Observational evidence that disk was formed from discrete clusters with unique multi-abundance signatures

M. Ness[1]+,

ness@mpia.de

ABSTRACT

Text is gibberish; column captions are gibberish. Table of lowest 100 chi2 values are given. This is remarkable and confusing (vr,vt,vz of many pairs).

Subject headings: Galaxy: stellar content — methods: data analysis — methods: statistical — stars: evolution — stars: fundamental parameters — techniques: spectroscopic

1.

2. Introduction

We know that stars move from their birth radius, but not known if this is a perturbing process or else is the dominant effect in the disk as it is today. observationally we know that at a given age there is a wide metallicity range of stars (cite an AMR paper), that the youngest stars show tight relationship between [Fe/H] and Rgal (Cepheid paper) and that older stars show a weaker relationship (Ness 2016) than younger stars at a given [FE/H]-[alpha/FE] indicative at a given metallicity stars are distributed over a wider radial span as a consequence of moving from brith locations, (compared to cheeped plot). As radial migration process changes the orbit radii without a boost in the eccentricity, there is then not kinematic signatures that are left and no structural changes to the disk; hence the challenge

[1]Max-Planck-Institut für Astronomie, Königstuhl 17, D-69117 Heidelberg, Germany

[2]Center for Cosmology and Particle Physics, Department of Phyics, New York University, 4 Washington Pl., room 424, New York, NY 10003, USA

[3]Center for Data Science, New York University, 726 Broadway, 7th Floor, New York, NY 10003, USA

[4]UCLAN

in evaluating this process observationally. This has led to the field of galactic archeology - using detailed chemical abundances to find stars of common origin of birth. Conjecture by Freeman and Bland-Hawthron that stars in the disk are born in open clusters, which will have homogenous abundance and a unique abidance signature. Given this expectation, expect to be able to reconstruct the disk if you can locate stellar siblings, which is the mission of large high resolution spectroscopic surveys obtaining large numbers ($\sim$ 1 million stars) with measurements of 30 elements to probe litany of nucleosynthetic processes (Freeman 2012, da Silva 2015). Main challenges in this are precision until recently been not good enough, but now overcome (e.g. Hogg et al., 2016) and that systematic offsets as a function of (Teff, logy) in X/Fe measurements due to departures from non LTE (e.g. Yeisson , Karin) so whilst technical challenges in modelling overcome necessary to consider restricted parameter space in Teff, logg for comparison of multi-dimensional abundance space and also the numbers of stars; clusters are expected to be of size N x N solar masses, which means that in a samples of even hundreds of thousands of stars, only a few members of the same cluster - stellar siblings are to be expected to be found.

3. Data

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chi2	field	name	vhelio	vr	vt	vz	vgal	rgal	glon	glat	ra	dec	feh	age1	age2	ΔD
0.95	N188	2M00581691+8540183	-42.7	-8.7	225.4	-19.3	134.7	9.0	123.1	22.8	14.6	85.7	0.09	1.7	5.0	0.003
0.95	N188	2M00571844+8510288	-42.0	-16.3	237.3	-26.9	135.9	9.0	123.1	22.3	14.3	85.2	0.08	2.0	4.3	0.003
1.33	225+30	2M08544714+0423560	14.9	3.7	235.8	-2.5	-127.4	8.4	223.8	29.3	133.7	4.4	-0.05	4.5	6.1	0.475
1.33	203-12	2M05482584+0352065	14.3	-14.2	221.1	-1.3	-80.6	8.9	202.1	-12.1	87.1	3.9	-0.05	5.8	8.1	0.475
1.75	117+01	2M00025808+6441392	-111.8	-138.2	229.2	-107.6	89.4	8.8	117.8	2.3	0.7	64.7	-0.05	2.4	2.2	2.183
1.75	101-04	2M22205838+5242316	-116.4	86.5	84.4	-0.8	108.5	9.4	101.2	-3.7	335.2	52.7	-0.05	2.8	2.3	2.183
1.92	195-08	2M05495473+1133060	32.2	10.2	233.5	4.9	-38.8	9.4	195.5	-8.0	87.5	11.6	-0.14	2.6	4.8	1.645
1.92	180+08	2M06180216+3222569	44.4	30.6	244.1	27.3	34.8	11.0	180.4	7.8	94.5	32.4	-0.14	3.1	4.7	1.645
2.12	K09_081+11	2M19531723+4806297	-33.8	26.8	206.2	6.7	194.6	7.9	82.1	10.4	298.3	48.1	-0.07	4.6	4.1	1.305
2.12	SGRCMI+02	2M19003793-2832341	-43.8	38.3	247.2	6.5	-5.9	7.4	7.9	-14.4	285.2	-28.5	-0.07	3.0	3.2	1.305
2.12	K09_081+11	2M19531723+4806297	-33.8	26.8	206.2	6.7	194.6	7.9	82.1	10.4	298.3	48.1	-0.07	4.6	4.1	1.305
2.12	SGRCMI+02	2M19003793-2832341	-43.8	38.3	247.2	6.5	-5.9	7.4	7.9	-14.4	285.2	-28.5	-0.07	3.0	3.2	1.305
2.16	210+04	2M07040366+0519407	35.1	1.2	228.1	-1.8	-86.2	9.6	209.6	5.2	106.0	5.3	-0.35	3.9	5.6	0.93
2.16	198+08	2M06485300+1649020	35.8	-5.2	175.3	-9.9	-41.5	10.5	197.6	7.0	102.2	16.8	-0.35	3.5	4.9	0.93
2.21	195+08	2M06444398+1834061	35.6	20.2	298.6	-10.9	-34.0	11.2	195.6	6.9	101.2	18.6	-0.36	3.5	4.5	2.05
2.21	165-08	2M04355788+3630133	43.6	39.7	242.2	-27.3	92.7	9.6	165.2	-7.3	69.0	36.5	-0.36	5.3	6.6	2.05
2.23	060-08	2M20170607+2046092	43.4	-518.9	274.0	-111.0	248.2	7.0	61.4	-8.2	304.3	20.8	0.09	0.8	4.3	2.532
2.23	060+08	2M19174590+2750593	45.9	-2.3	276.7	-7.1	251.8	7.3	60.7	7.1	289.4	27.8	0.09	1.1	2.9	2.532
2.32	K18_070+14	2M19080789+3921555	-15.7	35.6	220.1	16.6	201.0	7.6	70.4	13.8	287.0	39.4	0.06	1.0	2.6	0.762
2.32	N6791	2M19292894+3808438	-15.7	-58.5	210.3	35.5	204.7	7.6	71.1	9.6	292.4	38.1	0.07	1.5	3.7	0.762
2.54	K12_074+15	2M19082492+4413063	-13.3	-10000.0	-10000.0	-10000.0	206.5	7.7	75.0	15.7	287.1	44.2	-0.05	18.1	12.9	0.303
2.54	K12_074+15	2M19050213+4302026	-14.8	-132.8	219.5	-5.9	203.6	7.7	73.6	15.8	286.3	43.0	-0.06	13.2	12.9	0.303
2.64	235+00	2M07335726-1903306	52.4	12.9	229.5	23.1	-141.9	9.3	234.7	0.4	113.5	-19.1	-0.08	3.5	5.7	1.694
2.64	HD46375	2M06355214+0618162	50.1	0.4	200.3	146.0	-58.1	10.9	205.5	-0.6	99.0	6.3	-0.09	3.7	5.4	1.694
2.57	229+04	2M07384010-1208499	90.8	97.9	347.9	-4.3	-89.3	11.6	229.2	4.7	114.7	-12.1	-0.21	3.9	4.2	3.87
2.57	180-08	2M05153258+2505421	96.2	78.4	234.2	-52.0	88.2	9.5	179.6	-7.7	78.9	25.1	-0.21	4.1	6.4	3.87
2.64	235+00	2M07335726-1903306	52.4	12.9	229.5	23.1	-141.9	9.3	234.7	0.4	113.5	-19.1	-0.08	3.5	5.7	1.694
2.64	HD46375	2M06355214+0618162	50.1	0.4	200.3	146.0	-58.1	10.9	205.5	-0.6	99.0	6.3	-0.09	3.7	5.4	1.694
2.66	158-12	2M03534855+3909193	-39.3	-25.5	210.5	6.7	38.9	9.7	157.3	-11.2	58.5	39.2	-0.15	4.6	5.2	1.056
2.66	158-12	2M03505457+3836561	-34.0	-38.9	240.1	9.2	44.2	8.7	157.2	-12.0	57.7	38.6	-0.15	4.3	5.7	1.056
2.66	N6819	2M19413027+4015218	2.1	-59.3	247.0	-60.1	226.2	7.7	74.1	8.5	295.4	40.3	0.01	1.0	2.1	0.293
2.66	N6819	2M19412386+4021444	2.1	-0.8	228.4	70.3	226.2	7.7	74.1	8.5	295.3	40.4	0.02	1.2	2.4	0.293
2.67	053-04	2M19444199+1622401	27.8	-22.7	245.2	161.3	218.9	6.8	53.6	-3.9	296.2	16.4	-0.2	3.9	3.5	4.593
2.67	210-08	2M06144969+0009450	43.0	-17.7	185.9	-35.3	-75.7	9.9	208.6	-8.1	93.7	0.2	-0.2	3.2	2.6	4.593
2.67	K10_079+12	2M19350084+4638487	-68.9	-10000.0	-10000.0	-10000.0	156.7	8.0	79.3	12.5	293.8	46.6	0.22	15.1	12.9	1.565
2.67	045+30	2M17161198+2403519	-66.4	72.8	167.9	12.1	85.8	6.9	46.1	30.9	259.0	24.1	0.23	17.4	12.9	1.565
2.7	124-04	2M00572667+5906069	-14.3	34.9	209.9	-42.6	172.8	9.1	123.7	-3.8	14.4	59.1	-0.04	1.2	3.2	0.256
2.7	116-04	2M00022314+5933161	-13.2	1.6	246.7	-16.3	189.3	9.0	116.7	-2.7	0.6	59.6	-0.04	1.0	2.0	0.256
2.76	173+00	2M05294740+3446050	59.6	54.4	237.6	-22.1	77.8	9.7	173.3	0.3	82.4	34.8	-0.31	3.6	8.1	3.339
2.76	053-04	2M19462231+1506531	50.6	-57.4	246.2	-7.6	239.3	6.9	52.7	-4.9	296.6	15.1	-0.31	4.2	6.6	3.339
2.81	229+04	2M07381753-1212008	57.8	41.3	258.5	-57.3	-122.5	9.8	229.2	4.6	114.6	-12.2	-0.07	11.9	12.9	6.439
2.81	045-06	2M19322825+0804298	59.0	11.2	210.4	-417.3	227.6	5.9	44.8	-5.3	293.1	8.1	-0.07	11.0	12.9	6.439
2.89	203+12	2M07195711+1521493	65.9	19.2	206.2	61.9	-26.0	9.6	202.2	13.1	110.0	15.4	-0.29	4.1	4.5	0.269
2.89	203+12	2M07153259+1504347	72.8	42.5	228.2	18.9	-19.0	9.8	202.0	12.1	108.9	15.1	-0.28	3.5	3.6	0.269

chi2	field	name	vh	vr	vt	vz	vgal	rgal	glon	glat	ra	dec	feh	age1	age2	ΔD
0.95	N188	2M00581691+8540183	-42.7	-8.7	225.4	-19.3	134.7	9.0	123.1	22.8	14.6	85.7	0.09	1.7	5.0	0.003
0.95	N188	2M00571844+8510288	-42.0	-16.3	237.3	-26.9	135.9	9.0	123.1	22.3	14.3	85.2	0.08	2.0	4.3	0.003
1.07	098-04	2M22013004+5112294	-46.8	-10000.0	-10000.0	-10000.0	181.0	9.8	97.9	-3.2	330.4	51.2	-0.05	8.3	11.2	2.505
1.07	116-04	2M00100311+5856460	-52.6	-84.3	274.6	-48.0	148.0	9.4	117.6	-3.5	2.5	58.9	-0.06	6.7	5.0	2.505
1.33	225+30	2M08544714+0423560	14.9	3.7	235.8	-2.5	-127.4	8.4	223.8	29.3	133.7	4.4	-0.05	4.5	6.1	0.475
1.33	203-12	2M05482584+0352065	14.3	-14.2	221.1	-1.3	-80.6	8.9	202.1	-12.1	87.1	3.9	-0.05	5.8	8.1	0.475
1.43	K21_071+10	2M19320616+3818346	23.3	-15.6	258.5	14.6	244.3	7.8	71.5	9.2	293.0	38.3	-0.12	3.2	5.6	0.409
1.43	075+12	2M19241755+4304503	15.3	23.1	258.4	-1.0	237.8	7.8	75.1	12.6	291.1	43.1	-0.11	3.0	4.5	0.409
1.44	105-06	2M22564379+5232038	3.7	33.1	246.2	-9.6	222.1	8.8	105.8	-6.5	344.2	52.5	-0.3	3.4	4.8	3.34
1.44	218-04	2M06455965-0518383	32.6	24.4	285.9	12.0	-114.4	9.7	217.0	-3.6	101.5	-5.3	-0.3	4.3	5.9	3.34
1.69	M92	2M17180996+4147268	1.3	32.2	239.7	7.5	183.7	7.5	66.7	34.5	259.5	41.8	-0.46	6.7	8.6	1.114
1.69	105-45	2M00003119+1516179	-19.9	-49.8	246.4	18.4	129.4	8.2	105.2	-45.8	0.1	15.3	-0.46	4.7	5.4	1.114
1.75	117+01	2M00025808+6441392	-111.8	-138.2	229.2	-107.6	89.4	8.8	117.8	2.3	0.7	64.7	-0.05	2.4	2.2	2.183
1.75	101-04	2M22205838+5242316	-116.4	86.5	84.4	-0.8	108.5	9.4	101.2	-3.7	335.2	52.7	-0.05	2.8	2.3	2.183
1.75	203+18	2M07420918+1729354	44.4	24.7	215.2	-24.9	-45.0	9.6	202.5	18.9	115.5	17.5	-0.31	4.8	6.5	0.944
1.75	180+18	2M07060085+3546560	59.9	58.6	262.9	-13.1	48.2	8.9	181.4	18.2	106.5	35.8	-0.31	4.7	6.3	0.944
1.76	225+04	2M07252386-0858292	16.3	-22.9	239.8	-4.4	-152.8	9.5	224.8	3.4	111.3	-9.0	-0.31	2.4	2.6	0.617
1.76	235-06	2M07120270-2212072	27.0	-11.1	243.9	32.9	-167.9	9.6	235.0	-5.6	108.0	-22.2	-0.31	2.5	3.8	0.617
1.76	173+00	2M05295573+3539020	40.0	70.3	-91.9	-107.9	61.2	11.8	172.6	0.8	82.5	35.7	-0.39	4.6	6.0	2.42
1.76	HD46375	2M06353724+0607379	71.8	-58.0	-44.4	16.5	-36.9	12.1	205.7	-0.7	98.9	6.1	-0.38	3.5	4.7	2.42
1.84	K05_080+14	2M19252221+4834341	-36.7	-14.5	207.0	-7.8	187.6	7.9	80.3	14.8	291.3	48.6	-0.14	2.0	2.4	0.099
1.84	K09_081+11	2M19463466+4749523	-14.8	67.9	218.9	21.9	212.7	7.9	81.3	11.3	296.6	47.8	-0.14	1.7	1.4	0.099
1.84	203+04	2M06425690+1008167	70.5	44.0	278.5	48.9	-27.8	11.1	202.9	2.7	100.7	10.1	-0.2	4.7	7.4	1.725
1.84	176+04	2M05523388+3301425	70.3	62.7	237.9	-6.9	72.9	10.0	177.3	3.4	88.1	33.0	-0.2	4.3	6.1	1.725
1.86	200+60	2M10303577+2949105	-10.7	22.8	269.0	-21.3	-48.9	8.4	199.5	59.1	157.6	29.8	-0.31	4.7	6.5	2.125
1.86	105-06	2M22564379+5232038	3.7	33.1	246.2	-9.6	222.1	8.8	105.8	-6.5	344.2	52.5	-0.3	3.4	4.8	2.125

