

GC Report

Masruk

October 21, 2024

Contents

1	Cluster Data	2
2	Individual Cluster and analysis	4
2.1	NGC0104	4
2.2	NGC0288	5
2.3	NGC0362	6
2.4	NGC1851	7
2.5	NGC2298	8
2.6	NGC2808	9
2.7	NGC3201	10
2.8	NGC4590	11
2.9	NGC5024	12
2.10	NGC5053	13
2.11	NGC5272	14
2.12	NGC5466	15
2.13	NGC5904	16
2.14	NGC6093	17
2.15	NGC6121	18
2.16	NGC6144	19
2.17	NGC6171	20
2.18	NGC6205	21
2.19	NGC6218	22
2.20	NGC6254	23
2.21	NGC6304	24
2.22	NGC6341	25
2.23	NGC6388	26
2.24	NGC6715	27
2.25	NGC6717	28
2.26	NGC6723	29
2.27	NGC6752	30
2.28	NGC6838	31
2.29	NGC7078	32
2.30	NGC7089	33

1 Cluster Data

Following table shows comparative information on Metallicity [Fe/H] and Alpha Abundance [α/Fe] of the globular cluster observed by APOGEE.

Cluster Name	$N_{P_i, 90\%}$	Mean [Fe/H]	Median [Fe/H]	Std [Fe/H]	Mean [α/Fe]	Median [α/Fe]	Std [α/Fe]	N_{total}
Djorg_2	4	-1.06	-1.07	0.03	0.27	0.27	0.02	10
FSR1758	14	-1.44	-1.41	0.09	0.27	0.27	0.05	15
HP1	14	-1.22	-1.22	0.17	0.20	0.20	0.05	17
Liller1	3	-0.15	-0.08	0.33	0.04	0.02	0.02	30
NGC0104	292	-0.75	-0.75	0.06	0.28	0.28	0.02	302
NGC0288	43	-1.29	-1.27	0.07	0.28	0.29	0.03	43
NGC0362	68	-1.12	-1.11	0.06	0.13	0.13	0.04	70
NGC1851	67	-1.15	-1.12	0.18	0.20	0.17	0.13	71
NGC1904	39	-1.52	-1.52	0.13	0.13	0.13	0.07	40
NGC2298	12	-1.85	-1.83	0.08	0.19	0.24	0.12	12
NGC2808	129	-1.08	-1.09	0.08	0.13	0.16	0.08	132
NGC3201	209	-1.39	-1.36	0.13	0.19	0.20	0.11	217
NGC4147	3	-1.63	-1.66	0.06	0.23	0.24	0.04	3
NGC4590	38	-2.22	-2.23	0.09	0.24	0.25	0.10	41
NGC5024	39	-1.90	-1.90	0.09	0.25	0.24	0.09	41
NGC5053	17	-2.21	-2.22	0.11	0.24	0.25	0.10	17
NGC5139	1844	-1.61	-1.67	0.25	0.24	0.26	0.12	1864
NGC5272	295	-1.43	-1.41	0.10	0.18	0.19	0.08	299
NGC5466	17	-1.81	-1.80	0.09	0.16	0.16	0.11	17
NGC5634	2	-1.72	-1.72	0.06	0.20	0.20	0.06	2
NGC5904	258	-1.20	-1.20	0.10	0.19	0.20	0.06	259
NGC6093	3	-1.61	-1.61	0.00	0.25	0.25	0.00	3
NGC6121	218	-1.08	-1.05	0.10	0.33	0.33	0.04	224
NGC6144	1	-1.82	-1.82	0.00	0.47	0.47	0.00	1
NGC6171	60	-1.02	-0.99	0.11	0.32	0.32	0.04	65
NGC6205	144	-1.48	-1.48	0.09	0.15	0.16	0.09	152
NGC6218	105	-1.28	-1.27	0.06	0.28	0.29	0.04	107
NGC6229	8	-1.24	-1.26	0.07	0.18	0.20	0.08	11
NGC6254	86	-1.51	-1.51	0.07	0.21	0.25	0.09	87
NGC6273	78	-1.71	-1.72	0.14	0.16	0.17	0.09	81
NGC6293	20	-2.09	-2.07	0.08	0.14	0.13	0.12	20
NGC6304	24	-0.48	-0.48	0.05	0.24	0.25	0.04	34
NGC6316	13	-0.76	-0.76	0.03	0.25	0.25	0.03	24
NGC6341	72	-2.24	-2.23	0.08	0.18	0.17	0.15	80
NGC6380	18	-0.79	-0.78	0.08	0.27	0.27	0.03	28
NGC6388	63	-0.50	-0.49	0.13	0.06	0.06	0.04	75
NGC6397	182	-2.03	-2.02	0.06	0.19	0.17	0.10	187
NGC6401	2	-0.90	-0.90	0.42	0.39	0.39	0.00	7
NGC6441	8	-0.52	-0.51	0.04	0.19	0.19	0.07	25
NGC6517	1	-1.58	-1.58	0.00	0.25	0.25	0.00	1
NGC6522	6	-1.17	-1.19	0.08	0.20	0.19	0.03	15
NGC6540	3	-1.05	-1.05	0.01	0.23	0.23	0.07	6
NGC6544	26	-1.52	-1.49	0.09	0.22	0.21	0.05	27

NGC6553	8	-0.20	-0.20	0.02	0.16	0.15	0.02	17
NGC6558	5	-1.00	-1.05	0.23	0.24	0.22	0.03	6
NGC6569	10	-0.96	-0.99	0.07	0.26	0.27	0.06	14
NGC6642	7	-0.91	-1.10	0.50	0.24	0.27	0.10	12
NGC6656	390	-1.71	-1.70	0.10	0.22	0.21	0.10	412
NGC6715	90	-0.97	-1.21	0.55	0.06	0.07	0.11	1809
NGC6717	3	-1.16	-1.13	0.04	0.28	0.28	0.01	5
NGC6723	9	-1.04	-1.03	0.05	0.25	0.25	0.03	9
NGC6752	149	-1.49	-1.47	0.09	0.20	0.21	0.08	152
NGC6760	9	-0.75	-0.74	0.04	0.26	0.27	0.02	11
NGC6809	97	-1.77	-1.76	0.08	0.21	0.20	0.08	98
NGC6838	120	-0.75	-0.75	0.05	0.28	0.29	0.03	129
NGC7078	151	-2.29	-2.30	0.10	0.19	0.20	0.16	155
NGC7089	33	-1.47	-1.48	0.06	0.17	0.16	0.06	36
Pal1	2	-0.45	-0.45	0.00	0.10	0.10	0.02	3
Pal5	4	-1.24	-1.23	0.06	0.17	0.18	0.02	12
Pal6	6	-0.93	-0.94	0.08	0.28	0.28	0.02	6
Rup106	2	-1.31	-1.31	0.03	-0.05	-0.05	0.01	2
Ter10	1	-1.62	-1.62	0.00	0.17	0.17	0.00	2
Ter12	1	-0.56	-0.56	0.00	0.29	0.29	0.00	6
Ter2	3	-0.86	-0.89	0.05	0.28	0.28	0.01	5
Ter4	2	-1.37	-1.37	0.08	0.17	0.17	0.10	3
Ter5	4	-0.81	-0.67	0.29	0.17	0.21	0.12	24
Ter9	10	-1.38	-1.41	0.06	0.15	0.13	0.07	23
Ton2	7	-0.80	-0.63	0.34	0.22	0.25	0.08	11

Table 1: Cluster Data: Metallicity, Alpha Abundance, and Number of Stars with $N_{MP} \geq 90\%$

Among these clusters, Some of them have HST photometry data. I have separated them by looking into Schiavon catalogue (table1)[1] and the clusters are:

