

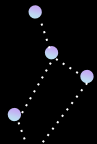
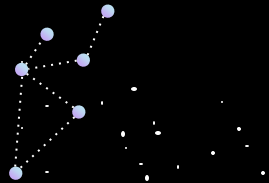
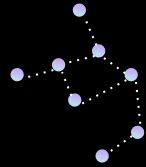
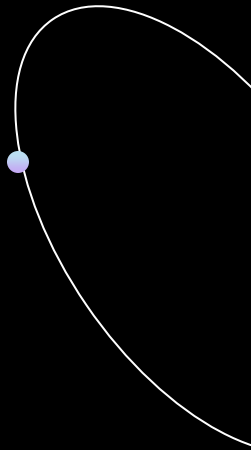
# LOCATION, LOCATION, LOCATION:

Exoplanets as a function of  
host star and Galactic zipcode

Jessie Christiansen – Caltech/IPAC

# How Could a Host Star Influence its Planets?

- Amount of material in the protoplanetary disk → stellar mass
- Composition → stellar chemical abundance profile
- Insolation → natal environment, stellar mass, age
- Dynamics → natal environment, stellar multiplicity



# STELLAR PROPERTIES WE'RE DISCUSSING

01

STELLAR MASS

02

STELLAR AGE  
(ROGERS)

03

STELLAR  
METALLICITY

04

GALACTIC  
ZIPCODE

# STELLAR PROPERTIES WE'RE *NOT* DISCUSSING

05

STELLAR ACTIVITY  
(ROETTENBACHER, LEE,  
Newton, Davenport)

06

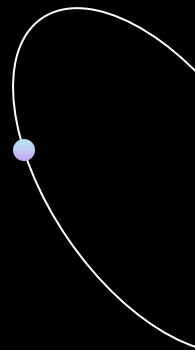
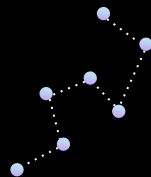
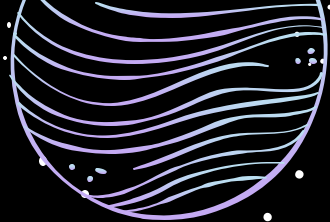
STELLAR  
MULTIPLICITY  
(Krauss)

07

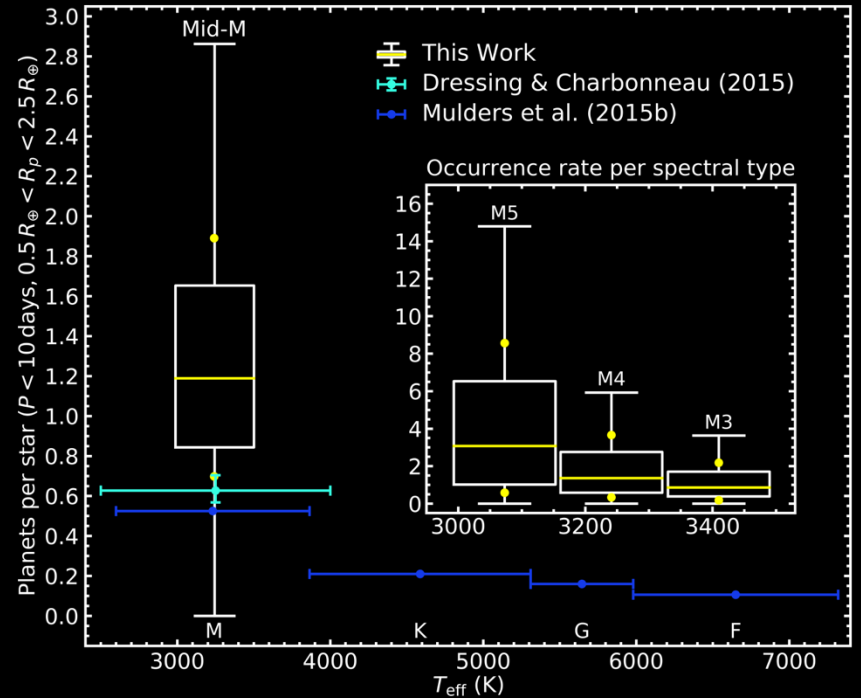
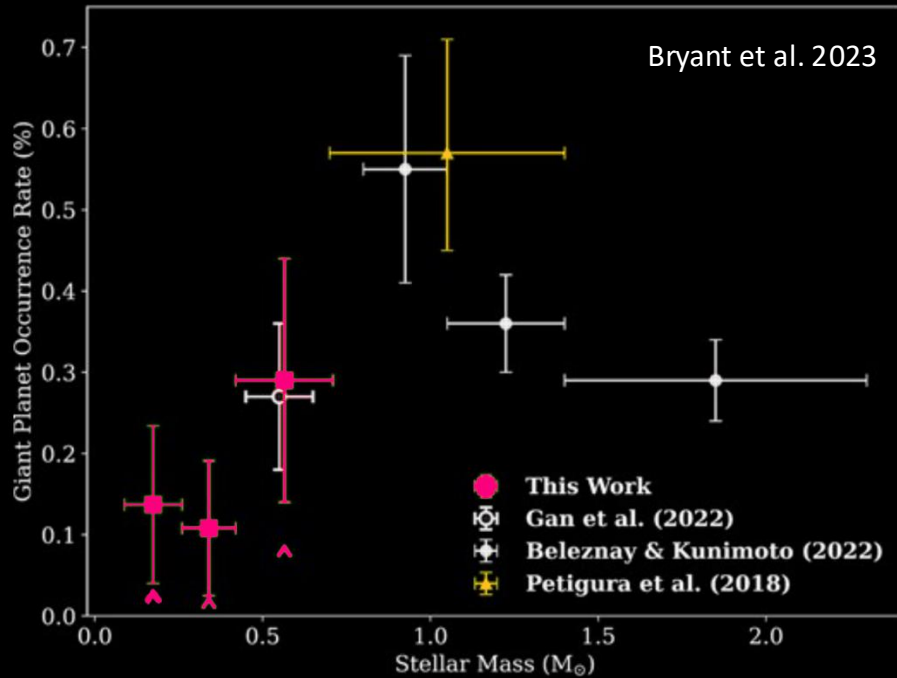
STELLAR VARIABILITY  
(FULTON, BEDELL)

08

STELLAR  
INCLINATIONS  
(RICE)



