Analysis of chromospheric flux-flux relationships in CARMENES sample

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Universidad Complutense de Madrid

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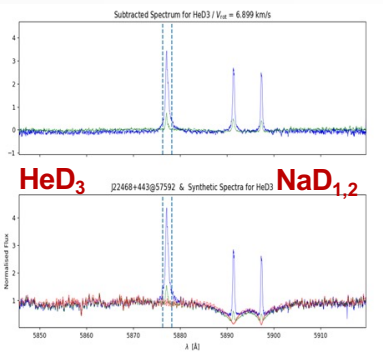
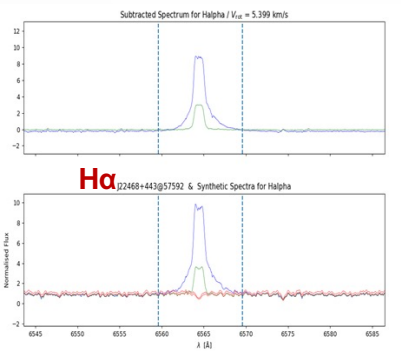
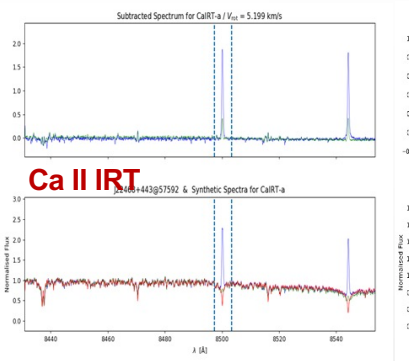
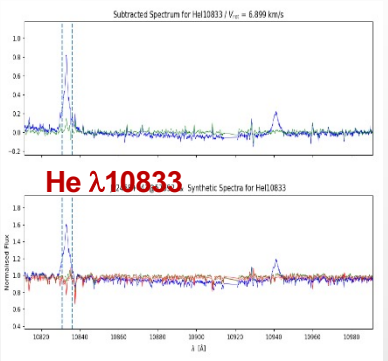






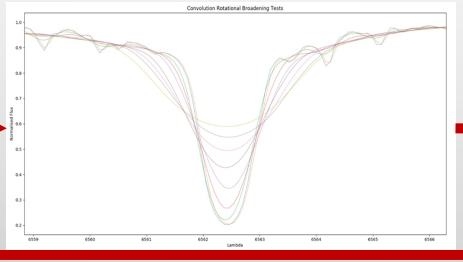


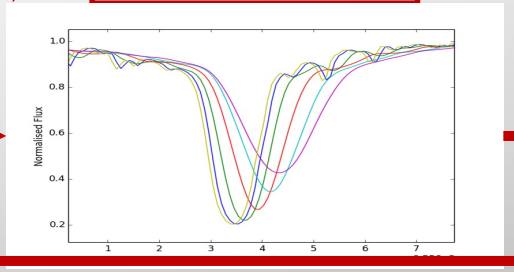
HeD$_3$ NaD$_{1,2}$ Hα Ca II IRT He λ10833

Spectral Subtraction Technique well suited for our purposes

iSTARMOD

Synthetic Spectrum





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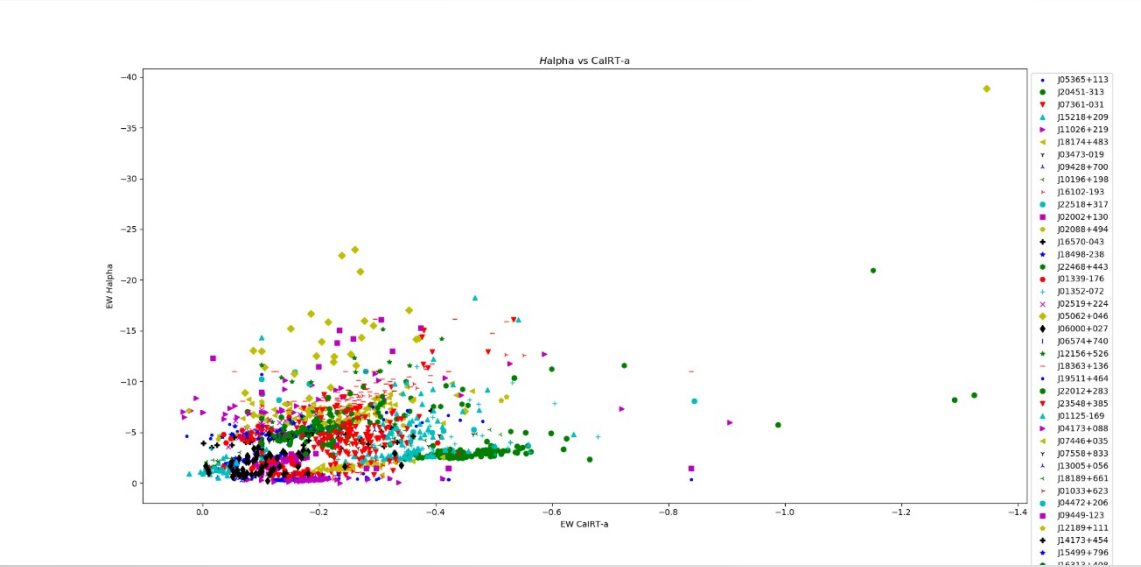

We start with the series of pEWs obtained by spectral subtraction technique

Applied to the RV-loud+ sub-sample

Tal-Or et al. (2018)

+50 additional stars

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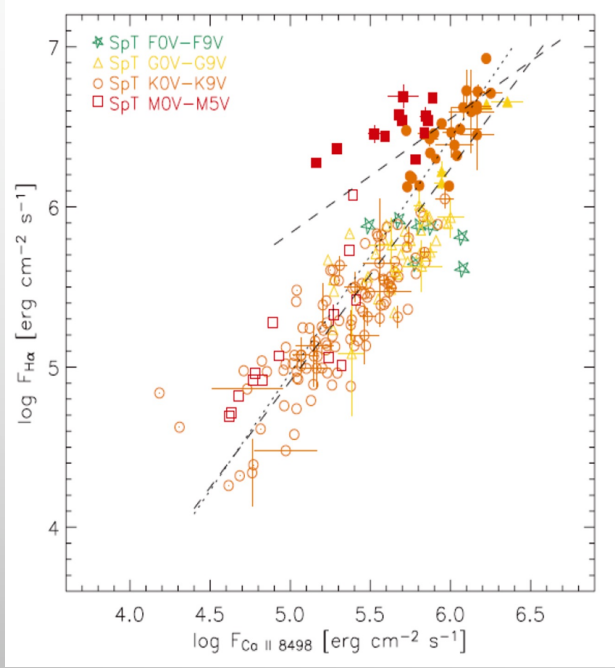
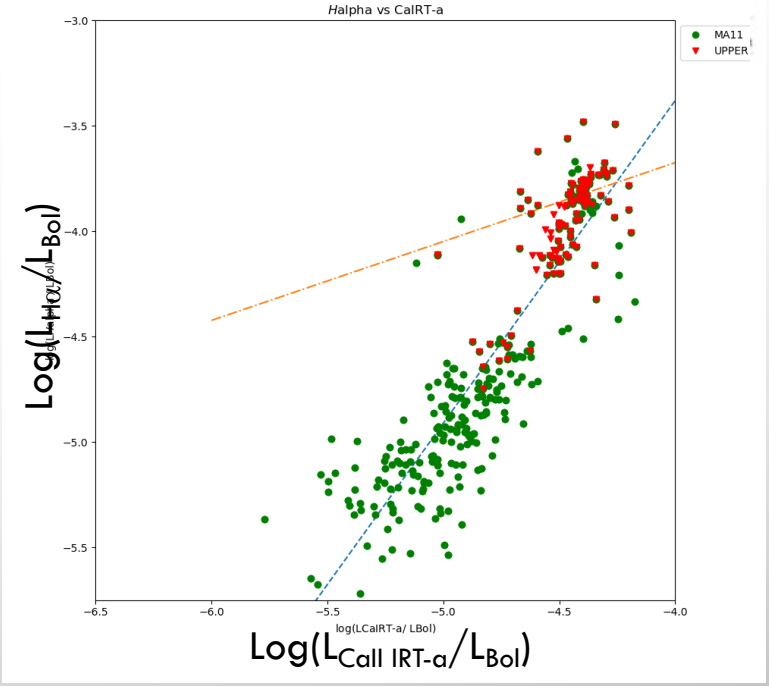
Flux-flux relationships → two emitter populations (on FGKM stars)

