

# KIC 009405337

## Q1-17 DR25 TCE Parameters

TCE	Run Type	KOI?	Period (Days)	Epoch (BKJD)	Depth (ppm)	Duration (Hours)	MES	SNR	$R_{\star}$ ( $R_{\odot}$ )	$T_{\star}$ (K)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009405337-01	OBS	No	1.693007	132.904651	707.1	8.660	7.5	8.6	3.00	6964	9.56	16956.60
009405337-02	OBS	No	11.877729	138.354152	1682.7	32.590	10.4	6.7	3.00	6964	12.98	1262.52

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009405337-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—CENT_SATURATED
009405337-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—CENT_SATURATED

**Notes:** OBS = Observed. INJ = Injected. INV = Inverted. SCR = Scrambled.

N = Not Transit-Like. S = Stellar Eclipse. C = Centroid Offset. E = Ephemeris Match.

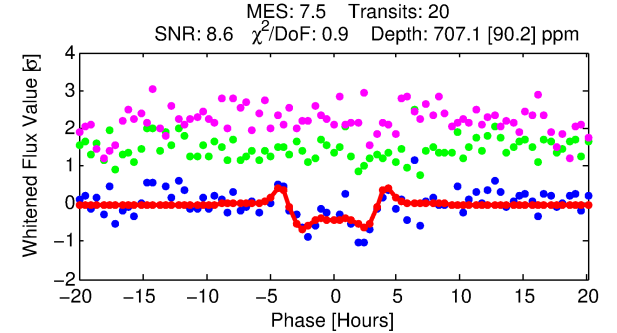
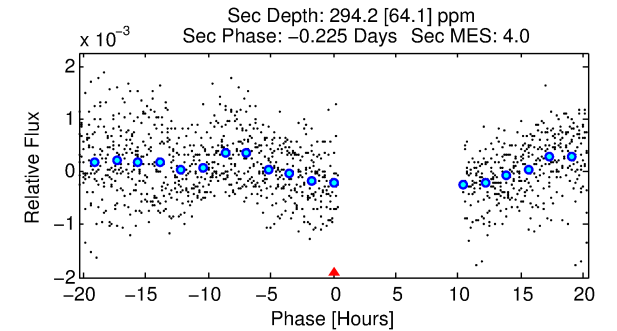
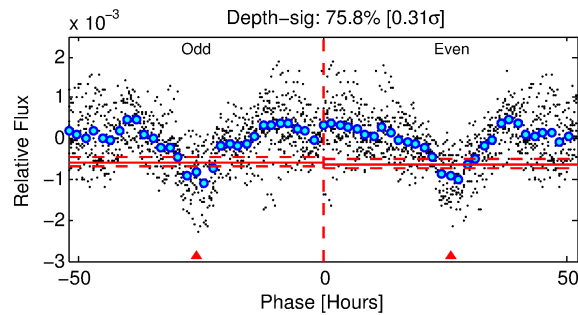
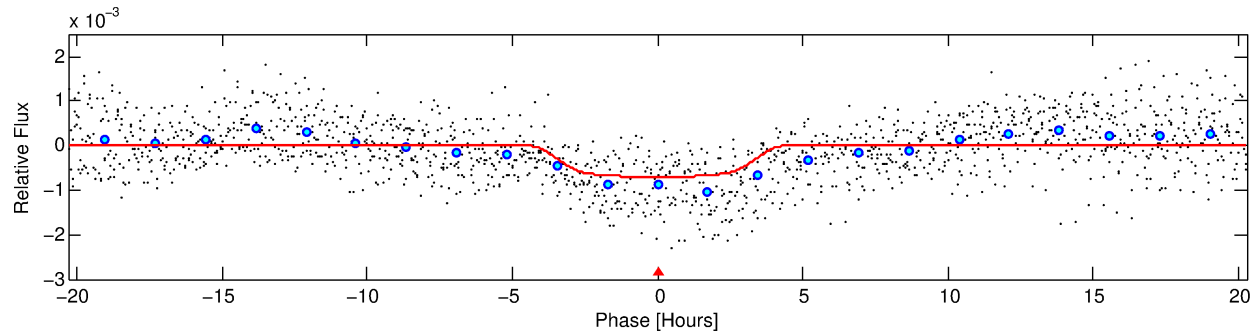
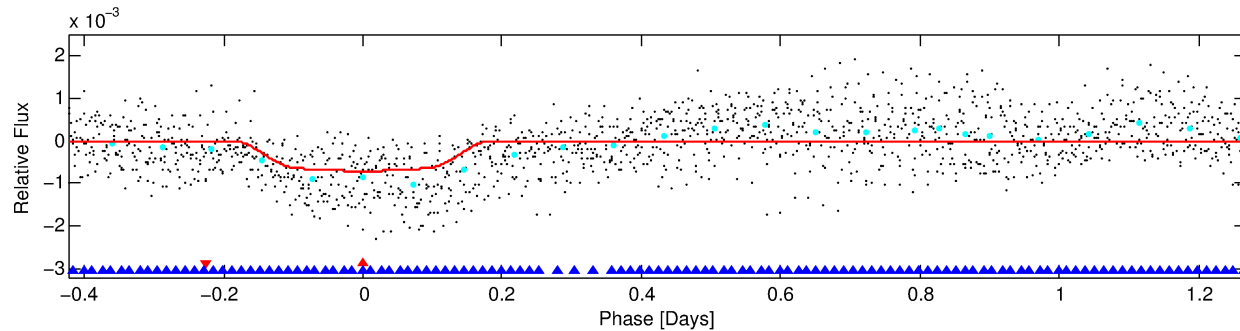
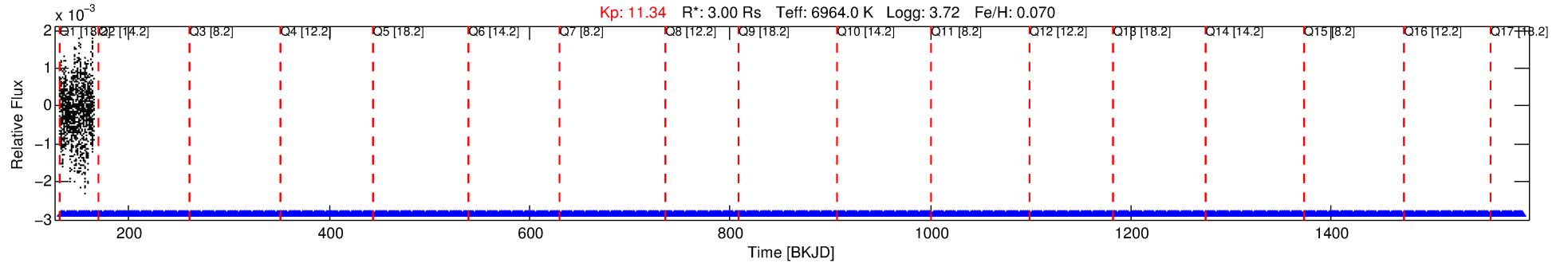
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009405337-01

No Significant Match Found

# DV One-Page Summary

KIC: 9405337 Candidate: 1 of 2 Period: 1.693 d



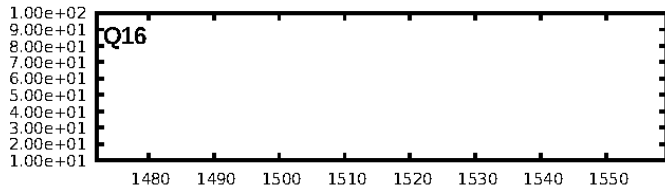
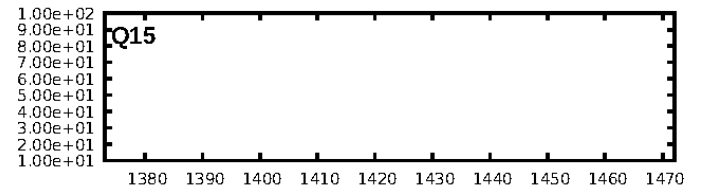
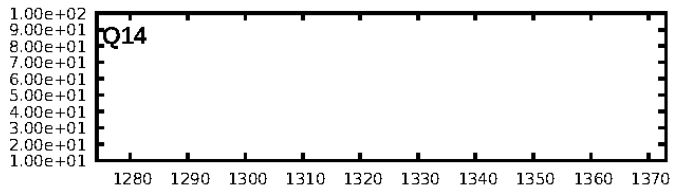
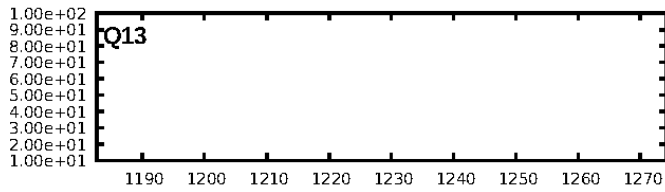
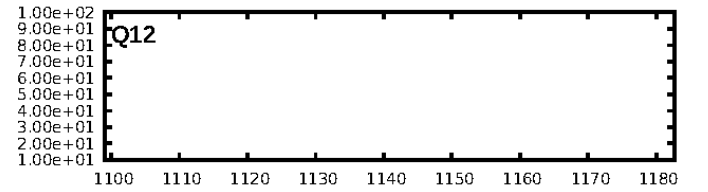
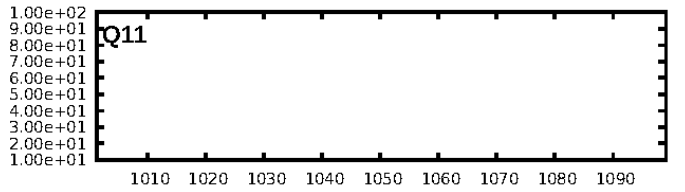
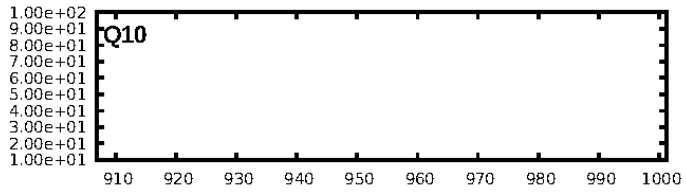
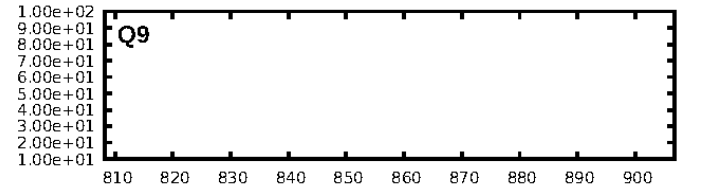
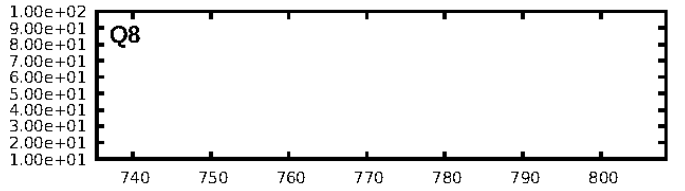
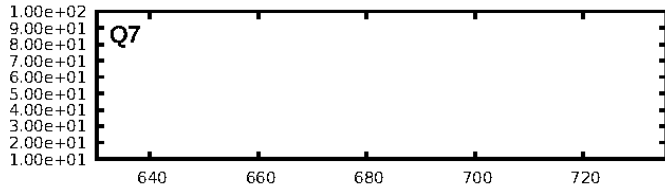
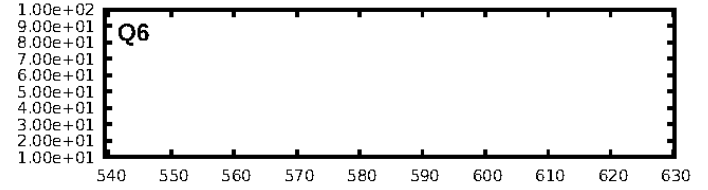
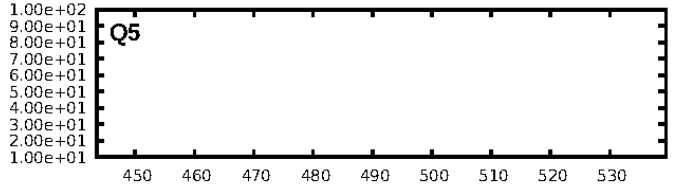
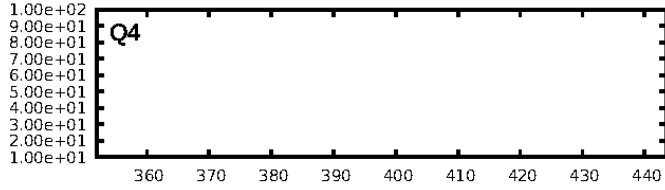
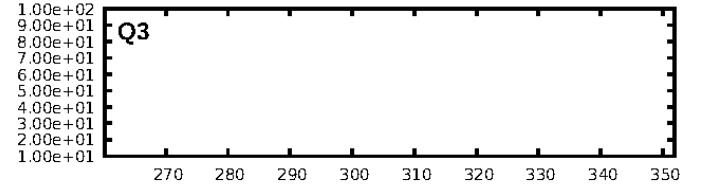
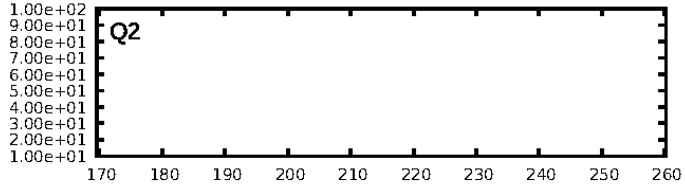
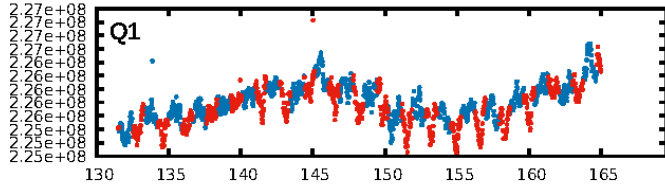
## DV Fit Results:

Period = 1.69301 [0.00076] d  
Epoch = 132.9047 [0.0081] BKJD  
Rp/R\* = 0.0292 [0.0020]  
a/R\* = 1.17 [0.03]  
b = 0.93 [0.01]  
Seff = 16956.60 [12499.75]  
Teq = 2910 [536] K  
Rp = 9.56 [4.27] Re  
a = 0.0334 [0.0147] AU  
Ag = 1.98 [1.50] [0.65 $\sigma$ ]  
Teffp = 5334 [420] K [3.56 $\sigma$ ]

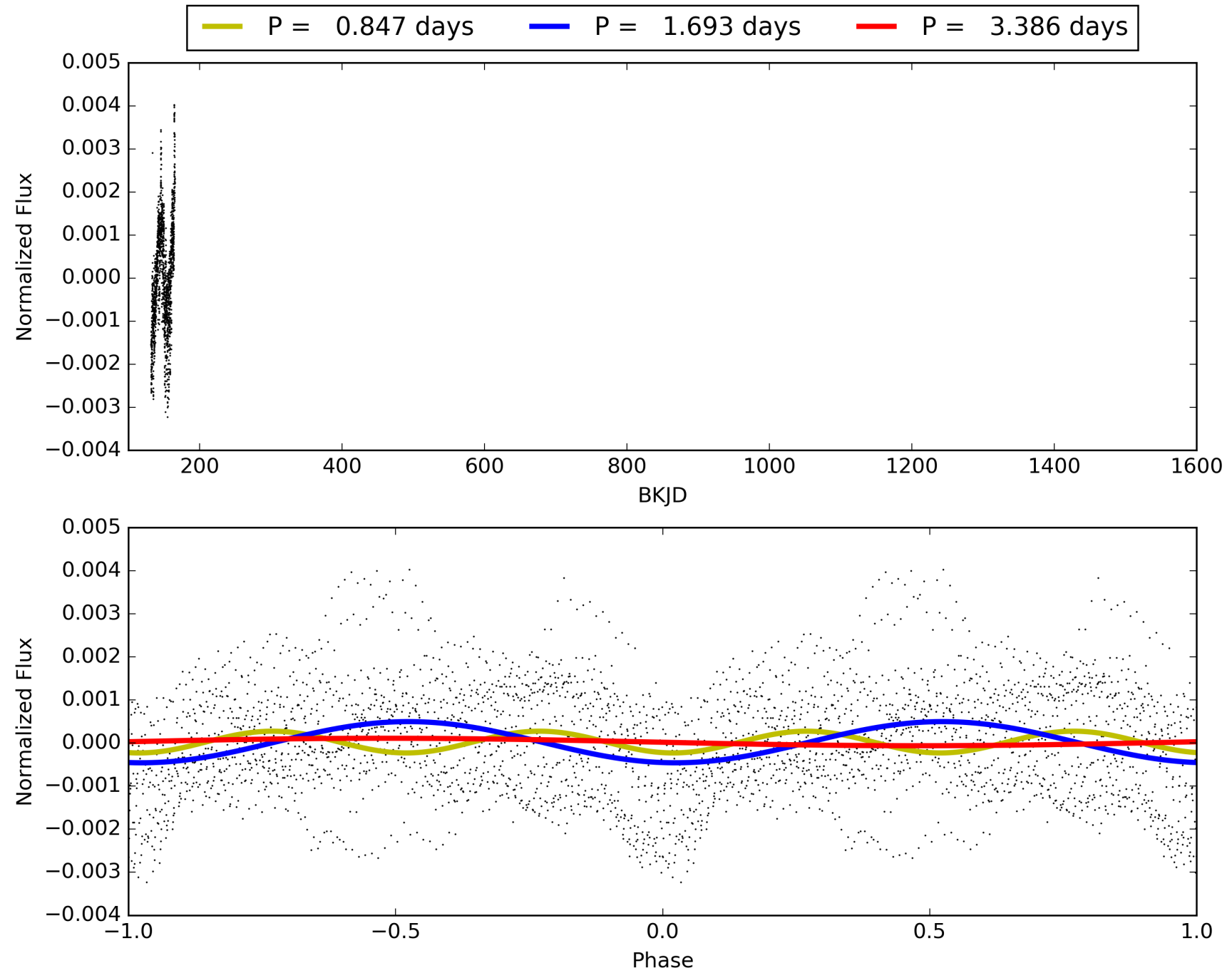
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [7.25 $\sigma$ ]  
ModelChiSquare2-sig: 63.8%  
ModelChiSquareGoF-sig: 100.0%  
Bootstrap-pfa: N/A  
RollingBand-fgt: N/A  
GhostDiagnostic-chr: 3.135  
Centroid-sig: 0.0%  
Centroid-so: 0.316 arcsec [1.35 $\sigma$ ]  
OotOffset-rm: N/A  
KicOffset-rm: N/A  
OotOffset-st: 0/0/0/0 [0]  
KicOffset-st: 0/0/0/0 [0]  
DiffImageQuality-fgm: N/A  
DiffImageOverlap-fno: 1.00 [1/1]

