

CoRoT 105906206: a δ Scuti Candidate in an Eclipsing Binary

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Introduction

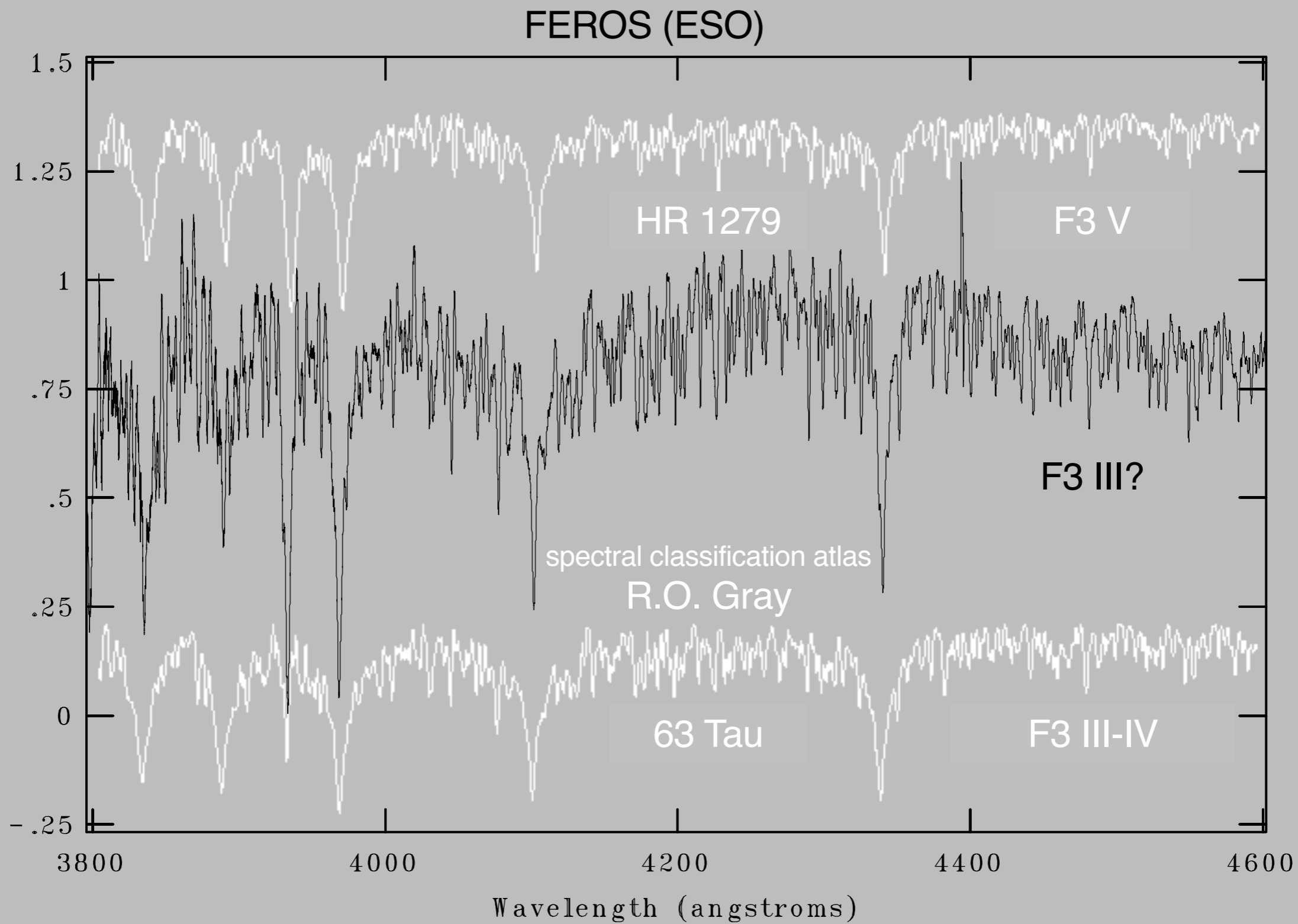
Why study pulsating stars in eclipsing binary systems?

- ★ Determination of several physical parameters of the components
(including masses and radii)
- ★ Test stellar models → better understanding of stellar interiors
and stellar evolution