Related with Dynamo processes in the interior of stars

Taken from Martínez-Arnáiz et al., (2011)





What is the picture provided by CARMENES sample?

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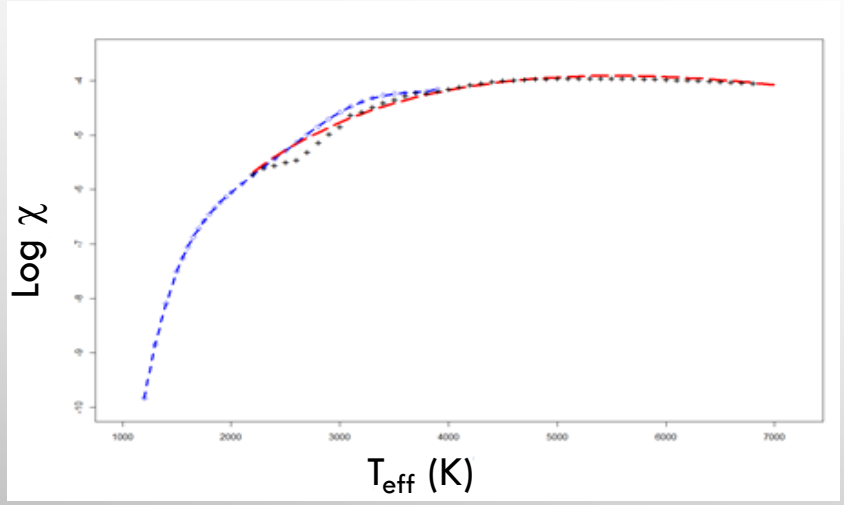
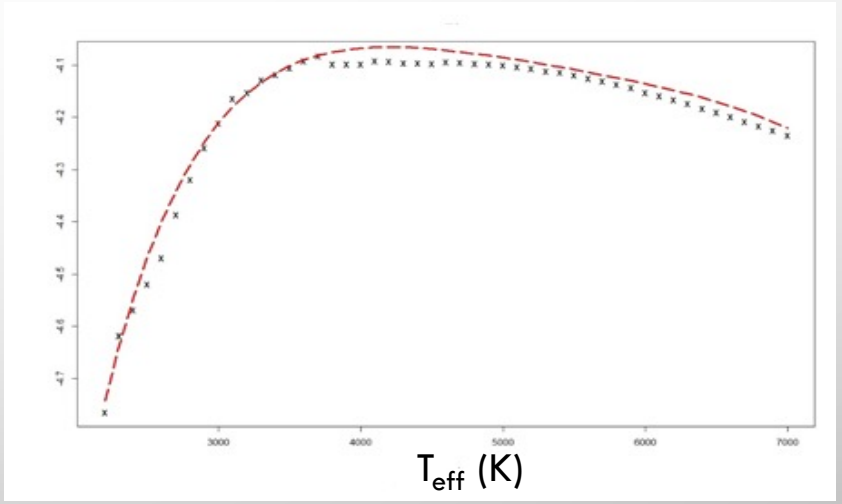
Using the χ Factor: in Walkowicz et al., (2004) & Reiners/Basri, (2008).

Calibrations of line-flux from the synth spectra of Cifuentes et al., (2018)

