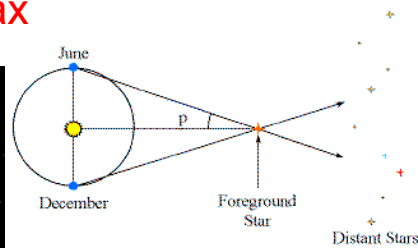


Measuring the Distances to the Stars:

Parallax



Parsec (pc)

= distance to star for which
angle $p = 1$ arcsec

= 3.26 LY

Hwk 2 due Sept 23

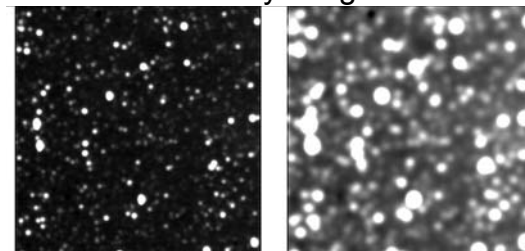
Hwk 3 not yet
assigned, but due
Sept 30

Midterm 1
Wed, Oct 2

<http://sci2.esa.int/interactive/media/html/sec23p1.htm>

What sets the parallax limit?

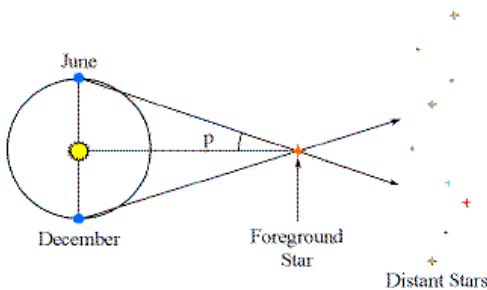
Fuzzy images



A field of stars

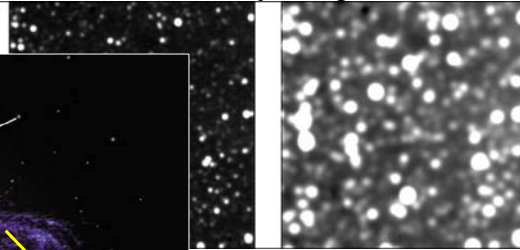
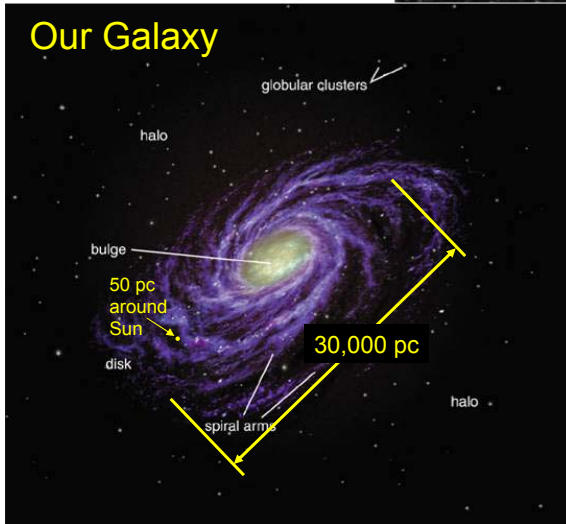
...blurred by Earth's atmosphere.

Old limit for parallax distances:
20-50 parsecs



What sets the parallax limit?

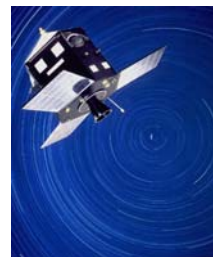
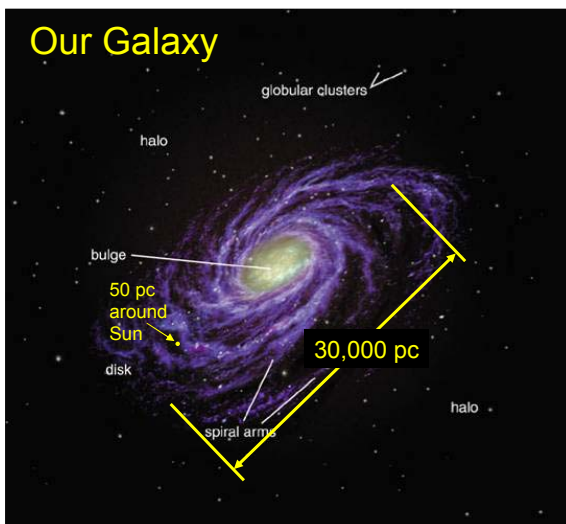
Fuzzy images



...blurred by Earth's atmosphere.

