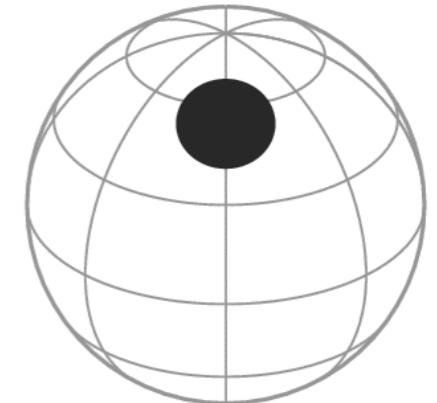


Rotating Stars from *Kepler* Observed with *Gaia* DR2



James R. A. Davenport

Collaborators: Kevin Covey, Ruth Angus, Marcel Agüeros,
David Kipping, Zoë Bell



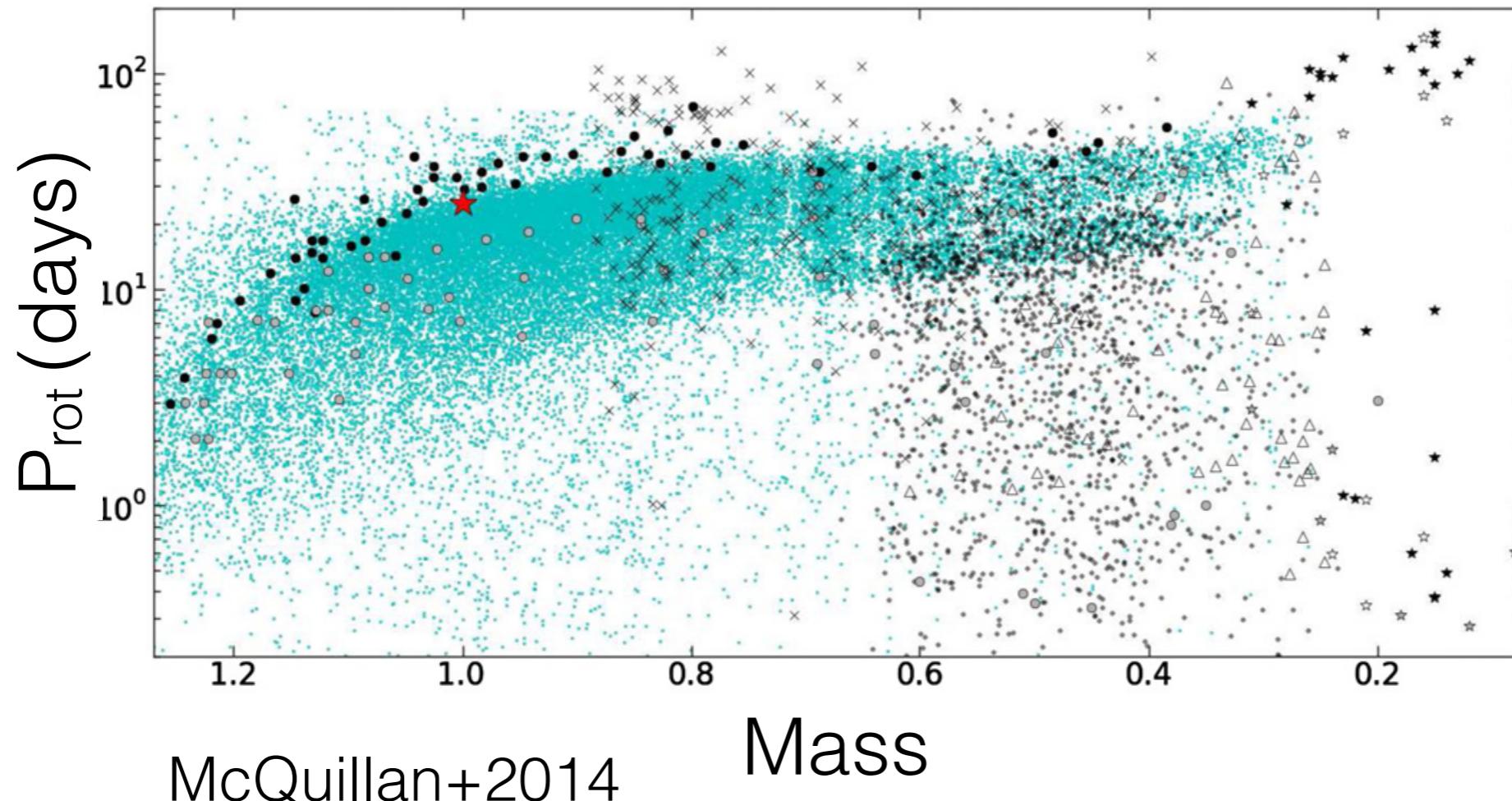
W

UNIVERSITY OF WASHINGTON

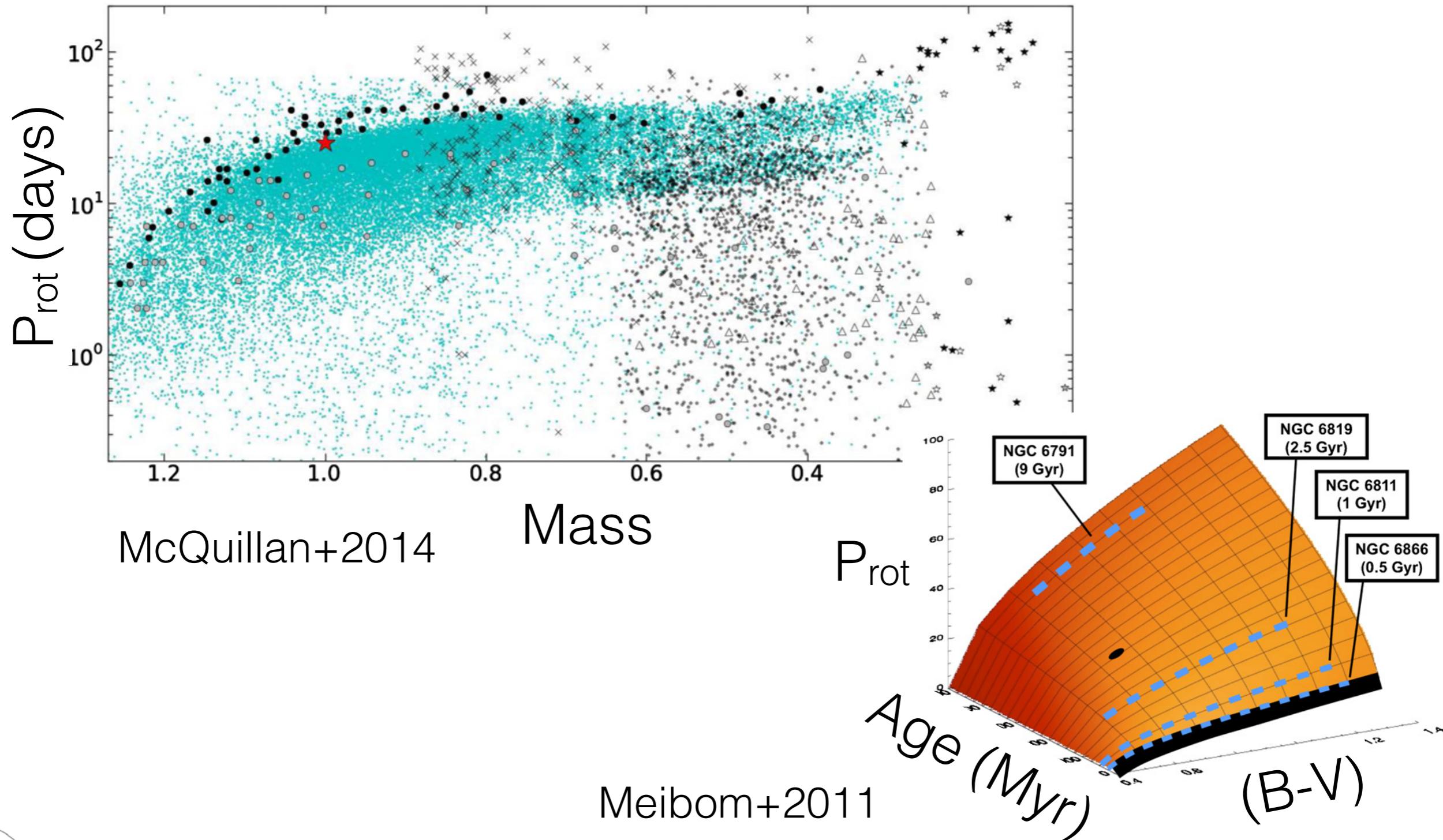


jradavenport

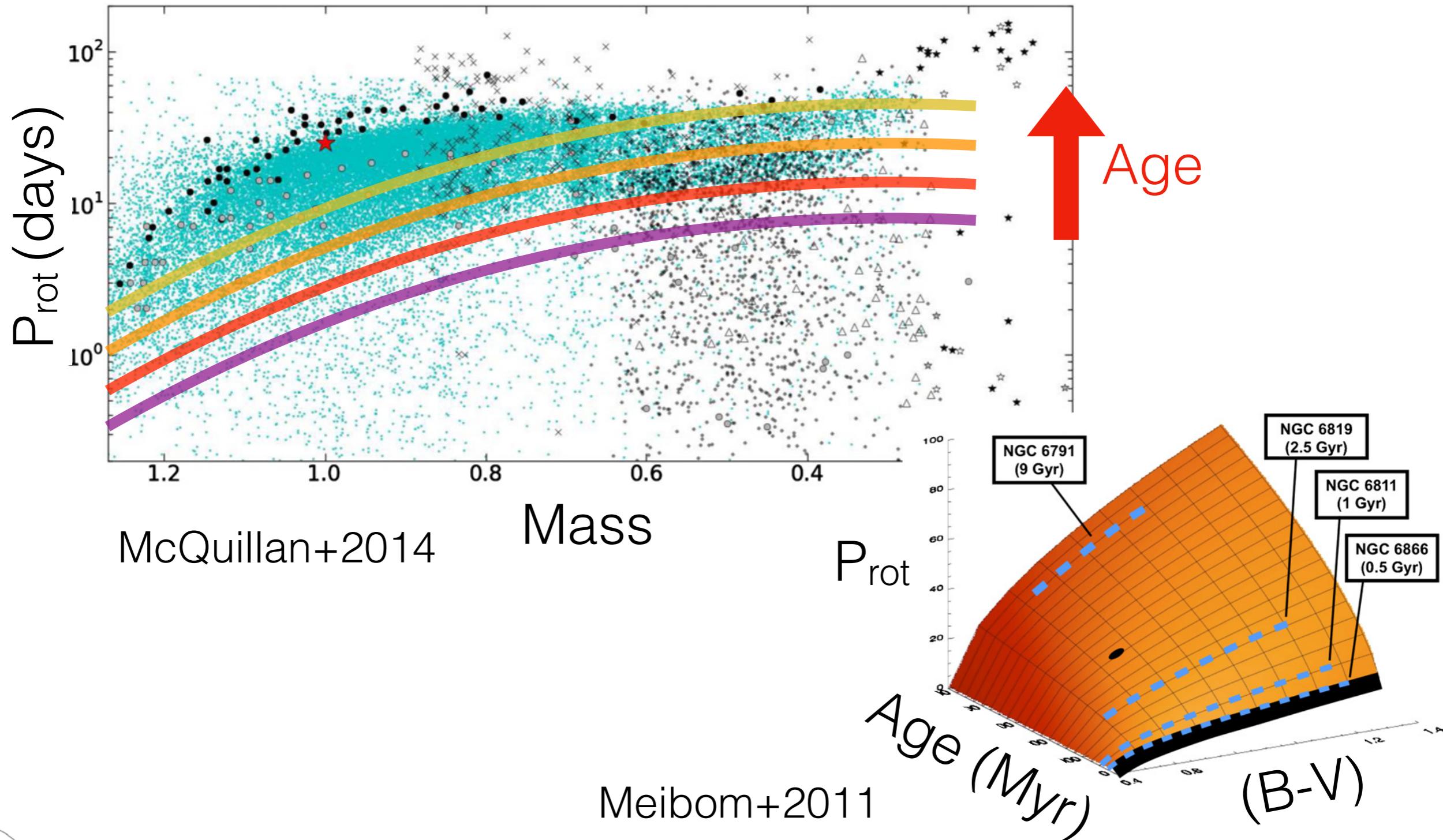
+34,000 Rotation Periods from Kepler



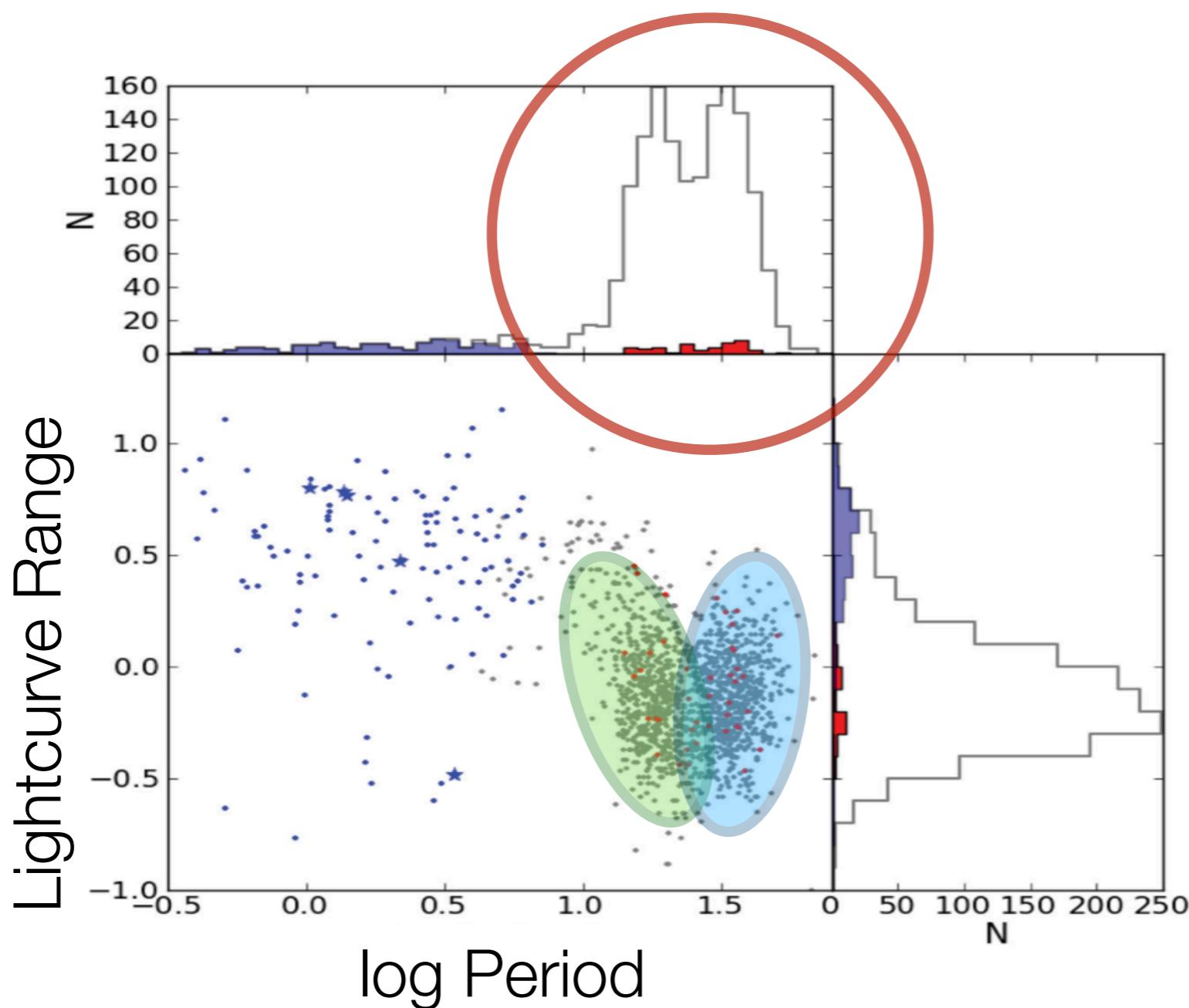
+34,000 Rotation Periods from Kepler