Cluster Name	$N_{VB_PROB \geq 90\%}$	$\langle [Fe/H] \rangle$	[Fe/H]	$\sigma_{[Fe/H]}$	$\langle [\alpha/Fe] \rangle$	[α/Fe]	$\sigma_{[\alpha/Fe]}$	N_{total}
NGC0104	292	-0.75	-0.75	0.06	0.28	0.28	0.02	302
NGC0288	43	-1.29	-1.27	0.07	0.28	0.29	0.03	43
NGC0362	68	-1.12	-1.11	0.06	0.13	0.13	0.04	70
NGC1851	67	-1.15	-1.12	0.18	0.20	0.17	0.13	71
NGC2298	12	-1.85	-1.83	0.08	0.19	0.24	0.12	12
NGC2808	129	-1.08	-1.09	0.08	0.13	0.16	0.08	132
NGC3201	209	-1.39	-1.36	0.13	0.19	0.20	0.11	217
NGC4590	38	-2.22	-2.23	0.09	0.24	0.25	0.10	41
NGC5024	39	-1.90	-1.90	0.09	0.25	0.24	0.09	41
NGC5053	17	-2.21	-2.22	0.11	0.24	0.25	0.10	17
NGC5272	295	-1.43	-1.41	0.10	0.18	0.19	0.08	299
NGC5466	17	-1.81	-1.80	0.09	0.16	0.16	0.11	17
NGC5904	258	-1.20	-1.20	0.10	0.19	0.20	0.06	259
NGC6093	3	-1.61	-1.61	0.00	0.25	0.25	0.00	3
NGC6121	218	-1.08	-1.05	0.10	0.33	0.33	0.04	224
NGC6144	1	-1.82	-1.82	0.00	0.47	0.47	0.00	1
NGC6171	60	-1.02	-0.99	0.11	0.32	0.32	0.04	65
NGC6205	144	-1.48	-1.48	0.09	0.15	0.16	0.09	152
NGC6218	105	-1.28	-1.27	0.06	0.28	0.29	0.04	107
NGC6254	86	-1.51	-1.51	0.07	0.21	0.25	0.09	87
NGC6304	24	-0.48	-0.48	0.05	0.24	0.25	0.04	34
NGC6341	72	-2.24	-2.23	0.08	0.18	0.17	0.15	80
NGC6388	63	-0.50	-0.49	0.13	0.06	0.06	0.04	75
NGC6715	90	-0.97	-1.21	0.55	0.06	0.07	0.11	1809
NGC6717	3	-1.16	-1.13	0.04	0.28	0.28	0.01	5
NGC6723	9	-1.04	-1.03	0.05	0.25	0.25	0.03	9
NGC6752	149	-1.49	-1.47	0.09	0.20	0.21	0.08	152
NGC6838	120	-0.75	-0.75	0.05	0.28	0.29	0.03	129
NGC7078	151	-2.29	-2.30	0.10	0.19	0.20	0.16	155
NGC7089	33	-1.47	-1.48	0.06	0.17	0.16	0.06	36

