Asteroseismology provides a **new range** of internal rotation **periods** and **ages** in which to calibrate **gyrochronology**

EXPANDING THE GYROCHRONOLOGY RELATION WITH ASTEROSEISMIC ROTATION AND AGE

Oliver J. Hall, Guy R. Davies, Martin B. Nielsen
+ friends

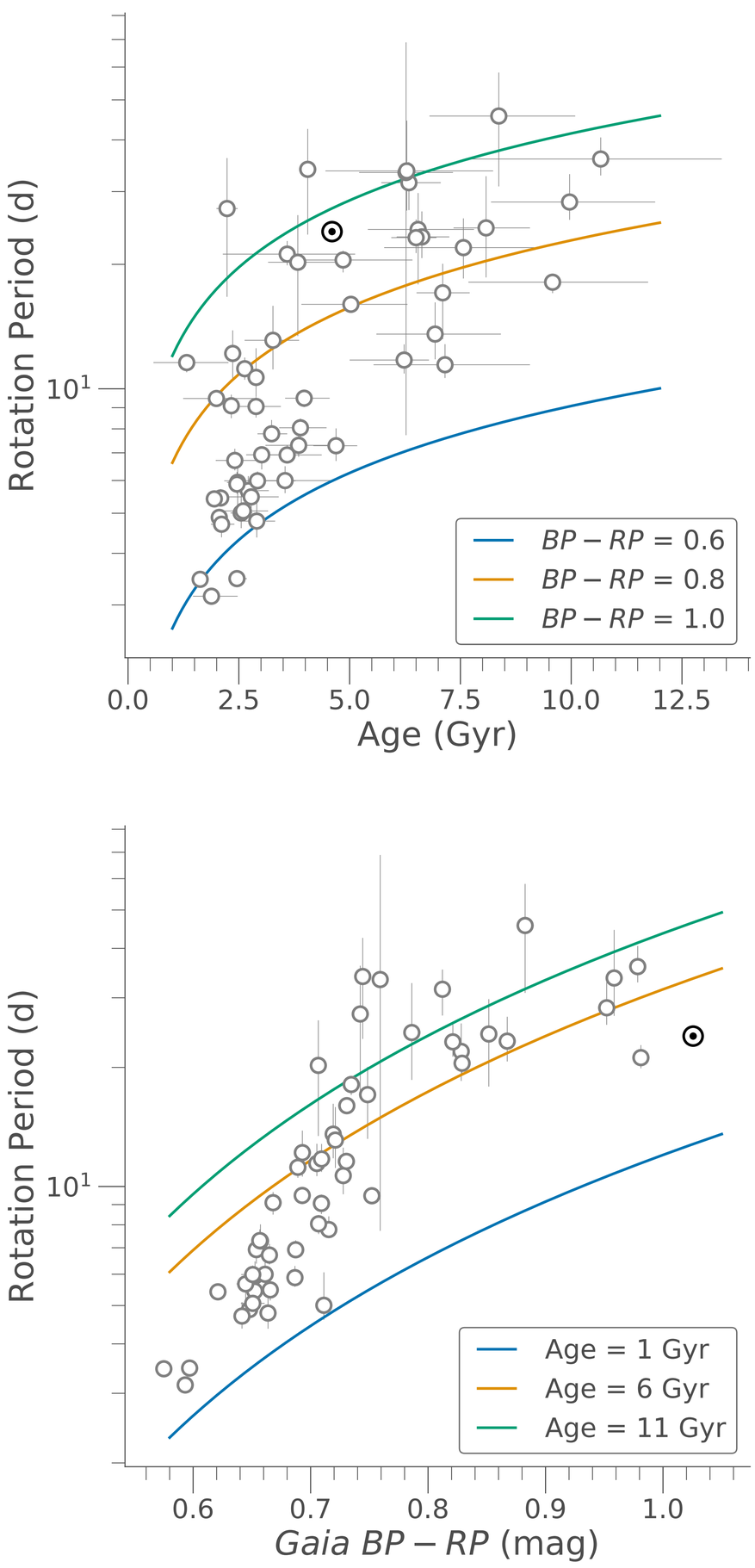
INTRO

- The **rotation** of stars **slows down** as they **age**, at a rate that is a function of **colour**.
- We can calibrate this **'gyrochronology'** relation to help us estimate stellar age.
- van Saders+16 showed that some old stars stop slowing down at a certain point. **Why?**
- Asteroseisic measurements of age and interal rotation periods allow us to **study older stars** in this area of interest.