1.89	105+12	2M21332479+6737156	-12.1	-71.1	307.3	-102.8	205.6	8.7	105.7	11.6	323.4	67.6	-0.22	2.7	2.9	2.327
1.89	165+04	2M05200445+4226221	6.6	25.6	164.1	-4.6	54.8	10.6	165.9	3.0	80.0	42.4	-0.21	3.9	4.5	2.327
1.91	105-45	2M23534868+1643361	76.8	50.1	179.2	-155.1	232.7	8.7	103.6	-44.0	358.5	16.7	-0.46	13.7	12.9	4.106
1.91	240+30	2M09294655-0644077	94.2	51.7	177.7	-10.2	-79.1	9.4	240.1	30.6	142.4	-6.7	-0.46	12.1	12.9	4.106
1.92	195-08	2M05495473+1133060	32.2	10.2	233.5	4.9	-38.8	9.4	195.5	-8.0	87.5	11.6	-0.14	2.6	4.8	1.645
1.92	180+08	2M06180216+3222569	44.4	30.6	244.1	27.3	34.8	11.0	180.4	7.8	94.5	32.4	-0.14	3.1	4.7	1.645
1.94	158-04	2M04284068+4423174	-44.5	-29.7	232.1	25.0	31.8	10.7	158.5	-3.0	67.2	44.4	-0.54	4.5	7.5	2.55
1.94	120-08	2M00263329+5543076	-62.3	211.6	-116.2	-482.2	133.0	10.6	119.4	-7.0	6.6	55.7	-0.54	3.9	6.2	2.55
1.96	200+60	2M10284325+2931277	15.3	27.2	235.5	-0.3	-24.5	8.4	200.0	58.6	157.2	29.5	-0.15	4.6	6.1	0.927
1.96	235+06	2M07570593-1625389	58.3	28.0	214.2	-28.6	-135.1	8.7	235.1	6.4	119.3	-16.4	-0.15	4.9	7.4	0.927
1.98	K12_074+15	2M19124406+4314396	-16.7	14.8	216.1	21.0	203.6	7.7	74.4	14.6	288.2	43.2	0.07	1.1	1.1	0.583
1.98	060+08	2M19091776+2738444	-16.0	19.4	217.5	24.4	187.4	7.4	59.6	8.6	287.3	27.6	0.08	1.3	1.1	0.583
1.98	173-12	2M04435669+2854449	7.0	12.5	224.0	28.8	28.0	11.7	172.2	-11.0	71.0	28.9	-0.26	2.5	3.4	1.276
1.98	180+04	2M06001420+3155348	25.8	16.2	219.4	4.3	21.3	10.5	179.0	4.2	90.1	31.9	-0.26	2.8	2.9	1.276
2.02	195+08	2M06472397+2031301	-6.2	-34.2	220.7	30.7	-69.7	9.4	194.1	8.3	101.8	20.5	-0.46	5.0	6.8	1.768
2.02	165+18	2M06315751+5026216	-30.4	-17.6	242.1	-20.6	21.8	10.8	164.7	17.7	98.0	50.4	-0.45	5.1	6.6	1.768
2.03	240+18	2M08511273-1336099	34.5	-23.0	228.1	26.6	-157.5	9.3	240.0	18.9	132.8	-13.6	-0.18	7.3	9.4	1.826
2.03	195+08	2M06484266+2013096	59.5	38.4	152.0	-124.1	-5.6	10.4	194.5	8.5	102.2	20.2	-0.18	6.6	8.1	1.826
2.08	198+08	2M06533226+1757106	43.3	28.8	308.6	40.6	-31.5	10.2	197.1	8.5	103.4	18.0	-0.22	3.3	3.3	2.416
2.08	100-60	2M00065863+0146388	-2.1	-11.7	230.6	0.7	107.8	8.1	100.8	-59.2	1.7	1.8	-0.21	2.6	2.4	2.416
2.08	K09_081+11	2M19515772+4845561	31.2	12.3	266.8	38.4	259.5	7.9	82.5	10.9	298.0	48.8	-0.14	4.4	6.2	0.442
2.08	K05_080+14	2M19311507+4743092	10.2	34.7	250.8	0.2	235.4	7.9	80.0	13.5	292.8	47.7	-0.14	5.6	9.2	0.442
2.08	N6819	2M19420775+4029016	-24.1	9.1	209.3	33.9	200.2	7.7	74.3	8.5	295.5	40.5	-0.2	4.9	5.0	2.343
2.08	195+30	2M08144693+2842277	-13.8	-31.6	229.8	-3.2	-65.7	9.2	193.7	29.8	123.7	28.7	-0.2	4.8	5.2	2.343
2.11	195+00	2M06173228+1608550	7.5	-10.6	249.4	22.8	-60.2	9.3	194.7	0.0	94.4	16.1	-0.23	1.8	2.9	0.994
2.11	210+00	2M06474676+0313053	53.5	149.8	532.1	-265.5	-69.0	10.0	209.7	0.7	101.9	3.2	-0.22	1.9	2.1	0.994
2.12	K09_081+11	2M19531723+4806297	-33.8	26.8	206.2	6.7	194.6	7.9	82.1	10.4	298.3	48.1	-0.07	4.6	4.1	1.305
2.12	SGRCMI+02	2M19003793-2832341	-43.8	38.3	247.2	6.5	-5.9	7.4	7.9	-14.4	285.2	-28.5	-0.07	3.0	3.2	1.305
2.14	165-08	2M04283152+3709234	-22.1	-38.6	376.2	117.0	32.7	9.6	163.7	-8.0	67.1	37.2	-0.19	4.7	3.3	1.441
2.14	146-04	2M03250705+5231300	-41.6	-24.5	244.8	-45.9	82.8	10.5	145.2	-3.6	51.3	52.5	-0.19	6.1	3.6	1.441
2.16	260+55	2M11163766+0036077	12.8	8.7	227.6	7.9	-112.6	8.1	258.4	55.1	169.2	0.6	-0.09	1.3	1.9	1.003
2.16	090-45	2M23181752+1253584	-26.2	64.4	203.1	9.3	135.7	8.0	90.5	-44.0	349.6	12.9	-0.09	0.9	2.9	1.003
2.16	210+04	2M07040366+0519407	35.1	1.2	228.1	-1.8	-86.2	9.6	209.6	5.2	106.0	5.3	-0.35	3.9	5.6	0.93
2.16	198+08	2M06485300+1649020	35.8	-5.2	175.3	-9.9	-41.5	10.5	197.6	7.0	102.2	16.8	-0.35	3.5	4.9	0.93
2.17	113-04	2M23394237+5733243	-77.7	51.9	140.9	25.5	130.6	9.6	113.4	-4.0	354.9	57.6	-0.07	3.9	4.5	1.129
2.17	109+04	2M22402858+6353162	-82.4	-9.5	179.1	-71.7	133.6	8.8	109.1	4.6	340.1	63.9	-0.07	5.3	6.9	1.129
2.2	180-12	2M05053174+2128566	31.0	20.4	228.8	10.5	16.0	9.0	181.2	-11.7	76.4	21.5	-0.28	3.8	4.6	1.206
2.2	COROTA3	2M06432503-0109044	-0.9	-40.4	238.1	-16.8	-135.1	9.7	213.0	-2.3	100.9	-1.2	-0.27	4.6	5.2	1.206
2.21	195+08	2M06444398+1834061	35.6	20.2	298.6	-10.9	-34.0	11.2	195.6	6.9	101.2	18.6	-0.36	3.5	4.5	2.05
2.21	165-08	2M04355788+3630133	43.6	39.7	242.2	-27.3	92.7	9.6	165.2	-7.3	69.0	36.5	-0.36	5.3	6.6	2.05
2.22	195+04	2M06310073+1637324	65.2	28.7	191.5	57.0	-6.3	9.9	195.8	3.1	97.8	16.6	-0.19	2.7	5.1	1.004
2.22	ORIONE	2M05410919-0924230	55.1	55.9	275.7	-3.3	-74.8	8.9	213.5	-19.9	85.3	-9.4	-0.18	2.3	3.0	1.004
2.23	060-08	2M20170607+2046092	43.4	-518.9	274.0	-111.0	248.2	7.0	61.4	-8.2	304.3	20.8	0.09	0.8	4.3	2.532
2.23	060+08	2M19174590+2750593	45.9	-2.3	276.7	-7.1	251.8	7.3	60.7	7.1	289.4	27.8	0.09	1.1	2.9	2.532
2.23	158+18	2M06235280+5758066	-59.9	-15.6	152.3	-20.3	20.8	10.4	156.8	19.3	96.0	58.0	-0.38	10.1	7.8	3.354
2.23	K11_076+13	2M19213304+4522372	-39.2	-111.6	200.5	51.1	183.8	7.8	77.1	14.0	290.4	45.4	-0.37	12.1	12.9	3.354
2.24	180-08	2M05102798+2451066	41.8	38.3	275.7	51.5	35.5	9.7	179.1	-8.8	77.6	24.9	-0.23	4.2	6.0	1.875
2.24	218-04	2M06451744-0443597	42.7	0.4	249.3	-35.5	-102.5	10.5	216.5	-3.5	101.3	-4.7	-0.23	2.9	5.2	1.875
2.25	SGR1	2M08145817+3218106	66.2	57.3	279.4	8.5	28.4	11.6	189.7	30.8	123.7	32.3	-0.51	6.3	7.7	0.371
2.25	195+08	2M06521996+2030286	35.0	41.5	189.5	-255.9	-30.2	11.4	194.6	9.4	103.1	20.5	-0.51	8.6	10.5	0.371
2.28	008-02	2M18085200-2340159	-1.2	-0.8	258.4	-72.2	36.4	7.1	7.2	-1.9	272.2	-23.7	-0.17	1.7	1.8	1.72
2.28	131+04	2M02154447+6538511	-2.7	-0.8	249.1	6.8	165.2	8.7	131.5	4.2	33.9	65.6	-0.17	1.3	1.6	1.72
2.3	100+60	2M14123416+5404415	-56.9	0.3	217.4	-43.4	65.4	8.2	99.5	59.2	213.1	54.1	-0.44	7.8	11.6	0.386
2.3	075+35	2M17200194+4951289	-49.8	58.1	196.0	-7.8	141.1	7.8	76.6	34.8	260.0	49.9	-0.43	7.0	10.9	0.386
2.31	105-06	2M22415166+5239386	-18.2	75.6	206.8	-17.6	203.2	9.6	103.9	-5.4	340.5	52.7	0.07	3.5	3.3	2.117
2.31	K19_076+07	2M19532519+3957532	-1.4	-19.5	233.8	21.3	224.2	7.7	74.9	6.4	298.4	40.0	0.06	3.2	2.8	2.117
2.32	K18_070+14	2M19080789+3921555	-15.7	35.6	220.1	16.6	201.0	7.6	70.4	13.8	287.0	39.4	0.06	1.0	2.6	0.762
2.32	N6791	2M19292894+3808438	-15.7	-58.5	210.3	35.5	204.7	7.6	71.1	9.6	292.4	38.1	0.07	1.5	3.7	0.762
2.33	135+00	2M02321266+6035574	-92.7	-69.0	209.7	-37.2	65.0	9.4	135.0	0.1	38.1	60.6	-0.37	5.0	8.8	2.157
2.33	128+04	2M01320122+6709459	-88.7	-65.7	255.7	16.4	91.4	10.9	126.9	4.6	23.0	67.2	-0.36	4.6	3.4	2.157
2.36	075-12	2M21043901+2922028	-32.2	57.2	210.4	75.2	187.9	7.9	74.9	-11.7	316.2	29.4	0.23	8.5	5.4	1.408
2.36	090+08	2M20352593+5413201	-28.6	97.5	197.0	-25.1	201.9	8.4	90.9	8.2	308.9	54.2	0.24	8.5	4.7	1.408
2.37	158-12	2M03463520+3911089	-69.1	-61.6	210.6	-24.1	12.9	10.0	156.2	-12.1	56.6	39.2	-0.2	4.0	5.0	0.954
2.37	180-12	2M05023613+2229253	-22.2	-30.4	167.3	23.2	-32.2	9.5	180.0	-11.6	75.7	22.5	-0.2	3.4	4.2	0.954
2.4	188+12	2M06511551+2804080	45.1	-15.1	202.4	177.1	8.2	11.3	187.5	12.4	102.8	28.1	-0.41	6.1	5.7	3.291
2.4	198+08	2M06532350+1732137	86.5	19.9	-28.1	-129.0	10.3	14.4	197.4	8.3	103.3	17.5	-0.41	4.7	4.4	3.291
2.41	180+08	2M06175439+3322034	42.0	34.6	181.7	-9.0	36.0	11.2	179.5	8.2	94.5	33.4	-0.19	6.6	9.8	1.302
2.41	176+04	2M05580824+3504308	37.3	32.1	240.9	-17.9	44.9	9.9	176.1	5.4	89.5	35.1	-0.2	4.9	7.7	1.302
2.43	K18_070+14	2M19061973+3838374	-55.1	28.9	193.4	-9.0	160.6	7.8	69.5	13.9	286.6	38.6	0.09	3.2	2.4	0.897
2.43	K06_078+16	2M19134763+4626327	-52.6	73.8	190.8	-9.5	169.1	7.8	77.5	15.7	288.4	46.4	0.1	2.7	3.8	0.897
2.43	158-12	2M03502553+3850149	-52.2	-41.0	205.8	-14.5	26.8	9.9	157.0	-11.9	57.6	38.8	0.18	5.1	4.8	1.916
2.43	101+04	2M21521126+5956075	-28.6	22.6	223.7	-59.3	196.1	8.7	102.2	4.5	328.0	59.9	0.17	3.9	3.7	1.916
2.43	K04_083+13	2M19350969+5017487	-5.7	-19.9	249.7	-34.1	220.3	8.0	82.6	14.1	293.8	50.3	-0.04	9.7	9.5	0.746
2.43	101-04	2M22262620+5220346	-24.1	-33.5	254.4	48.9	200.0	8.7	101.7	-4.4	336.6	52.3	-0.04	8.8	6.7	0.746
2.44	180+04	2M06064127+3030553	14.8	1.7	216.8	21.1	2.6	9.2	180.9	4.7	91.7	30.5	0.09	2.0	2.2	0.87

