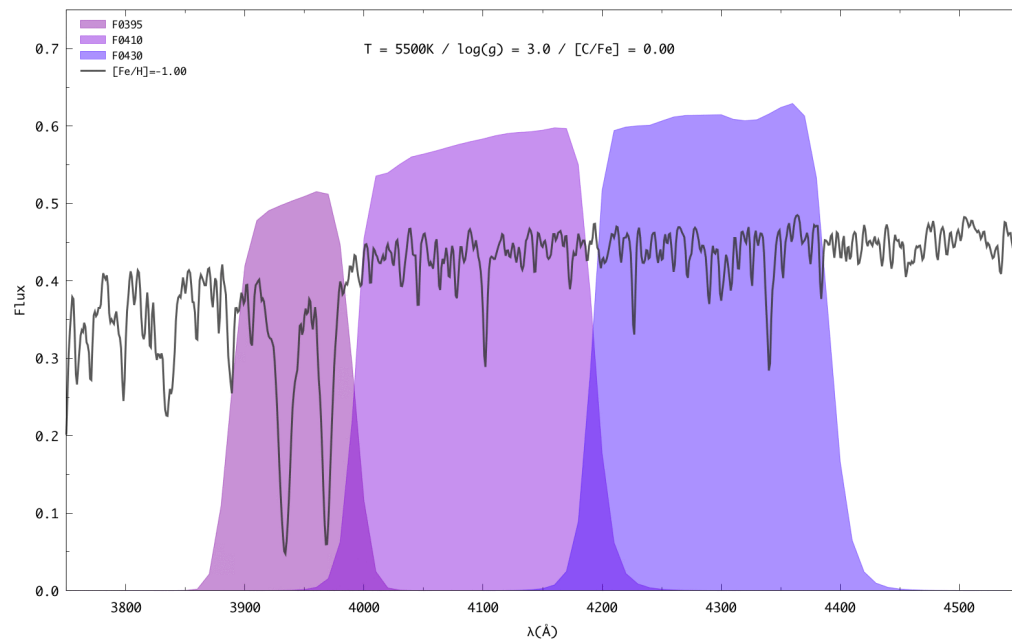
Artificial Neural Networks



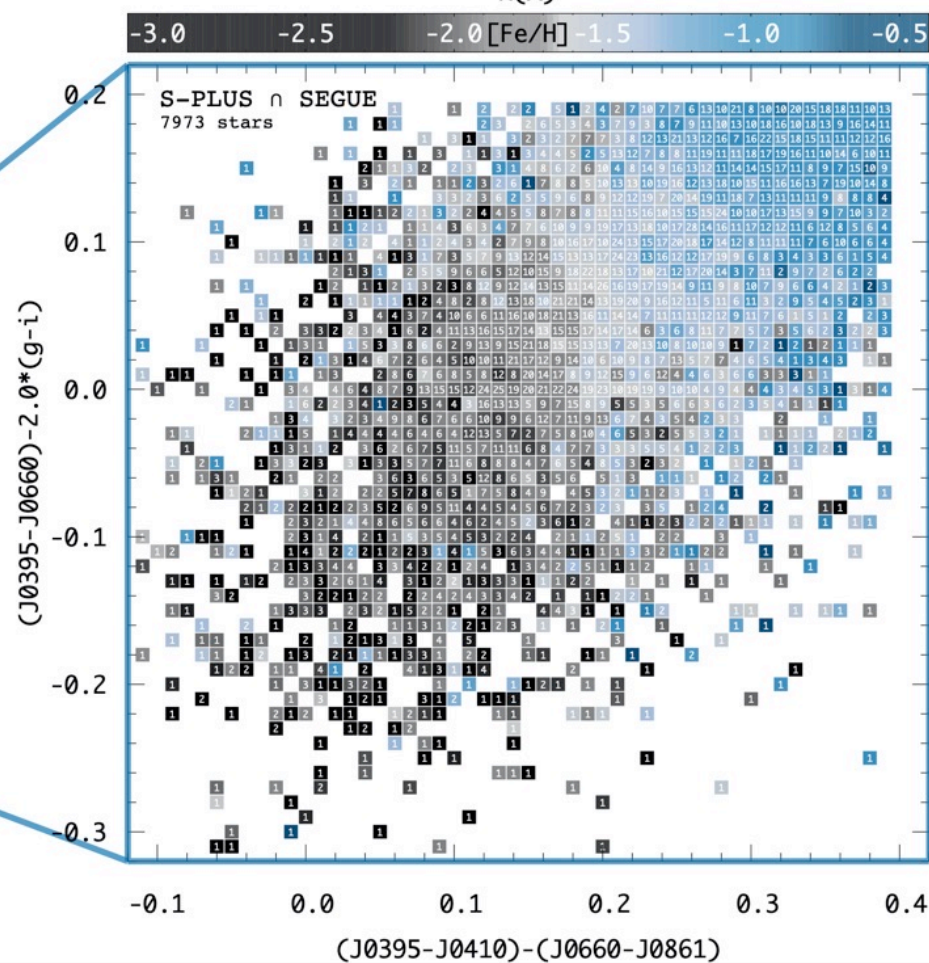
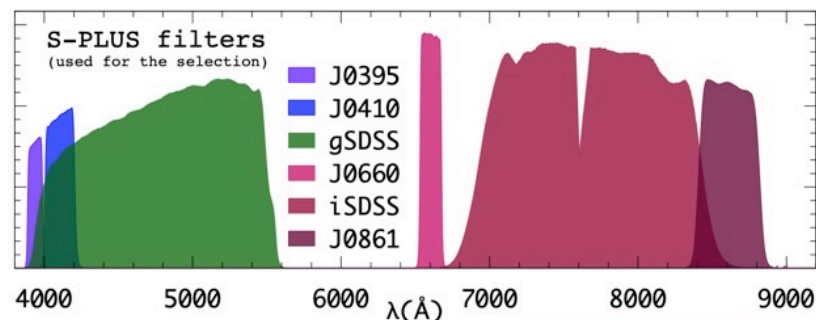
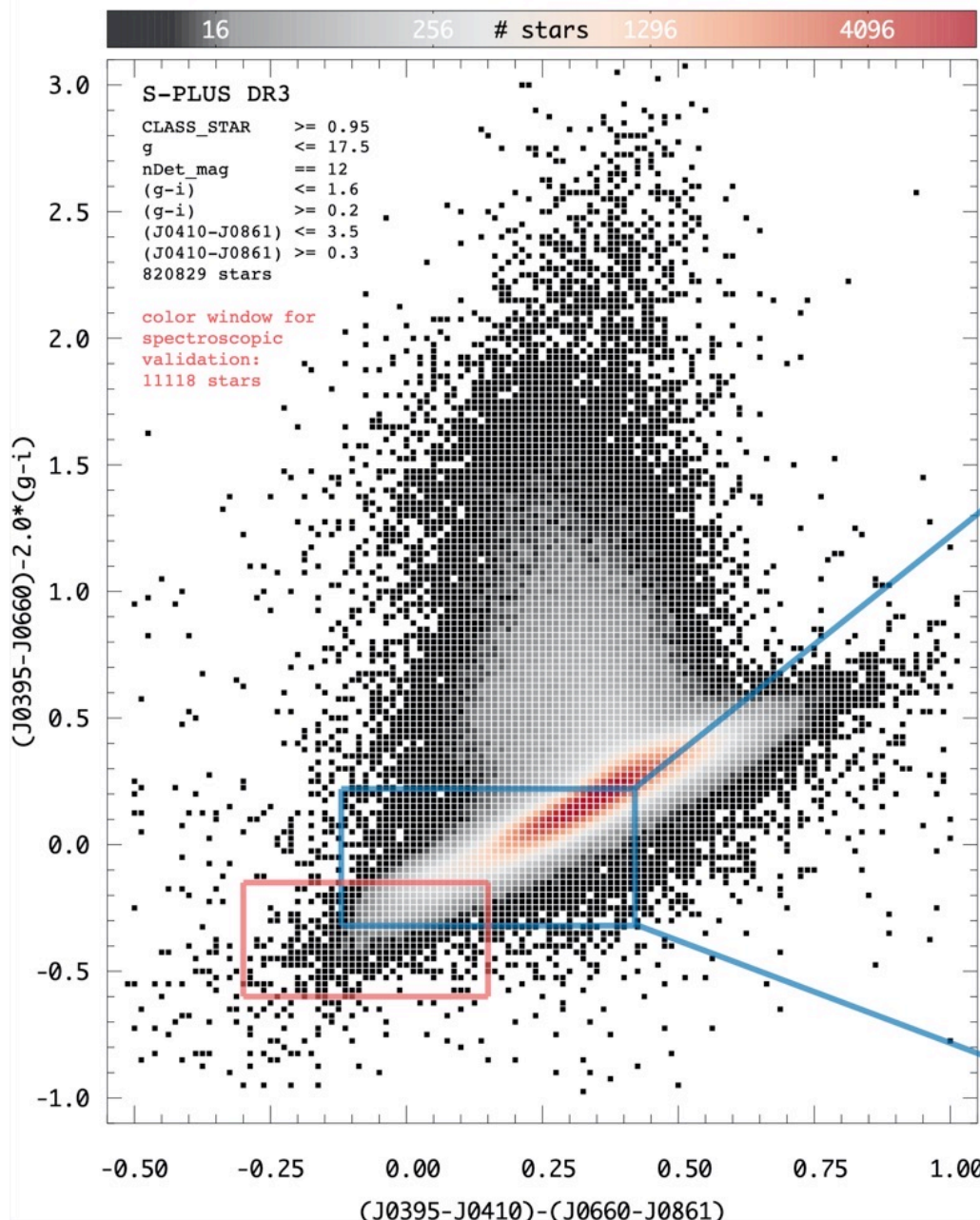
Whitten, Placco+2019/2021