Table 2: Cluster Data: Metallicity, Alpha Abundance, and N_{MP} 90%

2 Individual Cluster and analysis

2.1 NGC0104

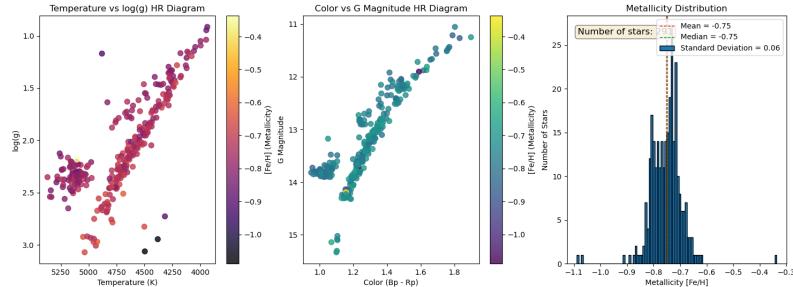


Figure 1: Metallicity for NGC0104

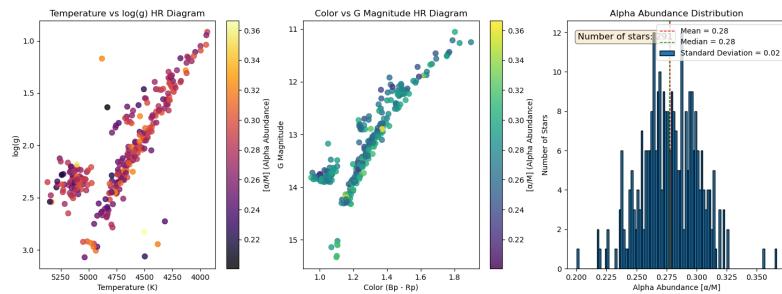


Figure 2: Alpha abundance distribution for NGC0104

Figure 3: Metallicity and Alpha abundance distribution for NGC0104

2.2 NGC0288

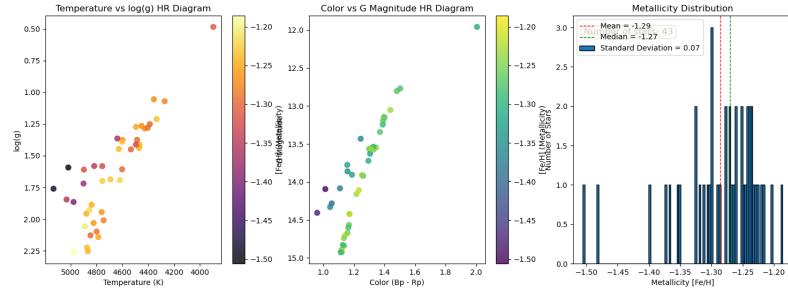


Figure 4: Metallicity for NGC0288

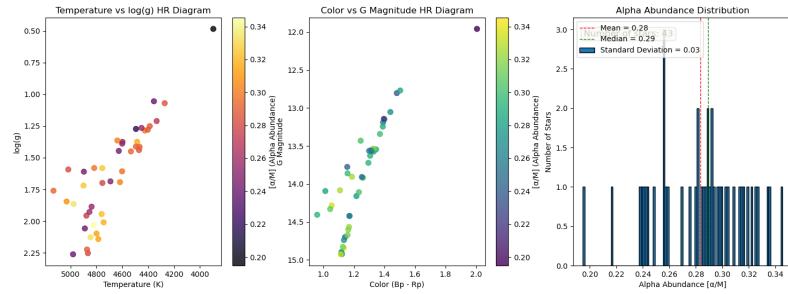


Figure 5: Alpha abundance distribution for NGC0288

Figure 6: Metallicity and Alpha abundance distribution for NGC0288

2.3 NGC0362

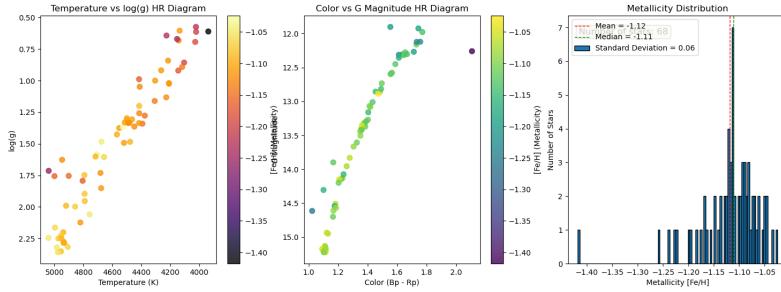


Figure 7: Metallicity for NGC0362

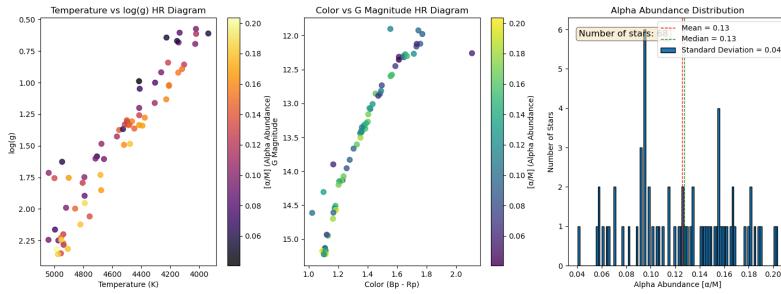


Figure 8: Alpha abundance distribution for NGC0362

Figure 9: Metallicity and Alpha abundance distribution for NGC0362

2.4 NGC1851

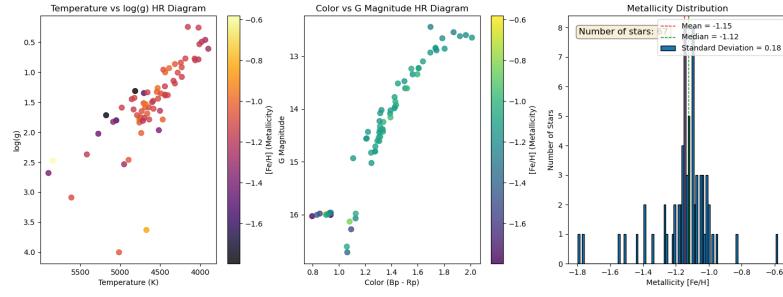


Figure 10: Metallicity for NGC1851

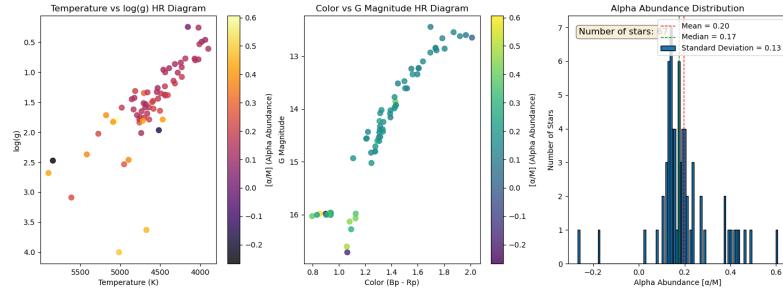


Figure 11: Alpha abundance distribution for NGC1851

Figure 12: Metallicity and Alpha abundance distribution for NGC1851

2.5 NGC2298

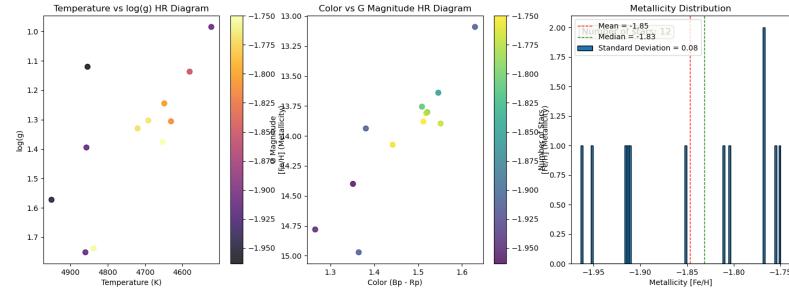


Figure 13: Metallicity for NGC2298

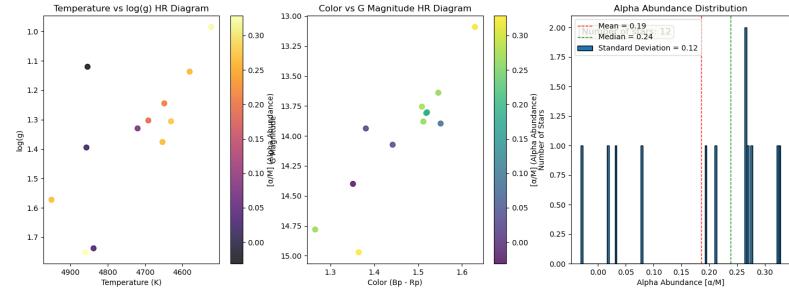


Figure 14: Alpha abundance distribution for NGC2298

Figure 15: Metallicity and Alpha abundance distribution for NGC2298

2.6 NGC2808

