

Outer ring R_1R_2 in the Galactic disk

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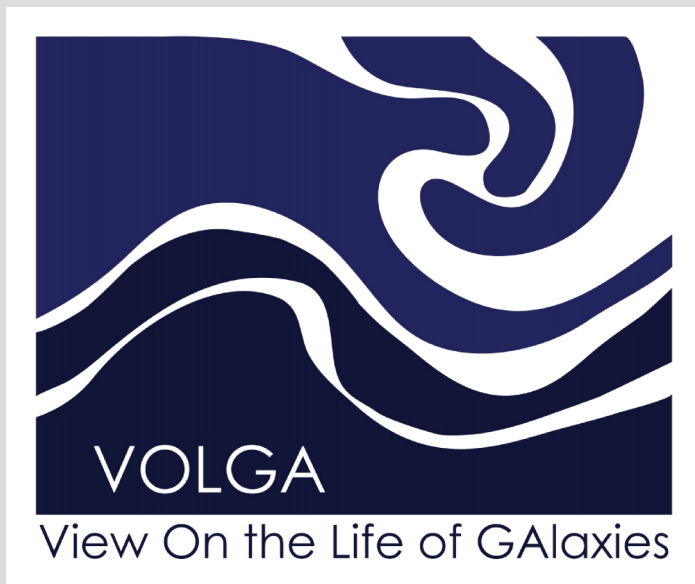
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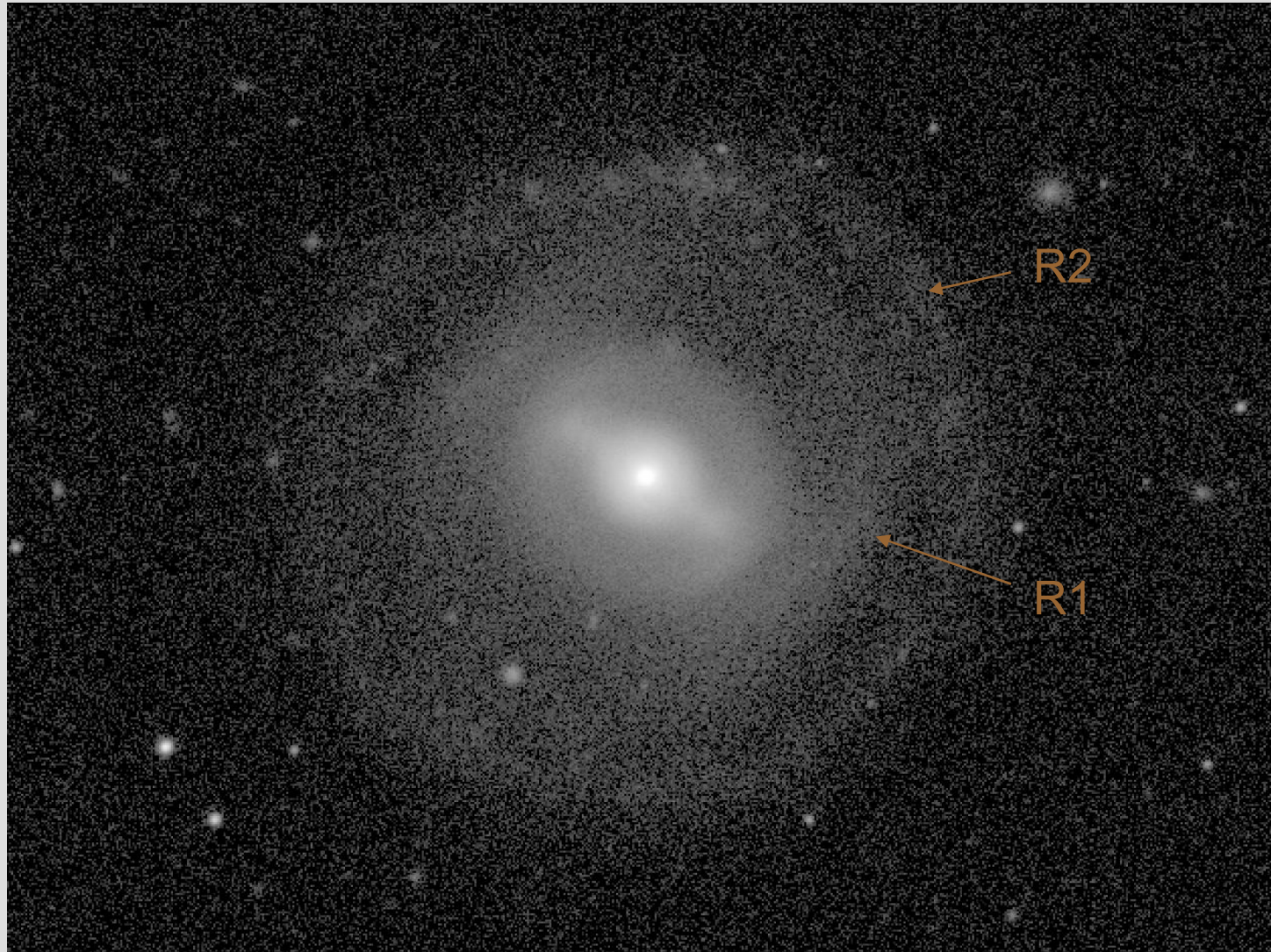