S-PLUS (metallicity indicator)



S-PLUS ([Fe/H]-sensitive colors)



The power in numbers

S-PLUS (0.8m) → ~20 million objects
(photometry - narrow+broad band)



Almeida-Fernandes+2022

Gemini South (8.0m) → 138 objects
(medium-resolution spectroscopy)
(GMOS - Poor weather program)



Placco+2022

Blanco (4.0m) → 348 objects
(COSMOS - visitor/remote)



Magellan/Clay (6.5m) → 1 object
(high-resolution spectroscopy)



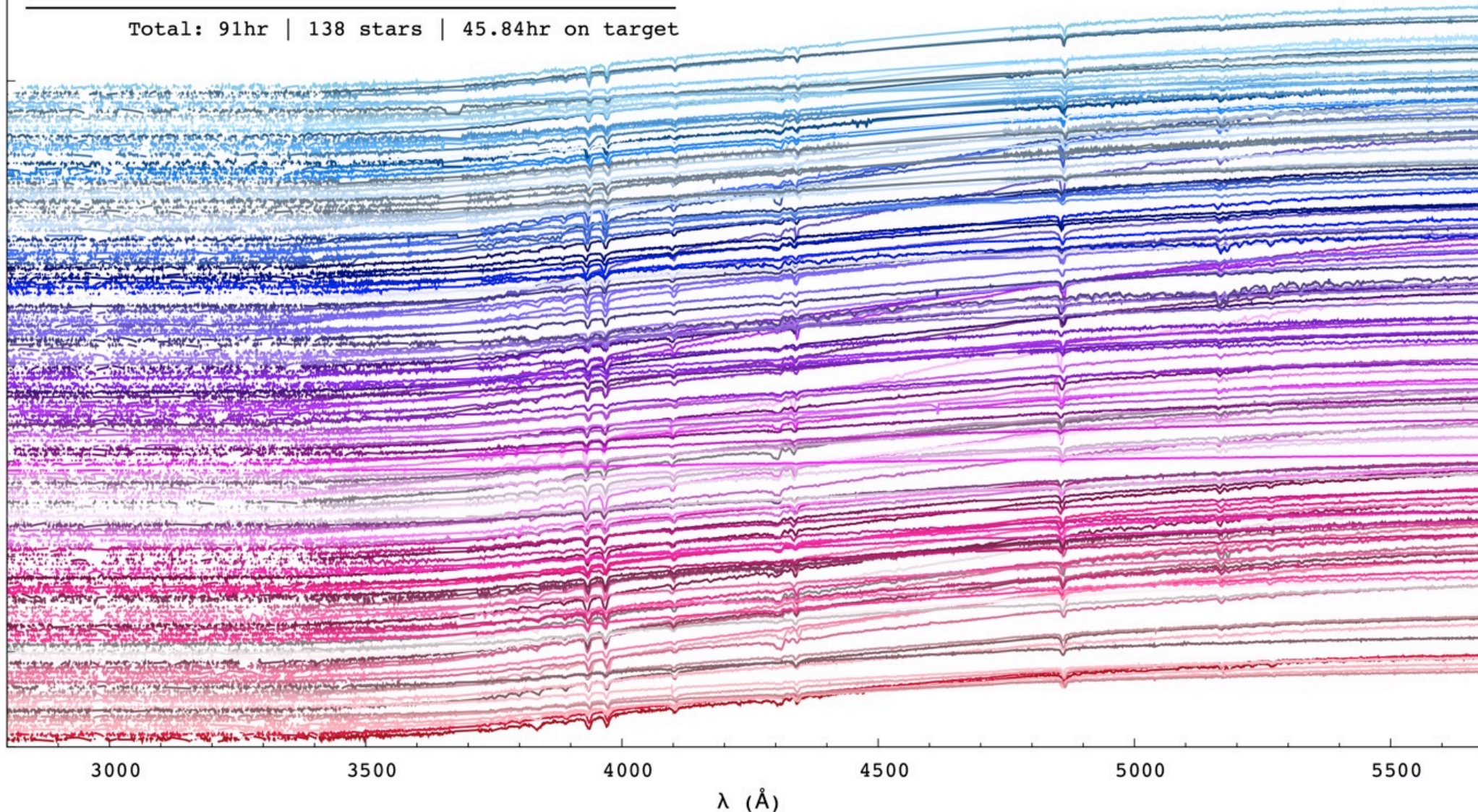
Placco+2021



Observing constraints \rightarrow IQ/CC/WV/SB = ANY/ANY/ANY/ANY

GS2022A-Q-406: 30hr	30 stars	12.59hr on target
GS2021A-Q-419: 40hr	81 stars	21.61hr on target
GS2019A-Q-408: 21hr	27 stars	11.64hr on target

Total: 91hr | 138 stars | 45.84hr on target

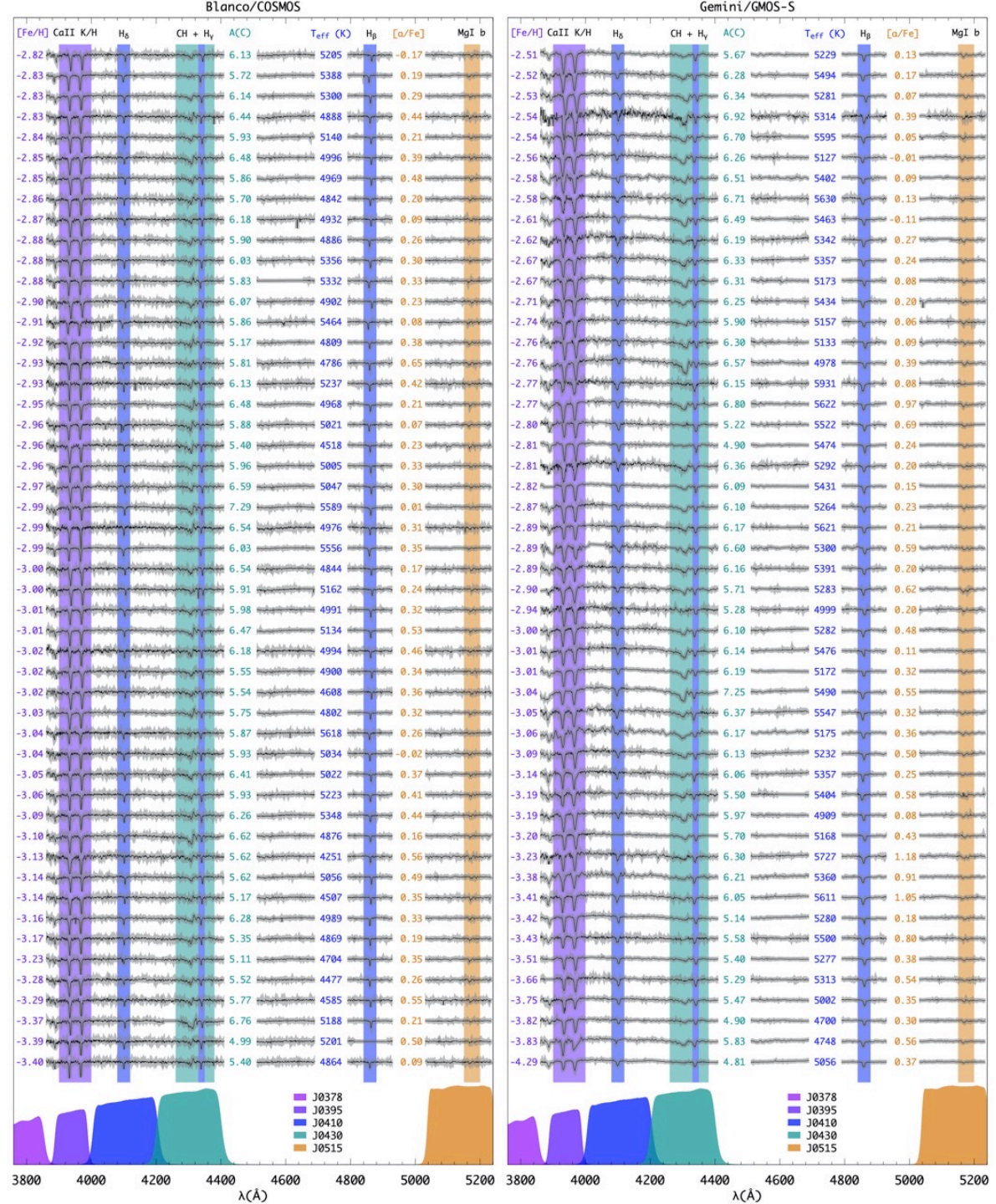
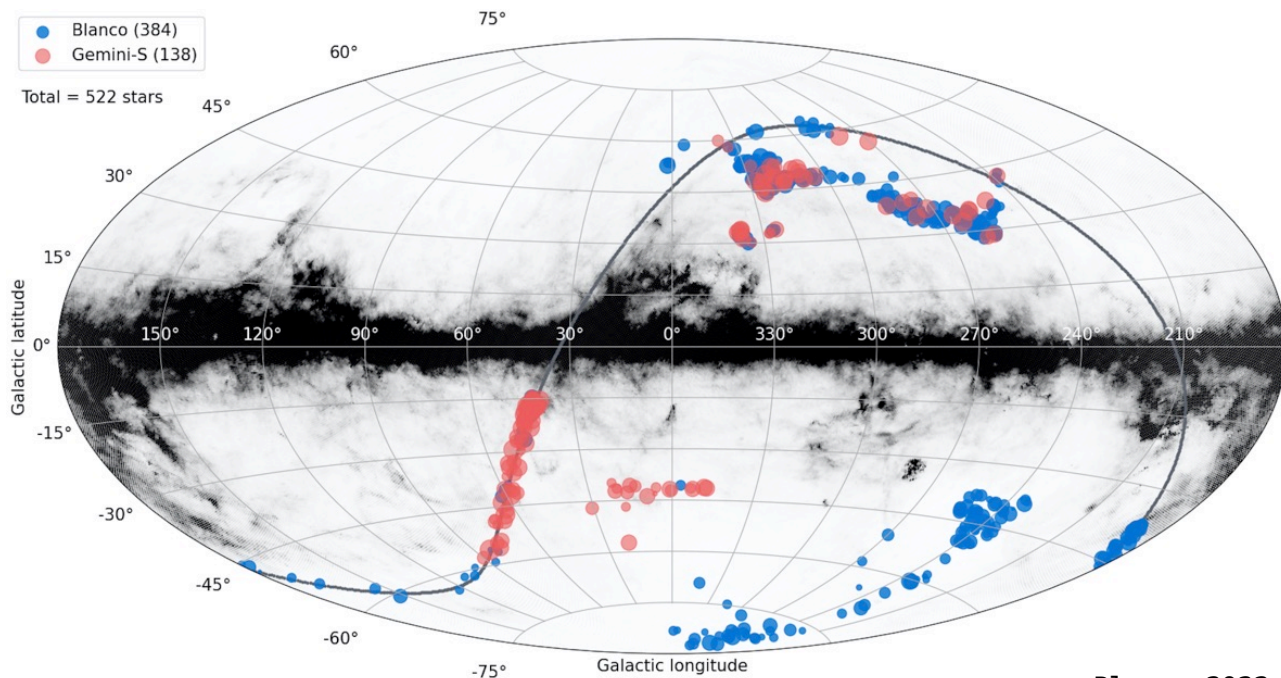