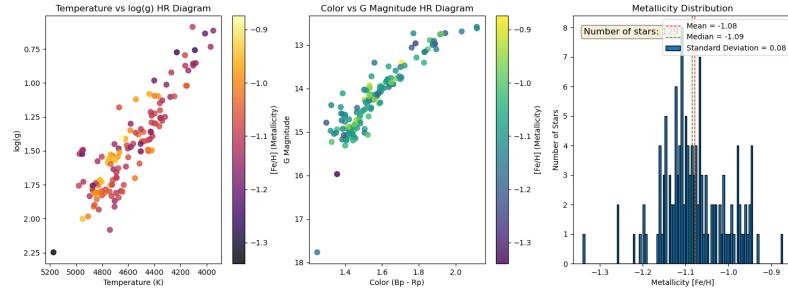


Figure 16: Metallicity for NGC2808

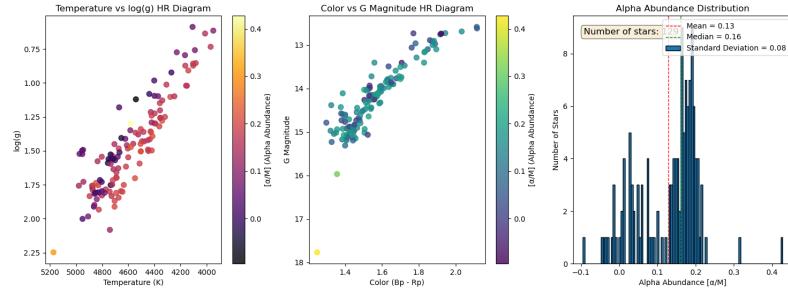


Figure 17: Alpha abundance distribution for NGC2808

Figure 18: Metallicity and Alpha abundance distribution for NGC2808

2.7 NGC3201

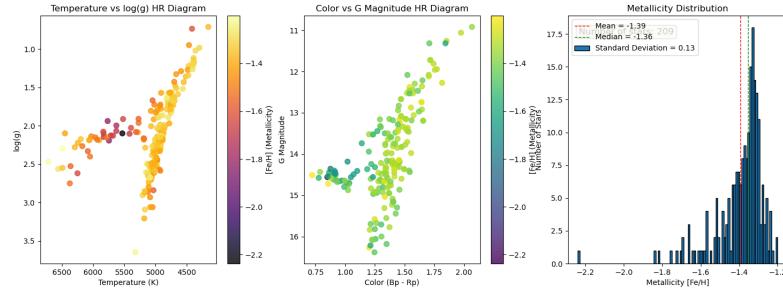


Figure 19: Metallicity for NGC3201

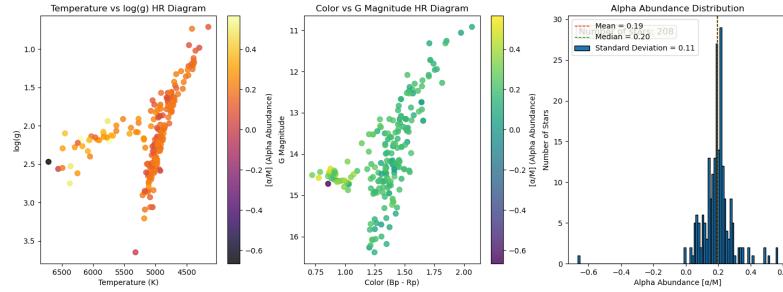


Figure 20: Alpha abundance distribution for NGC3201

Figure 21: Metallicity and Alpha abundance distribution for NGC3201

2.8 NGC4590

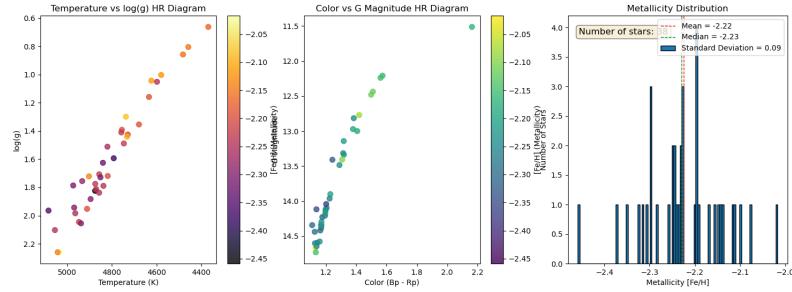


Figure 22: Metallicity for NGC4590

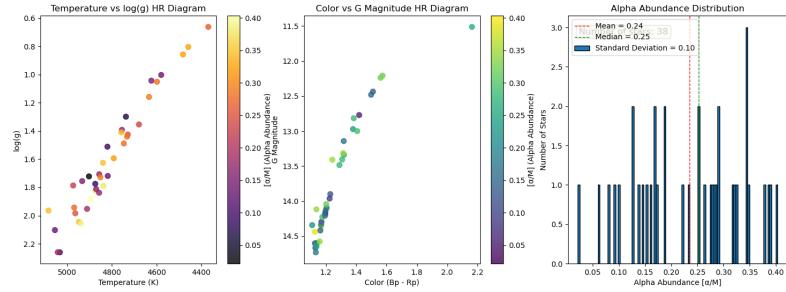


Figure 23: Alpha abundance distribution for NGC4590

Figure 24: Metallicity and Alpha abundance distribution for NGC4590

2.9 NGC5024

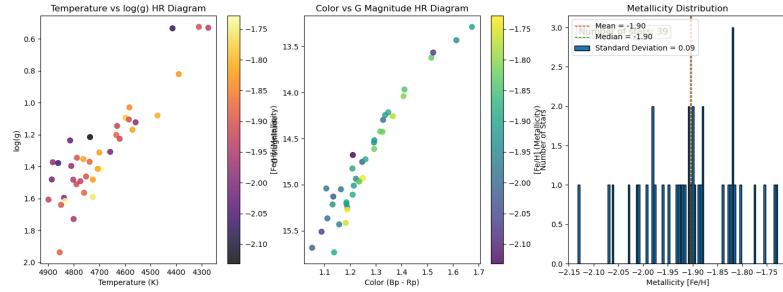


Figure 25: Metallicity for NGC5024

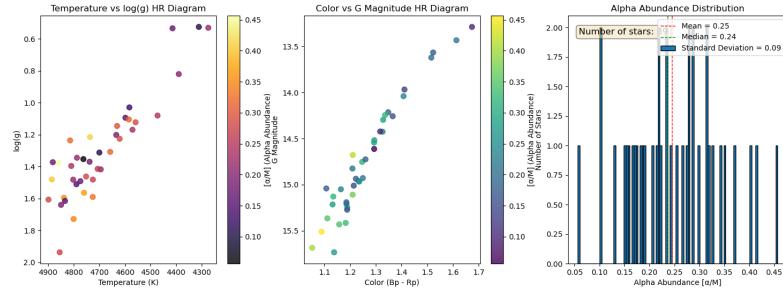


Figure 26: Alpha abundance distribution for NGC5024

Figure 27: Metallicity and Alpha abundance distribution for NGC5024

2.10 NGC5053

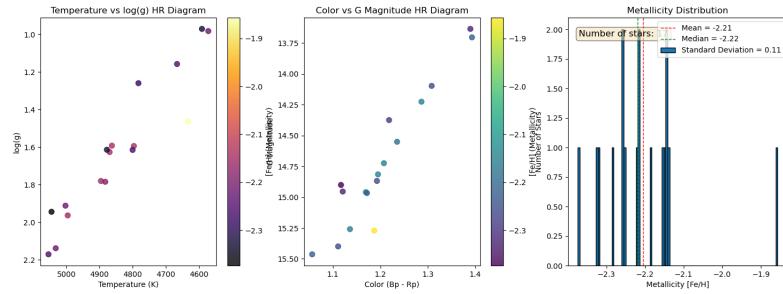


Figure 28: Metallicity for NGC5053

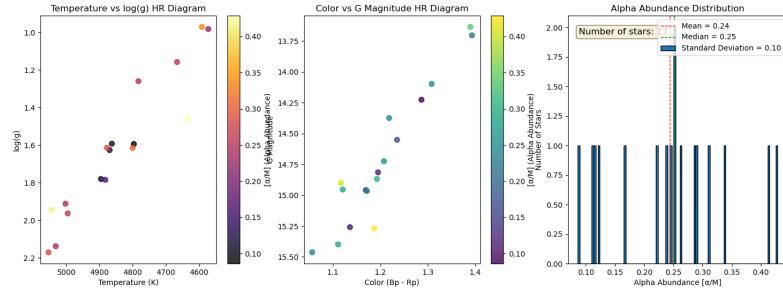


Figure 29: Alpha abundance distribution for NGC5053

Figure 30: Metallicity and Alpha abundance distribution for NGC5053

2.11 NGC5272

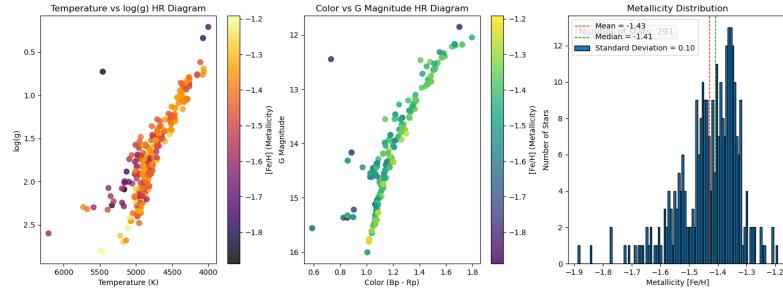


Figure 31: Metallicity for NGC5272

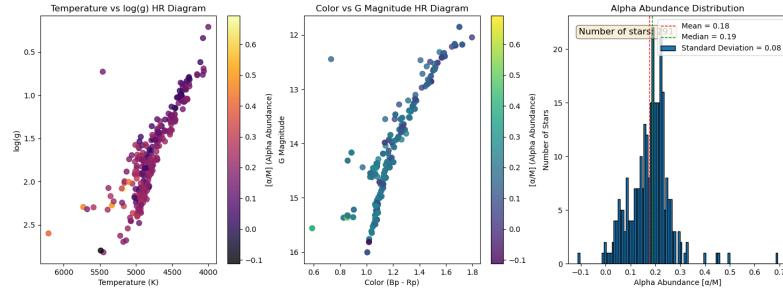