Old limit for parallax distances:
20-50 parsecs

Sharp Images from Space

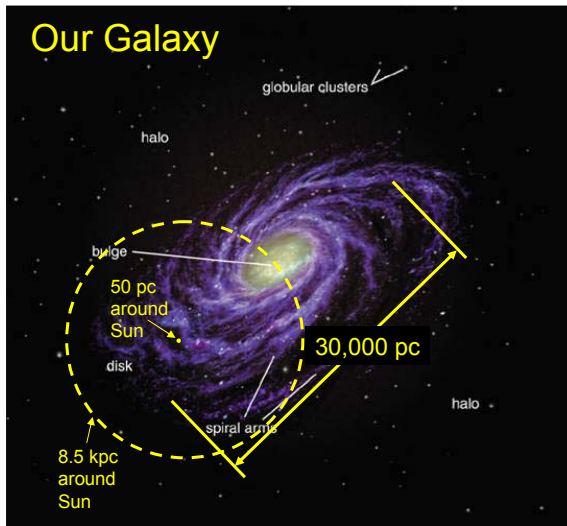


Hipparcos

Old limit for parallax distances:
20-50 parsecs

Hipparcos (1989-1993):
100-200 parsecs
($1\sigma = 1$ milliarcsec = 1kpc)

Coming Attraction



GAIA spacecraft: Dec 2011 launch

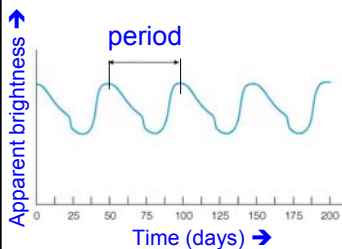
Old limit for parallax distances:
20-50 parsecs

Hipparcos (1989-1993):
100-200 parsecs
($1\sigma = 1$ milliarcsec = 1kpc)

GAIA: 8.5 kpc

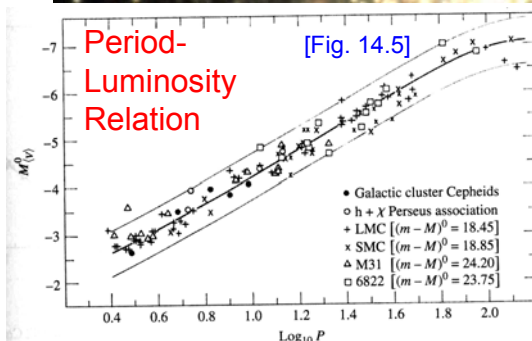
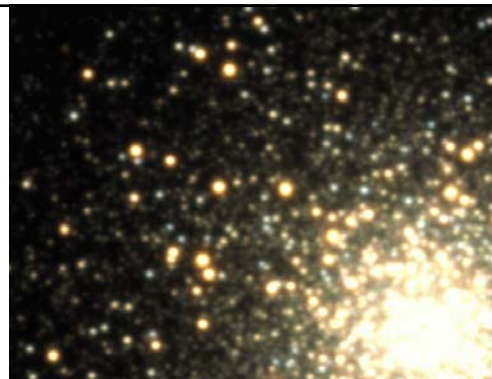
Pulsating Variable Stars