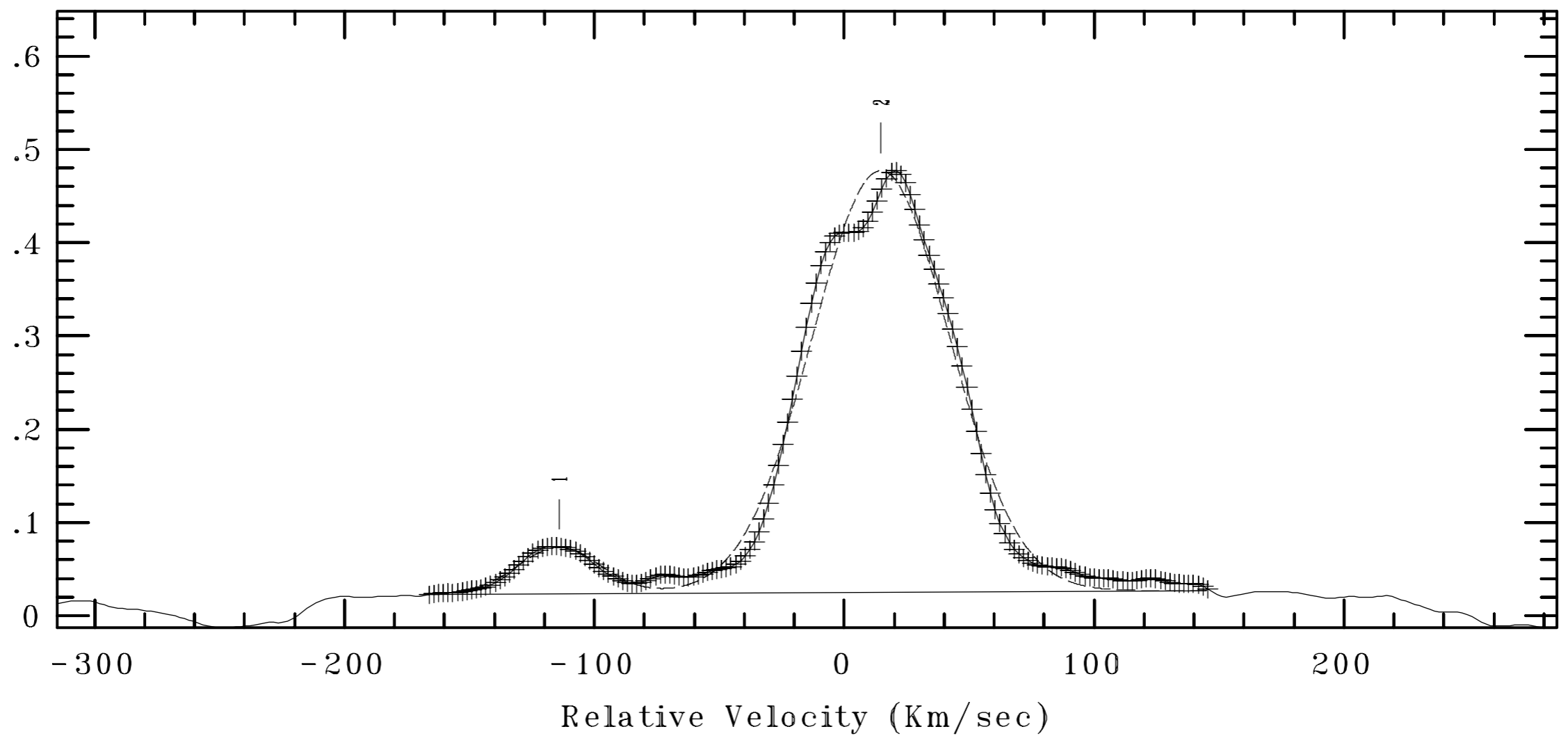
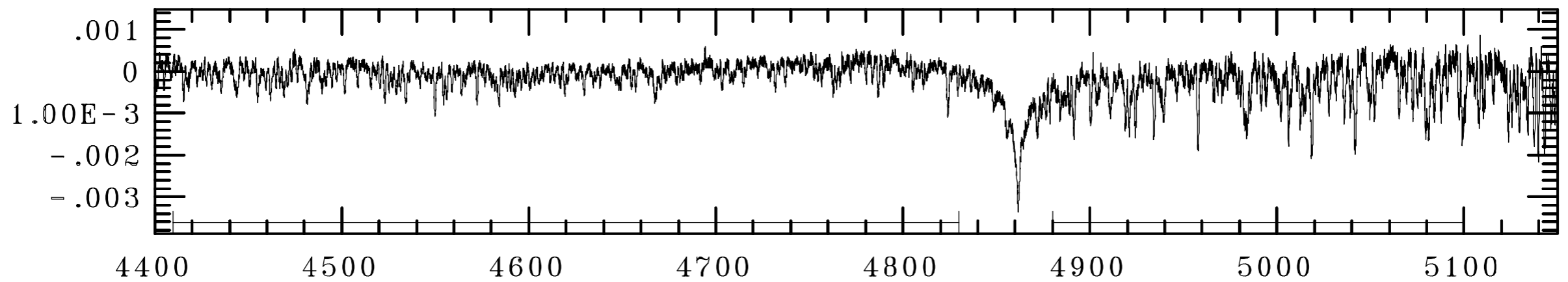
- ★ CoRoT → several candidates suitable for this kind of study
- ★ Combined with ground-based spectroscopic observations