2.44	139-04	2M02531310+5440029	-5.0	2.9	246.3	17.1	136.3	9.0	140.0	-4.1	43.3	54.7	0.09	2.5	2.8	0.87
2.44	000+14	2M16551636-2046276	-26.3	22.4	298.5	29.4	-14.6	6.2	0.3	14.0	253.8	-20.8	-0.44	8.3	12.3	1.92
2.44	080+45	2M16113582+5214194	-61.7	18.5	196.5	-35.3	105.5	7.9	81.1	45.3	242.9	52.2	-0.44	5.8	7.3	1.92
2.46	184+04	2M06121086+2743370	58.1	44.0	227.0	10.2	33.8	9.2	184.0	4.5	93.0	27.7	-0.27	4.1	6.6	1.982
2.46	195-08	2M05445520+1222237	37.4	-10000.0	-10000.0	-10000.0	-28.3	11.1	194.2	-8.7	86.2	12.4	-0.27	4.2	5.1	1.982
2.49	229-04	2M07044331-1602533	85.6	63.2	227.5	-41.2	-94.7	8.9	228.7	-4.4	106.2	-16.0	-0.29	5.0	9.1	0.575
2.49	206+04	2M06510793+0654230	81.3	37.8	185.0	-16.7	-30.6	9.4	206.7	3.1	102.8	6.9	-0.28	6.2	9.7	0.575
2.49	M35N2158	2M06042090+2515247	10.5	-5.1	210.9	-3.6	-19.5	9.0	185.3	1.7	91.1	25.3	-0.05	11.9	12.3	0.498
2.49	195-08	2M05521611+1243332	8.5	-21.4	188.2	24.1	-59.6	9.4	194.8	-7.0	88.1	12.7	-0.05	10.5	11.6	0.498
2.49	101+04	2M21410771+6002295	-66.4	52.6	166.6	-23.9	159.1	8.9	101.2	5.5	325.3	60.0	-0.13	10.3	10.4	1.354
2.49	128+04	2M01283547+6717350	-42.8	-0.8	223.3	64.1	138.2	10.2	126.5	4.7	22.1	67.3	-0.13	9.4	8.7	1.354
2.51	K18_070+14	2M19072538+3915428	-9.1	27.4	230.9	21.2	207.4	7.7	70.2	13.9	286.9	39.3	-0.03	2.0	4.1	0.555
2.51	090-45	2M23185271+1317122	-12.3	0.2	200.7	-18.4	150.3	8.0	91.0	-43.8	349.7	13.3	-0.03	1.3	2.7	0.555
2.52	060-12	2M20250395+1748497	5.0	28.0	250.2	52.1	204.8	7.3	59.9	-11.4	306.3	17.8	-0.16	3.1	4.9	1.865
2.52	131+04	2M02154776+6655301	32.8	70.3	232.9	6.9	201.6	9.0	131.1	5.4	33.9	66.9	-0.15	2.6	3.5	1.865
2.54	K12_074+15	2M19082492+4413063	-13.3	-10000.0	-10000.0	-10000.0	206.5	7.7	75.0	15.7	287.1	44.2	-0.05	18.1	12.9	0.303
2.54	K12_074+15	2M19050213+4302026	-14.8	-132.8	219.5	-5.9	203.6	7.7	73.6	15.8	286.3	43.0	-0.06	13.2	12.9	0.303
2.54	150+30	2M07355350+6613581	-3.5	15.8	207.2	2.2	94.9	8.6	149.8	29.1	114.0	66.2	0.11	8.5	7.4	2.104
2.54	045+12	2M18273515+1633358	34.0	-60.8	228.3	-32.7	202.5	6.8	45.3	12.6	276.9	16.6	0.13	7.5	9.4	2.104
2.57	229+04	2M07384010-1208499	90.8	97.9	347.9	-4.3	-89.3	11.6	229.2	4.7	114.7	-12.1	-0.21	3.9	4.2	3.87
2.57	180-08	2M05153258+2505421	96.2	78.4	234.2	-52.0	88.2	9.5	179.6	-7.7	78.9	25.1	-0.21	4.1	6.4	3.87
2.58	158-12	2M03534026+3823264	36.0	47.2	210.7	-30.8	112.2	9.8	157.8	-11.8	58.4	38.4	-0.27	4.8	9.7	0.76
2.58	180+18	2M07021963+3624448	55.9	42.2	182.1	21.4	47.6	10.0	180.5	17.7	105.6	36.4	-0.27	4.1	10.1	0.76
2.59	191+00	2M06072471+1800046	56.3	37.2	236.9	0.9	-0.7	9.5	192.0	-1.2	91.9	18.0	-0.12	2.8	3.0	0.928
2.59	M35N2158	2M06041875+2437304	76.5	63.0	266.0	-40.6	44.1	10.4	185.8	1.4	91.1	24.6	-0.12	3.2	4.0	0.928
2.59	K07_075+17	2M19034395+4519023	-11.0	-92.3	213.1	55.4	208.2	7.8	75.7	16.9	285.9	45.3	0.22	5.5	3.7	0.909
2.59	K05_080+14	2M19224384+4845217	-26.5	1.0	213.0	7.2	197.4	7.9	80.3	15.2	290.7	48.8	0.23	4.6	2.6	0.909
2.59	K05_080+14	2M19335862+4854239	-58.0	-10000.0	-10000.0	-10000.0	167.8	8.0	81.3	13.6	293.5	48.9	0.25	15.7	12.9	1.331
2.59	090-04	2M21331558+4559283	-77.3	-10000.0	-10000.0	-10000.0	153.3	8.9	90.9	-4.2	323.3	46.0	0.25	14.0	12.5	1.331
2.61	060+08	2M19141992+2758263	-3.1	330.6	225.8	-123.3	202.1	7.0	60.4	7.8	288.6	28.0	0.1	9.9	10.5	2.812
2.61	K13_071+16	2M18583627+4227550	-31.3	1.0	207.9	-6.3	185.3	7.7	72.6	16.7	284.7	42.5	0.1	13.4	10.6	2.812
2.61	161-04	2M04344653+4242272	-14.5	-0.6	231.6	52.8	54.1	10.5	160.5	-3.3	68.7	42.7	-0.22	1.2	1.4	1.631
2.61	191+04	2M06240367+2057091	10.9	-11.5	282.9	68.0	-42.6	11.1	191.2	3.7	96.0	21.0	-0.22	1.0	1.0	1.631
2.62	180-08	2M05154056+2402173	-44.5	-162.6	-184.5	-703.5	-56.2	10.1	180.4	-8.3	78.9	24.0	-0.22	1.6	1.4	2.815
2.62	109+04	2M22385765+6222501	-67.2	-34.7	215.6	2.8	150.3	9.2	108.2	3.4	339.7	62.4	-0.22	1.7	1.5	2.815
2.64	235+00	2M07335726-1903306	52.4	12.9	229.5	23.1	-141.9	9.3	234.7	0.4	113.5	-19.1	-0.08	3.5	5.7	1.694
2.64	HD46375	2M06355214+0618162	50.1	0.4	200.3	146.0	-58.1	10.9	205.5	-0.6	99.0	6.3	-0.09	3.7	5.4	1.694
2.64	203+00	2M06364193+0928117	48.8	1.6	201.4	69.3	-49.3	10.8	202.8	1.1	99.2	9.5	-0.5	4.7	4.2	1.377
2.64	218+00	2M06555593-0403186	86.1	21.0	207.6	30.9	-60.9	11.5	217.1	-0.9	104.0	-4.1	-0.5	3.6	4.2	1.377
2.66	N6819	2M19413027+4015218	2.1	-59.3	247.0	-60.1	226.2	7.7	74.1	8.5	295.4	40.3	0.01	1.0	2.1	0.293
2.66	N6819	2M19412386+4021444	2.1	-0.8	228.4	70.3	226.2	7.7	74.1	8.5	295.3	40.4	0.02	1.2	2.4	0.293
2.66	158-12	2M03534855+3909193	-39.3	-25.5	210.5	6.7	38.9	9.7	157.3	-11.2	58.5	39.2	-0.15	4.6	5.2	1.056
2.66	158-12	2M03505457+3836561	-34.0	-38.9	240.1	9.2	44.2	8.7	157.2	-12.0	57.7	38.6	-0.15	4.3	5.7	1.056
2.67	191-04	2M05512548+1745553	26.5	10.4	259.8	-4.5	-24.1	9.6	190.3	-4.6	87.9	17.8	-0.16	0.8	0.7	0.099
2.67	191-04	2M05595423+1812517	27.9	3.2	196.0	33.1	-25.0	9.7	190.9	-2.6	90.0	18.2	-0.17	0.6	0.5	0.099
2.67	053-04	2M19444199+1622401	27.8	-22.7	245.2	161.3	218.9	6.8	53.6	-3.9	296.2	16.4	-0.2	3.9	3.5	4.593
2.67	210-08	2M06144969+0009450	43.0	-17.7	185.9	-35.3	-75.7	9.9	208.6	-8.1	93.7	0.2	-0.2	3.2	2.6	4.593
2.67	K10_079+12	2M19350084+4638487	-68.9	-10000.0	-10000.0	-10000.0	156.7	8.0	79.3	12.5	293.8	46.6	0.22	15.1	12.9	1.565
2.67	045+30	2M17161198+2403519	-66.4	72.8	167.9	12.1	85.8	6.9	46.1	30.9	259.0	24.1	0.23	17.4	12.9	1.565
2.68	COROTA	2M06424318+0055025	63.0	17.2	198.5	-23.0	-64.7	9.4	211.1	-1.5	100.7	0.9	-0.17	3.9	5.6	0.417
2.68	199-04	2M06060979+1121051	8.1	-16.6	225.1	16.1	-71.1	9.2	197.6	-4.7	91.5	11.4	-0.16	4.9	7.0	0.417
2.7	124-04	2M00572667+5906069	-14.3	34.9	209.9	-42.6	172.8	9.1	123.7	-3.8	14.4	59.1	-0.04	1.2	3.2	0.256
2.7	116-04	2M00022314+5933161	-13.2	1.6	246.7	-16.3	189.3	9.0	116.7	-2.7	0.6	59.6	-0.04	1.0	2.0	0.256
2.7	K04_083+13	2M19473059+4924086	-52.2	35.9	191.2	-4.1	175.5	7.9	82.8	11.9	296.9	49.4	-0.01	6.7	12.9	0.281
2.7	K21_071+10	2M19313875+3758224	-55.0	-35.6	175.1	-5.2	165.6	7.7	71.1	9.1	292.9	38.0	-0.0	4.3	7.0	0.281
2.72	210+08	2M07183884+0623354	22.1	-21.8	244.0	54.3	-100.1	10.2	210.3	8.9	109.7	6.4	-0.42	5.3	6.5	1.44
2.72	221+04	2M07175969-0506065	35.4	37.0	332.2	-122.8	-121.4	11.2	220.5	3.6	109.5	-5.1	-0.42	6.9	9.0	1.44
2.73	045+12	2M18281772+1624030	-31.4	31.2	151.7	87.7	137.0	6.1	45.2	12.4	277.1	16.4	0.17	12.4	12.8	3.528
2.73	135+06	2M03044876+6636557	-29.5	7.7	200.1	-18.8	125.9	8.7	135.6	7.1	46.2	66.6	0.18	12.1	10.2	3.528
2.73	165-04	2M04534996+3847027	-52.1	-10000.0	-10000.0	-10000.0	-4.3	10.9	165.8	-3.2	73.5	38.8	-0.39	1.3	1.4	1.799
2.73	165+00	2M05073700+4108576	-36.8	-15.7	180.0	18.4	12.4	12.7	165.5	0.4	76.9	41.1	-0.38	1.0	1.2	1.799
2.76	173+00	2M05294740+3446050	59.6	54.4	237.6	-22.1	77.8	9.7	173.3	0.3	82.4	34.8	-0.31	3.6	8.1	3.339
2.76	053-04	2M19462231+1506531	50.6	-57.4	246.2	-7.6	239.3	6.9	52.7	-4.9	296.6	15.1	-0.31	4.2	6.6	3.339
2.77	HD46375	2M06281569+0540339	0.9	-28.7	234.2	-8.9	-106.3	9.3	205.2	-2.5	97.1	5.7	-0.0	5.8	6.2	1.749
2.77	105-45	2M00043646+1617516	3.4	17.4	224.1	-12.5	153.2	8.3	106.9	-45.1	1.2	16.3	-0.0	6.9	7.9	1.749
2.78	135-06	2M02163692+5512382	10.6	17.3	237.6	-21.5	166.9	8.5	135.0	-5.7	34.2	55.2	0.23	11.2	8.4	2.207
2.78	M107	2M16270902-1254574	16.3	-5.4	176.6	61.6	37.0	6.3	2.6	24.1	246.8	-12.9	0.24	8.7	6.6	2.207
2.78	150+00	2M04082666+5303420	-38.7	32.2	117.7	-69.5	69.5	10.7	150.0	0.9	62.1	53.1	-0.4	2.3	2.8	1.07
2.78	150-08	2M03302309+4634150	-41.9	-37.4	260.8	35.7	66.8	9.7	149.3	-8.0	52.6	46.6	-0.39	3.5	6.4	1.07
2.79	161-04	2M04323980+4246297	-8.6	15.4	164.9	4.9	61.2	9.3	160.1	-3.6	68.2	42.8	0.14	11.0	8.8	1.112
2.79	210+04	2M06582445+0546094	12.3	-17.6	244.9	67.6	-105.8	9.2	208.6	4.2	104.6	5.8	0.14	10.8	9.8	1.112
2.79	060-08	2M20110399+1948212	49.2	-85.7	271.4	109.1	251.5	6.9	59.8	-7.5	302.8	19.8	0.02	5.5	8.0	5.694
2.79	195-08	2M05520178+1206293	47.0	1.4	139.0	14.3	-23.1	10.6	195.3	-7.3	88.0	12.1	0.02	6.1	6.4	5.694
2.8	N6819	2M19412222+4016442	2.8	-42.4	228.2	82.7	226.8	7.7	74.1	8.5	295.3	40.3	0.01	1.4	1.7	2.319
2.8	150-08	2M03283069+4648064	34.2	59.4	201.5	-17.8	144.4	8.9	148.9	-8.0	52.1	46.8	0.02	1.9	2.3	2.319
2.81	062+62	2M14571472+3737125	22.7	23.7	174.7	68.6	128.7	7.6	62.6	61.6	224.3	37.6	-0.34	11.7	12.9	2.916