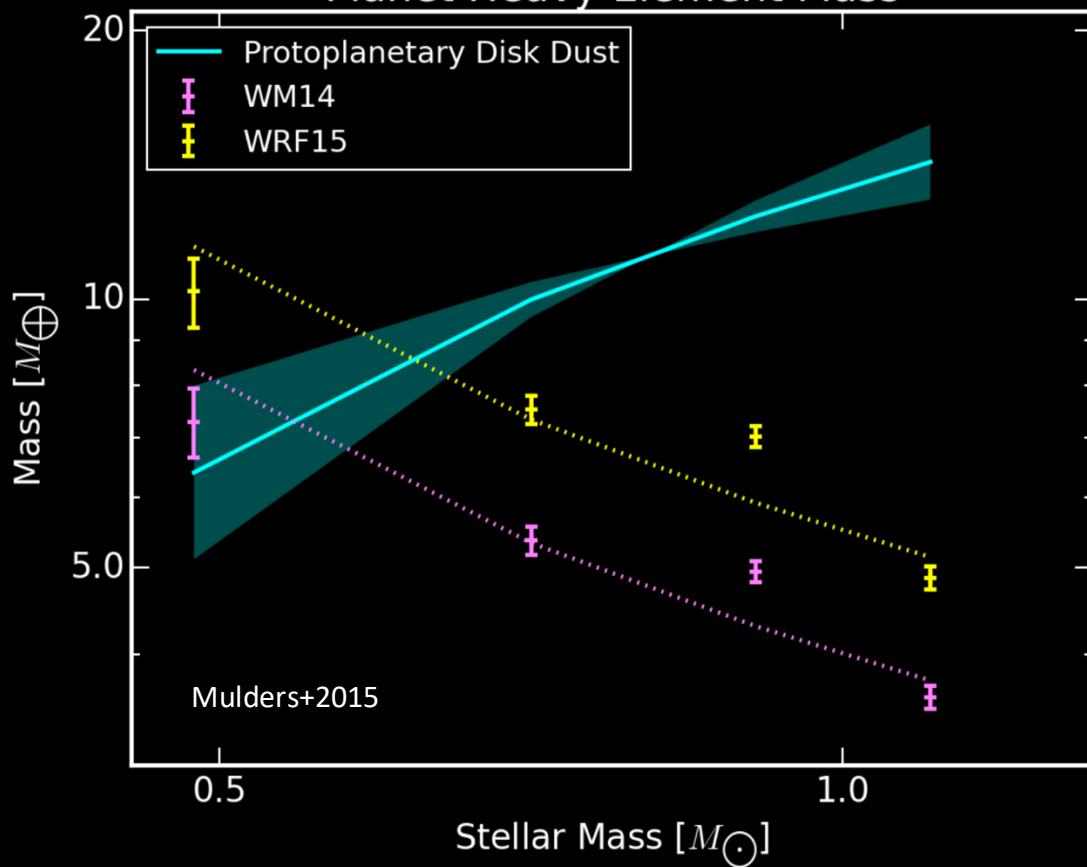
# STELLAR MASS



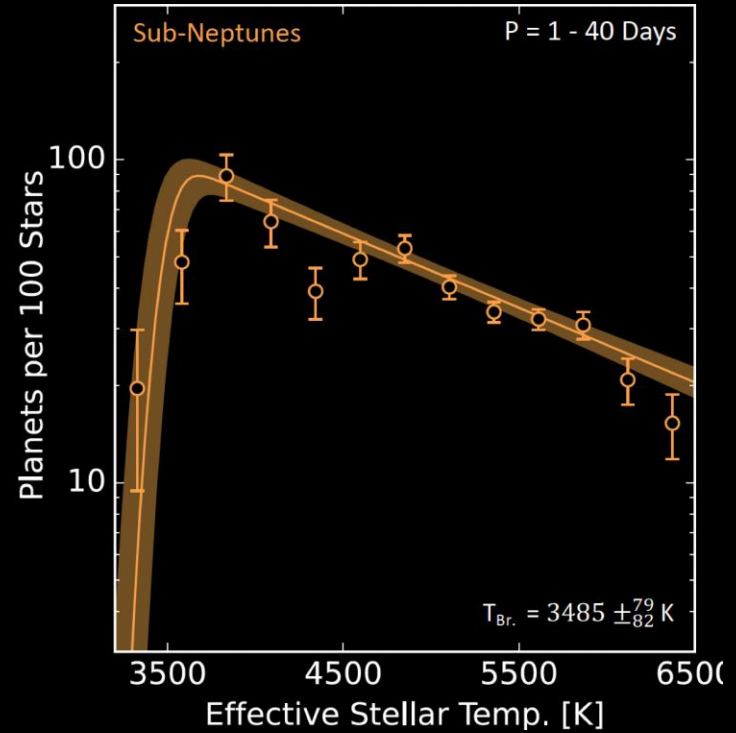
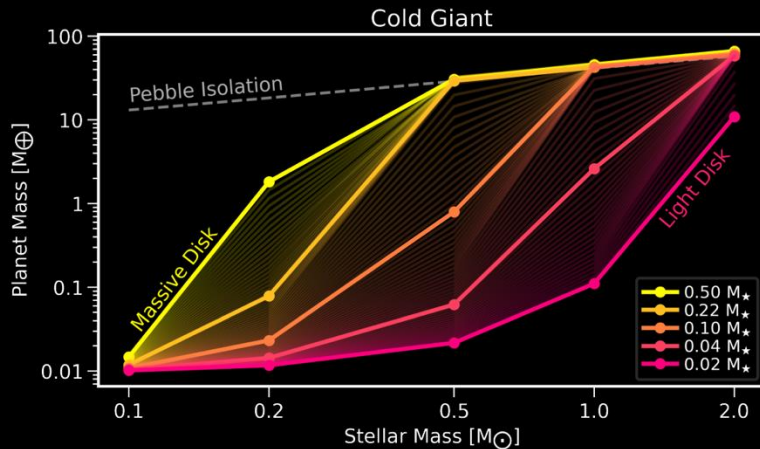
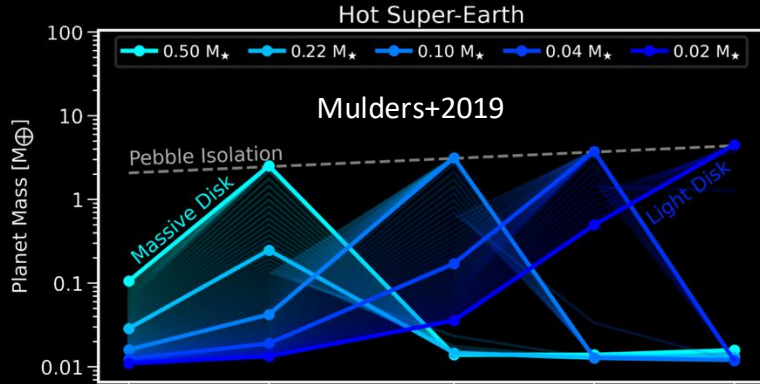
Hardegree-Ullman+2019 (see also Howard+2012, and RV survey results, e.g. Mayor+2011, Sabotta+2021)

# STELLAR MASS

## Planet Heavy-Element Mass

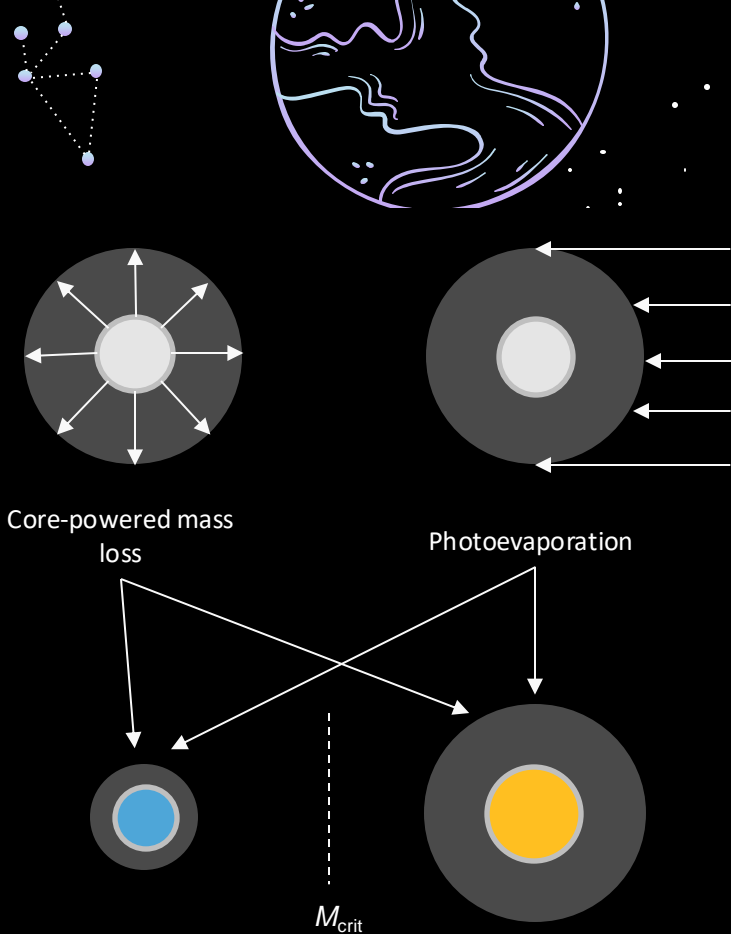
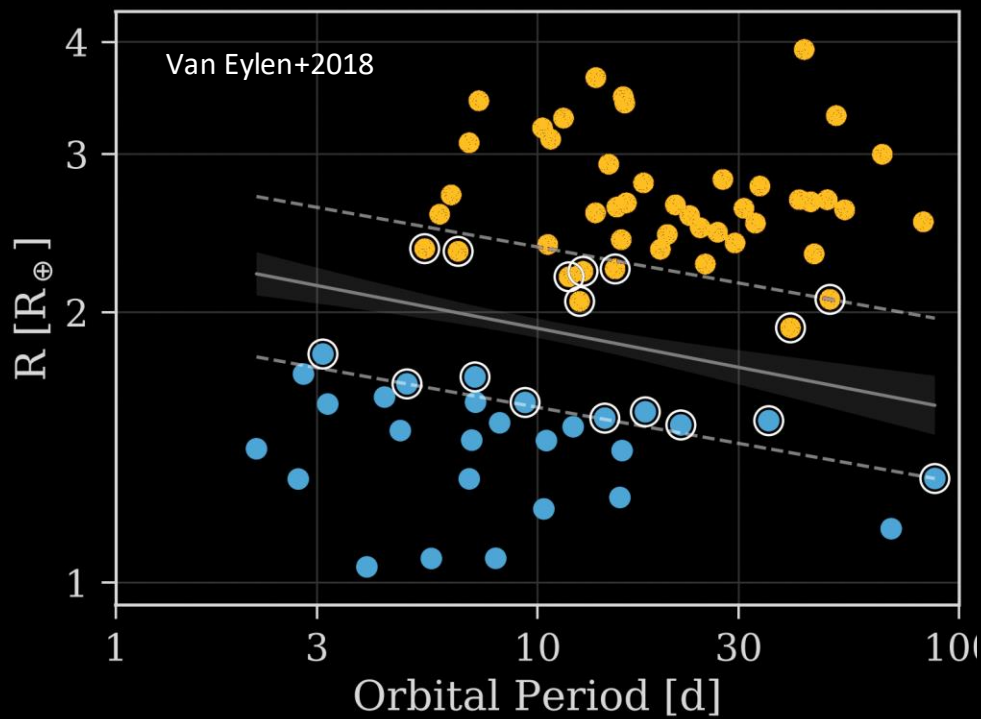