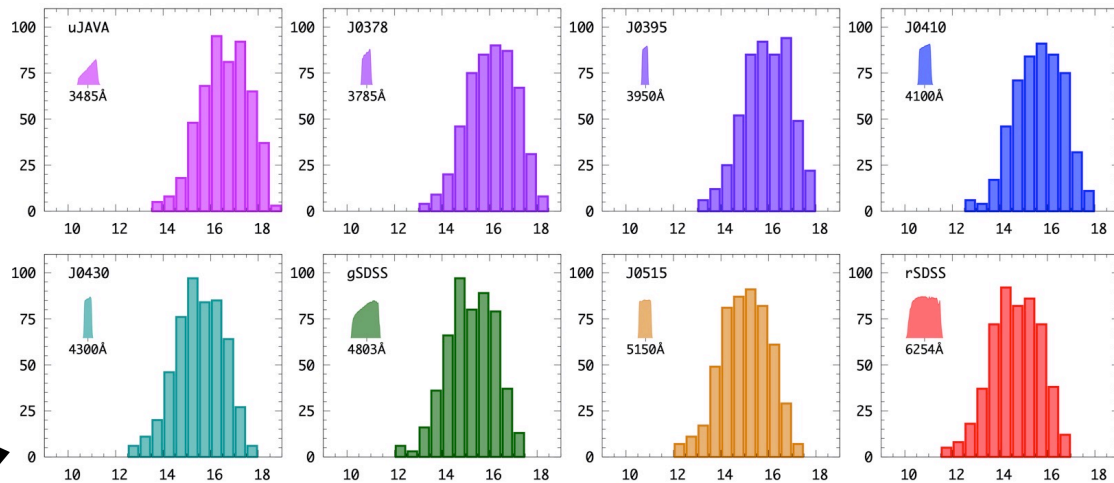
Gemini/GMOS + Blanco/COSMOS

Blanco (384)
Gemini-S (138)