2.81	253+51	2M10522335+0030297	48.6	90.6	118.1	-75.3	-85.9	8.9	250.9	51.0	163.1	0.5	-0.34	13.8	12.9	2.916
2.81	229+04	2M07381753-1212008	57.8	41.3	258.5	-57.3	-122.5	9.8	229.2	4.6	114.6	-12.2	-0.07	11.9	12.9	6.439
2.81	045-06	2M19322825+0804298	59.0	11.2	210.4	-417.3	227.6	5.9	44.8	-5.3	293.1	8.1	-0.07	11.0	12.9	6.439
2.81	109+04	2M22460841+6422186	-50.9	-3.5	216.0	-46.4	164.0	9.1	109.9	4.7	341.5	64.4	-0.19	8.2	6.6	2.148
2.81	098+04	2M21233636+5703241	-61.0	77.0	156.8	58.1	167.6	9.6	97.5	4.8	320.9	57.1	-0.19	5.8	4.8	2.148
2.81	K15_077+10	2M19501117+4258371	-52.8	13.6	190.1	-20.8	174.0	7.8	77.3	8.4	297.5	43.0	0.07	1.2	1.3	0.236
2.81	K11_076+13	2M19282745+4453145	-54.1	-67.1	184.1	-4.9	170.0	7.8	77.1	12.7	292.1	44.9	0.07	1.8	3.8	0.236
2.83	235+06	2M07585939-1551530	52.6	2.6	260.5	-22.0	-139.9	11.4	234.9	7.1	119.7	-15.9	-0.35	3.4	5.5	2.8
2.83	218+00	2M07051413-0353518	58.1	55.5	293.2	64.2	-91.5	9.7	218.0	1.3	106.3	-3.9	-0.35	3.2	2.4	2.8
2.85	195+00	2M06213204+1549240	50.8	23.9	205.4	-2.0	-19.7	9.2	195.5	0.7	95.4	15.8	0.14	3.3	4.5	1.116
2.85	180+00	2M05512188+2817329	73.4	61.2	294.5	74.1	59.6	10.3	181.2	0.7	87.8	28.3	0.13	4.0	5.1	1.116
2.86	N2420	2M07382696+2138244	74.0	66.3	234.6	-26.5	0.6	9.9	198.0	19.7	114.6	21.6	-0.19	4.8	8.0	0.683
2.86	195-08	2M05505077+1208250	71.4	67.0	287.8	21.9	2.0	9.2	195.1	-7.6	87.7	12.1	-0.19	4.3	4.6	0.683
2.86	K07_075+17	2M19055085+4543347	-10.6	-46.3	216.7	38.3	209.2	7.8	76.3	16.7	286.5	45.7	-0.05	8.3	7.8	0.246
2.86	K04_083+13	2M19350969+5017487	-5.7	-19.9	249.7	-34.1	220.3	8.0	82.6	14.1	293.8	50.3	-0.04	9.7	9.5	0.246
2.87	165-45	2M02505710+0821378	-9.6	-42.5	245.4	-13.4	18.5	8.5	166.4	-44.2	42.7	8.4	0.09	3.4	3.4	1.218
2.87	N6791	2M19250923+3808230	-5.6	-56.6	227.5	-36.7	213.9	7.7	70.7	10.3	291.3	38.1	0.1	4.4	4.8	1.218
2.88	135-12	2M01553377+4932280	-46.8	17.5	179.2	5.5	110.3	9.9	133.5	-12.0	28.9	49.5	0.06	7.5	7.6	1.974
2.88	105+30	2M17552116+7417371	-55.7	14.7	186.7	-19.0	139.7	8.2	105.3	29.8	268.8	74.3	0.07	7.4	5.4	1.974
2.88	225+30	2M08573102+0502542	43.3	30.1	213.1	-28.1	-96.9	9.2	223.5	30.2	134.4	5.0	-0.21	3.8	4.7	0.422
2.88	210+16	2M07423695+1007286	22.5	13.7	258.7	-14.6	-93.1	9.1	209.5	15.9	115.7	10.1	-0.22	4.1	4.6	0.422
2.88	SGRCMI+02	2M18563498-2919125	-81.8	65.6	199.9	38.1	-48.0	6.8	6.8	-13.9	284.1	-29.3	0.07	7.9	10.5	2.495
2.88	PAL1	2M03322074+8049021	-69.7	-38.7	189.4	21.9	96.2	9.1	129.2	20.0	53.1	80.8	0.06	11.9	12.9	2.495
2.88	124-04	2M00525359+5937393	-48.6	-1.4	220.0	37.3	140.1	9.8	123.1	-3.2	13.2	59.6	-0.15	7.2	8.7	1.297
2.88	146+04	2M04081380+5853361	-40.4	3.2	177.8	0.2	81.8	9.6	146.1	5.2	62.1	58.9	-0.15	8.1	7.7	1.297
2.89	058+57	2M15261891+3642096	-22.9	195.4	192.6	53.4	96.7	7.4	59.1	56.0	231.6	36.7	-0.76	9.8	12.9	1.339
2.89	330+75	2M13210428+1501177	-3.2	46.7	205.8	14.1	-18.9	7.5	334.1	76.1	200.3	15.0	-0.75	9.8	12.9	1.339
2.89	K18_070+14	2M19062317+4016004	13.6	-45.1	231.3	49.3	230.6	7.7	71.1	14.5	286.6	40.3	-0.42	4.0	6.6	2.153
2.89	218+00	2M06582266-0450574	50.7	40.1	257.5	61.4	-99.4	9.1	218.0	-0.7	104.6	-4.8	-0.42	3.5	4.3	2.153
2.89	203+12	2M07195711+1521493	65.9	19.2	206.2	61.9	-26.0	9.6	202.2	13.1	110.0	15.4	-0.29	4.1	4.5	0.269
2.89	203+12	2M07153259+1504347	72.8	42.5	228.2	18.9	-19.0	9.8	202.0	12.1	108.9	15.1	-0.28	3.5	3.6	0.269
2.9	090-08	2M21395460+4302522	-54.1	6.4	202.8	-14.1	175.2	8.9	89.8	-7.2	325.0	43.0	0.07	0.7	3.0	2.801
2.9	045+06	2M18524675+1427050	-22.3	54.1	188.6	19.4	150.6	6.1	46.0	6.2	283.2	14.5	0.07	0.8	4.1	2.801
2.91	330+60	2M13452210+0110499	4.1	-2.3	251.5	21.1	-39.3	7.7	331.7	61.0	206.3	1.2	-0.26	4.1	5.0	1.135
2.91	ANDR2	2M00434152+4142243	10.8	-8.2	272.3	12.5	188.6	8.5	121.4	-21.1	10.9	41.7	-0.27	3.8	4.4	1.135
2.92	240+45	2M10173086+0236427	31.6	-29.3	203.9	19.3	-106.5	8.6	239.9	45.8	154.4	2.6	-0.03	9.0	9.4	0.539
2.92	COROTA2	2M06491052-0336333	13.9	-2.1	265.6	-51.8	-129.5	9.1	215.9	-2.1	102.3	-3.6	-0.02	8.4	10.6	0.539
2.92	158-04	2M04150303+4425218	-26.0	-14.4	231.7	-74.8	56.6	11.0	156.7	-4.7	63.8	44.4	-0.28	3.1	2.7	1.62
2.92	128-04	2M01261877+5925050	-60.7	-26.1	220.4	16.2	117.5	9.7	127.4	-3.2	21.6	59.4	-0.28	3.2	3.5	1.62
2.93	090-08	2M21481948+4217428	-83.3	82.0	143.1	53.9	144.8	9.0	90.5	-8.8	327.1	42.3	0.31	12.5	12.9	0.285
2.93	090-04	2M21261356+4448284	-49.2	153.3	143.2	18.4	181.7	8.8	89.2	-4.2	321.6	44.8	0.3	13.1	7.4	0.285
2.95	040+45	2M16065217+2422367	-33.0	-10.4	204.5	-19.9	81.5	7.7	40.7	46.2	241.7	24.4	-0.17	6.9	6.8	2.728
2.95	120+08	2M00080855+7134126	-58.2	-14.1	226.7	-38.1	137.9	9.7	119.5	9.0	2.0	71.6	-0.17	7.7	7.8	2.728
2.95	206+04	2M06511402+0740026	89.6	23.3	133.7	52.2	-19.9	9.2	206.1	3.4	102.8	7.7	-0.39	13.0	12.9	2.16
2.95	280+49	2M11513793-1119301	93.5	-30.1	121.8	33.5	-50.2	7.9	280.3	48.9	177.9	-11.3	-0.39	13.3	12.9	2.16
2.96	214-04	2M06385872-0334143	10.1	-49.1	195.2	-13.8	-129.4	9.3	214.7	-4.4	99.7	-3.6	0.0	3.9	4.4	2.119
2.96	150-08	2M03330455+4504250	7.0	57.3	118.8	-101.2	110.8	10.0	150.5	-9.0	53.3	45.1	0.01	4.1	6.3	2.119
2.96	195-08	2M05515781+1154323	60.4	19.1	181.7	-9.3	-10.3	11.0	195.4	-7.4	88.0	11.9	-0.36	3.4	4.5	1.855
2.96	203-04	2M06140558+0733507	49.3	37.5	261.8	27.0	-45.9	9.2	201.9	-4.8	93.5	7.6	-0.36	3.1	3.6	1.855
2.96	K10_079+12	2M19322330+4659248	-81.9	-26.9	182.3	-100.6	143.4	7.9	79.4	13.0	293.1	47.0	-0.64	12.5	12.0	1.448
2.96	M92	2M17103346+4322475	-89.5	46.4	163.7	-57.5	91.6	7.4	68.5	36.1	257.6	43.4	-0.65	10.3	12.1	1.448
2.97	158+18	2M06222058+5729357	37.3	23.8	258.8	38.5	116.7	8.9	157.2	18.9	95.6	57.5	-0.35	3.6	4.9	1.788
2.97	198+08	2M06523903+1654438	64.7	28.0	196.1	5.6	-13.6	10.3	197.9	7.9	103.2	16.9	-0.34	4.7	5.3	1.788
2.98	045+12	2M18291190+1713387	-21.1	23.5	222.5	-15.2	149.5	7.2	46.0	12.6	277.3	17.2	0.15	8.6	3.5	0.368
2.98	030+12	2M18002270+0326427	-47.7	58.8	236.3	-15.5	75.1	7.0	30.2	12.9	270.1	3.4	0.15	8.6	5.6	0.368
2.98	K08_073+19	2M18490094+4428209	-9.1	-2.4	237.8	-17.5	206.2	7.8	73.9	19.0	282.3	44.5	-0.26	2.6	4.2	0.319
2.98	060+60	2M15061237+3639435	-2.4	54.5	220.5	28.5	106.2	7.7	60.0	60.0	226.6	36.7	-0.26	2.7	6.6	0.319
2.98	272+58	2M11441064+0006324	44.0	20.1	206.4	35.3	-71.3	8.0	269.3	58.5	176.0	0.1	0.04	14.7	12.9	1.732
2.98	045+12	2M18260483+1653172	34.4	-96.0	197.2	9.9	203.0	7.2	45.4	13.1	276.5	16.9	0.04	13.4	12.9	1.732
2.99	218+04	2M07124816-0116420	63.2	23.3	260.9	-9.6	-81.2	11.3	216.5	4.2	108.2	-1.3	-0.38	2.5	3.6	3.522
2.99	165+08	2M05382595+4717518	58.3	80.8	252.3	-64.0	115.8	11.9	163.6	8.4	84.6	47.3	-0.39	2.7	3.2	3.522
2.99	105-12	2M23065180+4719501	-14.3	48.0	227.1	47.0	201.0	8.6	105.2	-11.9	346.7	47.3	-0.19	2.2	3.1	0.762
2.99	K05_080+14	2M19305136+4929598	-15.1	-14.3	224.6	12.4	210.2	7.9	81.6	14.3	292.7	49.5	-0.18	1.9	1.7	0.762
3.0	221-04	2M06512248-0829160	66.9	-6.8	196.5	-12.1	-90.7	10.9	220.5	-3.9	102.8	-8.5	-0.22	4.3	7.3	2.634
3.0	173+00	2M05264187+3626258	27.6	32.1	180.1	13.6	52.9	10.5	171.5	0.7	81.7	36.4	-0.21	4.7	8.7	2.634
3.0	218+00	2M07020751-0510010	67.2	61.8	272.9	51.4	-85.0	9.4	218.7	0.0	105.5	-5.2	-0.21	2.0	1.5	0.344
3.0	210-04	2M06342943-0015477	56.8	12.6	182.8	176.9	-71.3	9.7	211.2	-3.9	98.6	-0.3	-0.21	2.1	2.0	0.344
3.0	188+00	2M06021495+2320444	25.0	-10000.0	-10000.0	-10000.0	-11.0	10.6	186.7	0.4	90.6	23.3	-0.4	6.0	6.4	0.691
3.0	188-04	2M05425185+2038161	31.2	6.0	194.6	-16.9	-5.5	11.3	186.8	-4.9	85.7	20.6	-0.4	3.9	4.3	0.691
3.01	120+75	2M12541471+4334012	32.5	43.2	206.1	42.6	94.1	8.1	121.1	73.6	193.6	43.6	0.08	8.9	9.0	1.476
3.01	182+25	2M07415297+3803014	13.0	17.8	198.5	-26.7	2.6	9.6	181.5	25.7	115.5	38.1	0.09	8.7	9.7	1.476
3.01	210-08	2M06214281-0138271	57.3	32.5	243.4	7.0	-69.7	9.5	211.0	-7.4	95.4	-1.6	-0.51	1.7	1.5	1.296
3.01	165-08	2M04354874+3556233	49.9	40.5	265.2	-31.5	97.4	9.6	165.6	-7.7	69.0	35.9	-0.51	1.6	1.3	1.296
3.01	124-04	2M00473810+5908019	-84.3	-24.1	213.0	45.3	105.7	10.7	122.4	-3.7	11.9	59.1	-0.38	3.2	5.0	1.023
3.01	109-04	2M23001257+5612180	-86.9	64.3	120.2	-90.3	130.3	9.7	107.9	-3.4	345.1	56.2	-0.38	4.6	4.9	1.023
3.02	218+00	2M07003885-0305130	106.2	50.7	225.5	85.7	-39.6	11.4	216.7	0.6	105.2	-3.1	-0.23	3.2	4.3	0.956

