

A Young Association in the COROT Anti-center Direction?

About the Program

The idea of the program is to search for young stars in the COROT windows to have insights into the early planetary systems. We are searching for stars with ages from 5 to 100 Myr, thus not in star forming regions. To have good age determinations, we are searching for kinematical young associations. We selected UCAC2 stars (thus having proper motions) that could be optical counterparts of ROSAT sources, as young stars in this age range have bright coronae. We choose stars brighter than red magnitude 15 within 26 of the ROSAT positional error. We are observing each candidate star with the coude spectrograph of the 1.6m telescope of the Pico dos Dias Observatory in the spectral range from the NaI D to the $\lambda 6707$ LiI lines. We try to obtain spectral classifications, radial velocities and Li equivalent widths. A possible young star should have the equivalent width of Li equal or stronger than that of the Pleiades stars with similar temperatures.

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The Kinematical Young Associations

In recent years we have detected young kinematical associations in the Solar neighborhood using the ROSAT Bright Sources Catalog – the SACY project. In the SACY we observed about 1500 TYCHO-2 stars that could be optical counterparts of ROSAT sources. We found concentrations around some particular space velocities (UVW). We consider these concentrations as possible kinematical associations. Each one of these kinematical associations forms a well defined sequence in an evolutionary diagram and has its own pattern in the distribution of the Lithium with temperature, indicating all stars have the same young age. As in general we do not have trigonometric parallaxes, we will estimate the distances and define membership minimizing the UVW distribution. In the SACY sample we found about 15 associations. We are using a similar approach in the COROT directions.

