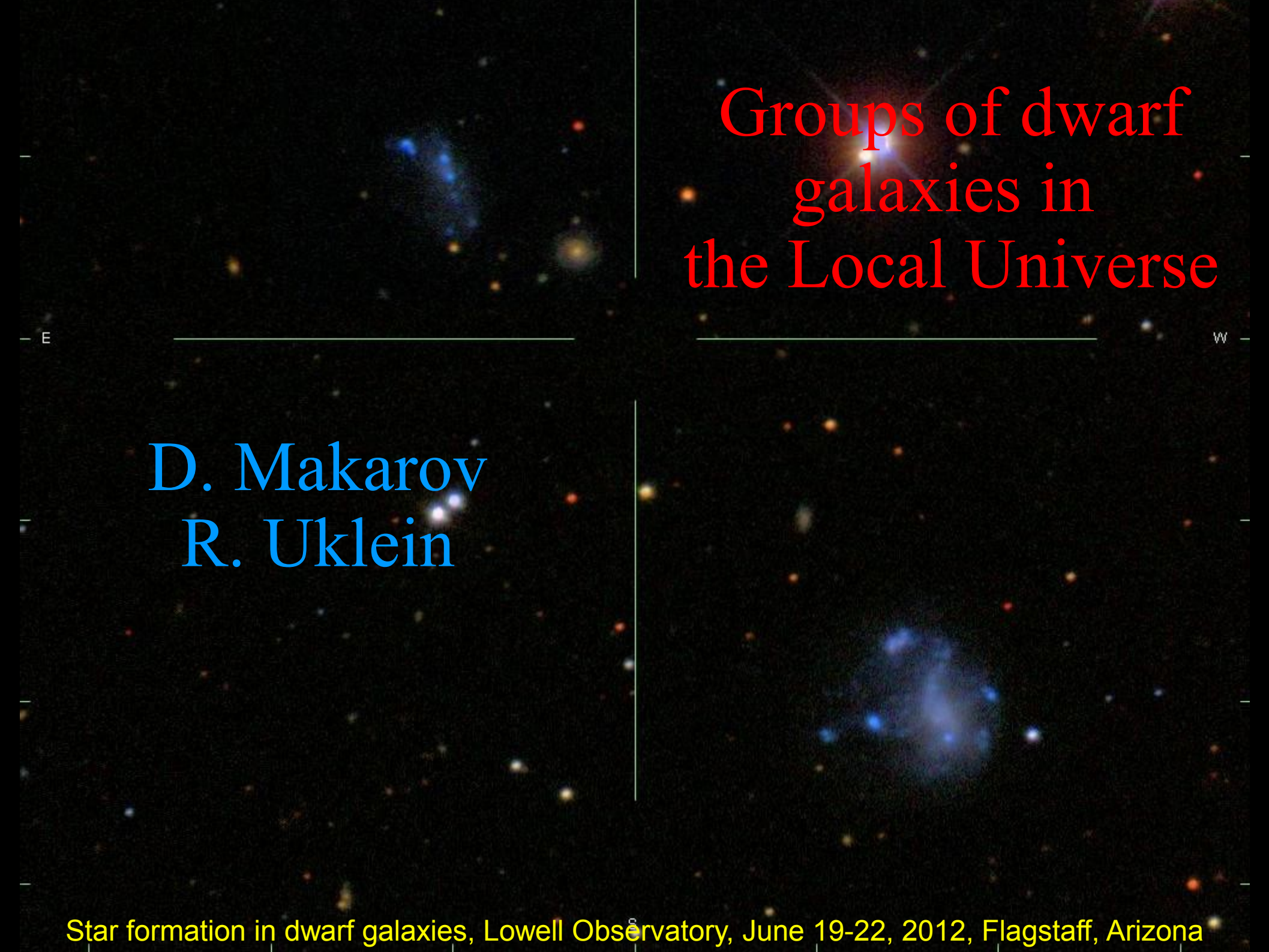
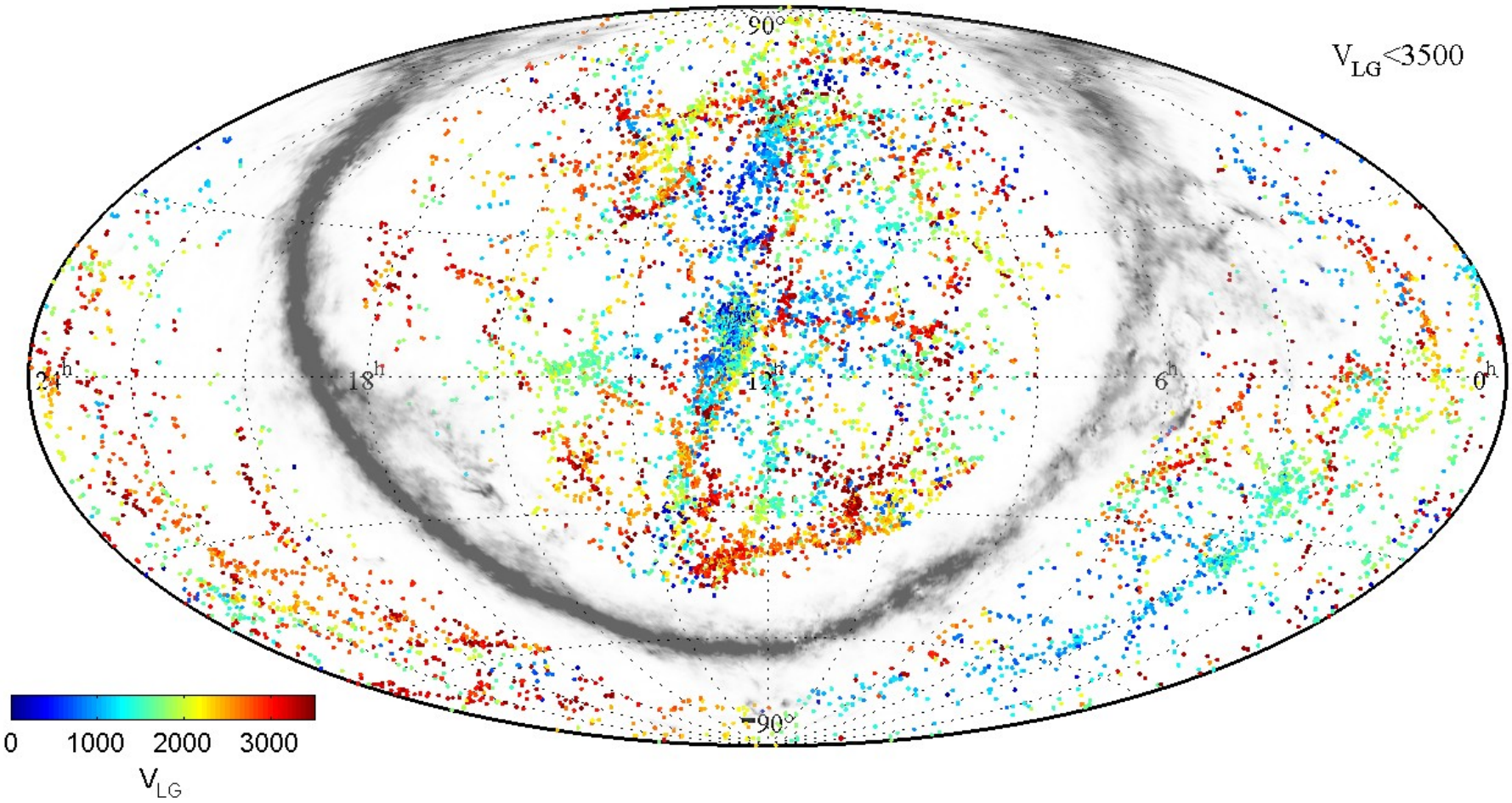


Groups of dwarf galaxies in the Local Universe

D. Makarov
R. Uklein

Star formation in dwarf galaxies, Lowell Observatory, June 19-22, 2012, Flagstaff, Arizona

Distribution of nearby galaxies

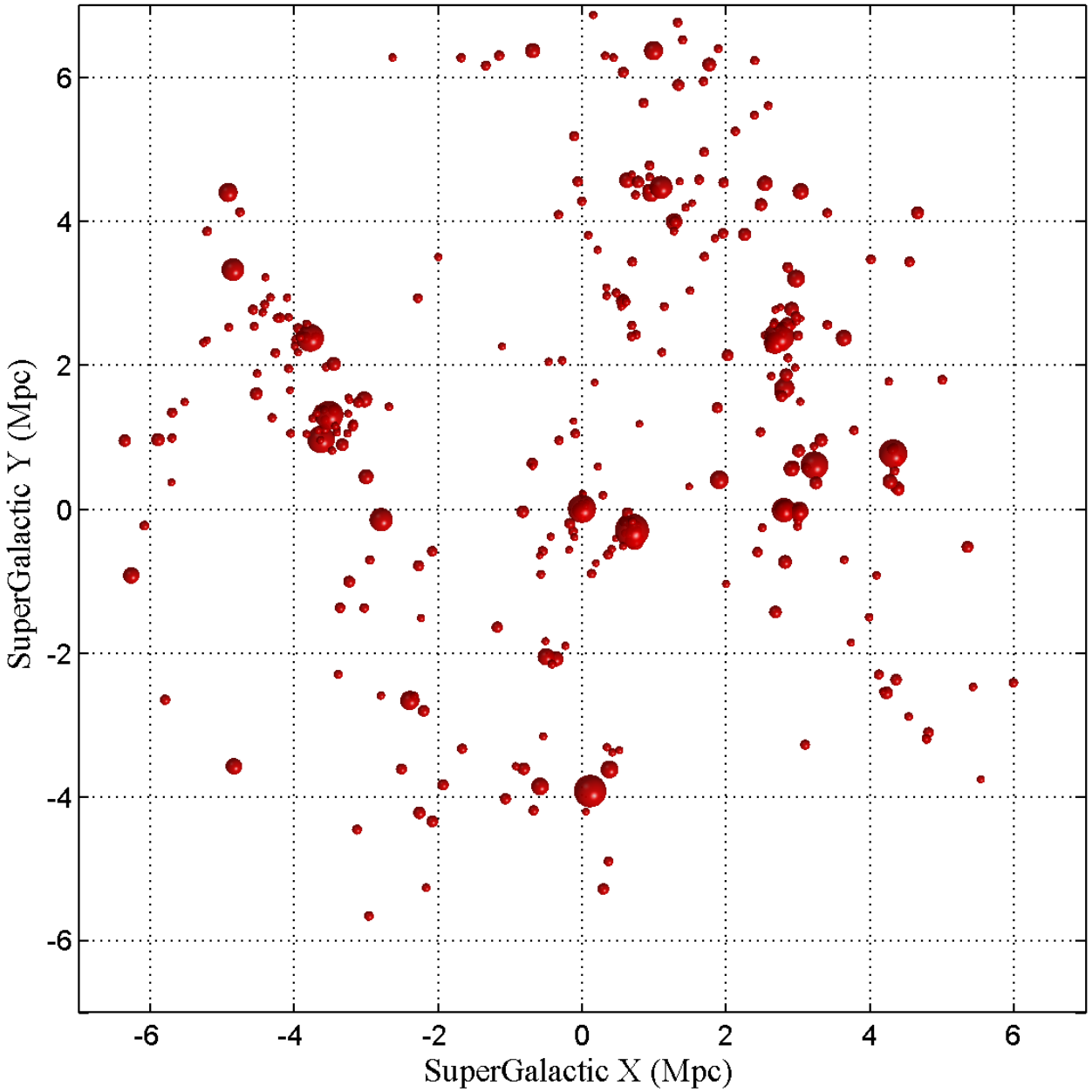


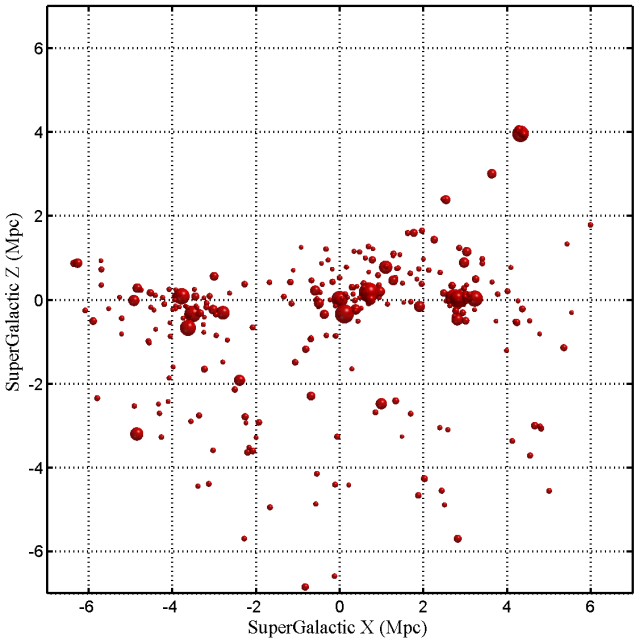
Grouping criteria

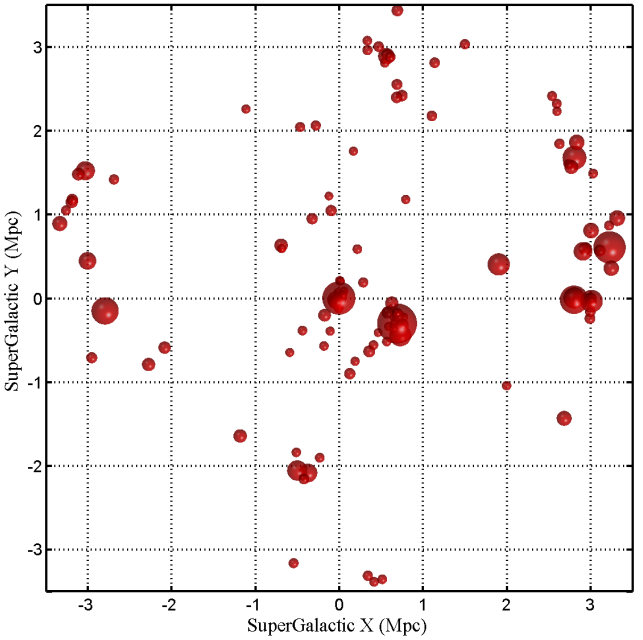
$$\frac{\mathrm{T}}{\Omega} = \frac{V^2 R}{2G\sum \mathcal{M}} < 1$$