CoRoT 105906206 Spectral Sample

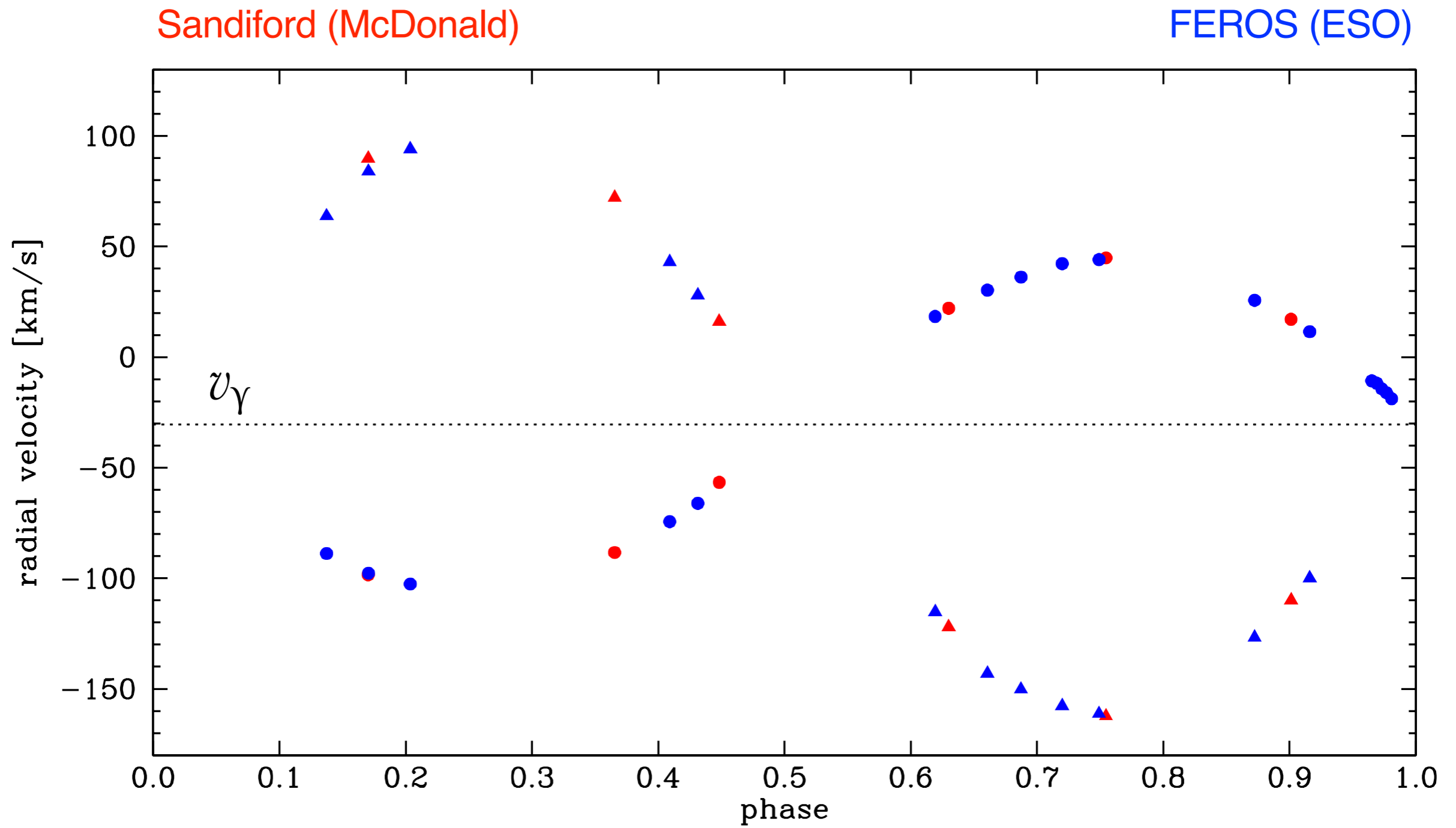


Radial Velocities - CCF

FEROS (ESO)

