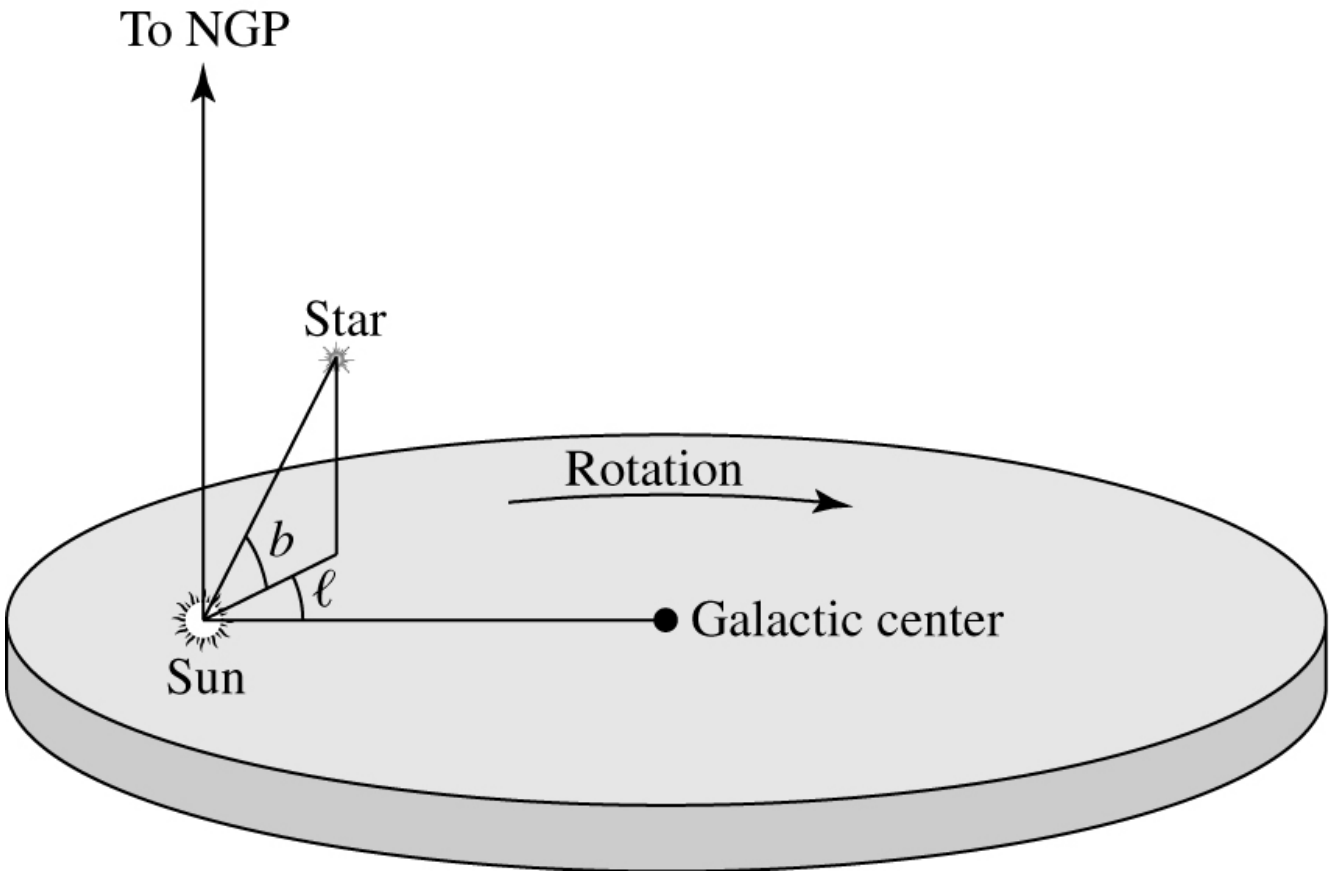
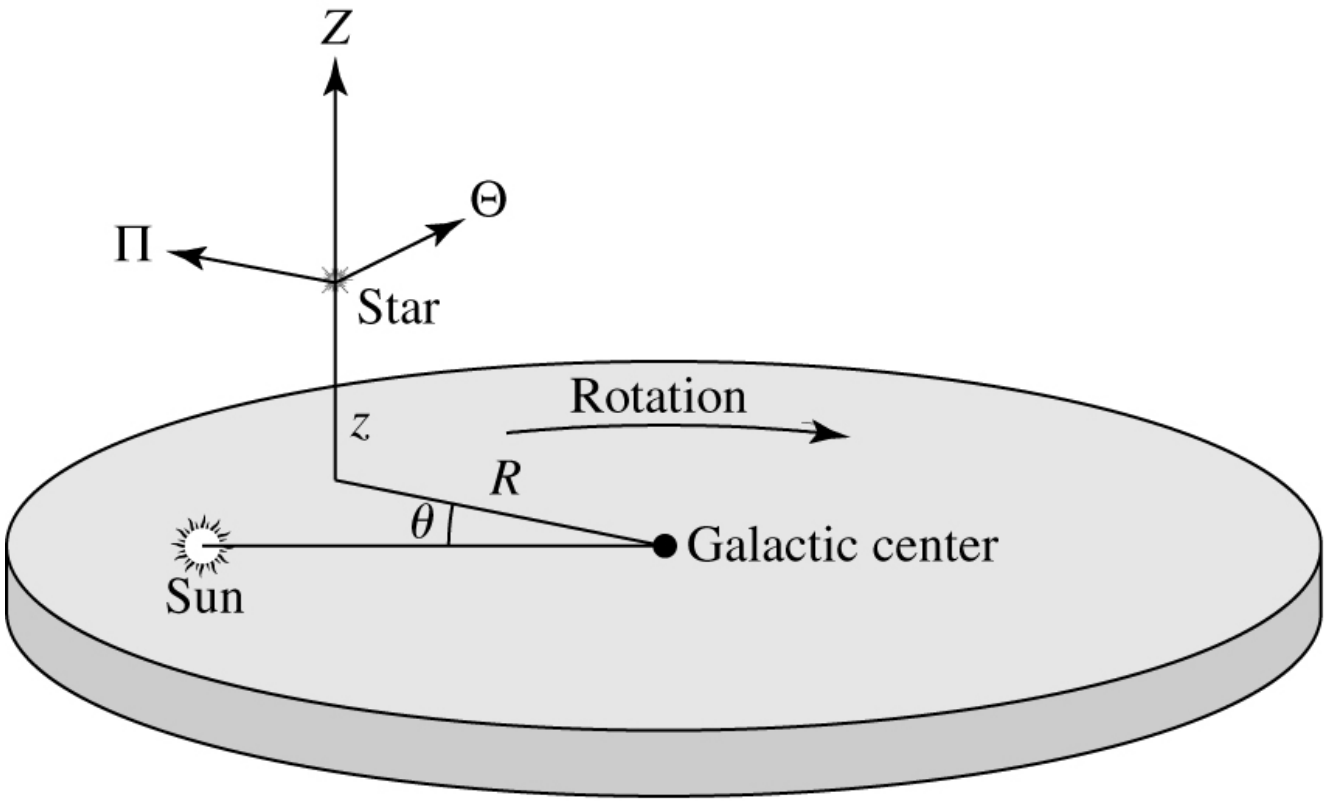
Galactic Coordinates, *l* and *b*.