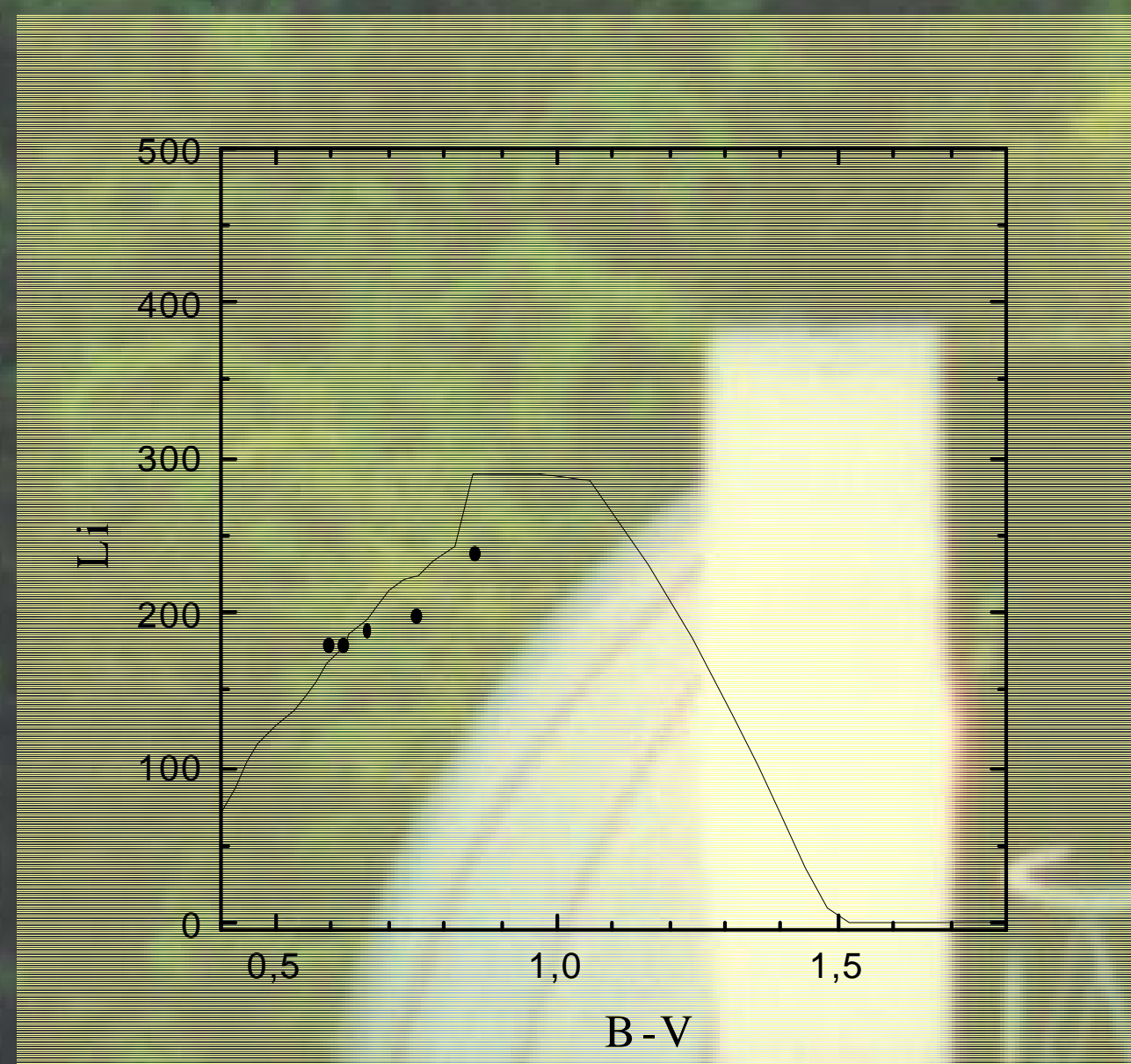


Fig. 1 - Li equivalent width of the "members"

A Kinematical Young Association at the Anti-center?

We have observed some of the candidate stars near the anti-center prime target stars. We detected LiI in 5 dwarf stars, from G1 to K2. Their Li is near the upper limit of the Pleiades age stars (figure 1), showing a similar age. Their radial velocities and proper motions are similar. We try to obtain a solution for a possible kinematical association, minimizing the spread in UVW and supposing that the resultant distances should be compatible with ZAMS. This latter condition is needed as we have no members with trigonometric parallaxes that inhibit the minimizing approach to diverge. The proper motion errors (at the implied distance) and the unreliable photometric information limit the quality of the solution. Nevertheless, we obtain a solution that includes all 5 stars. We present this solution in Table 1 and its relatively good quality can be seen in the HR diagram in figure 2 and in the space velocity plots in figures 3 to 5. We show also the space distribution of the stars (XYZ) in figures 6 to 8. This possible association would be at about 160pc with an age between 50 and 100myr.

The other observed stars in the anti-center direction are presented in Table 2.