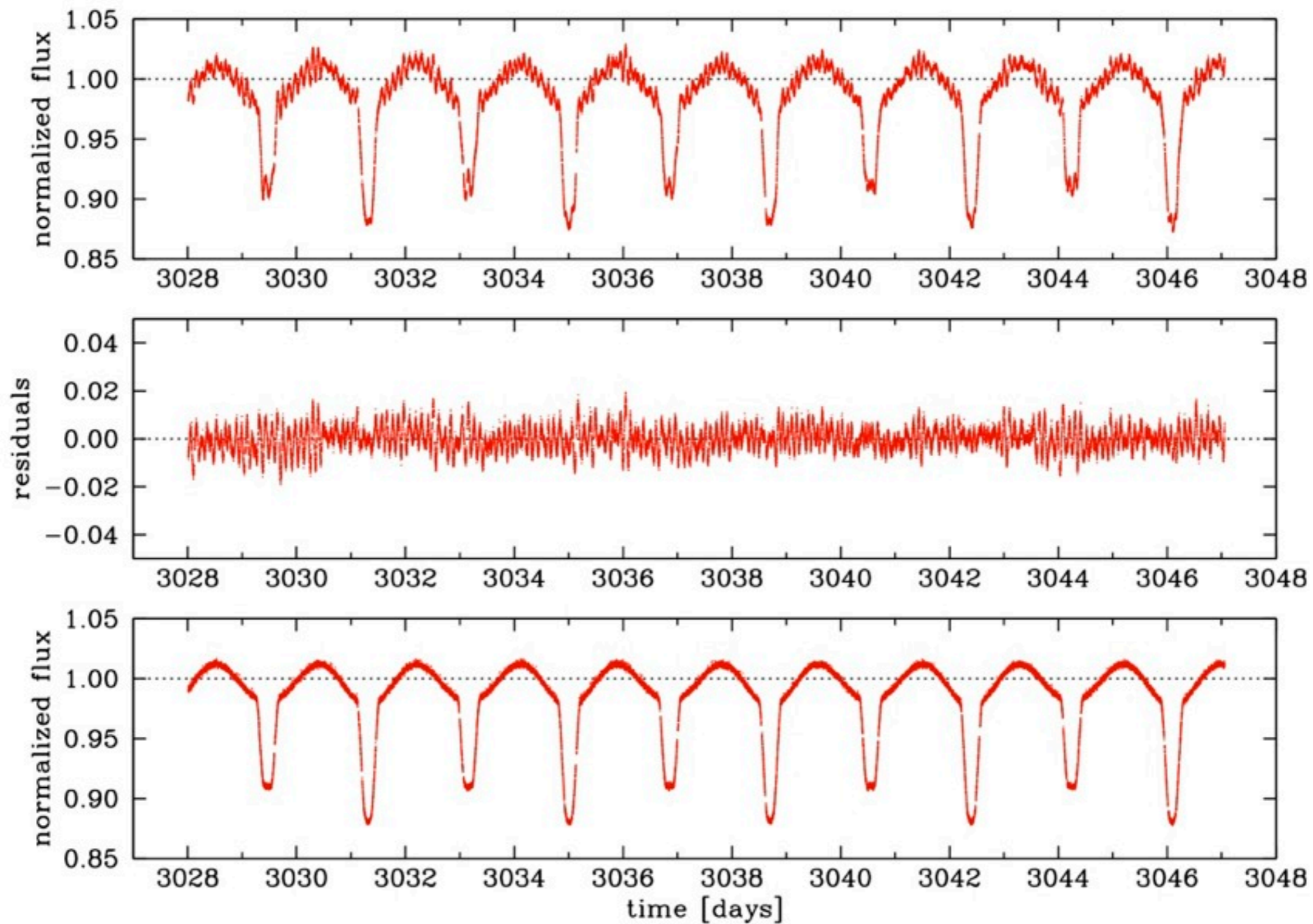


Radial Velocities



$$P \quad a \quad q = M_2/M_1 \quad e = 0 \quad \omega_0 = 0$$

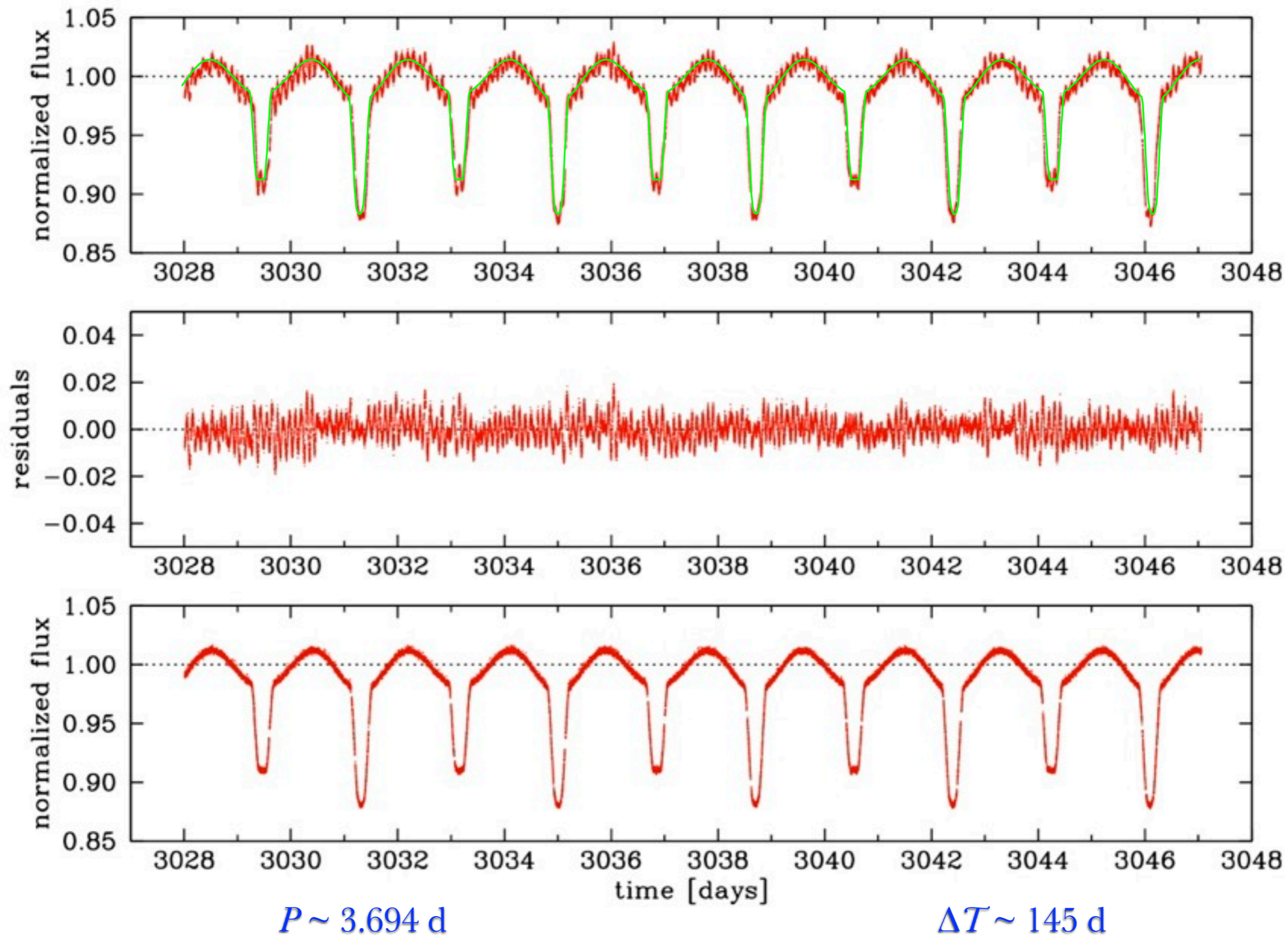
CoRoT LRc02 105906206 Light Curve Sample