$$\frac{\pi^2 R^3 H^2}{8G\sum \mathcal{M}} < 1$$

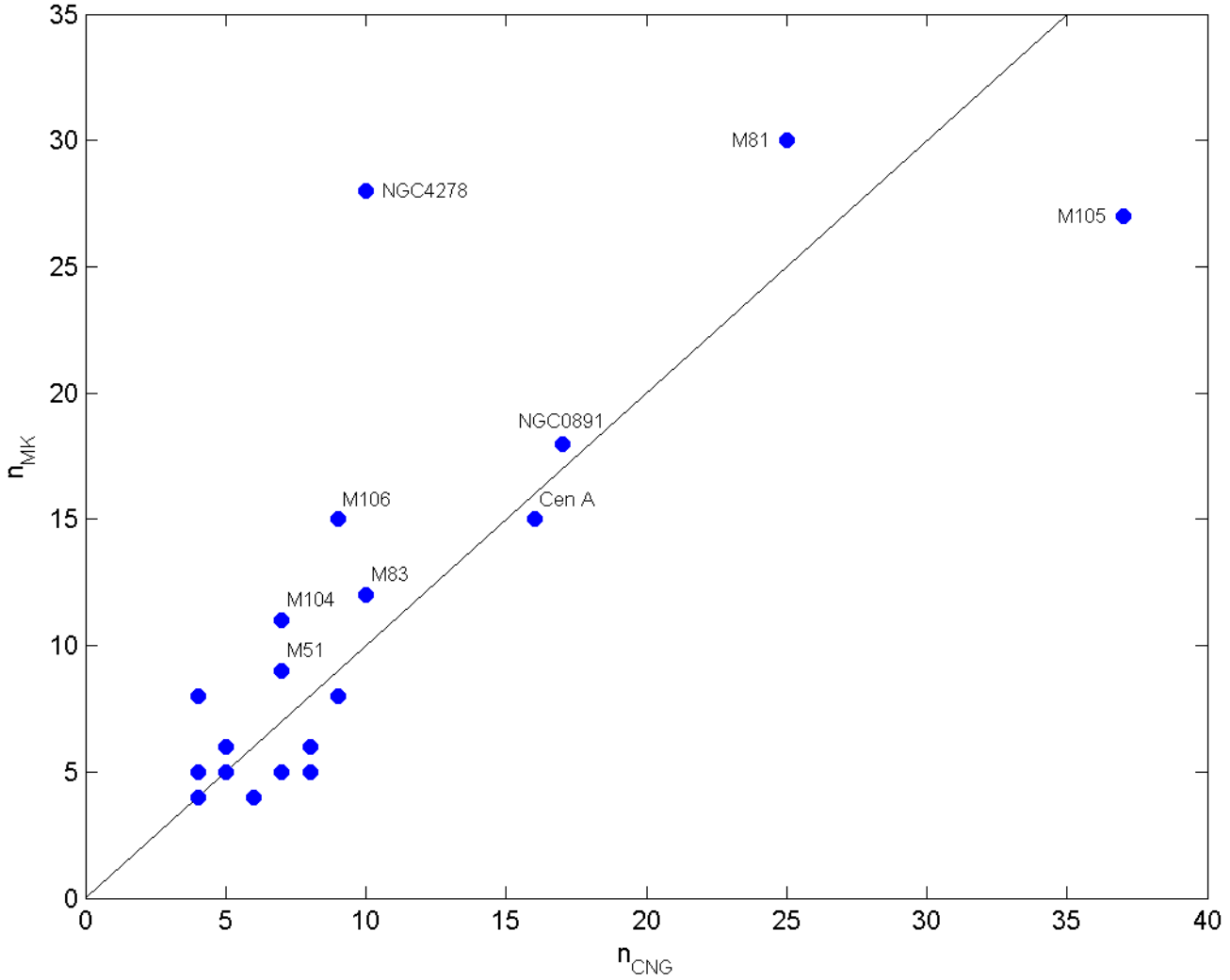
3D picture of the Local Volume



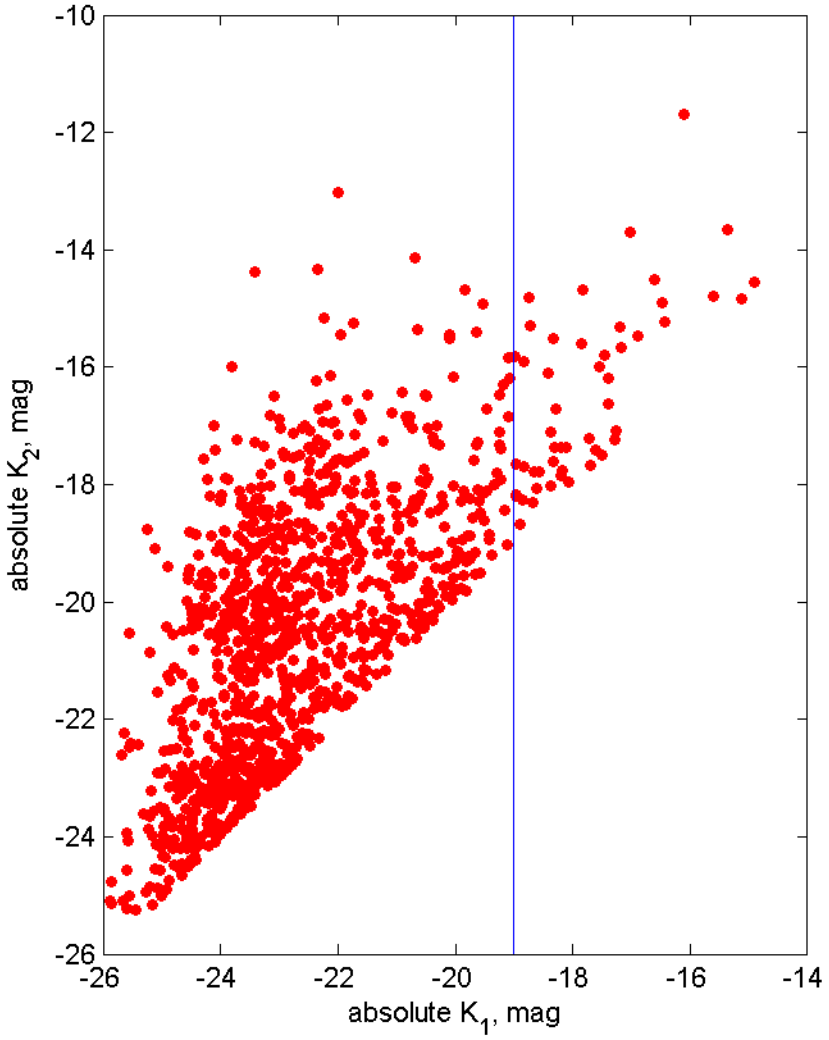




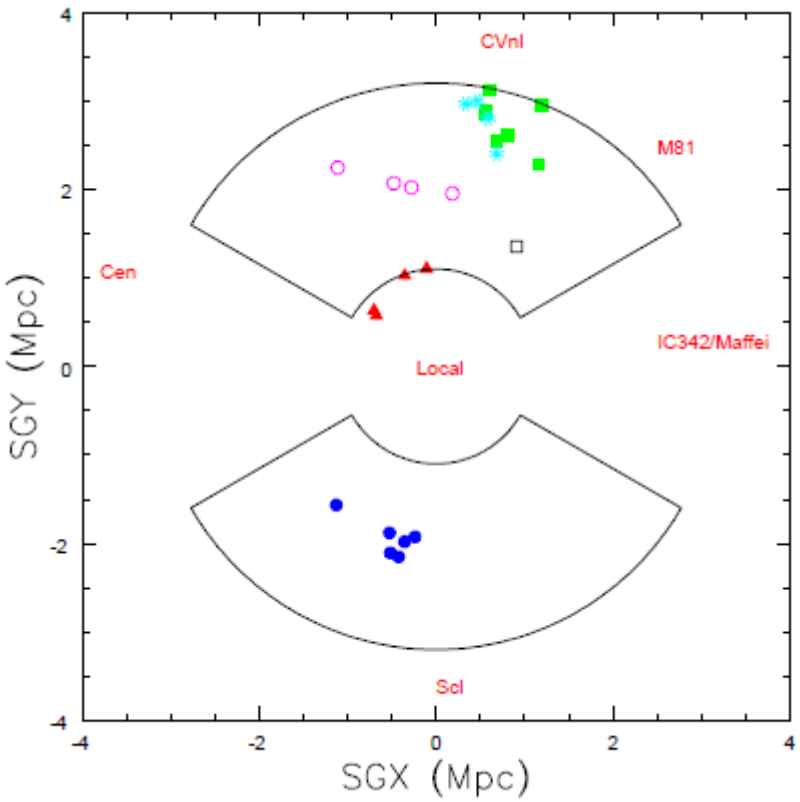
Tuning of the algorithm in nearby groups