## TCE 009405337-01, PDC Light Curves

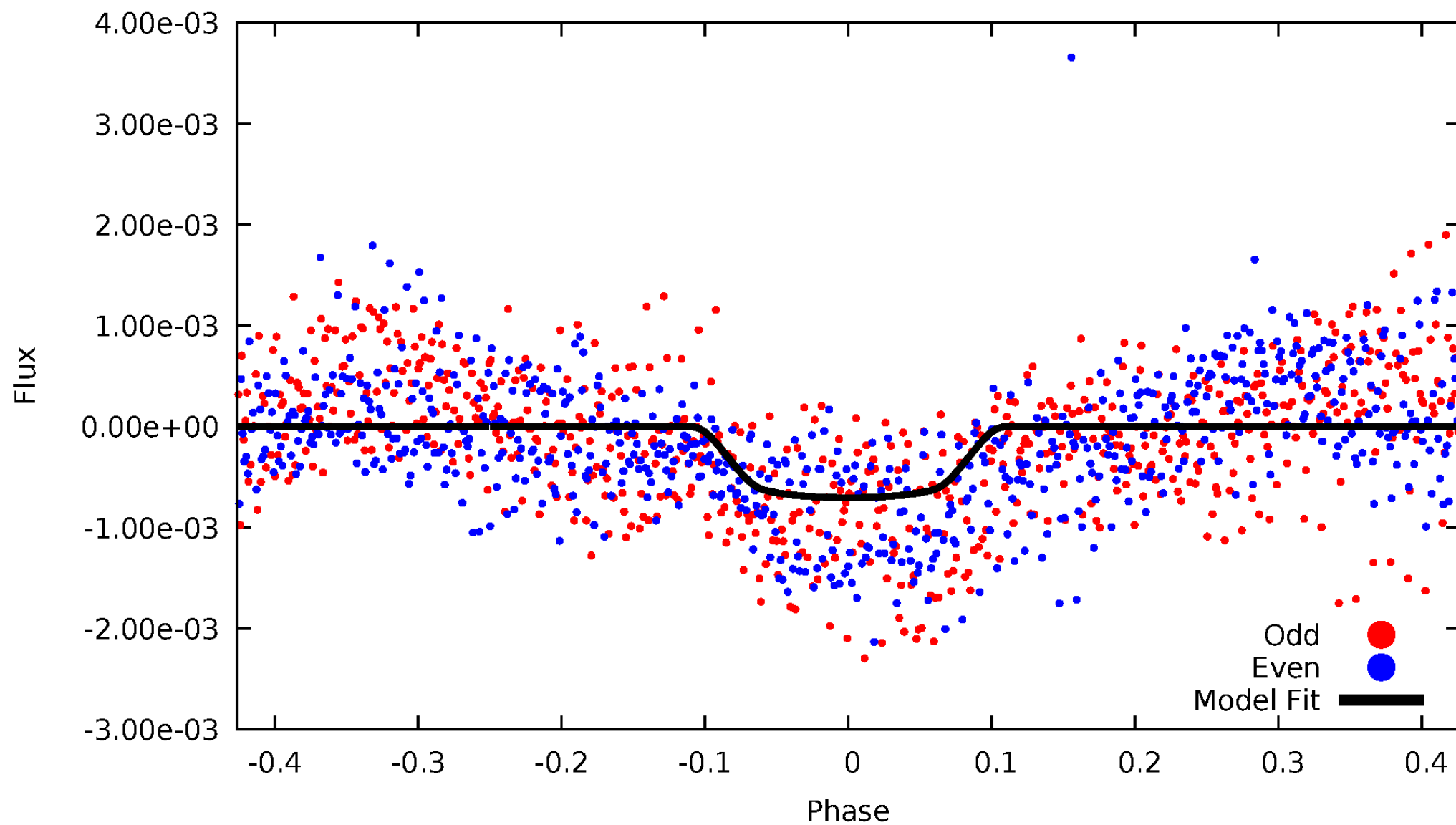


# TCE 009405337-01



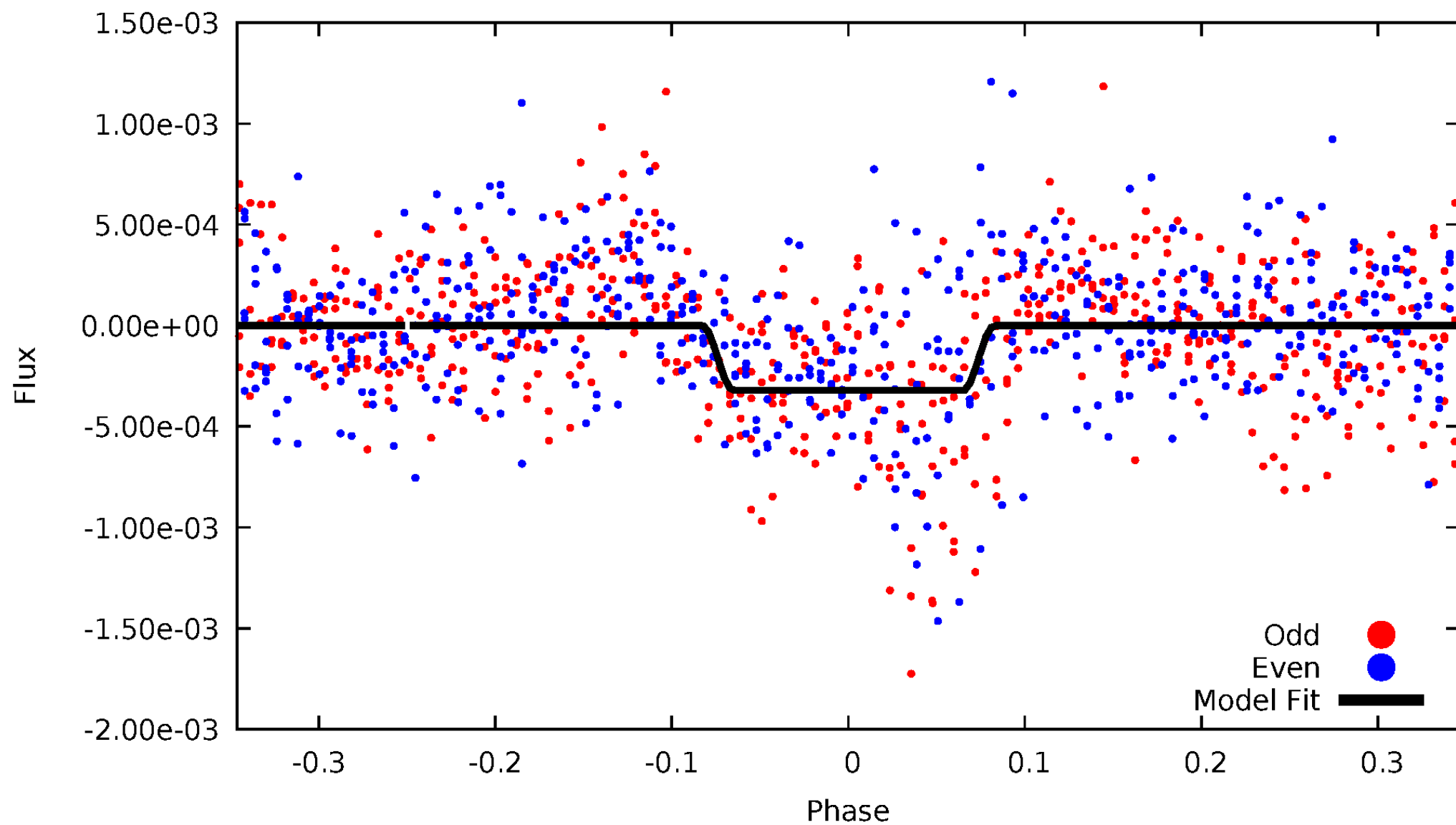
# DV Odd/Even

TCE 009405337-01



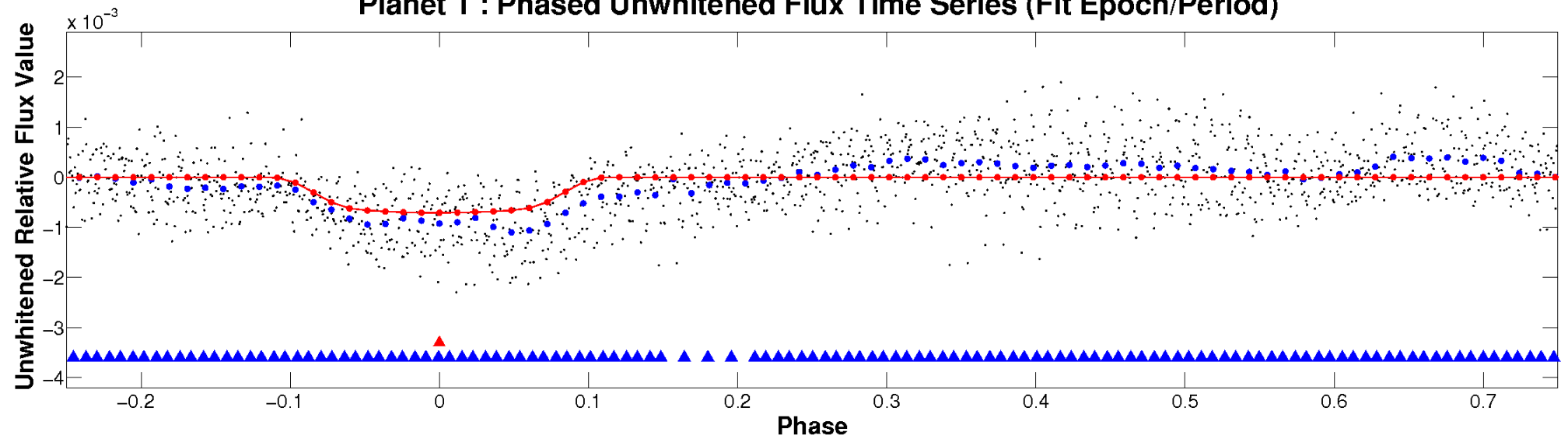
# ALT Odd/Even

TCE 009405337-01

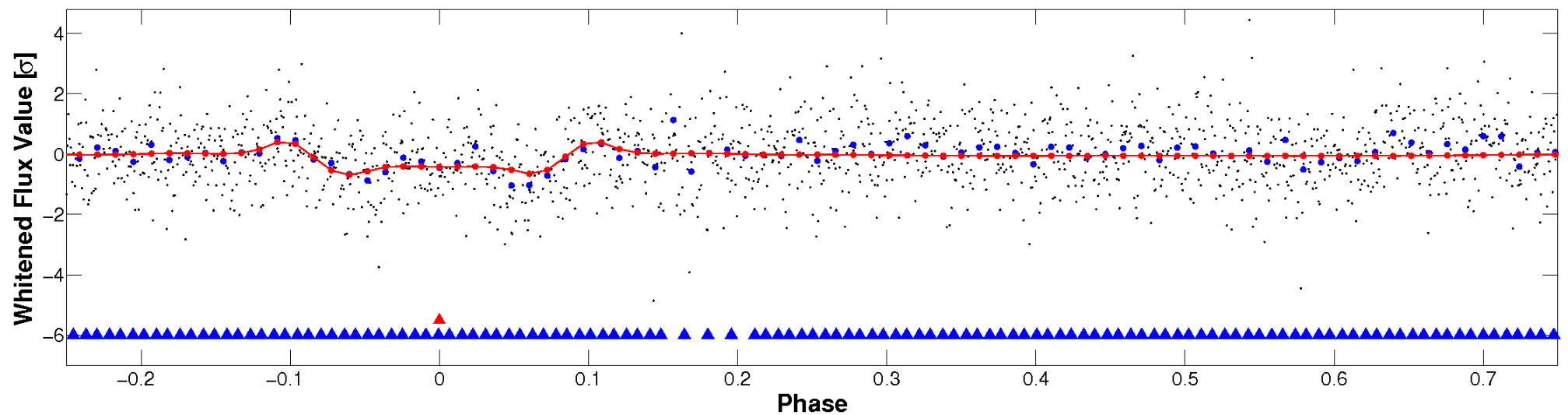


# Non-Whitened Vs. Whitened Light Curve

**Planet 1 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)**

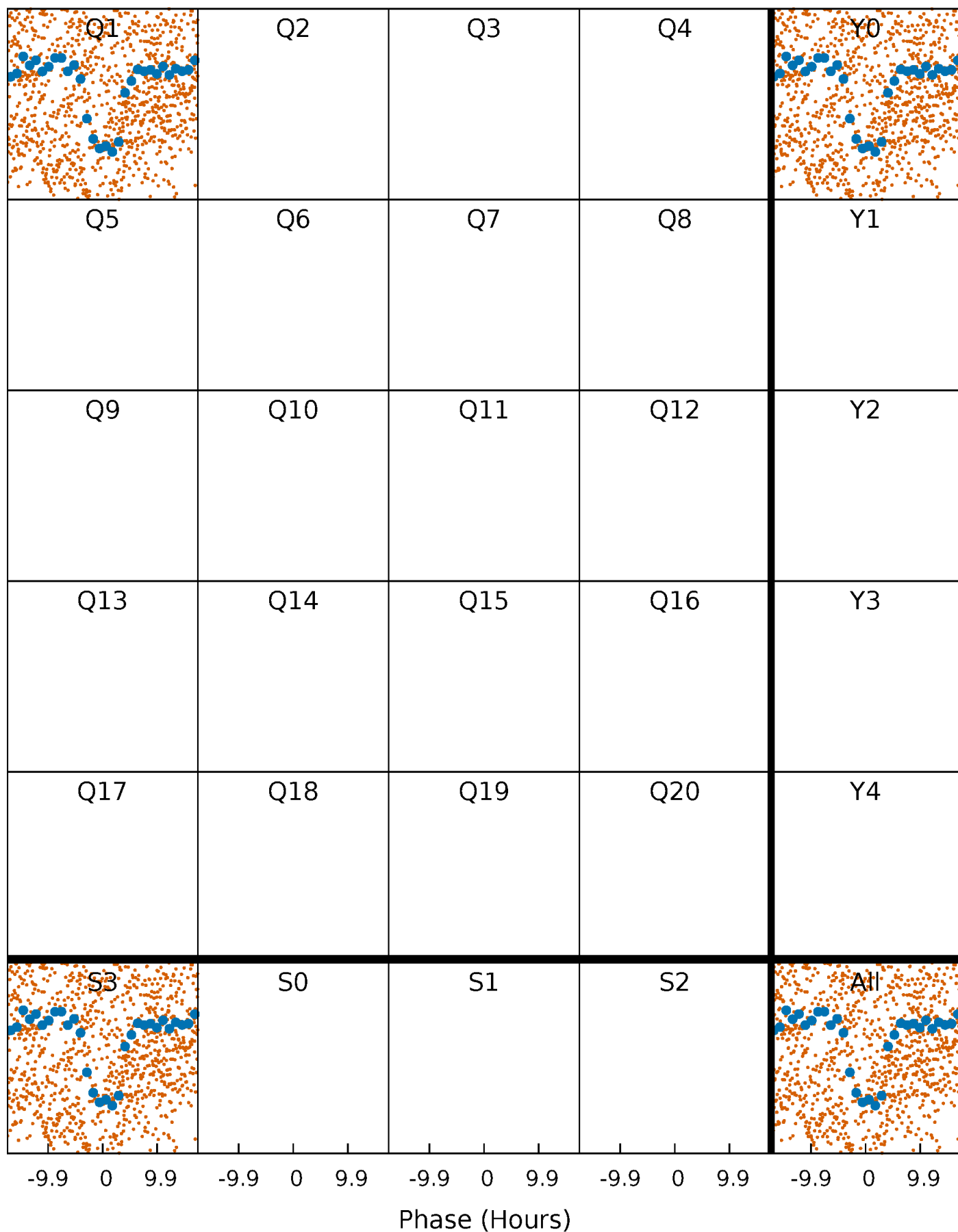


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

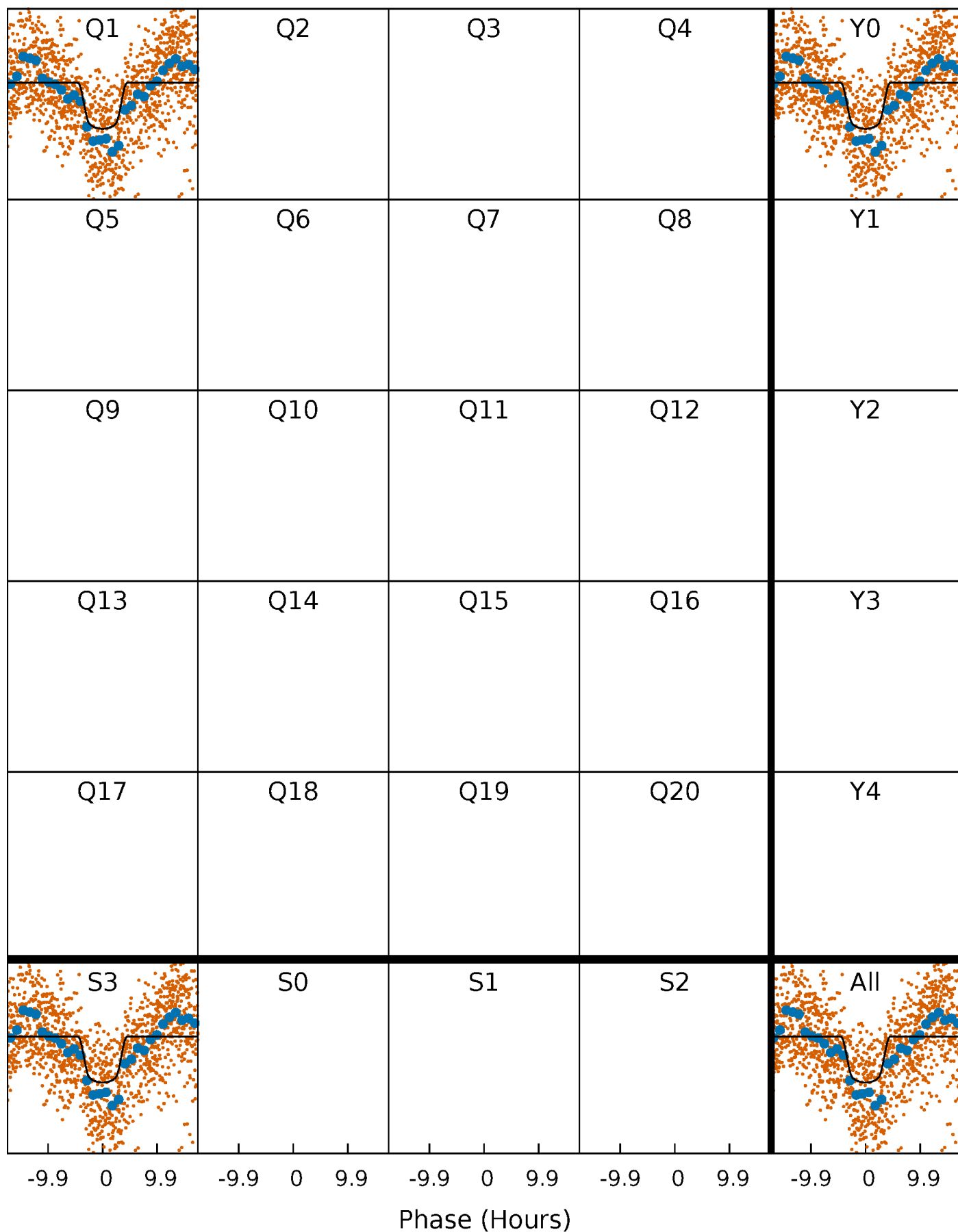
TCE 009405337-01   P= 1.693007 Days    $T_0=132.904651$  (BKJD)