If z is specified as a height in kpc, the distance is known.



Galactic Velocity components based on cylindrical coordinate system.

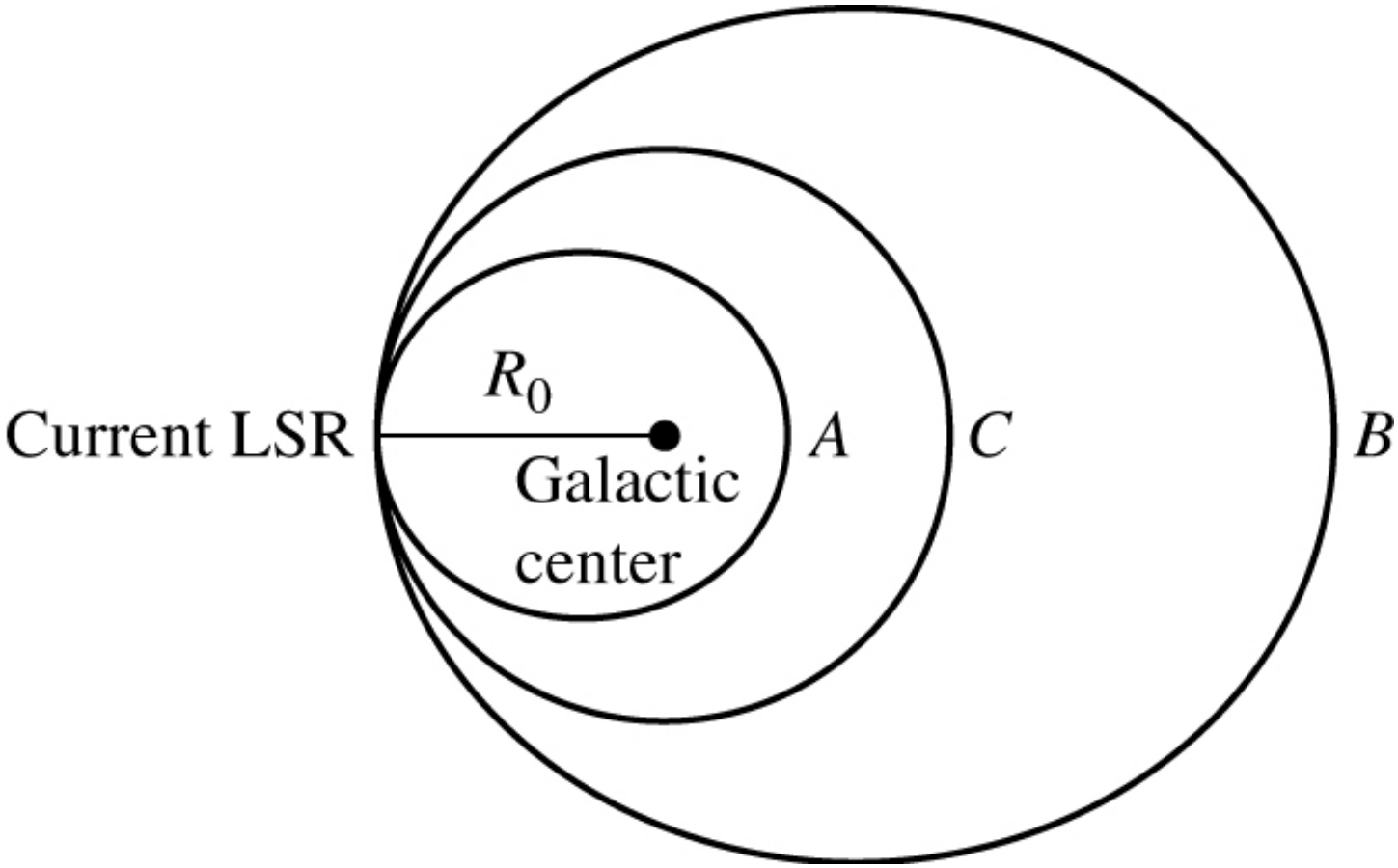
Rotation CW seen from NGP.
dR/dt, theta = R d(theta)/dt, Z = dz/dt



