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INFERRING STELLAR ROTATION PERIODS USING K2 AT SCALE

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ABSTRACT

We measure all the periods.

1. INTRODUCTION

Some words... (Luger et al. 2017)

(Foreman-Mackey et al. 2017) demonstrated that celerite could be used to compute the likelihood of a GP model where the kernel is a mixture of stochastically-driven, damped simple harmonic oscillators (SHOs). The power spectral density of each term in this model is:

$$S_k(\omega) = \sqrt{\frac{2}{\pi}}\,\frac{s_k\,\omega_k}{(\omega^2-{\omega_k}^2)^2+{\omega_k}^2\,\omega^2/{q_k}^2} \tag{1}$$

where s_k is the driving power, ω_k is the un-damped frequency, and q_k is the quality factor of the oscillator. We find that a restricted mixture of three SHO terms is flexible enough to capture the astrophysical variability while remaining simple enough to be easily interpreted. We set the quality factor of the first oscillator to $Q_1 = 1/\sqrt{2}$ to capture the stellar granulation using a "Harvey model". We constrain the other two terms with

$$a_2 \ge a_3, \tag{2}$$

$$P_2 = 2\,P_3, \quad \text{and} \tag{3}$$

$$q_2 \ge q_3 > 1/2 \tag{4}$$

where $a_k = s_k\,\omega_k\,q_k$ is the amplitude of the oscillator and $P_k = 4\,\pi\,q_k/\sqrt{4\,{q_k}^2-1}\,\omega_k$ is the oscillation period.

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Facility: Kepler

Software: corner.py (Foreman-Mackey 2016), Eigen (Guennebaud et al. 2010), emcee (Foreman-Mackey et al. 2013), matplotlib (Hunter et al. 2007), numpy (Van Der Walt et al. 2011), scipy (Jones et al. 2001).

APPENDIX

There's always an appendix.

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