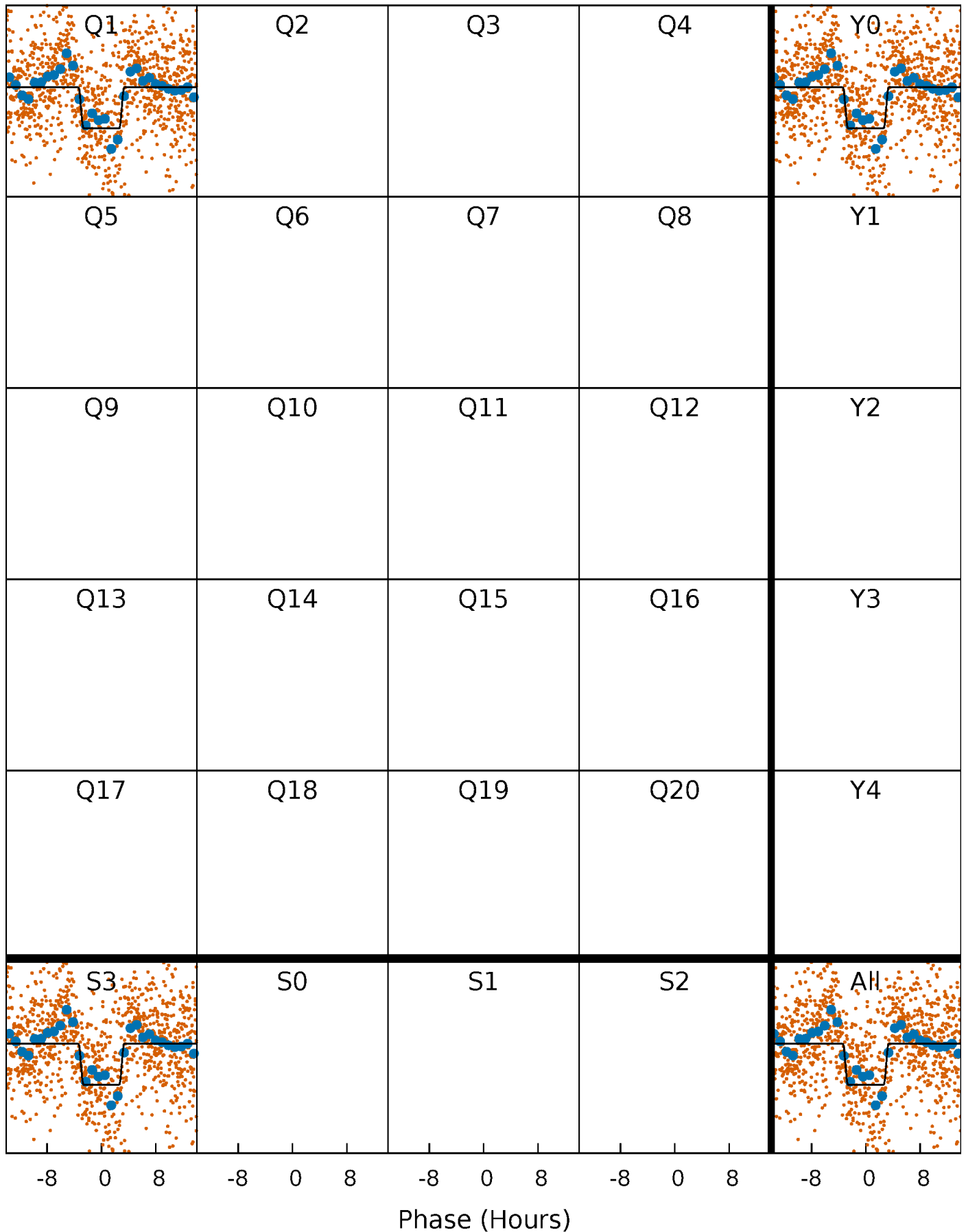
# DV Quarter-Phased Transit Curves

TCE 009405337-01   P= 1.693007 Days    $T_0=132.904651$  (BKJD)



### Alt. Detrend Quarter-Phased Transit Curves

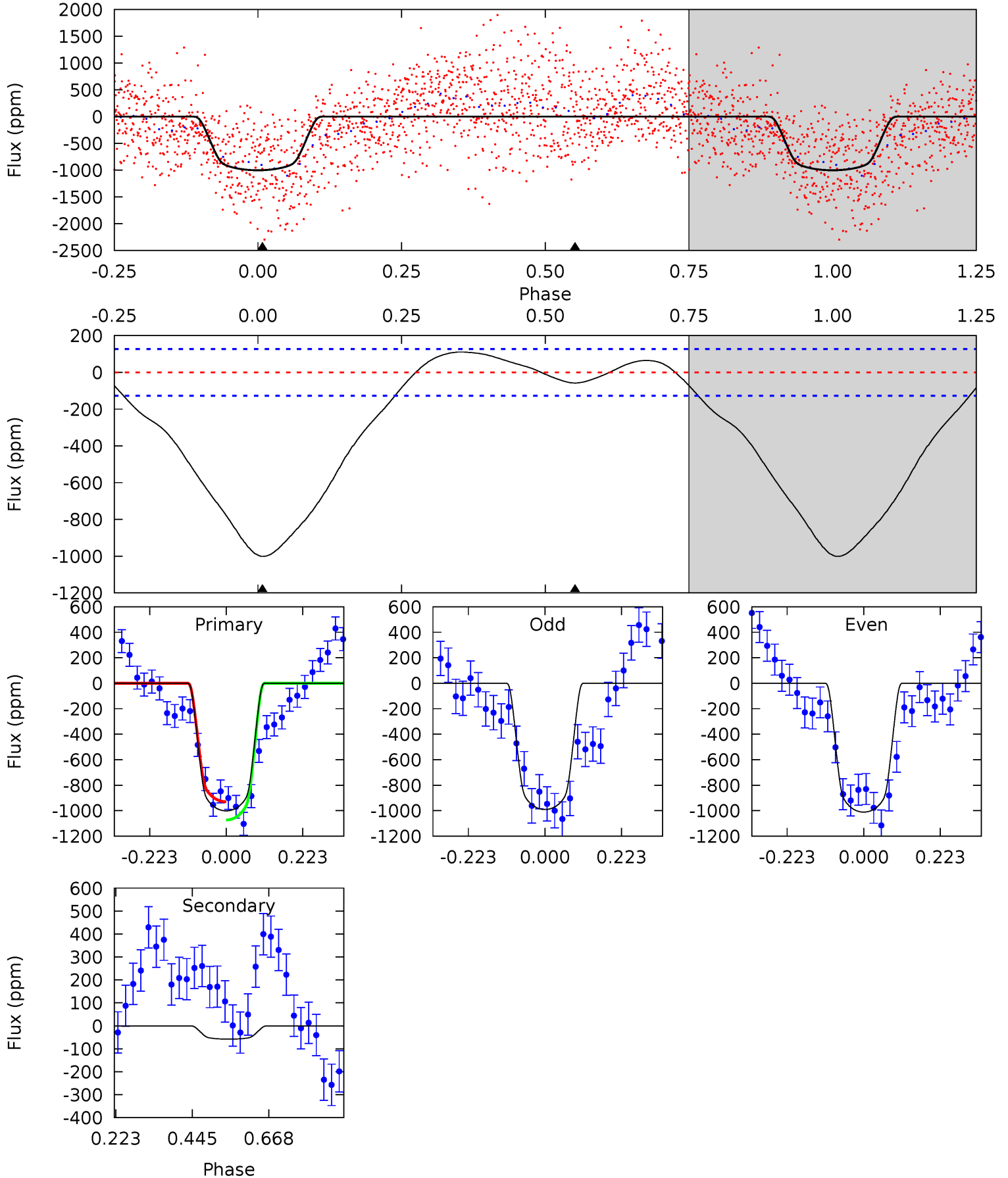
TCE 009405337-01    P= 1.690969 Days     $T_0=132.943377$  (BKJD)



# DV Model-Shift Uniqueness Test

009405337-01, P = 1.693007 Days, E = 131.211644 Days

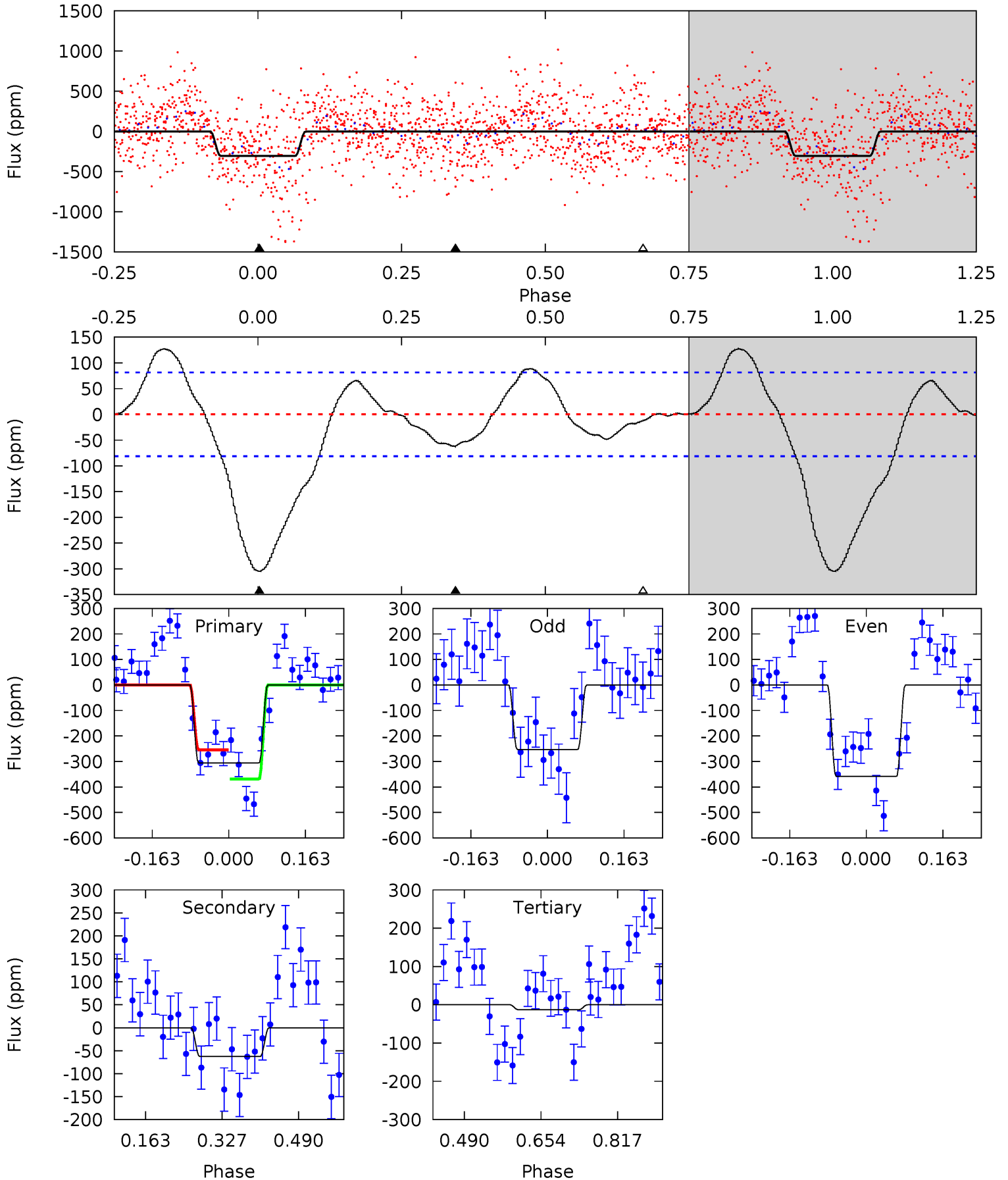
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
34.6	2.00	0	0	4.39	1.22	3.13	34.6	34.6	2.00	2.00	0.34	1.01	0.10	2.72



# Alt Model-Shift Uniqueness Test

009405337-01, P = 1.690969 Days, E = 131.252408 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
16.8	3.43	0.71	0	4.46	1.39	2.44	16.1	16.8	2.73	3.43	2.80	1.22	0.29	3.21



### Stellar Parameters For KIC 009405337

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$6964^{+195}_{-318}$	$3.724^{+0.424}_{-0.106}$	$0.070^{+0.200}_{-0.300}$	$2.998^{+0.566}_{-1.322}$	$1.735^{+0.170}_{-0.369}$	$0.091^{+0.385}_{-0.029}$
	+3%/-5%	+11%/-3%	+286%/-429%	+19%/-44%	+10%/-21%	+424%/-32%
Source	PHO54	PHO54	PHO54	DSEP		

KIC = Kepler Input Catalog; PHO = Photometry; SPE = Spectroscopy; AST = Asteroseismology  
 TRA = Transits; DESP = Dartmouth Models; MULT = Multiple Models

### Secondary Eclipse Parameters for KIC 009405337-01 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-58 \pm 29$	$9.11^{+1.46}_{-2.13}$	$3947^{+295}_{-488}$	$3230^{+613}_{-6260}$	$0.441^{+0.390}_{-0.229}$
Alt.	$-63 \pm 18$	$5.44^{+1.10}_{-1.28}$	$3941^{+280}_{-476}$	$4440^{+419}_{-479}$	$1.257^{+1.003}_{-0.487}$

