

# Seismic Quantities

pySYD pipeline

## *Information that we can obtain*

- In this study they look for Solar-like oscillations in a star's power spectrum ( $\leq 20 \mu\text{Hz}$ )
- They characterized by two globaleismic quantities:

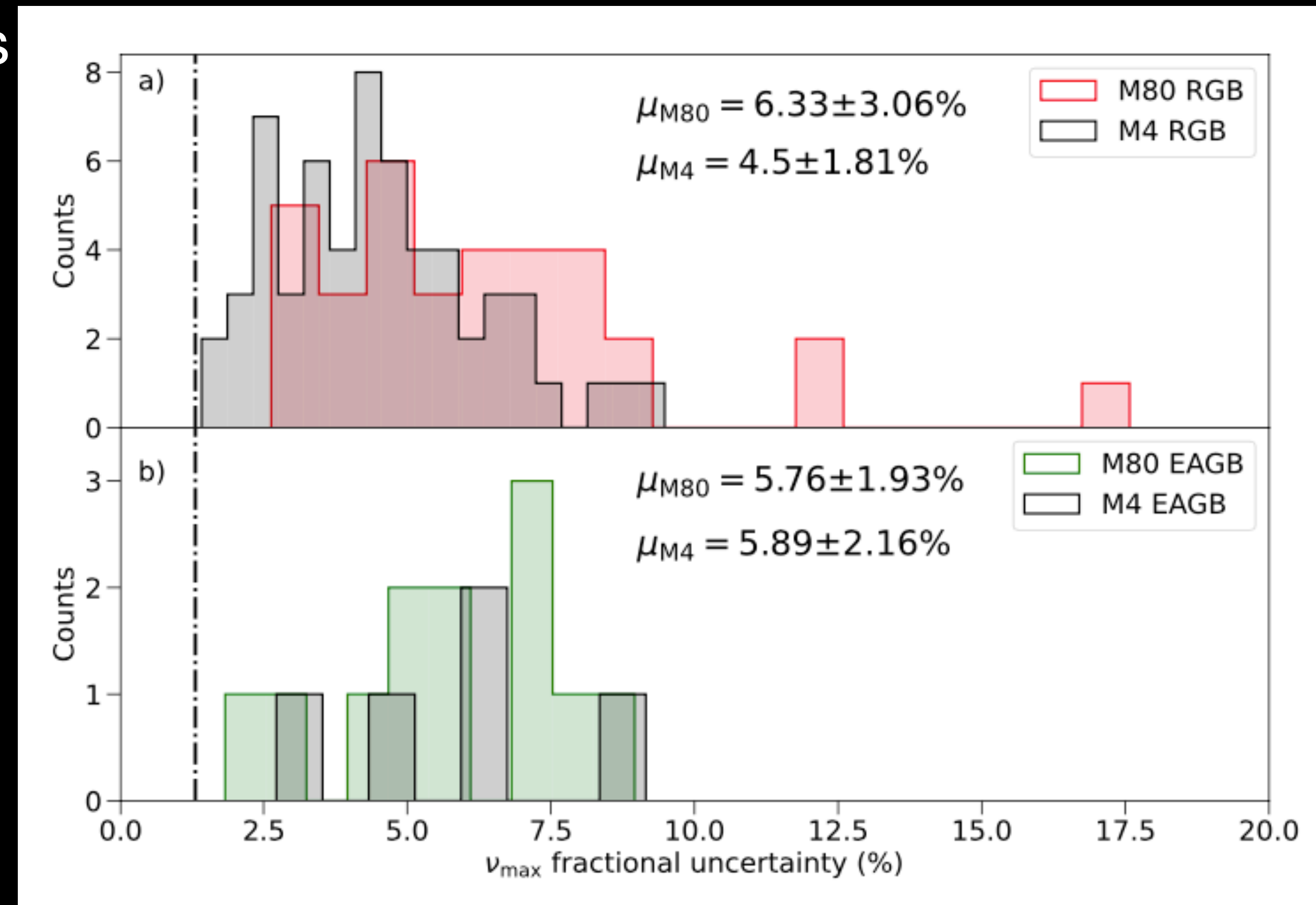
$\nu_{max}$  the frequency of the maximum acoustic power,

and

$\Delta\nu$  the large frequency spacing between adjacent overtone oscillation modes.

$$\nu_{max} \propto g T_{eff}^{-1/2}$$

$$\Delta\nu \propto \rho^{-1/2}$$



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## *Information that we need*

- They also have dependency of  $T_{\text{eff}}$  and  $L$

- The  $T_{\text{eff}}$  (JHK , UVBRI, Bp Rp ), (dereddened)

$$\theta_{\text{eff}} = b_0 + b_1 X + b_2 X^2 + b_3 X[\text{Fe}/\text{H}] + b_4 [\text{Fe}/\text{H}] + b_5 [\text{Fe}/\text{H}]^2$$

where  $\theta_{\text{eff}} = 5040/T_{\text{eff}}$ ,  $X$  represents the colour, and  $b_i$  ( $i = 0, \dots, 5$ ) are the coefficients of the fit.

González Hernández, J. I. 2009. doi:10.1051/0004-6361/200810904.

Mucciarelli, A. 2020. doi:10.3847/2515-5172/ab8820.

- And for  $L$

$$\log(L/L_{\odot}) = -0.4 [V_0 - (m - M)_0 + BC - M_{\text{bol},\odot}]$$

Alonso, A., 1999. doi:10.1051/aas:1999521.

$$\nu_{\text{max}} \propto g T_{\text{eff}}^{-1/2}$$

$$\Delta\nu \propto \rho^{-1/2}$$

$$\left(\frac{M}{M_{\odot}}\right) \simeq \left(\frac{\nu_{\text{max}}}{\nu_{\text{max},\odot}}\right)^3 \left(\frac{\Delta\nu}{\Delta\nu_{\odot}}\right)^{-4} \left(\frac{T_{\text{eff}}}{T_{\text{eff},\odot}}\right)^{3/2} \quad (1)$$

$$\left(\frac{M}{M_{\odot}}\right) \simeq \left(\frac{\Delta\nu}{\Delta\nu_{\odot}}\right)^2 \left(\frac{L}{L_{\odot}}\right)^{3/2} \left(\frac{T_{\text{eff}}}{T_{\text{eff},\odot}}\right)^{-6} \quad (2)$$

$$\left(\frac{M}{M_{\odot}}\right) \simeq \left(\frac{\nu_{\text{max}}}{\nu_{\text{max},\odot}}\right) \left(\frac{L}{L_{\odot}}\right) \left(\frac{T_{\text{eff}}}{T_{\text{eff},\odot}}\right)^{-7/2} \quad (3)$$

$$\left(\frac{M}{M_{\odot}}\right) \simeq \left(\frac{\nu_{\text{max}}}{\nu_{\text{max},\odot}}\right)^{12/5} \left(\frac{\Delta\nu}{\Delta\nu_{\odot}}\right)^{-14/5} \left(\frac{L}{L_{\odot}}\right)^{3/10} \quad (4)$$

Howell, M., 2023. doi:10.48550/arXiv.2307.07158.