+34,000 Rotation Periods from Kepler

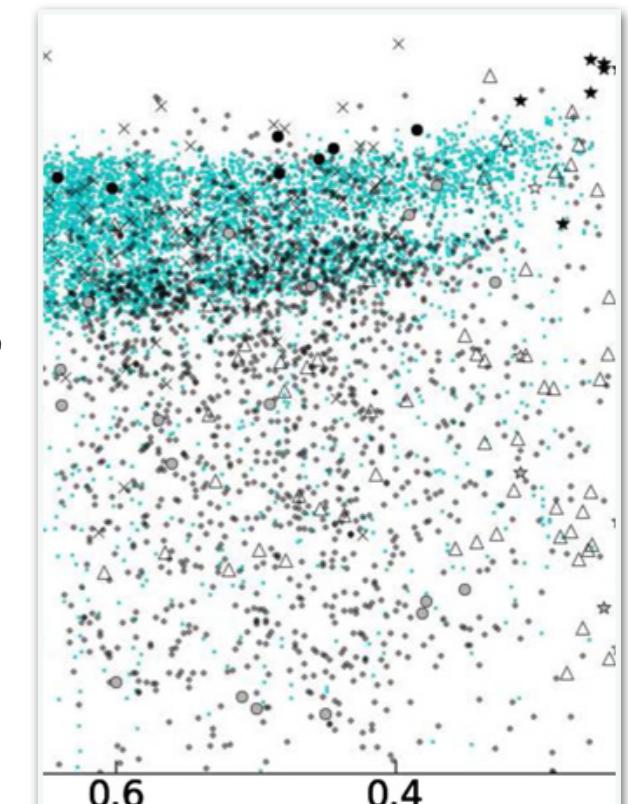


A Period **Bimodality**



First seen in M dwarfs

P_{rot} (days)

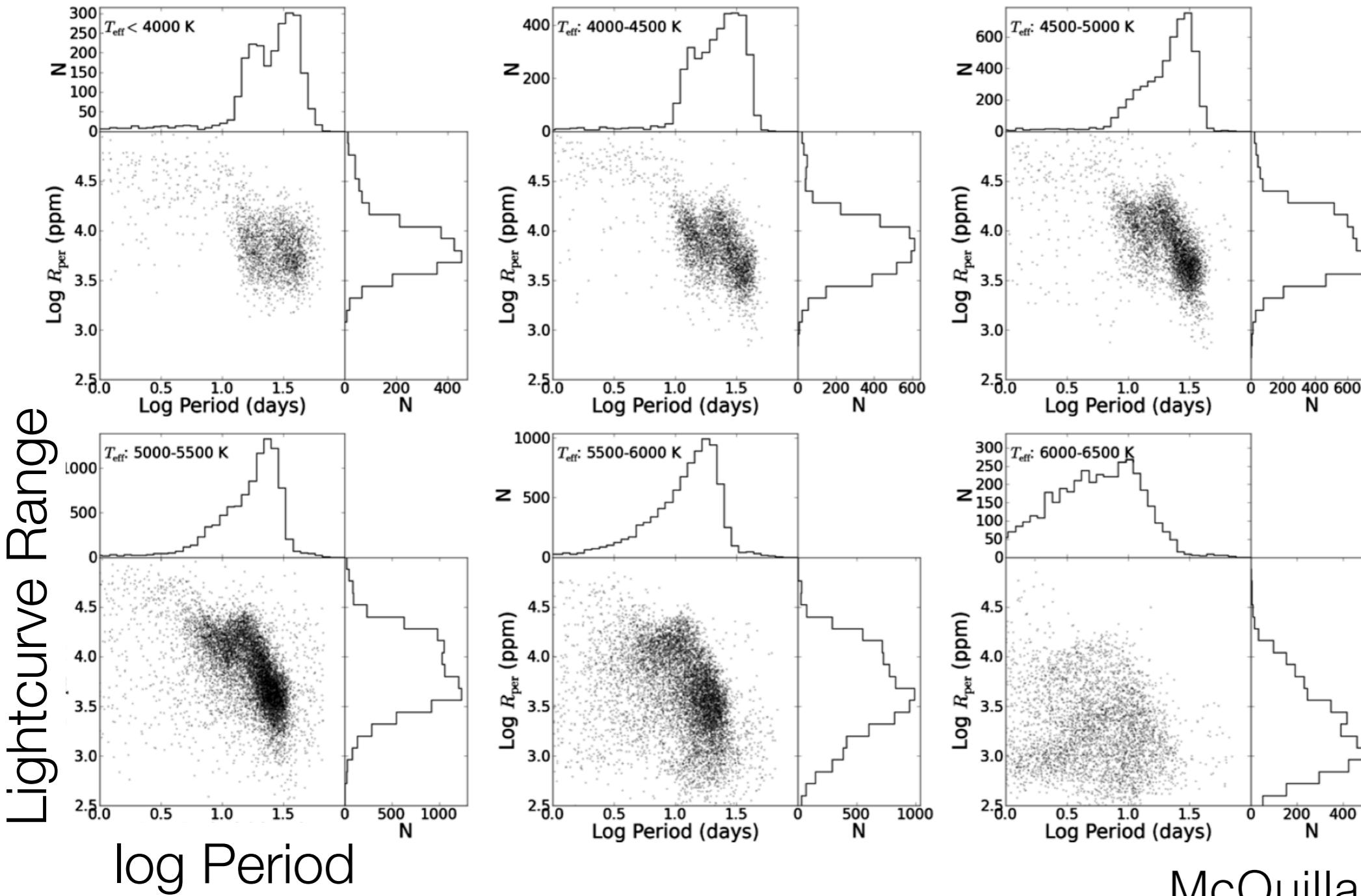


Mass

McQuillan+2013



A Period Bimodality *The Mystery Deepens!*



McQuillan+2014

K/M: yes

F/G: no?!



A Period **Bimodality**

2 Possible Explanations:

- 1) Variation in Star Formation History**
- 2) New transition phase in stellar spin-down**

How to test these?