3.02	221+04	2M07244769-0519444	66.9	36.3	261.6	-1.0	-92.4	10.5	221.5	4.9	111.2	-5.3	-0.23	3.5	3.1	0.956
3.03	060-08	2M20144750+2029339	34.9	-153.2	206.9	-85.0	238.9	7.2	60.8	-7.9	303.7	20.5	-0.05	3.9	5.4	2.809
3.03	191+00	2M06043801+1948300	23.0	2.0	206.9	10.5	-26.5	9.0	190.1	-0.9	91.2	19.8	-0.05	5.0	6.4	2.809
3.03	030-08	2M19123811-0609237	56.0	75.6	321.0	-4.1	177.3	5.4	29.8	-7.5	288.2	-6.2	0.16	8.5	8.8	6.037
3.03	188+12	2M06512785+2804450	26.9	2.4	328.9	71.9	-10.0	10.9	187.5	12.4	102.9	28.1	0.17	12.1	10.8	6.037
3.03	N6791	2M19194399+3704214	7.7	-6.0	248.2	-38.7	225.2	7.5	69.2	10.8	289.9	37.1	-0.28	3.2	5.3	4.797
3.03	235-12	2M06472489-2613177	38.5	-18.8	230.6	7.8	-156.2	10.0	236.2	-12.4	101.9	-26.2	-0.27	4.4	7.2	4.797
3.03	090-08	2M21463586+4321338	-69.9	-10000.0	-10000.0	-10000.0	158.8	8.7	90.9	-7.7	326.6	43.4	0.03	6.6	9.4	3.876
3.03	169-04	2M05053193+3631186	-64.0	-66.3	242.7	-34.6	-29.0	10.6	169.0	-2.7	76.4	36.5	0.04	6.0	7.6	3.876
3.04	165+08	2M05422261+4659002	-5.2	8.7	253.7	17.7	49.8	13.9	164.2	8.8	85.6	47.0	-0.25	4.1	4.6	4.455
3.04	124-04	2M00554007+5901294	-26.6	-6.5	243.3	-57.2	161.0	9.6	123.5	-3.8	13.9	59.0	-0.25	3.8	5.1	4.455
3.05	180-45	2M03113523+0133391	64.5	64.5	222.5	-10.1	58.2	8.5	178.2	-45.7	47.9	1.6	-0.11	7.3	9.5	3.195
3.05	218+04	2M07165764-0144320	87.0	-29.3	177.3	426.0	-59.9	11.1	217.4	4.9	109.2	-1.7	-0.11	8.6	11.9	3.195
3.05	214-04	2M06365884-0202580	110.1	55.3	296.3	-357.7	-24.3	11.9	213.1	-4.2	99.2	-2.0	-0.53	5.3	5.4	2.758
3.05	176+00	2M05391841+3241593	64.5	62.3	168.5	25.6	71.4	12.3	176.1	0.8	84.8	32.7	-0.52	4.3	5.1	2.758
3.08	030+75	2M13571250+2505059	-79.4	27.9	233.9	-67.7	-42.0	7.3	28.7	75.1	209.3	25.1	-0.56	9.9	12.9	3.018
3.08	105+30	2M17534408+7334121	-194.7	34.8	-19.2	13.3	1.3	9.3	104.5	30.0	268.4	73.6	-0.56	8.9	12.9	3.018
3.09	075+35	2M17163246+4730317	8.9	-32.4	251.0	-0.8	196.6	7.9	73.7	35.3	259.1	47.5	-0.41	3.0	3.0	2.171
3.09	165+18	2M06421293+5013367	-3.8	-2.1	217.6	20.3	45.1	10.0	165.5	19.1	100.6	50.2	-0.4	3.4	3.8	2.171
3.09	K01_082+17	2M19183178+5008359	-5.8	-7.6	247.9	-32.0	217.4	7.9	81.4	16.4	289.6	50.1	-0.09	4.4	4.3	1.877
3.09	160+45	2M09413881+5427079	2.3	-32.5	258.3	30.3	53.5	8.6	161.1	46.1	145.4	54.5	-0.09	5.4	7.7	1.877
3.09	N2420	2M07354874+2237024	74.6	49.2	194.6	4.7	5.4	9.3	196.8	19.5	114.0	22.6	-0.22	7.5	8.6	1.113
3.09	N2420	2M07380599+2207319	48.5	34.5	229.9	-26.8	-23.0	10.4	197.5	19.8	114.5	22.1	-0.23	6.6	9.5	1.113
3.1	101+04	2M21593759+5908335	-27.8	69.0	197.4	-11.8	196.8	8.8	102.4	3.3	329.9	59.1	-0.16	4.6	5.8	2.228
3.1	169+04	2M05335724+4134018	-15.0	-25.6	250.0	87.2	23.6	9.6	168.3	4.5	83.5	41.2	-0.15	4.2	5.2	2.228
3.1	184+04	2M06092107+2836503	24.5	7.6	311.5	68.5	4.5	11.5	182.9	4.3	92.3	28.6	-0.26	1.5	1.5	1.882
3.1	165-04	2M04440004+3935130	-18.3	-13.1	214.1	-23.6	36.5	9.8	163.9	-4.1	71.0	39.6	-0.26	1.8	2.0	1.882
3.1	101-04	2M22155256+5128297	-32.8	-55.0	237.4	-4.1	193.1	8.4	99.8	-4.3	334.0	51.5	0.07	2.9	2.5	0.434
3.1	090-08	2M21441916+4154209	-34.0	25.7	200.0	-39.6	194.4	8.2	89.7	-8.6	326.1	41.9	0.08	1.9	1.2	0.434
3.1	169-04	2M04535065+3639586	15.1	24.5	210.8	39.9	56.1	10.4	167.4	-4.5	73.5	36.7	-0.15	3.9	5.1	1.33
3.1	154-04	2M04022391+4706412	15.9	21.8	243.1	32.3	111.4	9.0	153.3	-4.2	60.6	47.1	-0.14	2.8	4.6	1.33
3.1	098-04	2M21584533+4927203	-36.7	-15.9	218.8	49.8	191.6	8.3	96.4	-4.3	329.7	49.5	-0.26	3.9	7.7	2.024
3.1	158-12	2M03531591+3800591	-47.7	-46.6	248.6	-4.6	27.6	10.1	158.0	-12.2	58.3	38.0	-0.26	5.8	12.9	2.024
3.11	191+00	2M06065474+1922297	41.4	26.1	230.5	16.9	-10.6	8.6	190.7	-0.6	91.7	19.4	-0.29	3.8	3.8	3.135
3.11	199+04	2M06411495+1516128	56.7	20.7	238.4	33.1	-23.4	11.6	198.2	4.7	100.3	15.3	-0.28	5.7	7.6	3.135
3.12	K10_079+12	2M19355067+4523182	-13.7	14.1	227.7	-0.6	211.8	7.8	78.2	11.8	294.0	45.4	0.1	1.8	1.6	0.618
3.12	105-12	2M23070402+4653569	-36.5	7.4	221.2	61.0	178.6	8.5	105.0	-12.3	346.8	46.9	0.11	2.7	2.2	0.618
3.13	PAL1	2M03262282+8005074	4.2	-7.6	254.6	6.4	170.1	8.3	129.5	19.2	51.6	80.1	-0.26	3.7	4.5	0.347
3.13	088+36	2M17150728+5805081	-4.0	33.0	245.5	-4.5	189.3	8.0	86.6	35.4	258.8	58.1	-0.26	3.4	3.2	0.347
3.14	HD46375	2M06322453+0612404	-1.6	-41.3	199.9	8.8	-108.8	8.9	205.2	-1.4	98.1	6.2	0.17	9.0	6.9	0.453
3.14	225+30	2M09013616+0411368	24.4	-18.8	177.6	-31.9	-118.5	8.9	225.0	30.7	135.4	4.2	0.18	7.6	6.1	0.453
3.15	090-45	2M23221234+1223023	-47.4	-18.8	97.5	-76.7	111.6	8.2	91.3	-44.9	350.6	12.4	-0.83	8.3	12.9	1.453
3.15	030+75	2M13541799+2527147	-36.1	38.9	109.3	-4.0	0.7	7.3	29.7	75.8	208.6	25.5	-0.83	9.7	12.9	1.453
3.15	090+30	2M17575275+6048056	-23.9	4.8	230.6	-20.2	180.7	8.0	89.7	29.9	269.5	60.8	0.23	3.5	1.1	0.431
3.15	K09_081+11	2M19490372+4700179	-12.9	-28.7	220.5	41.8	214.8	7.9	80.7	10.5	297.3	47.0	0.24	4.6	7.9	0.431
3.15	COROTA2	2M06511368-0526165	86.6	52.5	223.7	-55.2	-62.7	9.3	217.8	-2.5	102.8	-5.4	-0.26	3.3	2.9	0.654
3.15	195+08	2M06424767+1946400	56.1	39.5	256.3	9.6	-8.4	9.6	194.3	7.0	100.7	19.8	-0.26	3.2	3.6	0.654
3.16	225+30	2M08545409+0402502	1.6	95.1	244.2	-183.0	-141.8	9.4	224.2	29.2	133.7	4.0	-0.06	5.2	4.4	5.438
3.16	060+08	2M19163261+2813082	-6.5	121.0	211.1	29.9	199.6	7.0	60.9	7.5	289.1	28.2	-0.05	8.1	8.1	5.438
3.16	225-04	2M07032535-1320037	80.0	31.1	185.1	2.9	-93.6	8.5	226.2	-3.4	105.9	-13.3	-0.11	1.1	0.6	0.422
3.16	225-04	2M07020530-1300569	81.6	147.7	336.2	-83.5	-90.9	8.9	225.7	-3.6	105.5	-13.0	-0.1	1.5	0.9	0.422
3.16	221+04	2M07230739-0645201	69.8	45.4	292.3	161.6	-92.9	10.5	222.6	3.9	110.8	-6.8	-0.39	3.8	3.7	2.268
3.16	195+04	2M06342731+1641270	56.2	26.9	222.6	-115.4	-16.4	12.4	196.2	3.9	98.6	16.7	-0.4	3.4	2.9	2.268
3.17	000+16	2M16445207-1922561	20.9	-26.9	274.0	27.4	31.3	6.7	360.0	16.8	251.2	-19.4	-0.41	3.6	4.1	3.464
3.17	180-08	2M05093379+2435272	11.7	8.8	242.9	53.0	5.0	10.1	179.2	-9.1	77.4	24.6	-0.4	4.2	5.7	3.464
3.17	180+75	2M11494916+3504130	-4.1	-14.8	232.1	4.2	2.4	8.3	178.0	74.6	177.5	35.1	0.08	10.8	9.3	3.13
3.17	075+12	2M19254347+4328340	-4.0	116.1	222.5	-7.8	219.0	7.8	75.6	12.6	291.4	43.5	0.08	14.4	11.5	3.13
3.17	165+08	2M05363009+4645105	-47.3	-77.4	332.4	94.9	9.0	10.2	163.8	7.8	84.1	46.8	-0.12	8.8	12.9	2.54
3.17	101+04	2M21534888+6008490	-61.4	5.3	199.2	-44.7	162.9	9.0	102.5	4.5	328.5	60.1	-0.11	7.9	10.9	2.54
3.18	K03_077+20	2M18553980+4741393	-39.8	24.4	195.9	12.8	178.4	7.8	77.5	19.0	283.9	47.7	-0.08	2.4	2.4	0.123
3.18	K16_075+11	2M19323899+4104346	-37.0	60.0	214.6	-45.5	186.1	7.7	74.0	10.3	293.2	41.1	-0.08	2.2	2.1	0.123
3.18	K08_073+19	2M18464331+4237431	8.6	-43.6	252.6	-33.0	222.2	7.7	71.9	18.8	281.7	42.6	-0.11	4.2	5.4	0.928
3.18	088+36	2M17134985+5811181	3.1	21.6	247.0	5.7	196.0	8.0	86.8	35.5	258.5	58.2	-0.1	4.4	3.6	0.928
3.18	K05_080+14	2M19340593+4847520	12.6	148.6	199.1	130.5	238.4	8.1	81.2	13.6	293.5	48.8	-0.4	6.3	5.2	3.861
3.18	266+44	2M11031324-1142050	22.5	17.3	224.0	11.4	-142.0	8.2	265.3	43.1	165.8	-11.7	-0.4	5.6	6.8	3.861
3.18	060-12	2M20272994+1834208	4.4	-176.2	184.7	-30.7	205.9	7.1	60.9	-11.4	306.9	18.6	-0.17	5.5	4.8	2.126
3.18	082+35	2M17284205+5521322	30.9	18.5	256.7	42.1	227.4	8.0	83.2	33.6	262.2	55.4	-0.17	6.4	7.9	2.126
3.19	188+12	2M06544532+2854448	5.2	-4.5	245.8	-9.9	-29.6	9.0	187.1	13.4	103.7	28.9	-0.18	1.9	3.4	1.494
3.19	K18_070+14	2M19082717+3845234	10.4	-13.8	245.0	13.5	226.7	7.8	69.8	13.5	287.1	38.8	-0.17	1.5	2.4	1.494
3.21	101-04	2M22205957+5236301	-50.4	-19.1	216.5	49.4	174.5	8.7	101.1	-3.8	335.2	52.6	-0.1	2.1	2.0	1.789
3.21	135+12	2M03343803+7133452	-25.9	-24.2	224.7	17.6	129.0	8.4	135.2	12.7	53.7	71.6	-0.1	3.1	2.7	1.789
3.21	060-08	2M20105798+2016549	-23.8	798.2	261.1	-280.1	179.4	7.0	60.2	-7.2	302.7	20.3	0.13	5.7	3.4	6.249
3.21	203+04	2M06442850+1044051	-8.3	-61.3	188.2	-19.1	-105.1	11.3	202.6	3.3	101.1	10.7	0.13	8.5	5.9	6.249
3.22	120-04	2M00203090+5833243	-78.3	-14.3	179.7	12.8	119.5	9.1	118.9	-4.1	5.1	58.6	-0.01	8.0	12.3	1.858
3.22	180-12	2M05004323+2240126	-48.2	-62.0	200.6	-3.0	-56.7	9.6	179.5	-11.9	75.2	22.7	-0.0	7.1	10.0	1.858
3.23	098-04	2M22031819+5022029	-42.3	-11.1	202.9	-41.0	185.4	8.2	97.6	-4.0	330.8	50.4	0.02	0.8	0.9	0.59