Total = 522 stars

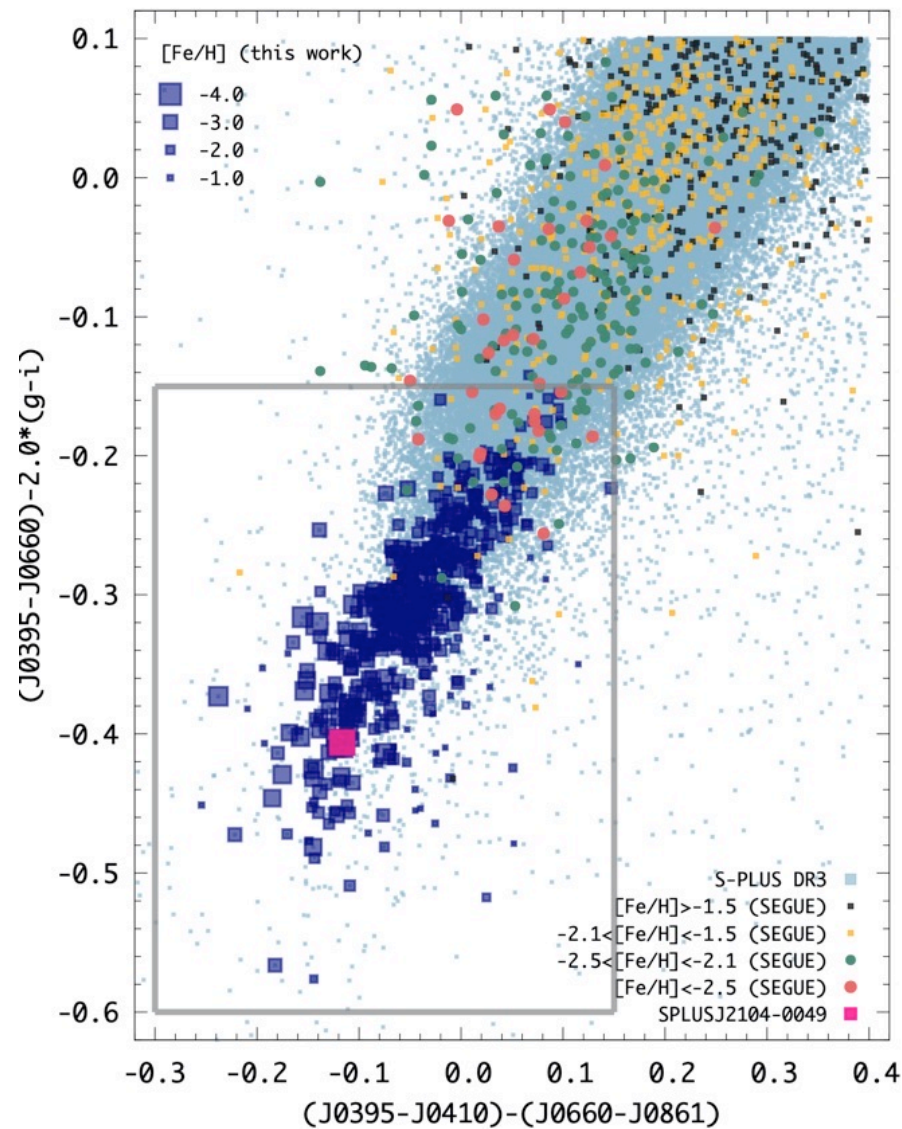
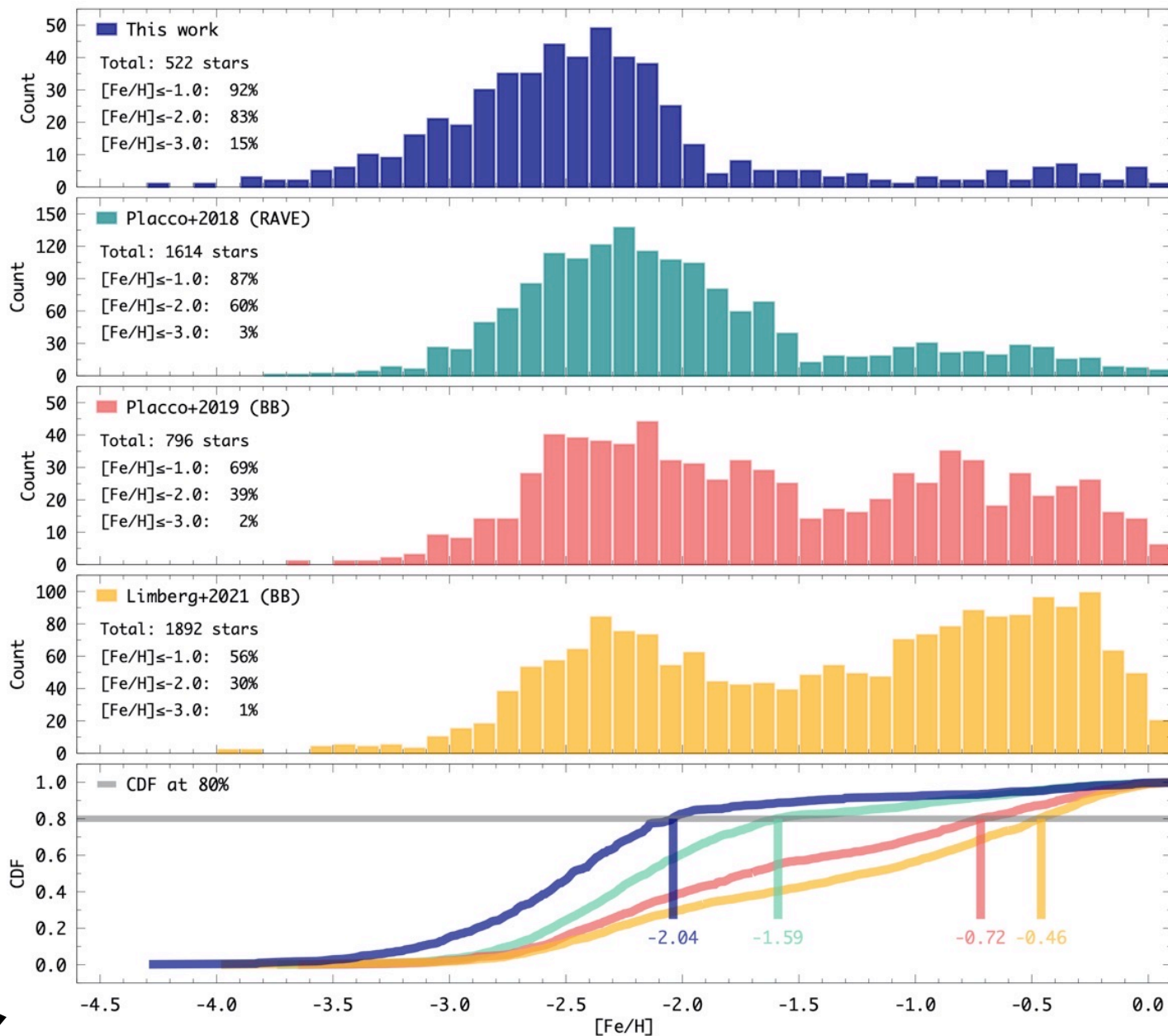