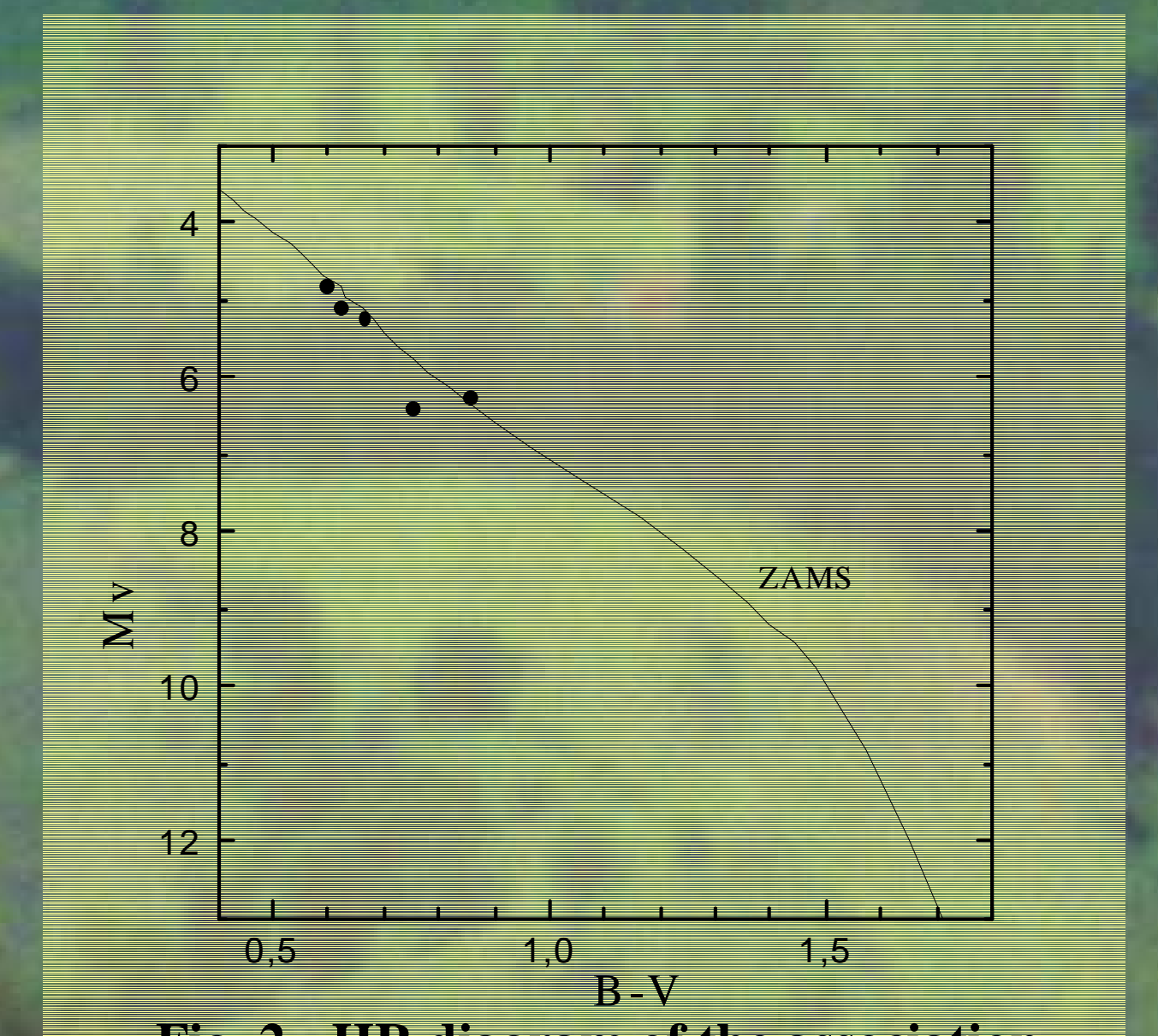


Fig. 2 - HR diagram of the association

Table 1 - Properties of the proposed members of the Association

Object	Target	RA	DEC	μ_{α}	μ_{δ}	RV	σ_{μ}	SPT	B	V	R	I	J	H	K	EW_{Li}	U	V	W	X	Y	Z	$[Li/L_{\odot}]$
0900-02471589	HD43587	06 11 58.8	+06 09 25	-6.1	-13.4	27.2	7.3	G4IV	11.36	10.88			9.60	9.25	9.18	190	-20.9	-13.5	-10.3	-124.9	-82.8	-14.0	-3.1
CI06316705	HD43587	06 13 24.0	+05 22 10	-1.0	-8.9	26.0	5.8	K2IV	13.36	12.42	12.00	11.50	10.73	10.20	10.08	240	-20.9	-13.5	-6.8	-156.8	-69.1	-17.8	-3.4
0825-03423597	HDS2265	06 53 24.1	-06 33 12	-21.2	-3.9	23.9	7.8	G8IV		11.9			10.68	10.30	10.22	200	-20.9	-11.8	-13.6	-99.7	-80.7	-5.7	-3.1
0825-03512479	HDS2265	06 55 44.7	-05 59 21	-10.6	-0.3	24.0	4.9	G1V	13.64	11.32			10.69	10.40	10.33	180	-21.3	-11.4	-10.0	-160.0	-128.5	-6.3	-3.6
0815-03527860	HDS2265	06 56 09.8	-04 59 48	-10.9	-3.4	24.2	4.7	G2V	12.59	11.67			10.60	10.32	10.22	180	-20.1	-13.2	-13.8	-156.9	-130.0	-4.5	-3.9

Table 2 - Properties of the other observed stars in the anti-center

Object	Target	RA	DEC	μ_{α}	μ_{δ}	RV	SPT	B	V	R	I	J	H	K	$[Li/L_{\odot}]$	Comments
CI0626530	HD43587	06 11 05.0	+04 53 03	13.4	-6.5	+59V	K0IIIe	13.57	12.96	12.01	11.37	10.25	9.68	9.51	-3.1	EBI $H_{\alpha}=1.7\text{\AA}$ $EW_{Li}=0.13\text{\AA}$ RSCVn?
0900-02450032	HD43587	06 11 18.7	+07 11 09	-0.9	-3.4	+65:	G2?		13.5			12.00	11.67	11.59	-2.5	low S/N
0900-02450738	HD43587	06 11 20.0	+07 11 03	10.6	2.3	0:	M4Ve	14				9.66	9.09	8.81	-3.3	$H_{\alpha}=6\text{\AA}$
CI05835660	HD49933	06 41 11.4	+00 03 32	-0.5	0.7	+58:	K1III:	15.11	13.77	13.20	12.38	11.13	10.53	10.34	-2.7	low S/N
CI05847603	HD49933	06 41 34.3	+00 37 07	-3.2	1.8		B5:	14.94	14.15	13.99	13.76	13.29	13.15	13.11	-3.1	low S/N
CI05956049	HD49933	06 44 50.0	+00 00 53	-6.1	-12.9	-85/+108	K1III+V?	13.98	13.00	12.52	11.93	11.08	10.49	10.34	-2.8	H_{α} both in em. RSCVn
0825-03411879	HDS2265	06 53 06.1	-06 02 28	-5.1	2.8		A?		12.3			12.01	11.89	11.85	-3.2	low S/N
0825-03520159	HDS2265	06 55 57.4	-06 45 14	-16.9	2.9		F?		14			12.94	12.63	12.59	-2.5	low S/N