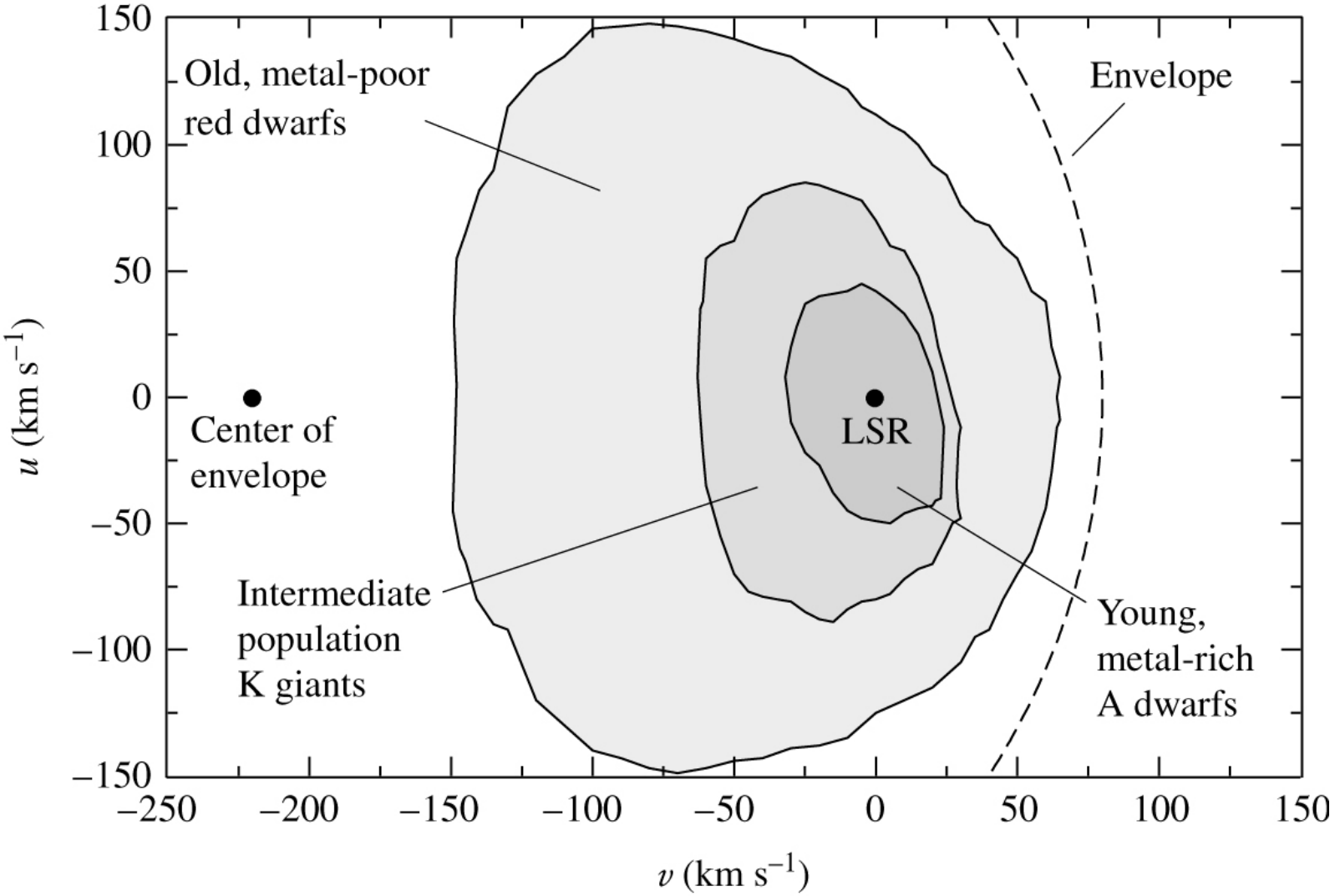
Origin of the spread in u values of stars in Solar neighborhood (the LSR).

Stars with orbits like A have u<0.
Stars with orbits like C have u=0.
Stars with orbits like B have u>0.

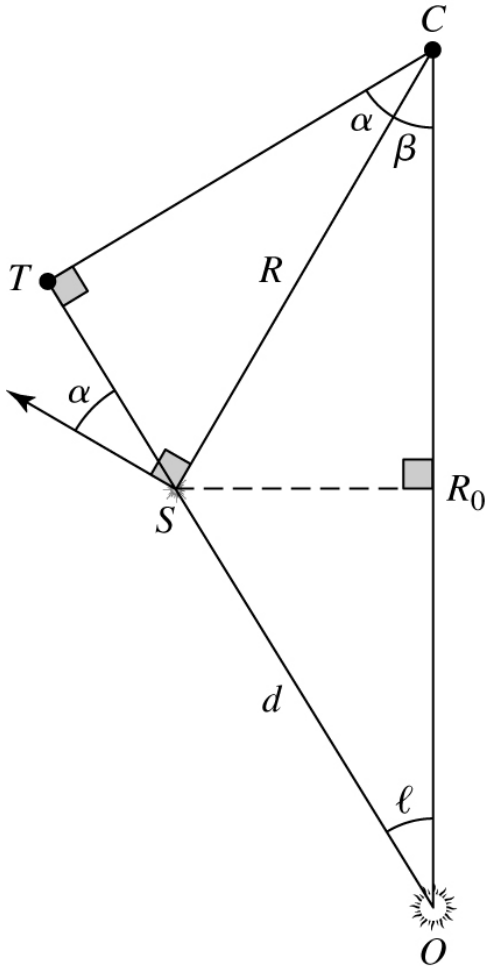
Avg is u_avg < 0 because more stars like A than like B.



Asymmetric Drift - the average theta (azimuthal) velocity component falls behind the circular velocity.
For the MW: the peculiar motions of stars in our neighborhood increasingly fall behind the LSR in v (azimuthal) motion as older populations of stars are considered.



Differential rotation.



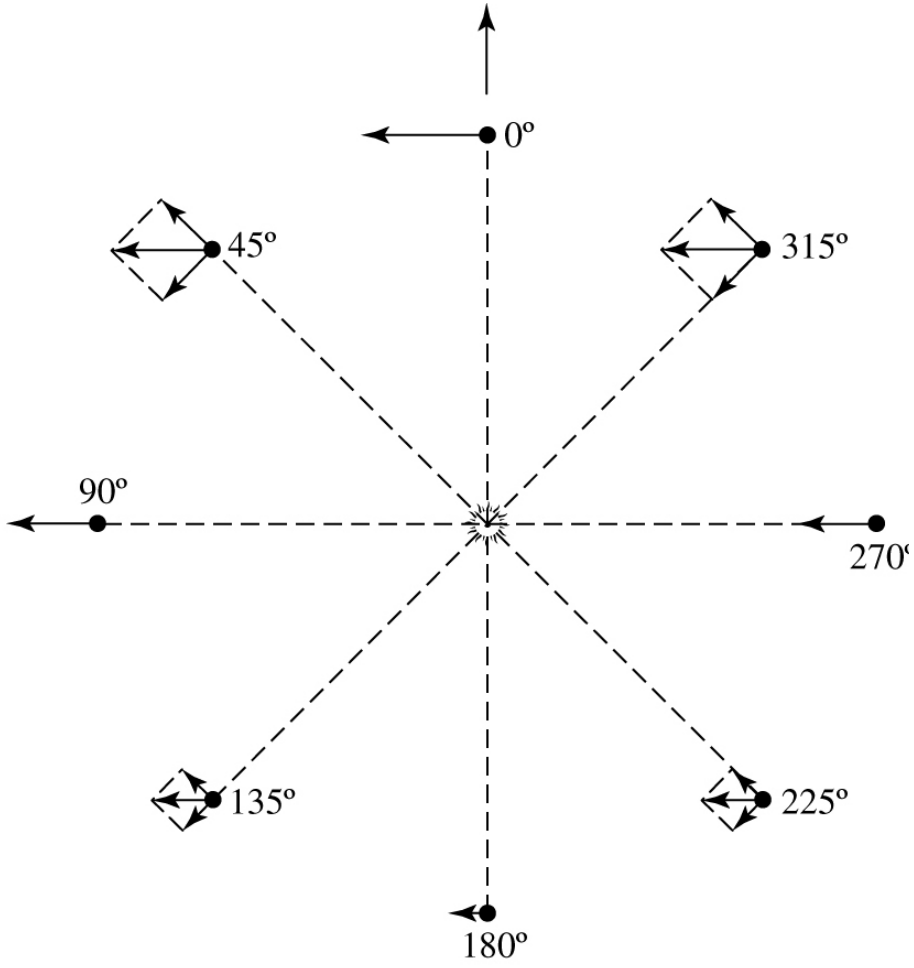
Geometry for analyzing motions of stars in the extended solar neighborhood (d<~6 kpc)