# STELLAR MASS



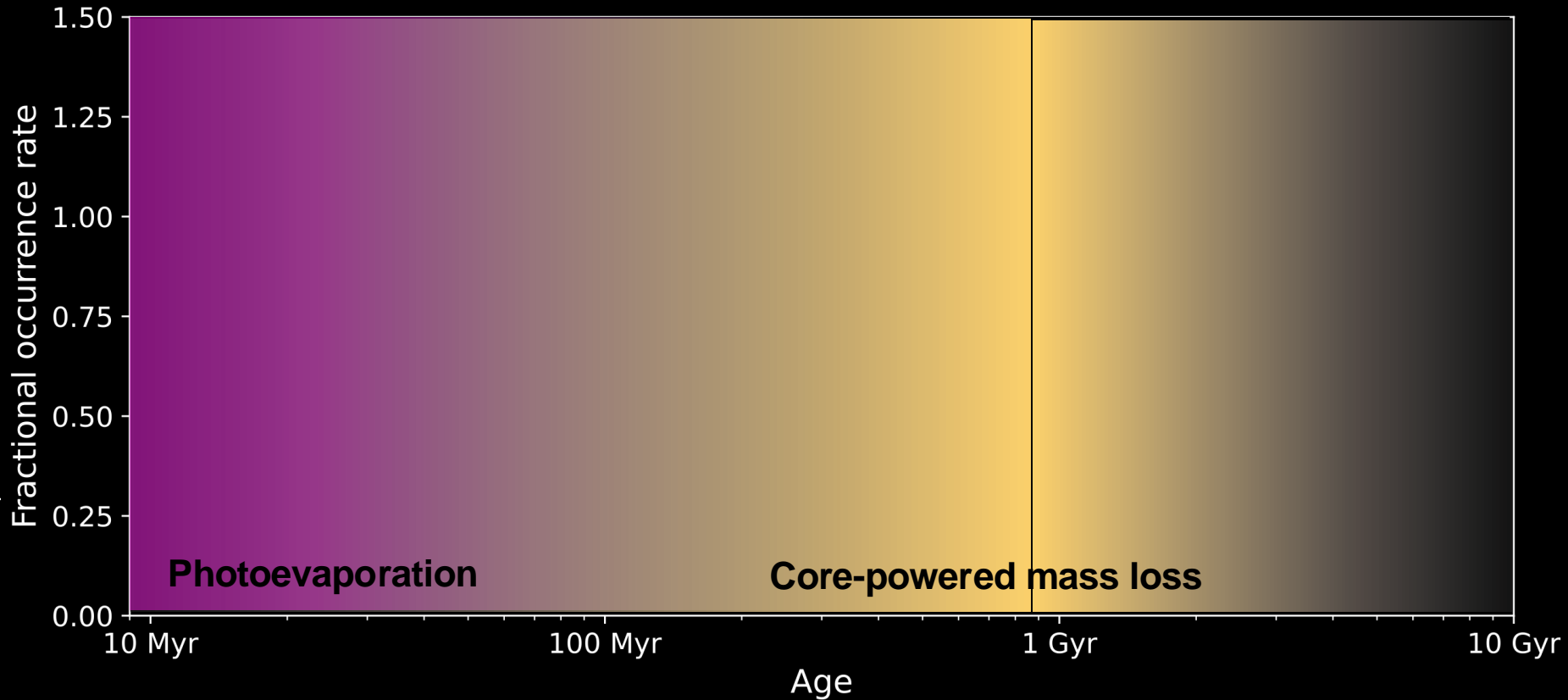
Hardegree-Ullman, in prep

# STELLAR AGE

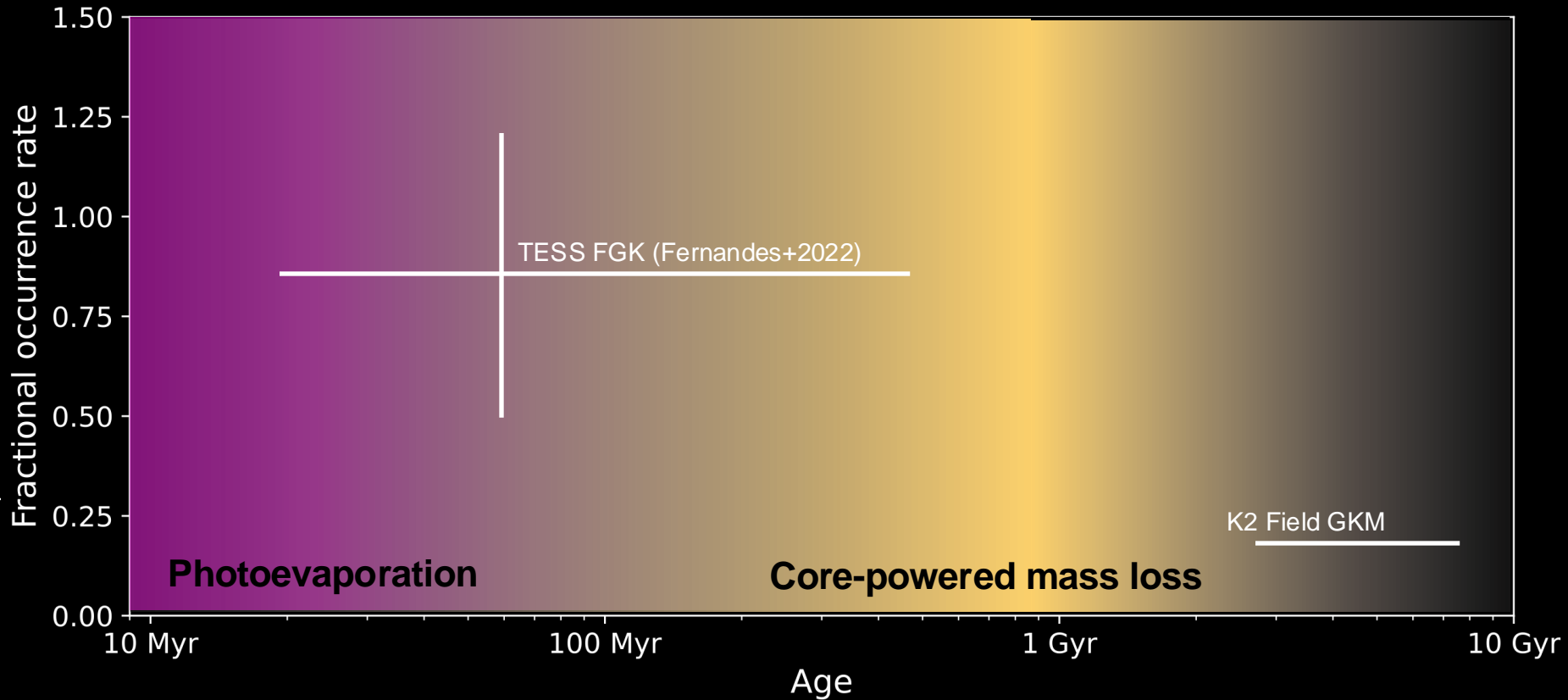




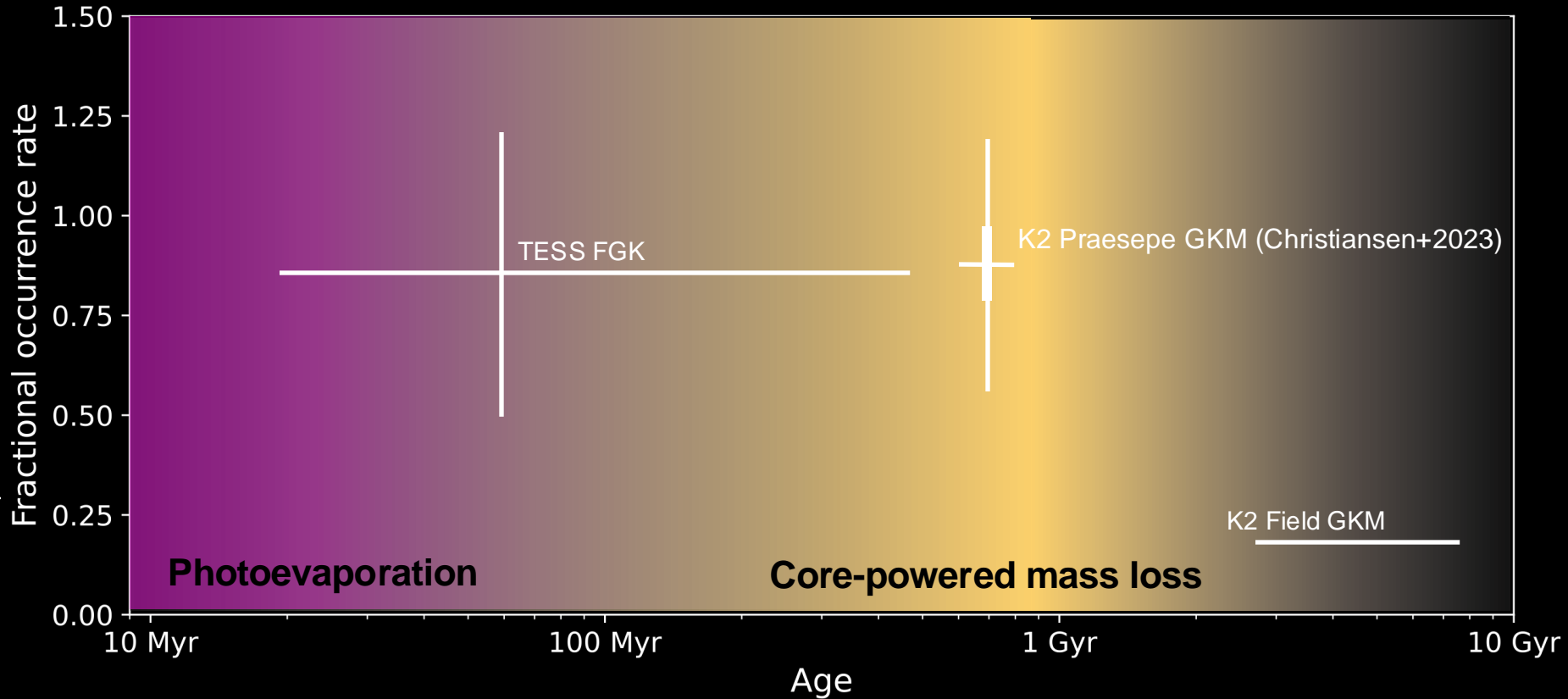
# STELLAR AGE



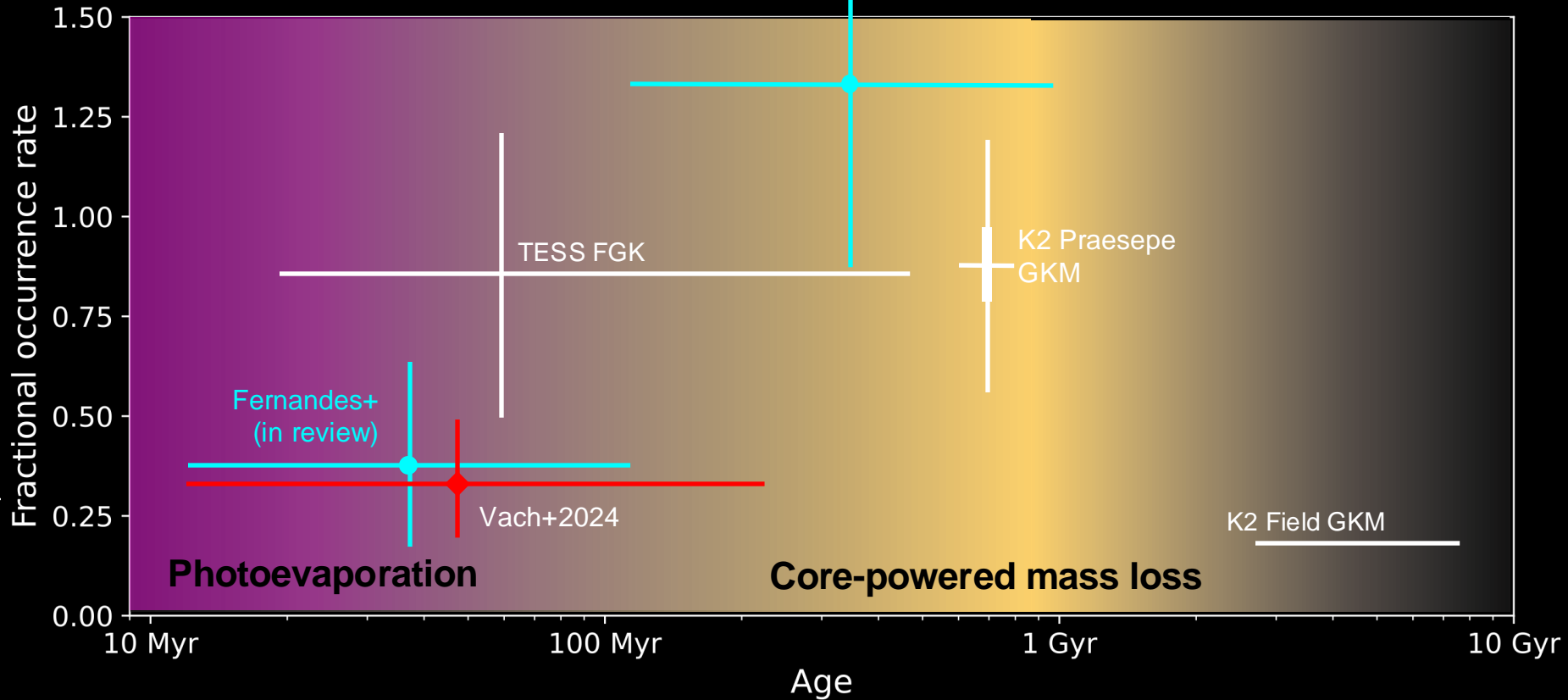