$P \sim 3.694$ d

$\Delta T \sim 145$ d

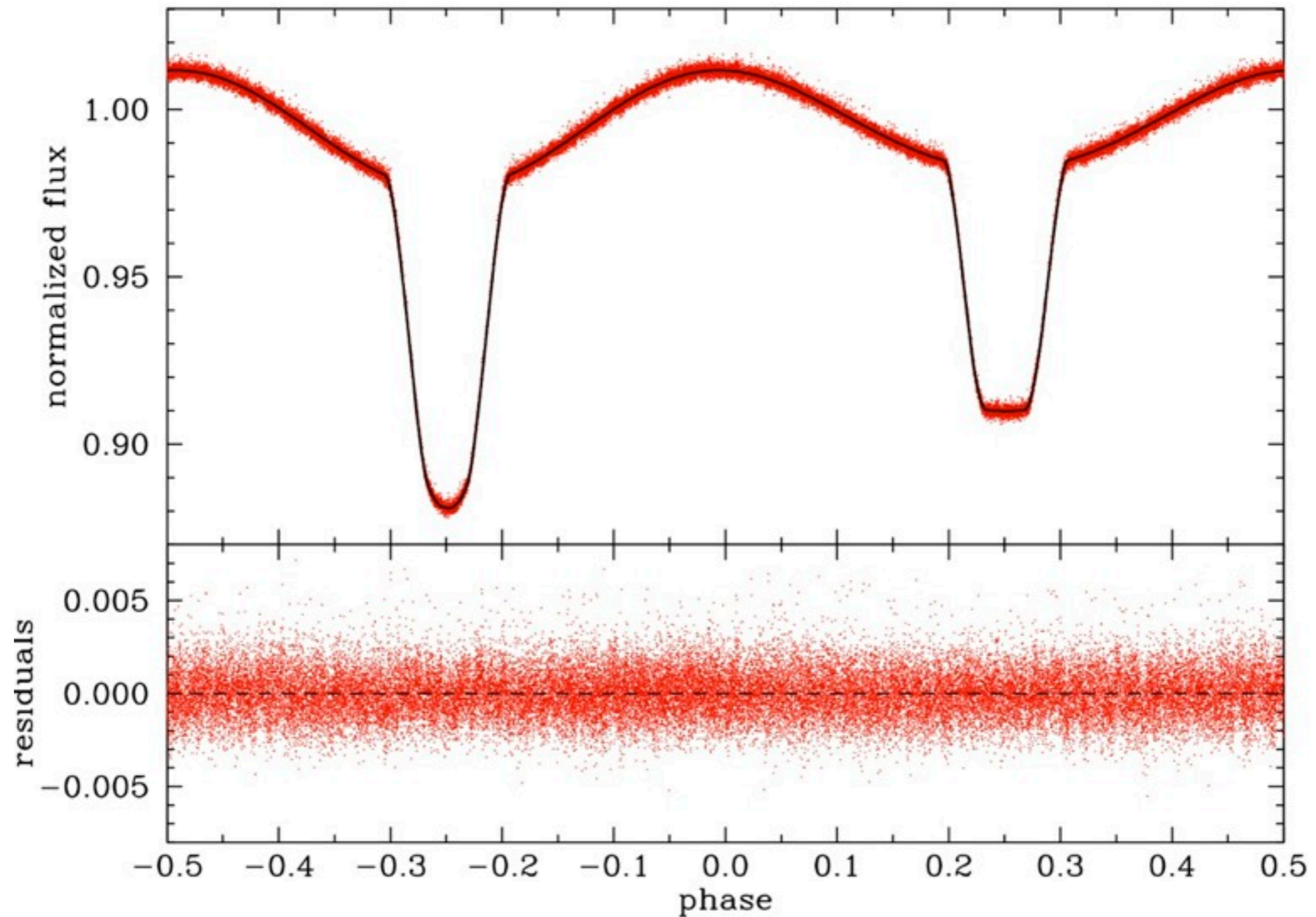
CoRoT LRc02 105906206 Light Curve Sample



Best Model

Iterative pre-whitening process (Period04, PHOEBE)

190 significant frequencies removed

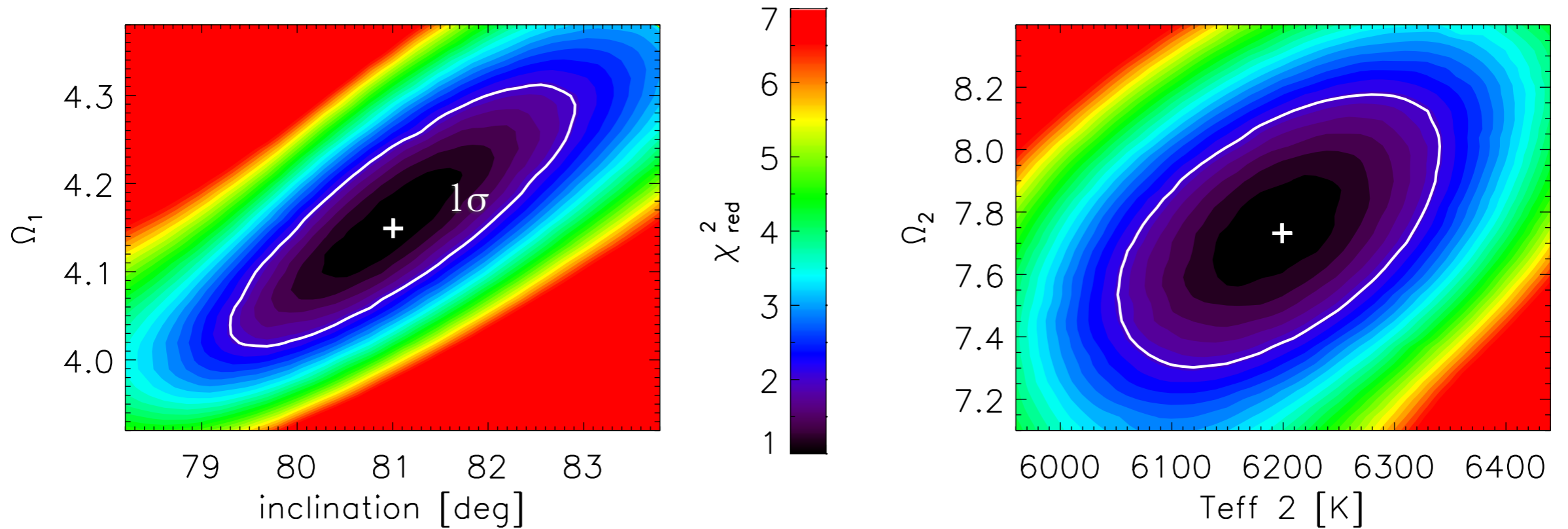


Best Parameters

	Primary	Secondary
P [days]	3.694011 ± 0.000004	
a [R_{\odot}]	15.36 ± 0.08	
$q = M_1/M_2$	0.572 ± 0.008	
v_{γ} [km/s]	-30.40 ± 0.35	
e	0 (fixed)	
ω_0	0 (fixed)	
$T_{\text{eff}1}, T_{\text{eff}2}$ [K]	6800 (F3 III, fixed)	6199 ± 149
i [$^{\circ}$]	81.0 ± 1.9	
Ω_1, Ω_2	4.15 ± 0.16	7.73 ± 0.45
M_1, M_2 [M_{\odot}]	2.27 ± 0.07	1.30 ± 0.05
R_1, R_2 [R_{\odot}]	4.35 ± 0.21	1.35 ± 0.05
$\log g_1, \log g_2$	3.52 ± 0.04	4.29 ± 0.04