S can be a clump of neutral H gas as well as a star. If it is H gas, it is observed in radio (21 cm), which gives high precision line-of-sight (radial) velocities).

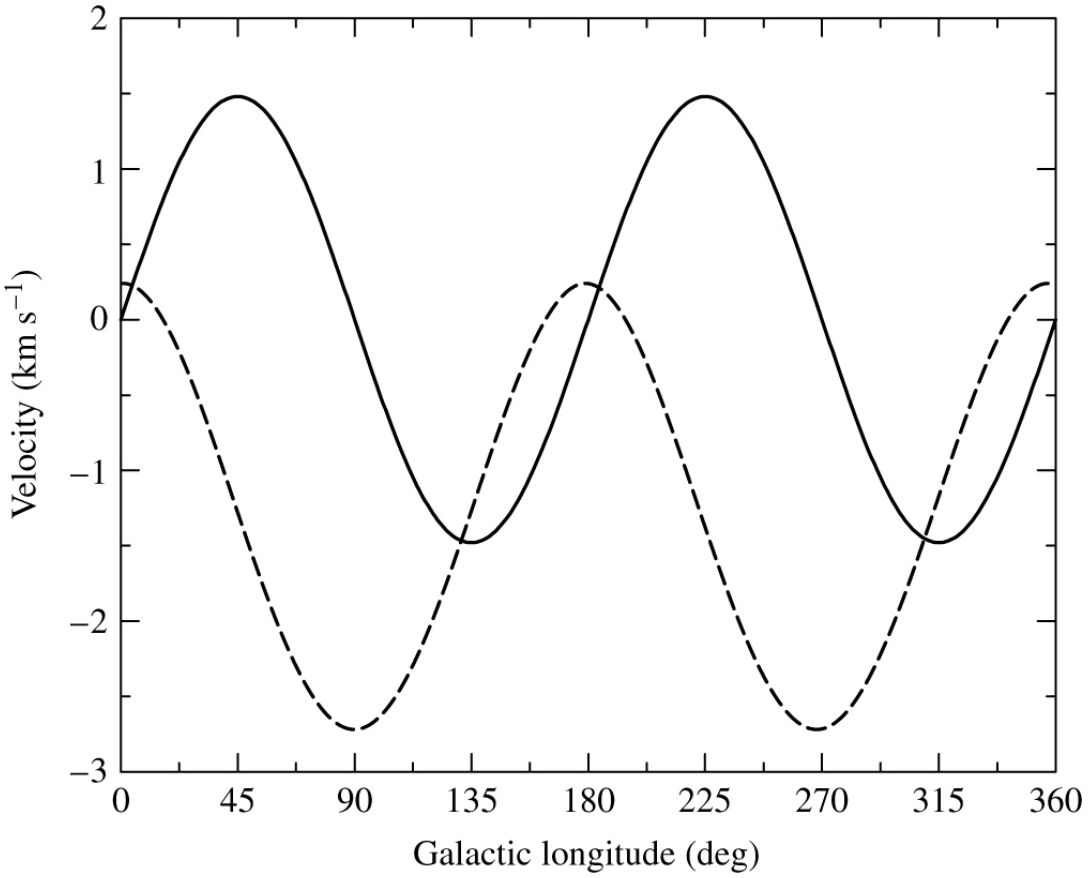
Differential rotation.

a) How stars in the solar neighborhood (d<0.5 kpc) would appear if there was differential rotation such that $|V_{circ}|$ decreases with R. (i.e., $d\Theta/dR < 0$).

b) Both tangential (dashed line) and radial velocity (solid line) components show sinusoidal dependence on Galactic longitude .

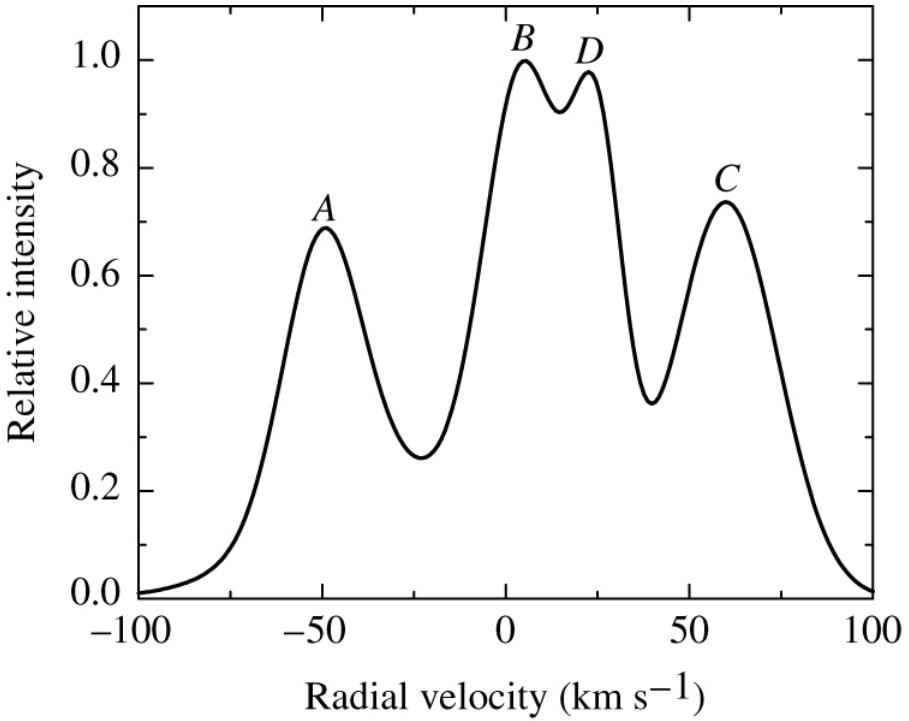


(a)