Placco+2022



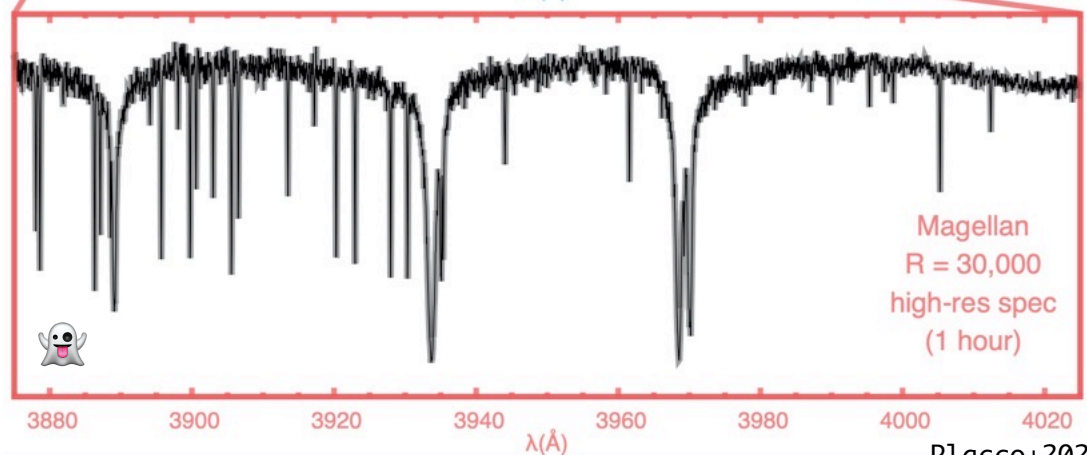
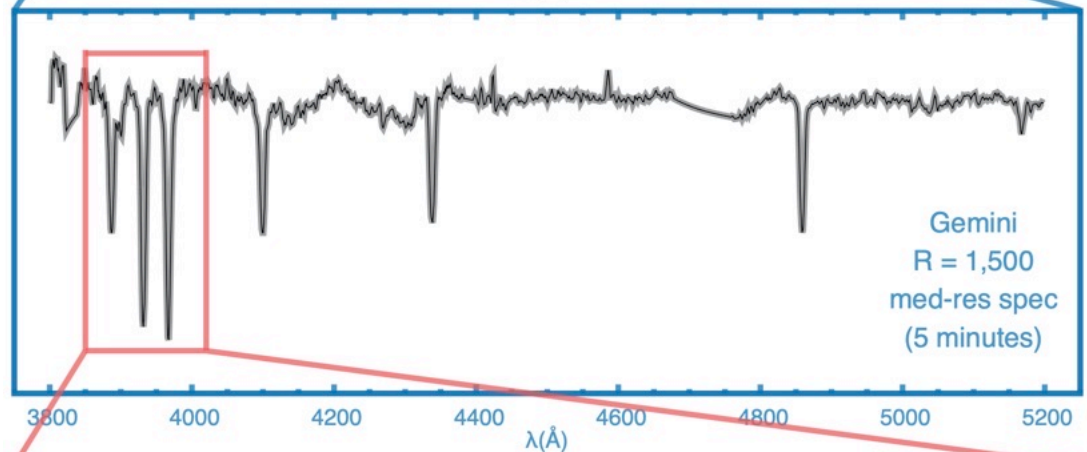
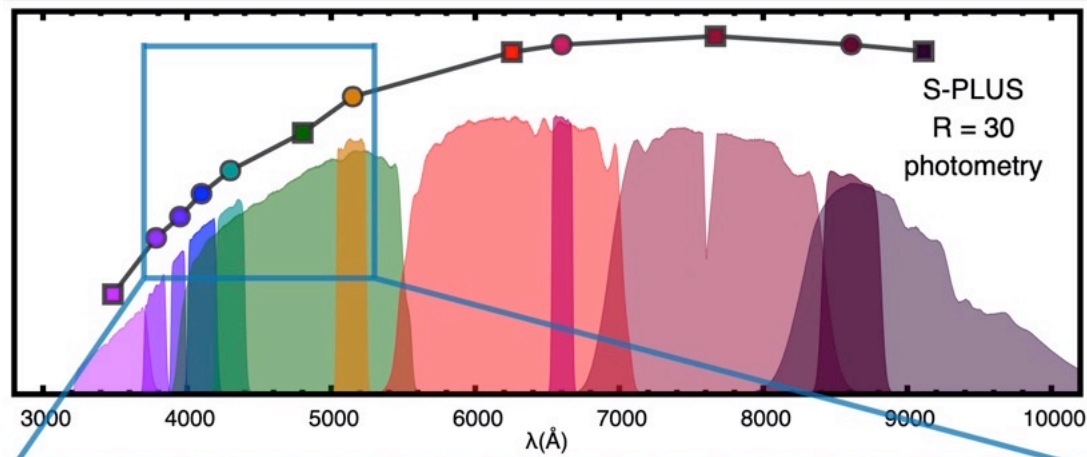
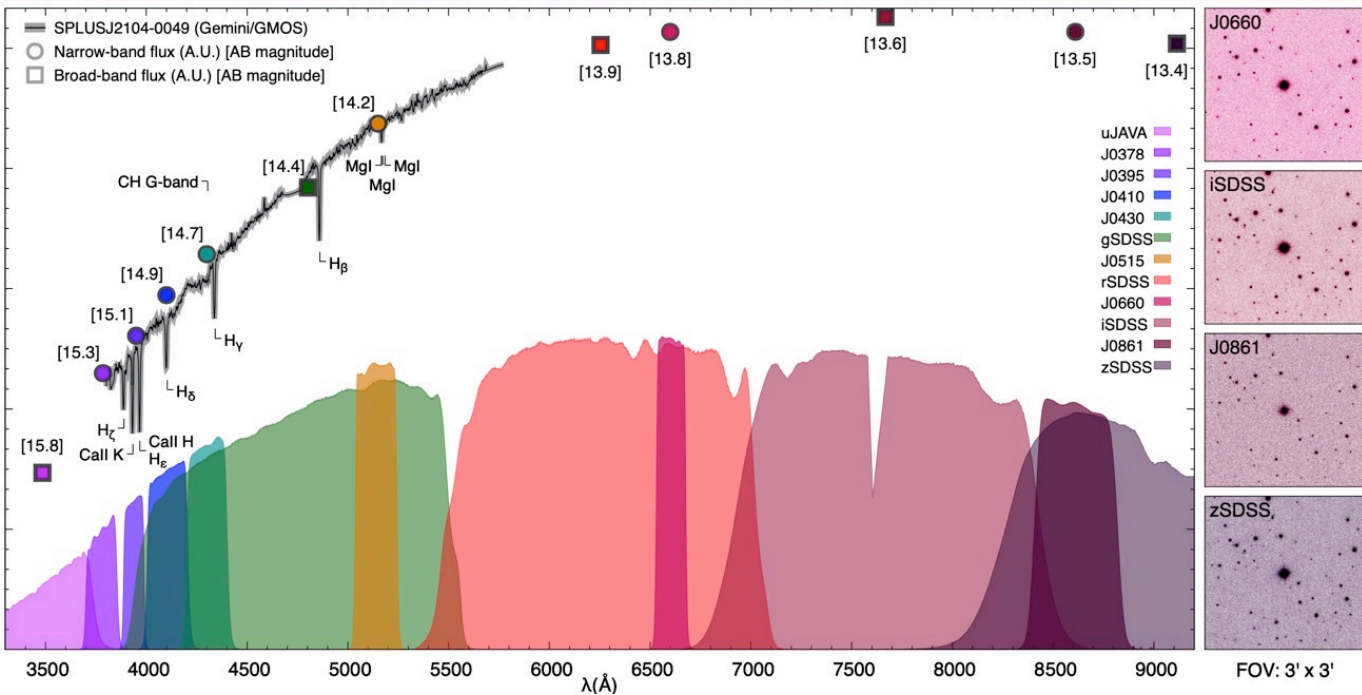
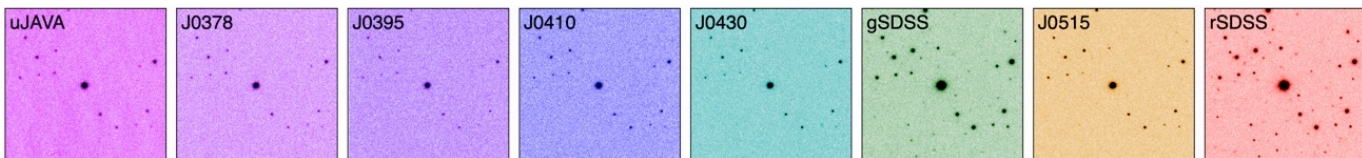