$$\frac{L_{H_\alpha}}{L_{Bol}} = \chi\, EW(H_\alpha)$$

$$log\ \chi = \frac{F_{H_\alpha}}{F_{Bol}}$$

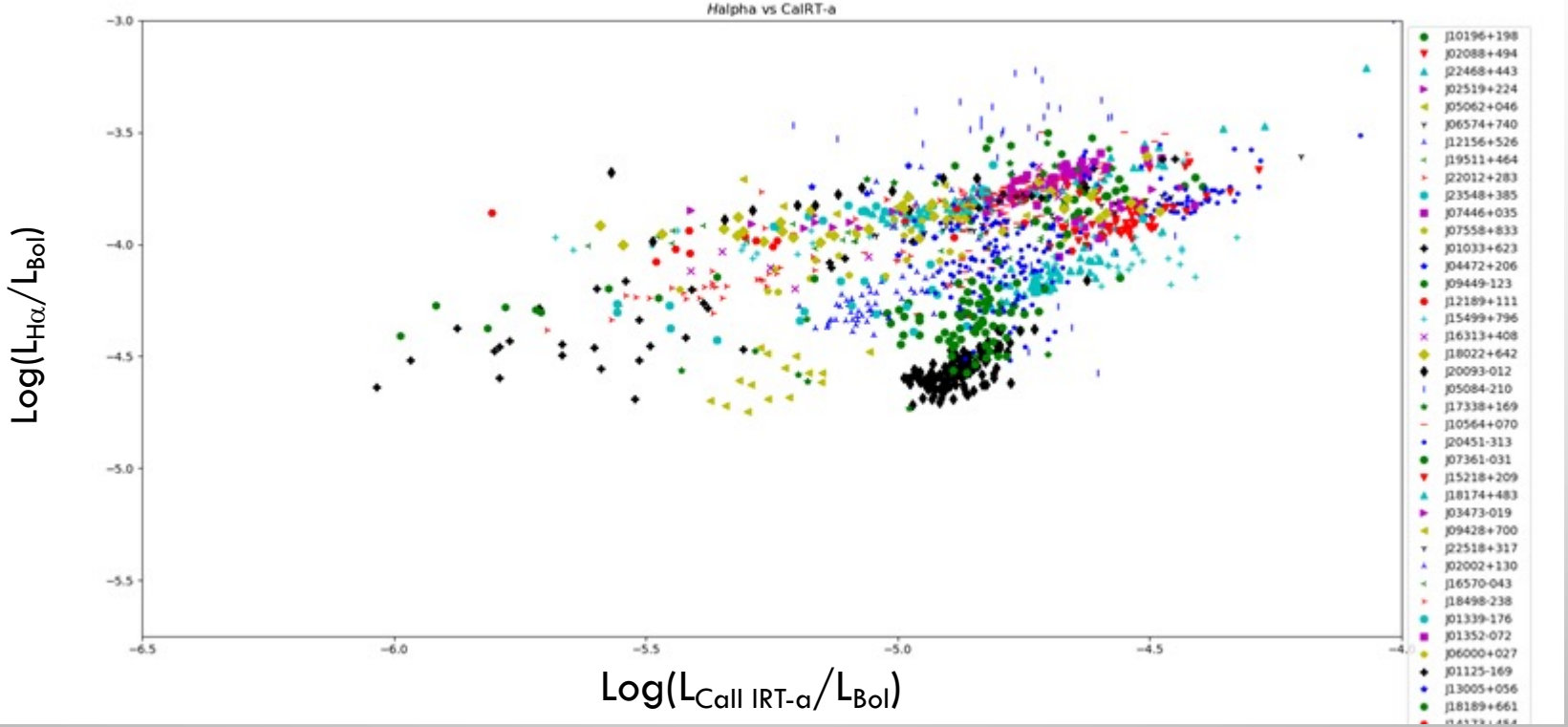




Added for comparison purposes the P_5(Teff) fit polynomial of Reiners/Basri, 2008

Analysis of chromospheric flux-flux relationships in CARMENES sample

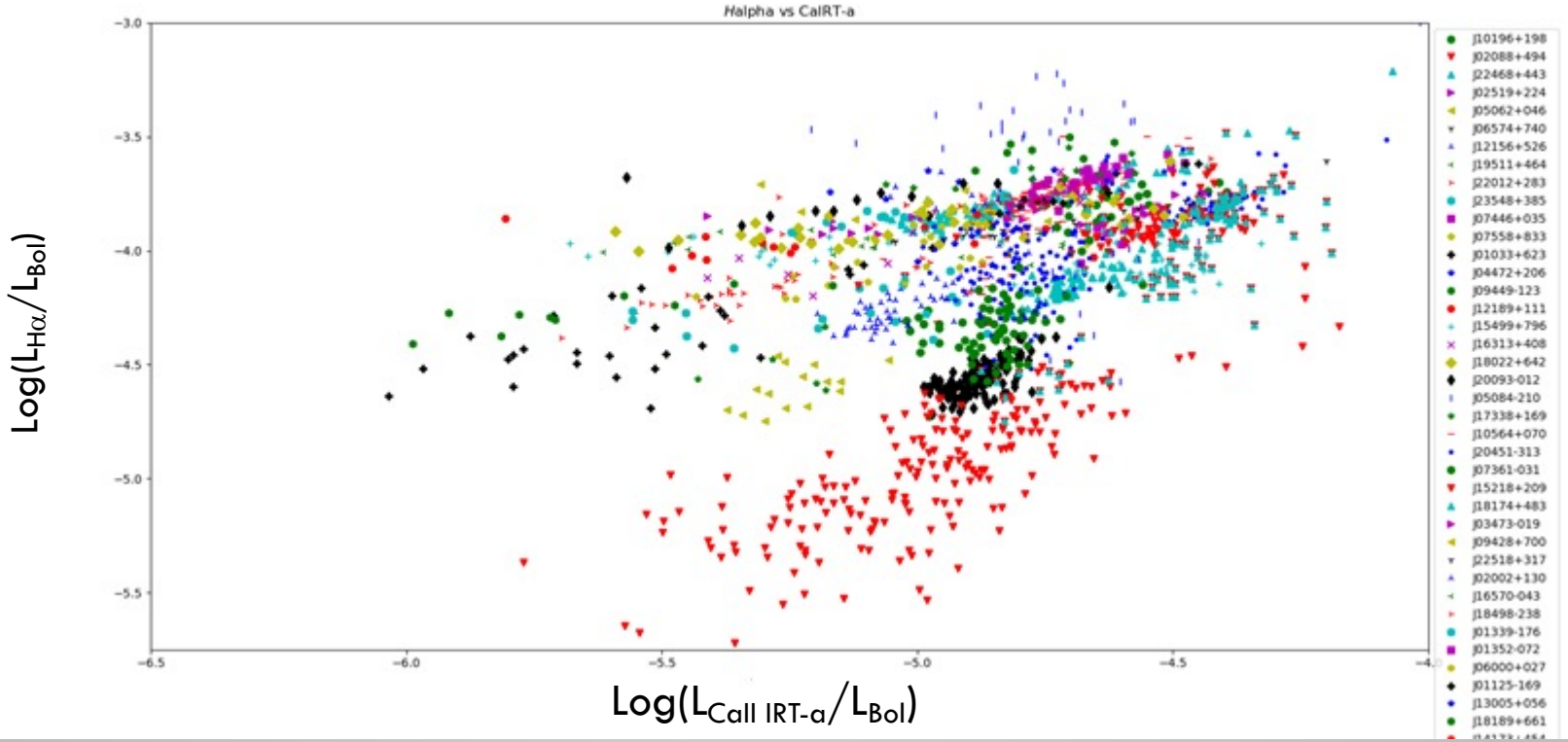
→ End up in the flux-flux relationship from the whole subsample