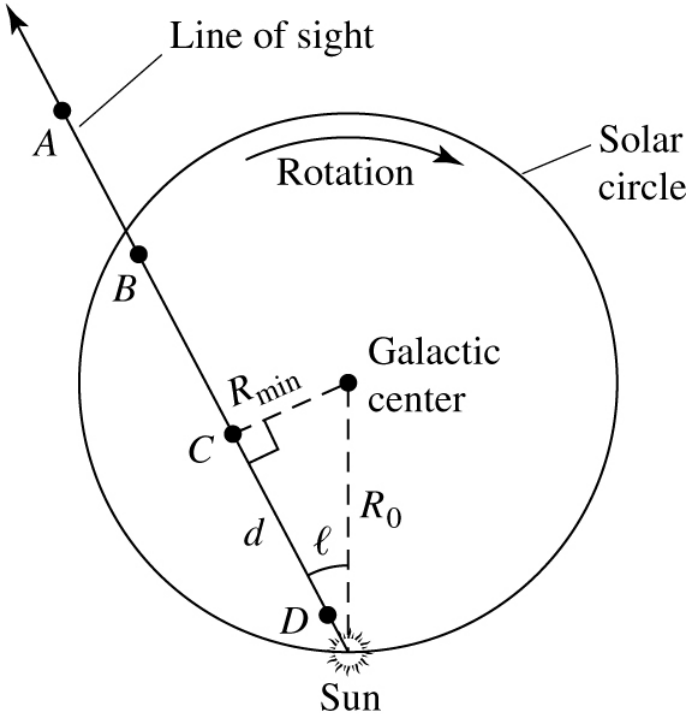


(b)

Using HI, 21cm radiation to measure disk kinematics.