# STELLAR AGE



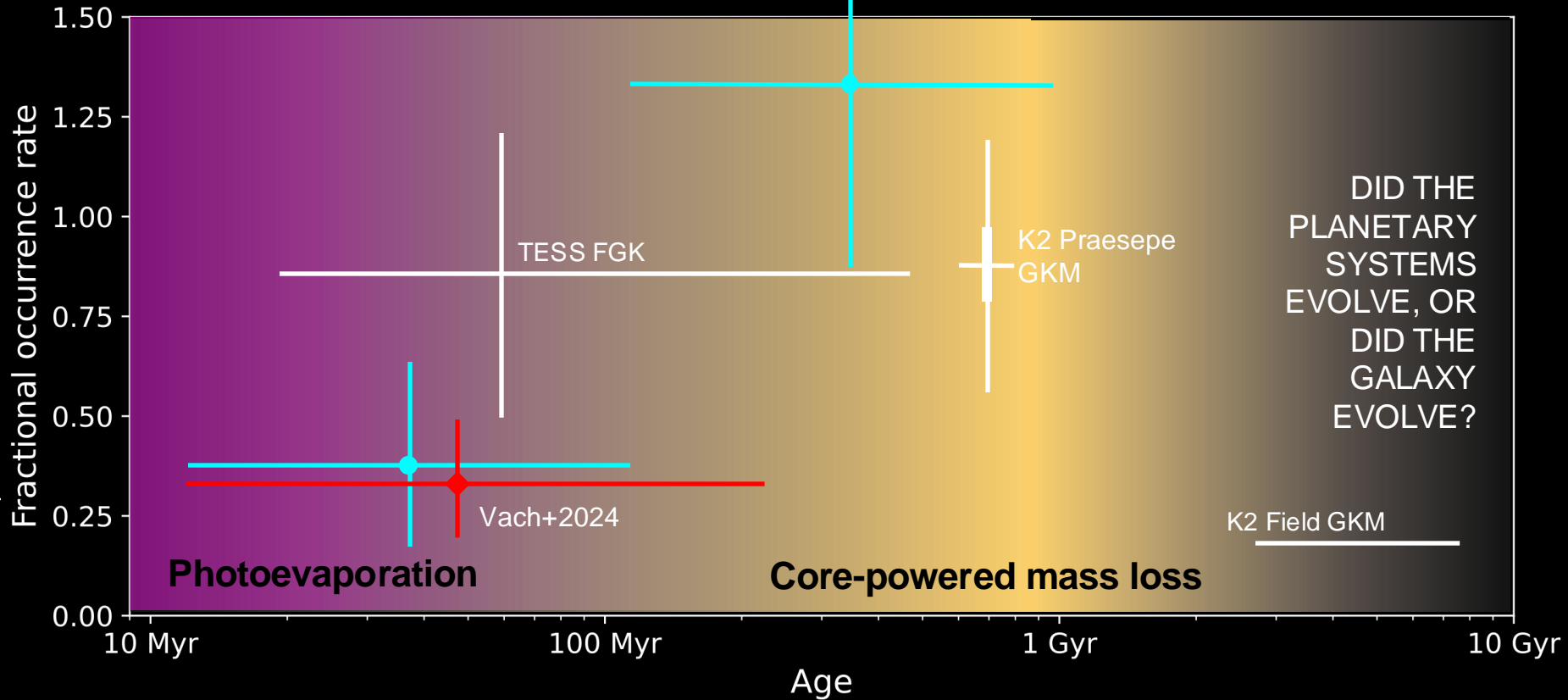
# STELLAR AGE



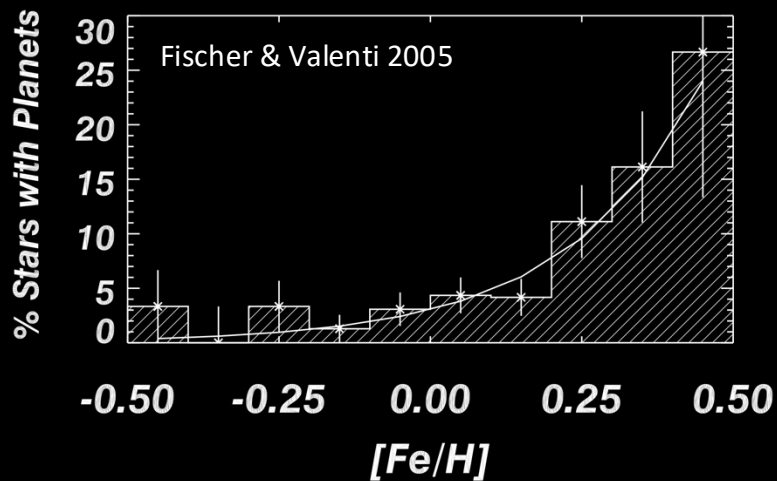
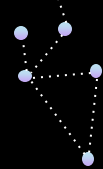
# STELLAR AGE



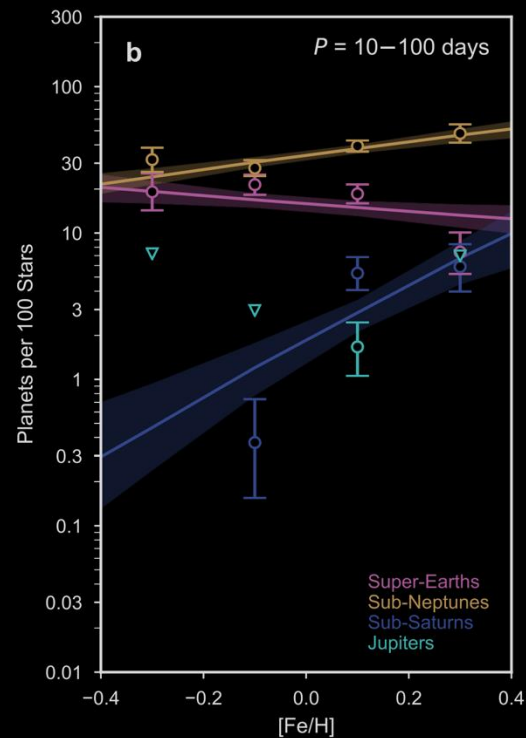
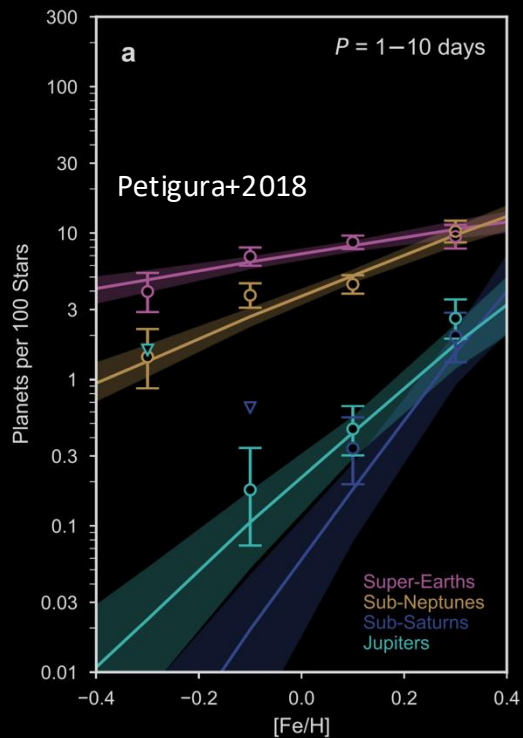
# STELLAR AGE