Figure 32: Alpha abundance distribution for NGC5272

Figure 33: Metallicity and Alpha abundance distribution for NGC5272

2.12 NGC5466

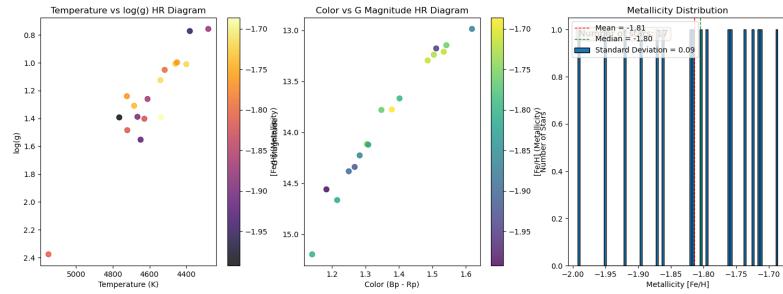


Figure 34: Metallicity for NGC5466

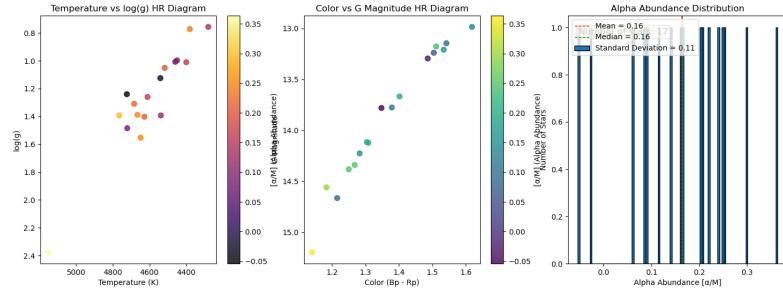


Figure 35: Alpha abundance distribution for NGC5466

Figure 36: Metallicity and Alpha abundance distribution for NGC5466

2.13 NGC5904

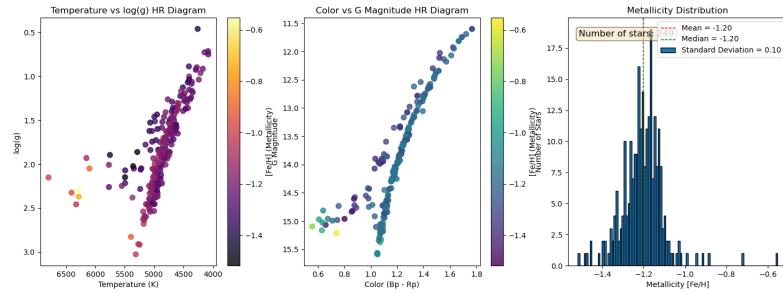


Figure 37: Metallicity for NGC5904

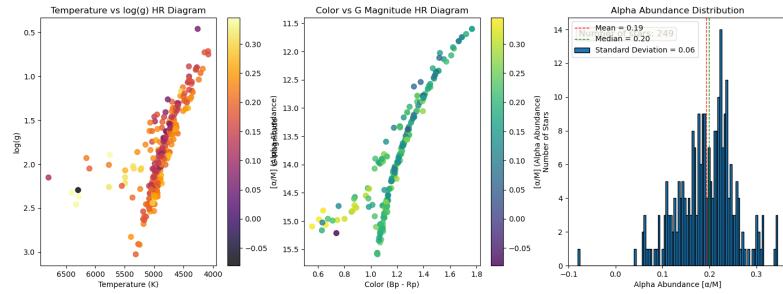


Figure 38: Alpha abundance distribution for NGC5904

Figure 39: Metallicity and Alpha abundance distribution for NGC5904

2.14 NGC6093

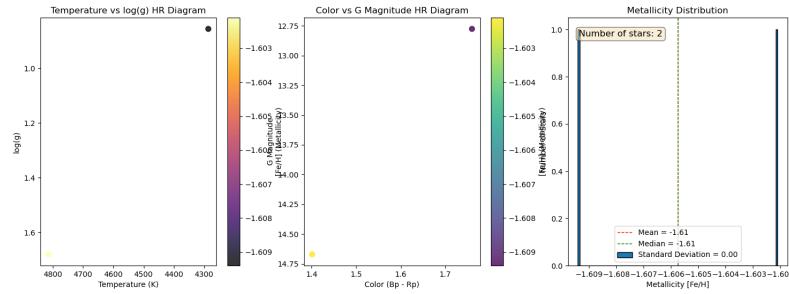


Figure 40: Metallicity for NGC6093

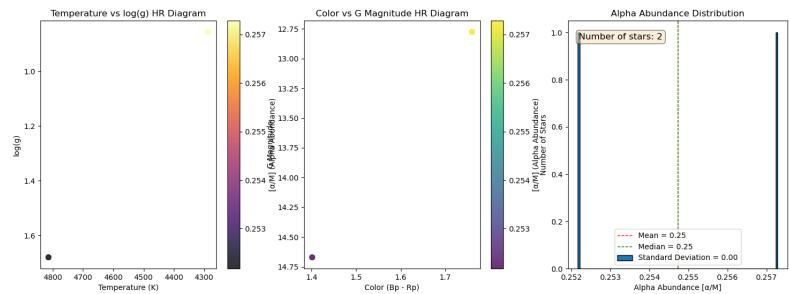


Figure 41: Alpha abundance distribution for NGC6093

Figure 42: Metallicity and Alpha abundance distribution for NGC6093

2.15 NGC6121

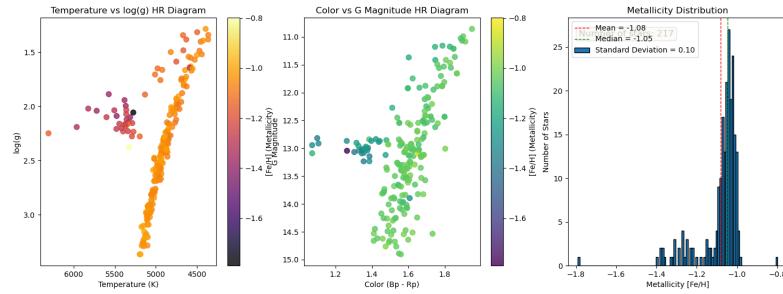


Figure 43: Metallicity for NGC6121

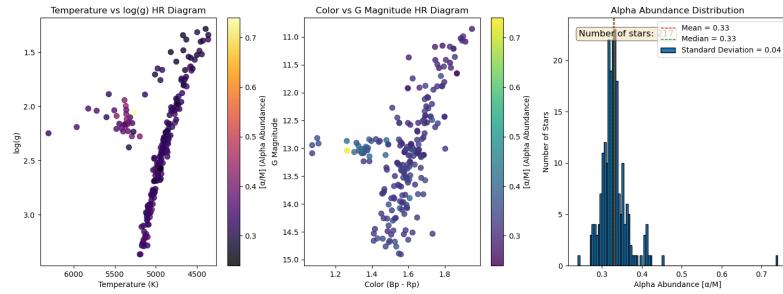


Figure 44: Alpha abundance distribution for NGC6121

Figure 45: Metallicity and Alpha abundance distribution for NGC6121

2.16 NGC6144

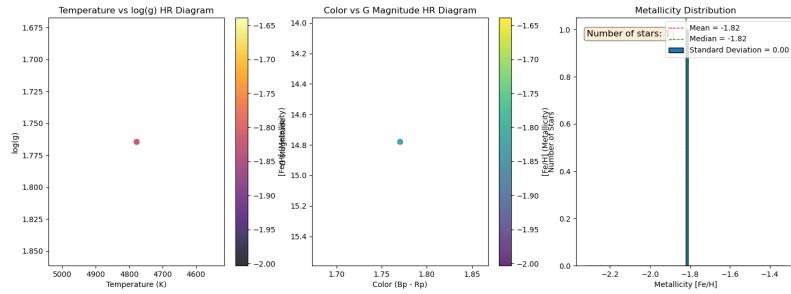


Figure 46: Metallicity for NGC6144

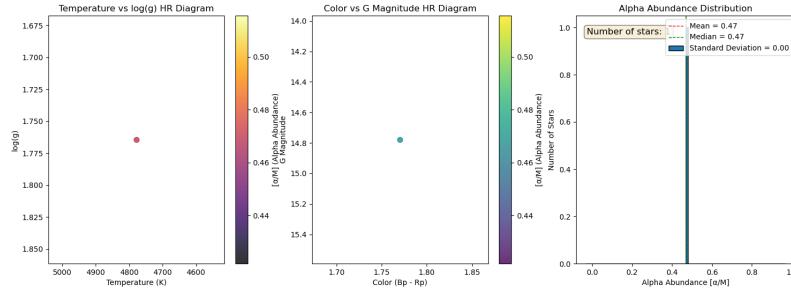


Figure 47: Alpha abundance distribution for NGC6144