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NGC 1211 - (R₁R₂')SB(rl)0/a

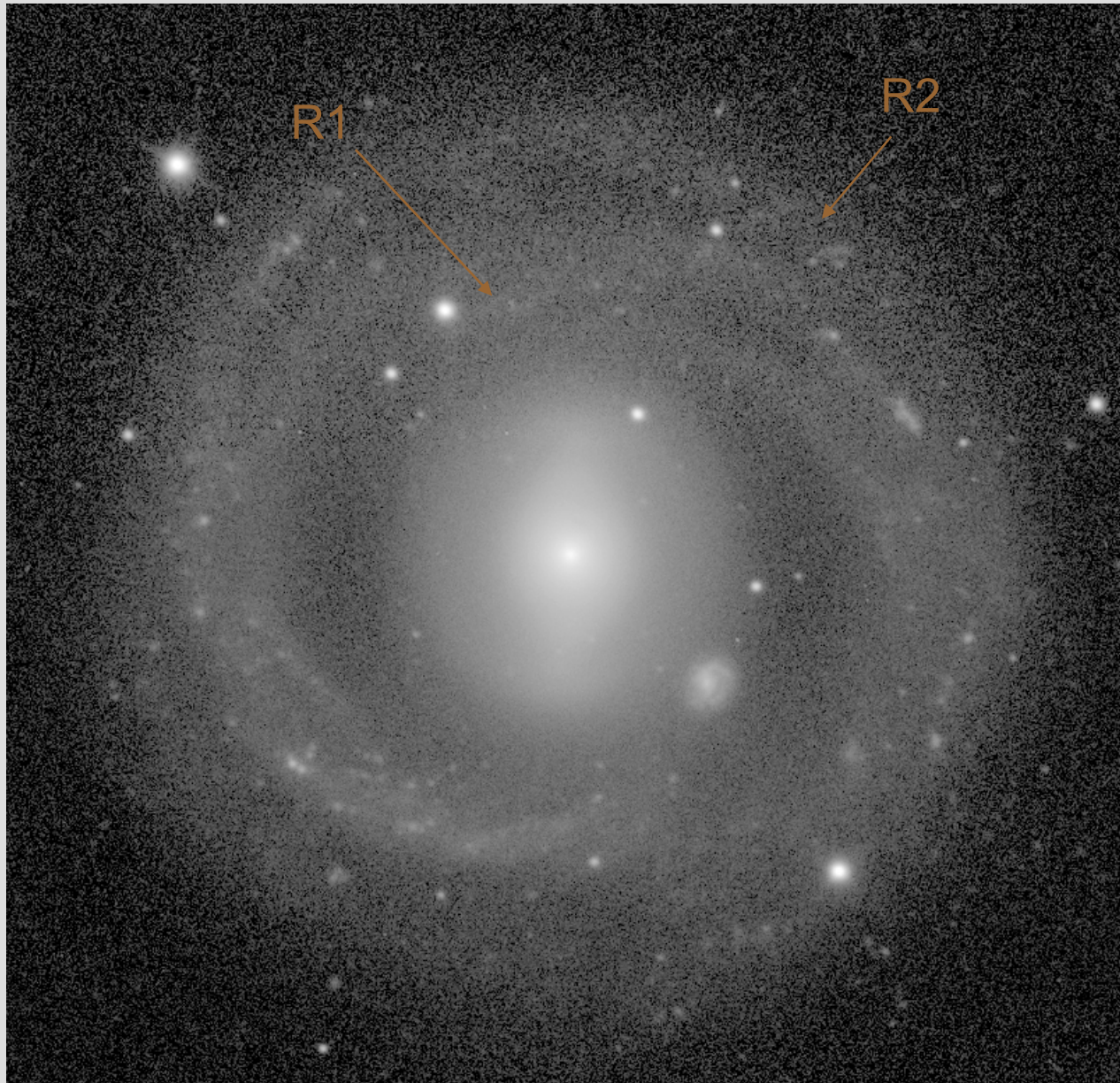


*R. Buta,
H.G. Corwin,
S.C. Odewahn,*

*De
Vaucouleurs
Atlas of
Galaxies*

2007

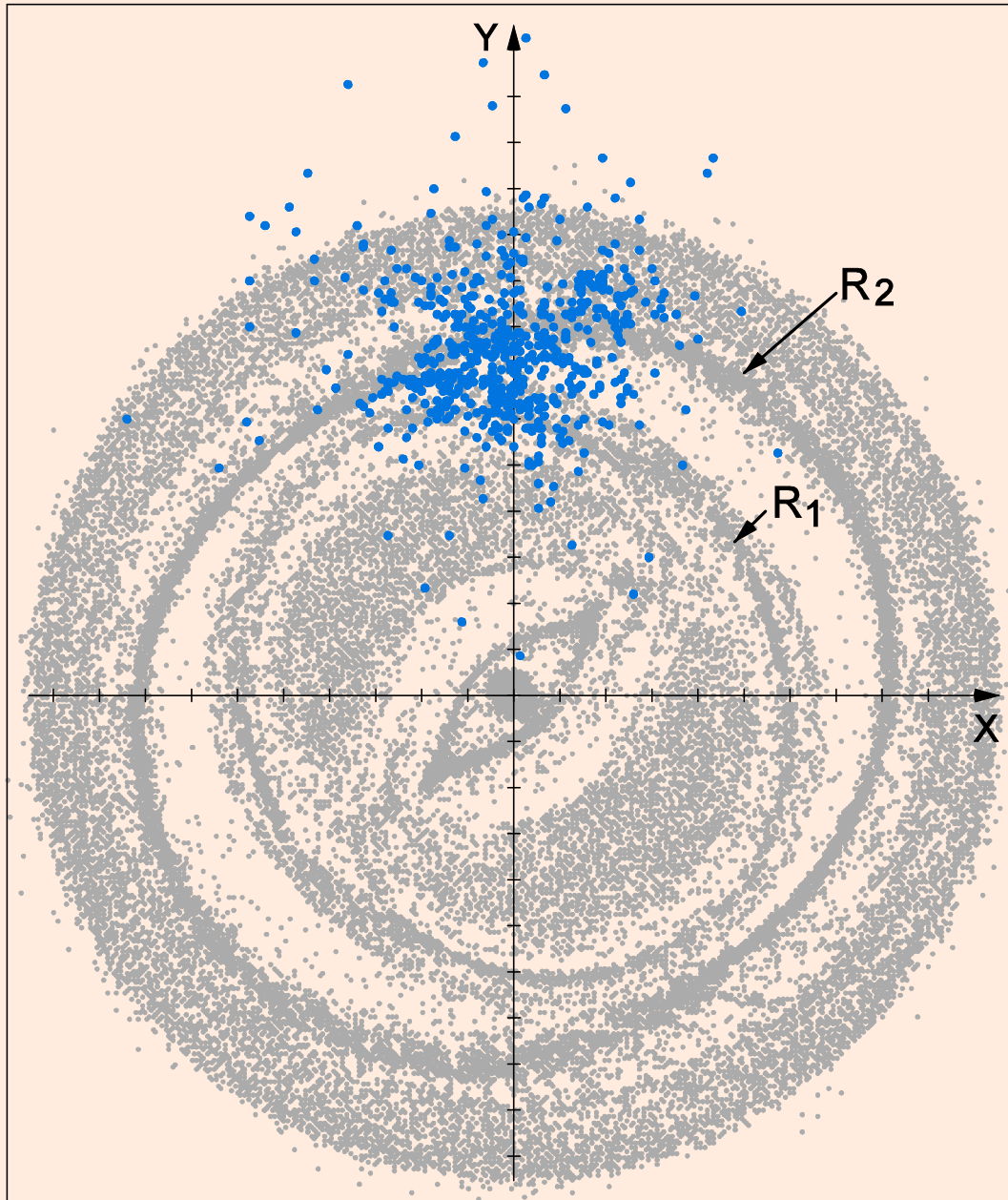
NGC 5701 - (R1R2')SB(l)a



**NASA
SLOAN