3.23	K05_080+14	2M19304193+4905158	-40.7	-36.2	201.4	4.6	184.6	7.9	81.2	14.2	292.7	49.1	0.02	1.1	2.5	0.59
3.23	240+75	2M11580736+2001372	-22.3	-119.8	195.0	-12.4	-65.7	8.2	240.3	75.9	179.5	20.0	0.21	19.1	12.9	1.69
3.23	M5PAL5	2M15203549+0142503	-16.6	1.1	173.5	-2.1	5.6	6.6	3.9	46.2	230.1	1.7	0.22	14.8	12.6	1.69
3.23	188+12	2M06434670+2811258	-8.8	-17.0	340.0	-0.3	-42.9	10.6	186.7	10.9	100.9	28.2	-0.12	2.7	2.8	2.858
3.23	075-45	2M22414305+0615009	-16.3	6.4	201.2	-11.2	141.1	7.9	74.9	-44.2	340.4	6.3	-0.12	3.9	5.6	2.858
3.24	240+30	2M09265194-0632015	6.0	-55.9	222.1	12.7	-167.0	8.7	239.4	30.2	141.7	-6.5	-0.02	6.7	7.1	2.573
3.24	N6229	2M16522603+4808428	-17.2	-51.4	210.5	6.2	161.8	7.7	74.4	39.4	253.1	48.1	-0.01	7.9	7.6	2.573
3.26	176+04	2M05545508+3450064	44.8	32.5	244.7	86.8	52.8	11.5	175.9	4.7	88.7	34.8	-0.43	1.9	1.8	2.427
3.26	210-04	2M06322966+0207251	71.0	-10.7	140.6	13.5	-49.1	12.1	208.9	-3.2	98.1	2.1	-0.43	1.8	1.6	2.427
3.28	K07_075+17	2M18595082+4614038	-44.1	49.1	184.3	19.7	174.6	7.8	76.4	17.9	285.0	46.2	-0.16	11.7	10.8	5.118
3.28	180+19	2M07073087+3822024	-59.4	-32.3	144.2	-103.9	-61.5	12.0	178.9	19.4	106.9	38.4	-0.16	13.8	12.9	5.118
3.28	182+25	2M07413490+3656492	-58.5	-74.4	225.4	-0.5	-73.2	9.4	182.6	25.4	115.4	36.9	-0.32	2.7	6.5	2.209
3.28	K14_080+08	2M20030794+4429213	-43.5	-23.5	199.2	-15.4	185.5	7.9	79.8	7.1	300.8	44.5	-0.32	4.0	6.4	2.209
3.28	203+00	2M06354656+1014556	65.7	34.6	216.4	19.4	-29.5	9.5	202.0	1.2	98.9	10.2	-0.09	3.5	4.7	4.389
3.28	053+04	2M19130986+2006087	54.1	13.4	265.1	53.4	245.4	6.7	53.3	4.5	288.3	20.1	-0.09	4.1	5.4	4.389
3.29	165+04	2M05200295+4251293	32.1	49.7	226.2	-48.9	81.7	12.6	165.5	3.3	80.0	42.9	-0.21	1.3	2.2	1.657
3.29	165+00	2M05032590+4115166	24.8	5.8	375.8	79.3	76.1	10.9	165.0	-0.2	75.9	41.3	-0.2	1.5	1.7	1.657
3.29	180+04	2M06010020+3221377	14.8	9.4	218.0	-44.9	11.6	9.9	178.7	4.6	90.3	32.4	-0.27	1.5	1.5	3.298
3.29	180-04	2M05313840+2714039	27.1	14.2	388.1	-23.5	18.5	13.2	179.8	-3.5	82.9	27.2	-0.28	1.0	1.2	3.298
3.31	203+00	2M06374091+0934530	50.2	11.3	227.2	34.7	-48.0	10.8	202.8	1.3	99.4	9.6	-0.46	4.2	4.5	0.436
3.31	195+00	2M06192451+1641183	42.3	16.2	247.2	95.1	-24.3	10.8	194.5	0.7	94.9	16.7	-0.45	2.9	3.7	0.436
3.31	M35N2158	2M06135261+2342054	62.1	39.0	236.1	70.7	22.6	10.9	187.7	2.9	93.5	23.7	-0.32	1.9	2.8	1.136
3.31	195+08	2M06524486+1841461	61.0	38.5	206.4	-38.5	-10.9	9.8	196.3	8.7	103.2	18.7	-0.32	1.4	0.8	1.136
3.31	165+08	2M05370000+4610166	-61.1	-56.3	242.0	-34.0	-6.9	9.8	164.4	7.6	84.3	46.2	-0.5	7.2	11.4	0.406
3.31	N1333	2M03243527+3139478	-55.7	-46.5	221.5	8.4	17.8	10.0	157.3	-20.8	51.1	31.7	-0.49	5.8	8.9	0.406
3.31	053-04	2M19474503+1431199	6.1	23.2	241.8	-10.5	193.6	7.2	52.3	-5.5	296.9	14.5	0.18	1.2	1.1	0.8
3.31	027+00	2M18415695-0616040	25.3	-6.4	247.5	-43.1	135.9	6.4	26.3	-0.8	280.5	-6.3	0.17	0.9	0.7	0.8
3.32	188+12	2M06472839+2648367	26.4	-10.5	177.3	61.9	-14.0	10.6	188.3	11.1	101.9	26.8	-0.38	3.9	2.7	0.874
3.32	195-08	2M05512348+1113362	48.7	-42.0	-11.5	-71.9	-24.0	11.3	196.0	-7.9	87.8	11.2	-0.39	5.5	3.6	0.874
3.32	158+18	2M06194111+5607473	39.2	48.4	240.2	21.9	114.5	10.3	158.4	18.1	94.9	56.1	0.2	5.6	5.8	1.876
3.32	210+00	2M06420241+0240121	68.4	1.9	148.6	-20.5	-53.7	9.4	209.5	-0.9	100.5	2.7	0.22	6.7	5.3	1.876
3.33	110+60	2M13430957+5557455	-23.4	20.6	224.1	-14.1	92.2	8.2	108.6	59.7	205.8	56.0	-0.1	4.9	6.3	0.991
3.33	060+30	2M17362579+3542059	1.1	14.9	260.9	-28.5	183.3	7.5	60.4	29.9	264.1	35.7	-0.1	3.2	4.2	0.991
3.34	240+30	2M09241617-0721069	40.8	28.8	235.1	4.1	-134.6	8.8	239.7	29.2	141.1	-7.4	-0.33	6.7	11.0	2.318
3.34	180+19	2M07050913+3717191	0.1	-0.0	291.8	-25.2	-5.6	10.7	179.8	18.6	106.3	37.3	-0.33	7.6	12.9	2.318
3.34	N6791	2M19311478+3813001	-38.8	-23.1	212.3	-112.6	182.0	7.6	71.3	9.3	292.8	38.2	-0.11	5.0	6.7	0.763
3.34	075+30	2M17515468+4804470	-19.0	-33.0	216.2	1.6	181.6	7.7	75.1	29.5	268.0	48.1	-0.1	6.8	11.7	0.763
3.34	N2420	2M07360387+2113018	17.5	-9.0	219.8	-1.1	-56.9	9.8	198.2	19.0	114.0	21.2	-0.19	6.2	12.9	3.78
3.34	169+04	2M05295716+4019528	18.0	20.5	331.4	-78.5	55.2	13.2	168.6	3.4	82.5	40.3	-0.18	9.5	12.9	3.78
3.34	K09_081+11	2M19451221+4735348	-40.8	95.5	196.8	10.8	186.5	7.9	80.9	11.4	296.3	47.6	-0.24	5.3	5.3	3.41
3.34	135+12	2M03335286+7149584	-37.6	42.4	183.3	-11.4	117.8	11.2	134.9	12.9	53.5	71.8	-0.24	4.6	4.2	3.41
3.35	180-12	2M04581124+2242381	-13.1	-5.1	112.9	85.1	-20.1	11.7	179.2	-12.3	74.5	22.7	-0.26	3.3	3.0	3.949
3.35	K09_081+11	2M19512705+4848102	-28.3	7.9	210.9	15.6	199.9	7.9	82.5	11.0	297.9	48.8	-0.26	2.5	2.3	3.949
3.35	COROTA3	2M06421960-0043323	28.6	-22.0	222.3	16.6	-104.0	10.6	212.5	-2.4	100.6	-0.7	-0.29	5.4	5.8	3.087
3.35	150+08	2M04383322+5739097	-25.2	-58.5	406.8	-89.2	83.9	10.7	149.7	7.1	69.6	57.7	-0.29	7.5	8.9	3.087
3.36	075-45	2M22452280+0451326	-19.3	12.7	210.0	2.3	133.1	7.9	74.6	-45.8	341.3	4.9	-0.01	5.0	6.0	0.561
3.36	120-45	2M00465942+1657410	-6.7	74.3	184.4	9.1	122.8	8.4	121.4	-45.9	11.7	17.0	-0.0	4.3	4.4	0.561
3.36	165-04	2M04472531+3921105	-30.1	-18.1	274.9	41.3	22.5	13.4	164.6	-3.7	71.9	39.4	-0.67	3.9	3.6	0.806
3.36	165-04	2M04513596+3923168	-66.3	-35.2	92.1	-116.2	-15.6	14.2	165.0	-3.1	72.9	39.4	-0.67	3.9	4.4	0.806
3.36	165-04	2M04465585+4016082	-16.5	8.0	170.0	56.1	39.1	10.8	163.8	-3.2	71.7	40.3	-0.09	1.9	3.7	1.924
3.36	131+04	2M02203746+6606263	-28.0	6.9	253.1	-8.4	138.9	10.7	131.8	4.8	35.2	66.1	-0.08	2.3	2.2	1.924
3.36	K04_083+13	2M19393497+5036085	-105.9	-91.1	148.9	4.2	120.7	8.0	83.2	13.6	294.9	50.6	0.03	8.6	12.1	3.168
3.36	090-08	2M21405000+4340584	-92.2	-10000.0	-10000.0	-10000.0	137.2	9.6	90.4	-6.8	325.2	43.7	0.03	6.5	7.5	3.168
3.37	N6819	2M19390672+3751175	17.2	114.9	248.2	-33.9	239.1	7.6	71.7	7.7	294.8	37.9	0.21	8.5	12.9	4.883
3.37	210+08	2M07154346+0453543	57.8	6.0	158.1	-109.8	-68.4	9.9	211.3	7.6	108.9	4.9	0.21	10.7	12.9	4.883
3.37	143-04	2M03080578+5352097	-9.7	42.4	202.3	21.0	124.2	10.7	142.3	-3.8	47.0	53.9	-0.51	5.1	5.8	2.902
3.37	195+00	2M06233103+1623107	21.5	-13.3	210.2	-6.3	-47.8	11.2	195.2	1.4	95.9	16.4	-0.51	3.9	2.4	2.902
3.38	150+16	2M05340730+6331423	20.3	52.9	217.6	-19.6	130.0	9.3	148.9	16.1	83.5	63.5	-0.2	2.8	2.5	0.894
3.38	188+00	2M05590598+2310055	8.2	-5.7	245.7	-23.4	-27.1	9.0	186.5	-0.3	89.8	23.2	-0.19	3.1	3.5	0.894
3.38	007+07	2M17362346-2003542	-17.1	8.9	243.1	-38.4	18.5	6.2	6.4	6.5	264.1	-20.1	0.22	2.8	1.9	2.726
3.38	120-08	2M00261042+5359158	-56.7	-24.9	204.6	-4.7	138.1	8.8	119.2	-8.7	6.5	54.0	0.25	3.4	2.9	2.726
3.38	060-04	2M19593142+2214053	27.1	35.0	251.0	-25.3	232.3	7.1	60.4	-3.9	299.9	22.2	-0.0	1.7	3.0	3.601
3.38	210+08	2M07131374+0708065	48.2	3.7	182.6	-8.0	-70.0	8.9	209.0	8.1	108.3	7.1	-0.01	1.5	5.4	3.601
3.38	180+18	2M07064836+3708158	24.2	11.8	204.4	14.6	17.5	8.9	180.1	18.8	106.7	37.1	-0.07	3.6	3.8	1.166
3.38	180+19	2M07105020+3806429	25.7	15.1	177.2	13.1	21.8	10.1	179.4	19.9	107.7	38.1	-0.06	3.1	4.3	1.166
3.39	K19_076+07	2M19513410+3952162	-56.4	-22.4	180.0	-8.8	169.0	7.8	74.7	6.6	297.9	39.9	0.11	2.5	3.3	1.465
3.39	120-04	2M00360285+5736012	-59.9	-20.6	213.6	47.8	133.2	9.2	120.9	-5.2	9.0	57.6	0.13	1.6	1.6	1.465
3.4	158-12	2M03571038+3738578	21.1	24.3	221.9	10.6	93.4	8.4	158.8	-12.0	59.3	37.6	-0.02	2.7	3.7	0.432
3.4	180-04	2M05335821+2600374	50.8	37.4	248.5	-24.7	36.9	8.8	181.1	-3.7	83.5	26.0	-0.02	3.2	5.3	0.432
3.41	120+30	2M16241411+8459259	-15.4	8.9	229.4	-1.0	161.1	8.5	118.3	30.1	246.1	85.0	0.1	3.8	4.9	0.664
3.41	K04_083+13	2M19423208+4856290	3.9	-6.8	245.0	7.5	230.9	7.9	81.9	12.4	295.6	48.9	0.1	5.1	5.9	0.664