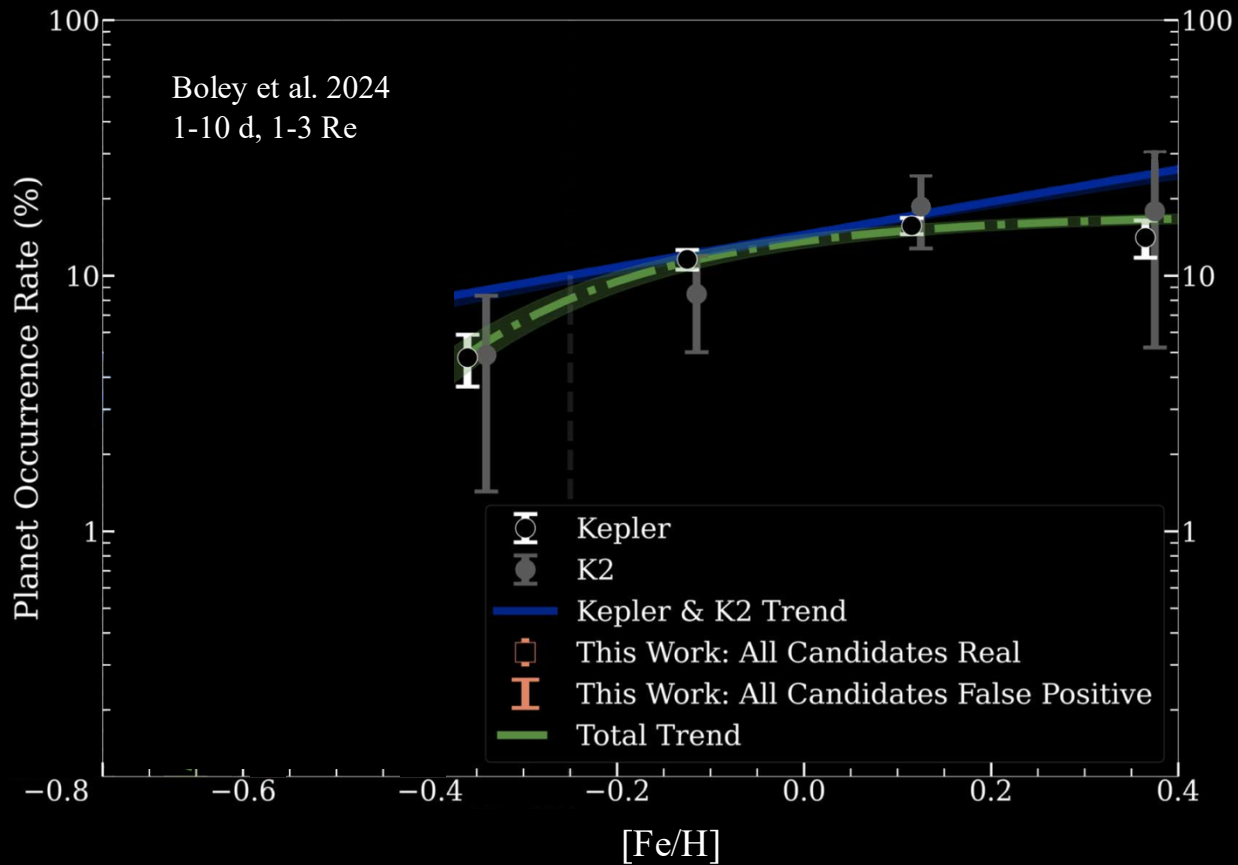
# STELLAR METALLICITY



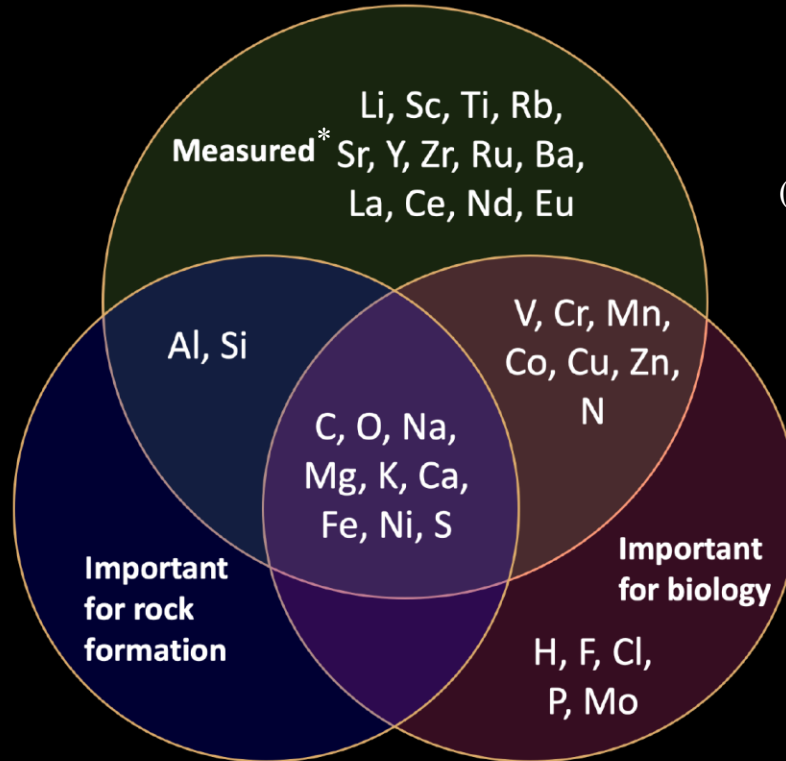
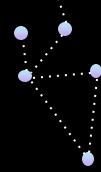
(See also Gonzalez 1997)



# STELLAR METALLICITY



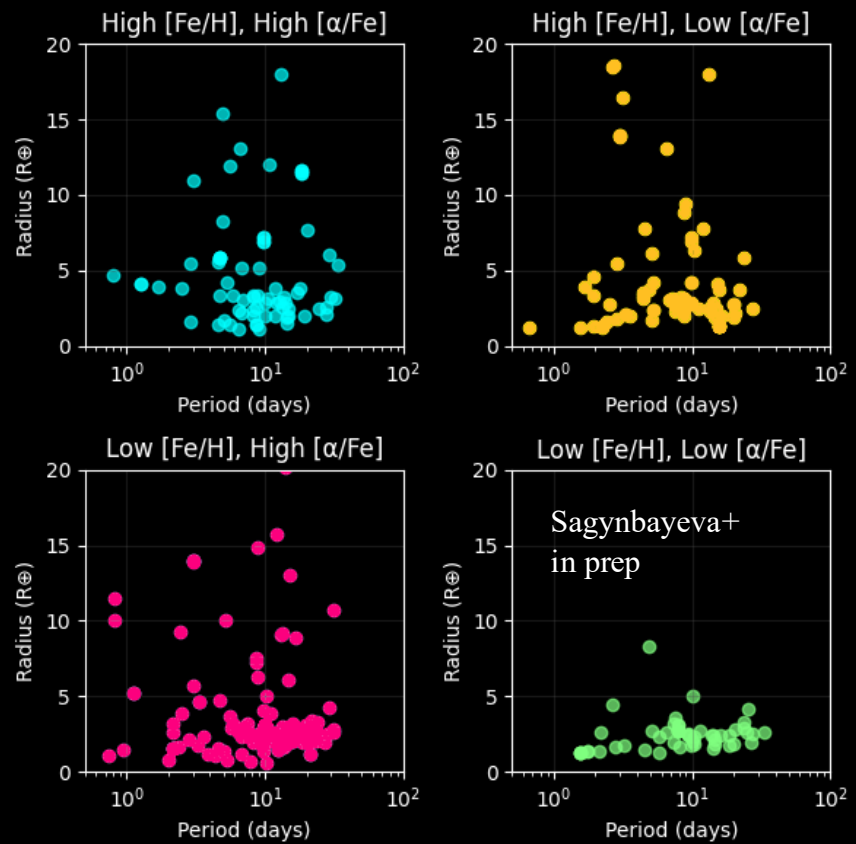
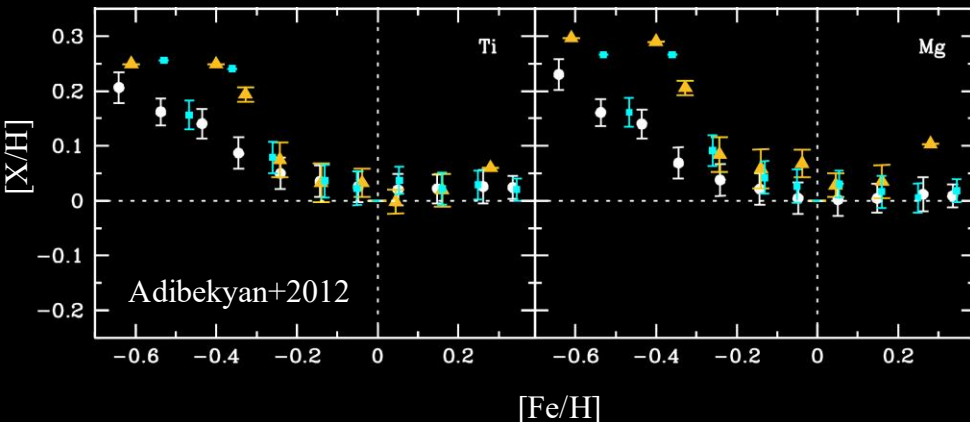
# STELLAR METALLICITY (And BEYOND!)