Analysis of chromospheric flux-flux relationships in CARMENES sample

End up in the flux-flux relationship from the whole subsample

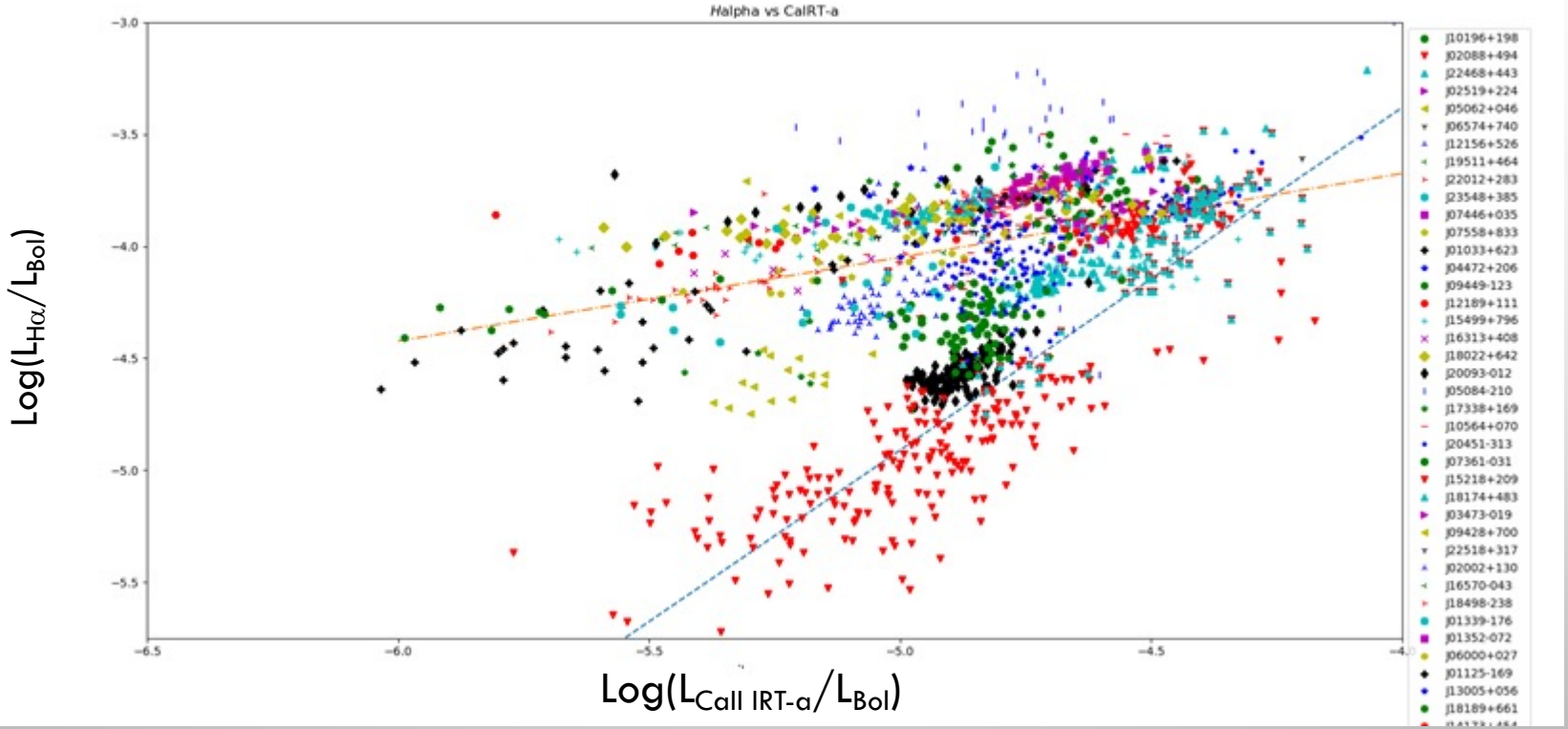
An adding the Martínez-Arnaiz et al.,(2011) values



Analysis of chromospheric flux-flux relationships in CARMENES sample

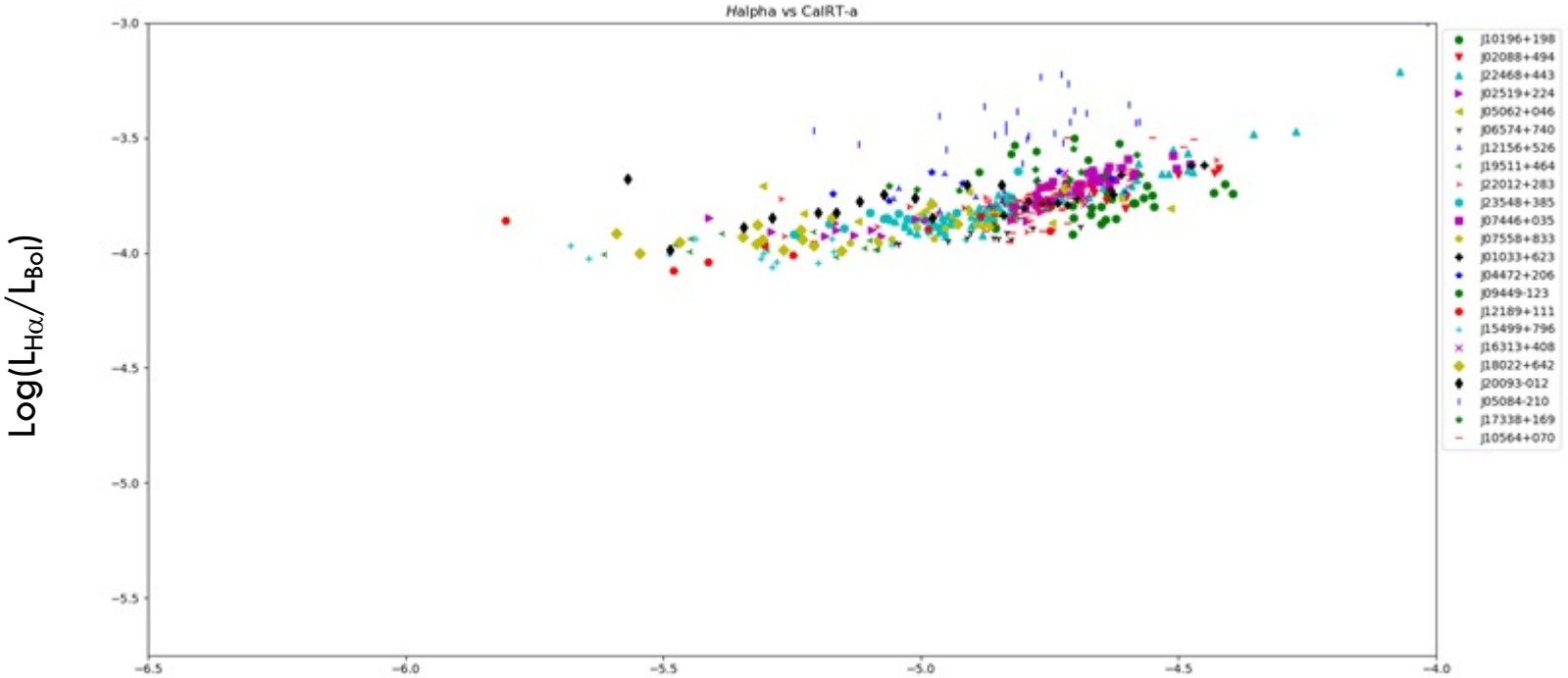
End up in the flux-flux relationship from the whole subsample

An adding the Martínez-Arnaiz et al.,(2011) values, with the fits



Analysis of chromospheric flux-flux relationships in CARMENES sample

Three branches instead of two?