Atlas**

**Sloan
Digital
Sky
Survey**

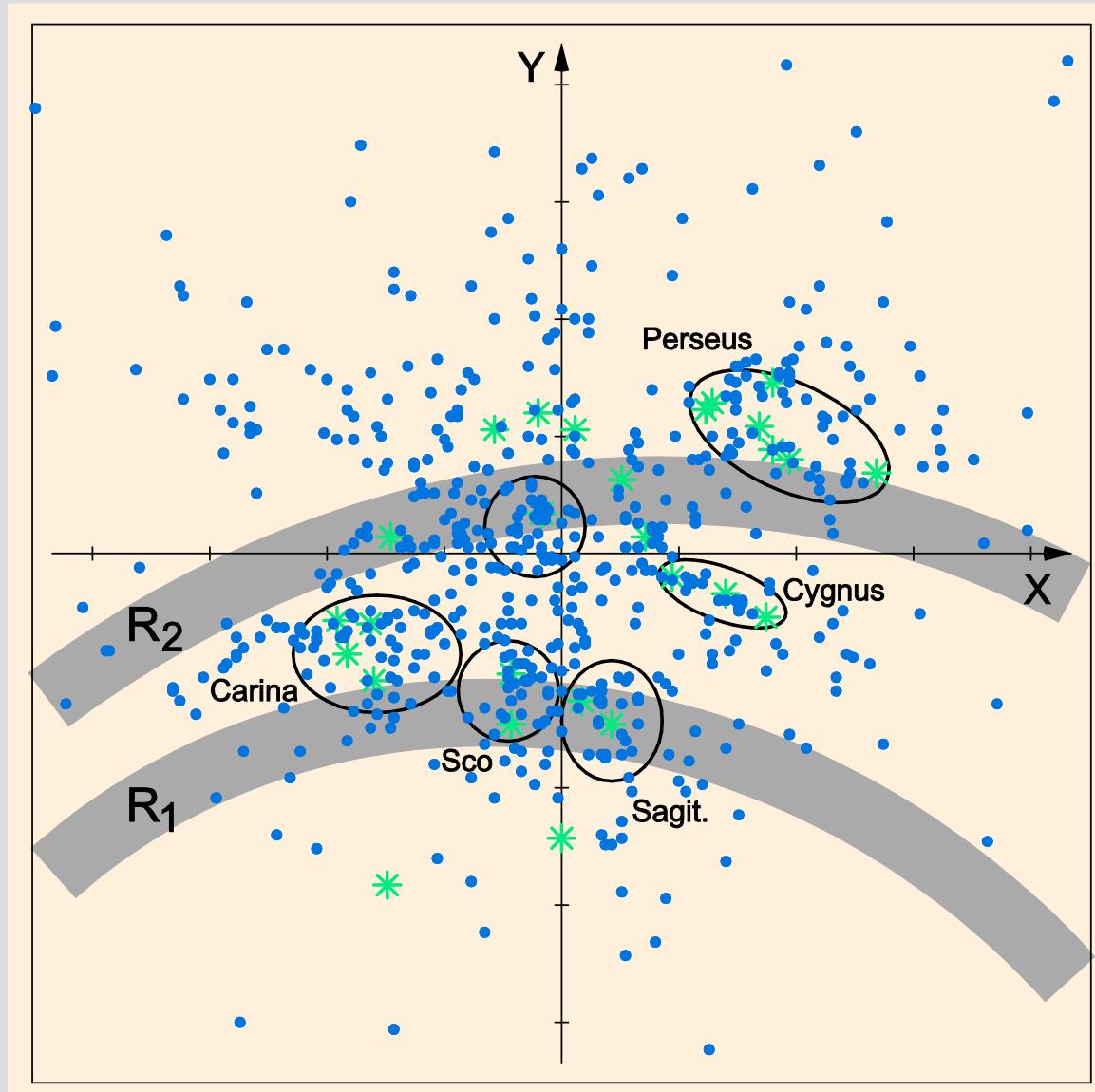
**York et al.
(2000)**



**Distribution of
young open clusters
(Age < 100 Myr)
(blue circles)
from the catalog
by Dias et al . (2002)
and
model particles
(gray circles)
in the Galactic plane**