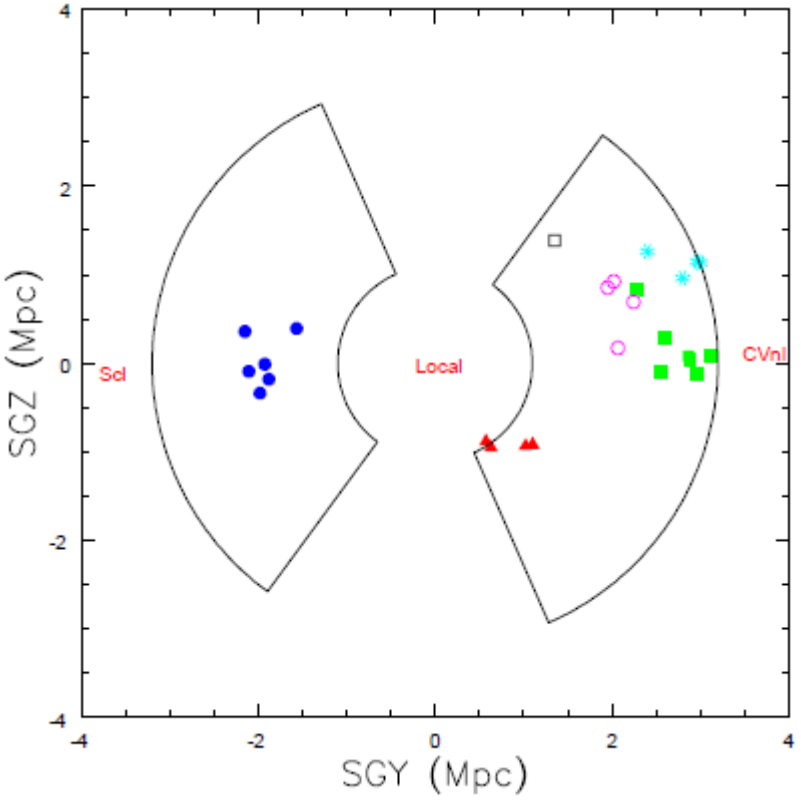


Main parameters of the groups

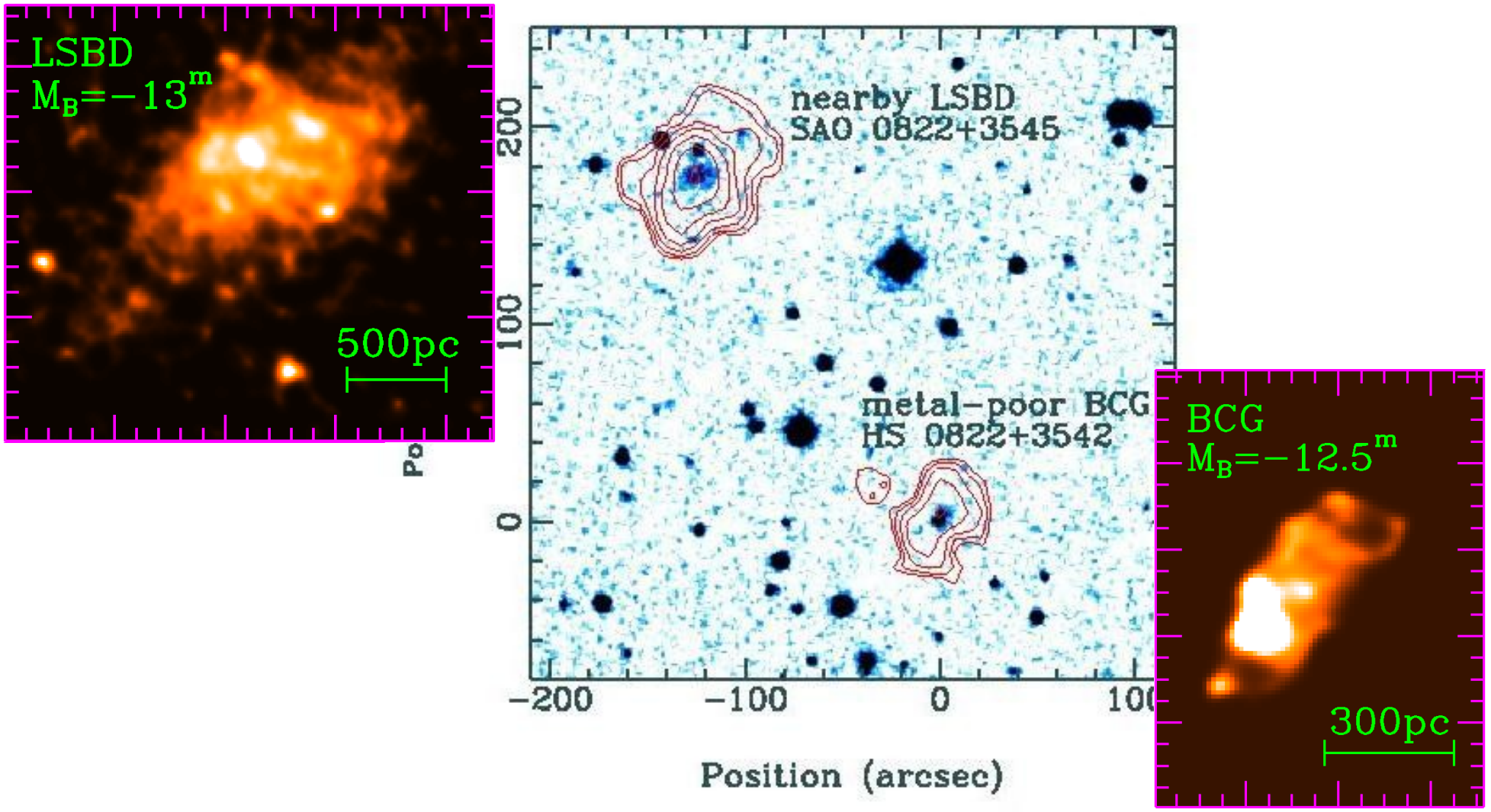


Associations of dwarf galaxies by Tully et al. 2006

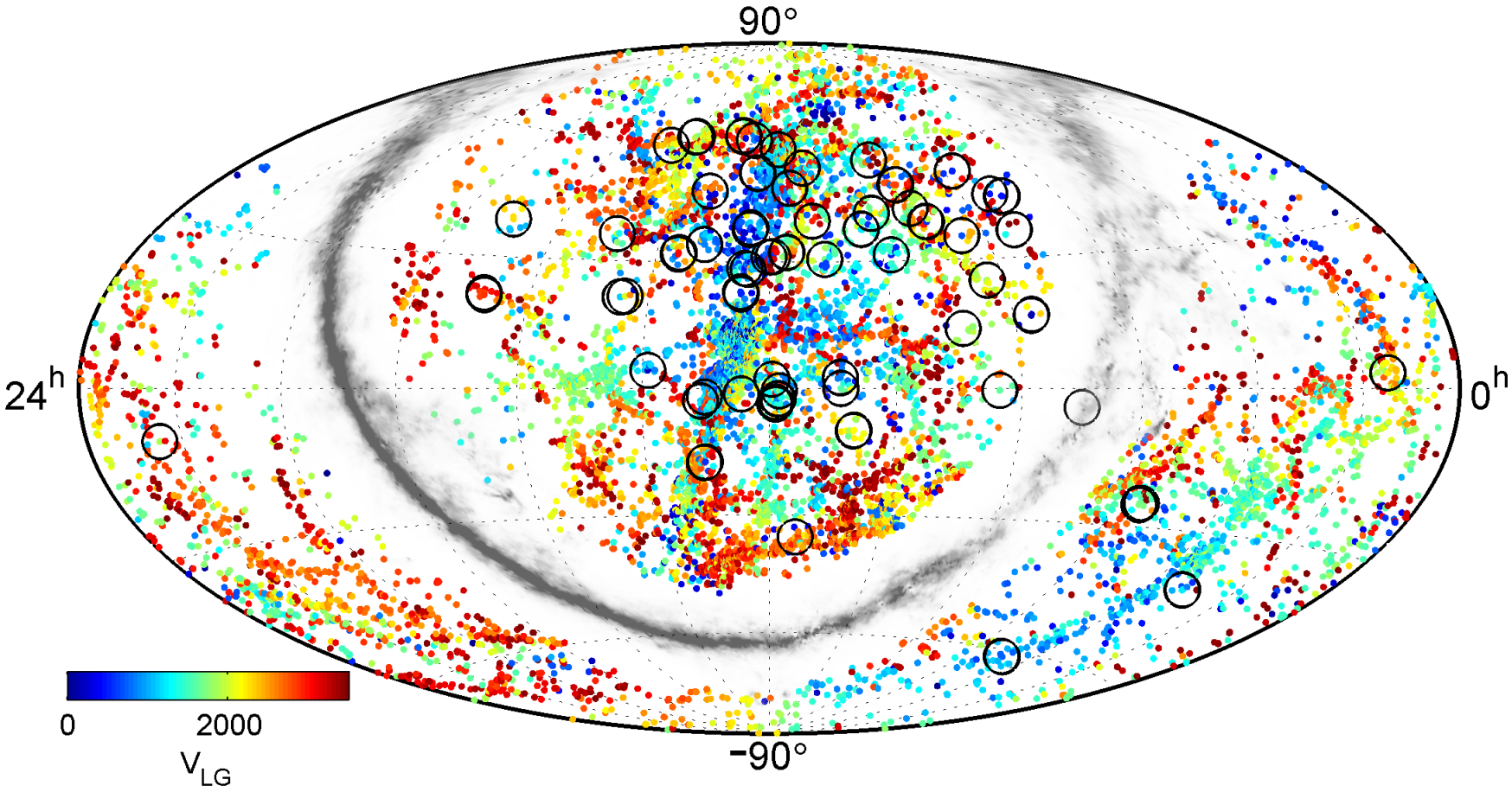




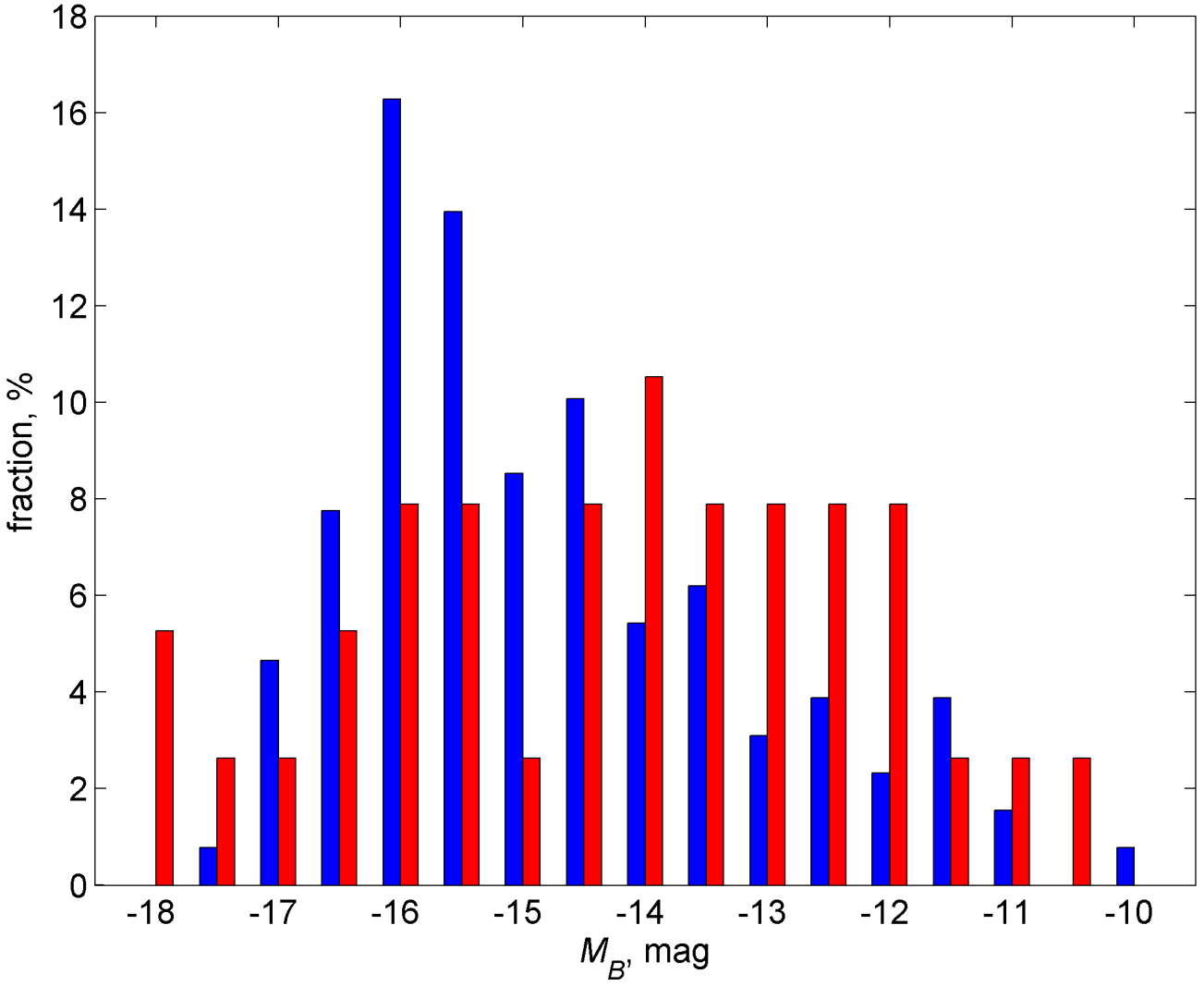
Pair of low-metallicity galaxies in the nearby void by Pustilnik et al. 2006