Error Estimate

Monte Carlo simulations → confidence levels for two parameter fits



$$T_{\text{eff}, 2} = 6199^{+142}_{-149} \text{ K}$$

$$i = 81.0^{+1.9}_{-1.8} \text{ deg}$$

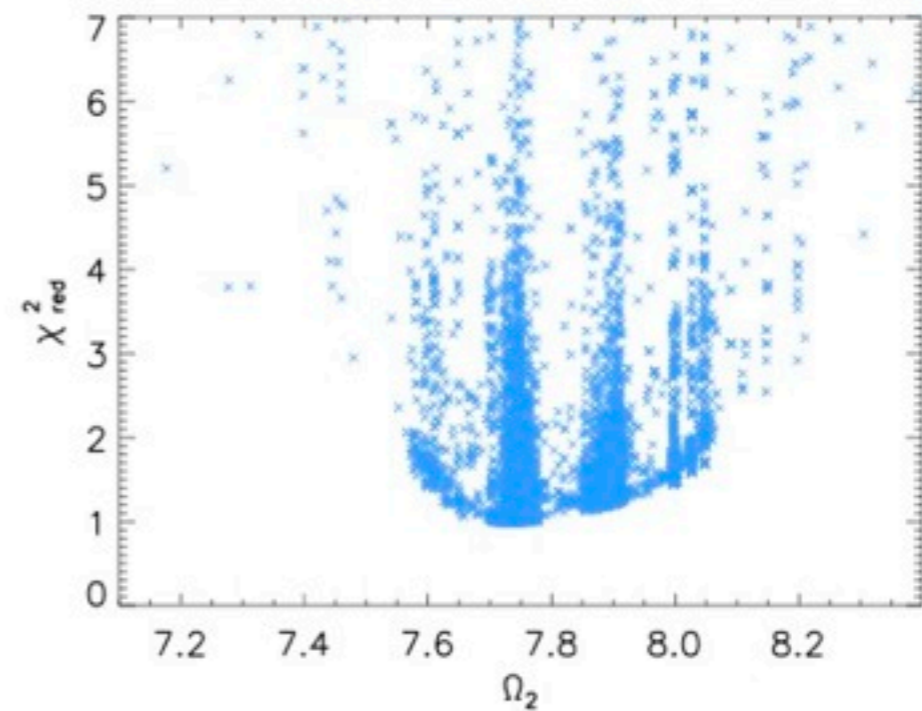
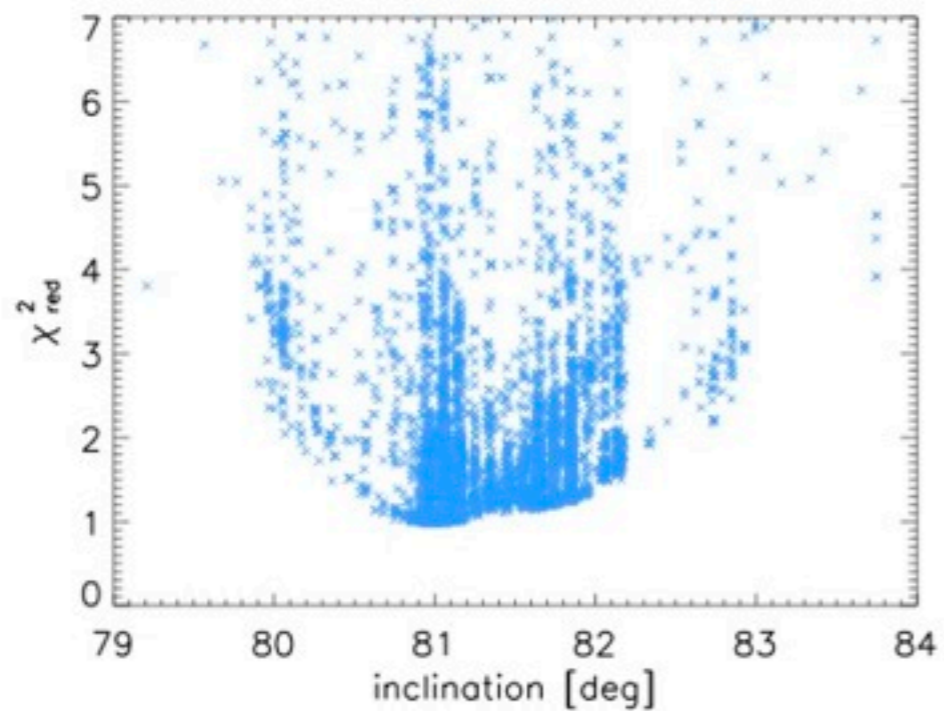
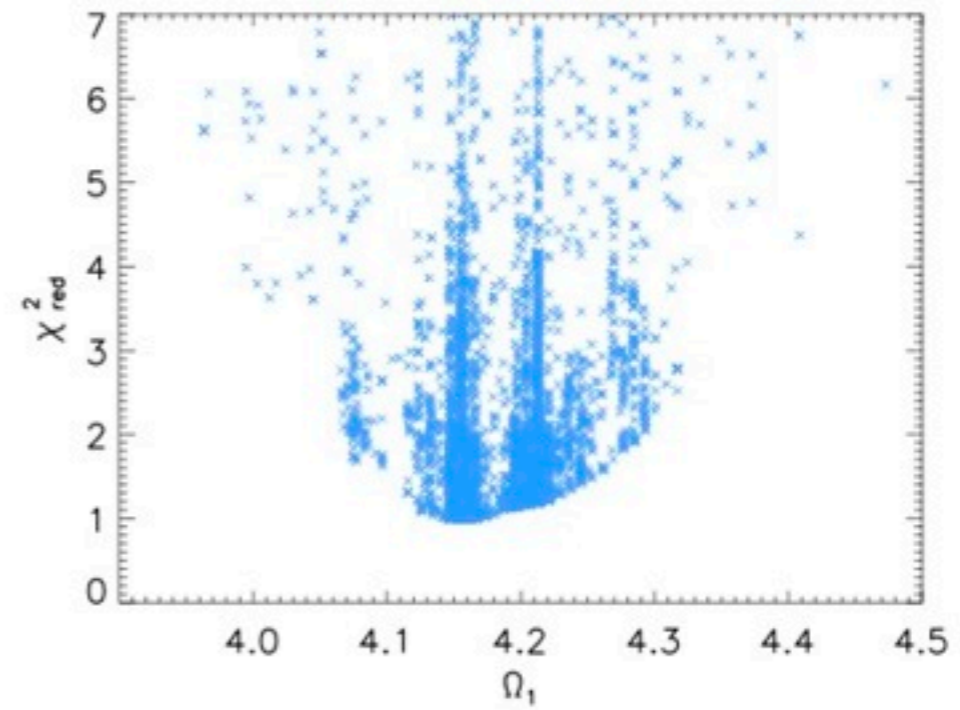
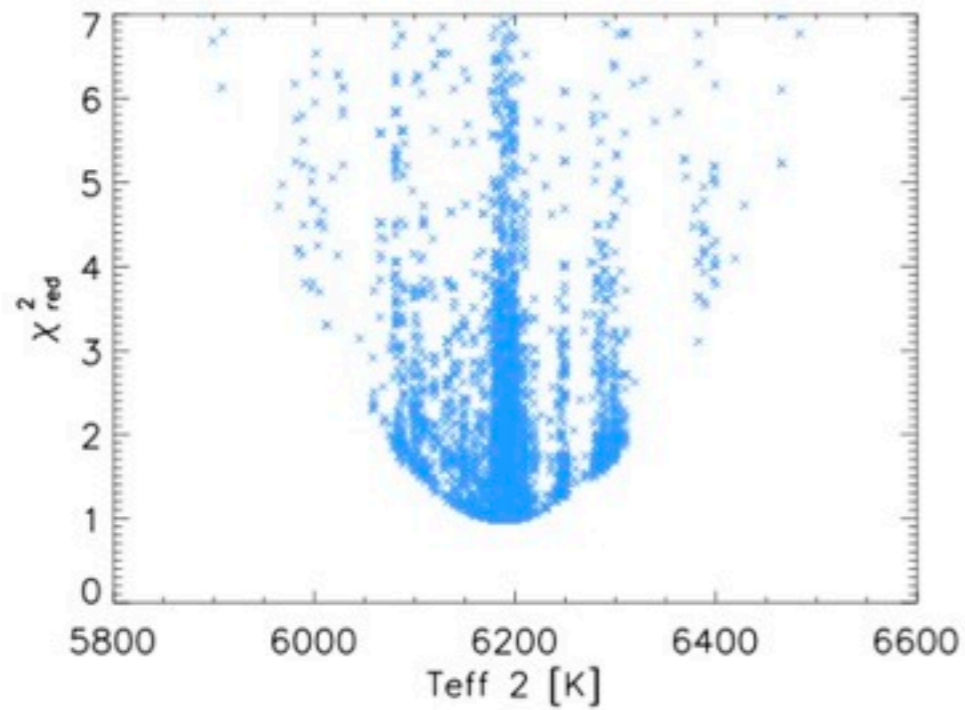
$$\Omega_1 = 4.15^{+0.16}_{-0.13}$$

