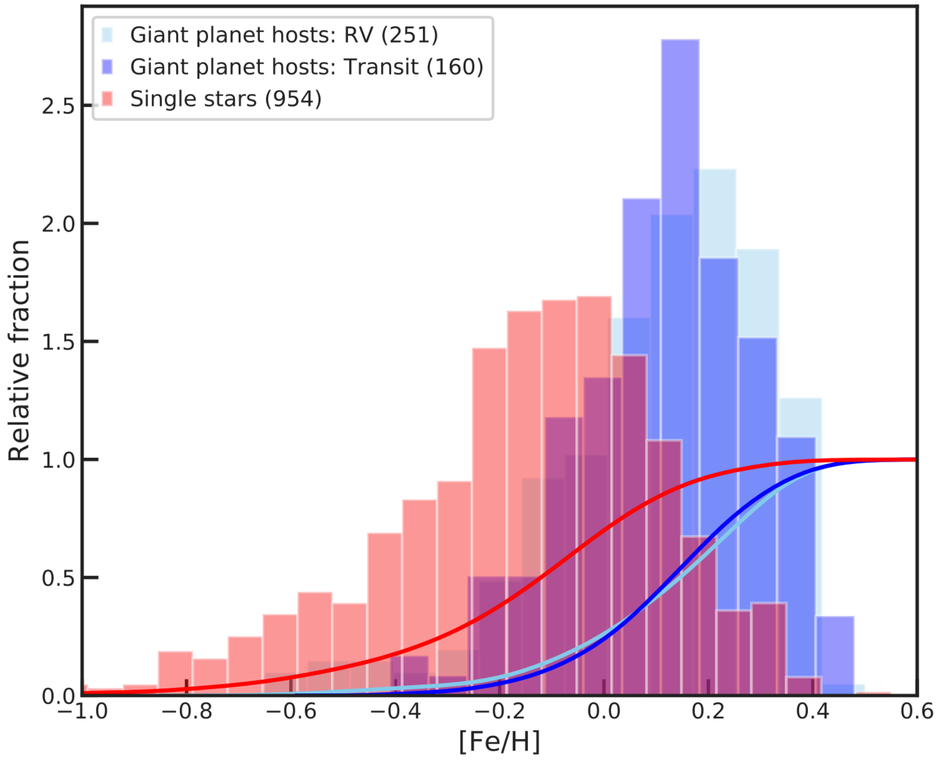
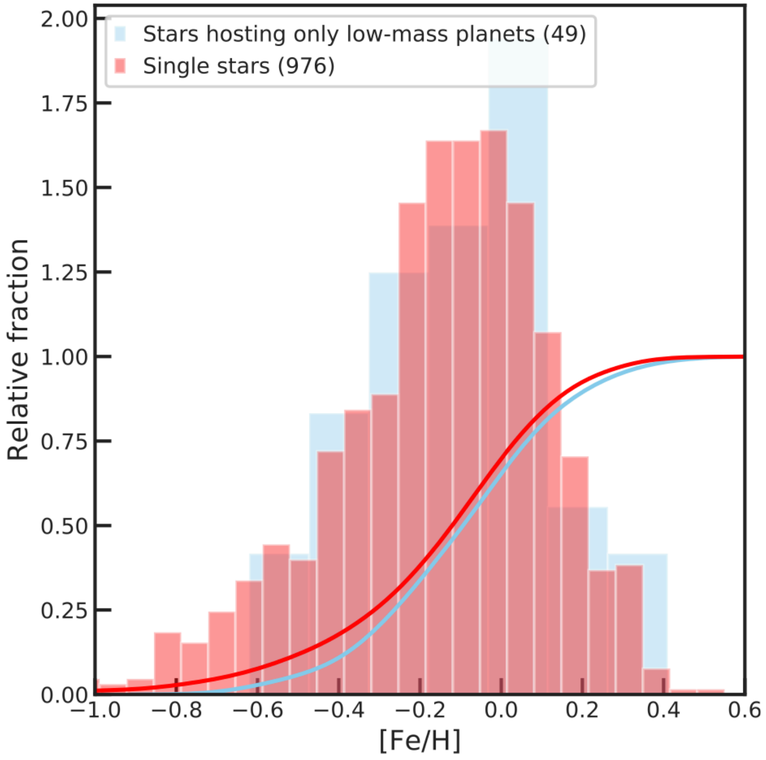
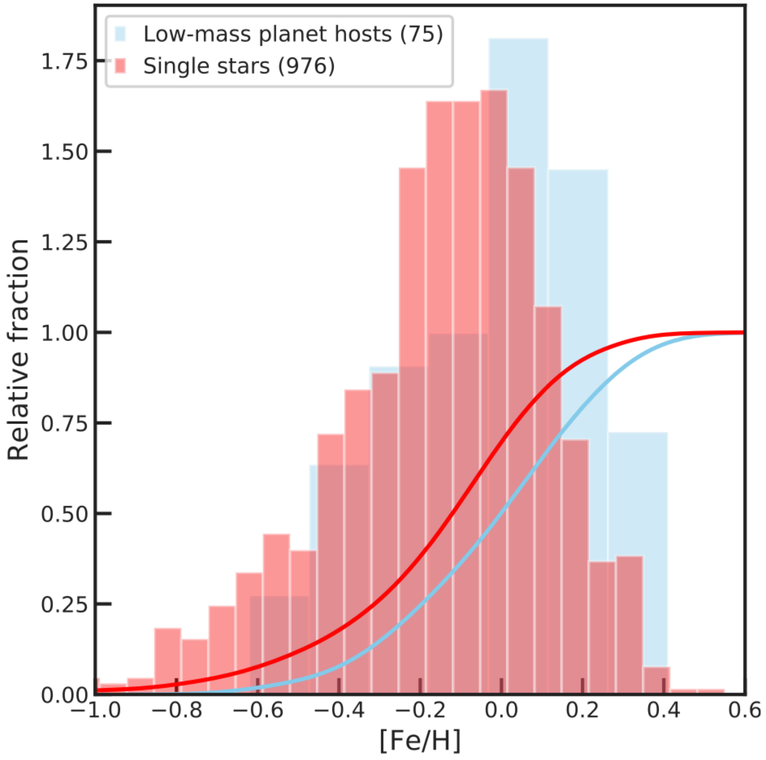