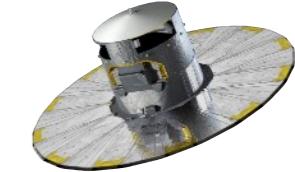
- Do F/G stars show bimodality?**
- Is bimodality *everywhere*?**
- Connect to other age indicators?**



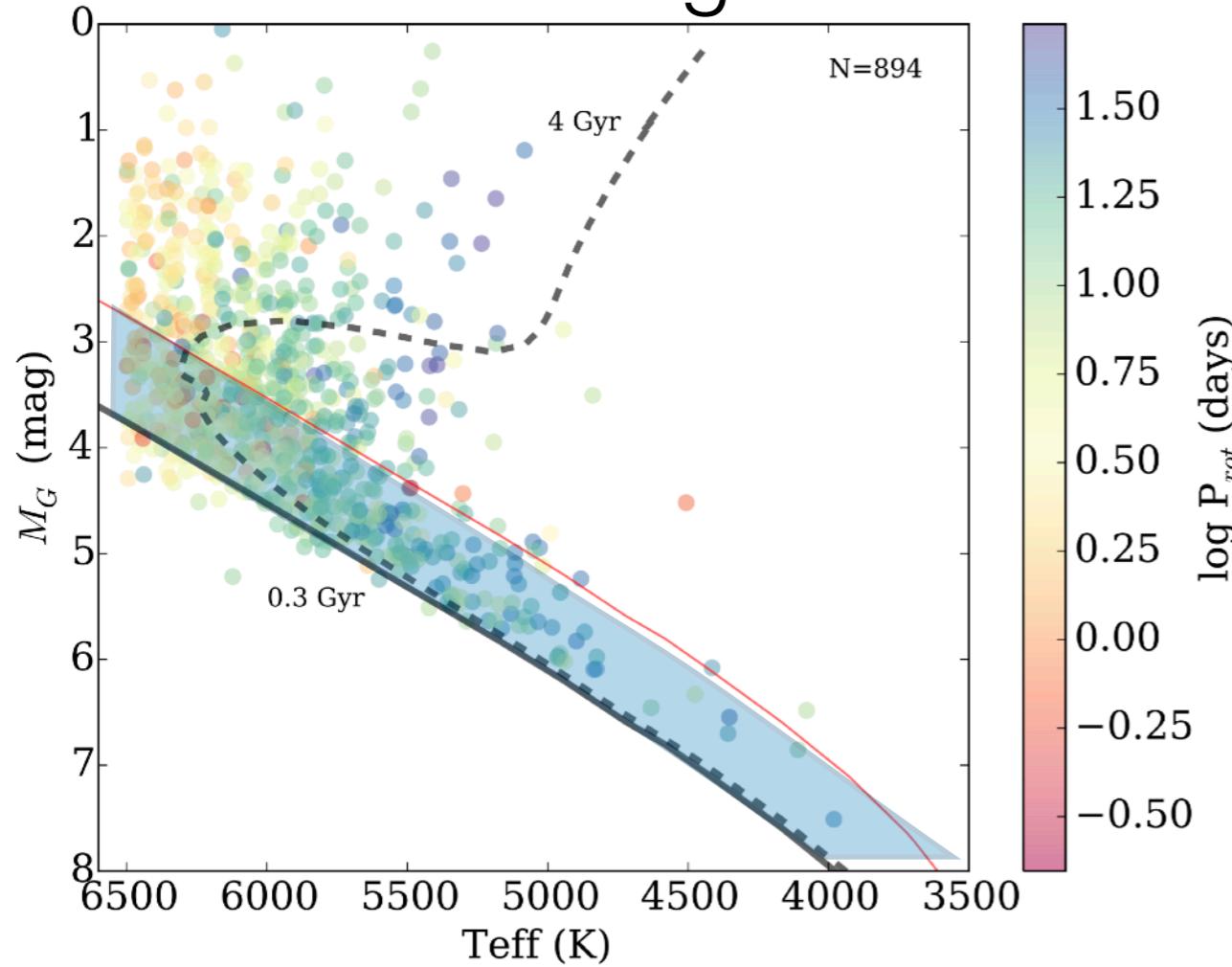
Period Bimodality **IS** found in G dwarfs!



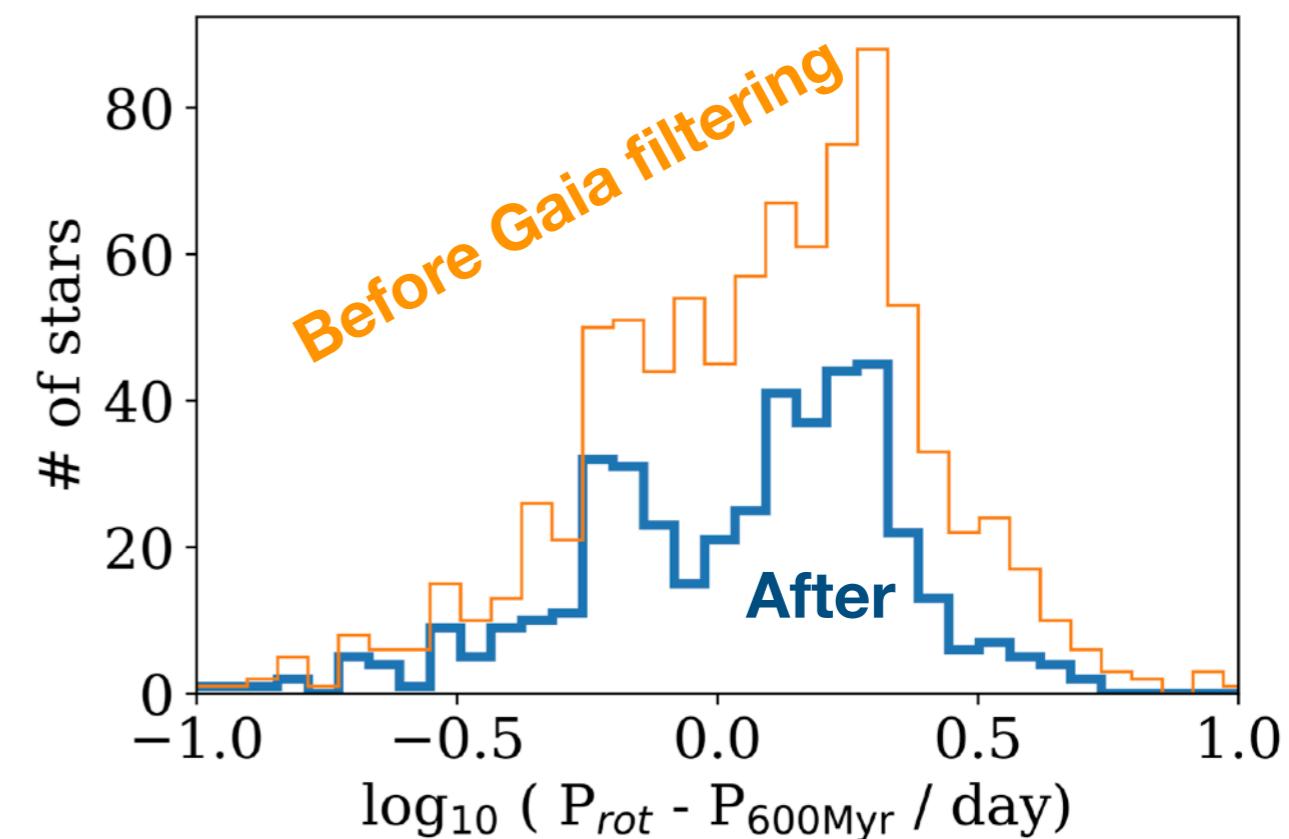
Match Kepler to Gaia (DR1/TGAS)



Select Main Sequence,
filter out subgiants



Period bimodality **IS**
found for G dwarfs!

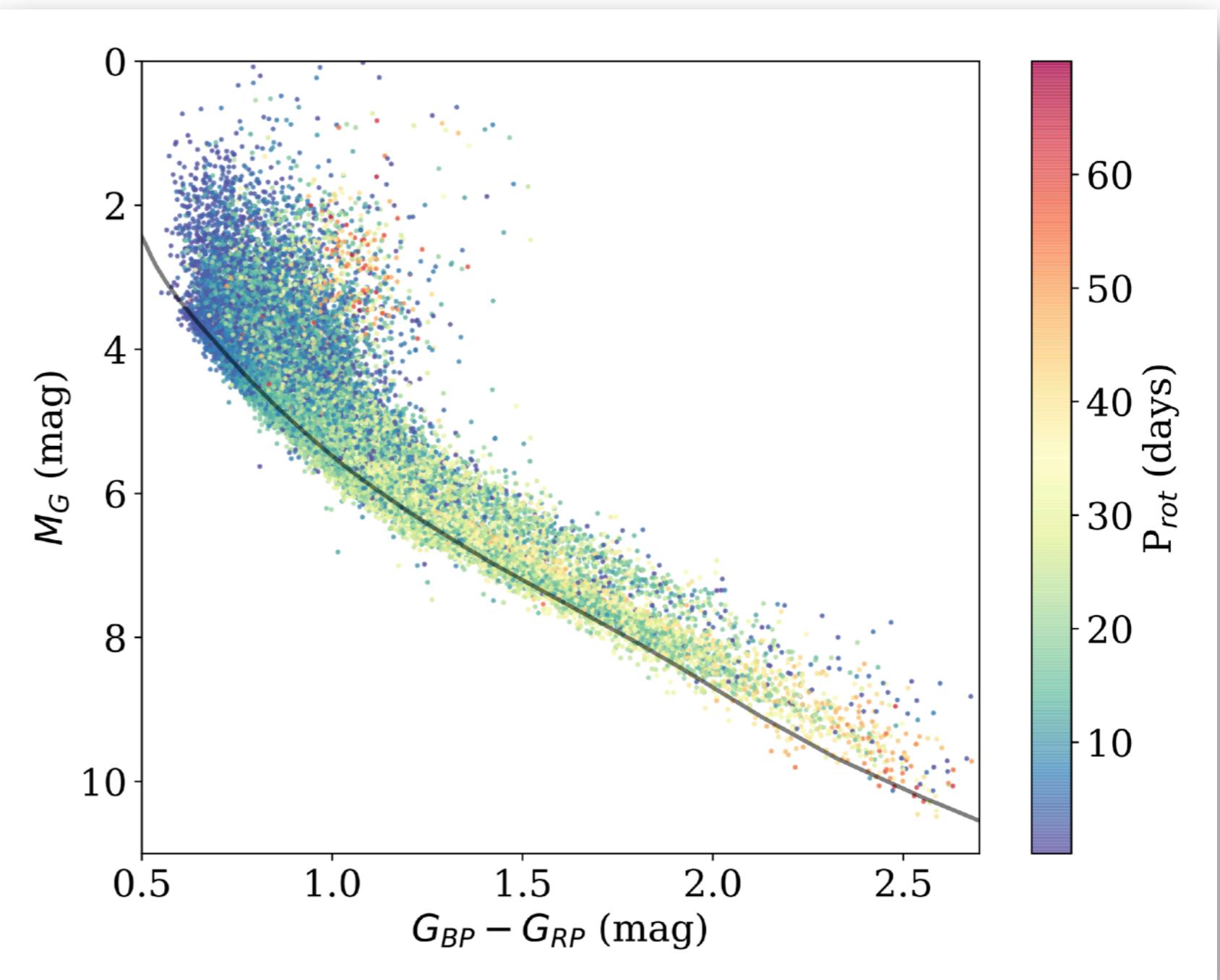
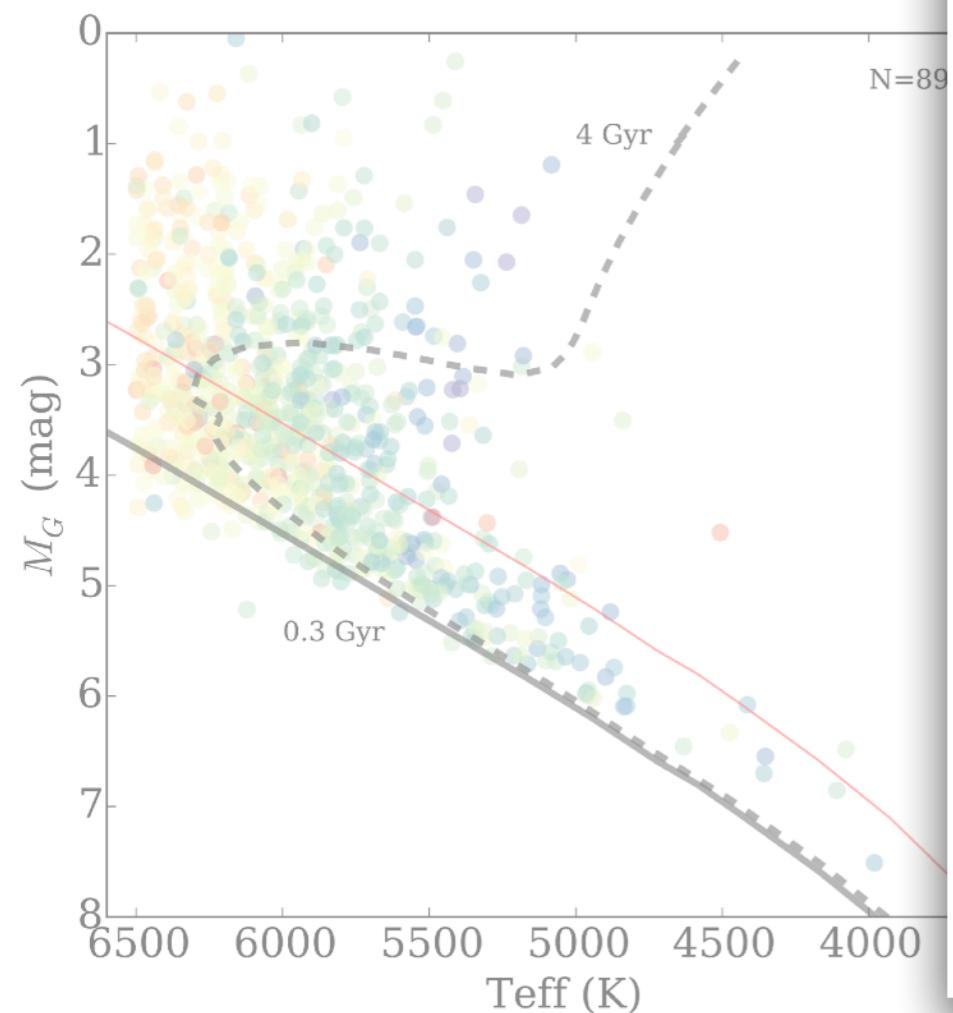