(\*APOGEE, GALAH, LAMOST)

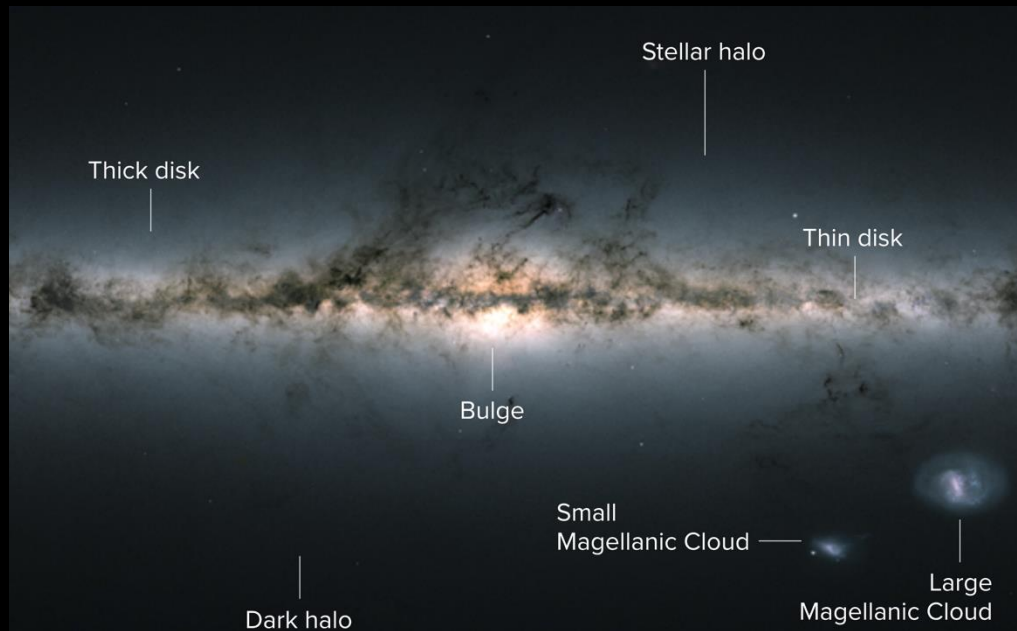
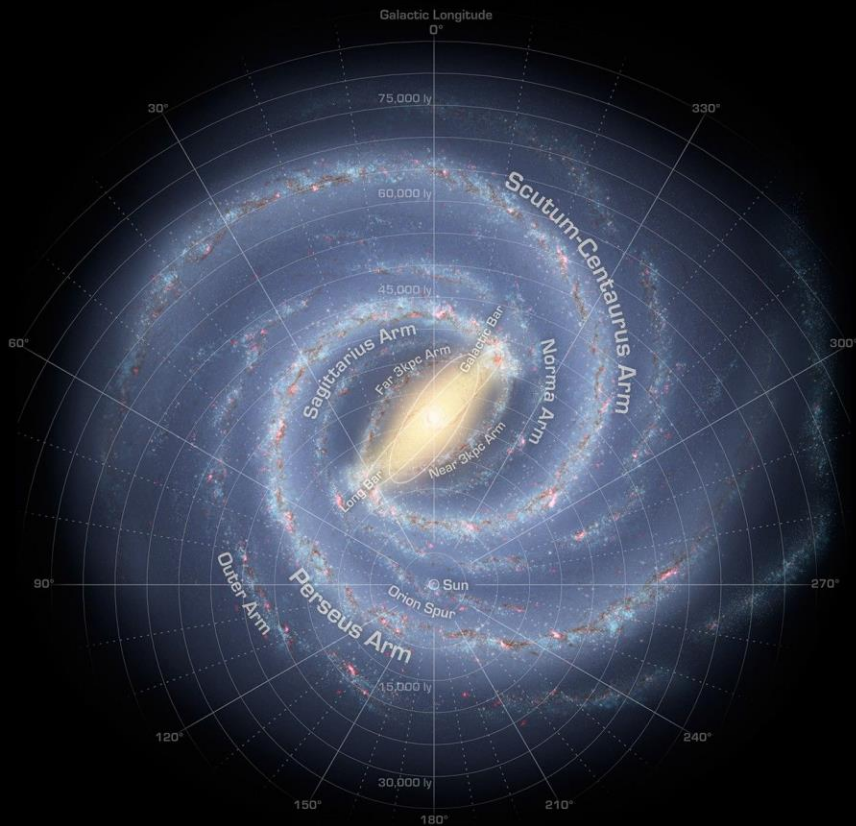
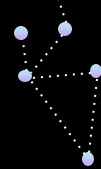


# STELLAR METALLICITY (And BEYOND!)

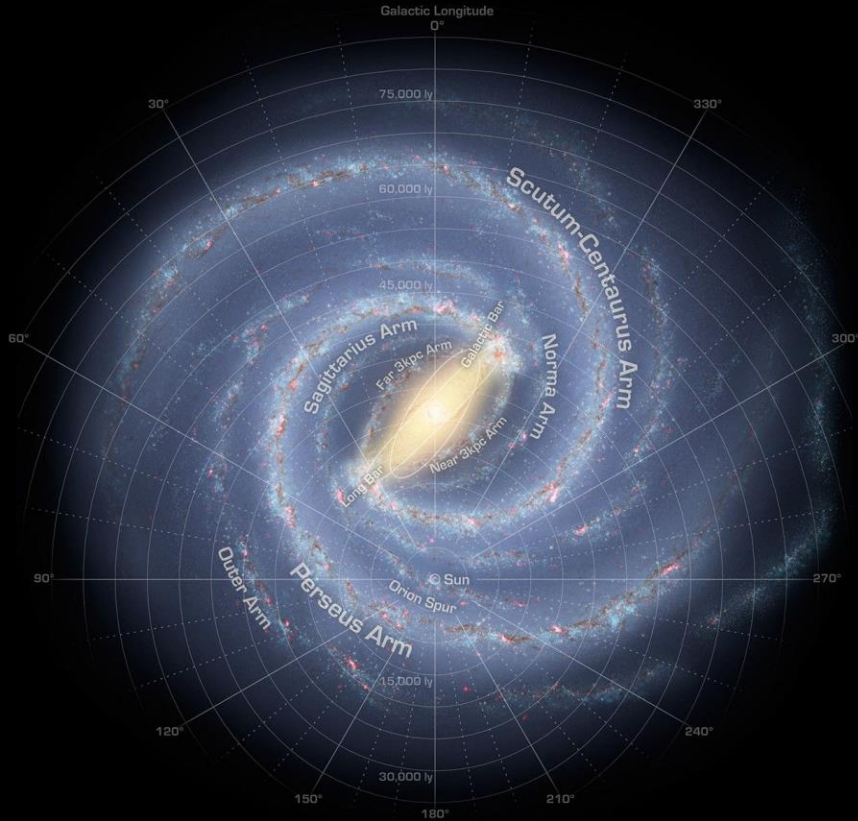


Excited to push these trends further with  
TESS!

# GALACTIC ZIPCODE



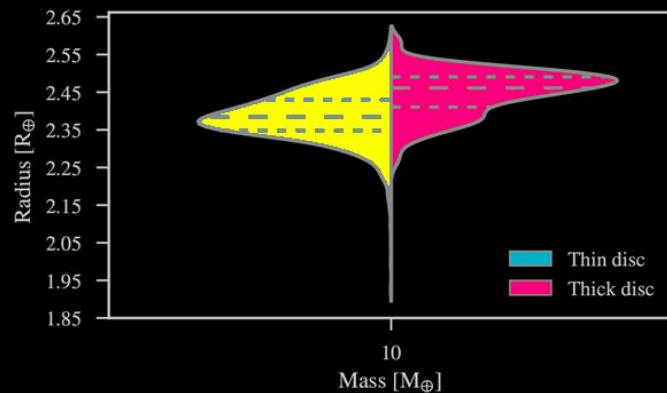
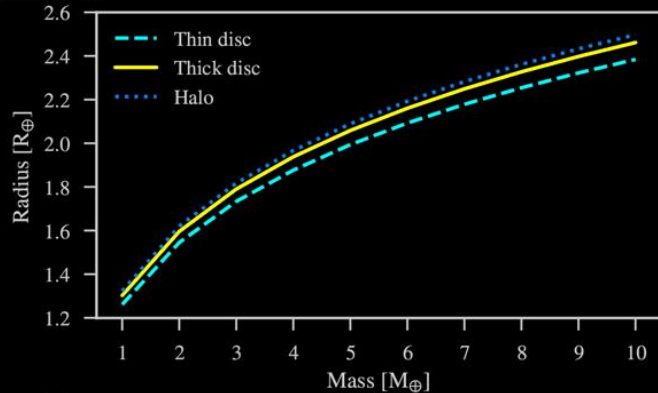
# Galactic Zipcode