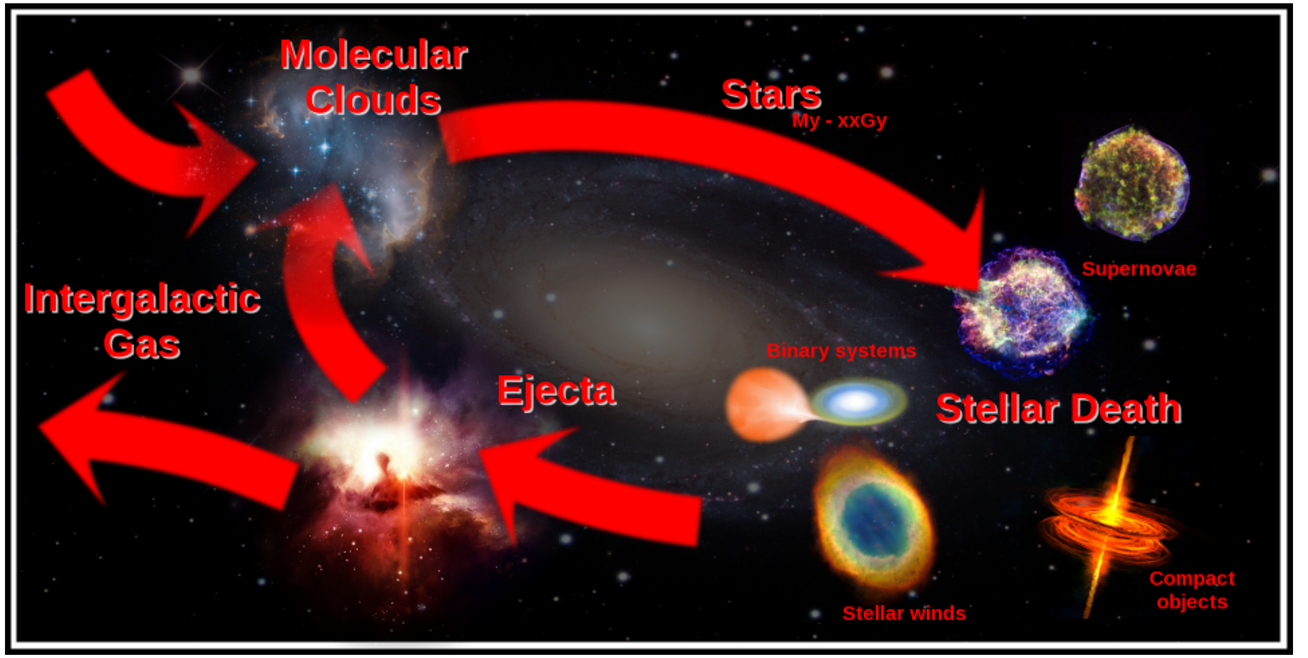


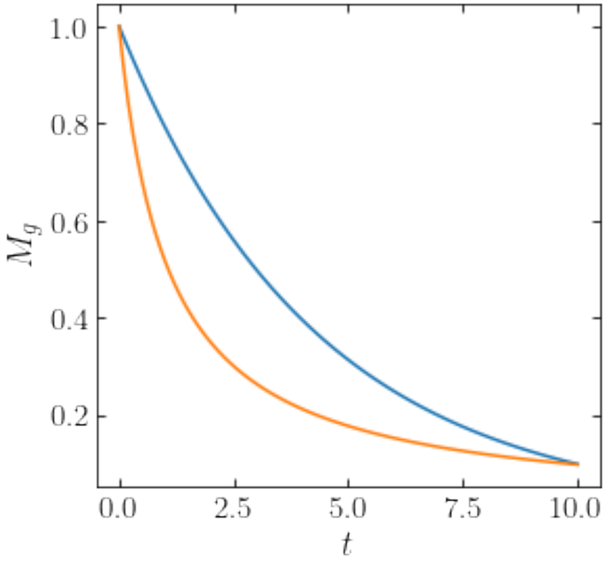


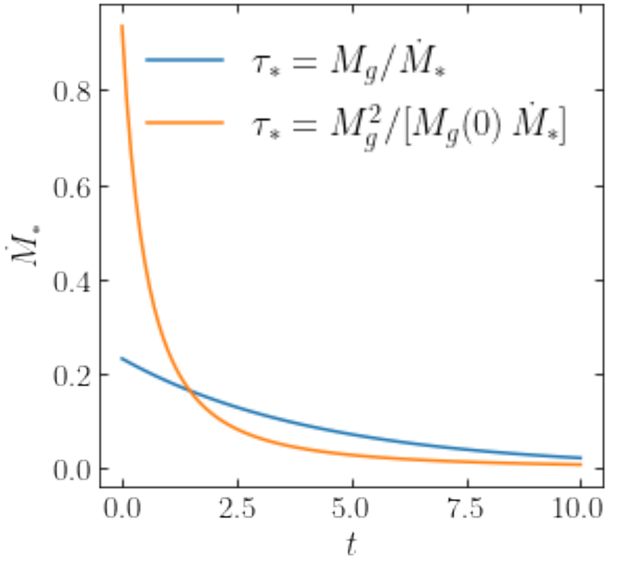
Giants +

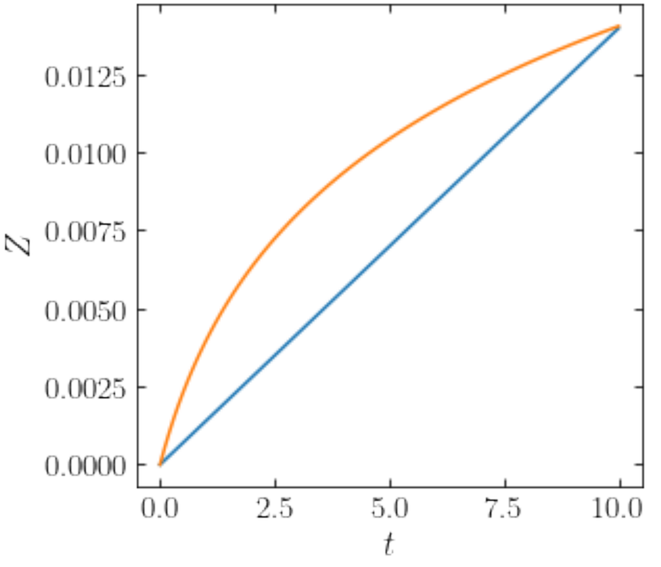
Rocky only

