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Theoretical Limits in Constraining Tidal Quality Factors of Binary Stars

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ABSTRACT

1. INTRODUCTION

2. METHODS

2.1. *Observational Constraints*

Model input parameters and prior constraints:

	Model Input	Prior	Observational Constraint	Good Unc
M_1	primary mass [$M_\odot$]	$\mathcal{N}(m,s)$	kepler solution (lc eclipse + rvs)	0.001
M_2	secondary mass [$M_\odot$]	$\mathcal{N}(m,s)$	kepler solution (lc eclipse + rvs)	0.001
$P_{\rm rot1,i}$	pri init rotation period [days]	$log\mathcal{N}(m,s)$	dist in young open clusters	
$P_{\rm rot2,i}$	sec init rotation period [days]	$log\mathcal{N}(m,s)$	dist in young open clusters	
$P_{\rm orb,i}$	init orbital period [days]	$\mathcal{U}(4.0,10.0)$	uninformed	
e_i	init eccentricity	$\mathcal{U}(0,0.5)$	uninformed	
age	system age [yr]	$\mathcal{N}(m,s)$	open cluster age	10%
$\varepsilon_{1,i}$	pri init obliquity [deg]	$\mathcal{U}(0,30)$	uninformed	
$\varepsilon_{2,i}$	sec init obliquity [deg]	$\mathcal{U}(0,30)$	uninformed	
$\mathcal{Q}_1$	pri tidal phase lag	$\mathcal{U}(4,9)$	uninformed	
$\mathcal{Q}_2$	sec tidal phase lag	$\mathcal{U}(4,9)$	uninformed	
τ_1	pri tidal time lag [log(s)]	$\mathcal{U}(-4,2)$	uninformed	
τ_2	sec tidal time lag [log(s)]	$\mathcal{U}(-4,2)$	uninformed	

Model output parameters and likelihood constraints:

	Model Output	Likelihood	Observational Constraint	Good Unc
$P_{\rm rot1,f}$	pri final rotation period [days]	$\mathcal{N}(m,s)$	lc autocorrelation function	0.1
$P_{\rm rot2,f}$	sec final rotation period [days]	$\mathcal{N}(m,s)$	spectroscopic $v \sin i$	0.1
$P_{\rm orb,f}$	final orbital period [days]	$\mathcal{N}(m,s)$	lc lomb scargle	10^{-5}
e_f	final eccentricity	$\mathcal{N}(m,s)$	lc eclipse + rvs	0.001
$R_{1,f}$	pri final radius [$R_\odot$]	$\mathcal{N}(m,s)$	stellar models + photometry	0.01
$R_{2,f}$	sec final radius [$R_\odot$]	$\mathcal{N}(m,s)$	eclipse shape + pri radius	0.01
$L_{1,f}$	pri final lumniosity [$L_\odot$]	$\mathcal{N}(m,s)$	stellar models + photometry	0.1
$L_{2,f}$	sec final lumniosity [$L_\odot$]	$\mathcal{N}(m,s)$	stellar models + photometry	0.1
$T_{\rm eff1,f}$	pri final temperature [K]	$\mathcal{N}(m,s)$	stellar models + spectra	
$T_{\rm eff2,f}$	sec final temperature [K]	$\mathcal{N}(m,s)$	stellar models + spectra	