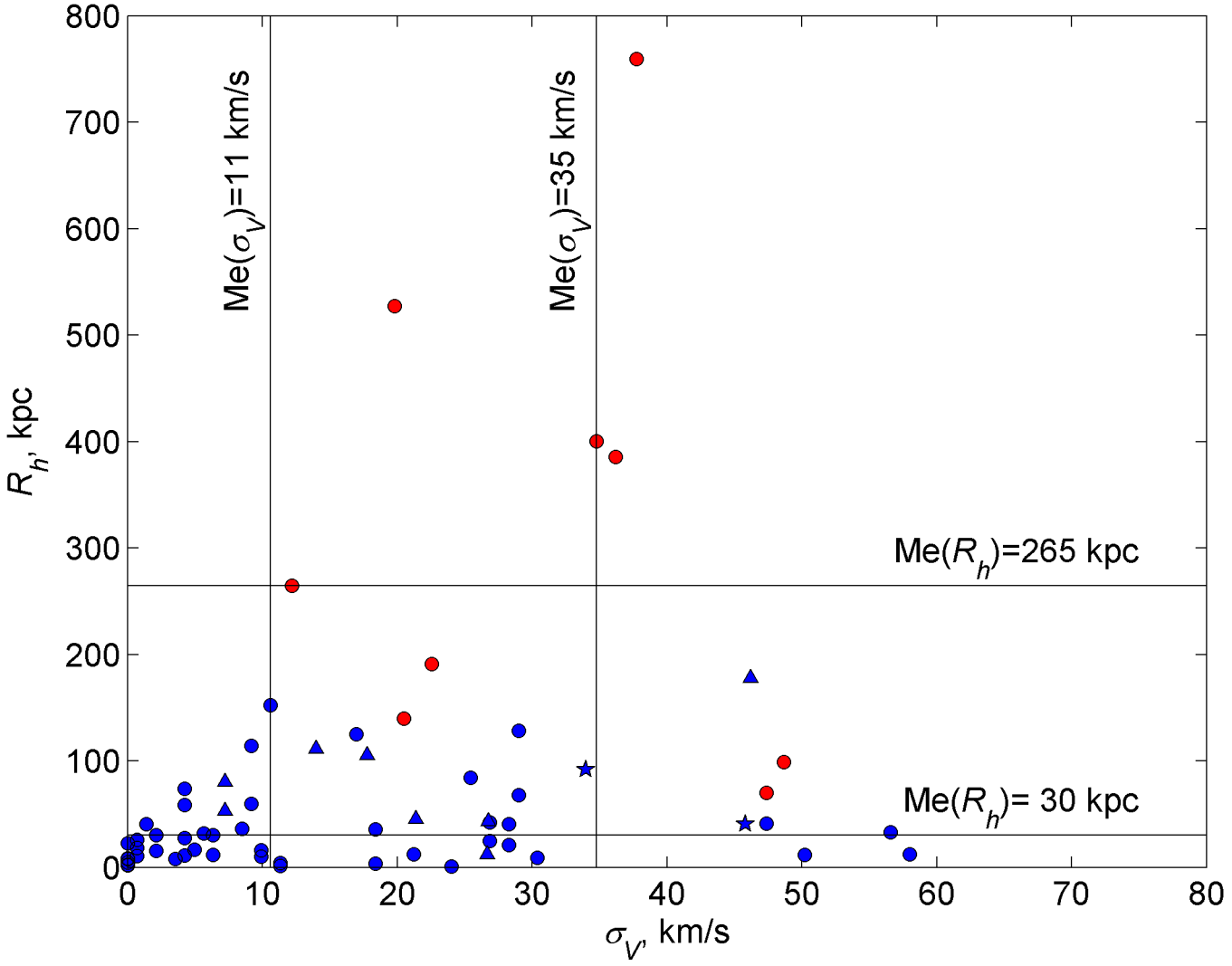
Distribution of the groups of dwarfs



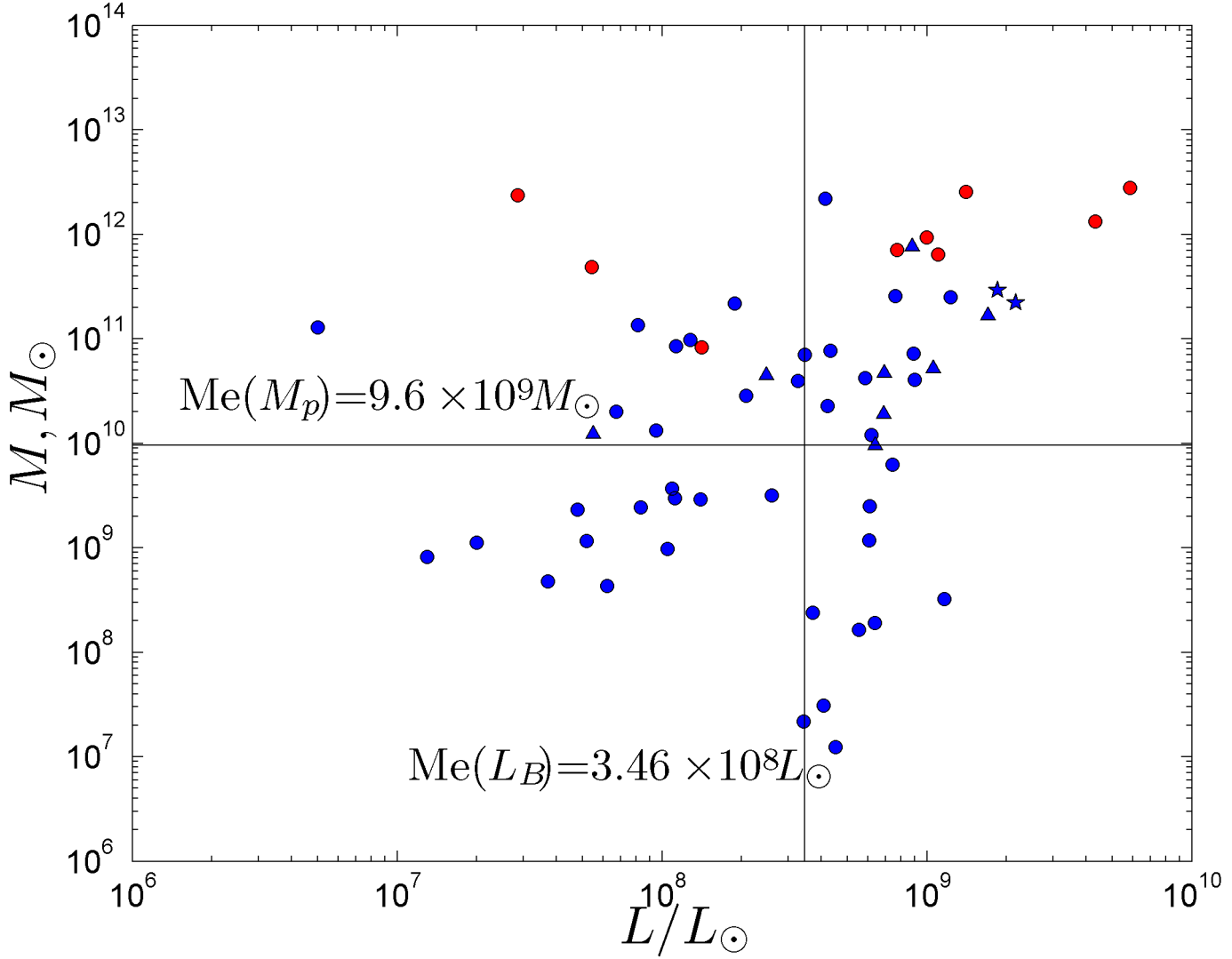
Luminosity function



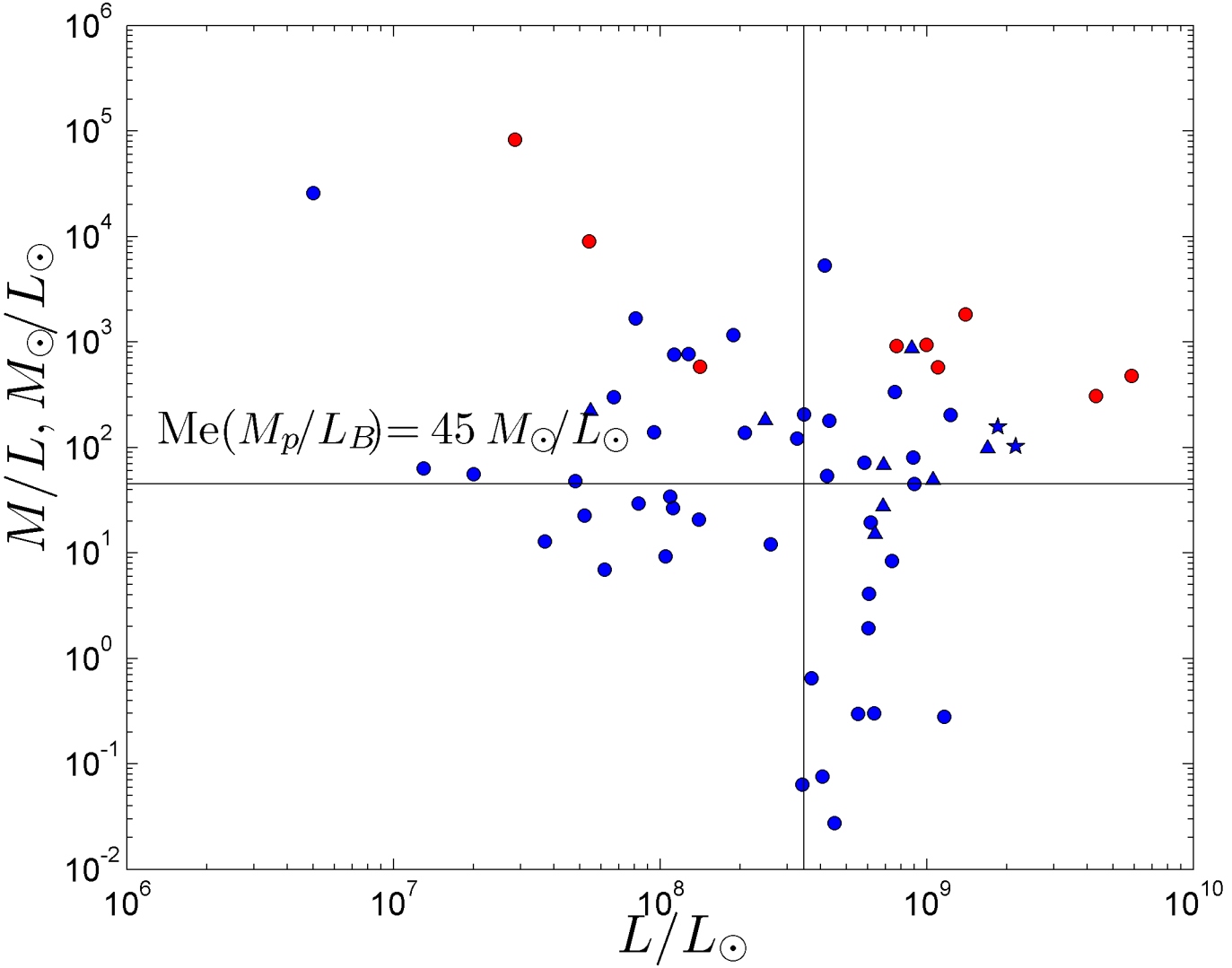
Main parameters of the groups of dwarfs



Main parameters of the groups of dwarfs



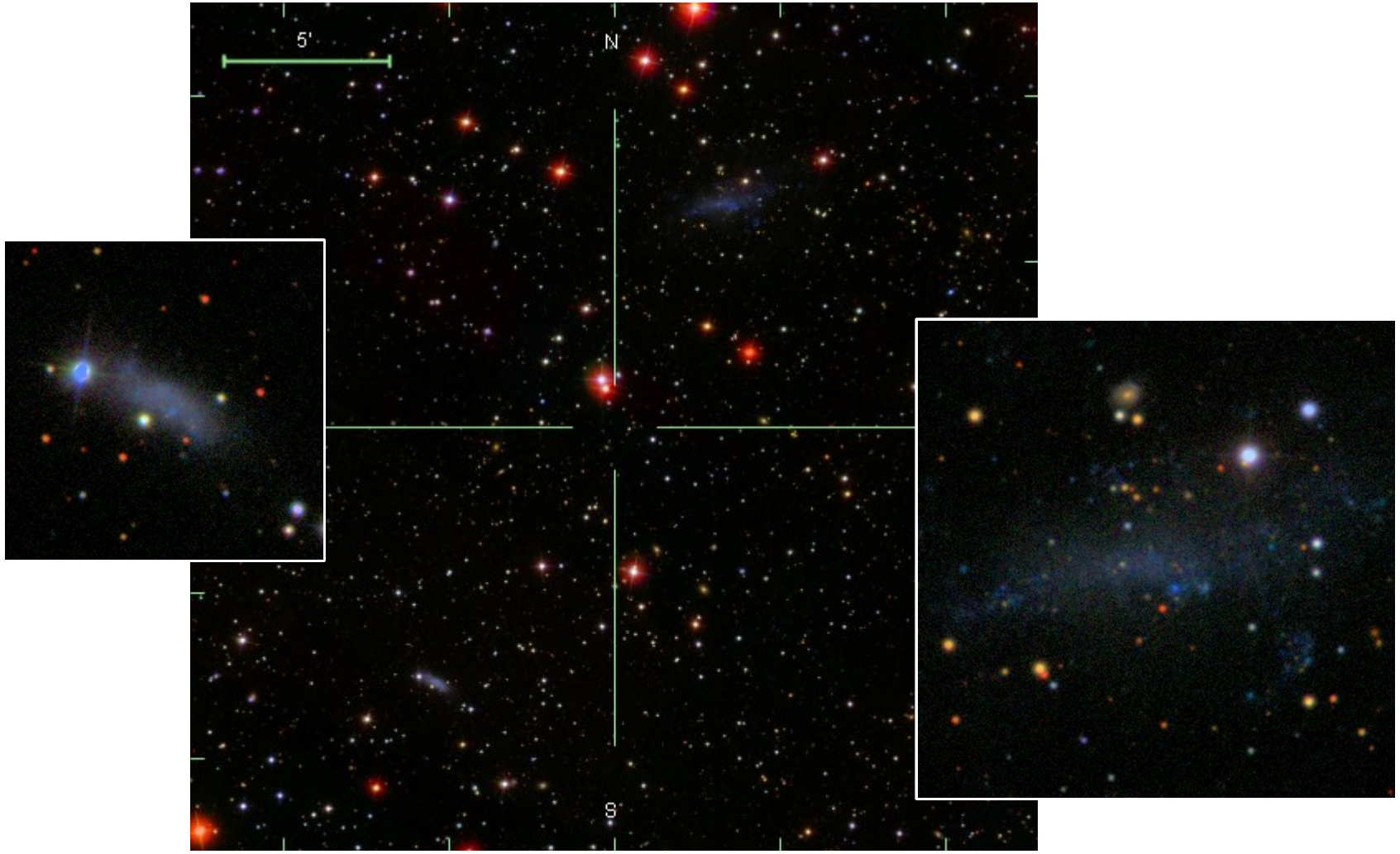
Main parameters of the groups of dwarfs



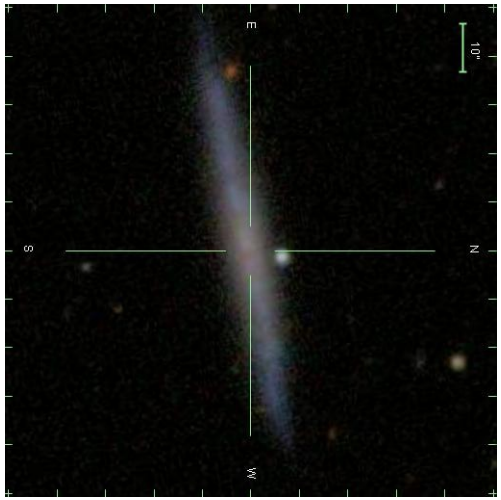
Properties of the groups of dwrfs

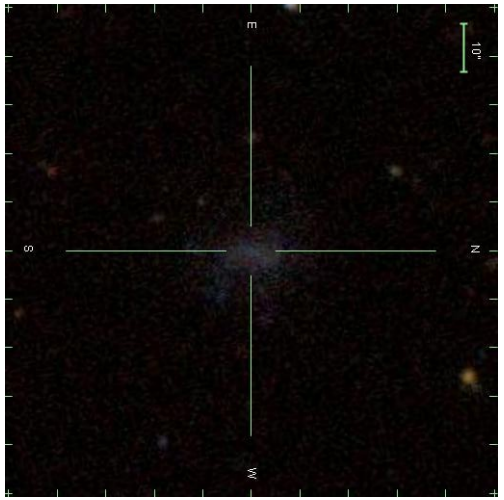
	n	σ_V km/s	R_h kpc	M_p $10^{10} M_\odot$	L $10^9 L_\odot$	M/L $M_\odot/L_\odot$
LSC	1082	42	160	61	42	21
n=2	516	24	121	14	17	11
n=3	171	41	156	46	40	15
$n \geq 4$	395	74	204	330	120	31
AD	7	35	265	38	1.0	380
GD	57	11	30	0.96	0.35	45
n=2	47	9	22	0.29	0.29	26
n=3	8	20	67	4.6	0.69	83
$n \geq 4$	2	40	66	26	2.0	129