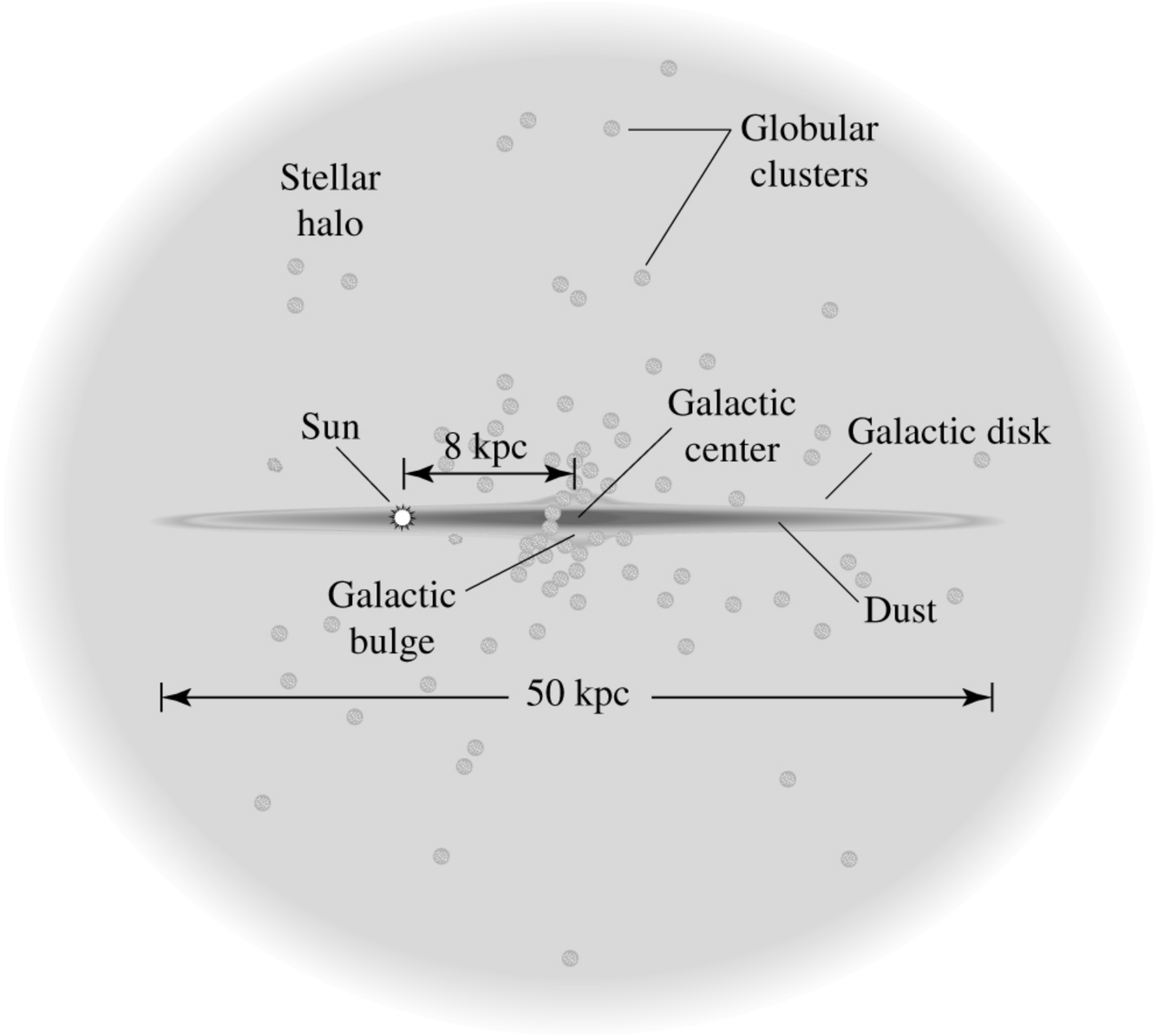
Rocky +

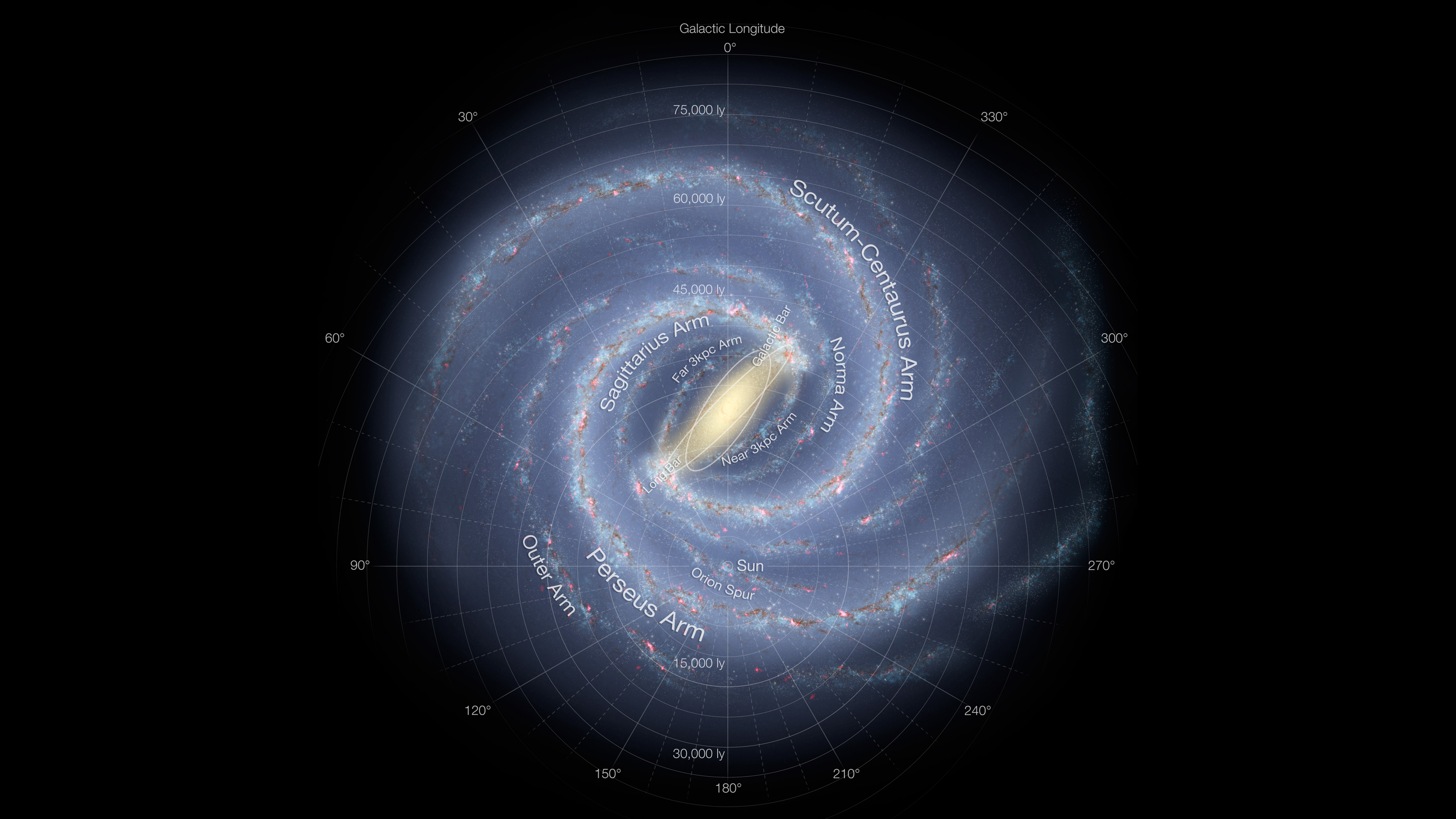

Molecular Clouds
Stars
My - xxGy
Supernovae
Intergalactic Gas
Binary systems
Ejecta
Stellar Death
Stellar winds
Compact objects