Characteristics of the proposed Association

$$\pi = 6.1 \pm 1.4$$

$$U = -20.9 \pm 0.7$$

$$V = -13.5 \pm 2.1$$

$$W = -10.5 \pm 2.5$$

$$X = -142 \pm 28$$

$$Y = -92 \pm 35$$

$$Z = -10 \pm 6$$

Age from 50 to 100Myr

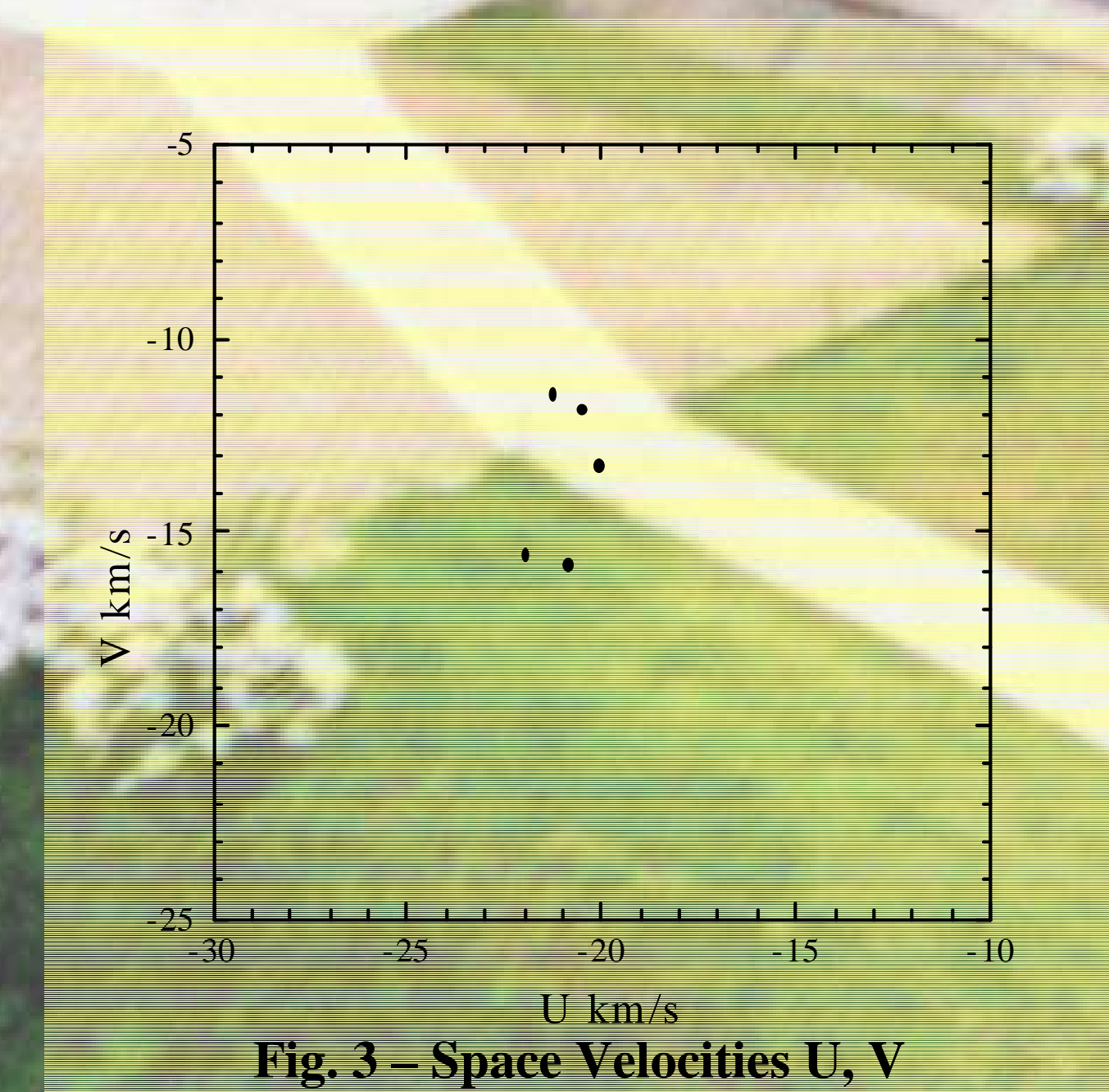