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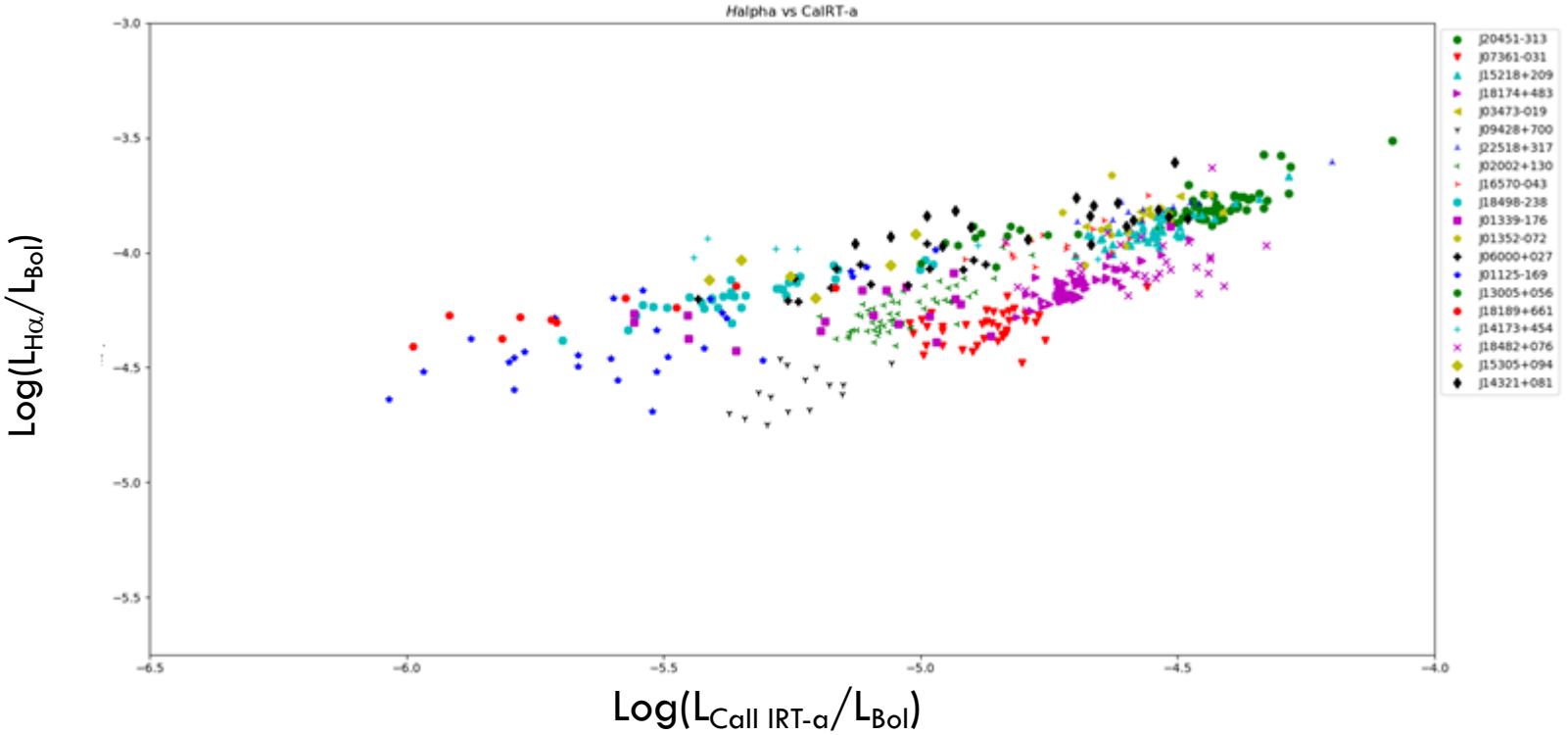

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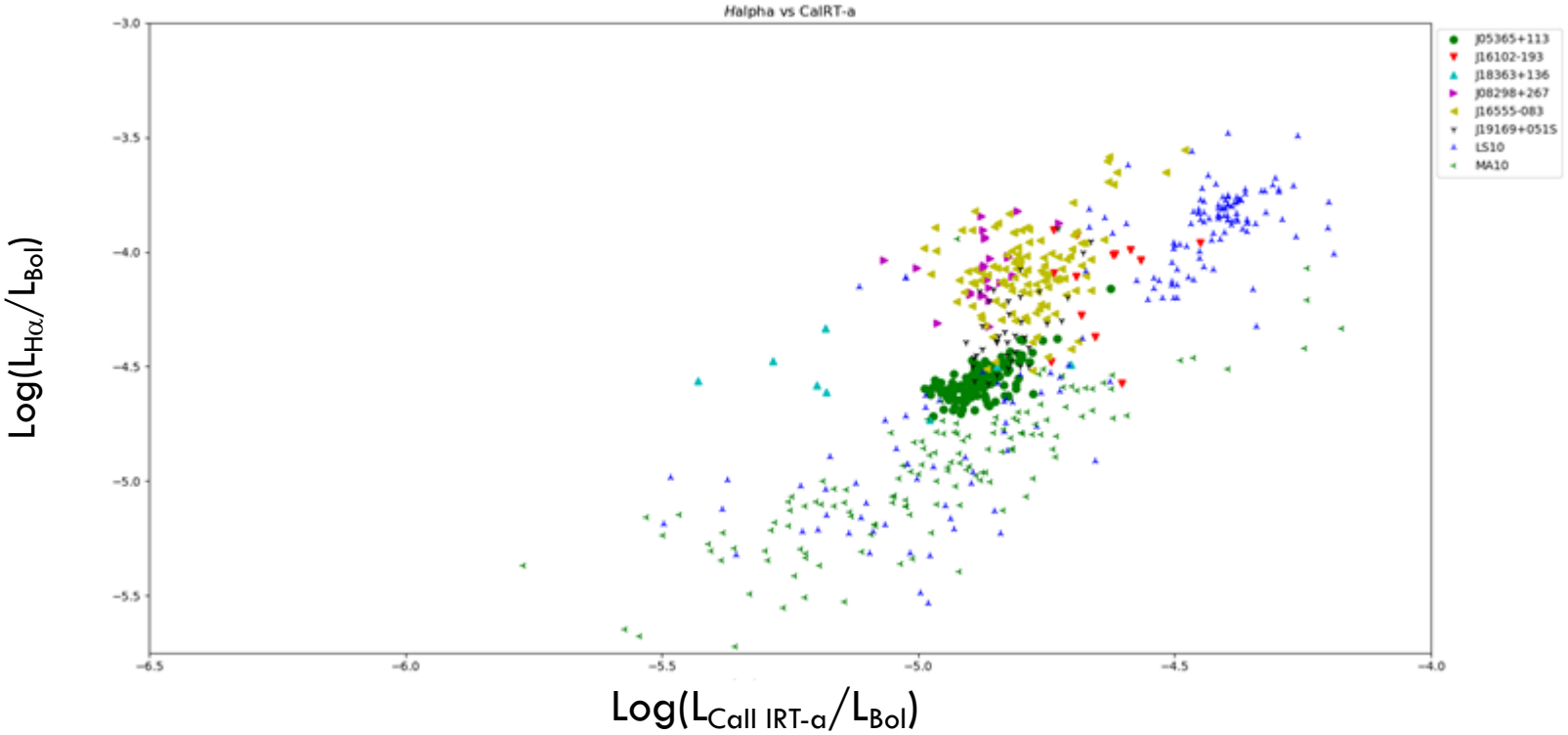