$T_{\text{max}}$  = Theoretical Maximum Planetary Temperature  
 $T_{\text{obs}}$  = Observed Planetary Temperature (Assuming  $A=0.3$ )  
 $A_{\text{obs}}$  = Observed Albedo (Assuming  $T=0$ )

If a secondary eclipse is present, the system is likely an EB if  $T_{\text{obs}} \gg T_{\text{max}}$  AND  $A_{\text{obs}} \gg 1.0$

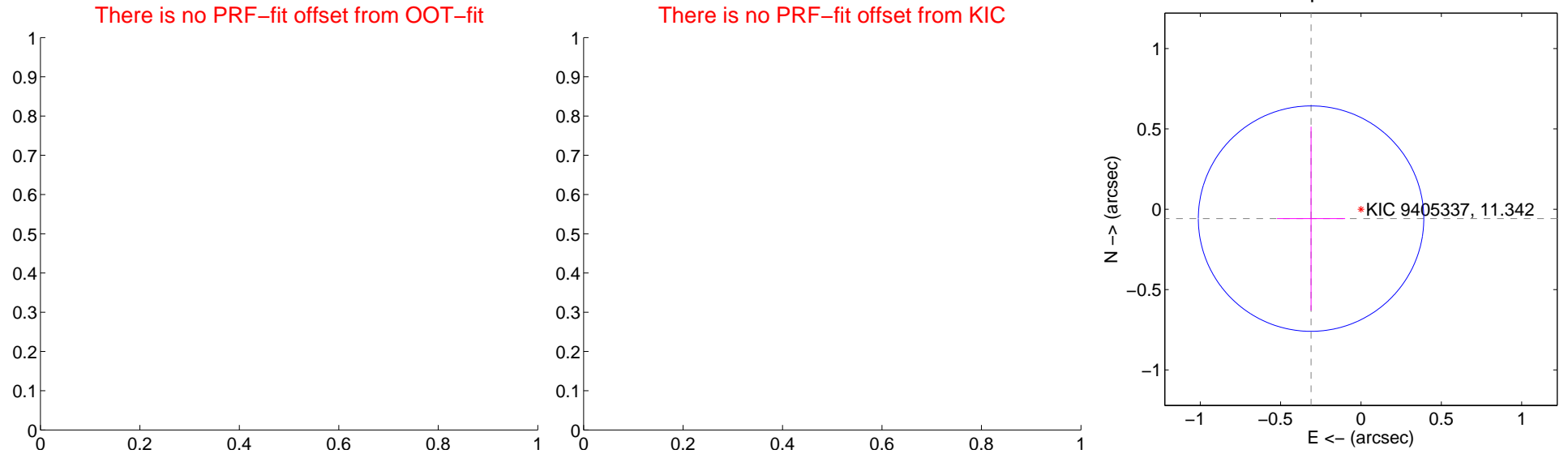
## DV Centroid Data

Supplemental centroid analysis for 009405337-01. **Kepler magnitude: 11.34.** Transit SNR 8.58

**There are 0 quarters with good PRF difference image offsets**

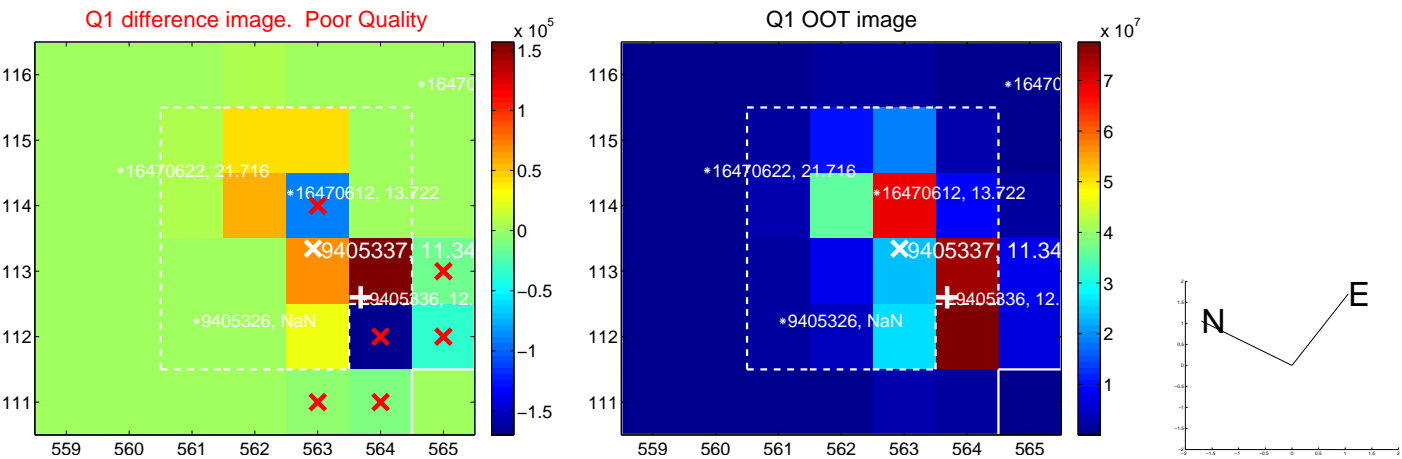
The direct PRF centroid is offset from the target star catalog position by about NaN arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	—	—	—	—
PRF-fit source offset from KIC position	—	—	—	—
photometric centroid source offset	$0.32 \pm 0.23$	1.35	$0.31 \pm 0.21$	$-0.06 \pm 0.57$



Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three- $\sigma$ . Red \*: target star. Blue \*: Other stars. Text next to a star gives its KIC ID and kepmag. KIC IDs > 15,000,000 are from the UKIRT catalog.

white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





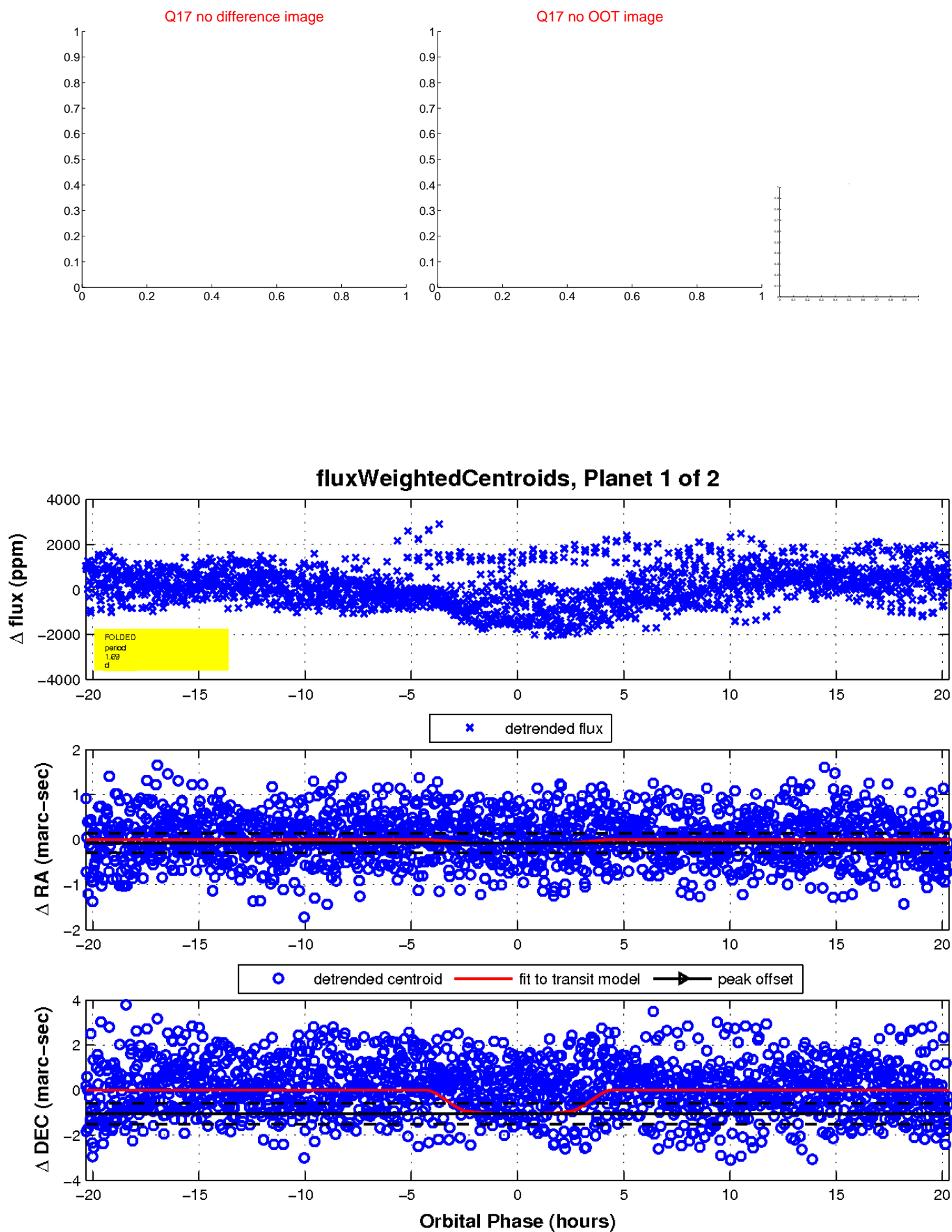
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

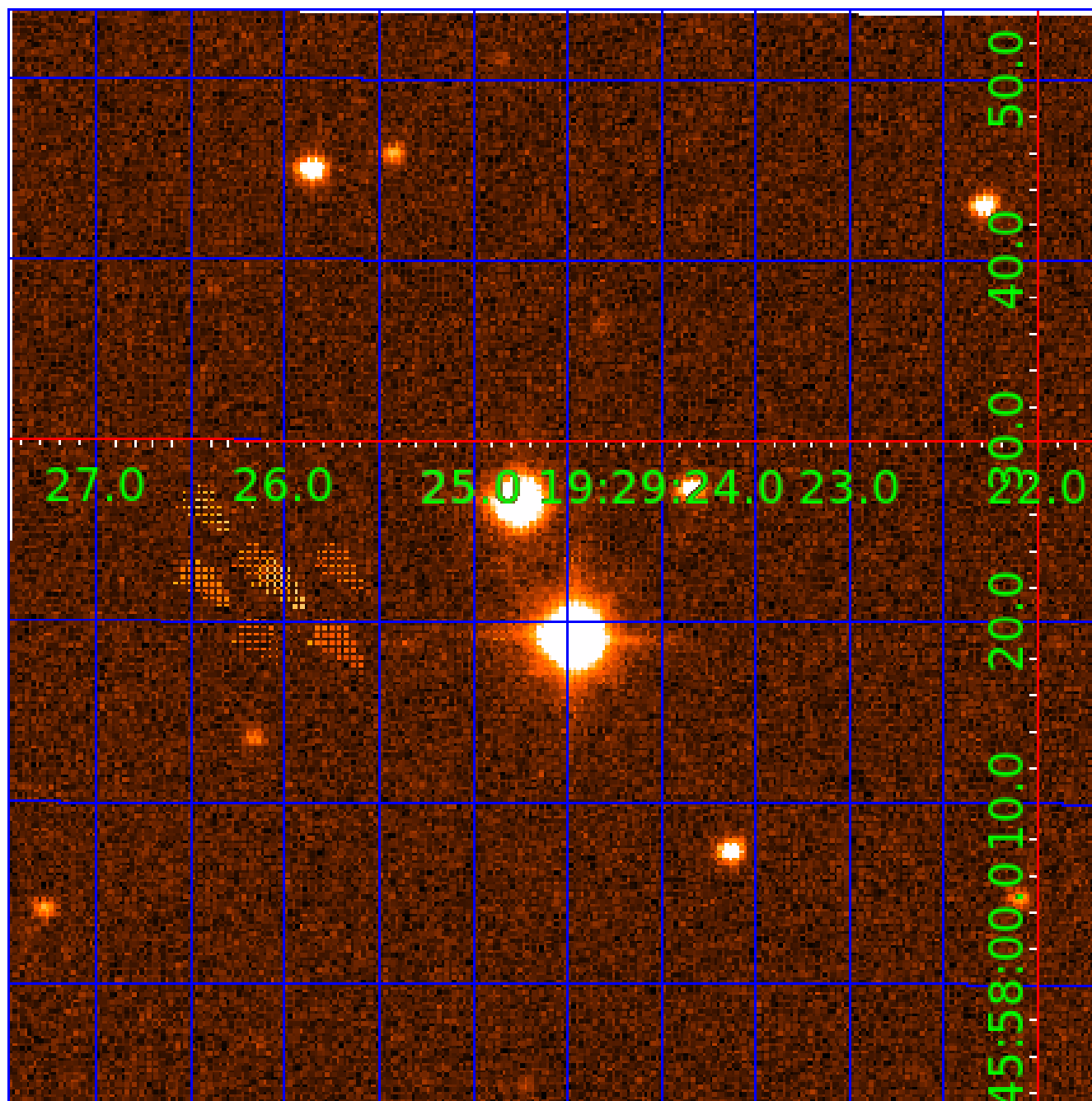


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 009405337

## Q1-17 DR25 TCE Parameters

TCE	Run Type	KOI?	Period (Days)	Epoch (BKJD)	Depth (ppm)	Duration (Hours)	MES	SNR	$R_{\star}$ ( $R_{\odot}$ )	$T_{\star}$ (K)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009405337-01	OBS	No	1.693007	132.904651	707.1	8.660	7.5	8.6	3.00	6964	9.56	16956.60
009405337-02	OBS	No	11.877729	138.354152	1682.7	32.590	10.4	6.7	3.00	6964	12.98	1262.52

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009405337-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—CENT_SATURATED
009405337-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—CENT_SATURATED

**Notes:** OBS = Observed. INJ = Injected. INV = Inverted. SCR = Scrambled.

N = Not Transit-Like. S = Stellar Eclipse. C = Centroid Offset. E = Ephemeris Match.