Fig. 3 - Space Velocities U, V

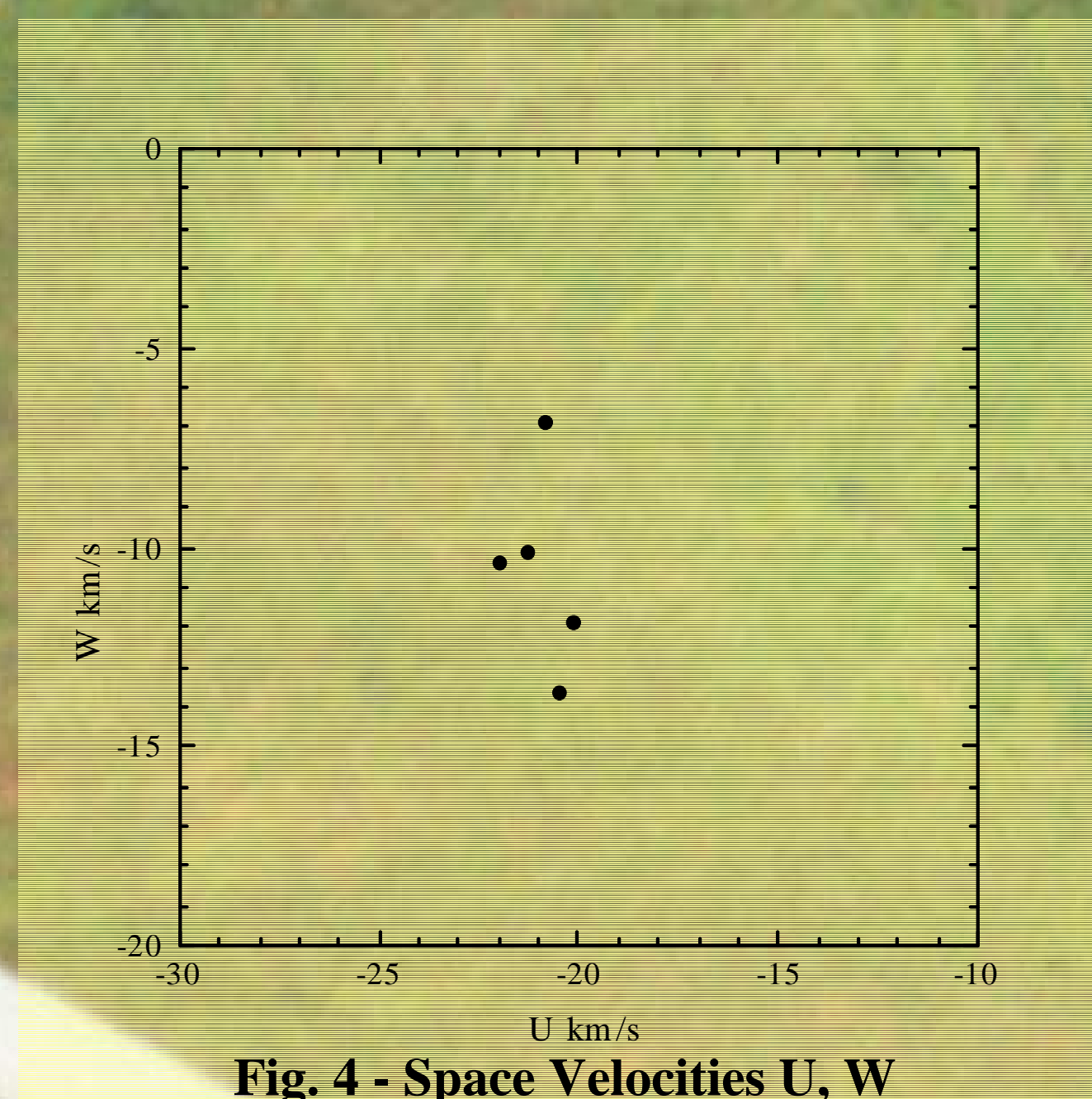


Fig. 4 - Space Velocities U, W

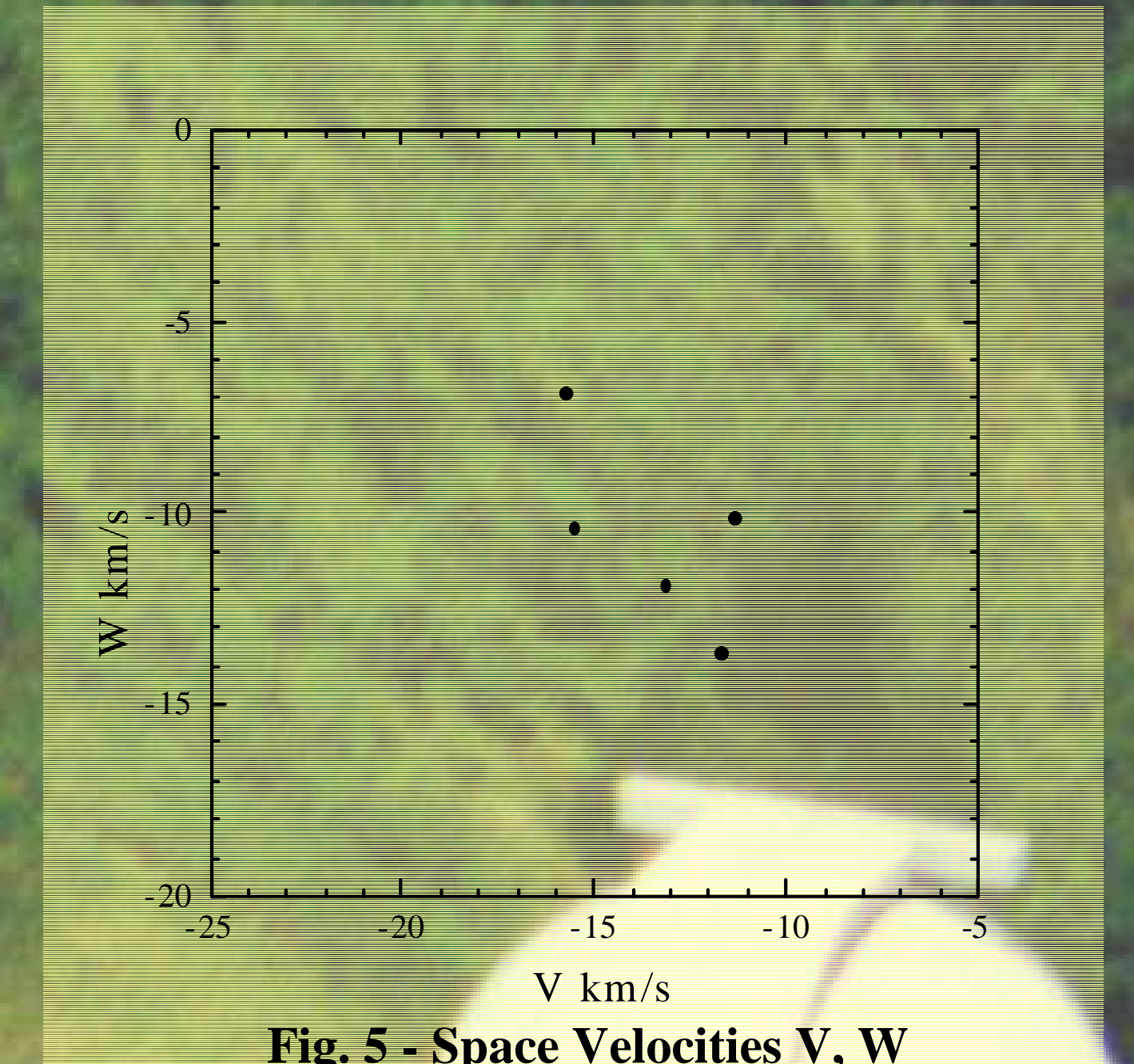