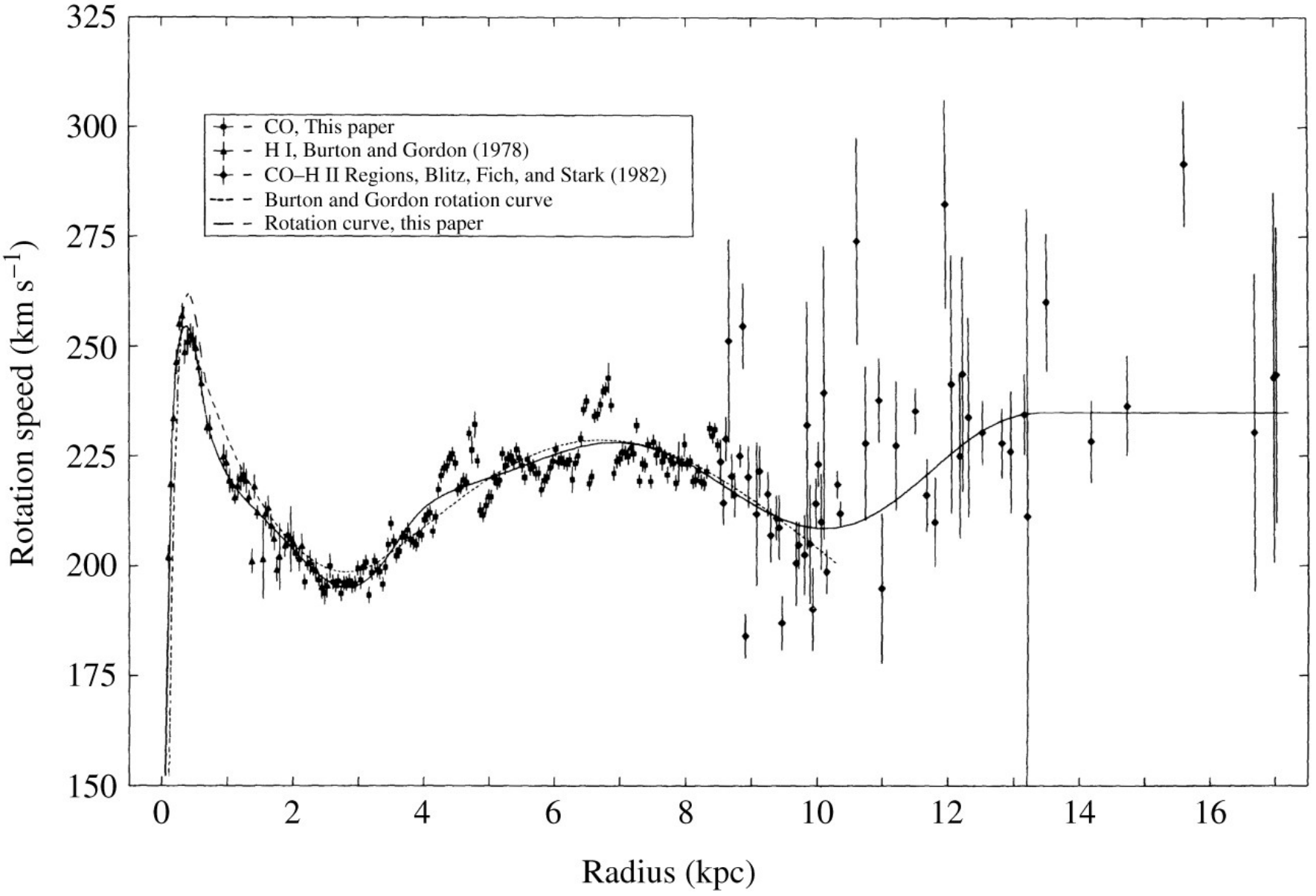


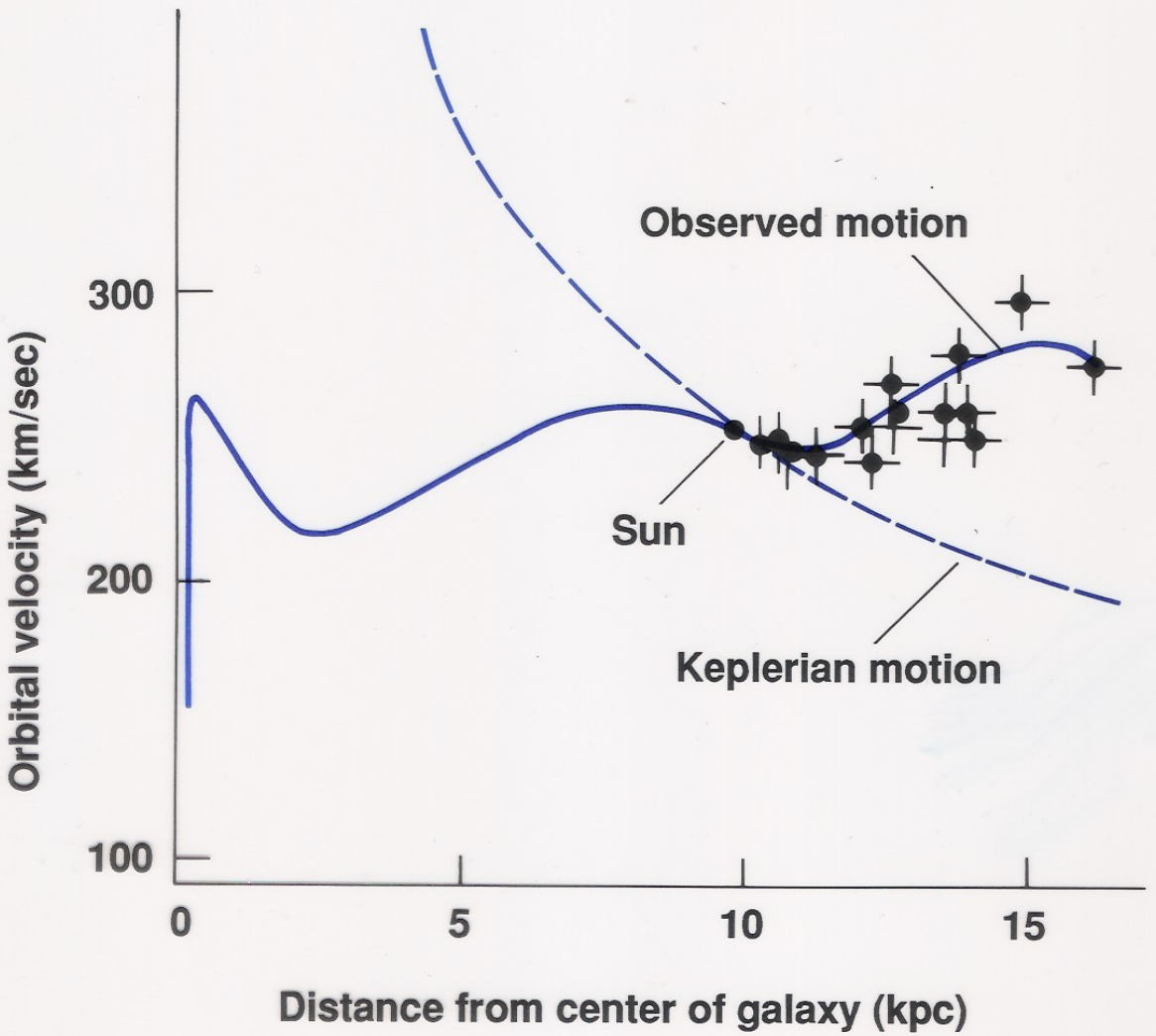
(a)



(b)

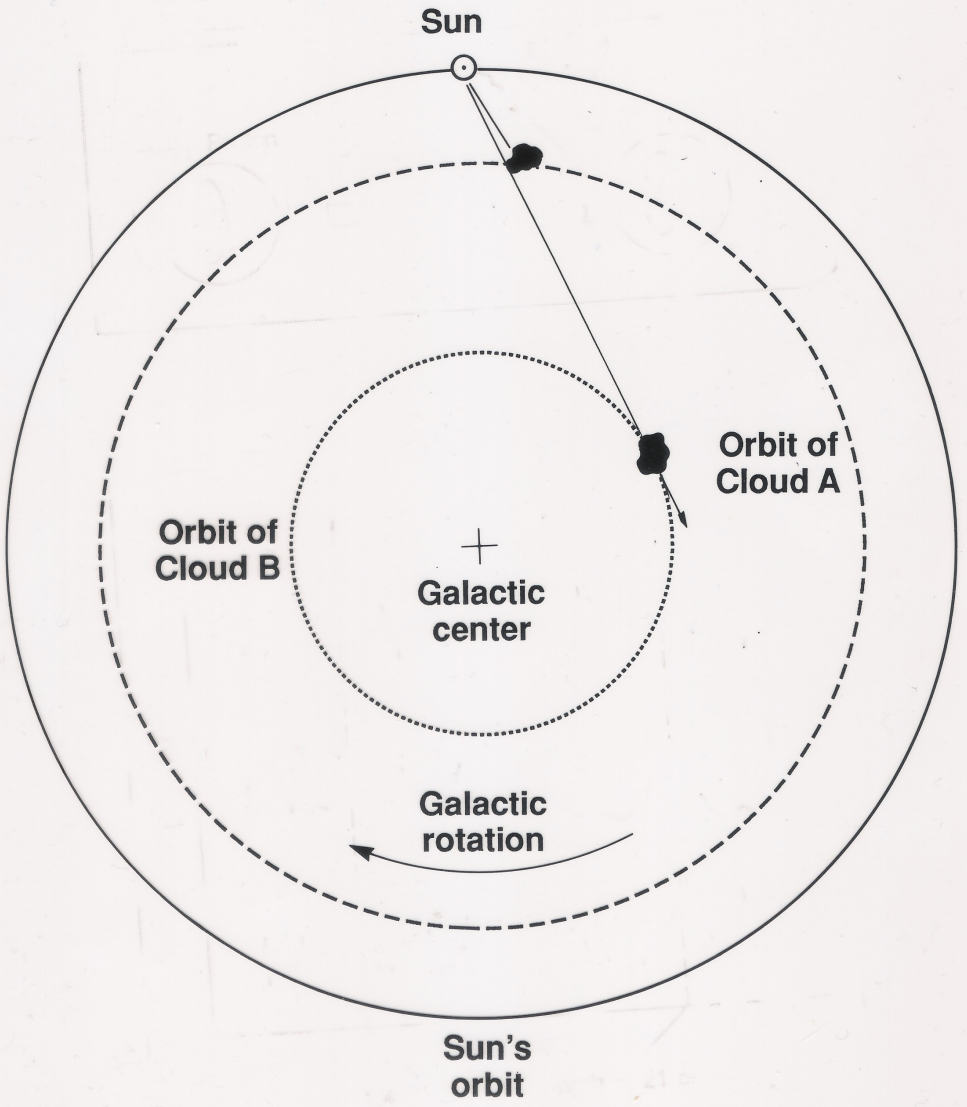
The Milky Way's rotation curve gleaned (indirectly) from various observations.