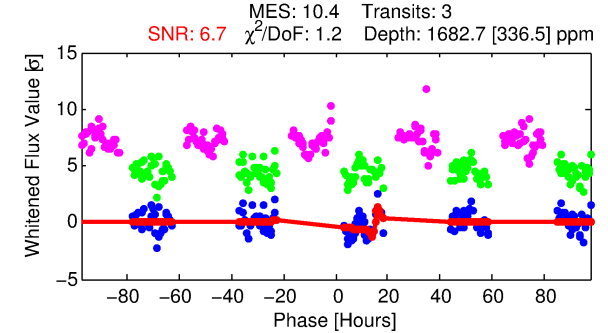
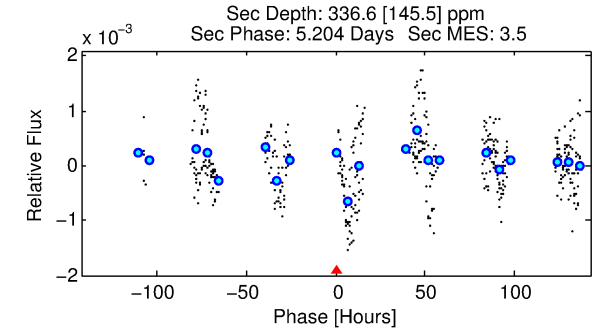
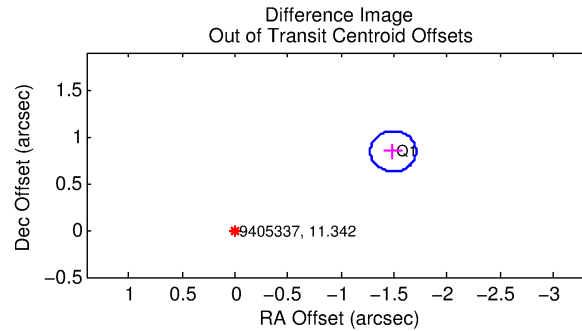
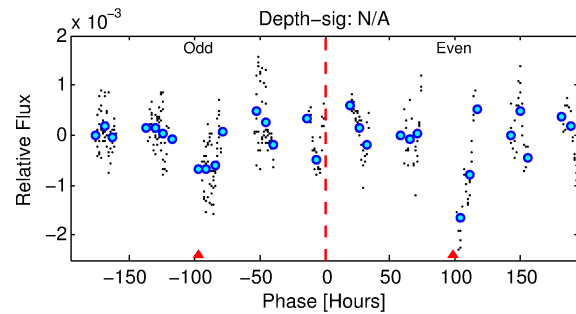
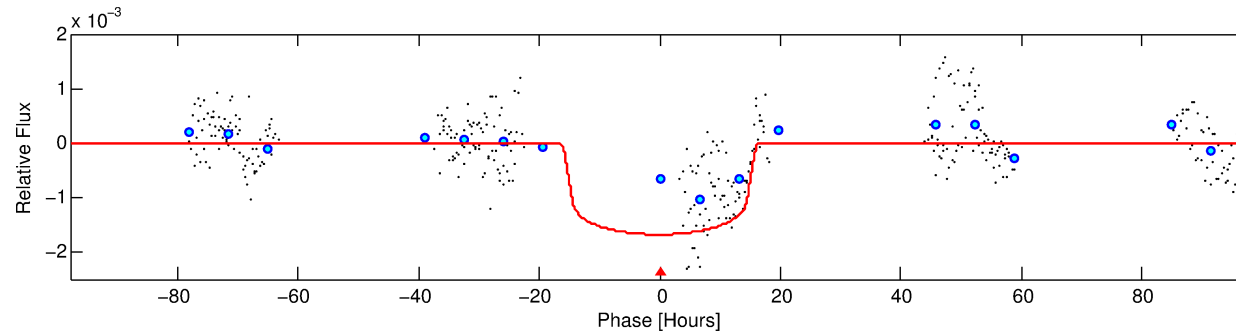
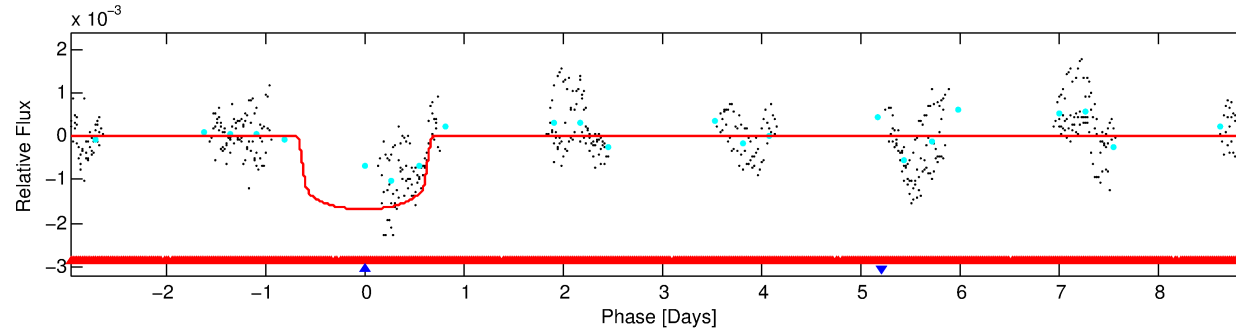
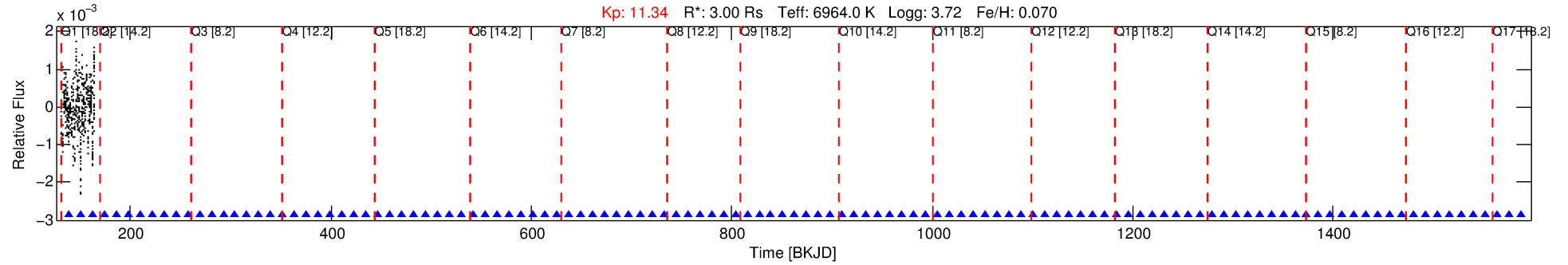
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009405337-02

No Significant Match Found

# DV One-Page Summary

KIC: 9405337 Candidate: 2 of 2 Period: 11.878 d



## DV Fit Results:

Period = 11.87773 [0.01182] d  
Epoch = 138.3542 [0.1346] BKJD  
Rp/R\* = 0.0397 [0.0044]  
a/R\* = 2.44 [0.67]  
b = 0.63 [0.17]  
Seff = 1262.52 [930.68]  
Teq = 1520 [280] K  
Rp = 12.98 [5.90] Re  
a = 0.1225 [0.0537] AU  
Ag = 16.50 [14.24] [1.09σ]  
Teff = 4736 [613] K [4.77σ]

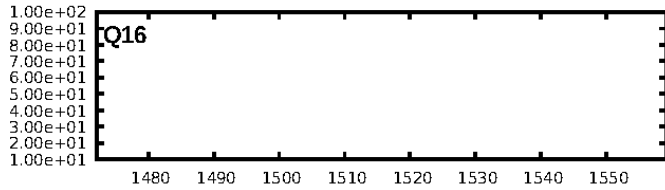
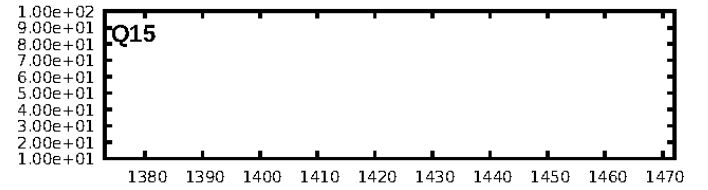
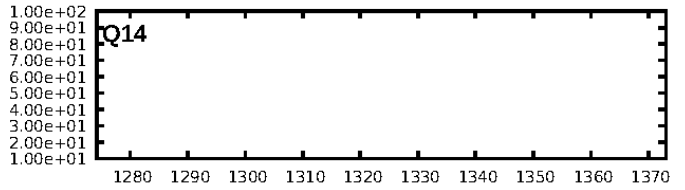
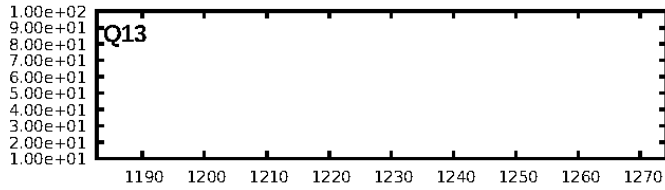
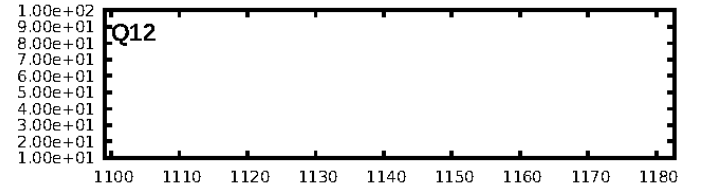
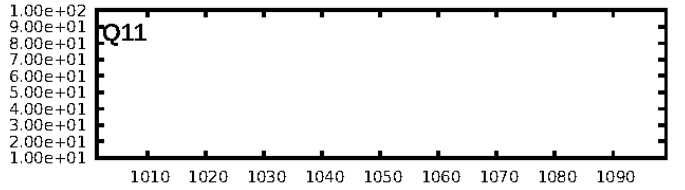
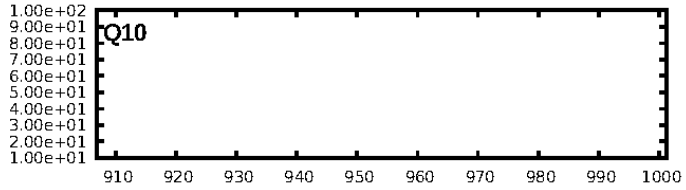
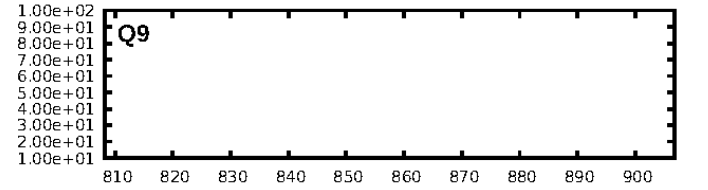
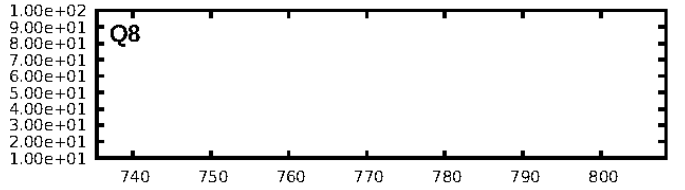
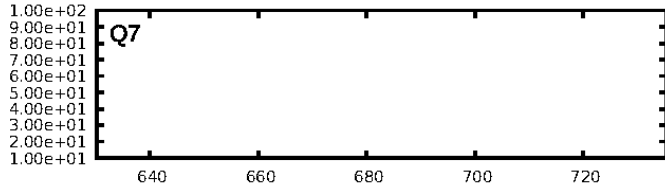
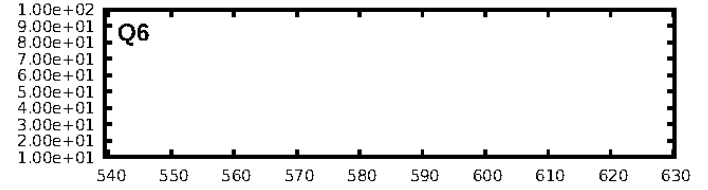
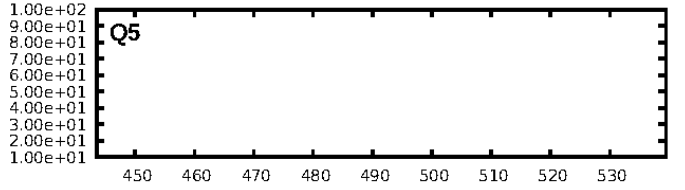
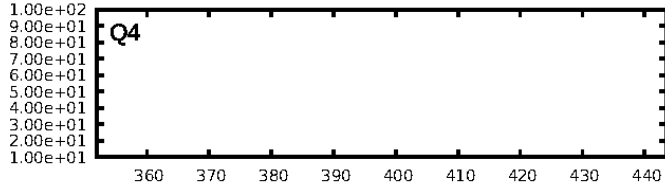
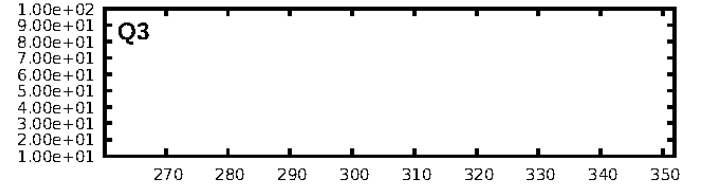
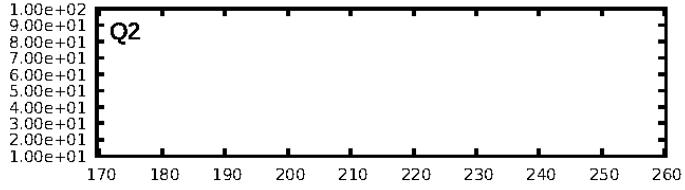
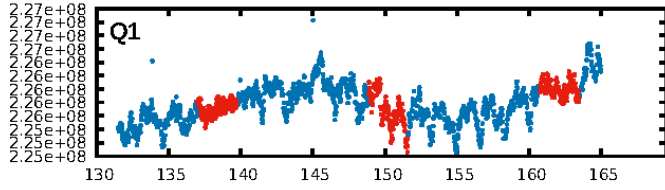
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [7.25σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 10.3%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: N/A  
RollingBand-fgt: N/A  
GhostDiagnostic-chr: -0.5596  
Centroid-sig: 0.8%  
Centroid-so: 2.095 arcsec [7.47σ]  
OotOffset-rm: 1.715 arcsec [23.83σ]  
KicOffset-rm: 4.071 arcsec [56.59σ]  
OotOffset-st: 0/0/0/1 [1]  
KicOffset-st: 0/0/0/1 [1]  
DiffImageQuality-fgm: 1.00 [1/1]  
DiffImageOverlap-fno: 0.00 [0/1]