Davenport 2017



Gaia DR2

Gaia DR1

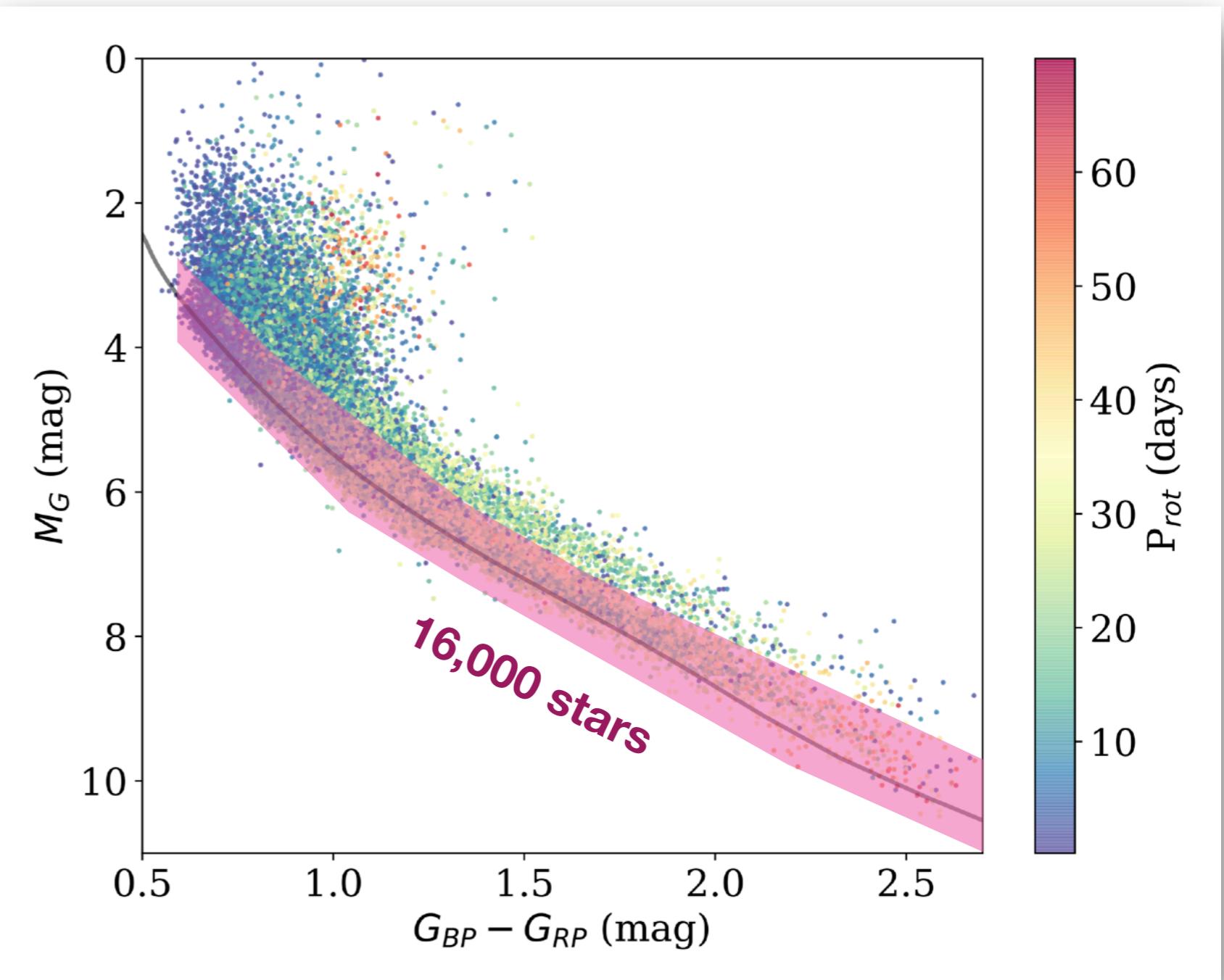
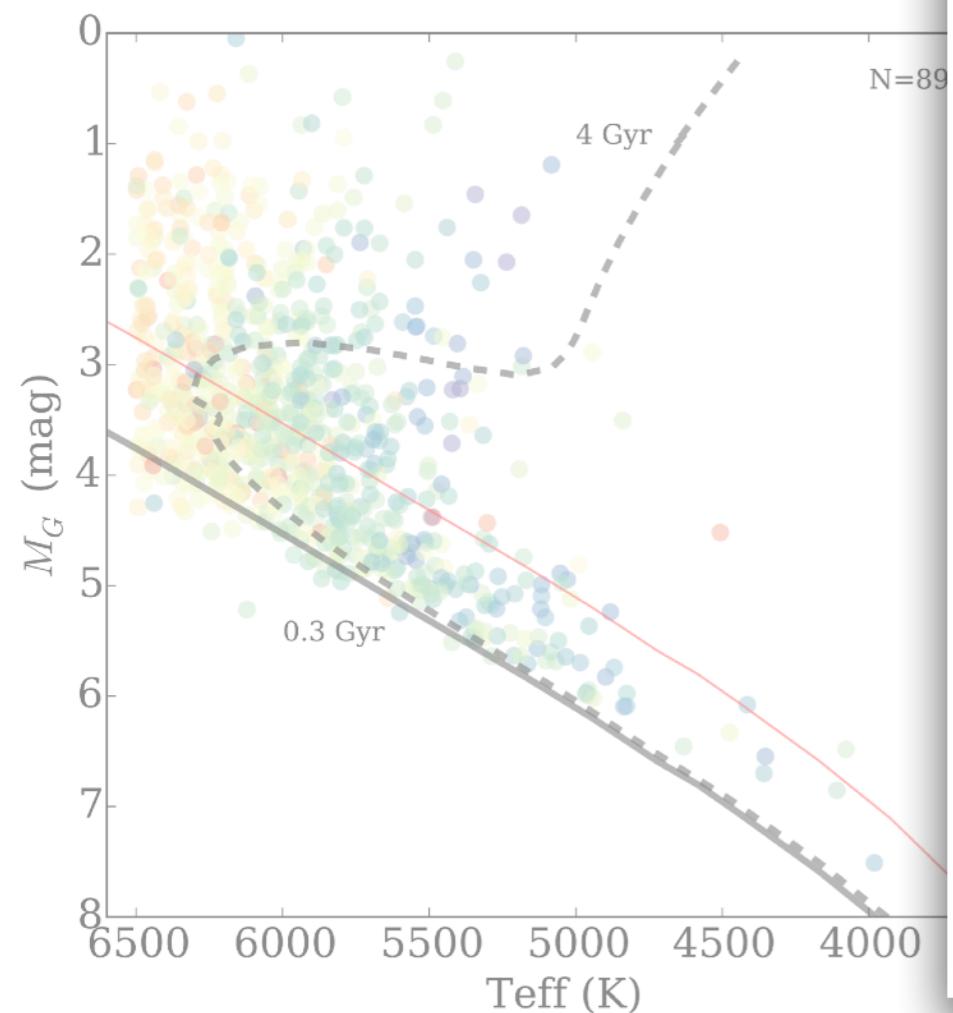