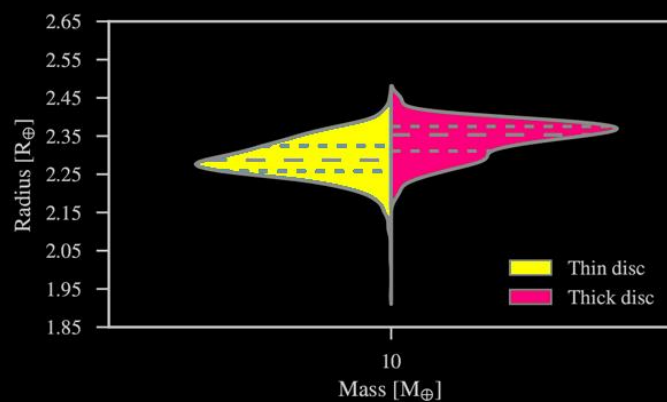
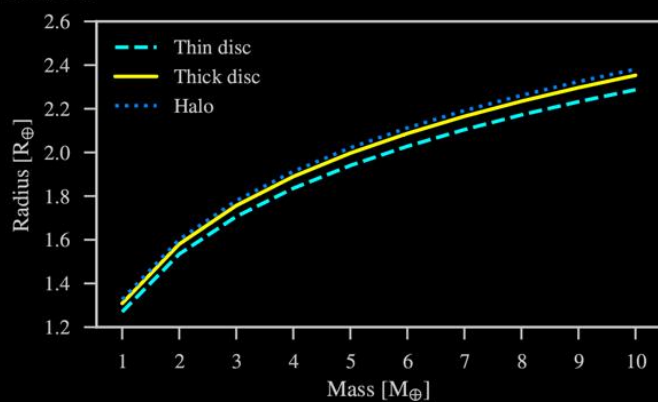
- Age (increases with increasing scale height)
- Metallicity (decreases with increasing scale height)
- Dynamical history (older stars born in more clustered environments)
- Ionization (starburst history, etc)
- (Is there a Galactic Habitable Zone?)

# Galactic Zipcode

Model A

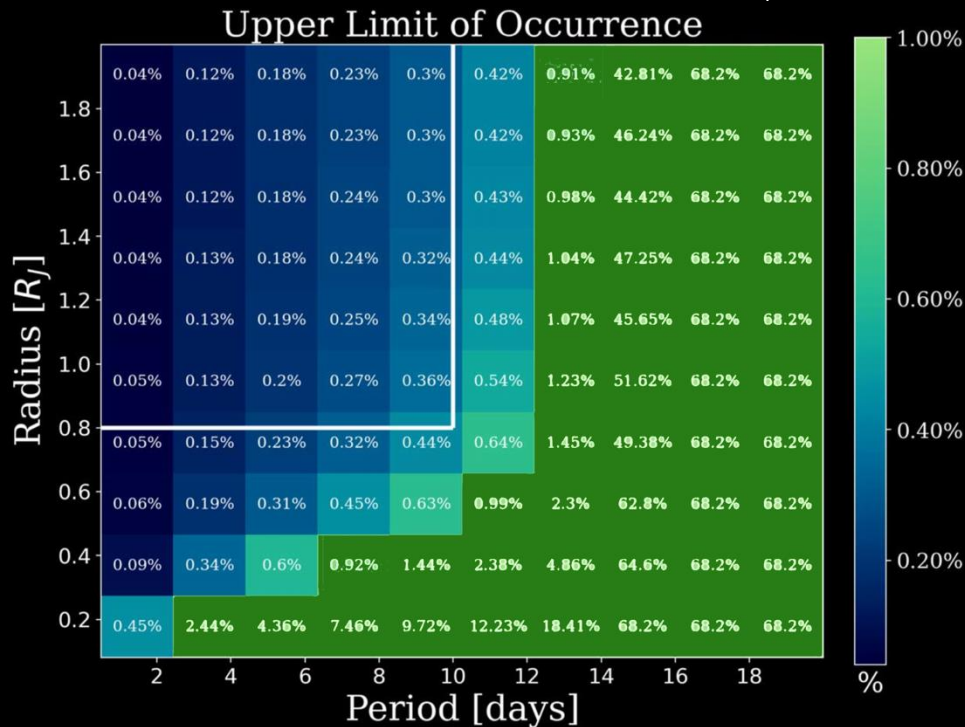
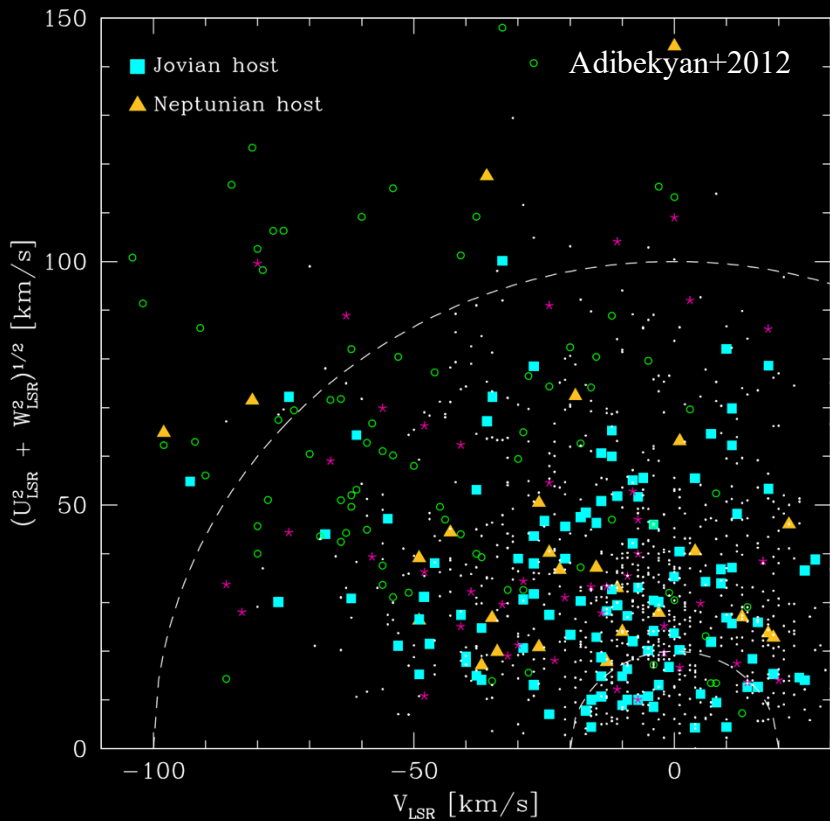