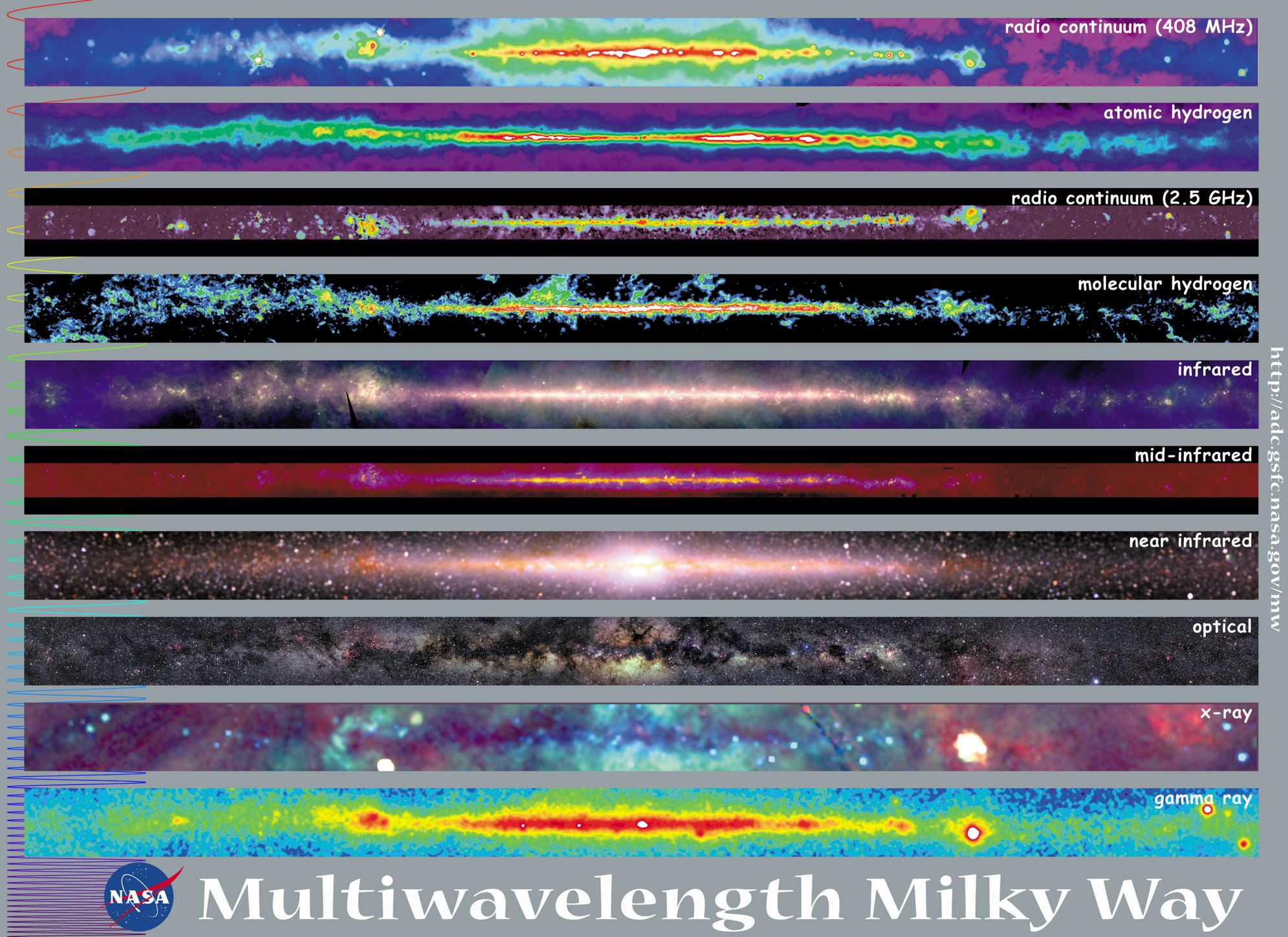

1.0
0.8
0.6
0.4
0.2
M_g
0.0
2.5
5.0
7.5
10.0
t


$\tau_* = M_g/\dot{M}_*$
$\tau_* = M_g^2/[M_g(0)\ \dot{M}_*]$
0.8
0.6
0.4
0.2
0.0
$\dot{M}_*$
0.0
2.5
5.0
7.5
10.0
t


0.0125
0.0100
0.0075
0.0050
0.0025
0.0000
Z
0.0
2.5
5.0
7.5
10.0
t


Stellar
halo
Globular
clusters
Sun
8 kpc
Galactic
center
Galactic disk
Galactic
bulge
Dust
50 kpc


Galactic Longitude
0°
30°
330°
75,000 ly
60,000 ly
45,000 ly
60°
300°
Scutum-Centaurus Arm
Sagittarius Arm
Far 3kpc Arm
Galactic Bar
Norma Arm
Near 3kpc Arm
Long Bar
90°
270°
Outer Arm
Perseus Arm
Sun
Orion Spur
15,000 ly
120°
240°
30,000 ly
150°
210°
180°