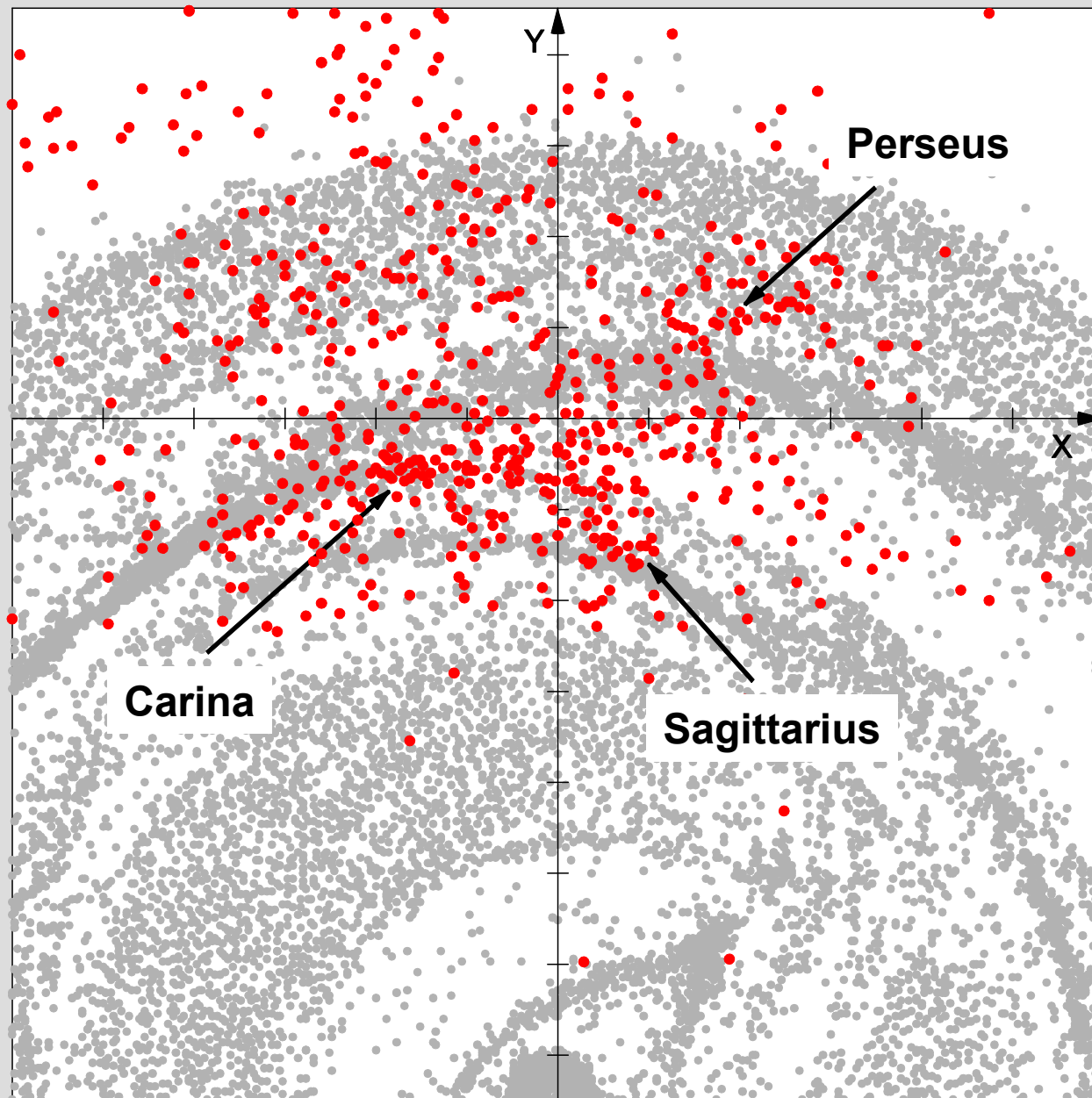
**Model by P. Rautiainen,
Analytical bar:
a=4 kpc, b=1.3 kpc,
fast bar,
5 10⁴ test particles,
collide inelastically,
 $\theta_b = 45^\circ$**

Tuning-fork-like structure



Distribution of young open clusters ● and OB-associations ★ in the Galactic plane.