Figure 48: Metallicity and Alpha abundance distribution for NGC6144

2.17 NGC6171

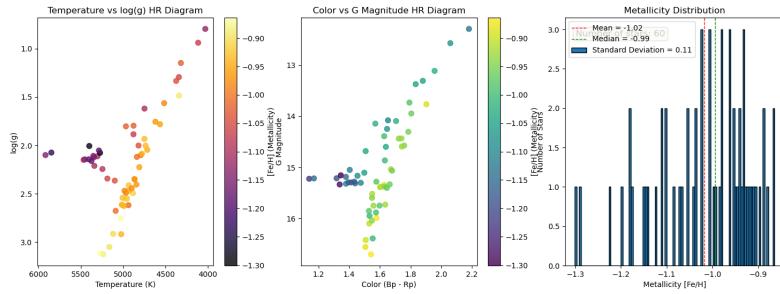


Figure 49: Metallicity for NGC6171

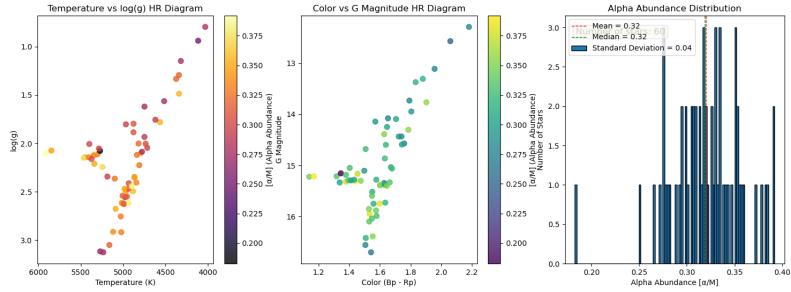


Figure 50: Alpha abundance distribution for NGC6171

Figure 51: Metallicity and Alpha abundance distribution for NGC6171

2.18 NGC6205

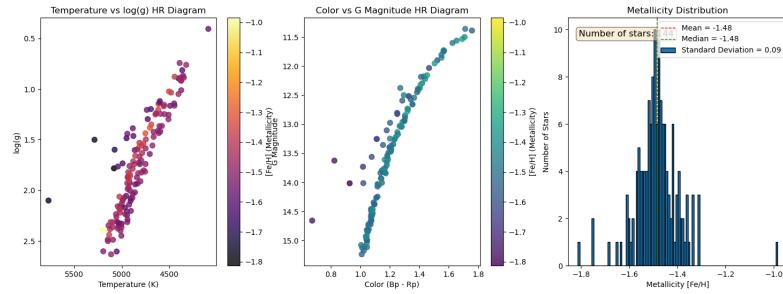


Figure 52: Metallicity for NGC6205

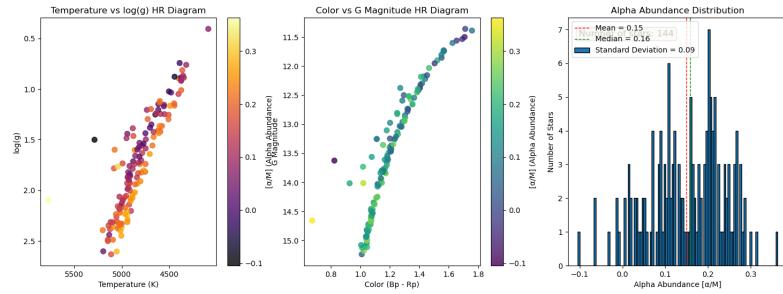


Figure 53: Alpha abundance distribution for NGC6205

Figure 54: Metallicity and Alpha abundance distribution for NGC6205

2.19 NGC6218

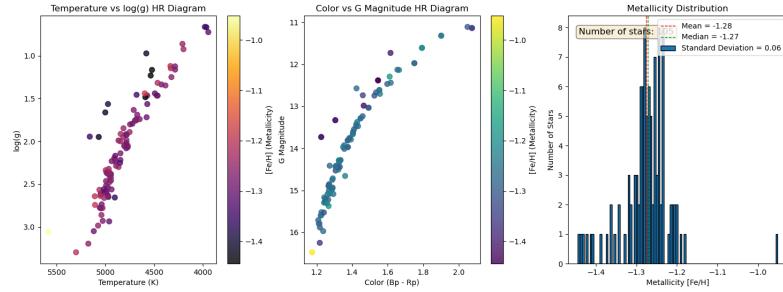


Figure 55: Metallicity for NGC6218

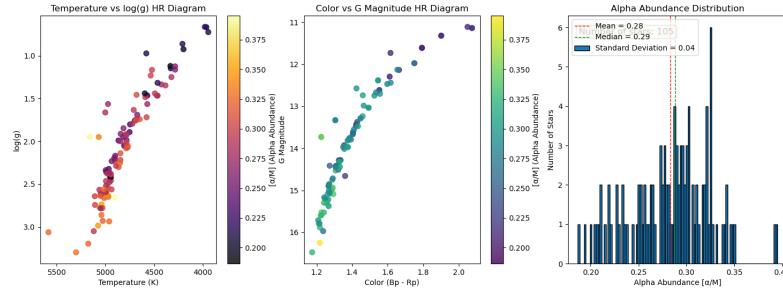


Figure 56: Alpha abundance distribution for NGC6218

Figure 57: Metallicity and Alpha abundance distribution for NGC6218

2.20 NGC6254

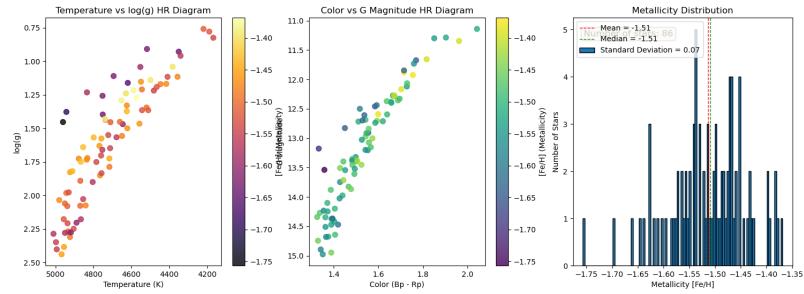


Figure 58: Metallicity for NGC6254

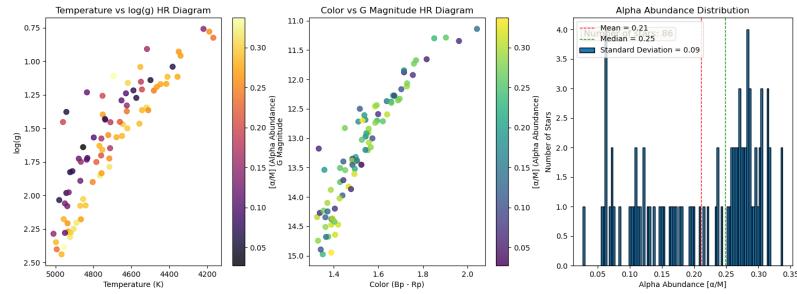


Figure 59: Alpha abundance distribution for NGC6254

Figure 60: Metallicity and Alpha abundance distribution for NGC6254

2.21 NGC6304

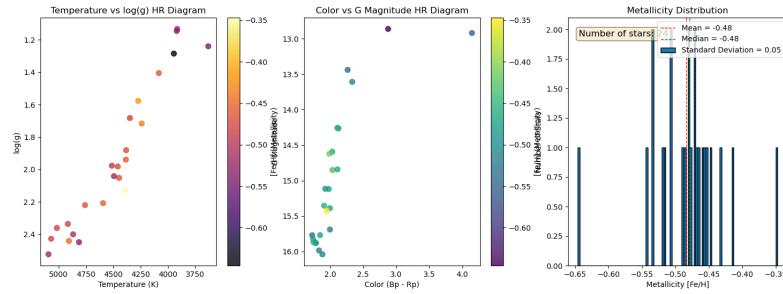


Figure 61: Metallicity for NGC6304

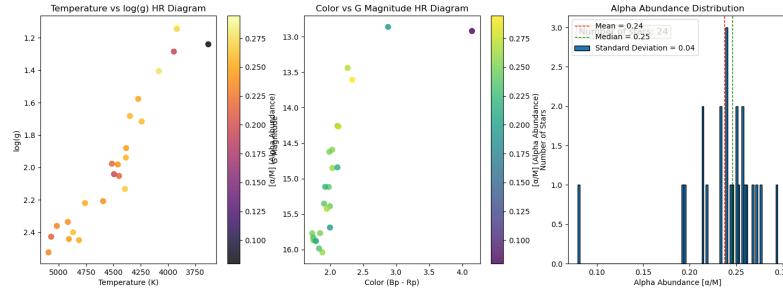


Figure 62: Alpha abundance distribution for NGC6304

Figure 63: Metallicity and Alpha abundance distribution for NGC6304

2.22 NGC6341

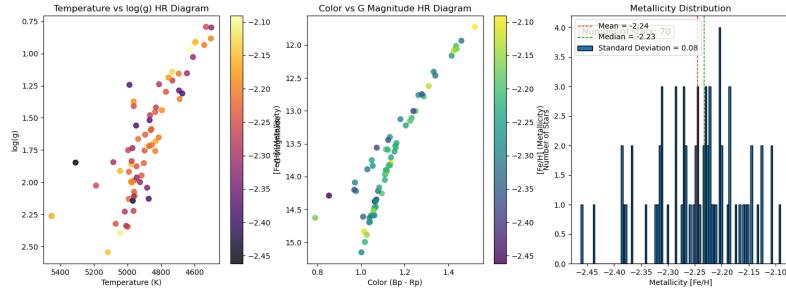