Effectiveness in finding $[Fe/H] < -2$ stars

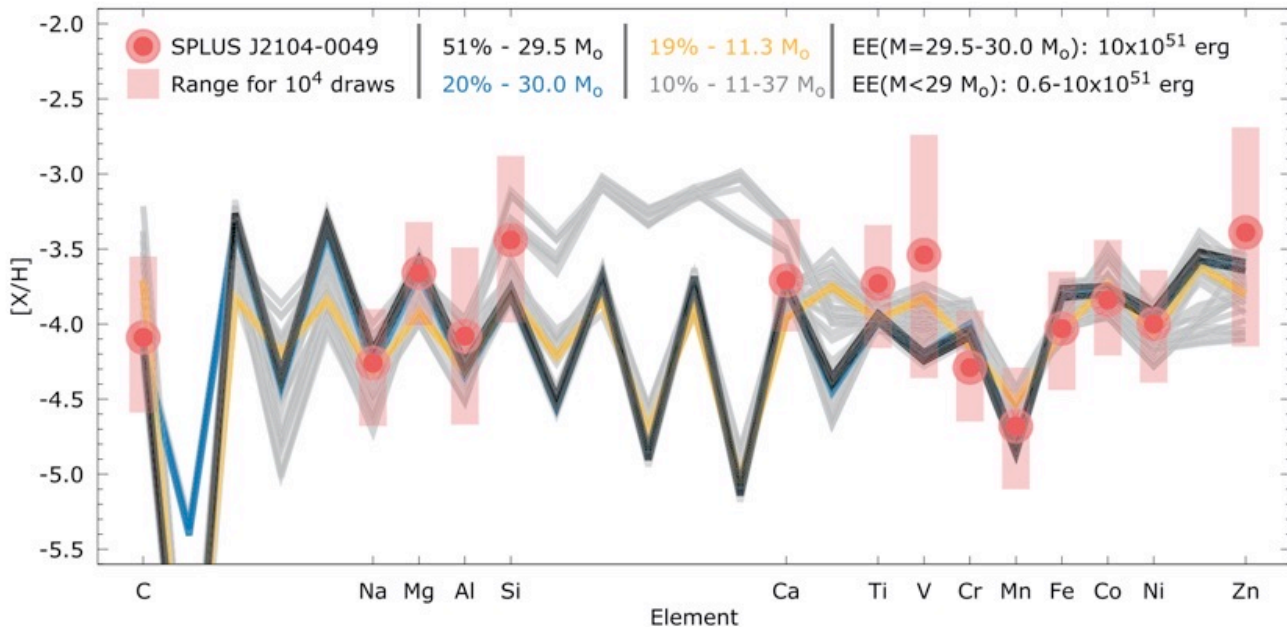
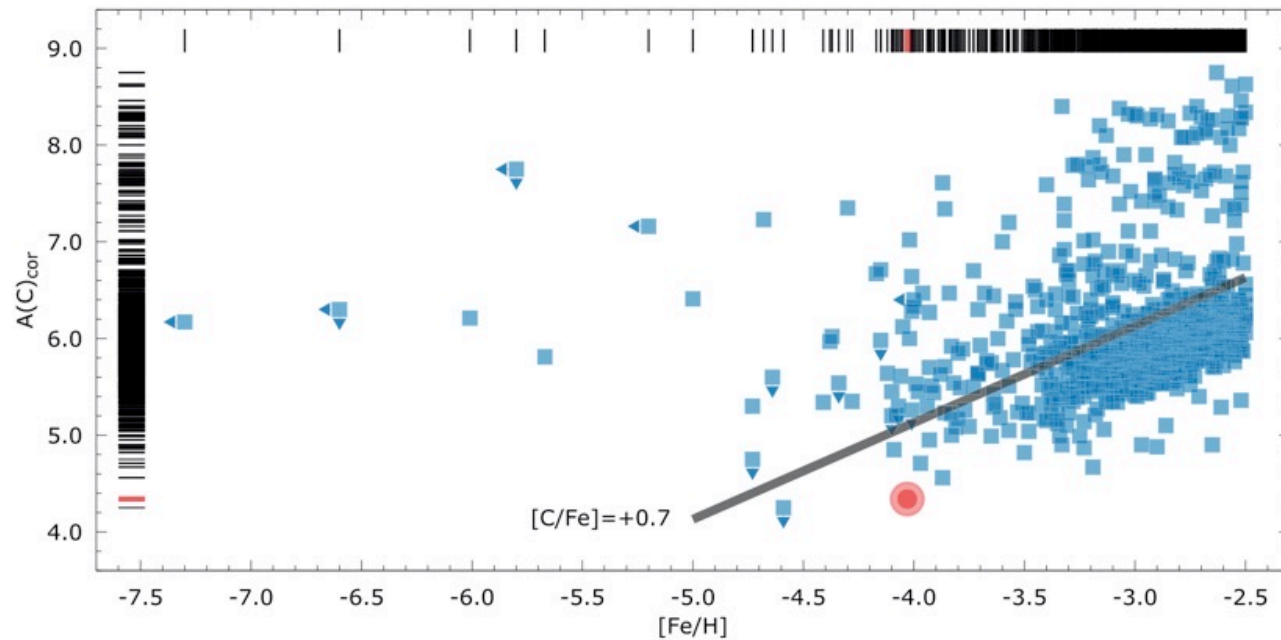
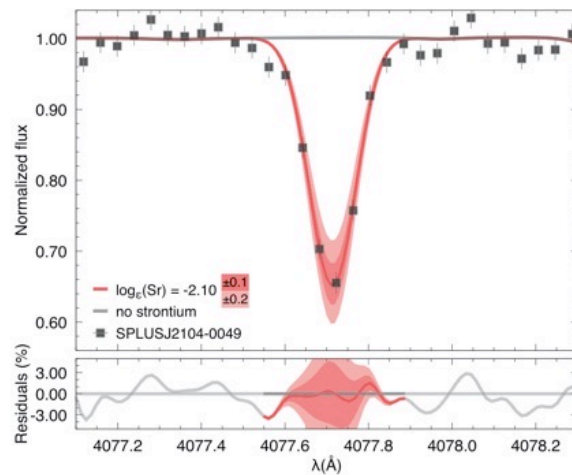
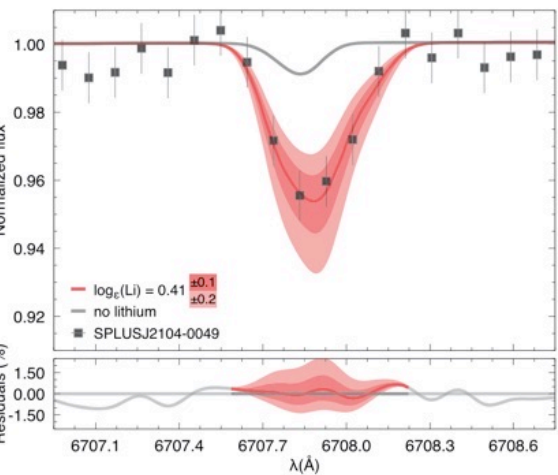
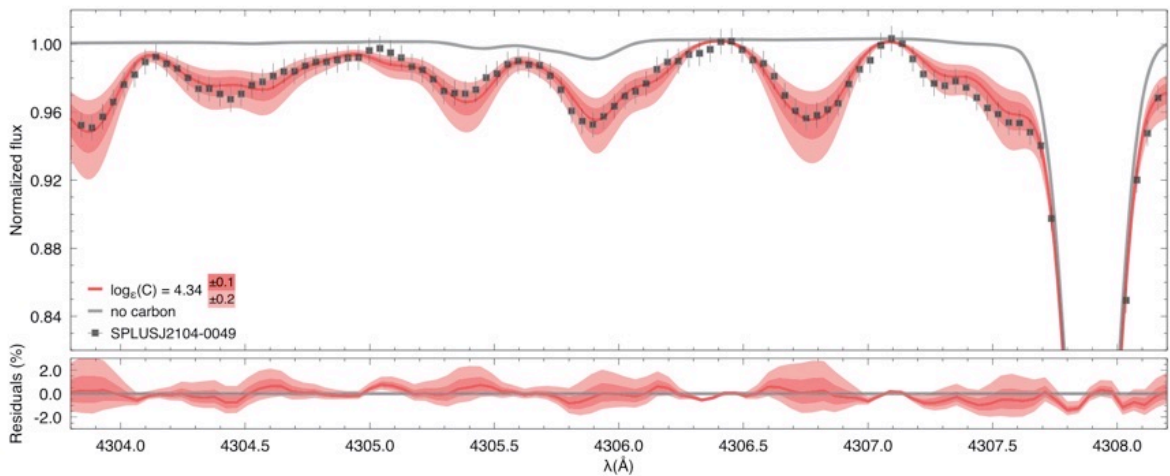