Ellipses show stellar-gas complexes : Sagittarius (Sagit.), Carina, Cygnus, Local System (LS), Perseus.



Distribution
of classical
Cepheids (●)
(Berdnikov et al.
2000)

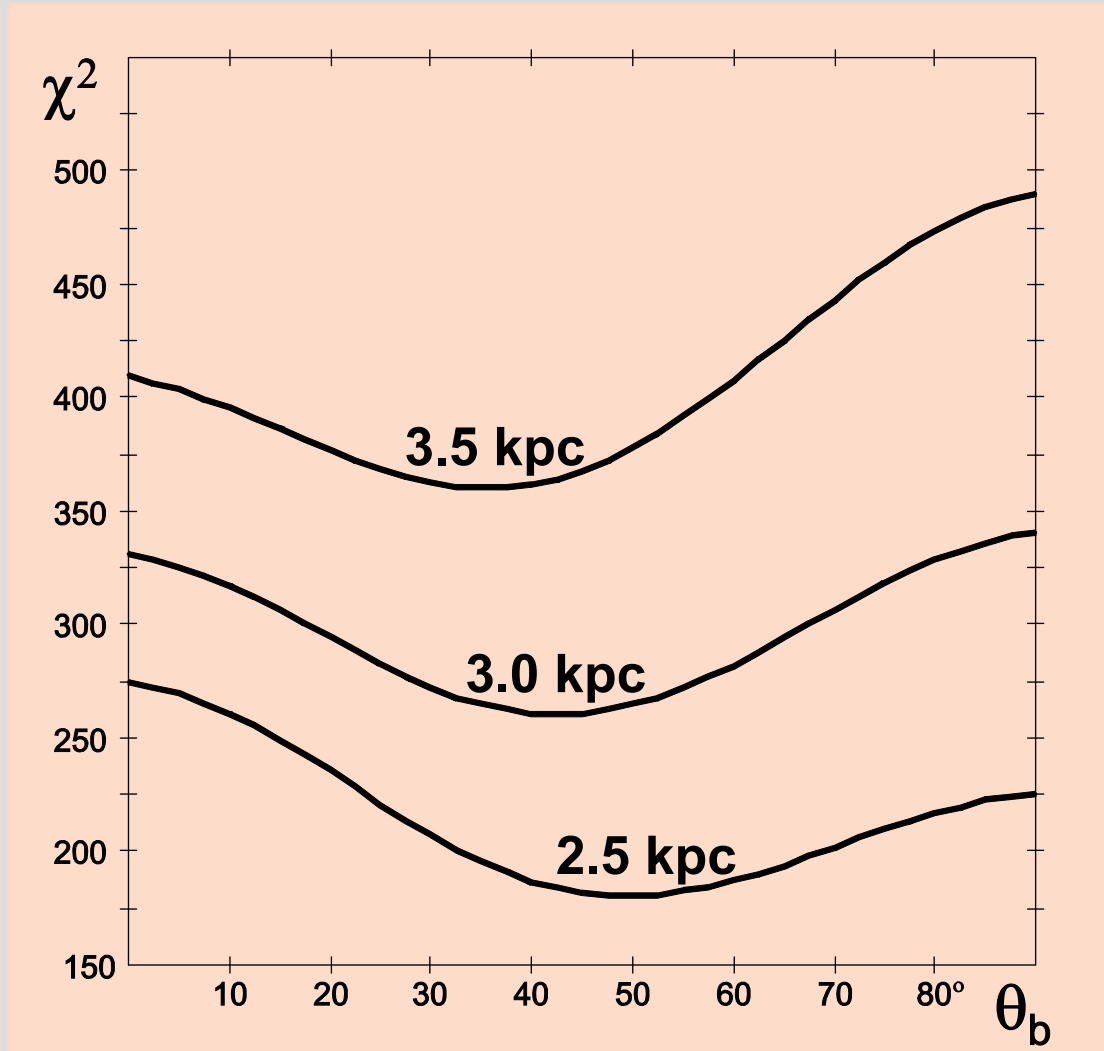
and
model particles
(○)

in the Galactic
plane.