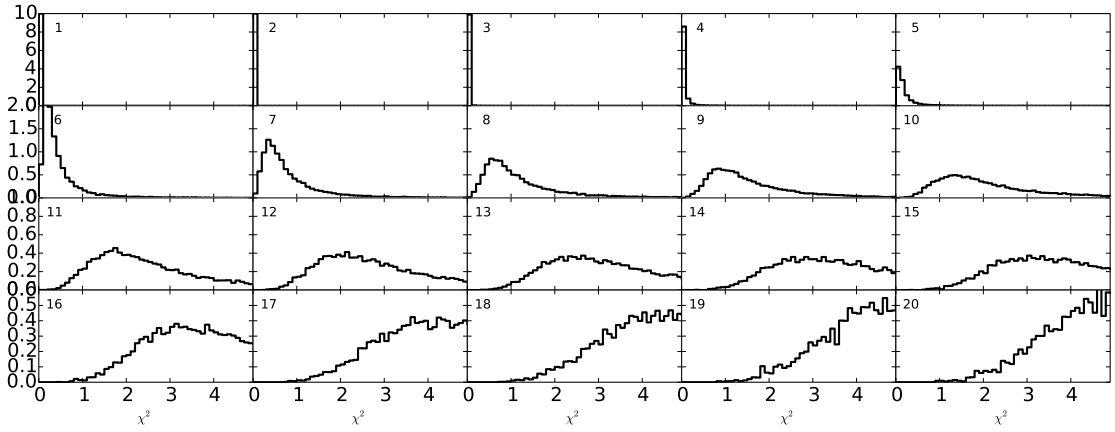

Fig. 1.— At left, neighbours of stars drawn at random with metallicities within the errors and at right the nearest neighbour for a 20 element chi2

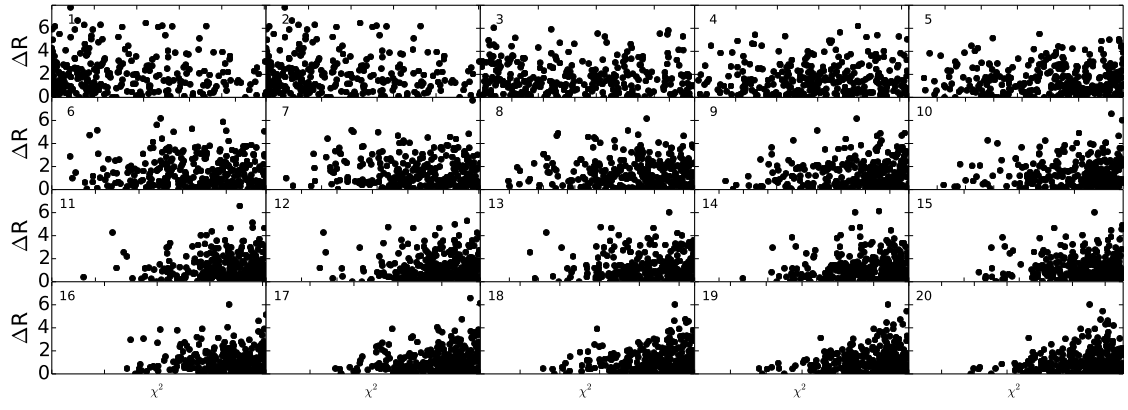

Fig. 2.— At left, neighbours of stars drawn at random with metallicities within the errors and at right the nearest neighbour for a 20 element chi2

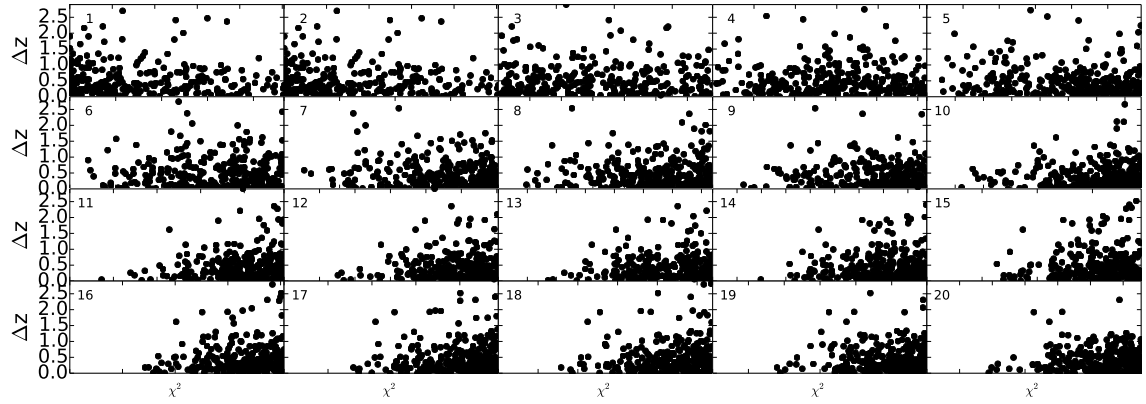

Fig. 3.— At left, neighbours of stars drawn at random with metallicities within the errors and at right the nearest neighbour for a 20 element chi2

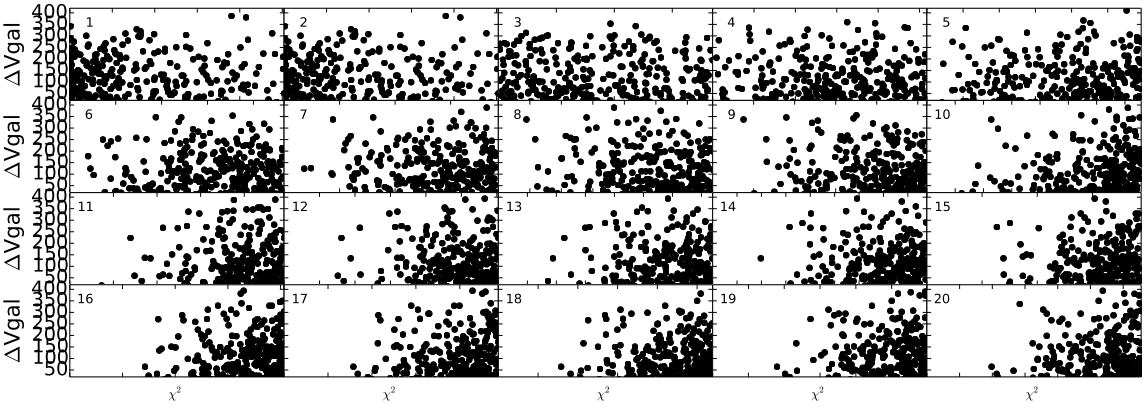

Fig. 4.— At left, neighbours of stars drawn at random with metallicities within the errors and at right the nearest neighbour for a 20 element chi2

4. Results

. . . If ΔR decreases with increasing number of abundances added, this implies that at a given metallicity of gas, the interstellar medium was not well mixed,

. . . - summarise the paper of YST and what they determined from APOGEE data and then point to section where show comparison of *The Cannon* 's results for the same elements as ASPCAP for YS's high alpha-sequence. Use spectral derivatives; also found comparable results using a 2 x resolution element wavelength window filter where every instance appears in the lines list; better for some and worse for others.

. . . In Section X we demonstrate the improvement as a function of SNR compared to current approaches and compare filtered versus unfiltered approach. This demonstrates we achieve error bars which are 2-3 times smaller and this is critical for chemical tagging and also shows that can get higher precision labels with less observing time; can probe further out into the disk getting fainter targets or observe larger numbers of stars.

. . . In Section Y we demonstrate we are on the same scale as ASPCAP's high SNR data which shows an rms of x and as SNR decreases the rms increases, as a result of the lower fidelity of ASPCAP's results.

. . . different nucleosynthetic processes and so birth conditions

5. Notes

Over the past several years, however, this assumption of stars remaining near their birth radii has been firmly shaken by the realization that rapid stellar migrations of several kpc are possible (Sellwood & Binney 2002, hereafter SB02). Roskar 2012

6. Data

. . .