Fig. 5 - Space Velocities V, W

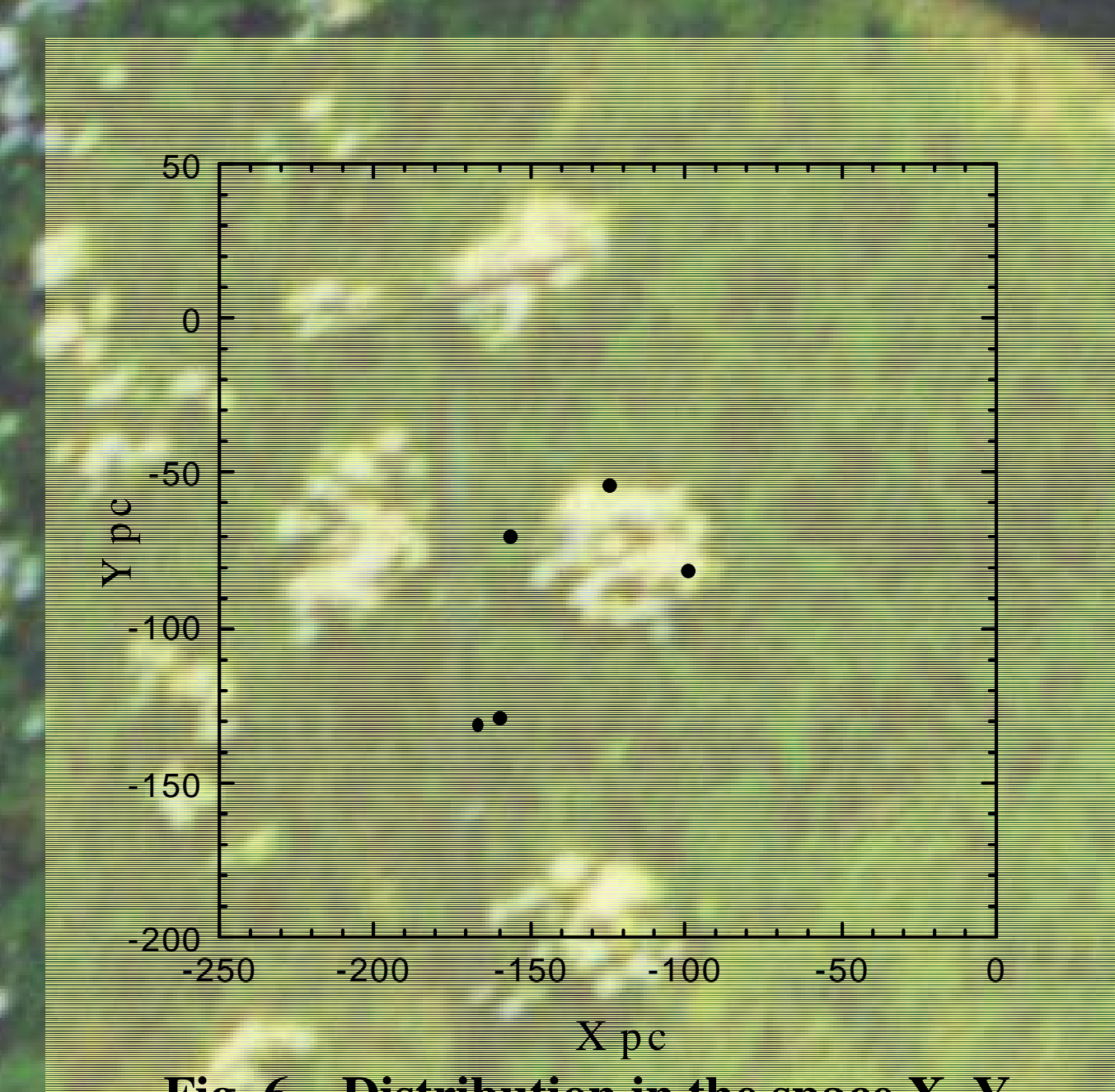


Fig. 6 - Distribution in the space X, Y

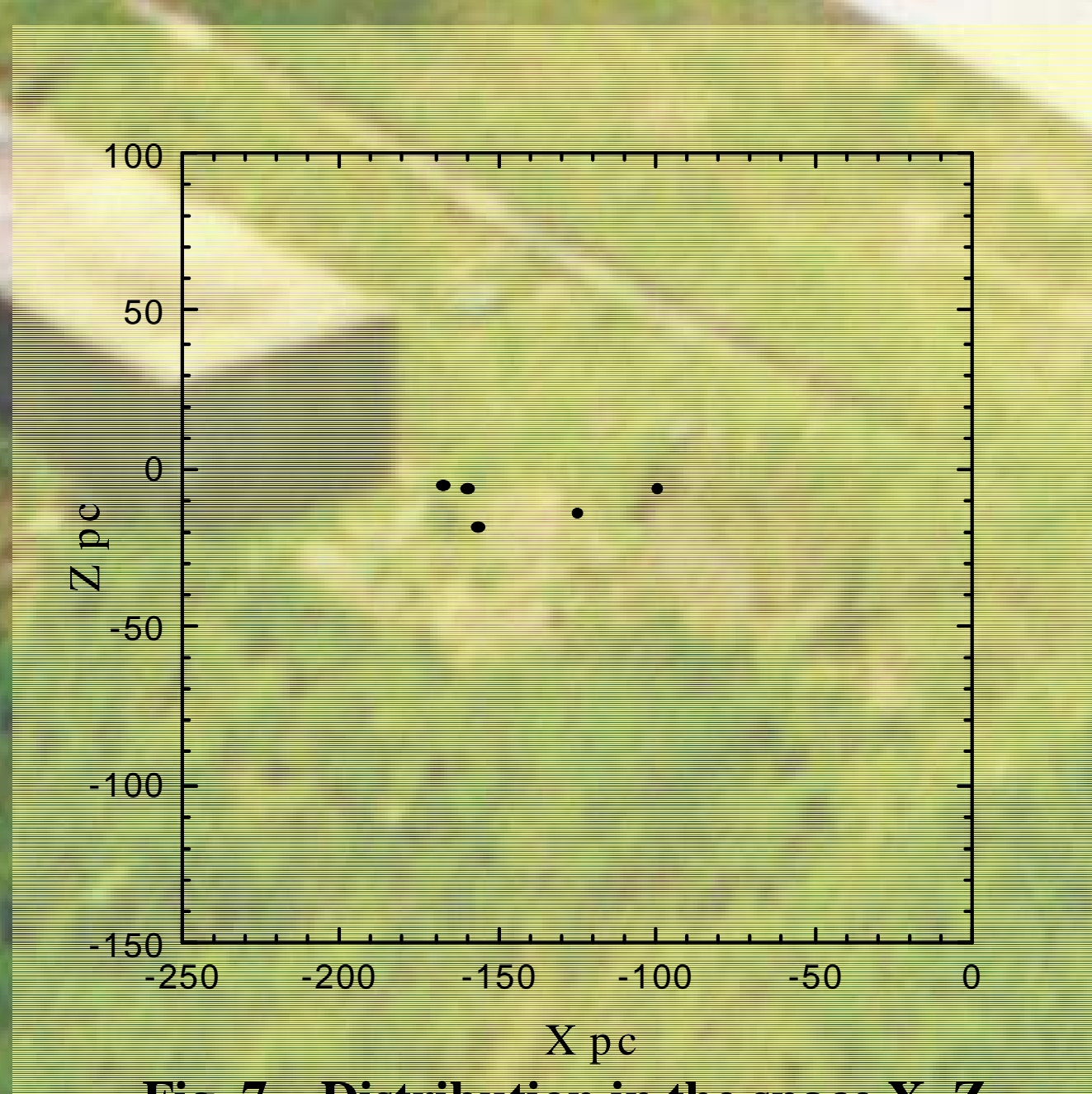