Tuning-fork-like
structure 

Yong Open Clusters

The χ^2 functions calculated for different values of θ_b



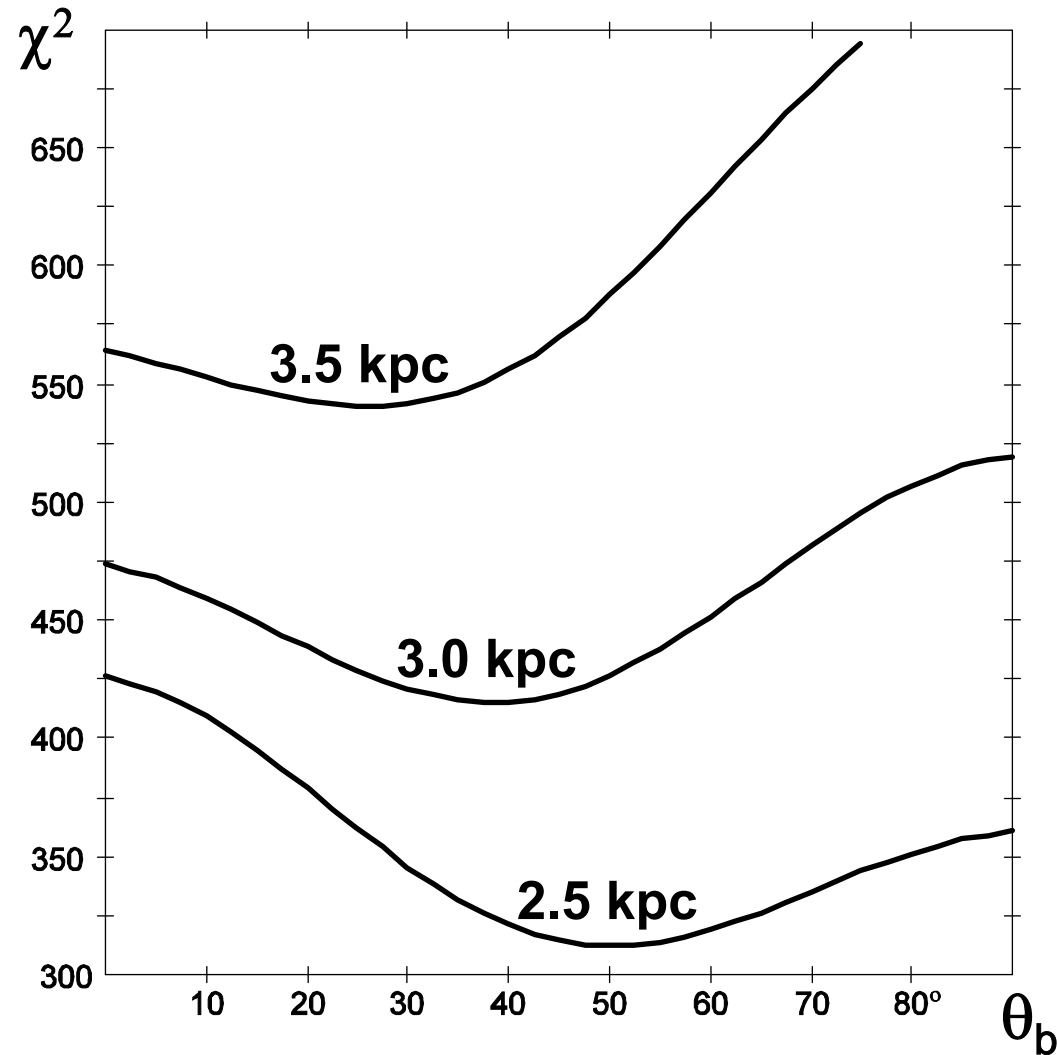
Position of the minimum

r_{\max}	θ_b
2.5 kpc	$50 \pm 5^\circ$
3.0 kpc	$43 \pm 5^\circ$
3.5 kpc	$35 \pm 5^\circ$

The average value:

$$\theta_b = 43 \pm 10^\circ$$

The χ^2 functions calculated for different values of θ_b



CEPHEIDS

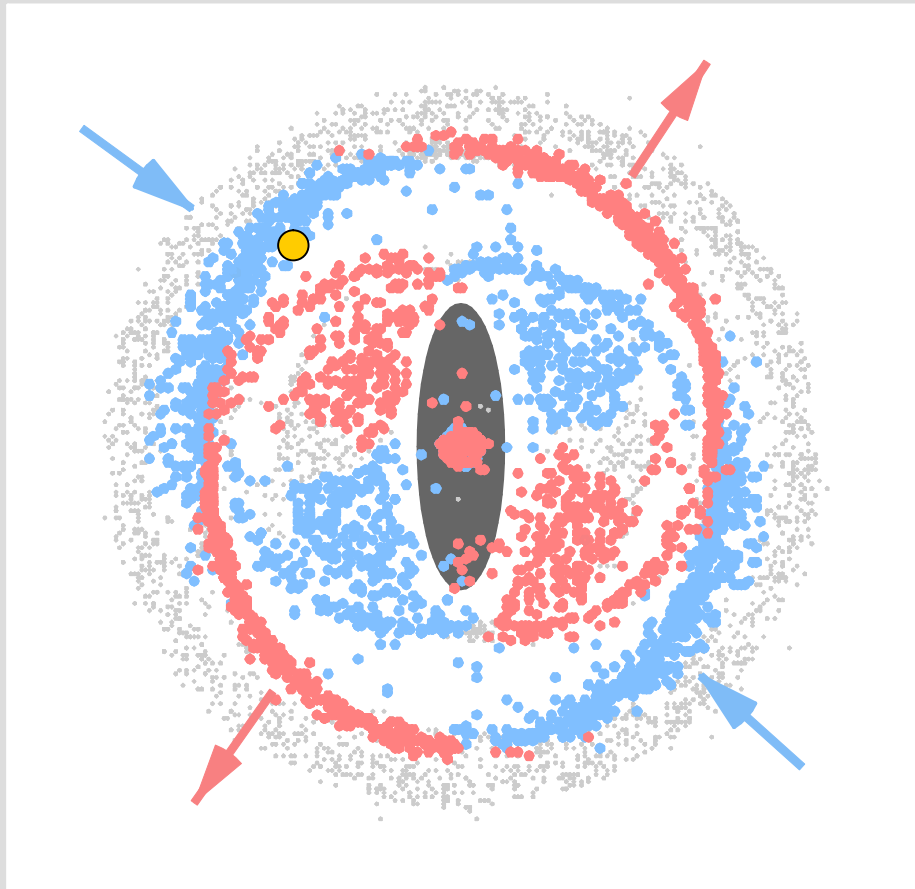
Position of the minimum

r_max	θ_b
2.5 кПК	$50 \pm 5^\circ$
3.0 кПК	$37 \pm 5^\circ$
3.5 кПК	$25 \pm 5^\circ$

The average value:

$$\theta_b = 37 \pm 13^\circ$$

Model particles in the outer rings demonstrate the alternation of systematic motions directed toward and away from the Galactic center.



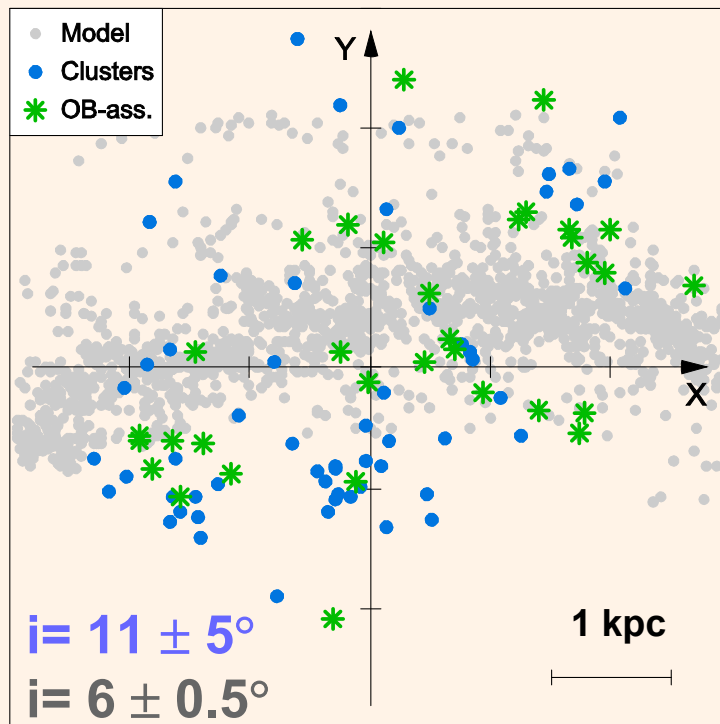
Distribution of model particles with radial velocities V_R directed

- away from the Galactic center**
- toward the Galactic centre**

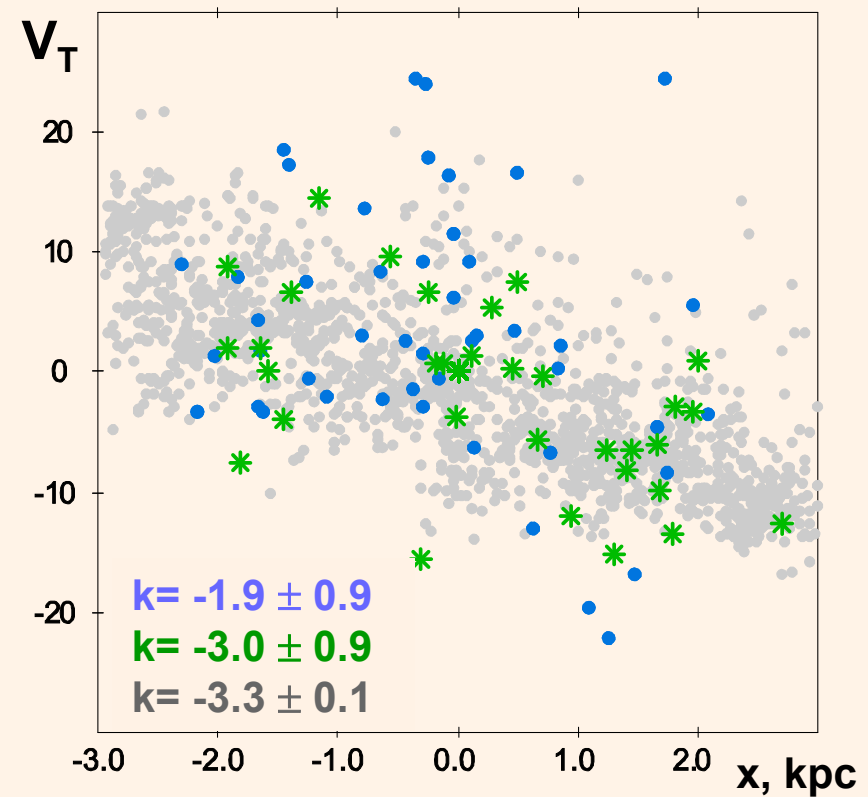
Kinematical evidence of the solar location near the descending segment of the outer ring R2