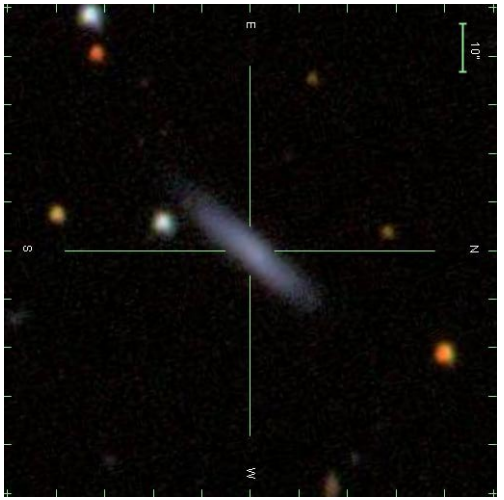
Example of a group of dwarfs

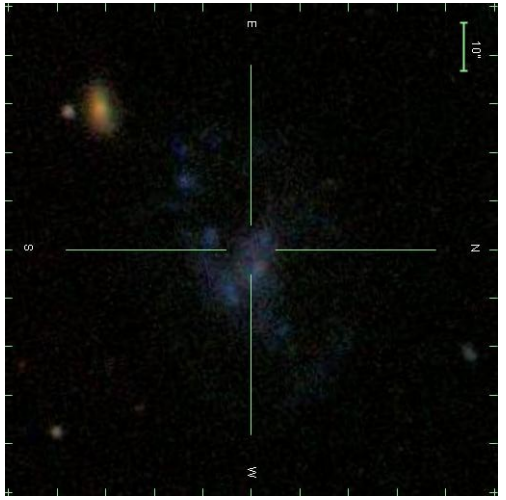


Example of a group of dwarfs

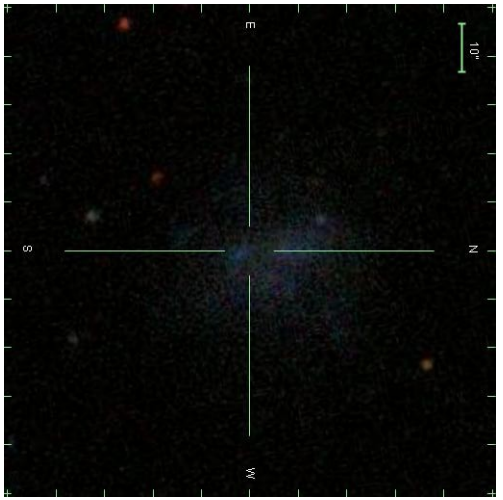

E
S
N
W
10"

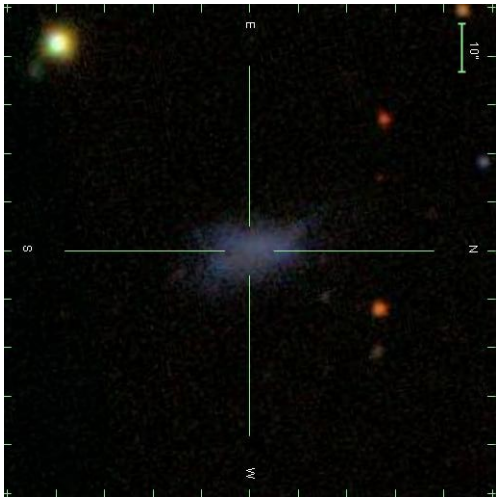

E
S
N
W
10"


E
S
N
W
10"

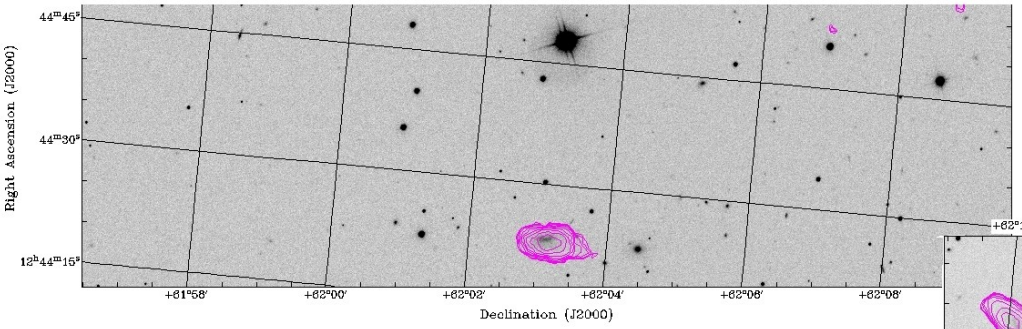

E
S
N
W
10"

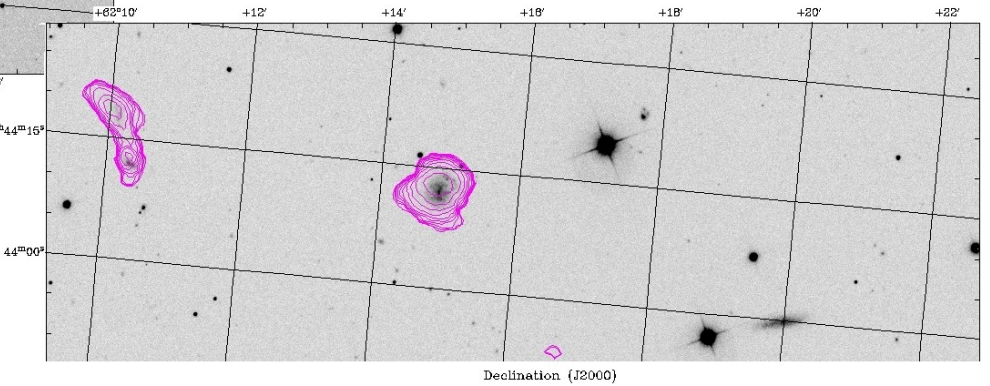

J1337+32

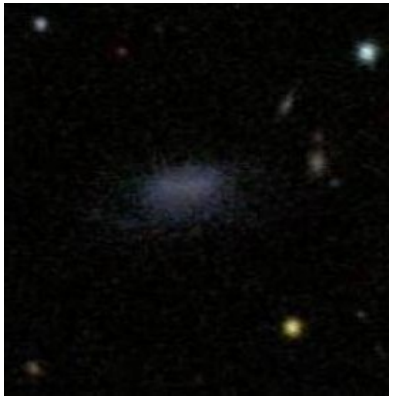

E
S
N
W
10"

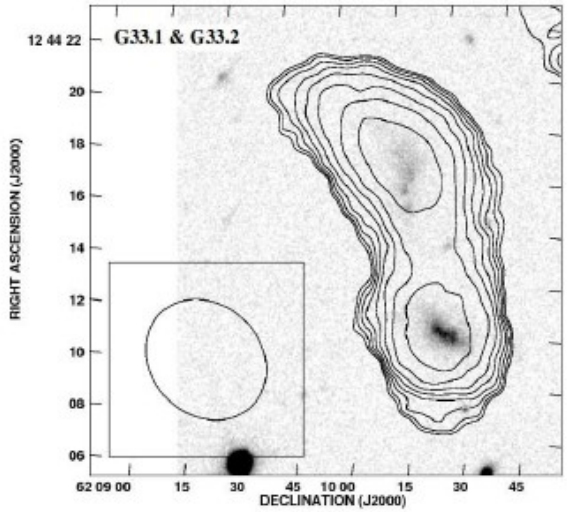

E
S
N
W
10"

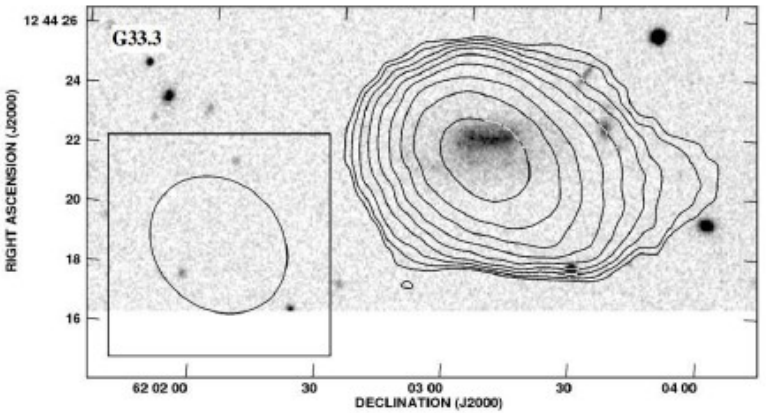
J1244+62

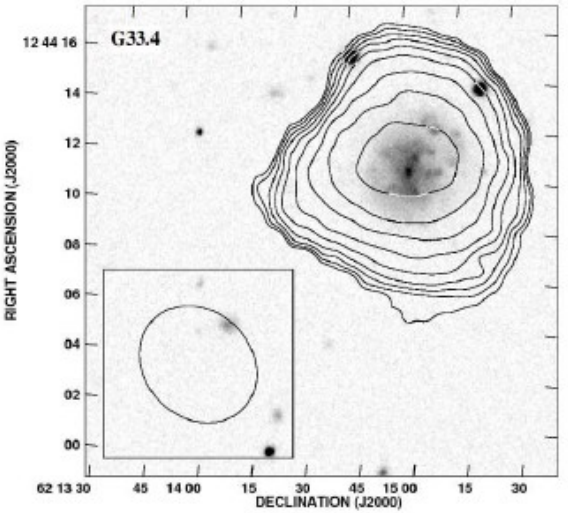

Right Ascension (J2000)
44m45s
44m30s
12h44m15s
+61°58′
+62°00′
+62°02′
+62°04′
+62°06′
+62°08′
Declination (J2000)

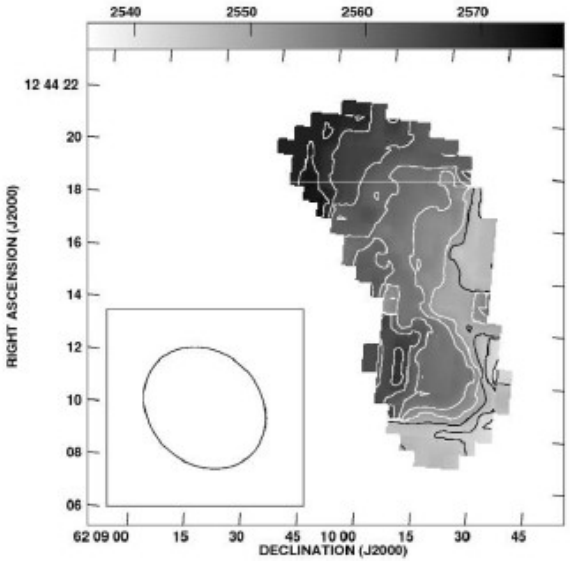

+62°10′
+12′
+14′
+16′
+18′
+20′
+22′
12h44m15s
44m00s
Declination (J2000)