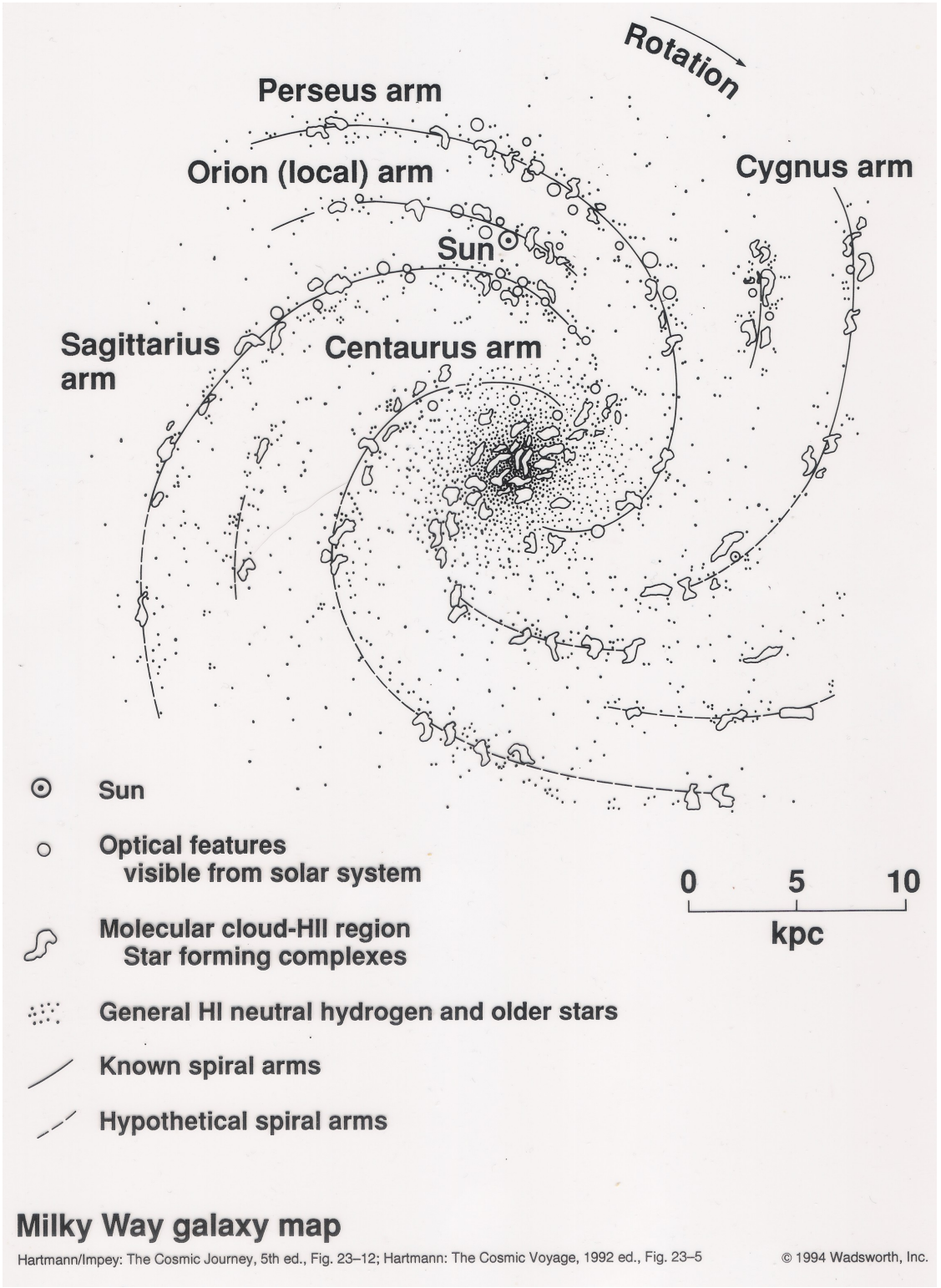
Orbital velocity of stars in the galaxy

Seeds: Horizons, 1995 ed., Fig. 12–11; Foundations of Astronomy, 1994 ed., Fig. 15–13