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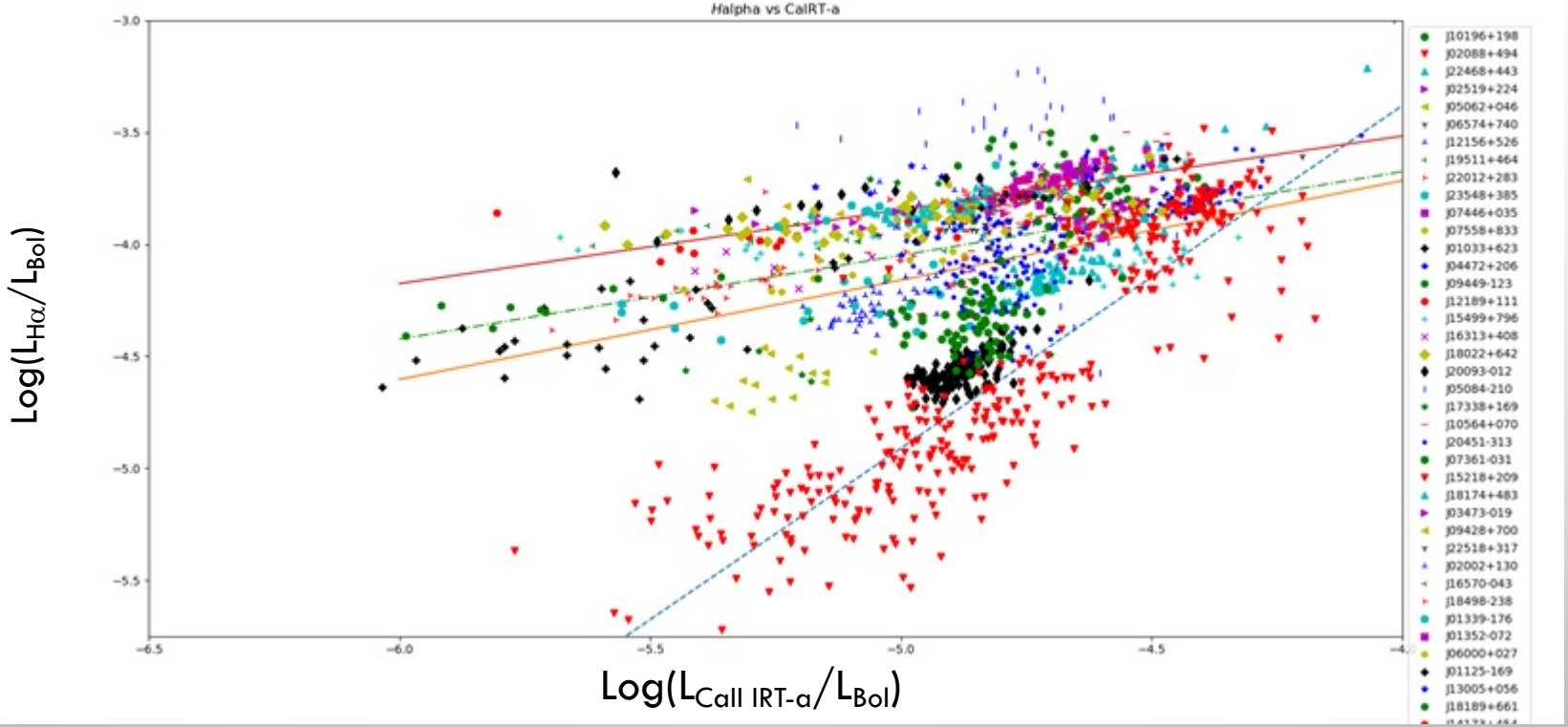

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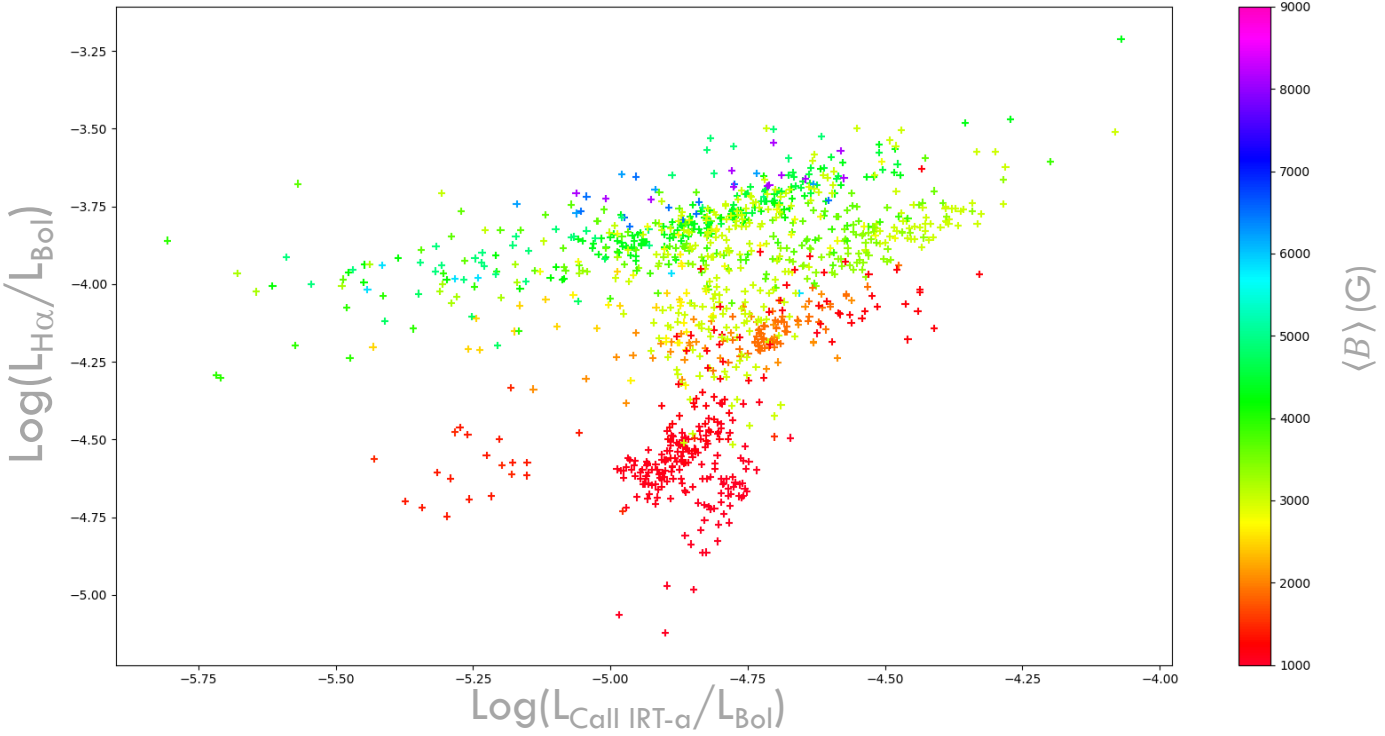
Trying to elucidate this incorporating the Magnetic Fields for the stars of the CARMENES sample – Reiners et al. (2022)