METHOD

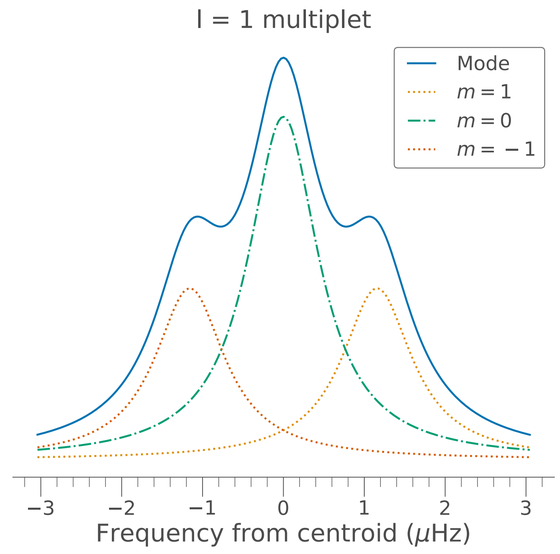
- We use the **Davies+16, Lund+17, Silva Aguirre+15,17** samples for their ages and locations of individual frequencies.
- We obtain rotation periods for **54 stars** (so far!) by fitting a holistic model to the l = {0, 1, 2} p-modes, treating the mode frequencies as **latent variables**.
- We fit the classical Barnes+07 gyrochronology relation with ***Gaia BP-RP*** colours using **latent variables** to treat uncertainties in the three observeables.

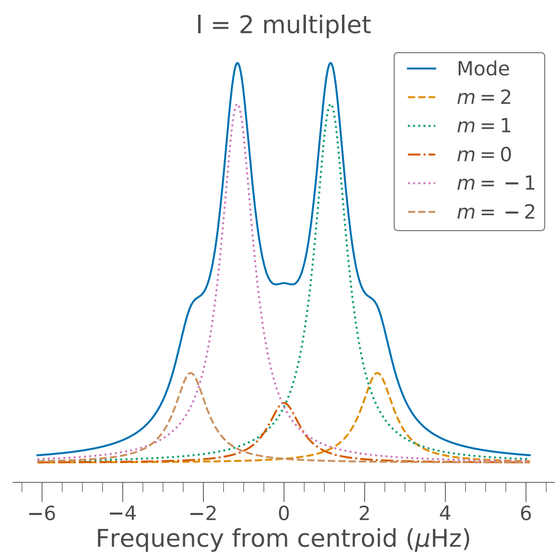
RESULTS SO FAR



ROTATIONAL SPLITTING

- The **rotation** and **inclination** of a star change how modes appear.
- The examples below are for a star with a period of 10 days and an inclination of 45°.





WHATS NEXT?

- **Improving** the fitting process with Gaussian Process priors on **linewidth** and **height.**
- **Fitting** an improved gyrochronology model that treats **mass**, **metallicity**, and the **heteroskedastic** uncertainties.
- **Comparing** our data to evolutionary models and clusters to figure out when (if?) rotation stops slowing.