Fig. 7 - Distribution in the space X, Z

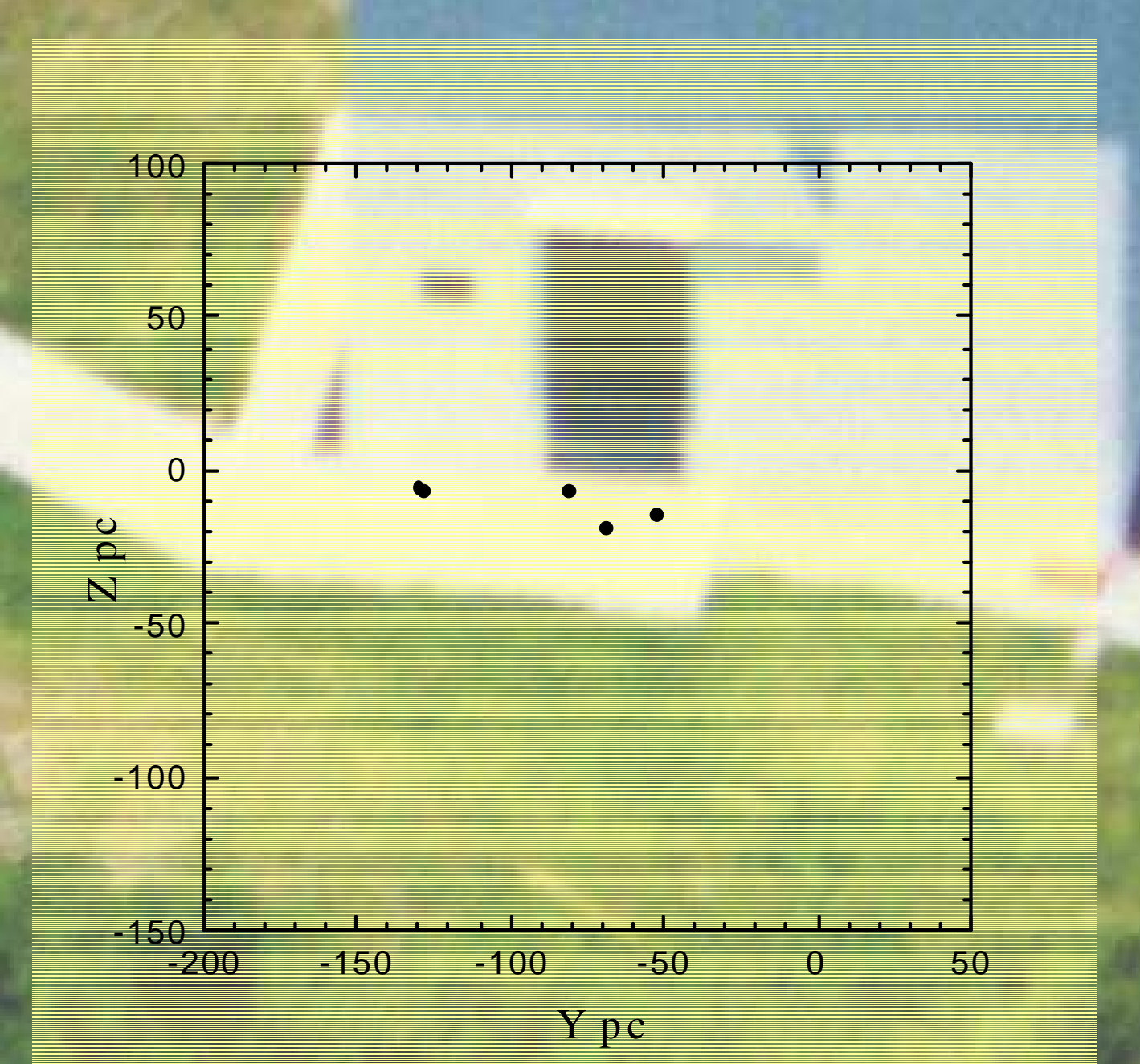


Fig. 8 - Distribution in the space Y, Z