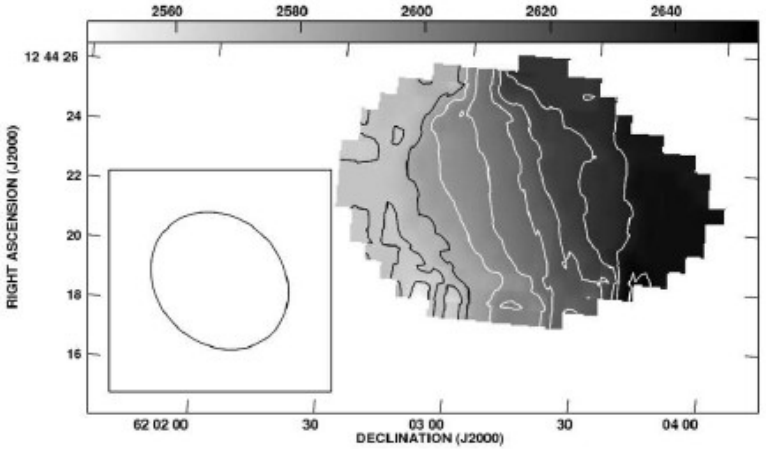


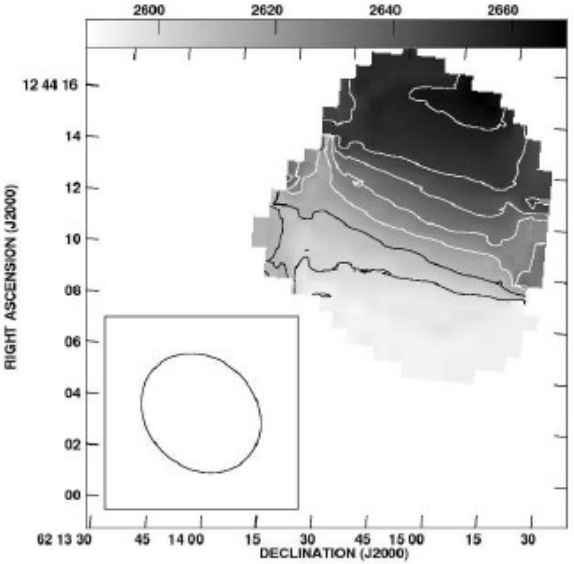

G33.1 & G33.2
RIGHT ASCENSION (J2000)
DECLINATION (J2000)

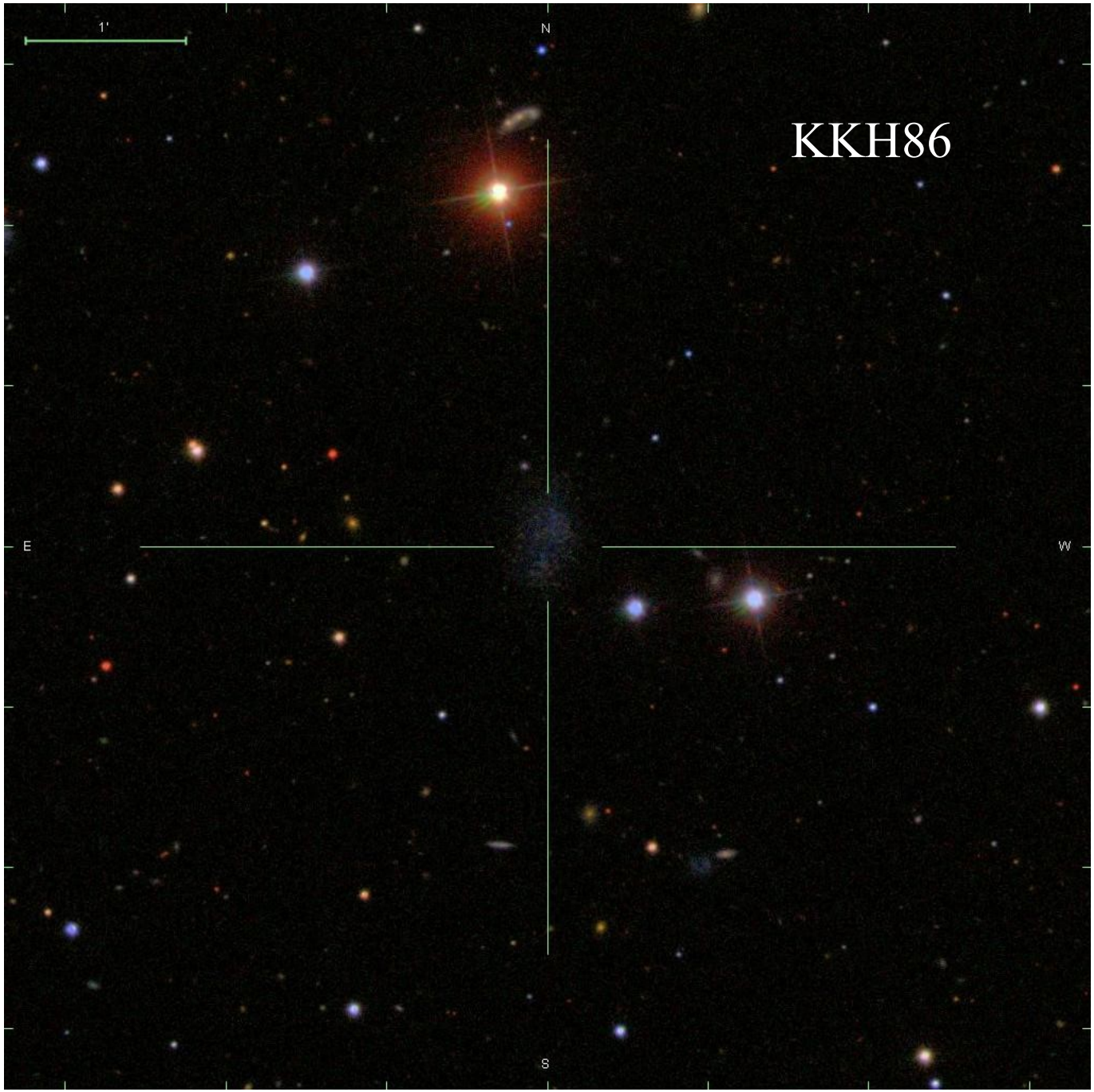

G33.3
RIGHT ASCENSION (J2000)
DECLINATION (J2000)


G33.4
RIGHT ASCENSION (J2000)
DECLINATION (J2000)

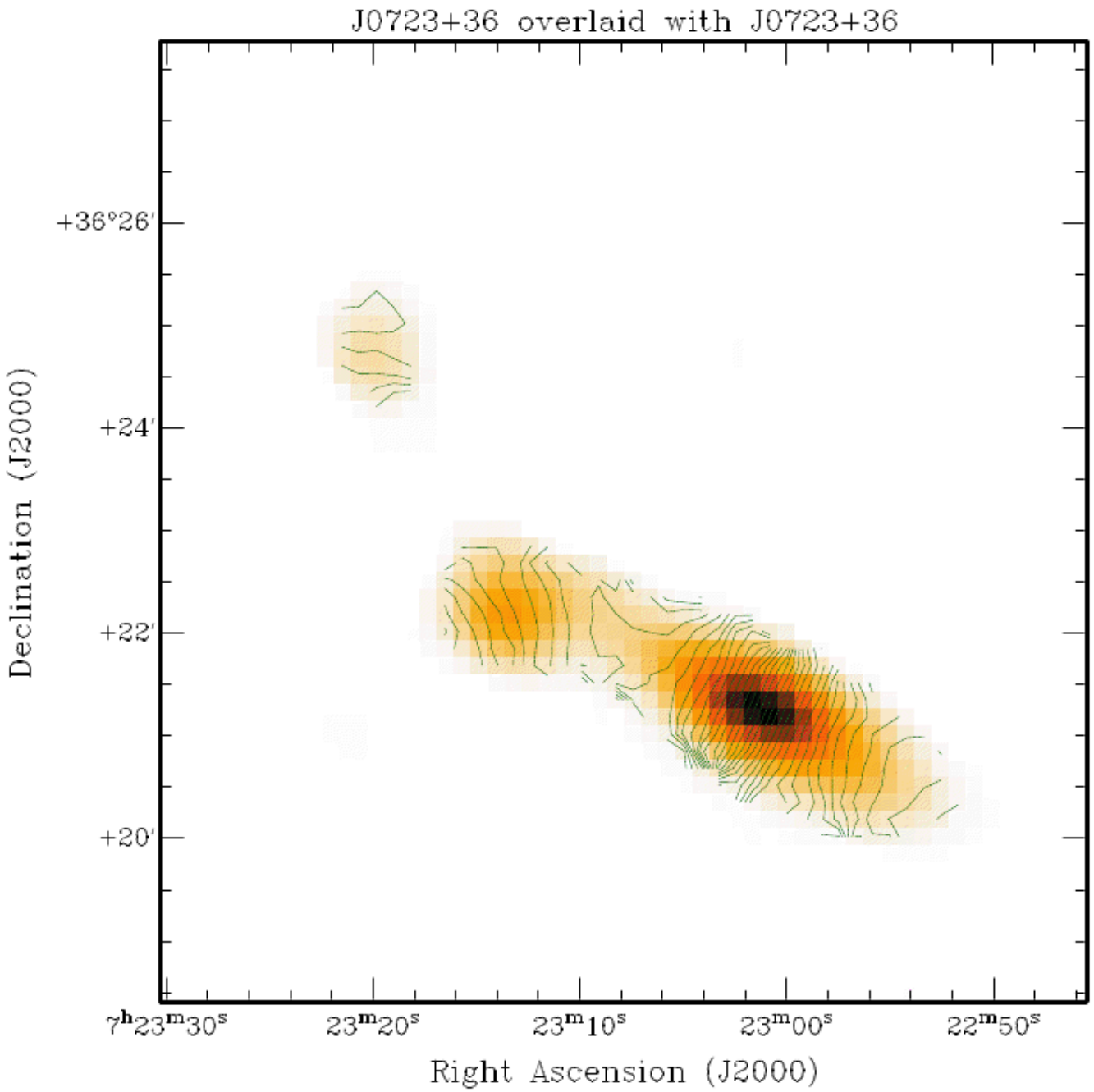

RIGHT ASCENSION (J2000)
DECLINATION (J2000)


RIGHT ASCENSION (J2000)
DECLINATION (J2000)

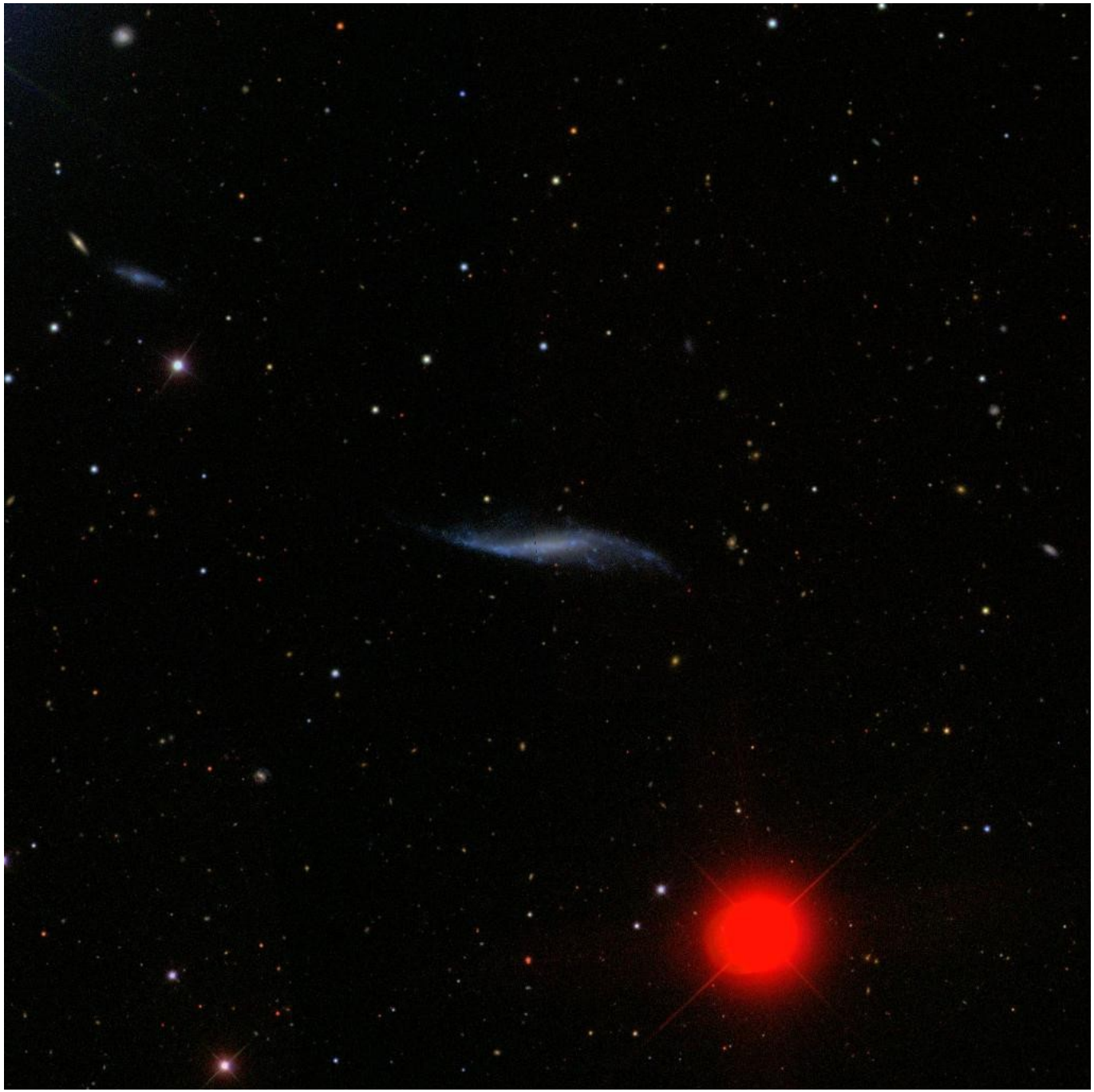

RIGHT ASCENSION (J2000)
DECLINATION (J2000)