Davenport & Covey submitted
arXiv: 1807.09841



Gaia DR2

Gaia DR1

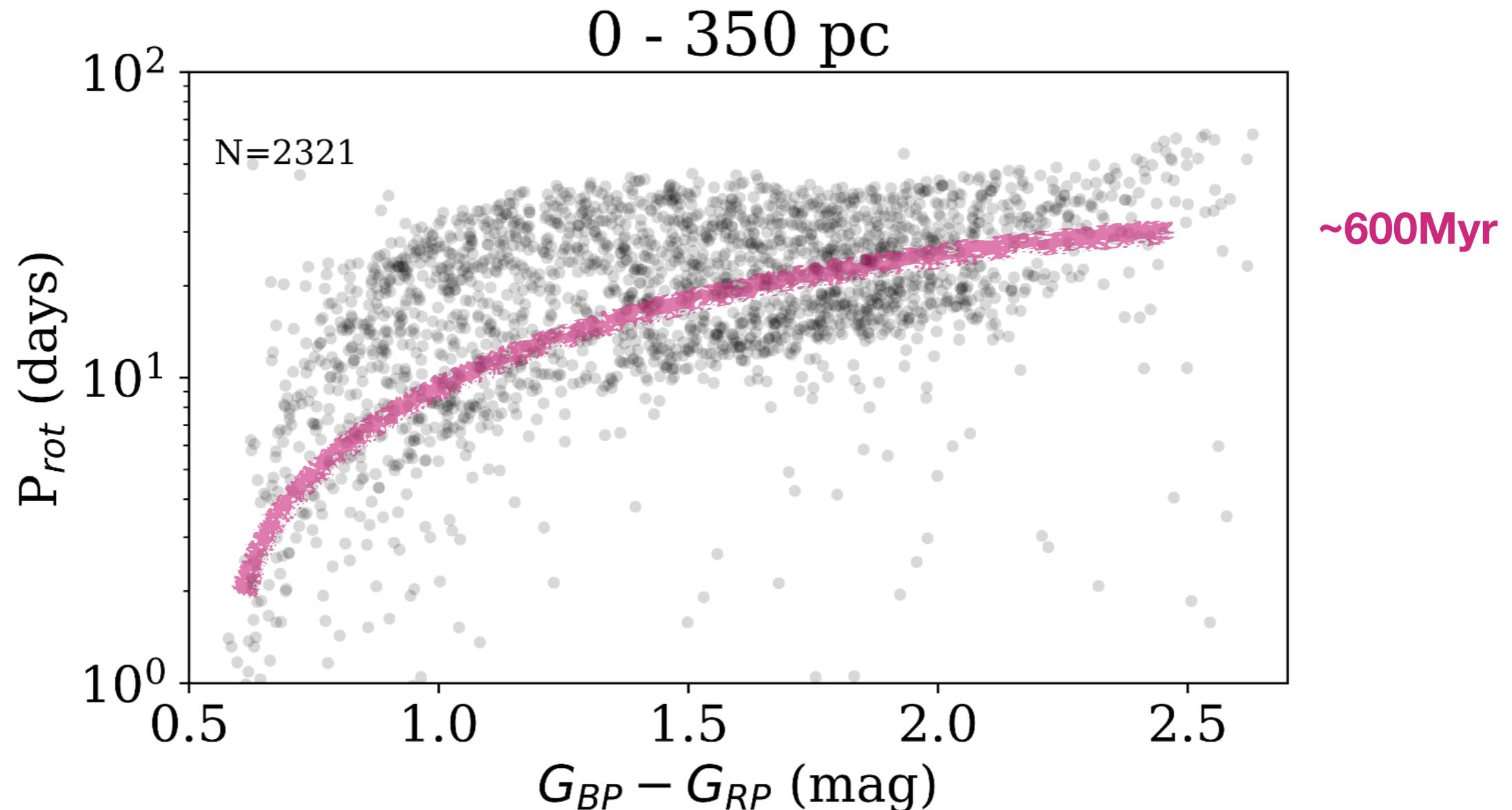


Davenport & Covey submitted
arXiv: 1807.09841



A more complete view

Gaia DR2

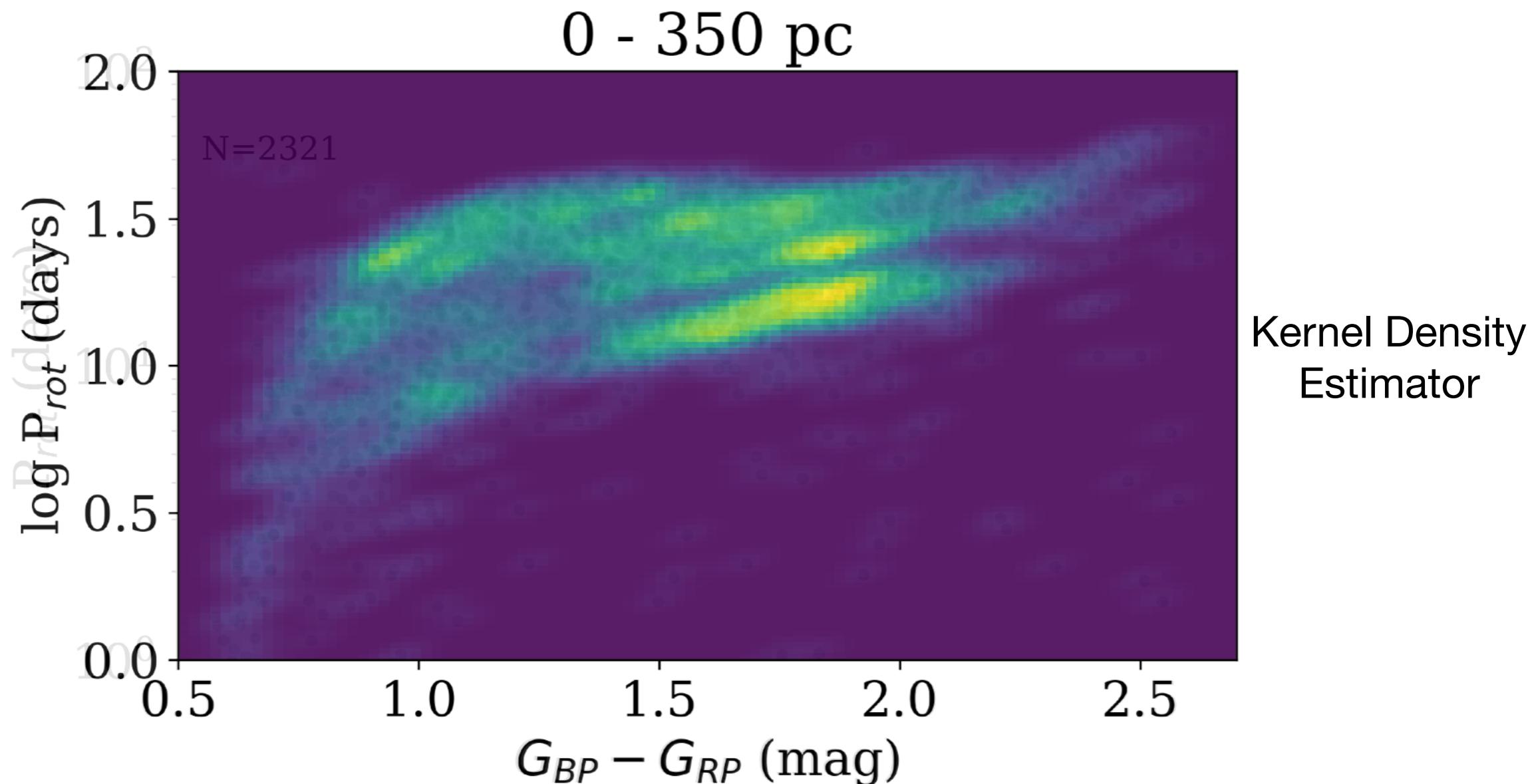


Davenport & Covey submitted
arXiv: 1807.09841



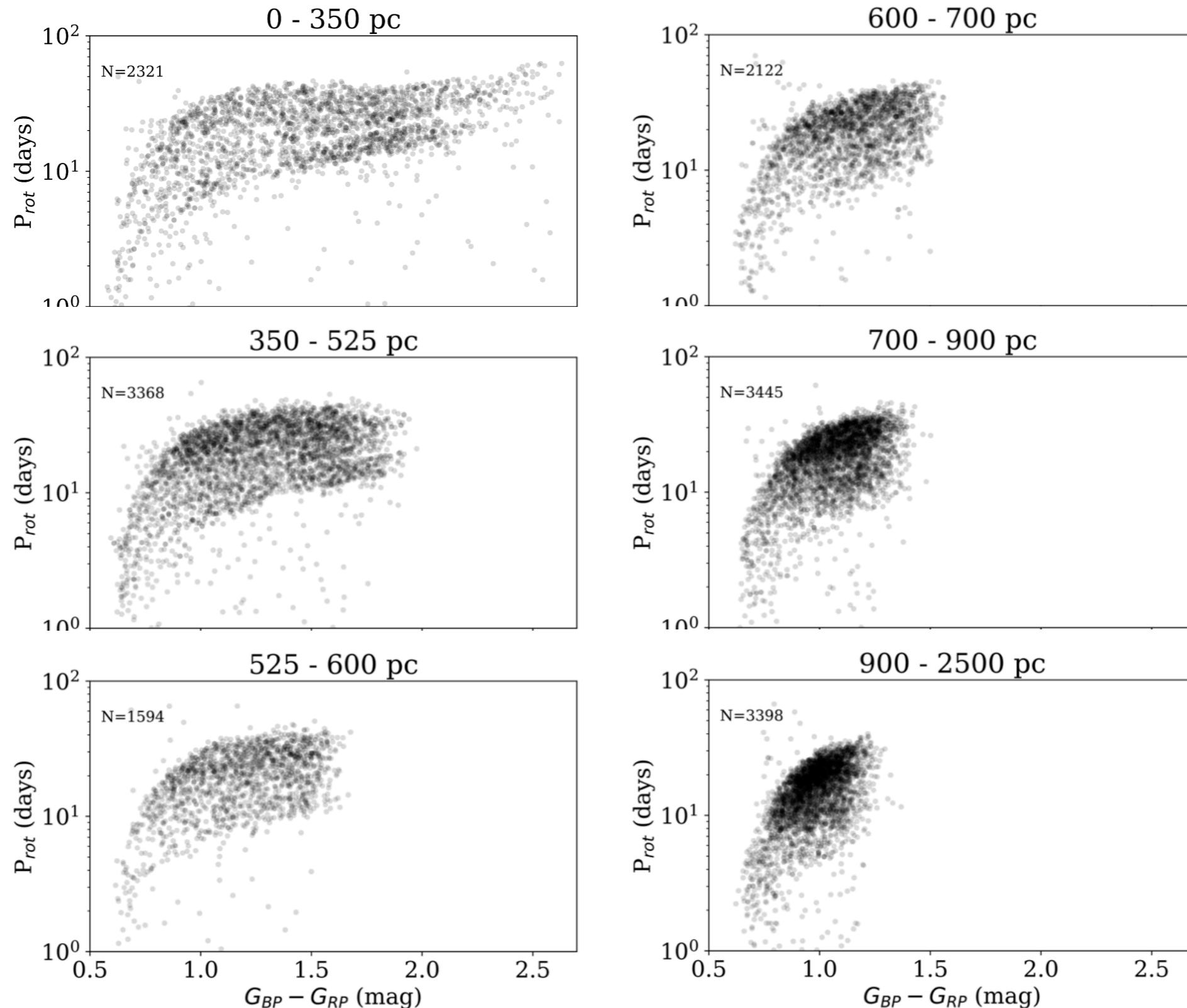