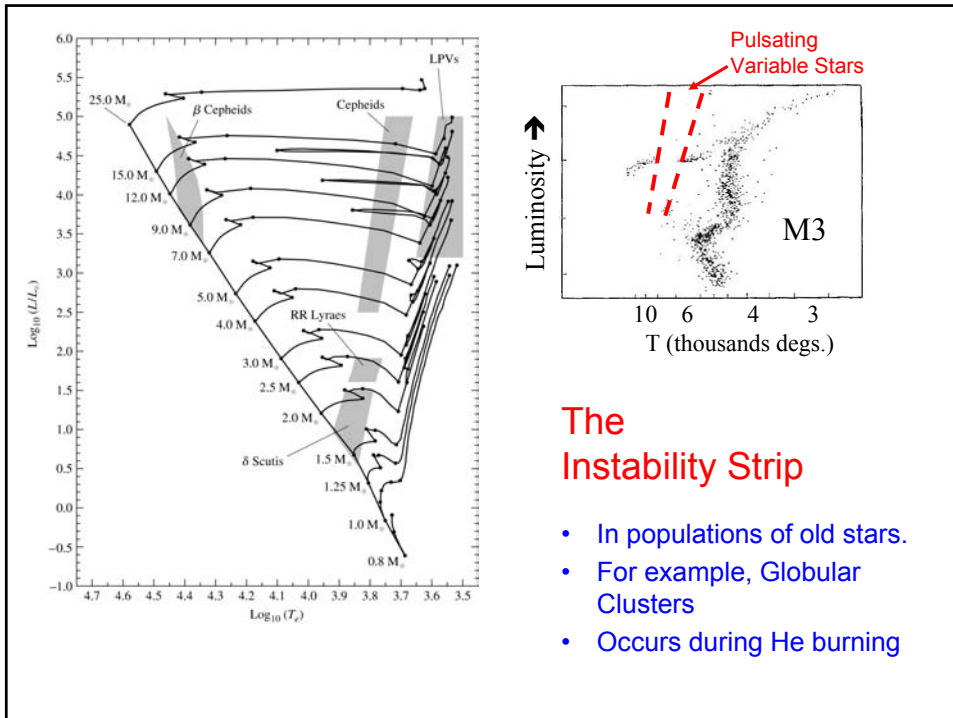
- These stars regularly expand & contract.
- Like a big spring.
- Change in size →
 - change in temperature
 - change in luminosity



P-L relation

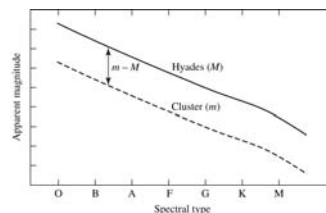
- discovered in Magellanic Clouds
- calibrated locally, using (statistical) parallaxes



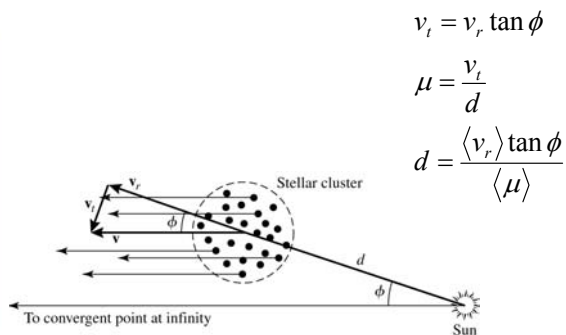
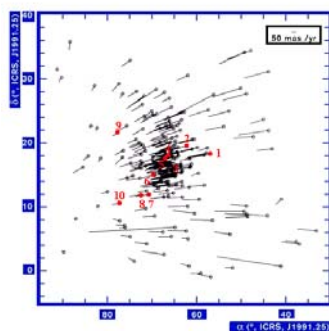


Measuring Distances inside the MW

- Parallax
- Pulsating variables
- Main sequence fitting for clusters

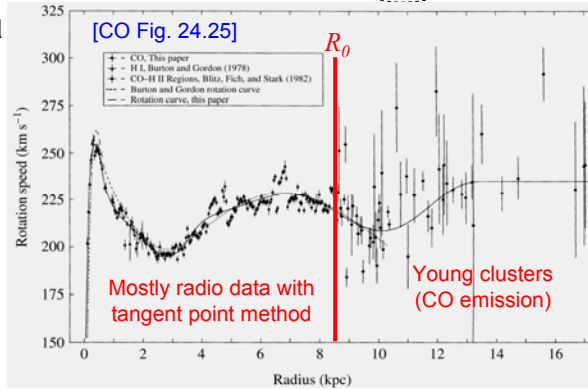
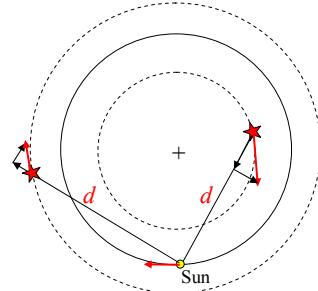


- Calibrate with Hyades (moving cluster method = pp. 919-922)



Measuring the MW Rotation Curve

- In principle, for stars, clusters, etc:
 - measure distance d and v_r
 - assume circular orbit
- For H I 21cm, CO, etc. radio emission:
 - Only can measure v_r
 - Use tangent point method
 - Only works inside R_0
- Outside R_0
 - Must use other methods.
 - Must know actual distance + velocity.



Galactic Rotation Curves

(take your pick)

- Most data points interior to R_0 are from tangent point method.
- Beyond R_0 most data points are young objects with known distances & motions.
- But Merrifield used variation of apparent thickness of H I disk with longitude (complicated).