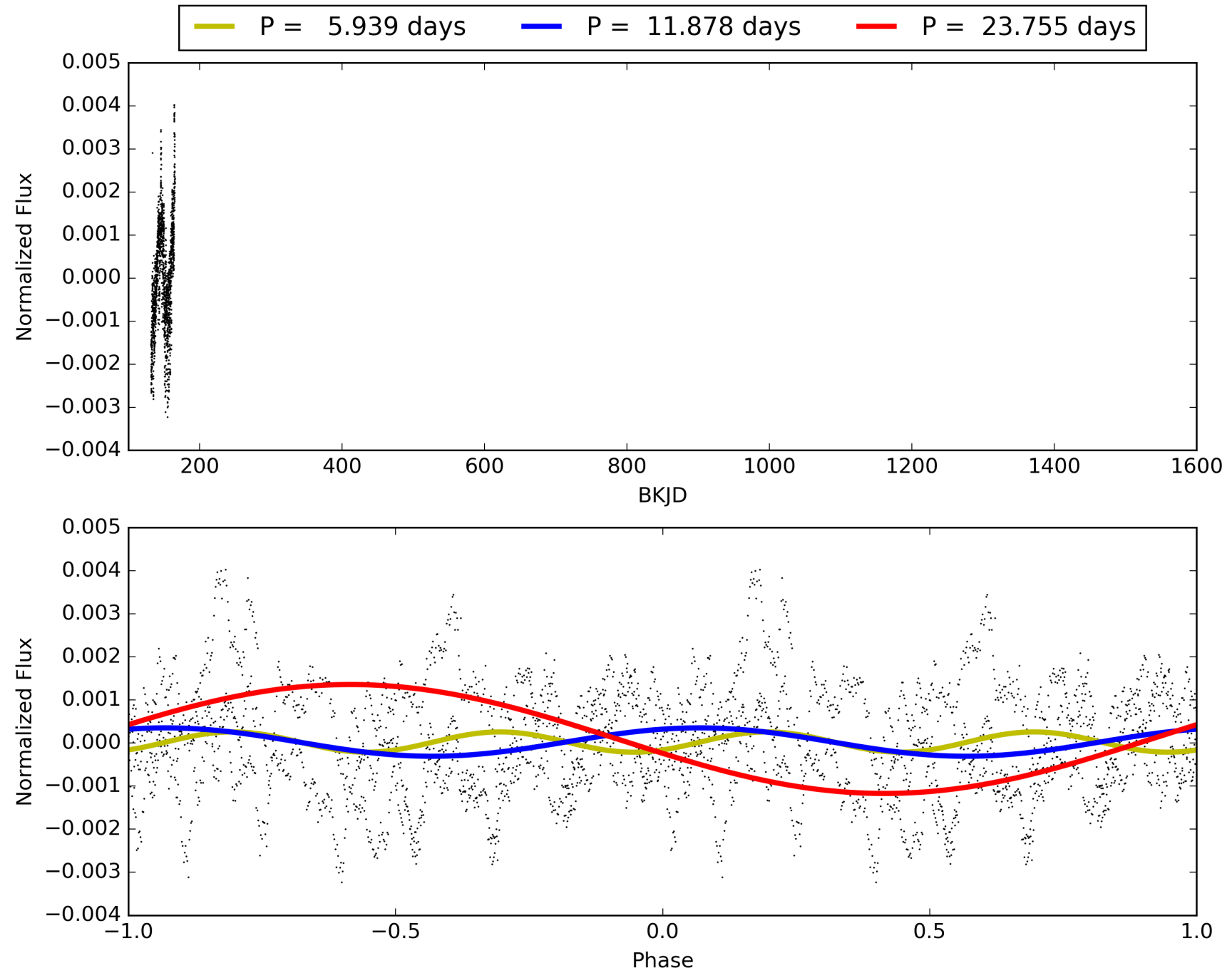
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 21:17:52 Z