3. RESULTS

Figure 1. EQTIDE + STELLAR: CPL model

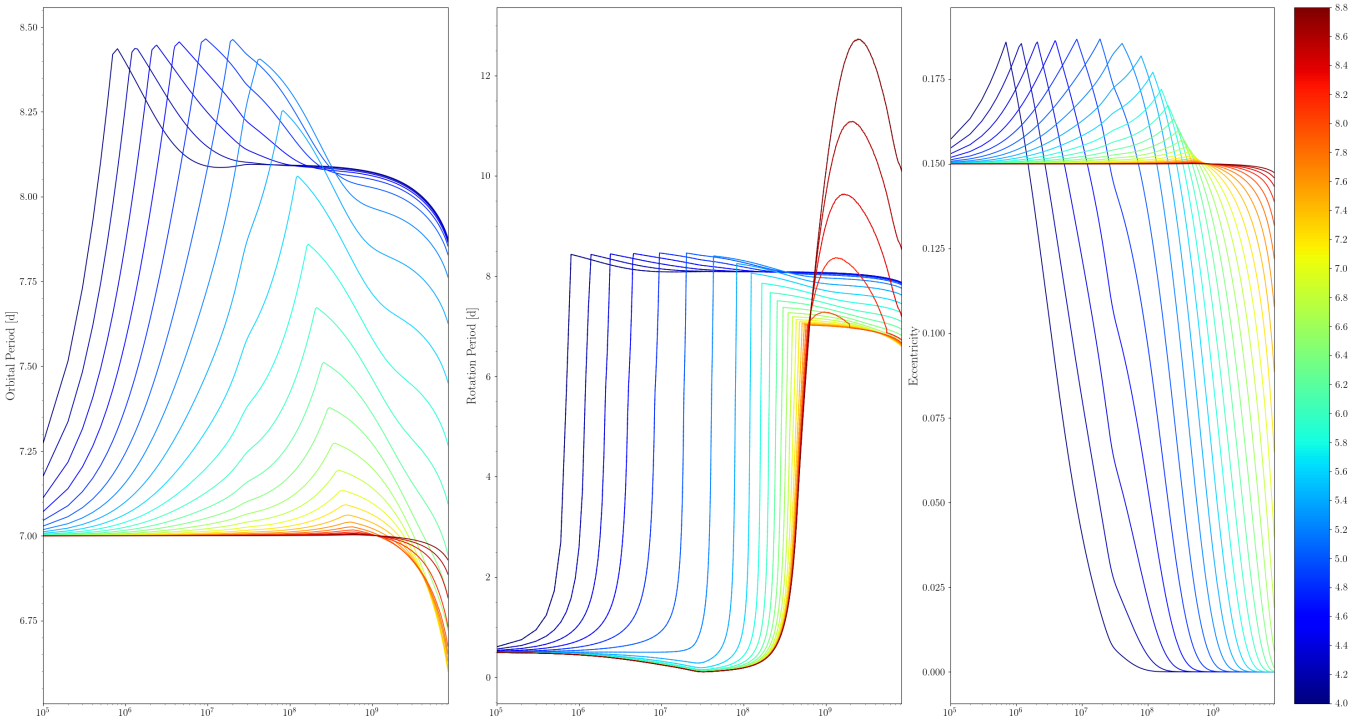
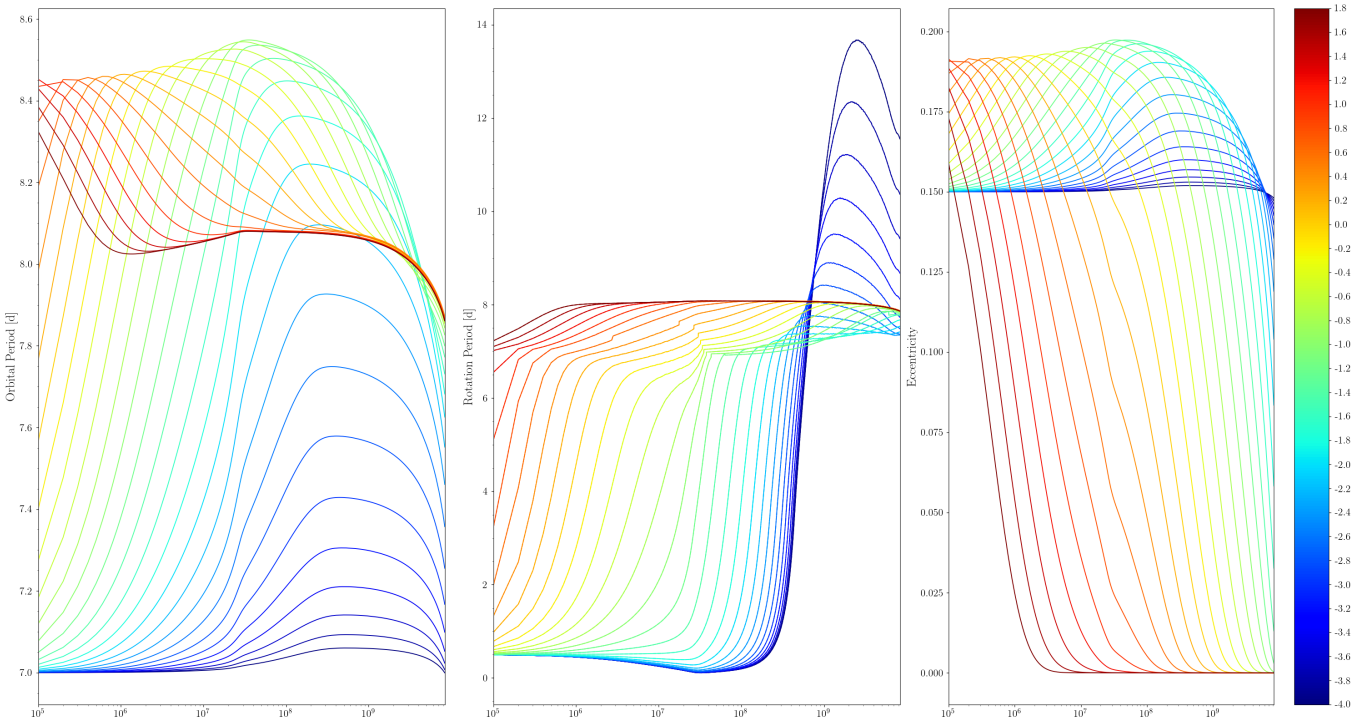


Figure 2. EQTIDE + STELLAR: CTL model



4. DISCUSSION

5. CONCLUSION

APPENDIX

REFERENCES