Multiwavelength Milky Way

http://adc.gsfc.nasa.gov/mw

The Disk

The Milky Way's dominant stellar component

$$\rho(R,z) = \rho_0 e^{-z/z_0} e^{-R/h}$$

z_0 = scale height = varies by component of disk

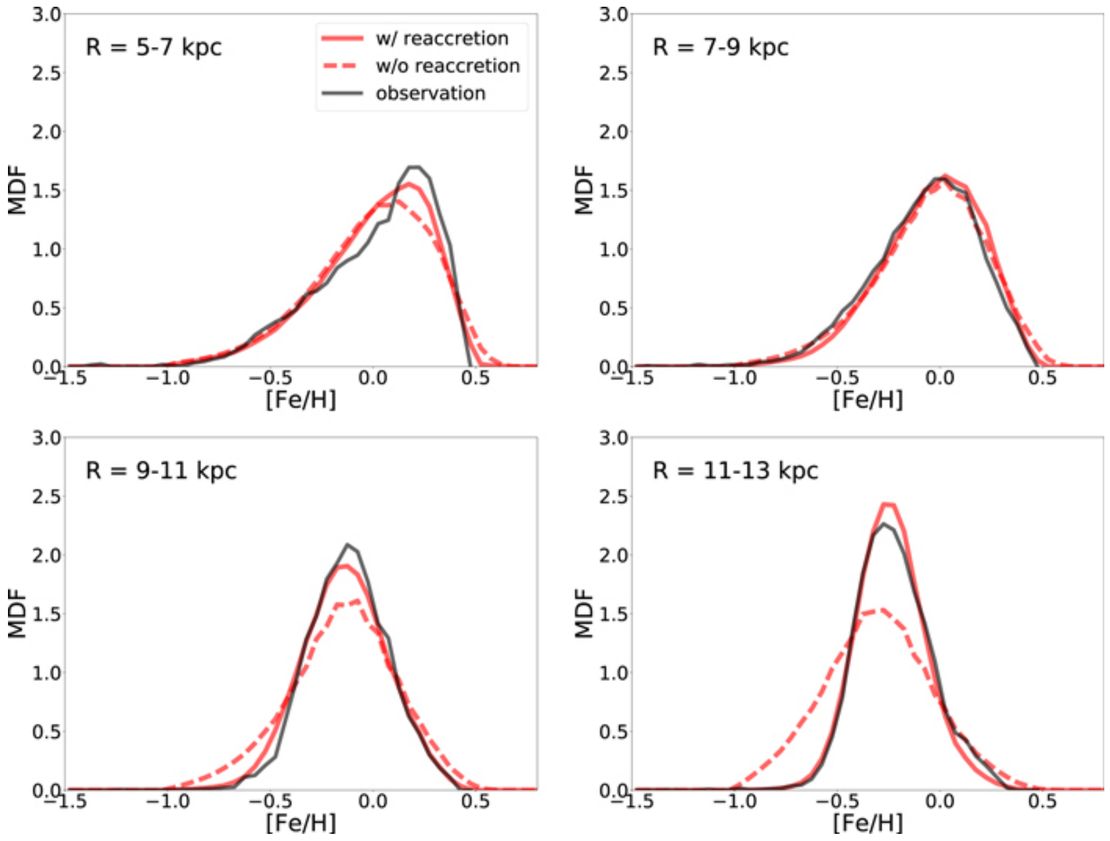
h = scale length ≃ 3kpc

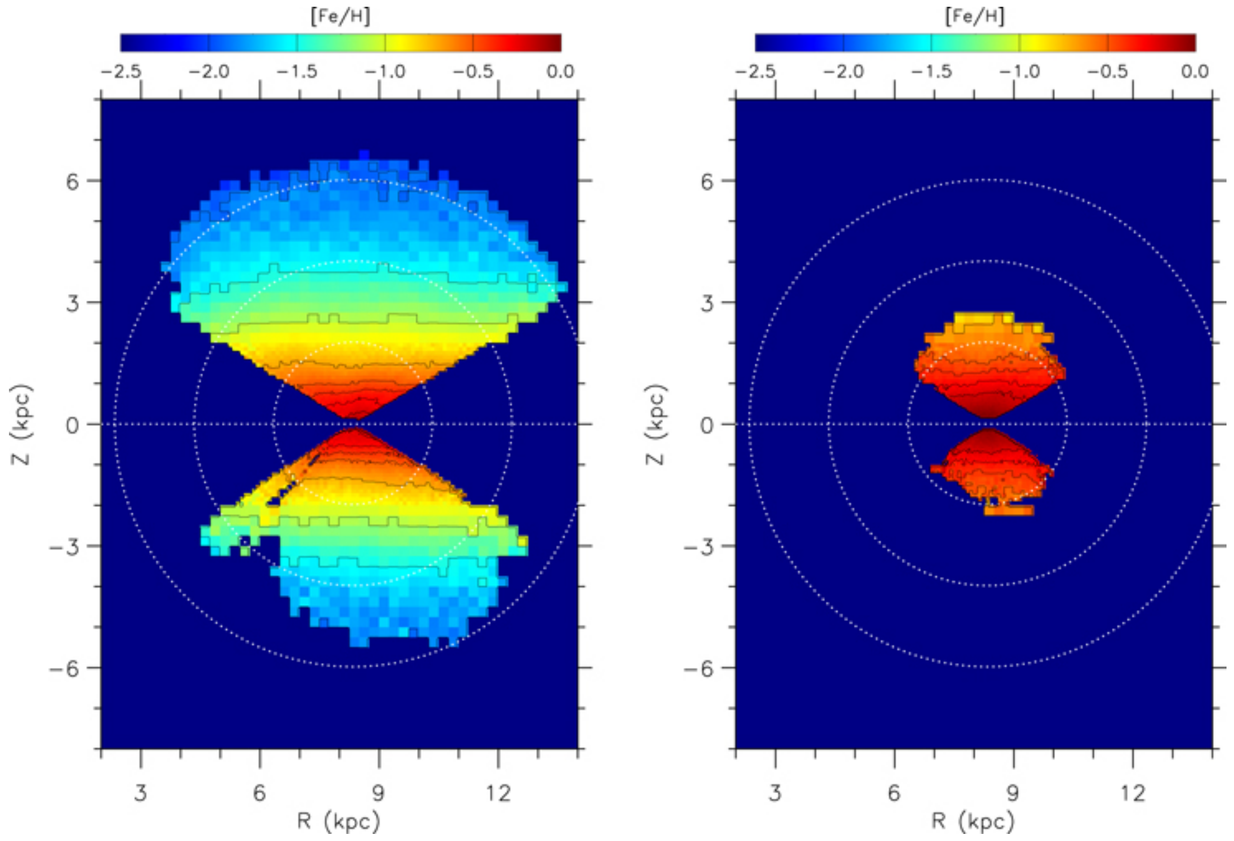
$R_\odot$ ≃ 8 kpc → Sun is in "outskirts"

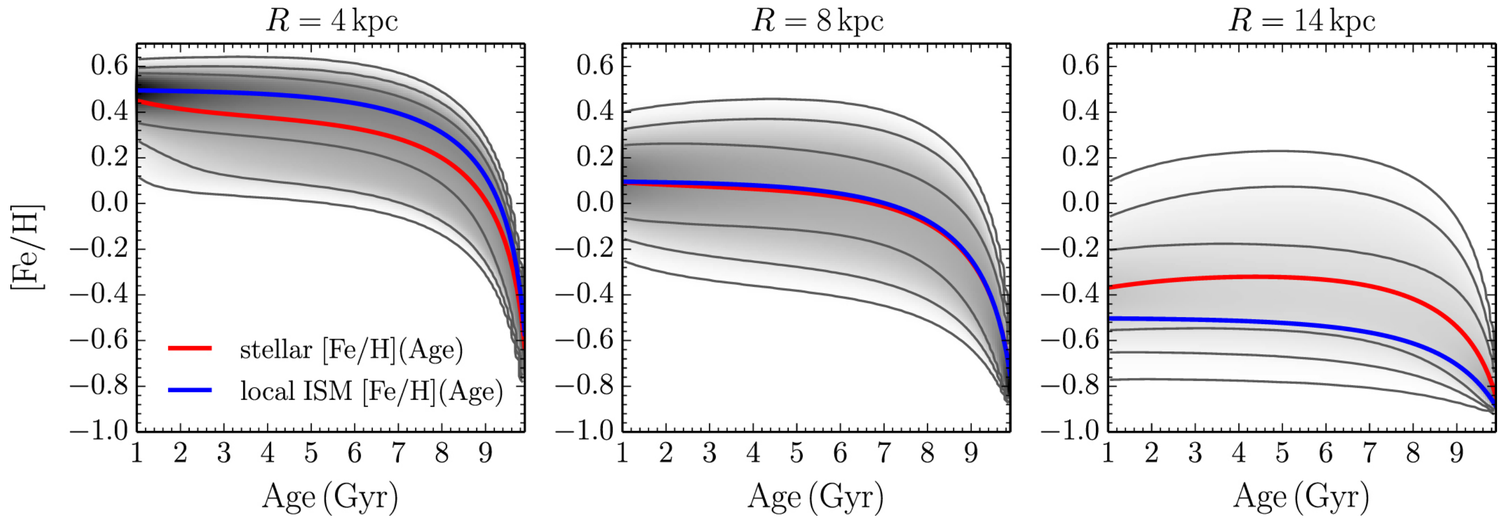
total mass ~ 10^{11} solar masses

	z_0	[Fe/H]	age	population
young thin disk	~50 pc	> 0.0	young	Pop I
old thin disk	~300-400 pc	-0.5 — +0.3	middle-age	Pop I
thick disk	~1-1.5 kpc	-1.5 — -0.4	old	Pop I & II

How might we account for the differences in ages, metallicities, scale heights?