A more complete view

Gaia DR2

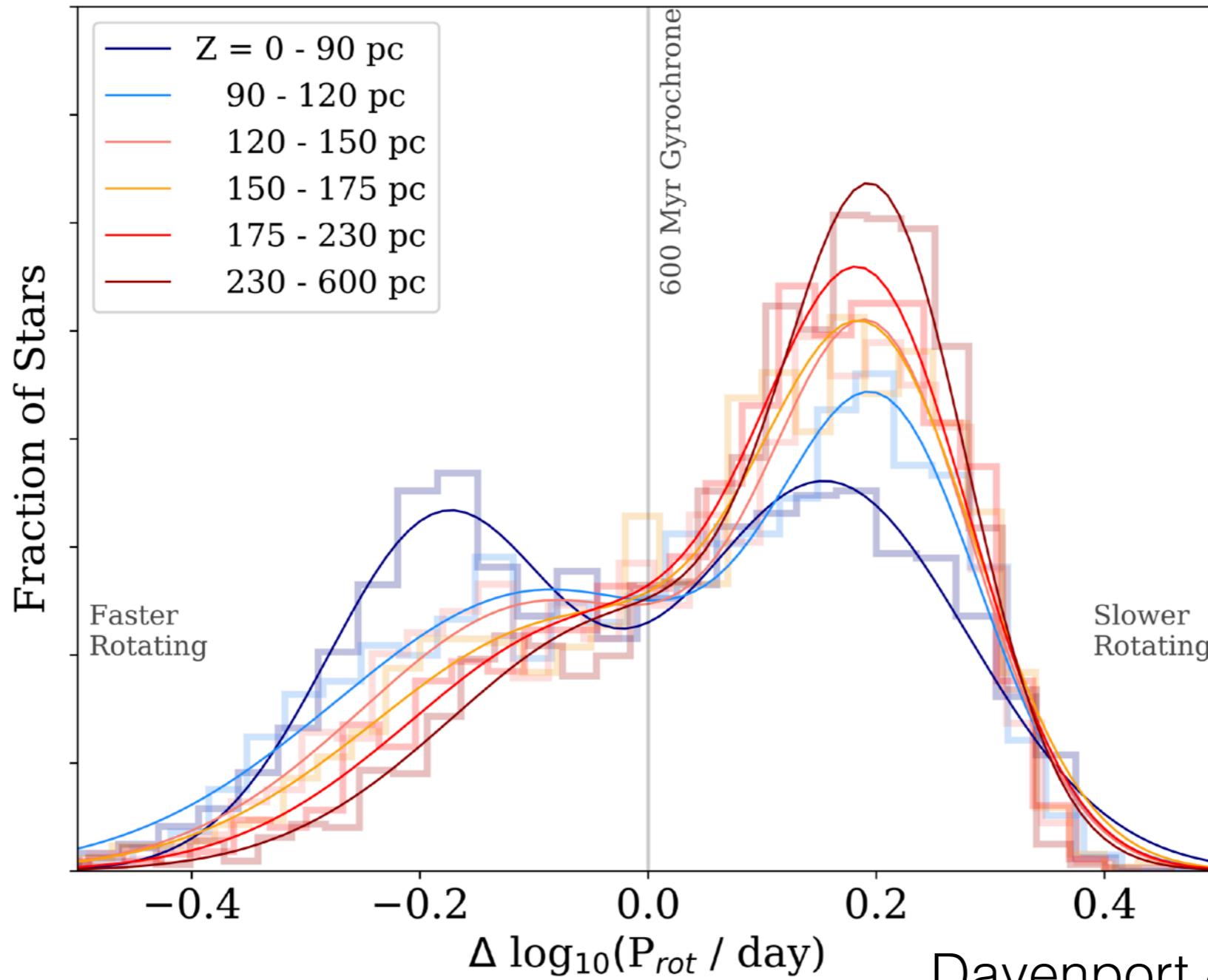


Explore in distance

Gaia DR2



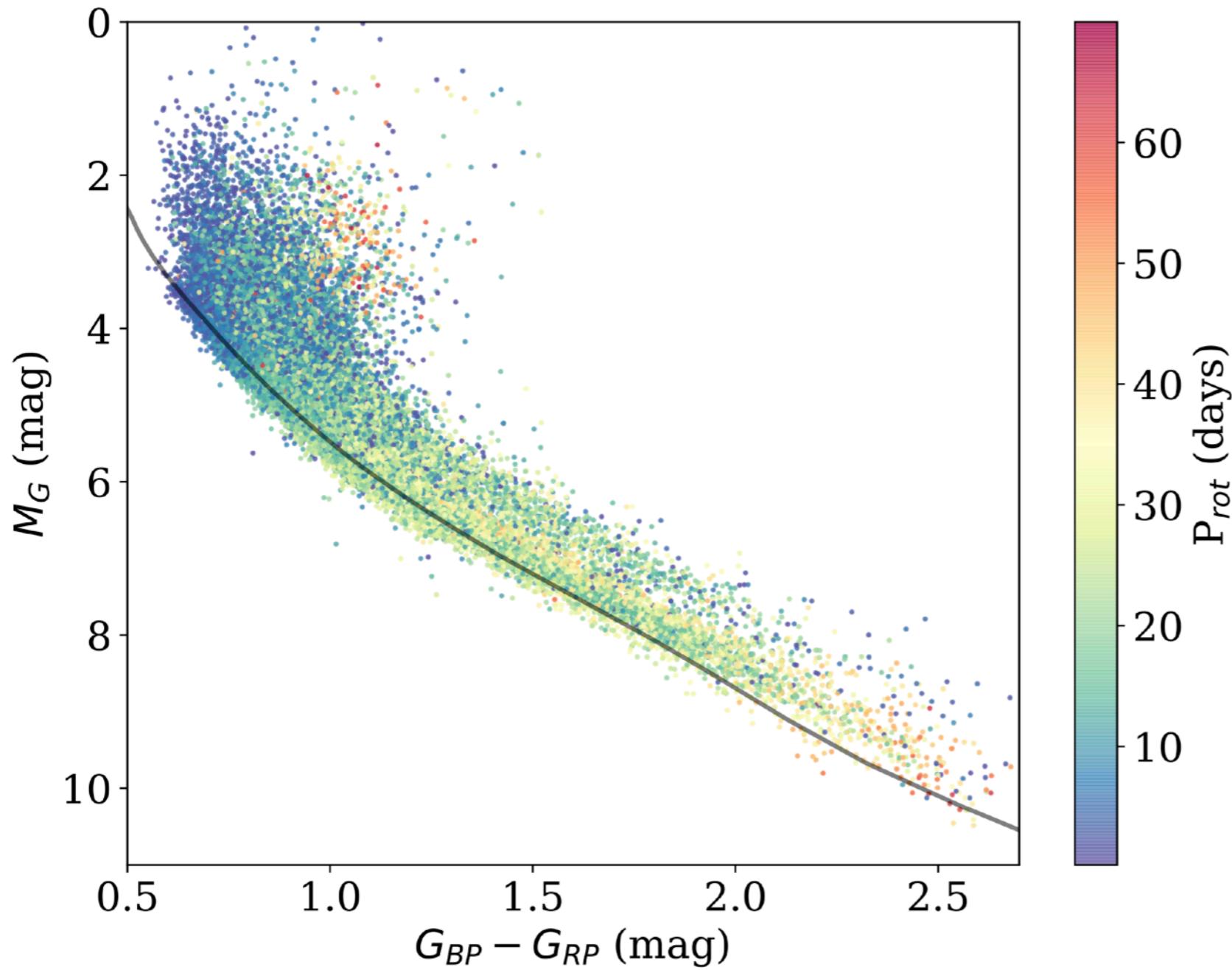
Bimodality drops with Height (Z)



Davenport & Covey submitted
arXiv: 1807.09841



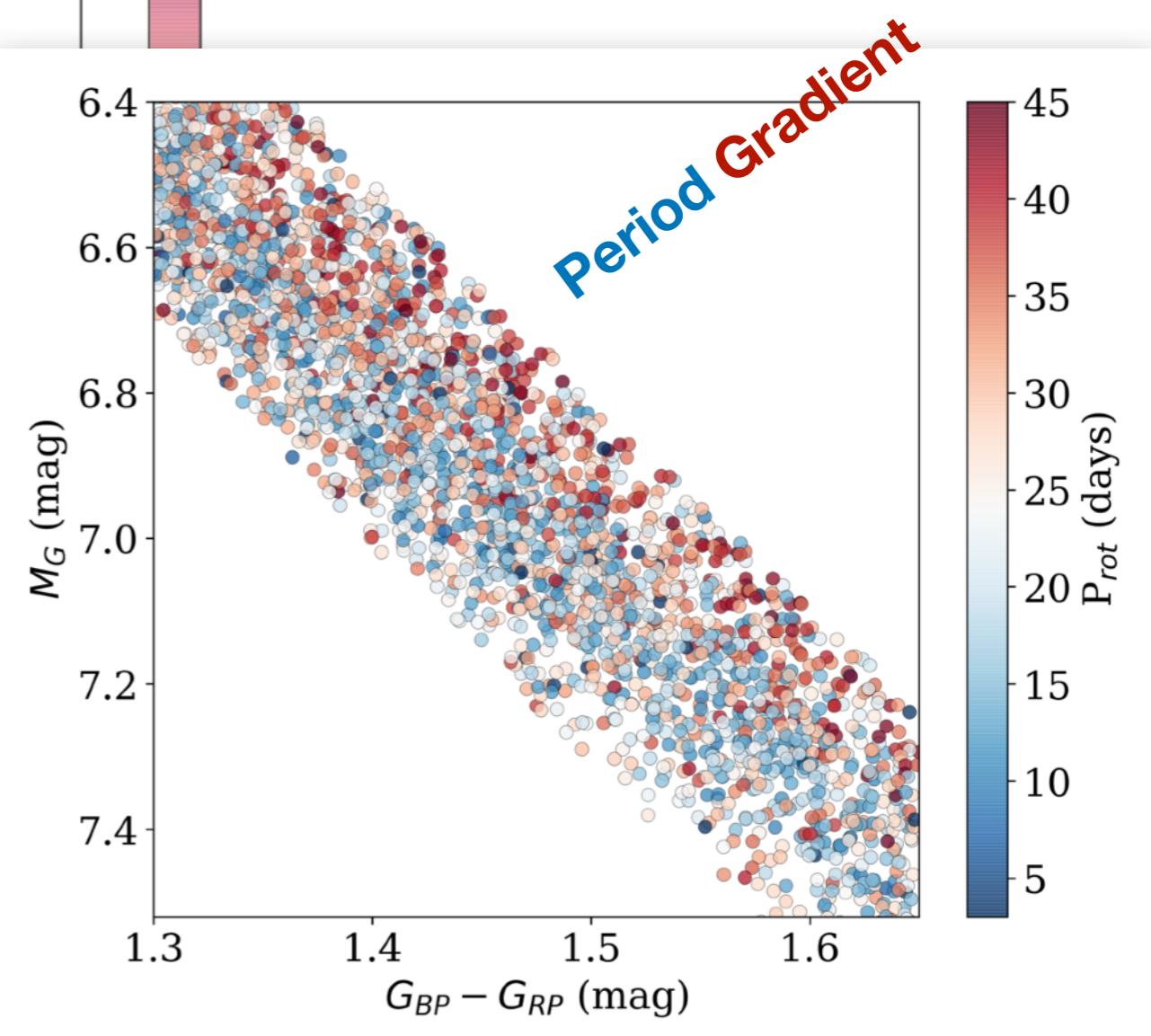
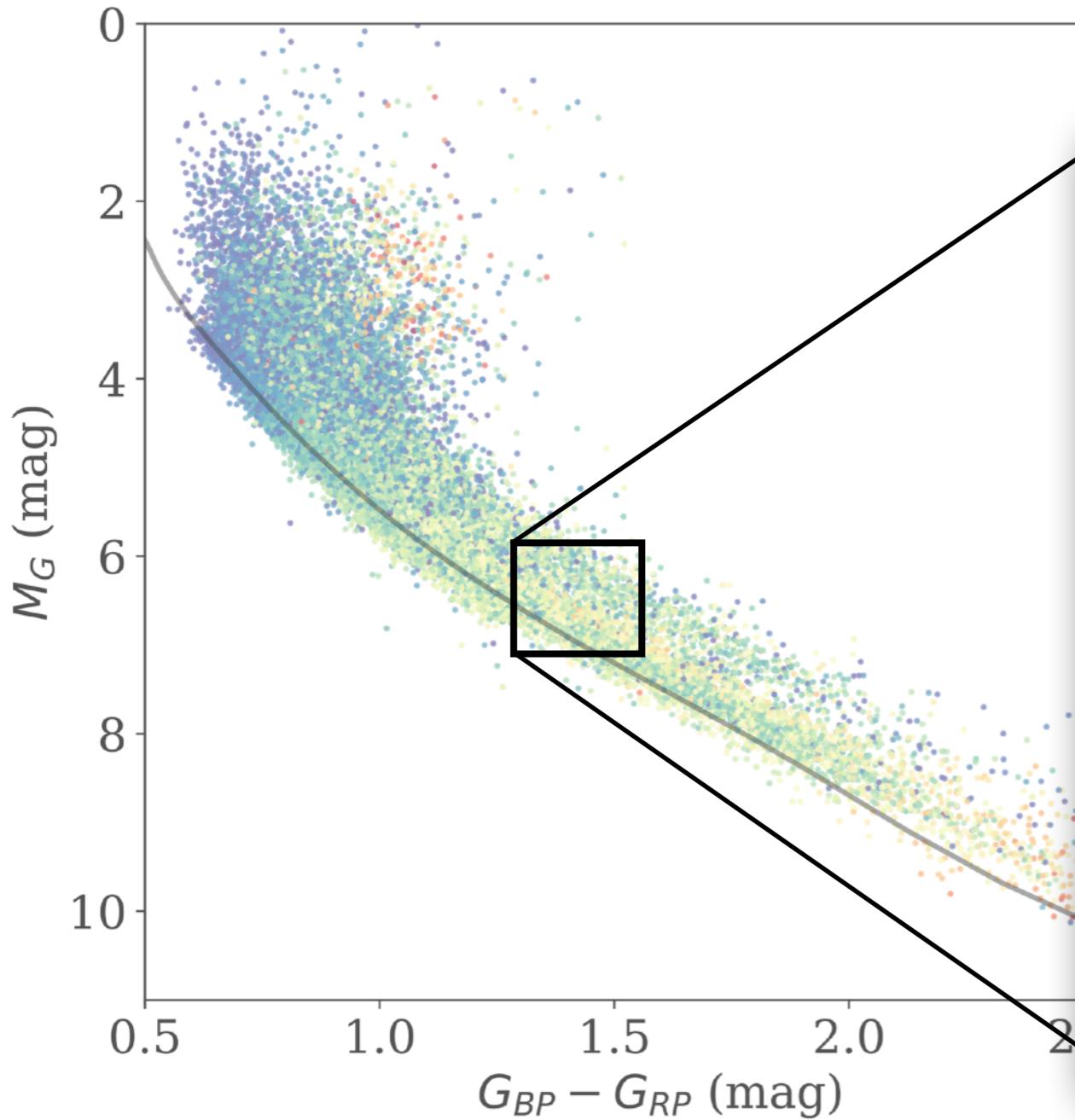
Something unexpected