Young open clusters and OB-associations with $V_R < 0$

Distribution of objects in
the Galactic plane



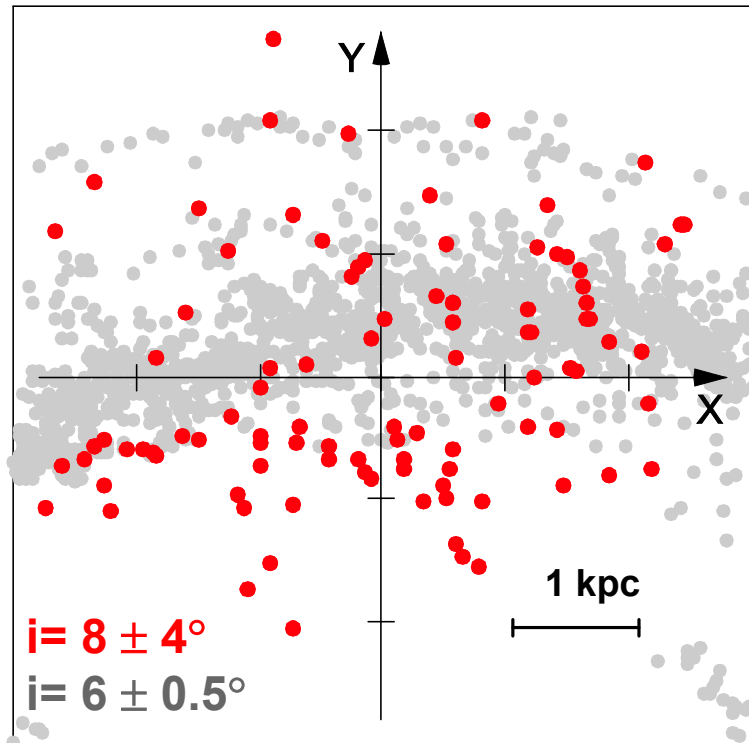
Dependence of the azimuthal
residual velocity V_T on x-coord.



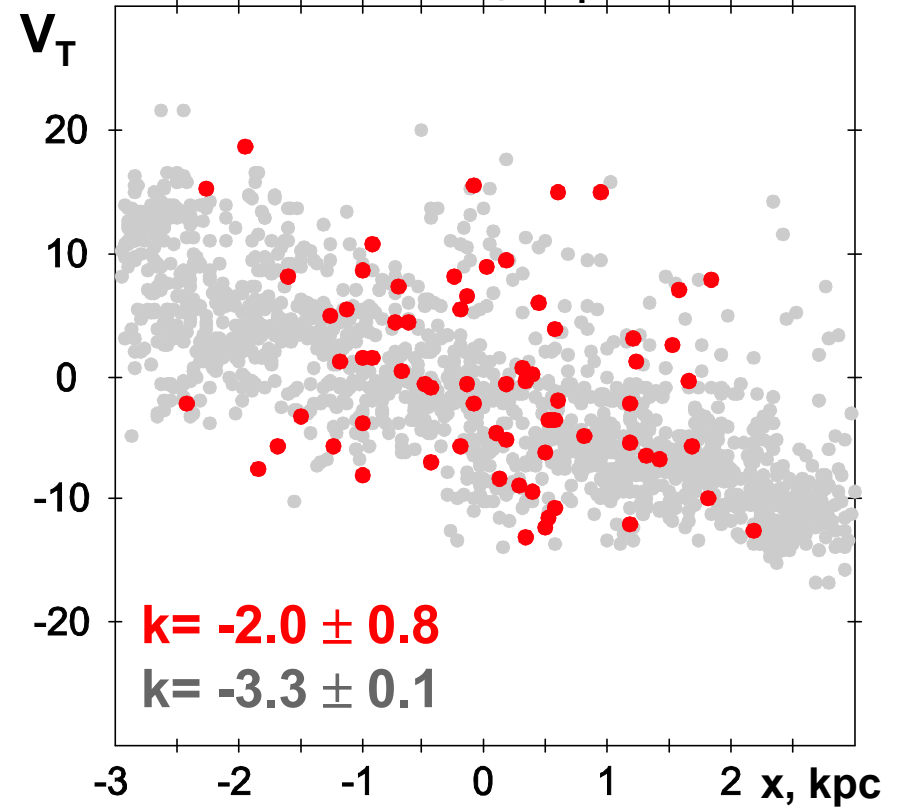
Kinematical features of the ring R2

Cepheids with $V_R < 0$

Distribution of objects in the Galactic plane



Dependence of the azimuthal residual velocity V_T on x-coord.



Conclusions:

- 1) Distribution of young open clusters and classical Cepheids in the Galactic plane has the shape of a tuning fork.
- 2) The optimum value of solar position angle with respect to the major axis of the bar, θ_b , providing the best agreement between the distribution of young objects and model particles is $\theta_b = 43 \pm 10^\circ$ (young open clusters) and $\theta_b = 37 \pm 13^\circ$ (Cepheids).
- 3) Young objects with the negative Galactocentric radial velocity ($V_R < 0$) outline a leading spiral-arm fragment with the pitch angle $i = 11 \pm 5^\circ$ (young open clusters) and $i = 8 \pm 4^\circ$ (Cepheids).
- 4) Young open clusters, OB-associations and classical Cepheids with $V_R < 0$ show the decrease of the azimuthal residual velocity V_T with increasing coordinate x , where the X -axis is directed in the sense of Galactic rotation.

Thanks!