R = 5-7 kpc
w/ reaccretion
w/o reaccretion
observation
R = 7-9 kpc
R = 9-11 kpc
R = 11-13 kpc
MDF
[Fe/H]

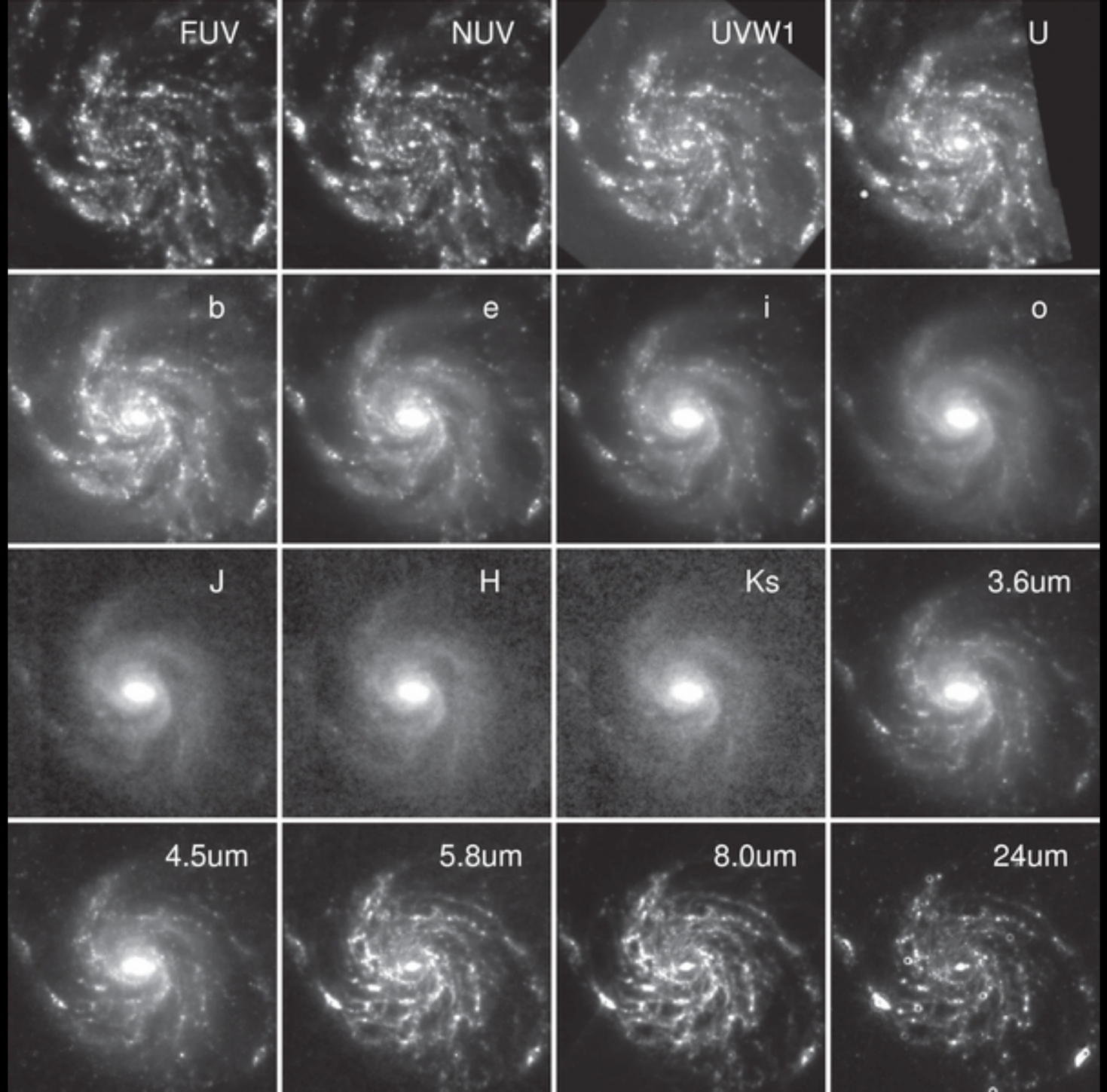

[Fe/H]
Z (kpc)
R (kpc)


R = 4 kpc
R = 8 kpc
R = 14 kpc
[Fe/H]
stellar [Fe/H](Age)
local ISM [Fe/H](Age)
Age (Gyr)