1'
N
E
W
S
KKH86


J0723+36


J0723+36 overlaid with J0723+36
+36°26'
+24'
+22'
+20'
Declination (J2000)
7h23m30s
23m20s
23m10s
23m00s
22m50s
Right Ascension (J2000)


W
S



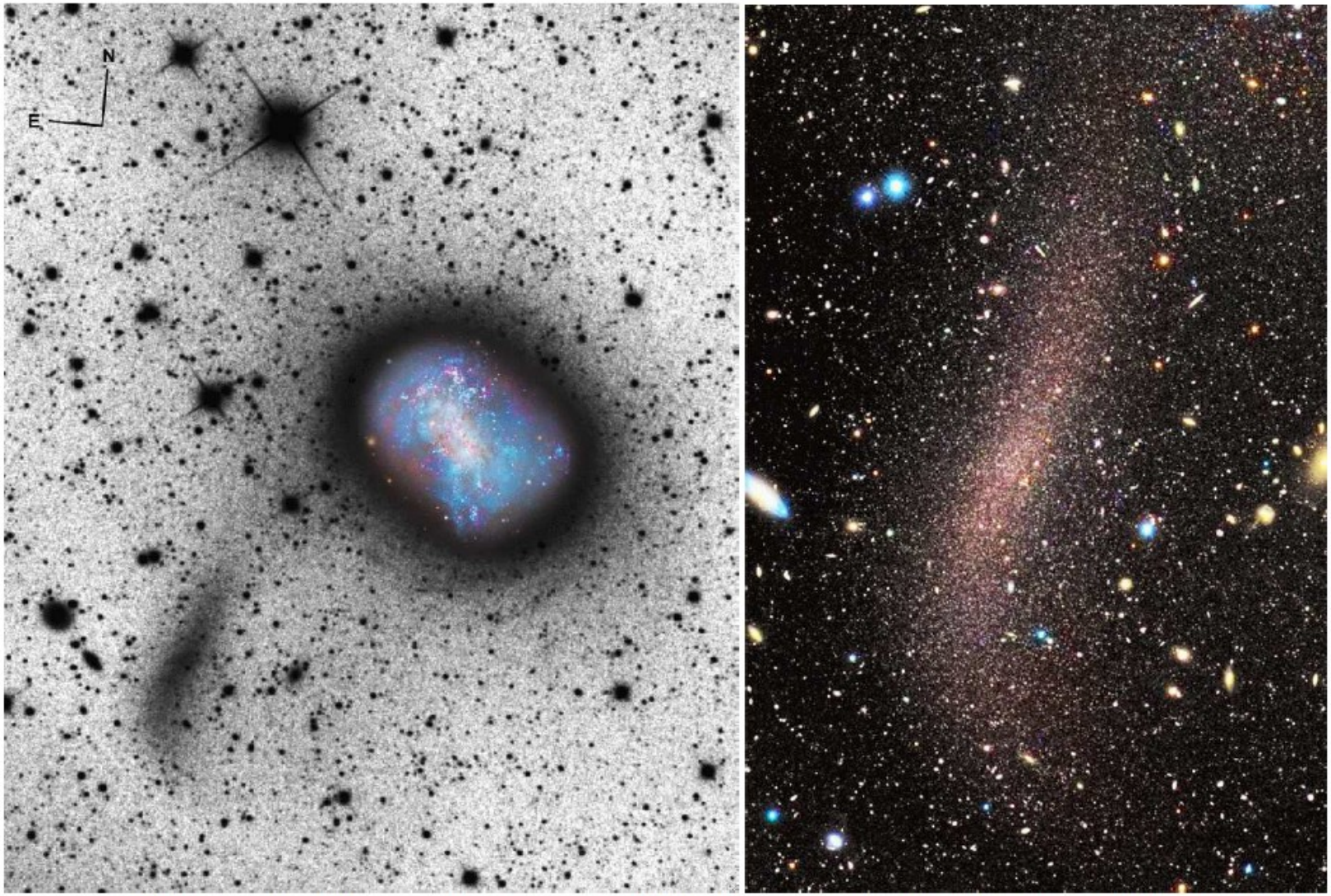
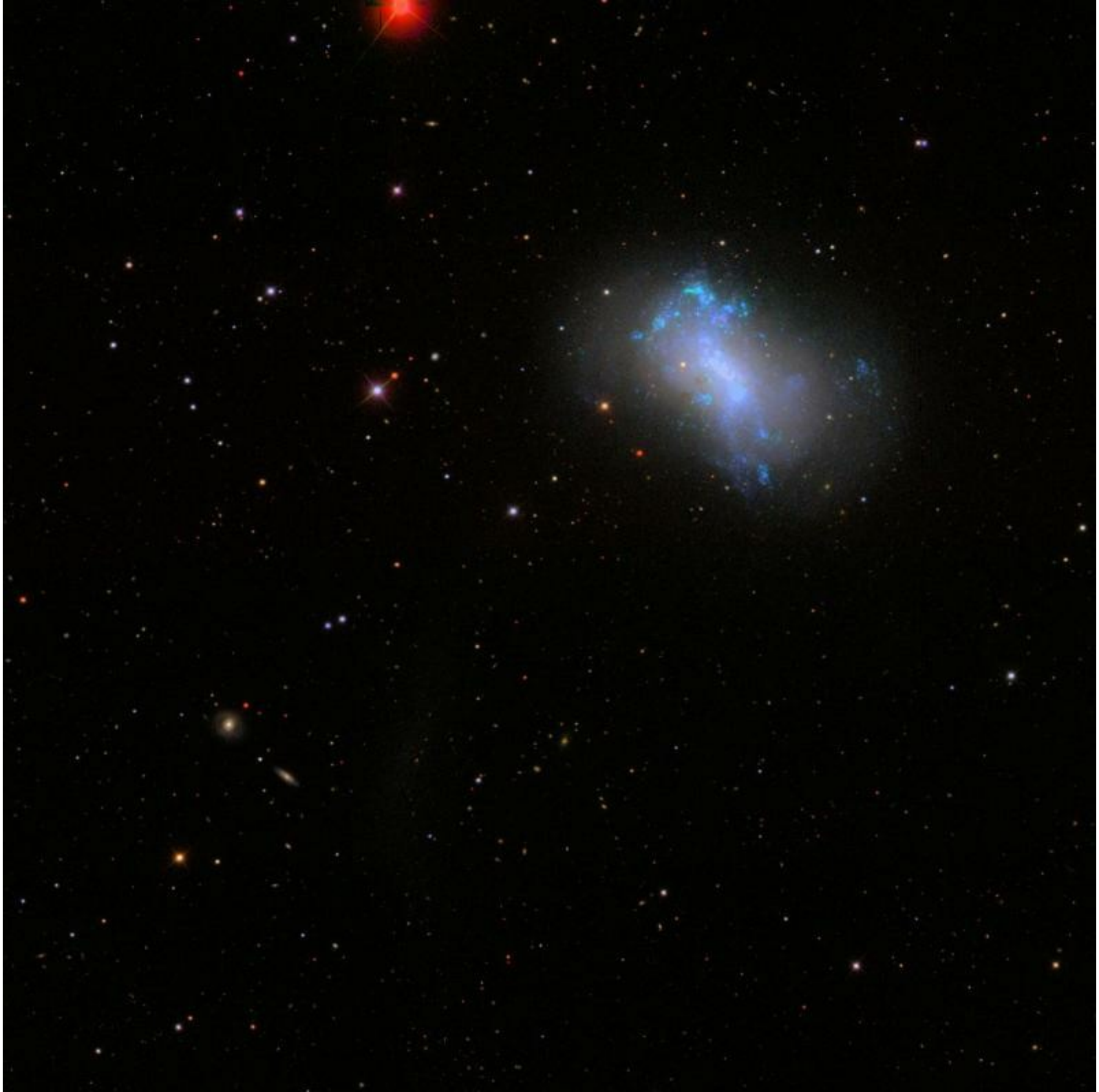
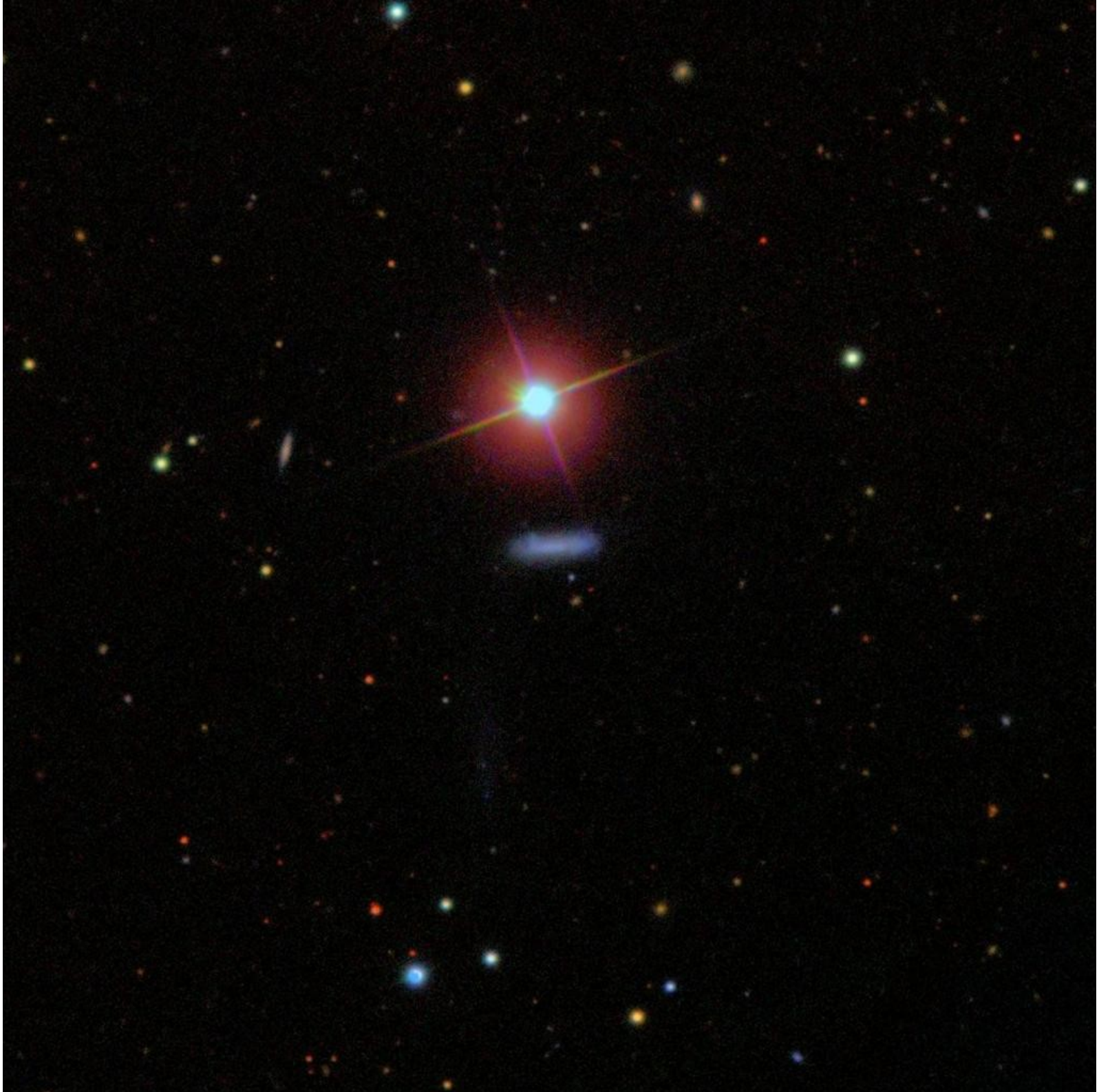
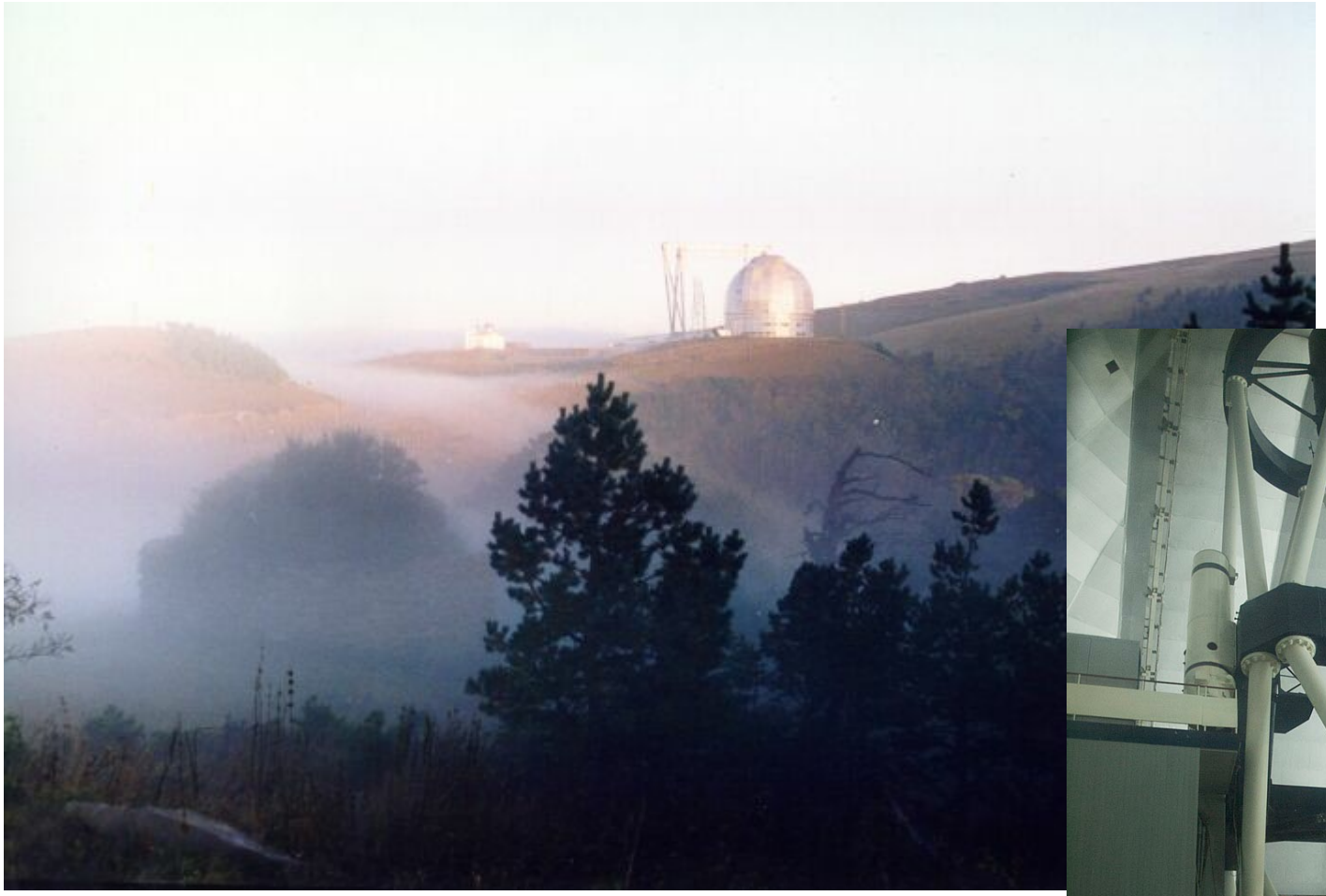