Davenport & Covey submitted
arXiv: 1807.09841



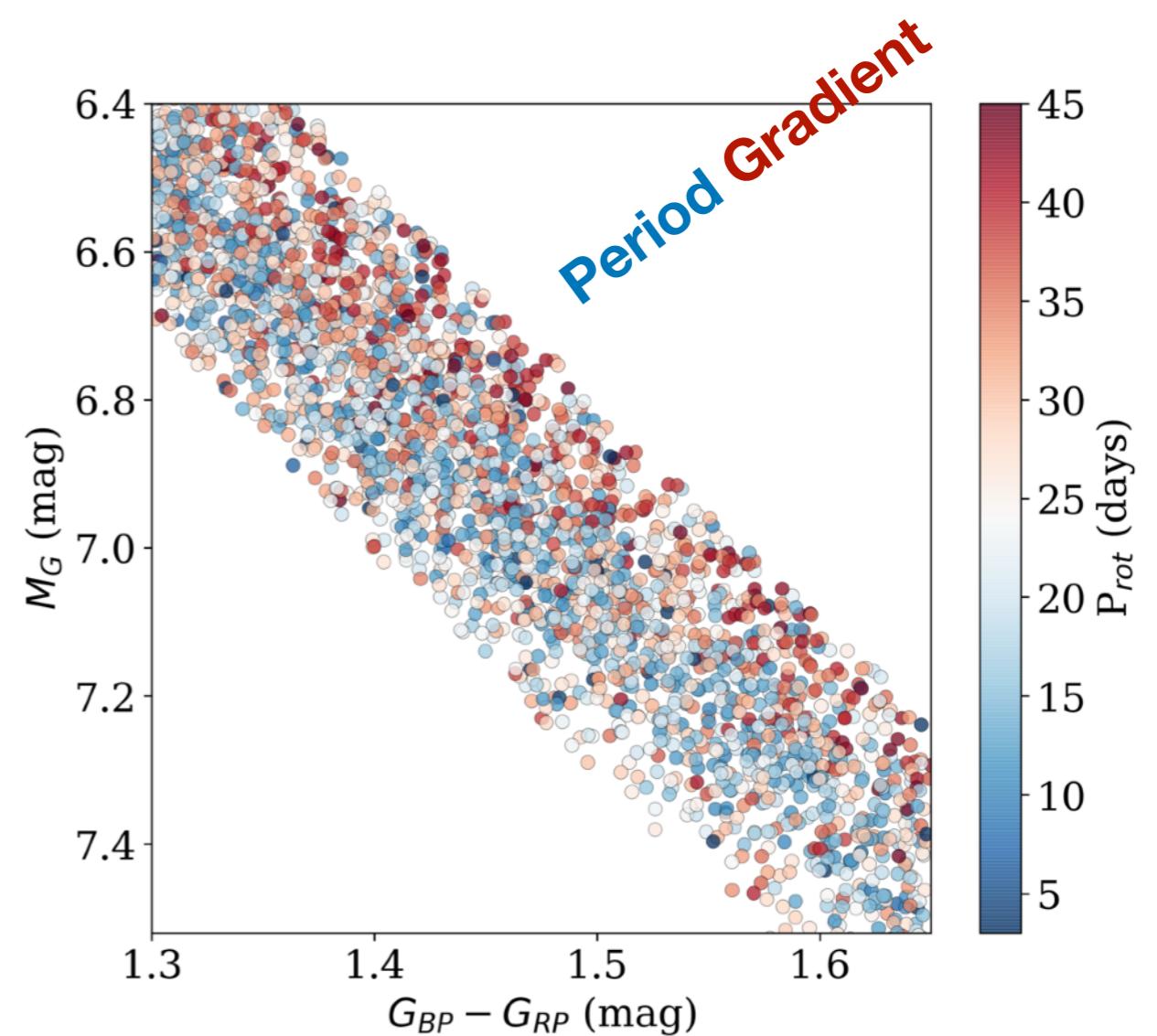
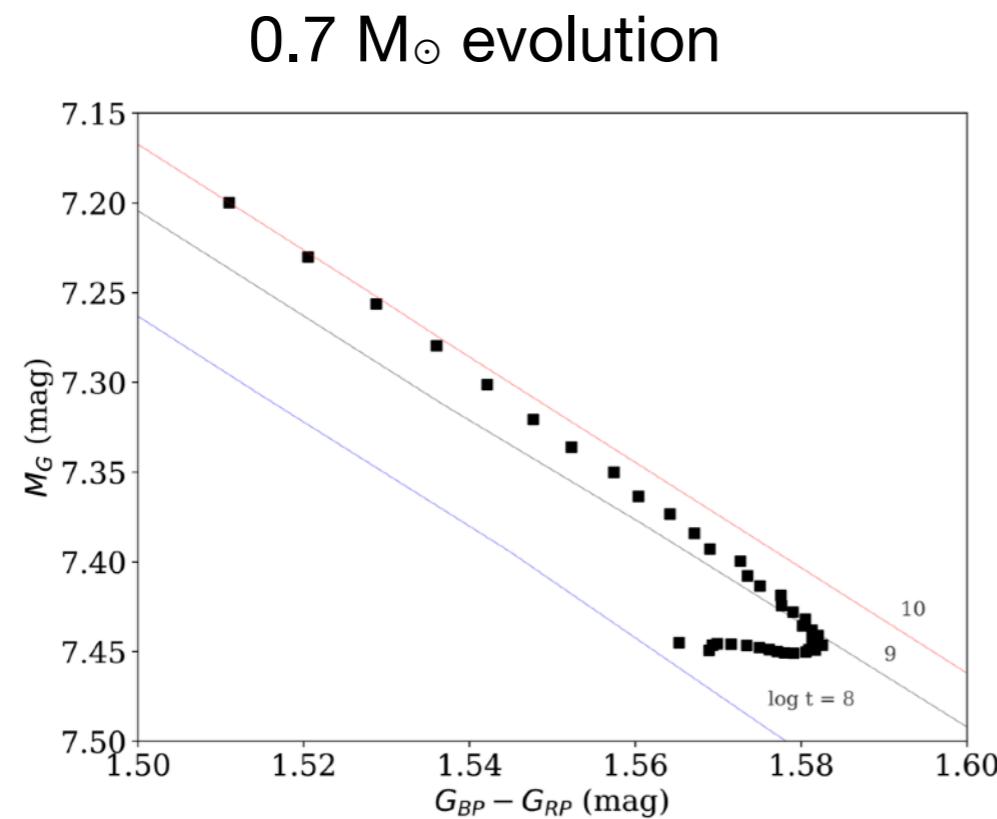
Ages on the main sequence?



Davenport & Covey submitted
arXiv: 1807.09841



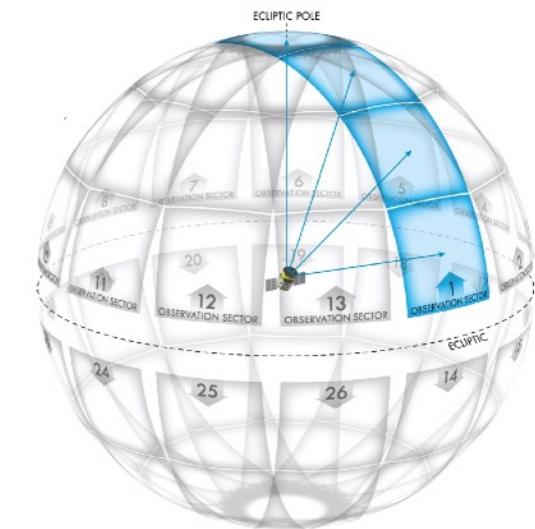
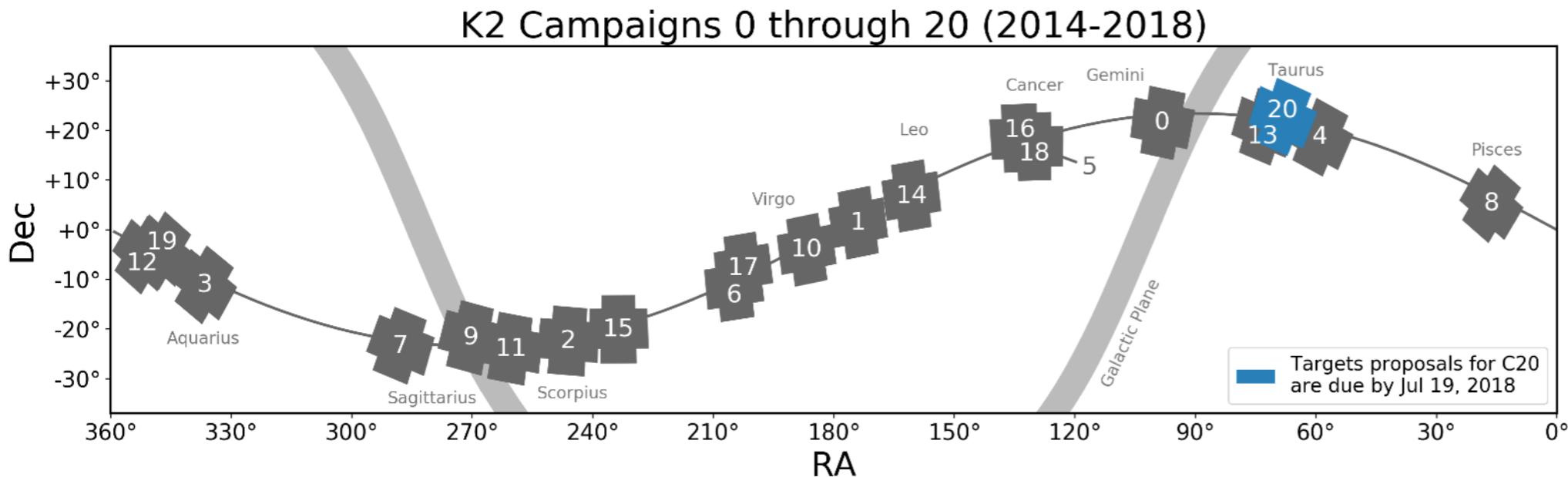
Ages on the main sequence?



Davenport & Covey submitted
arXiv: 1807.09841



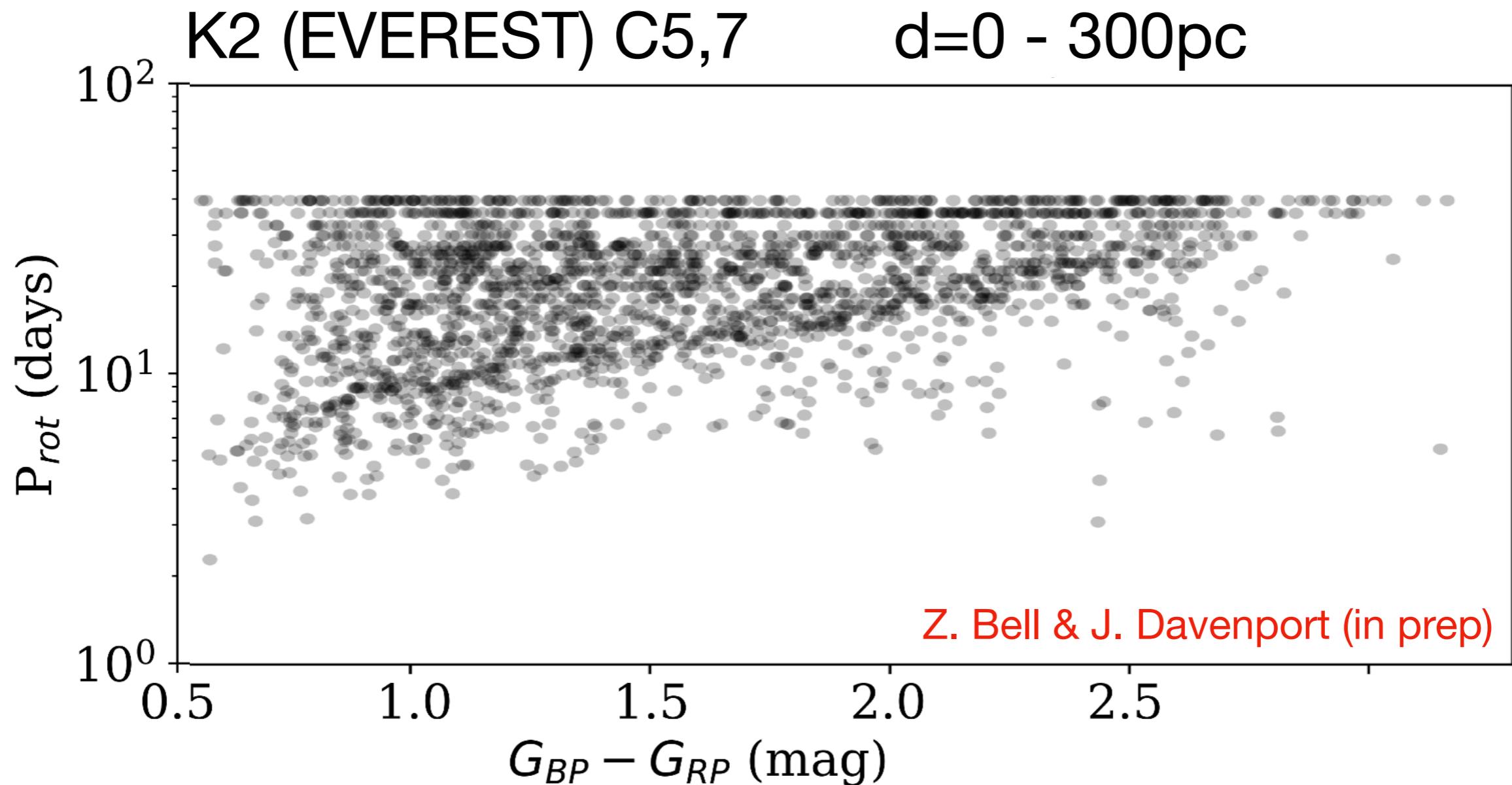
Next: Extend to K2 & TESS (+Gaia)



- How localized is the bimodality?
- Star formation history on small scales?
- Effects of spiral arms visible?