pink = star formation regions

ionized hydrogen

emit light in Balmer α = 3→2 transition

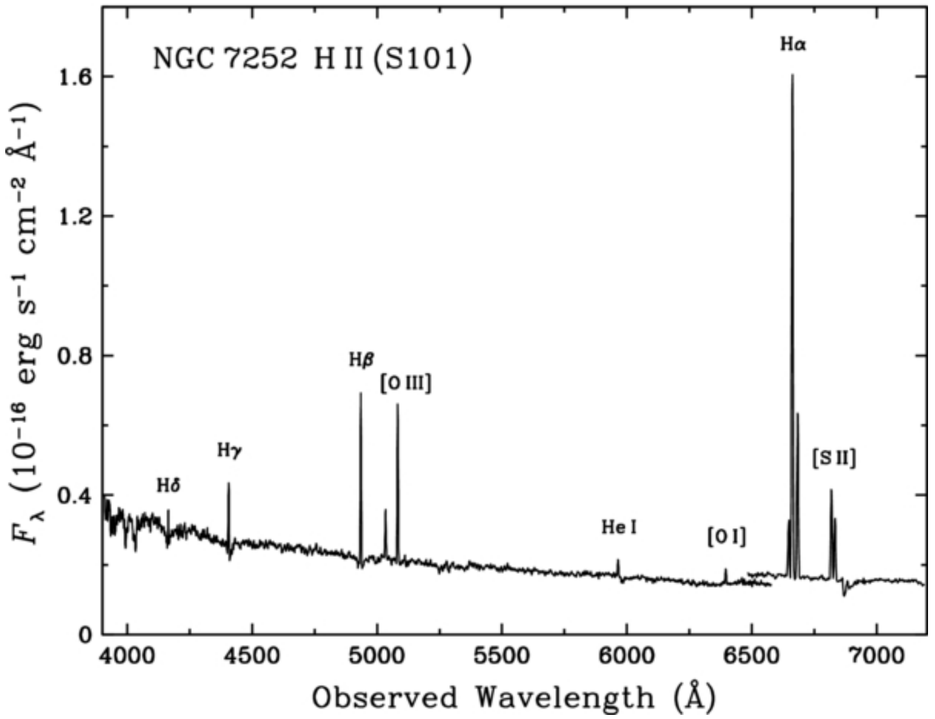

FUV
NUV
UVW1
U
b
e
i
o
J
H
Ks
3.6um
4.5um
5.8um
8.0um
24um

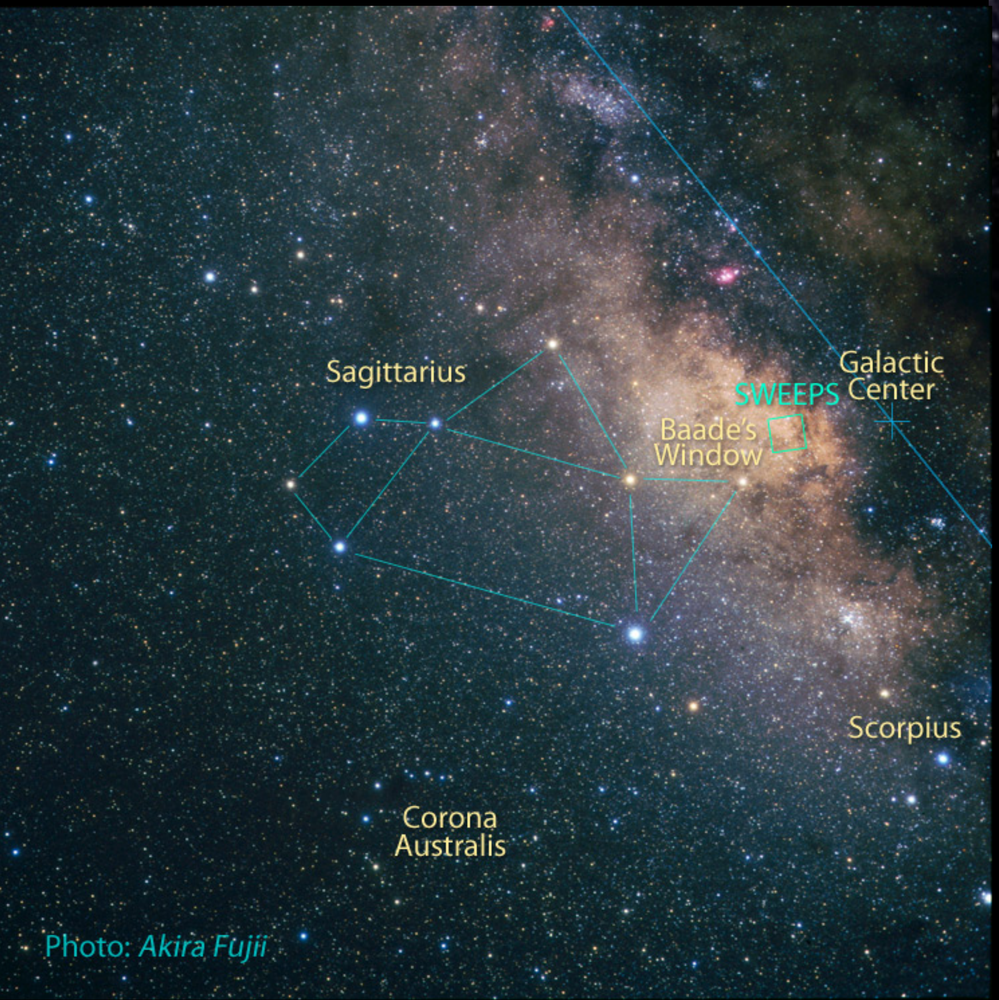
Interstellar Medium

“the stuff between the stars”

Gas (H, He, molecules), Dust

neutral Hydrogen (HI) — cool
ionized Hydrogen (HII) — hot
molecular Hydrogen (H_2) — cold