Figure 64: Metallicity for NGC6341

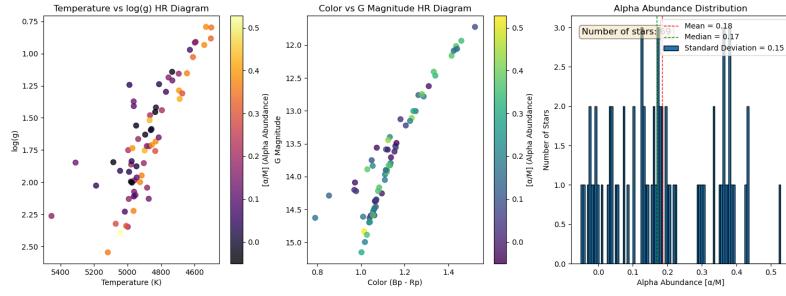


Figure 65: Alpha abundance distribution for NGC6341

Figure 66: Metallicity and Alpha abundance distribution for NGC6341

2.23 NGC6388

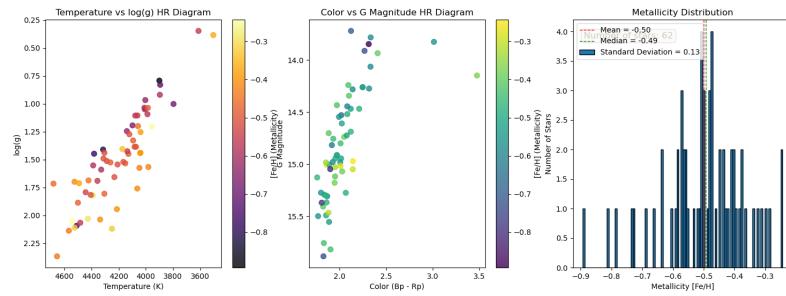


Figure 67: Metallicity for NGC6388

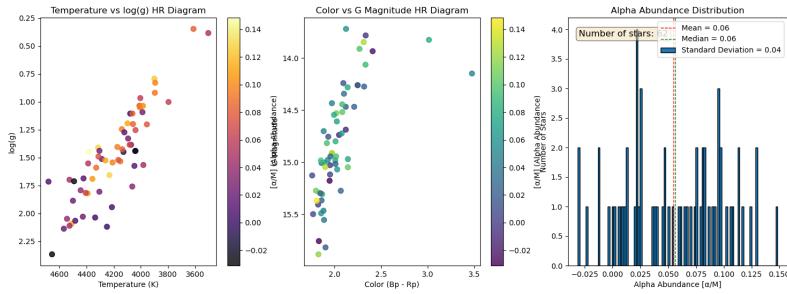


Figure 68: Alpha abundance distribution for NGC6388

Figure 69: Metallicity and Alpha abundance distribution for NGC6388

2.24 NGC6715

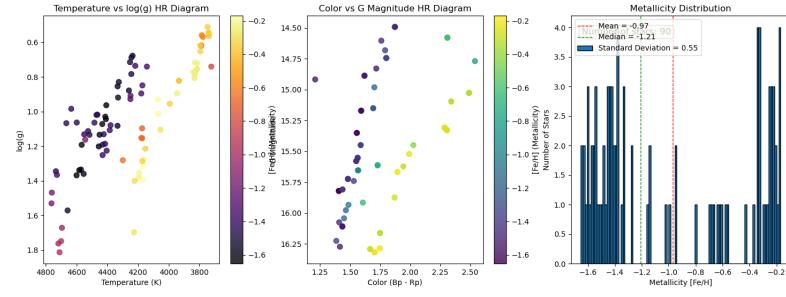


Figure 70: Metallicity for NGC6715

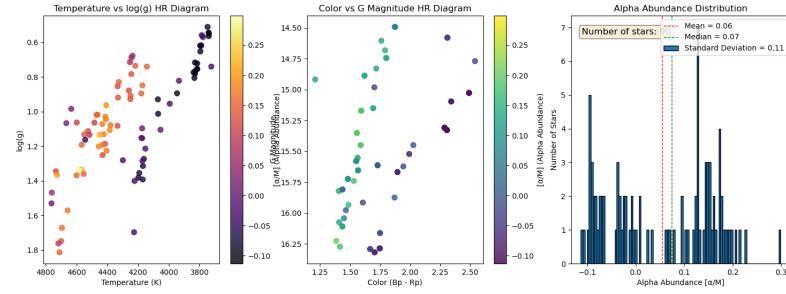


Figure 71: Alpha abundance distribution for NGC6715

Figure 72: Metallicity and Alpha abundance distribution for NGC6715

2.25 NGC6717

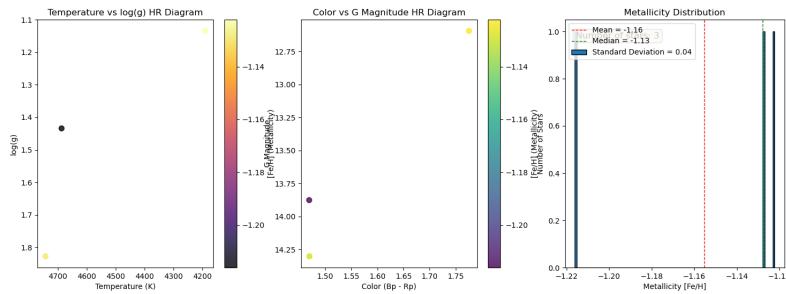


Figure 73: Metallicity for NGC6717

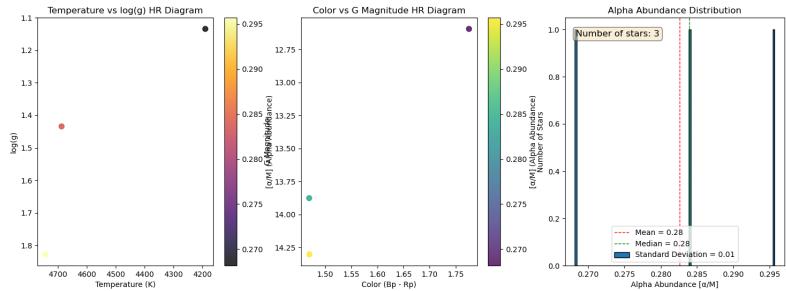


Figure 74: Alpha abundance distribution for NGC6717

Figure 75: Metallicity and Alpha abundance distribution for NGC6717

2.26 NGC6723

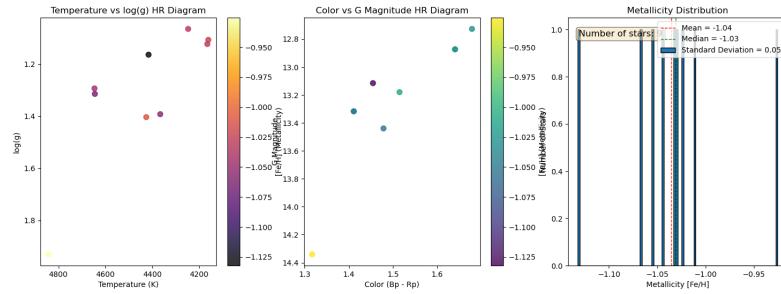


Figure 76: Metallicity for NGC6723

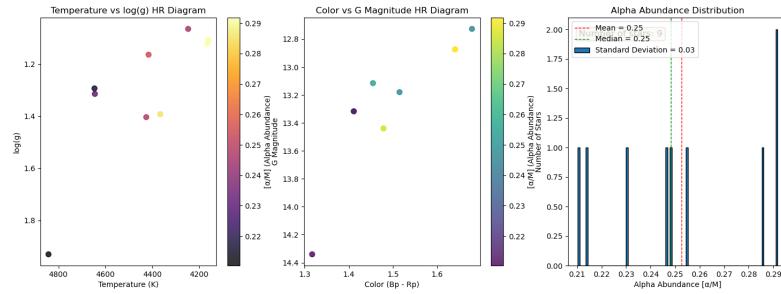


Figure 77: Alpha abundance distribution for NGC6723

Figure 78: Metallicity and Alpha abundance distribution for NGC6723

2.27 NGC6752

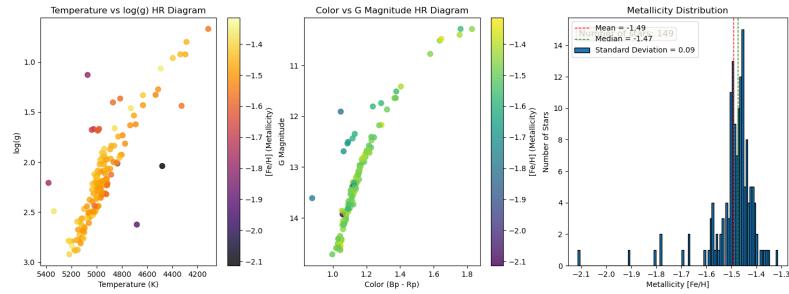


Figure 79: Metallicity for NGC6752

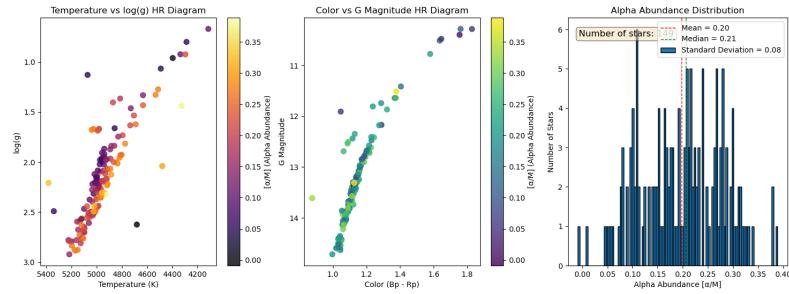


Figure 80: Alpha abundance distribution for NGC6752