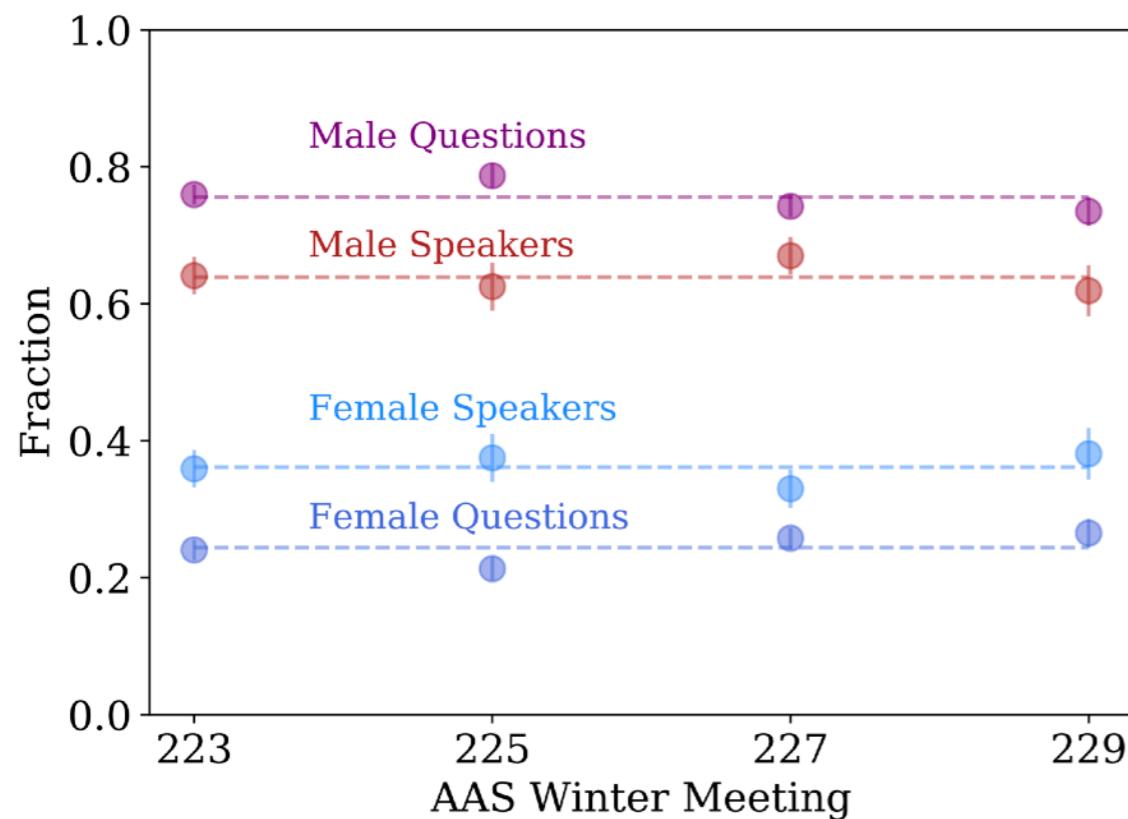
Next: Extend to K2 & TESS (+Gaia)



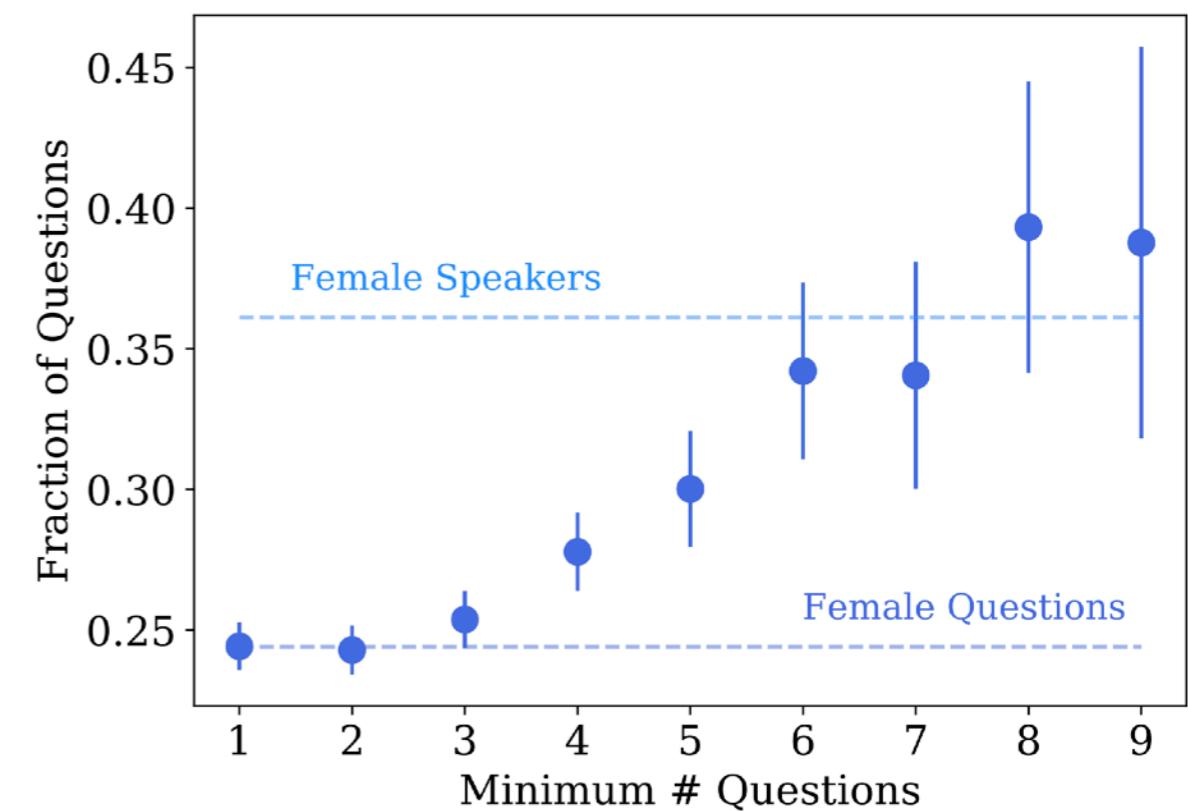
Aside: Gender Ratios in Talks

astrogender.site

Men ask 2 Q's for every
1 by a Woman



Longer Q/A's have better
gender ratios



Let Jr people speak first!

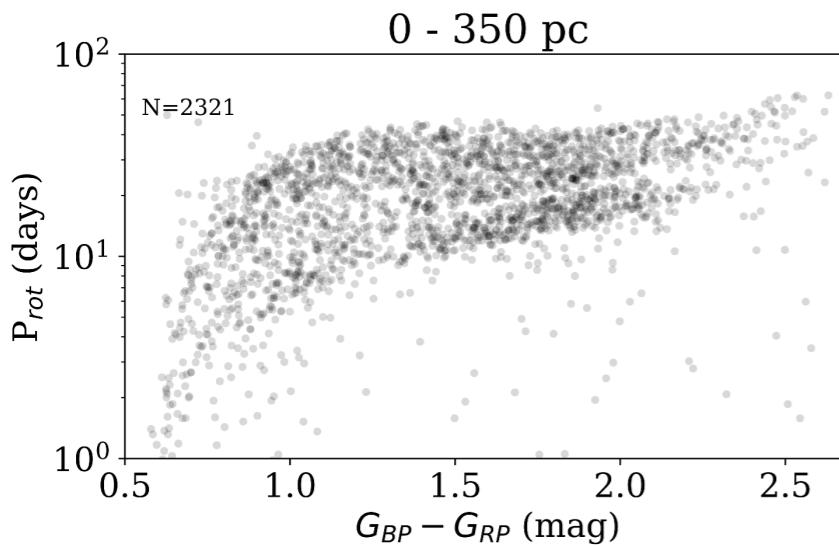
Let Q/A go longer!

Davenport et al. (2014)
Schmidt, Douglas, et al. (2017)
Schmidt & Davenport (2017)



jradavenport

Summary

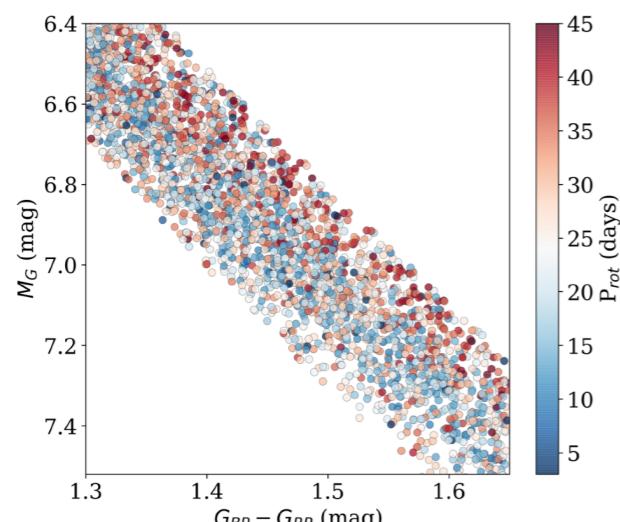
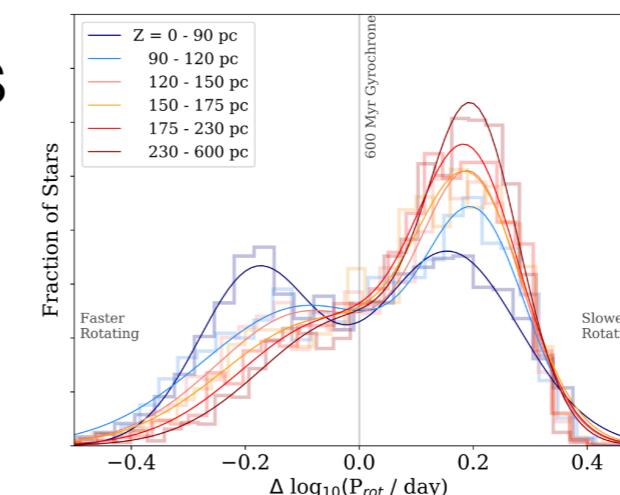


Kepler: Bimodal rotation period distribution for G/K/M dwarfs!

Implies dip in Star Formation @ 600Myr

Bimodality decreases with height (Z)

Need K2 & TESS!



Period gradient across Main Seq: Ages?

New isochrones needed!