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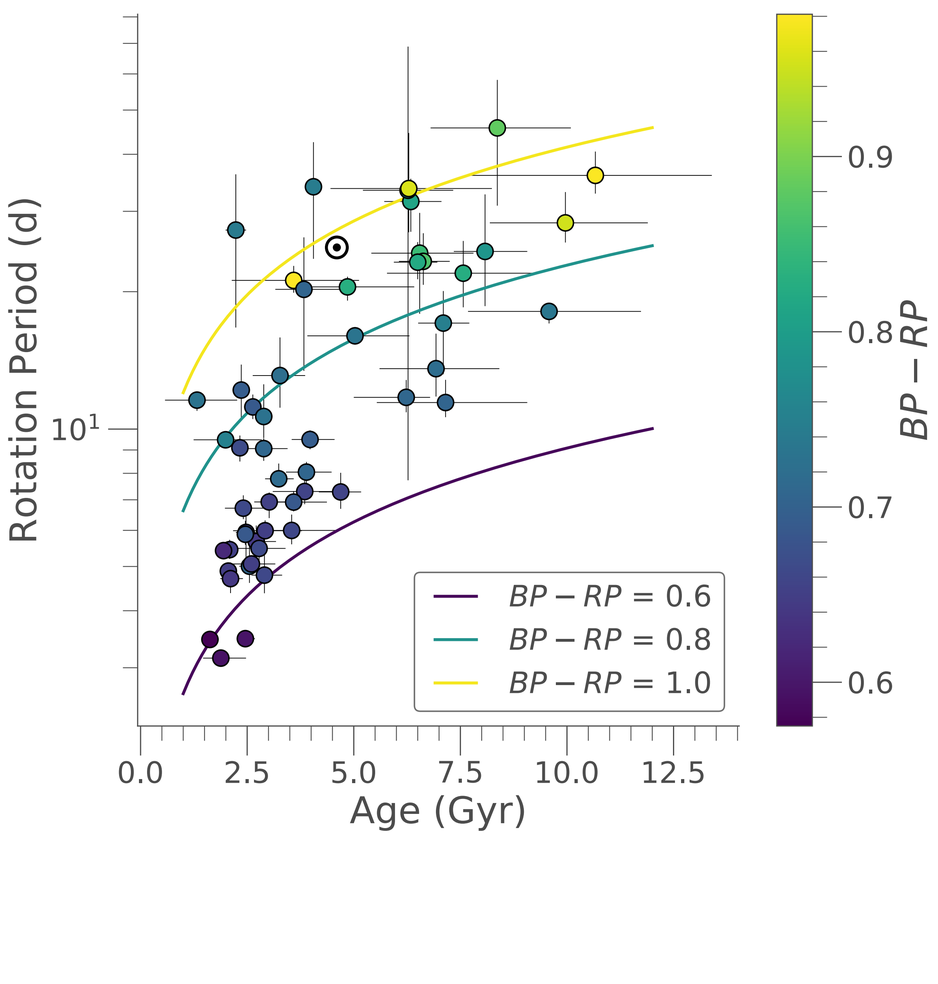

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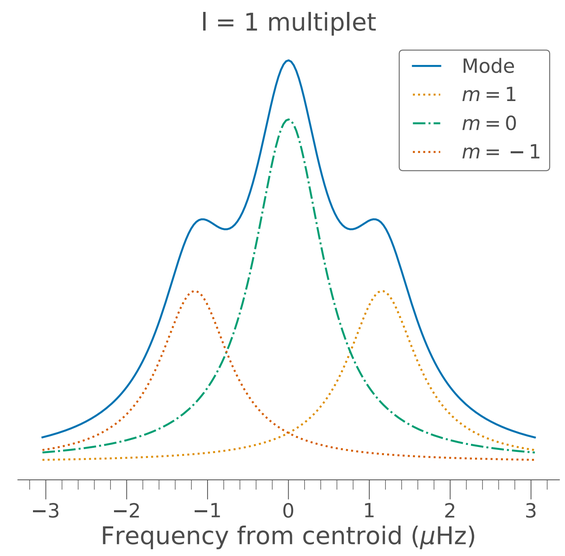

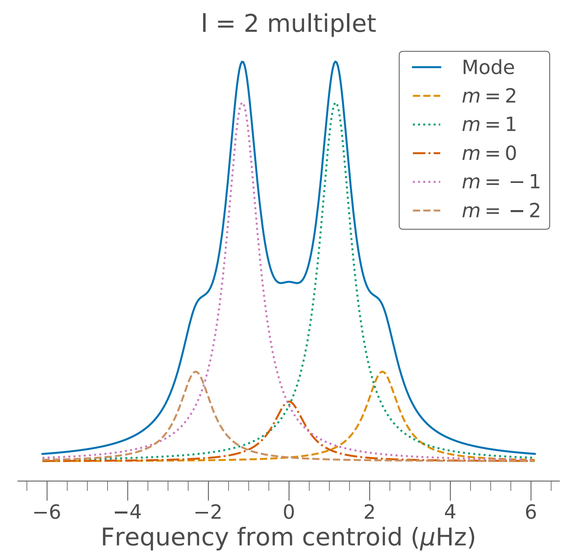

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