$$\Omega_2 = 7.73^{+0.45}_{-0.43}$$

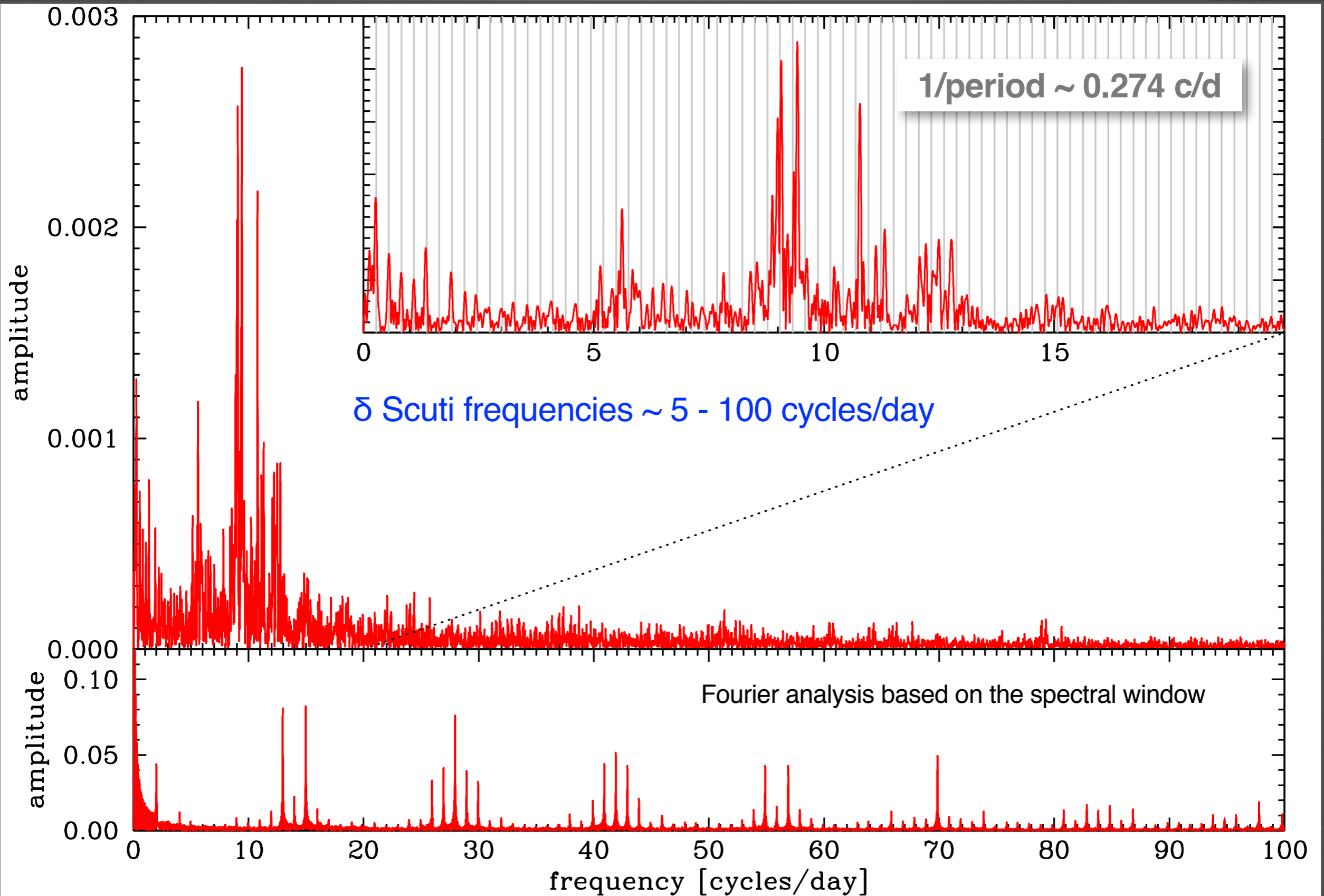
Exploring the Parameter Space

Pikaia algorithm (Charbonneau 1995)

100 individuals over 100 generations \rightarrow about 10,000 points



Amplitude Spectrum



Conclusions and Future Work

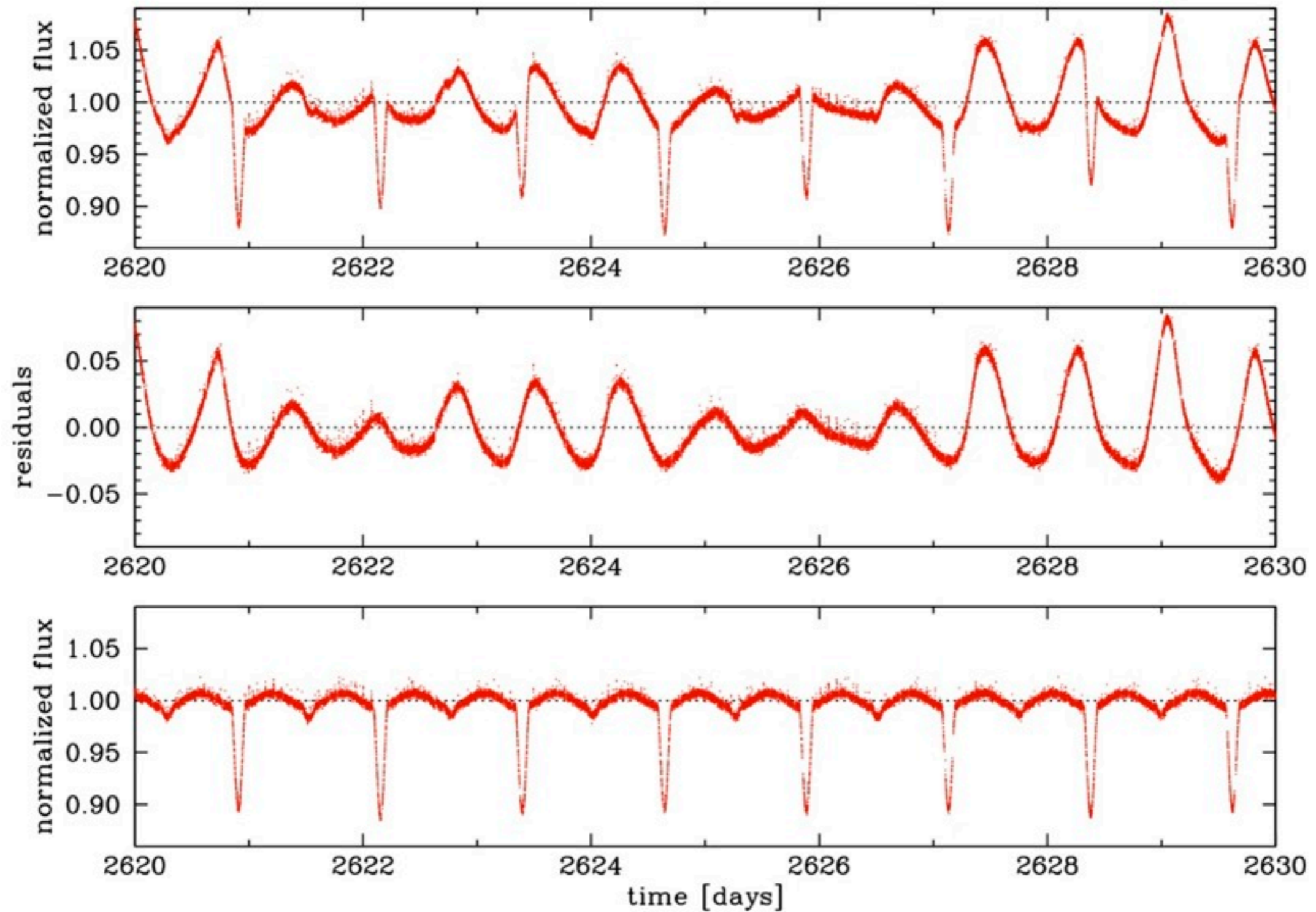
- ★ Pulsation frequencies are consistent with a δ Scuti variable

BUT we still have to:

- ★ perform a detailed study of the frequencies
(independent frequencies X possible combinations)
- ★ estimate the rotation velocity of the components

Conclusions and Future Work

Another ongoing analysis



$P \sim 1.245$ d

$\Delta T \sim 30$ d