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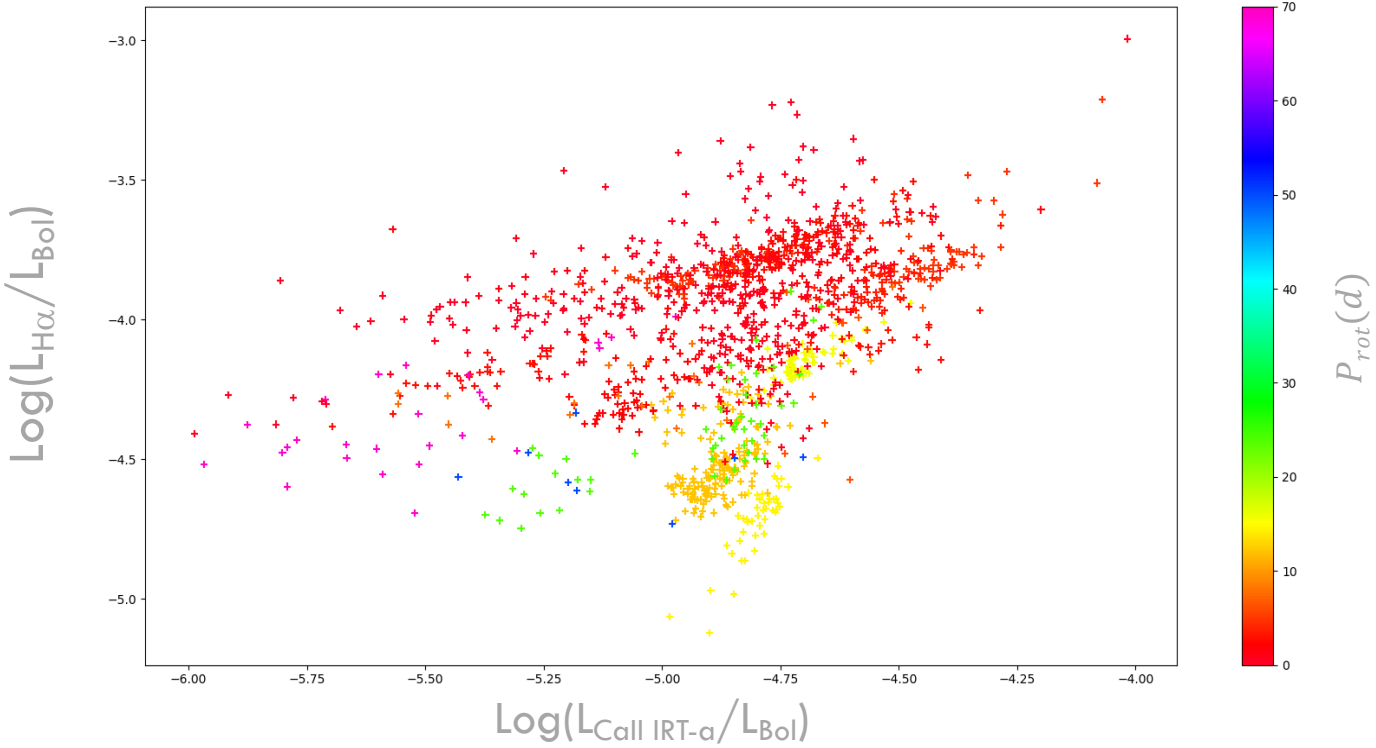
Flux-flux and rotation period w. data from Shan et al.



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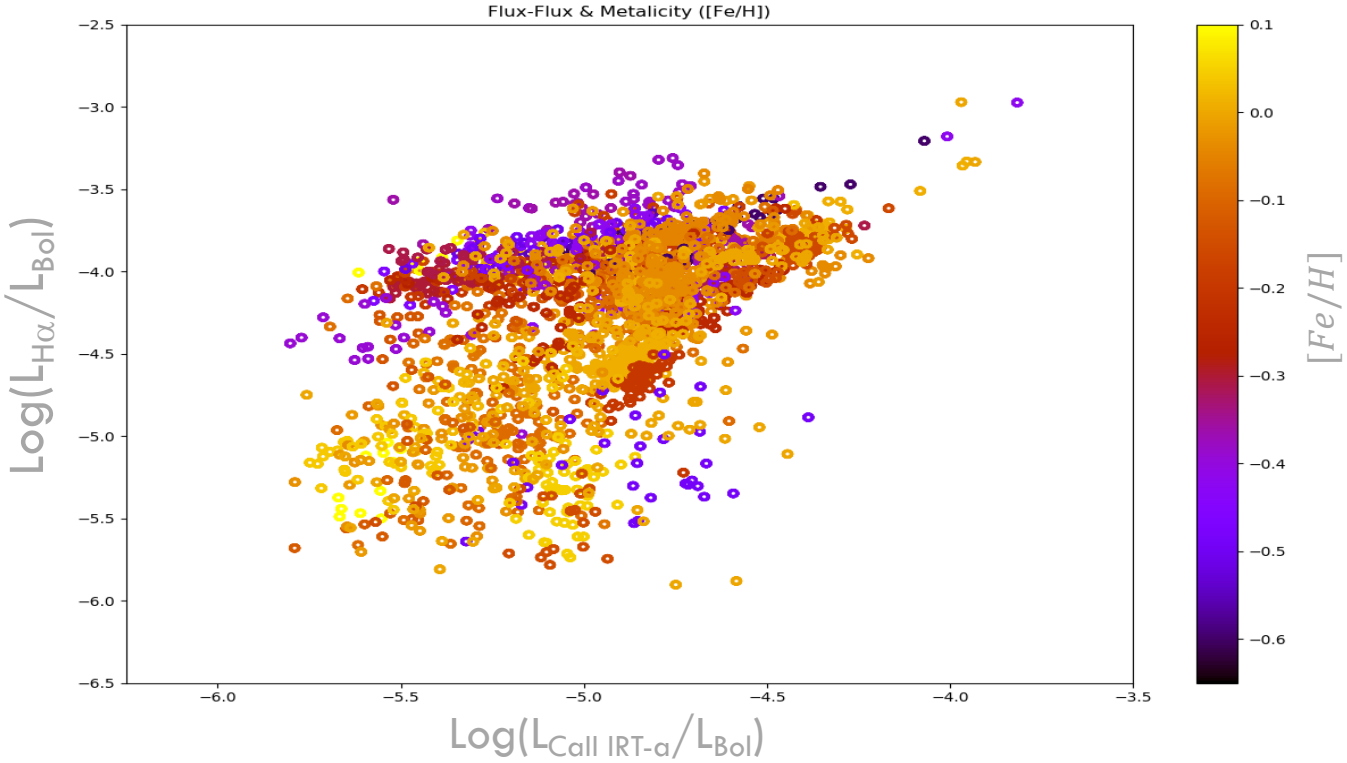
Flux-flux and Metallicity. From the [Fe/H] data in carmencita v104