Model B

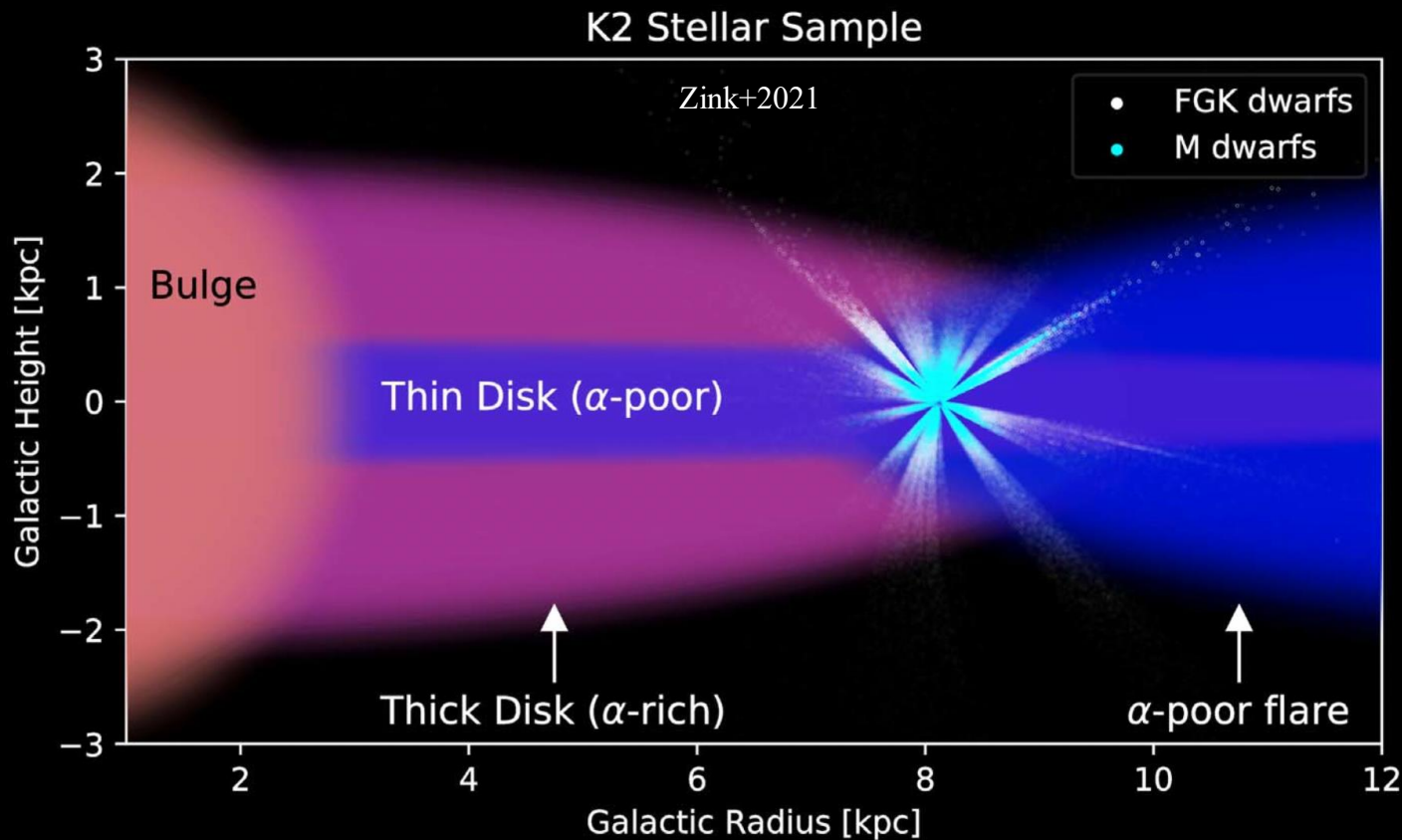


Michel+2020

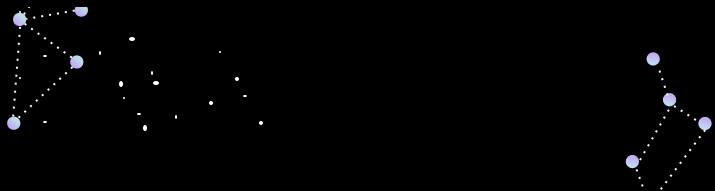
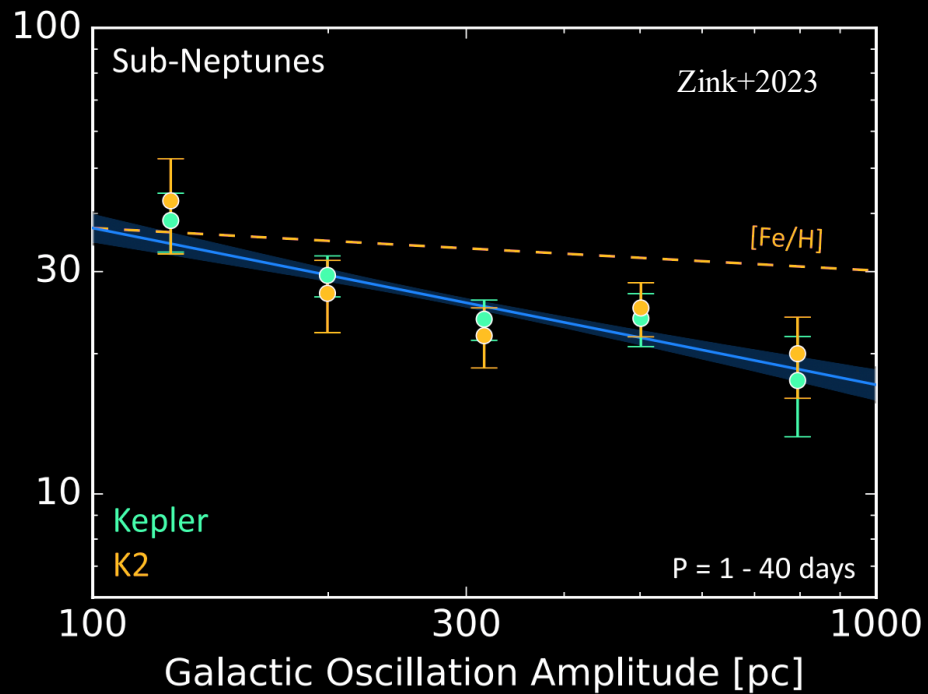
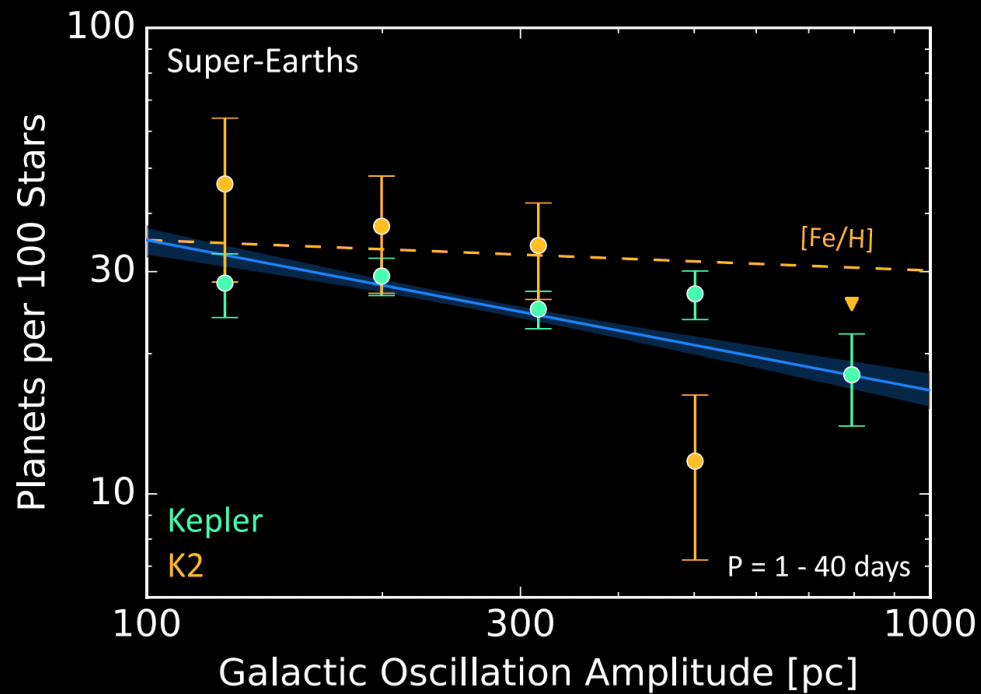
# Galactic Zipcode



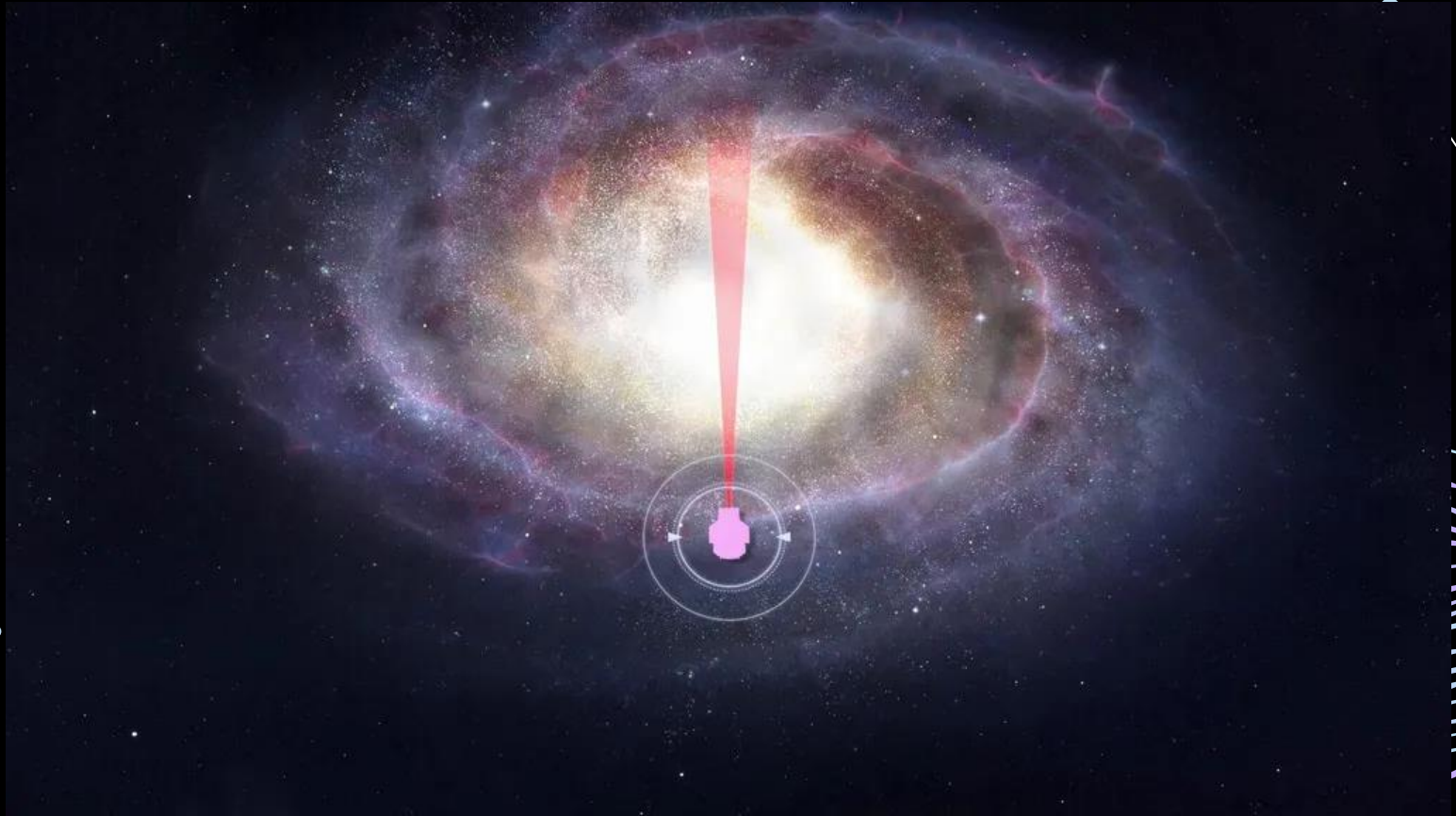
# Galactic Zipcode



# Galactic Zipcode



# Galactic Zipcode





# Summary

- Know thy star-planet correlation, know thy physics
- Incidence of planets increases with:
  - Decreasing stellar mass (to a point!) → lower mass disks more efficient at making or keeping small planets
  - Age (until it decreases again!) → time-dependence of evolution (planetary OR stellar)
  - Metallicity (but not [just] iron!) → total mass of solid material may drive planet formation
  - Decreasing Galactic scale height → dynamical history of thick disk stars?