7. APOGEE value-added individual abundances catalogue

. . . criteria are closest in 20 abundance space + ages within 45%

. . . Note this shows that in the low alpha sequence - the youngest stars are along all metallicity and sit at a lower [Mg/Fe] than the older stars.

run -i plotgroupsnew

Acknowledgments

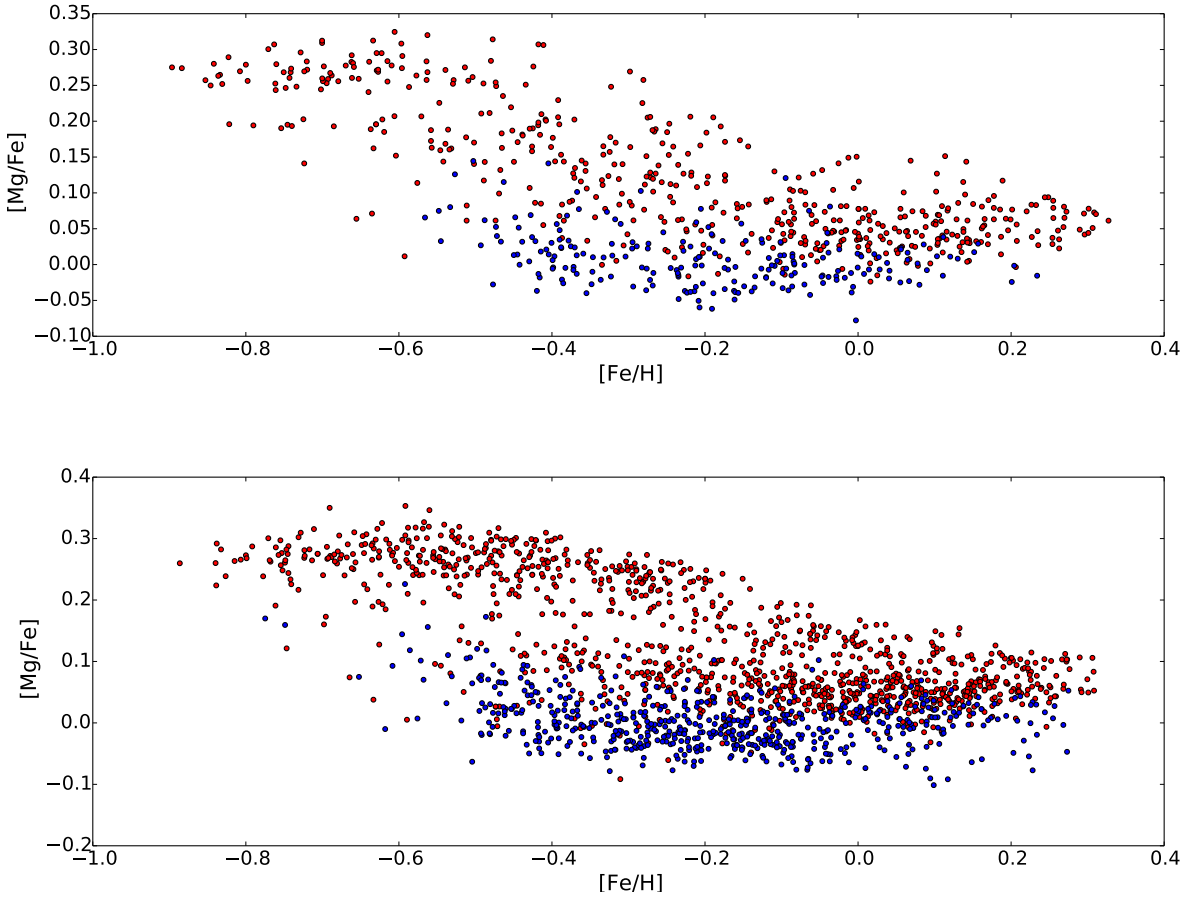

Fig. 5.— Mean values for the1000 pairs with chi2 < 5 shown with blue being ages < 2 Gyr and old being ages > 7 Gyr: at top just fe and at bottom is 20 elements

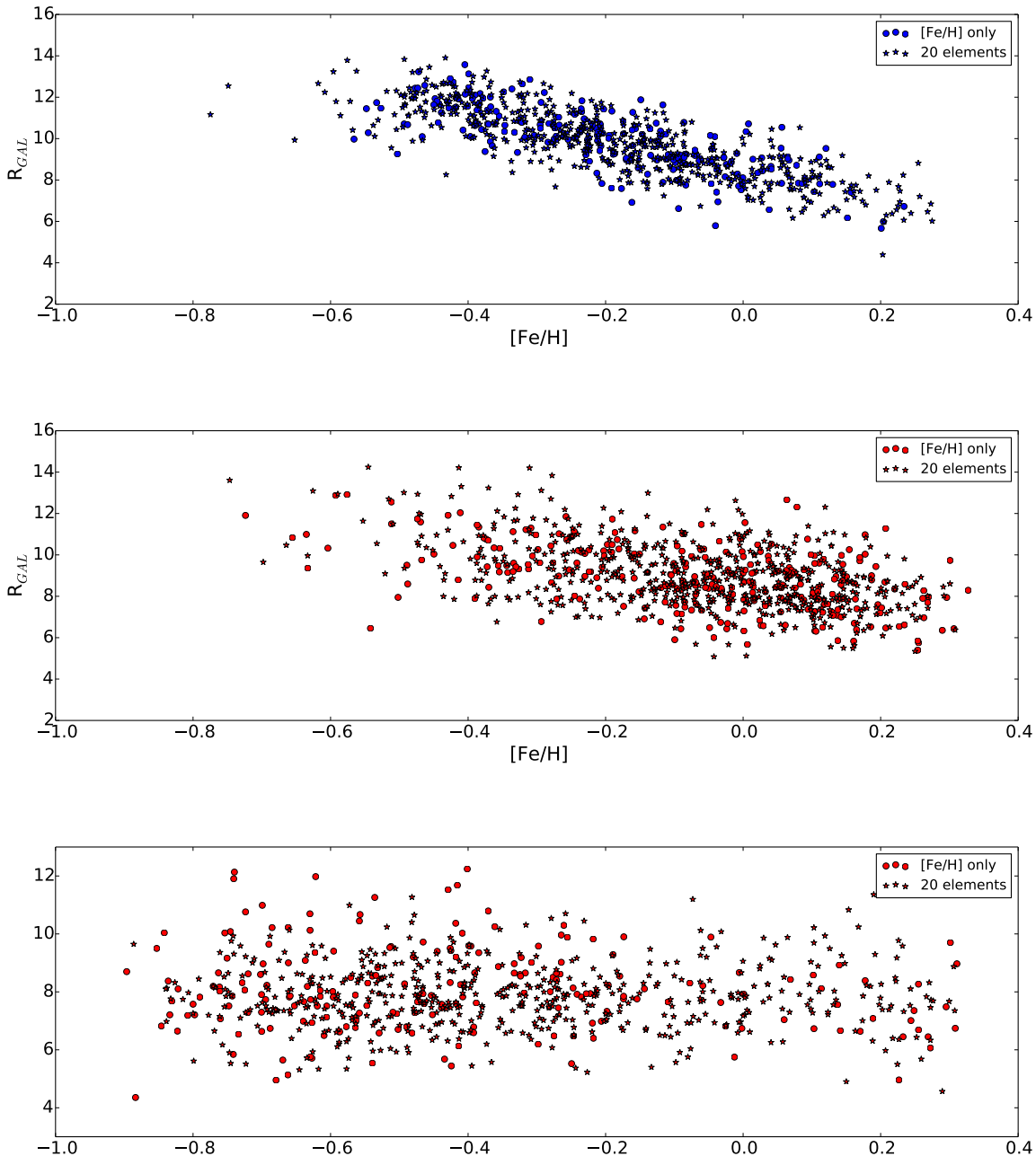

Fig. 6.— young pairs, old pairs in low alpha sequence, old pairs in high alpha sequence: looks the same if you select on just fe/h or in 20 element space

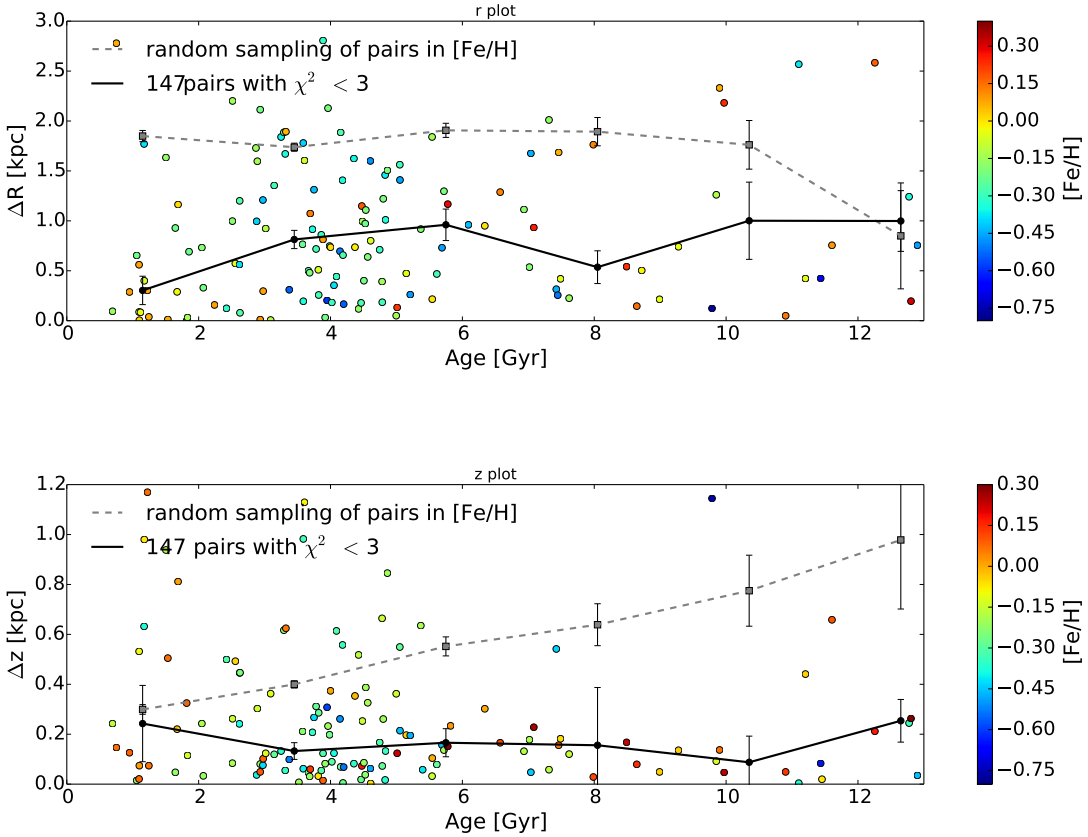

Fig. 7.— At left, neighbours of stars drawn at random with metallicities within the errors and at right the nearest neighbour for a 20 element chi2

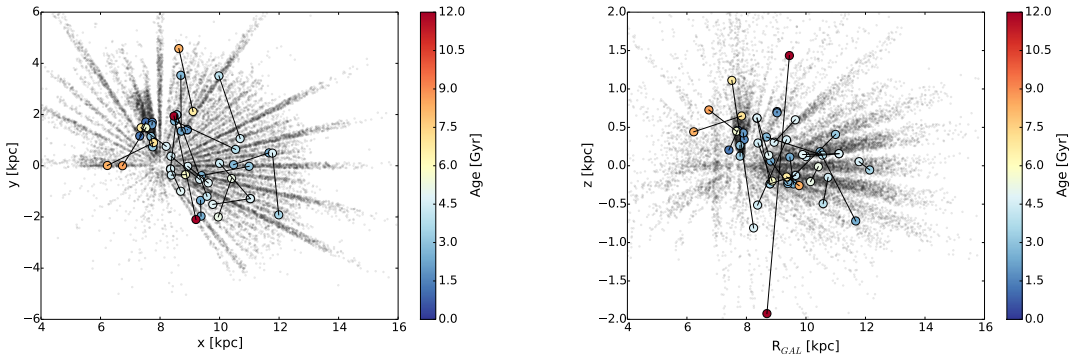

Fig. 8.— 25 nearest neighbours in 20 abundance space; metallicities span -0.75 to 0.3 dex.

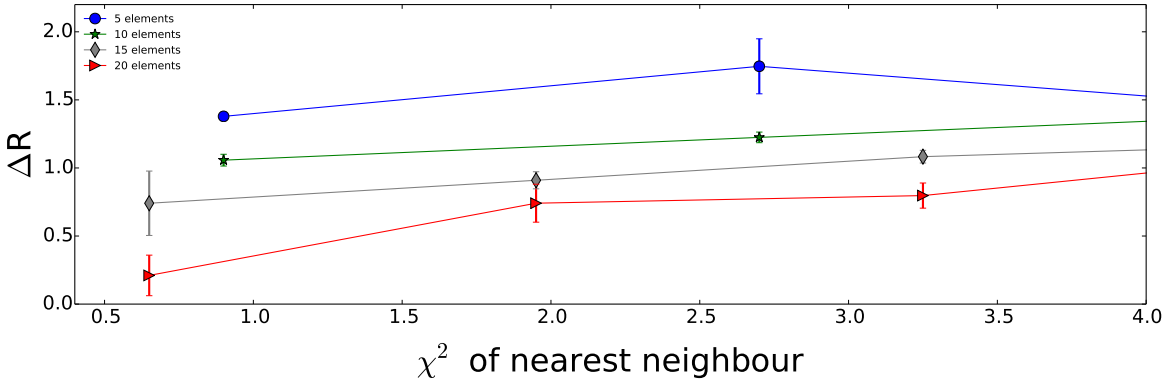

Fig. 9.— At left, neighbours of stars drawn at random with metallicities within the errors and at right the nearest neighbour for a 20 element chi2

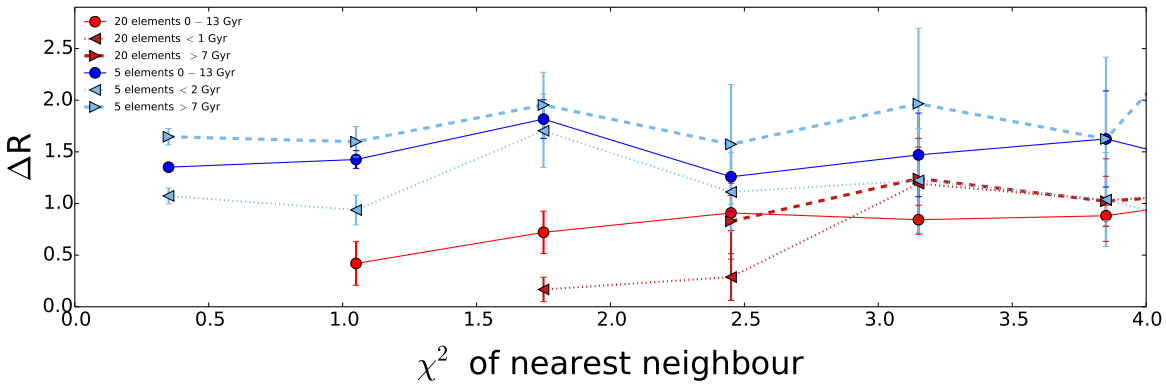

Fig. 10.— At left, neighbours of stars drawn at random with metallicities within the errors and at right the nearest neighbour for a 20 element chi2