Figure 81: Metallicity and Alpha abundance distribution for NGC6752

2.28 NGC6838

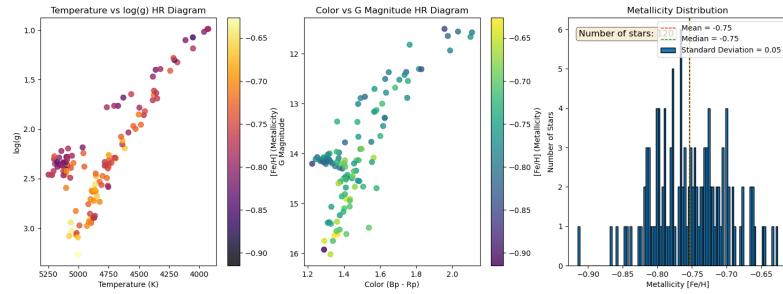


Figure 82: Metallicity for NGC6838

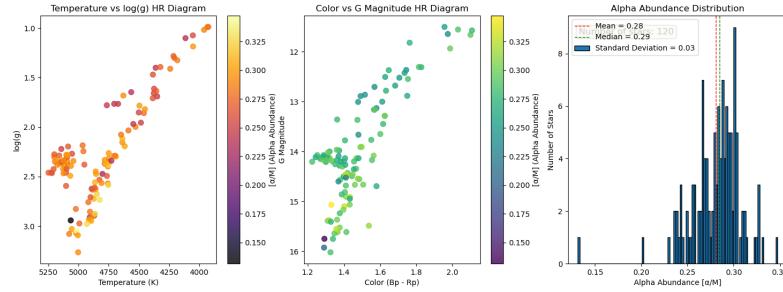


Figure 83: Alpha abundance distribution for NGC6838

Figure 84: Metallicity and Alpha abundance distribution for NGC6838

2.29 NGC7078

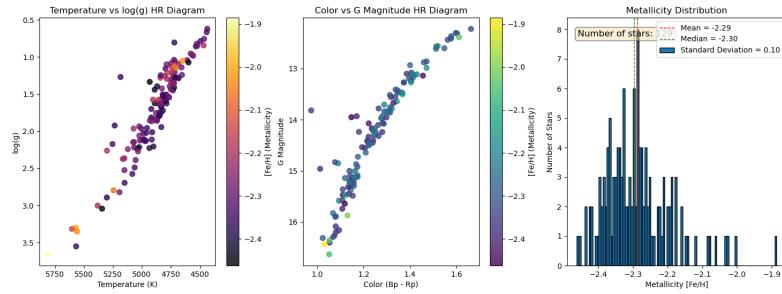


Figure 85: Metallicity for NGC7078

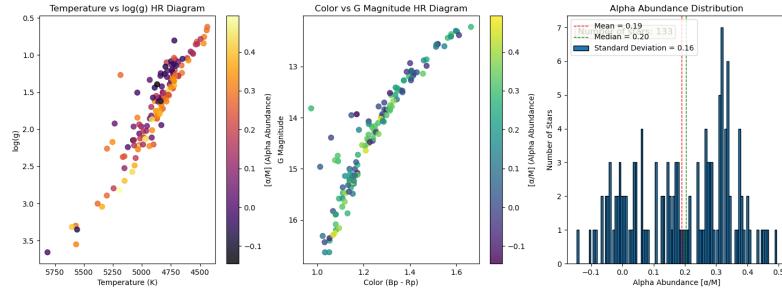


Figure 86: Alpha abundance distribution for NGC7078

Figure 87: Metallicity and Alpha abundance distribution for NGC7078

2.30 NGC7089

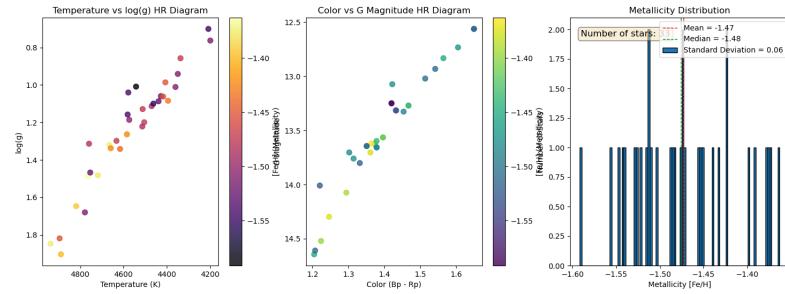


Figure 88: Metallicity for NGC7089

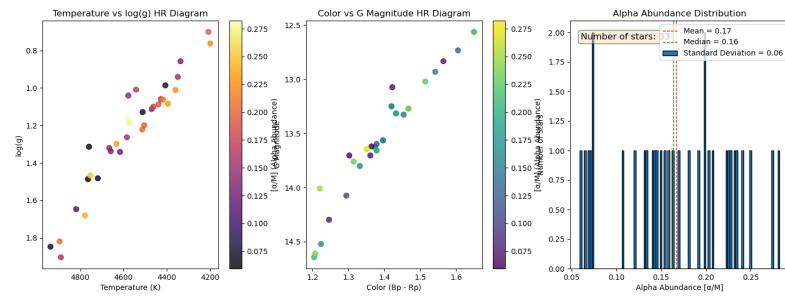


Figure 89: Alpha abundance distribution for NGC7089

Figure 90: Metallicity and Alpha abundance distribution for NGC7089

References

- [1] Ricardo P Schiavon, Siân G Phillips, Natalie Myers, Danny Horta, Dante Minniti, Carlos Allende Prieto, Borja Anguiano, Rachael L Beaton, Timothy C Beers, Joel R Brownstein, Roger E Cohen, José G Fernández-Trincado, Peter M Frinchaboy, Henrik Jönsson, Shobhit Kisku, Richard R Lane, Steven R Majewski, Andrew C Mason, Szabolcs Mészáros, and Guy S Stringfellow. The APOGEE value-added catalogue of Galactic globular cluster stars. *Monthly Notices of the Royal Astronomical Society*, 528(2):1393–1407, 10 2023.