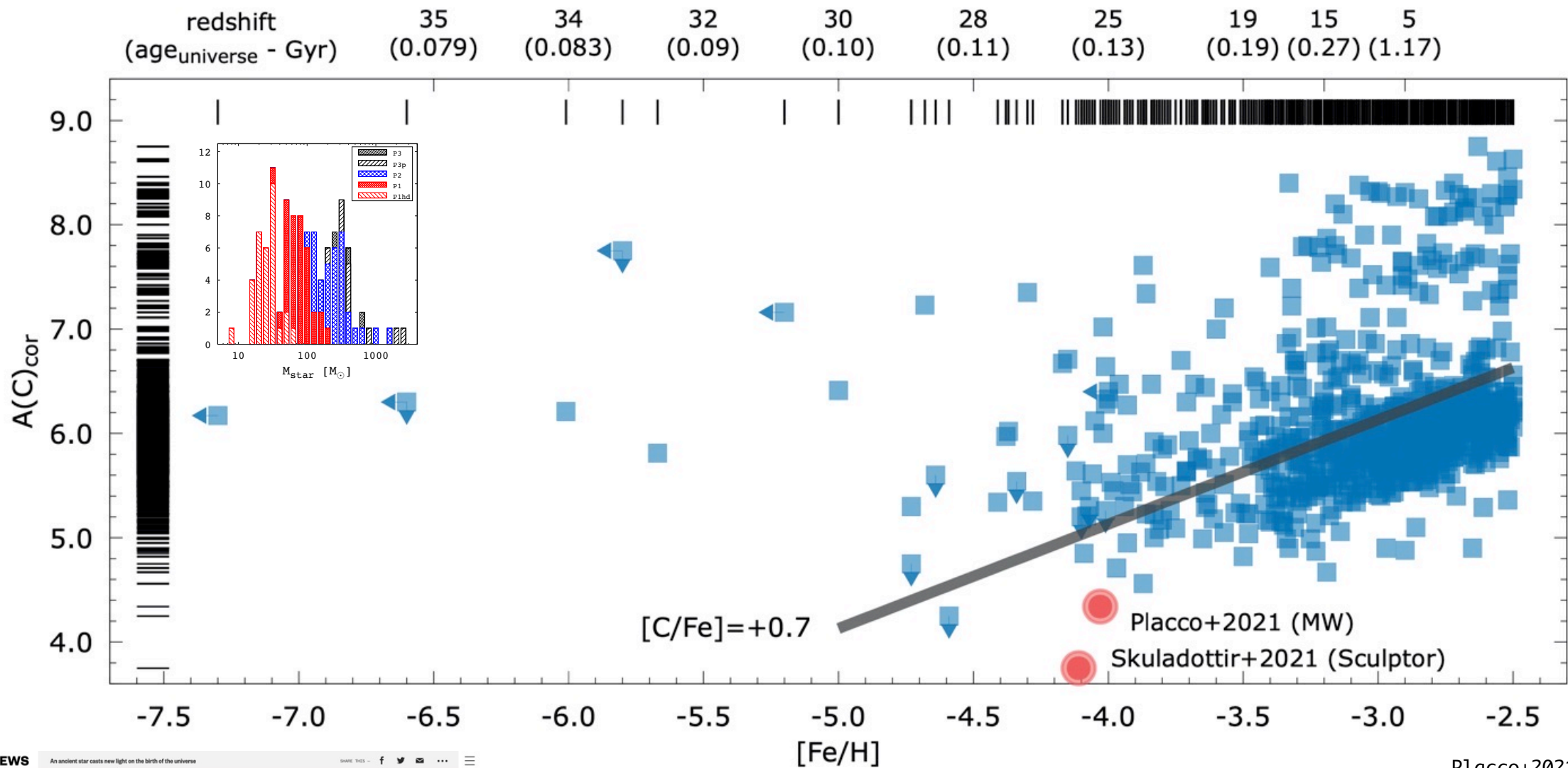
SPLUS J210428.01-004934.2



SPLUS J2104-0049 → Lowest carbon ever measured for a MW UMP



Milky Way Science with cosmological implications



Placco+2021

Narrow-band photometry:

- Accurate T_{eff} , $\log g$, and $[\text{Fe}/\text{H}]$
- Selected chemical abundances (C, Mg, Ca, N)
- Targeting for massive spectroscopic surveys

Stellar parameters and abundances:

- Statistics on metal-poor stars (10^7 stars)
- Conduct detailed chemical studies \rightarrow GHOST/MIKE/...

Near-Field Cosmology:

- Provides pieces to our large collective “Astro Puzzle”
- Potential for discovery and “incremental science”



Extra: Ca II H+K Narrowband filter on DECam. A case study