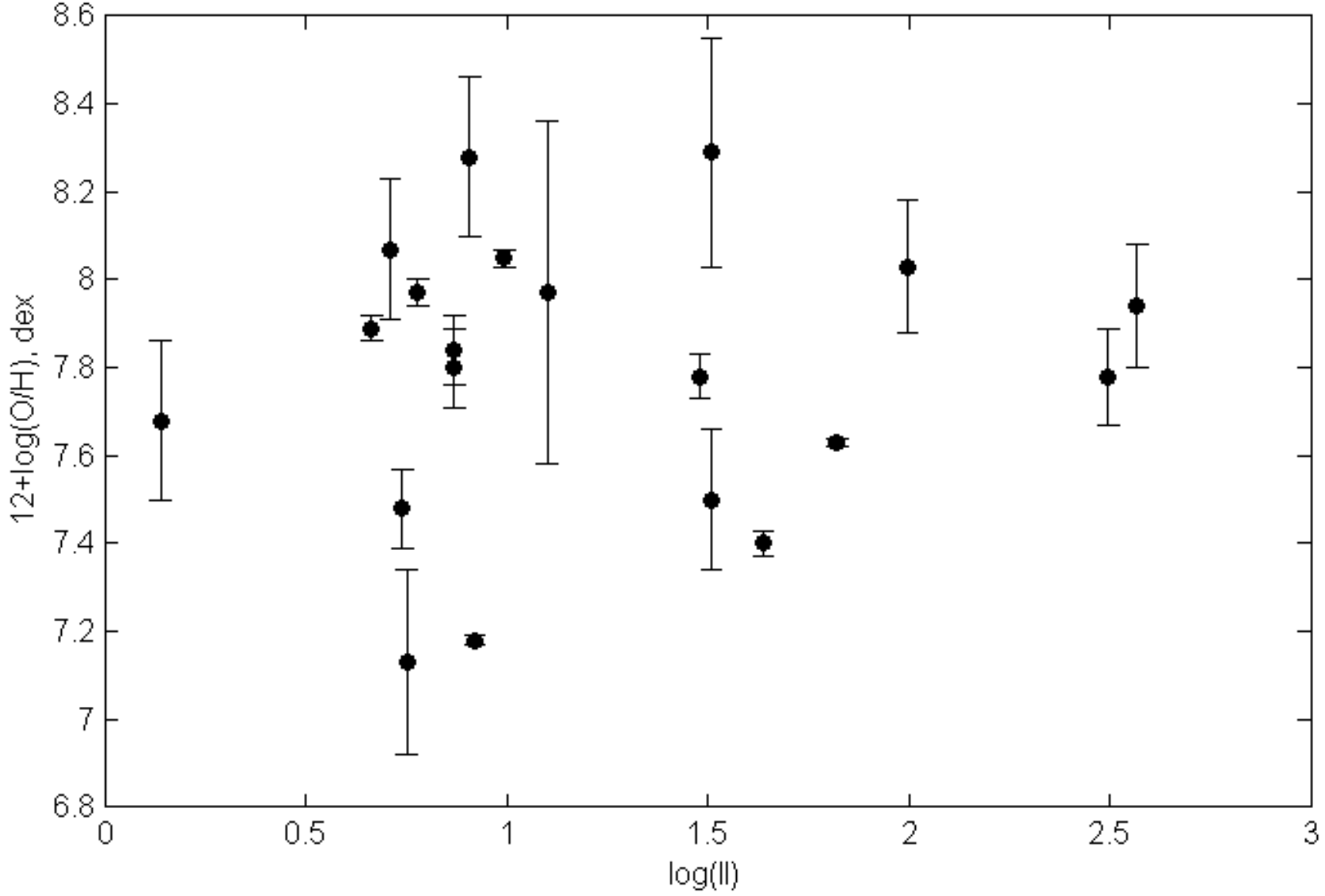
FIG. 1.— NGC 4449 and its halo stream. *Left:* image from BBRO, showing a $19.0' \times 24.5'$ (21×27 kpc) field. *Right:* $5.5' \times 8.6'$ (6×9.5 kpc) subsection of the Subaru/Suprime-Cam data, showing the stream resolved into stars. In both panels, shallower BBRO exposures in red/green/blue filters provide indicative colors.

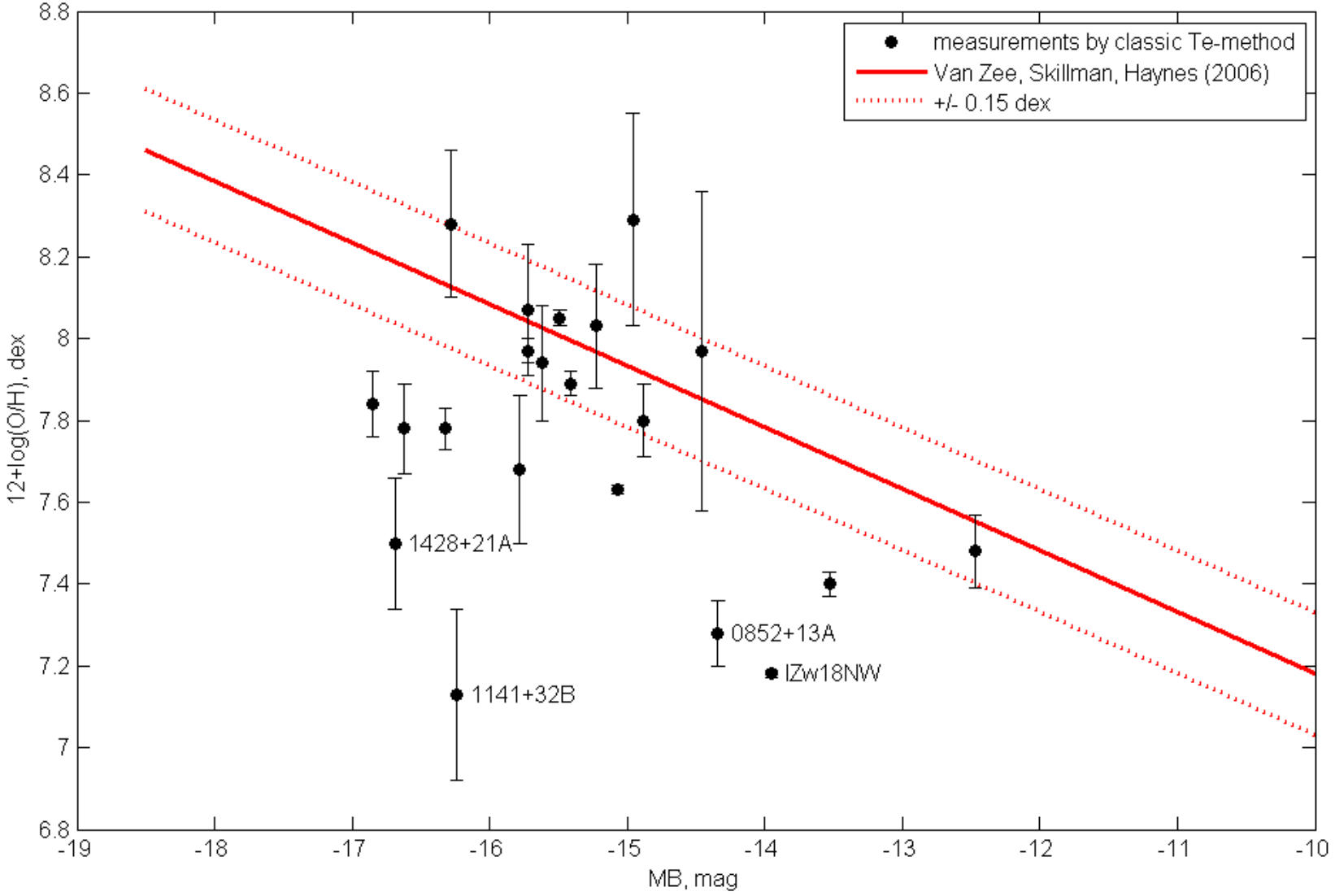







СССР
ЛОМО


8.6
8.4
8.2
8
7.8
7.6
7.4
7.2
7
6.8
12+log(O/H), dex
0
0.5
1
1.5
2
2.5
3
log(II)


measurements by classic Te-method
Van Zee, Skillman, Haynes (2006)
+/- 0.15 dex
1428+21A
1141+32B
0852+13A
IZw18NW
12+log(O/H), dex
MB, mag
8.8
8.6
8.4
8.2
8
7.8
7.6
7.4
7.2
7
6.8
-19
-18
-17
-16
-15
-14
-13
-12
-11
-10

Conclusions

- The groups of dwarfs make up about 5% of all groups in the Local Supercluster.

- The total number of multiple dwarfs should be at least factor of 5-6 greater.

- They form elongated structures. Probably, these groups are in stage of its formation.

- Amount of dark matter in groups of dwarfs is higher then in ordinary groups.

- Significant part of galaxies in these systems has lower metallicity according to “standard” luminosity – oxygen abundancy relation.