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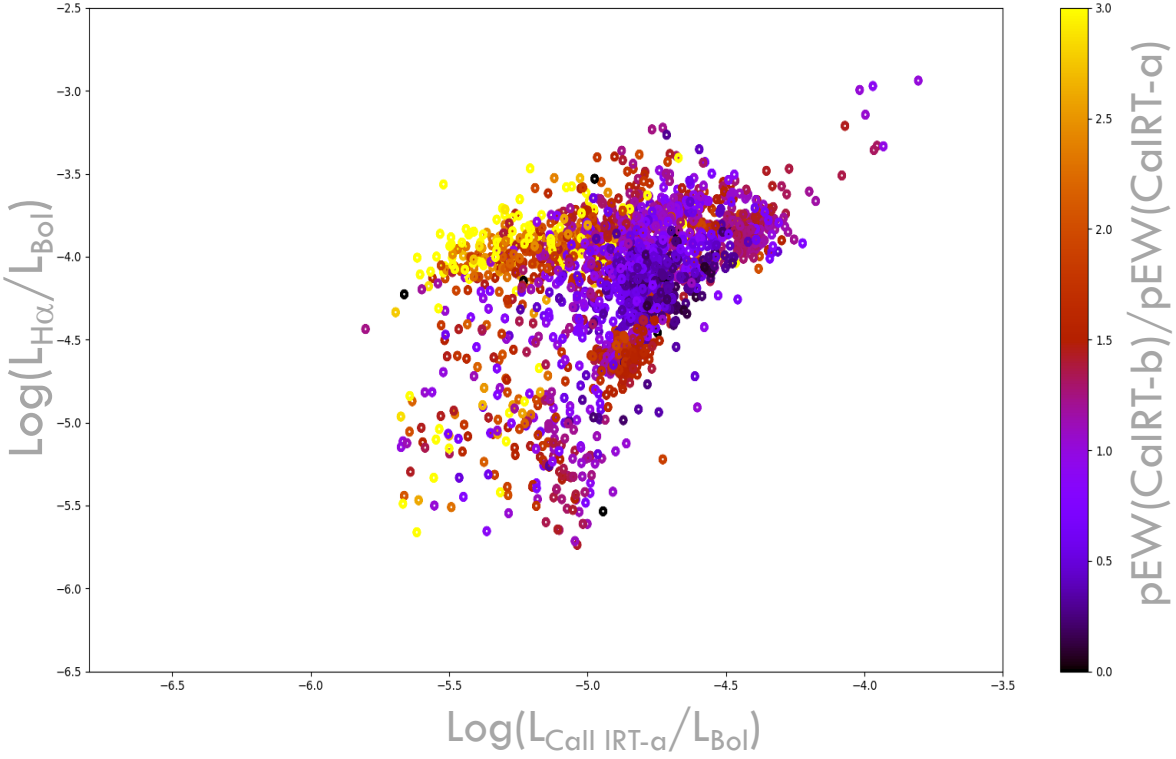
Flux-flux and ratio pEW(CaII IRT-b)/pEW(CaII IRT-a)



$$\frac{pEW(CaII\ IRT-b)}{pEW(CaII\ IRT-a)} = 1.5\text{-}3\ \text{plagues}$$

$$\frac{pEW(CaII\ IRT-b)}{pEW(CaII\ IRT-a)} = 3\text{-}9\ \text{prot.}$$

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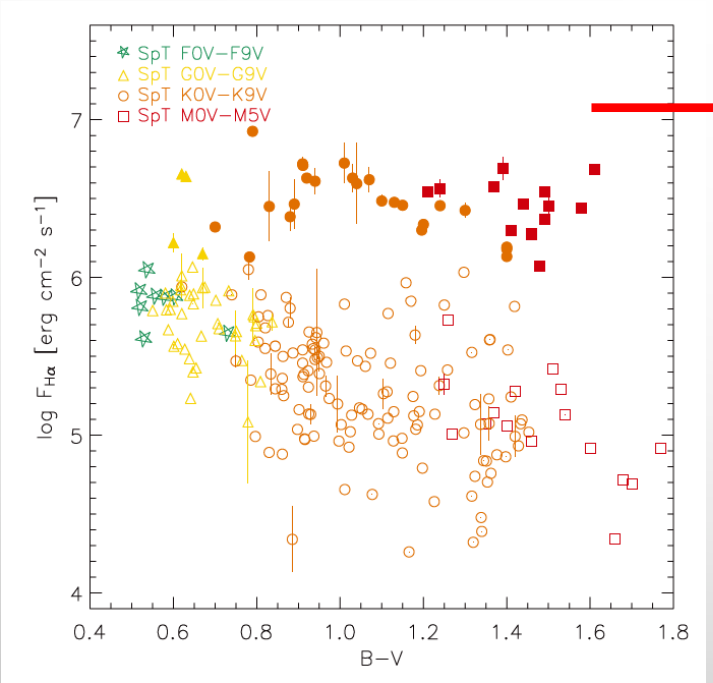
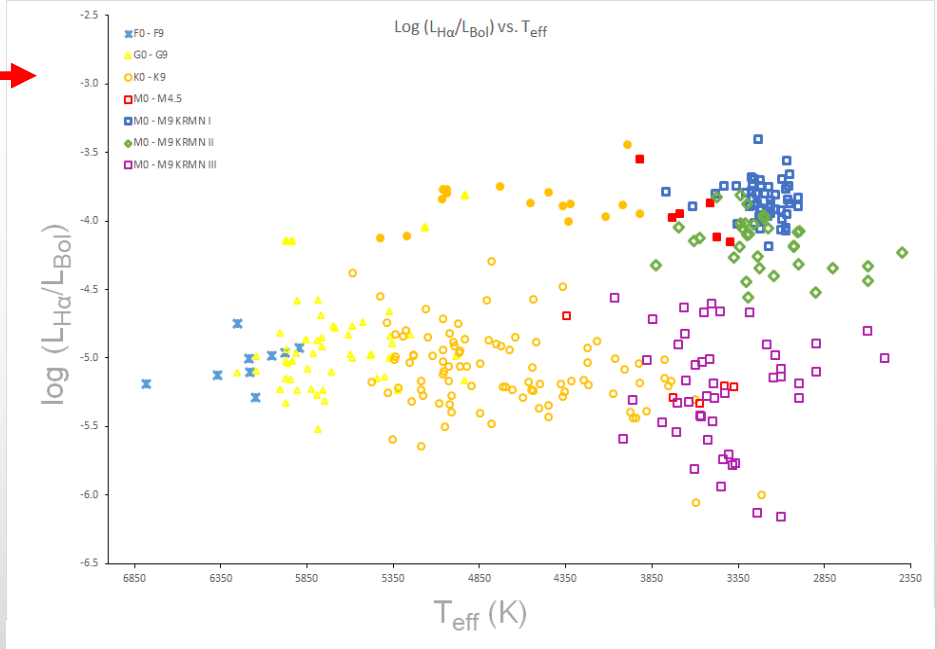
pEW(Hα) vs T_{eff} (data from carmencita v104)

Filling the Vaughan-Preston gap?





Taken from Martínez-Arnáiz et al., (2011)

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Next steps:

- Depict mean values (out of flares)
- Complete the analysis with HeD3, NaD1&NaD2 in VIS spectra
- Extend this analysis to other lines in the NIR spectra: HeIλ10833, Paschen lines,….