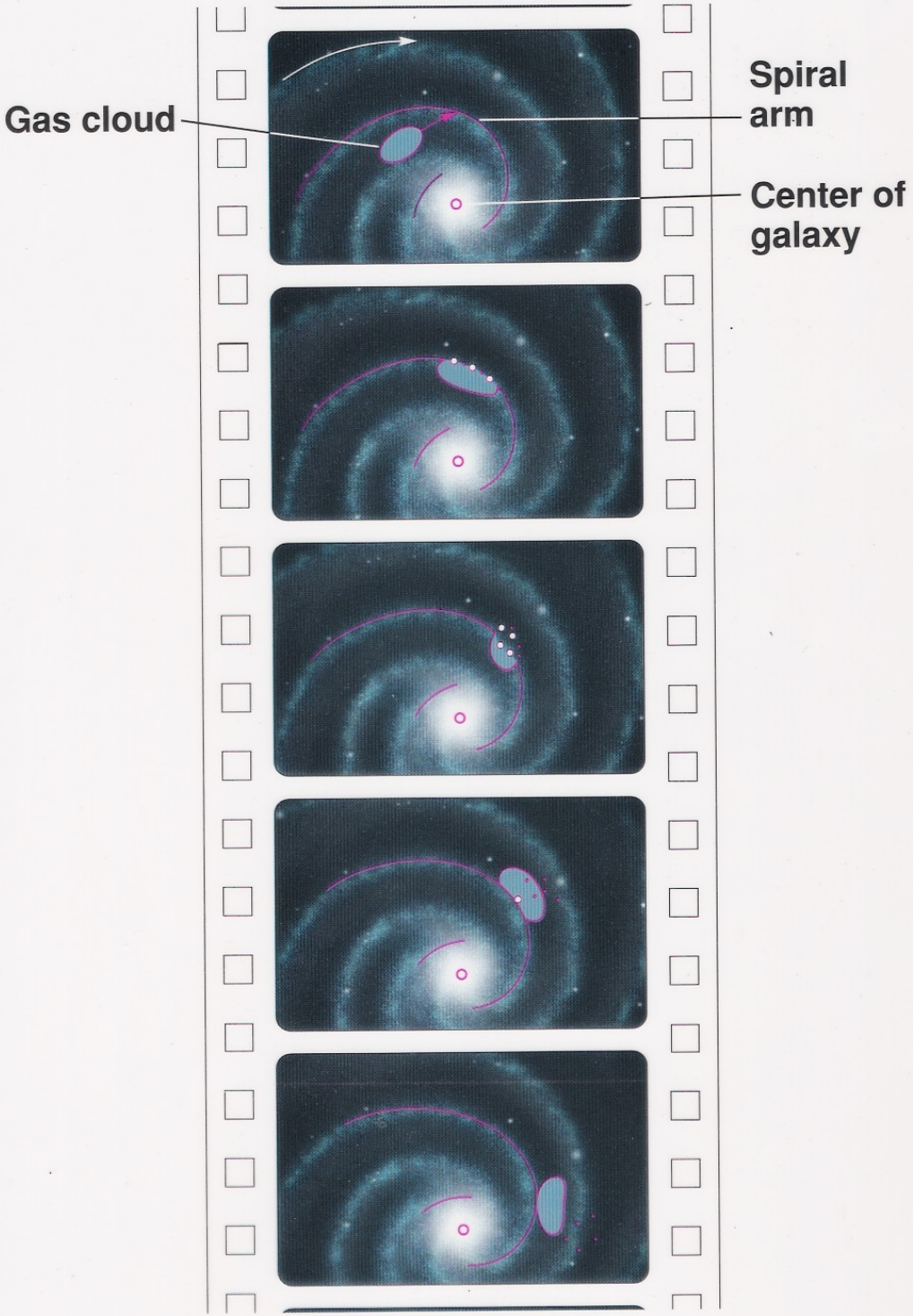
Using the Doppler shift to plot a cloud's position

Hartmann/Impey: The Cosmic Journey, 5th ed., Fig. 23–10

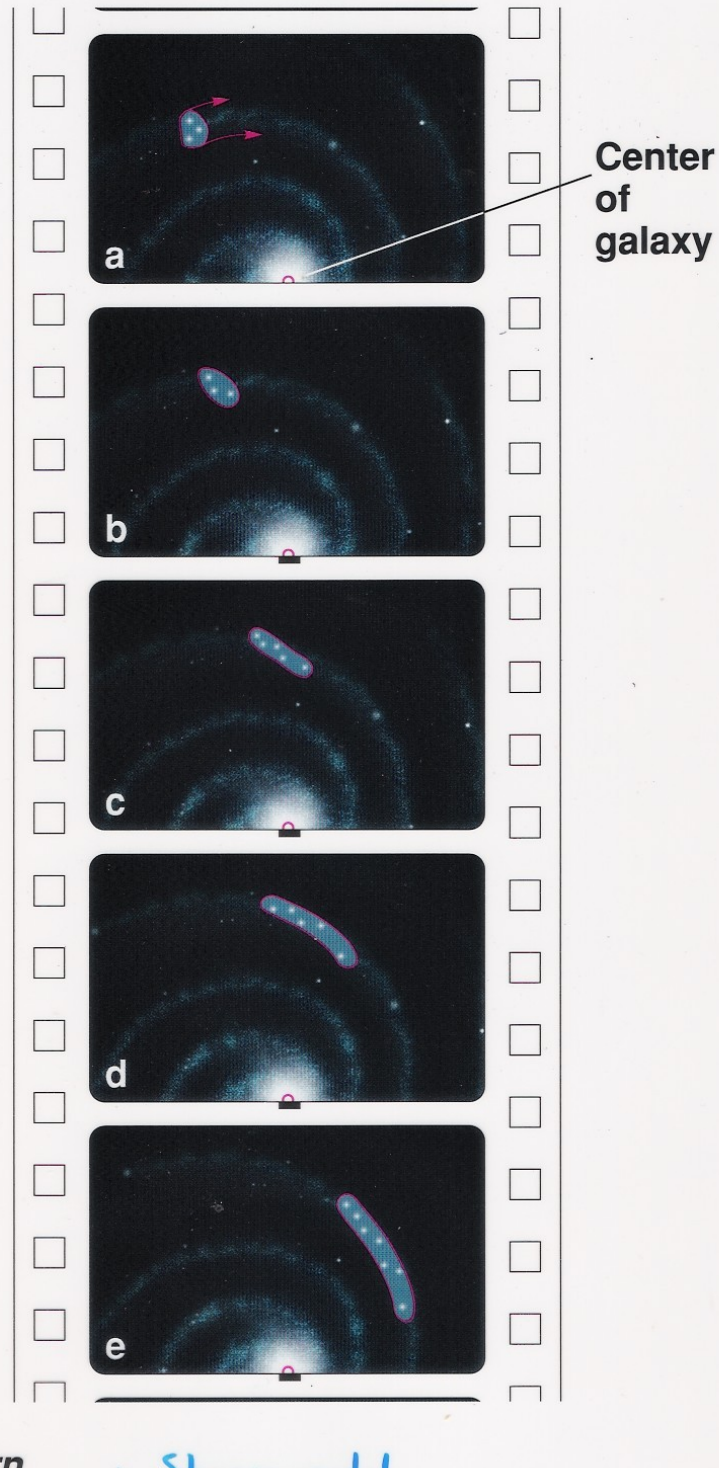


Milky Way galaxy map

Hartmann/Impey: The Cosmic Journey, 5th ed., Fig. 23–12; Hartmann: The Cosmic Voyage, 1992 ed., Fig. 23–5



© 1997 Wadsworth Publishing Company/ITP



Spiral pattern - Sheer model