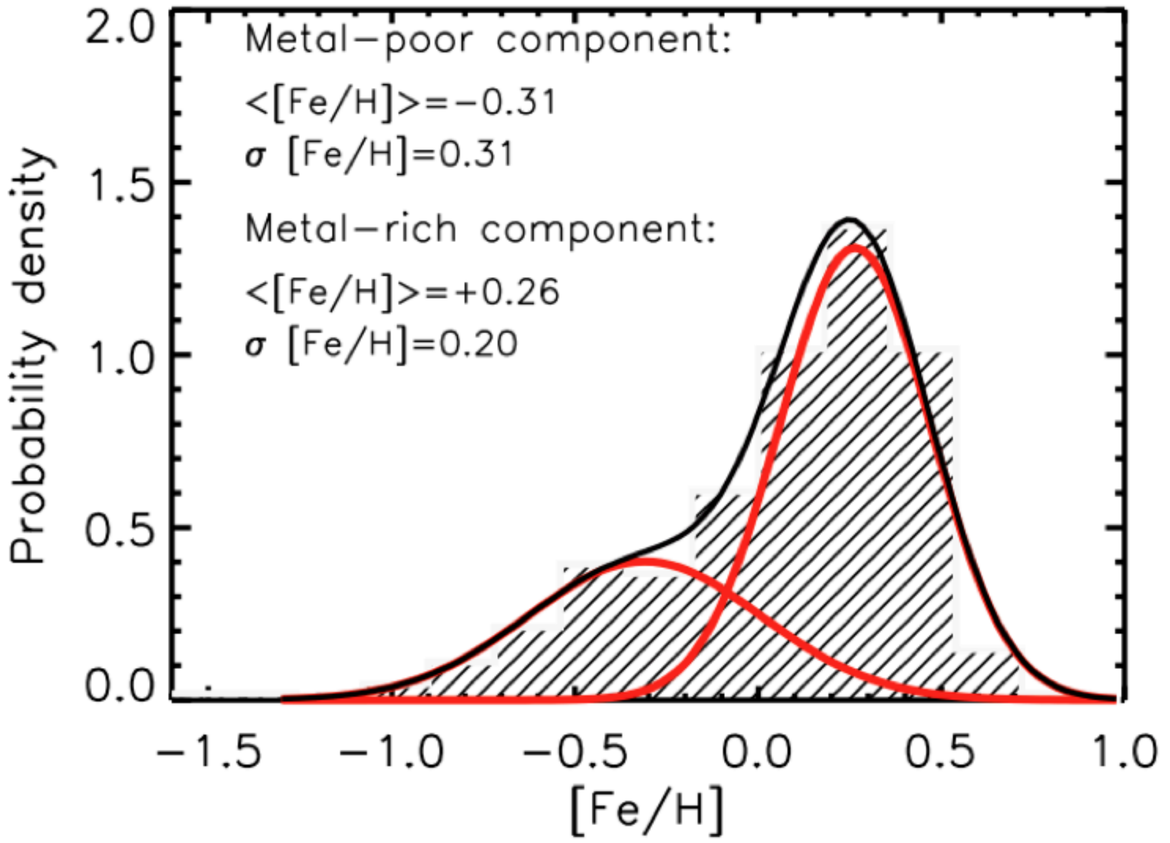




The Bulge

age = > 9 billion years
mass ~ 10^{10} solar masses

hard to really study due to dust…



metallicities: -1 < [Fe/H] < +0.5

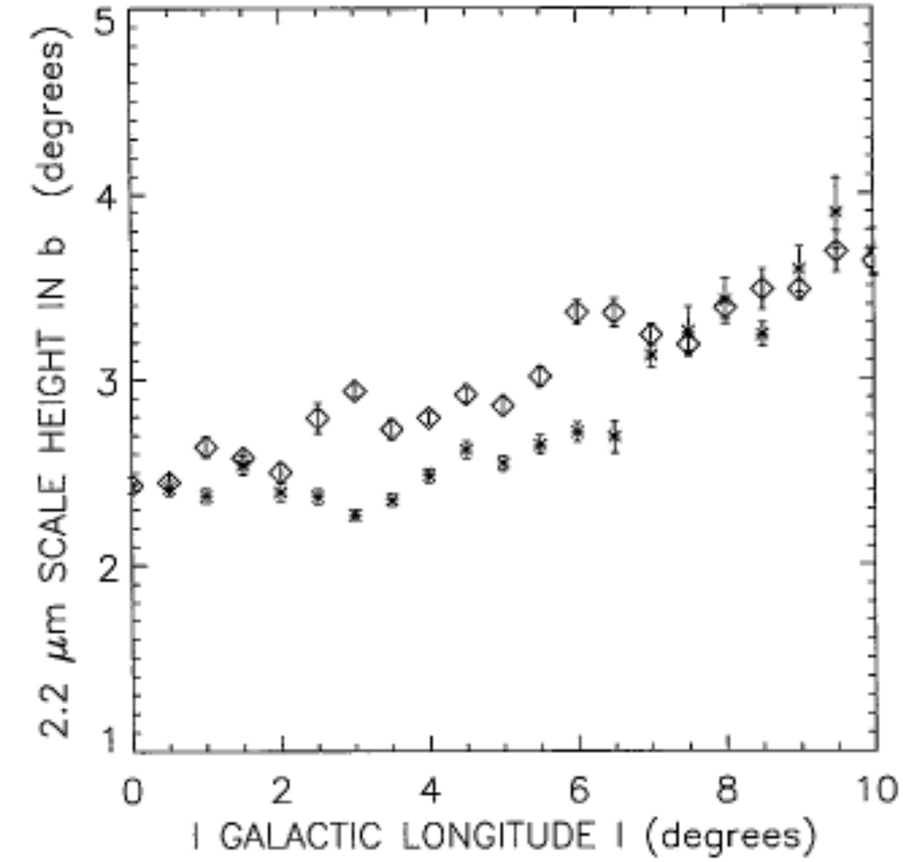
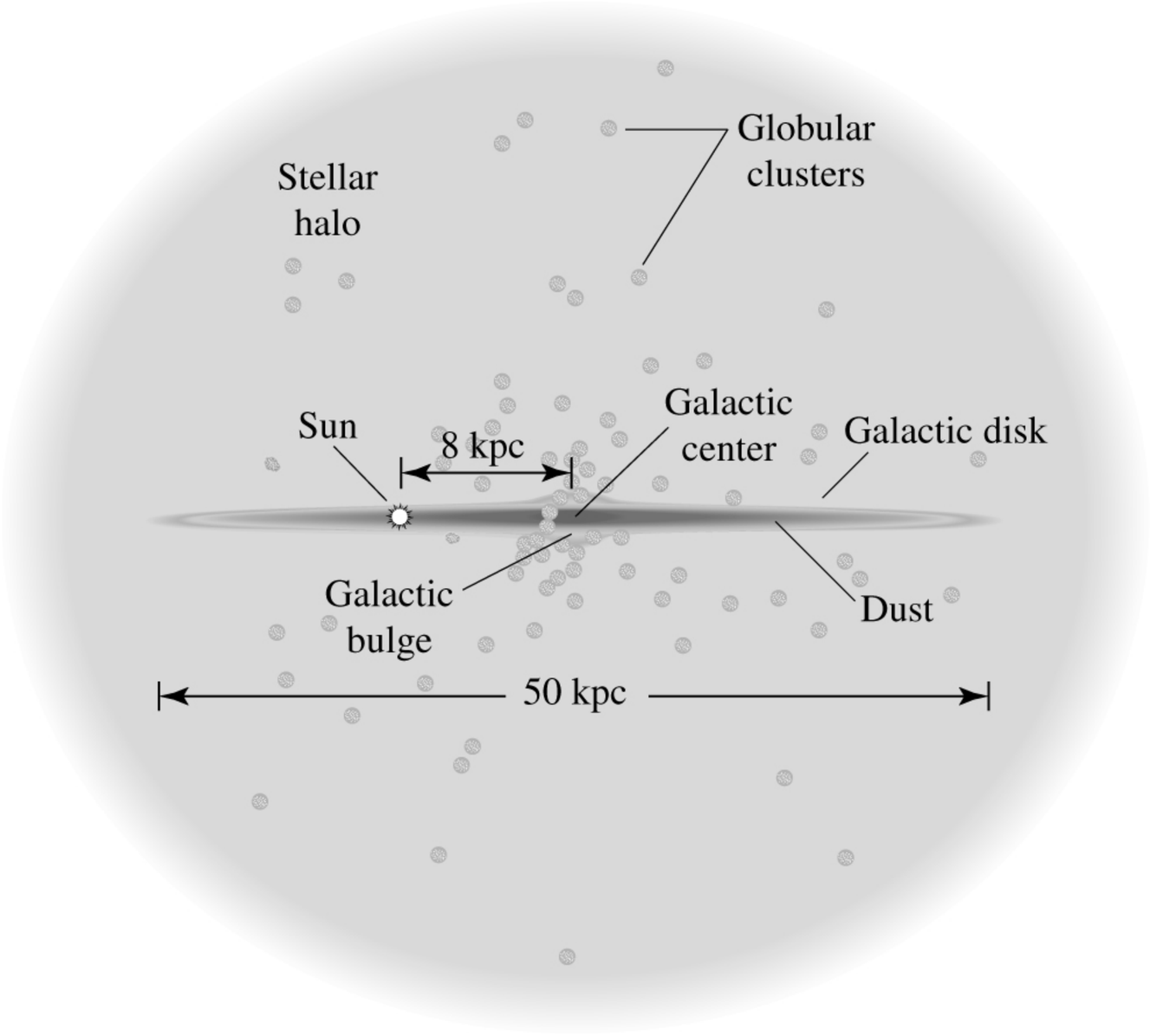


FIG. 2.—2.2 μm angular scale heights at fixed longitude. Scale heights for $l < 0°$ are represented by asterisks, whereas diamonds are for scale heights at positive Galactic longitudes. The error bars represent 1 σ errors on the computed scale height.

shape probably an elongated bar



Stellar Halo

globular clusters & “field” stars

GCs ages: 9-13 Gyr
metallicities: two populations
young, metal-rich; old, MP
distribution: two populations

field stars: also very metal-poor
total mass = 10^8 - 10^9 M_{sun}

$$n(r) = n_0 r^{-3.5}$$

n_0 ~ 0.2% thin disk maximum