This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

## TCE 009405337-02, PDC Light Curves



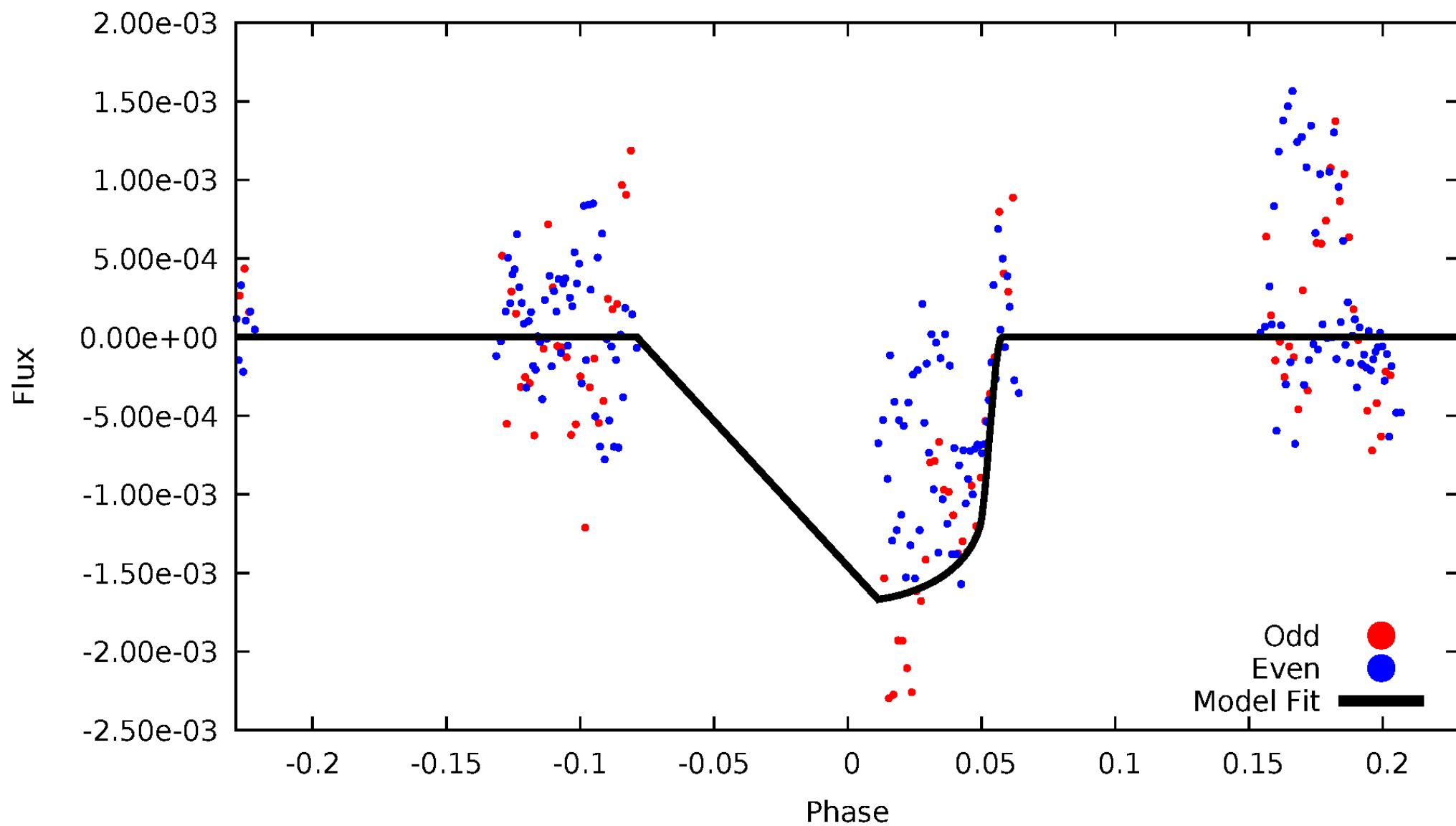
# TCE 009405337-02





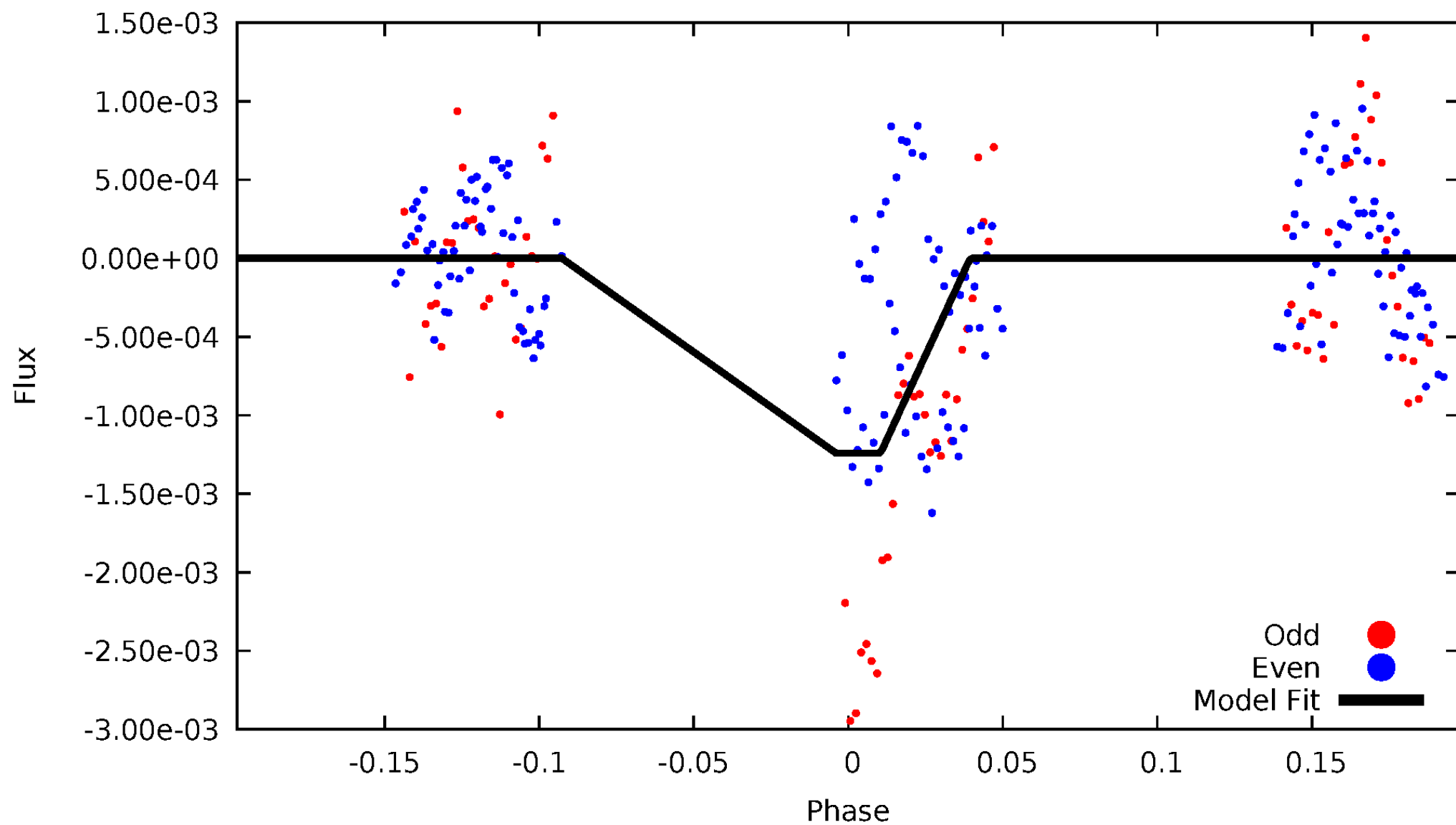
# DV Odd/Even

TCE 009405337-02



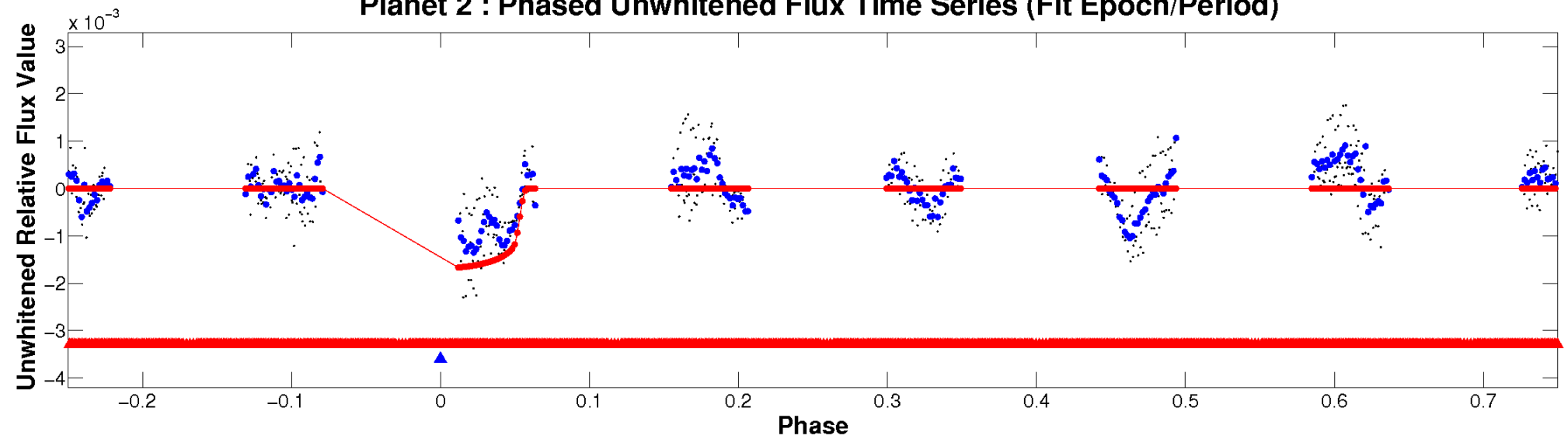
# ALT Odd/Even

TCE 009405337-02

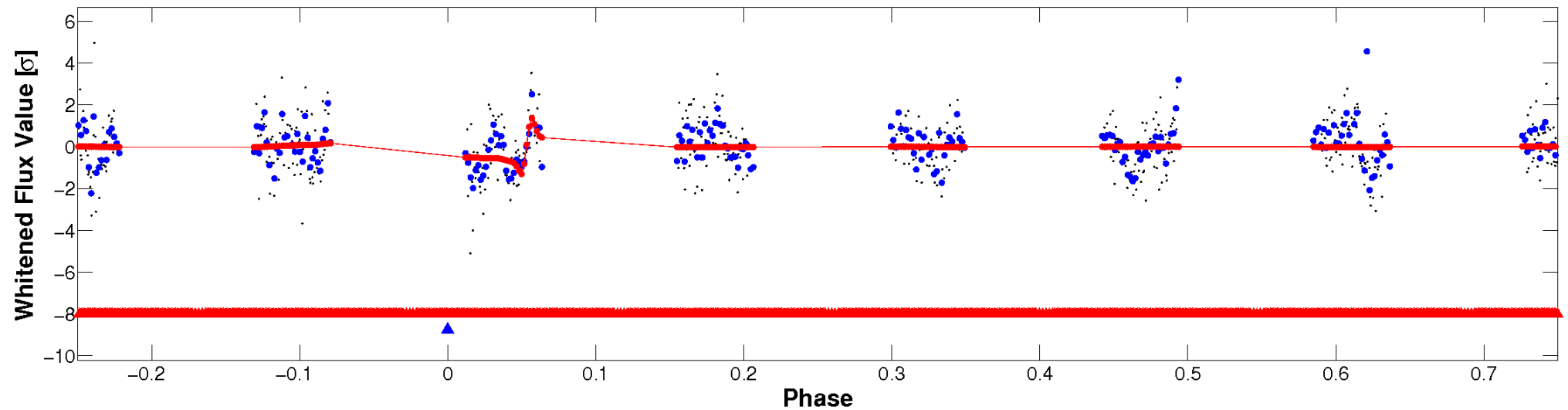


# Non-Whitened Vs. Whitened Light Curve

## Planet 2 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

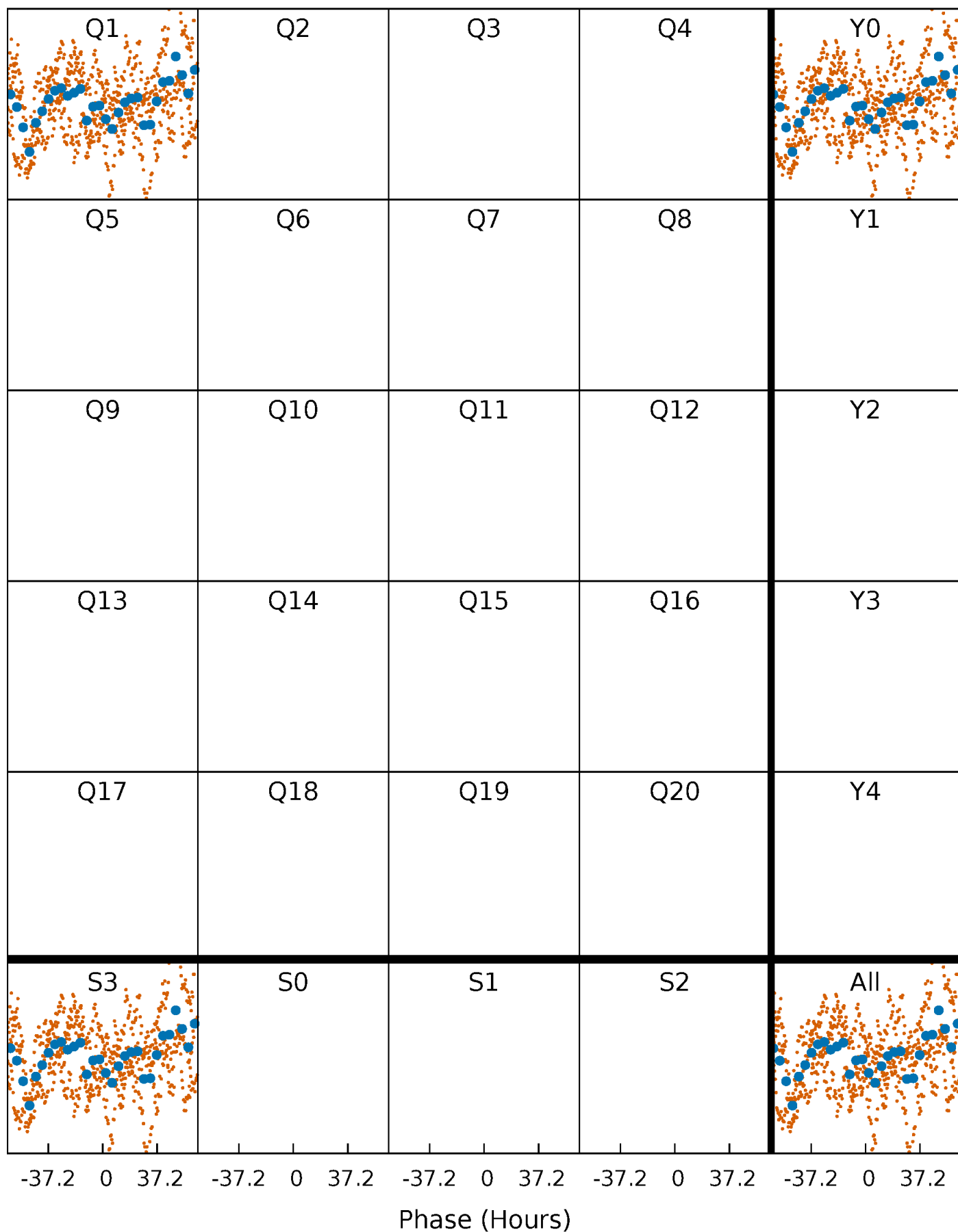


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



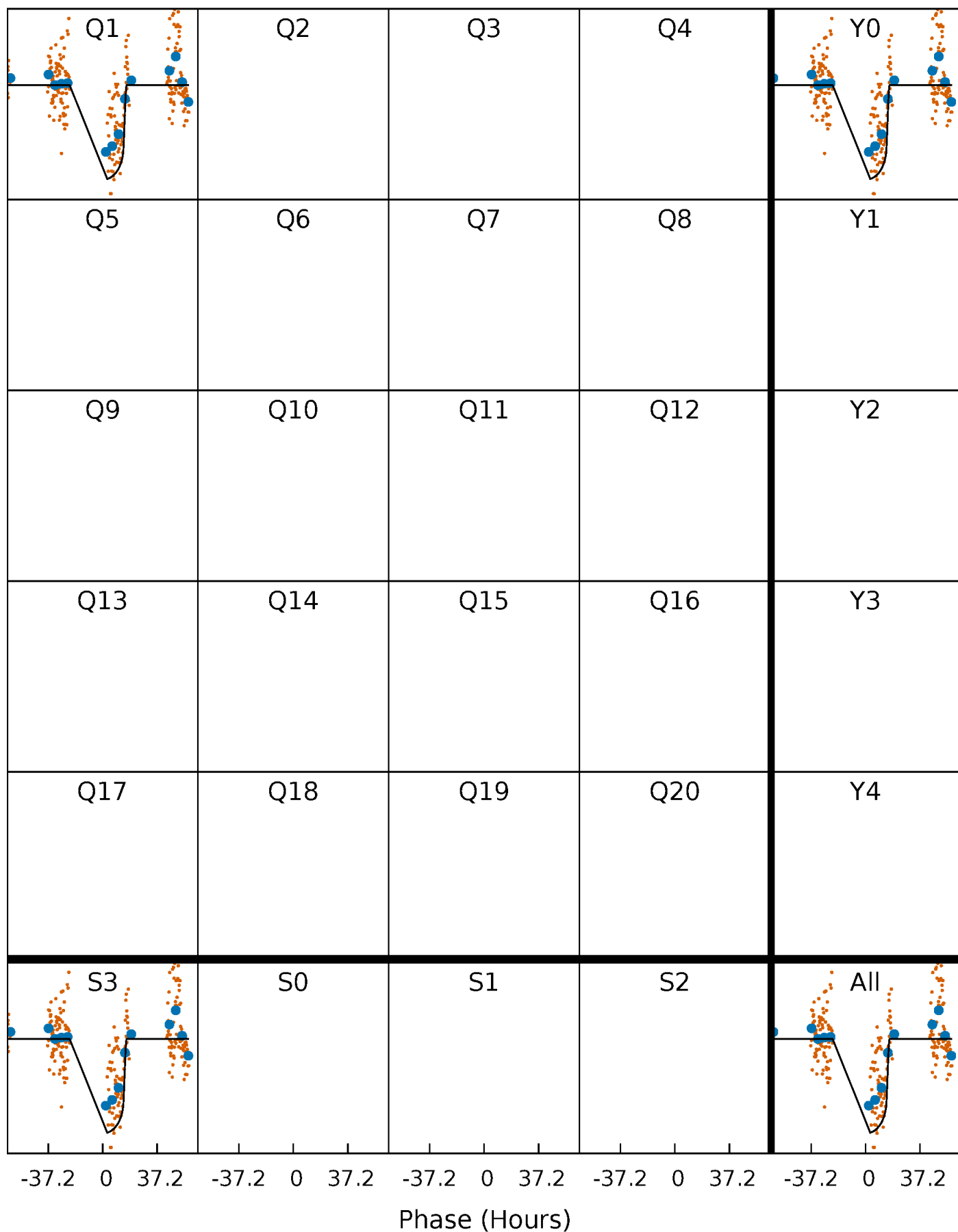
# PDC Quarter-Phased Transit Curves

TCE 009405337-02   P= 11.877729 Days    $T_0=138.354152$  (BKJD)



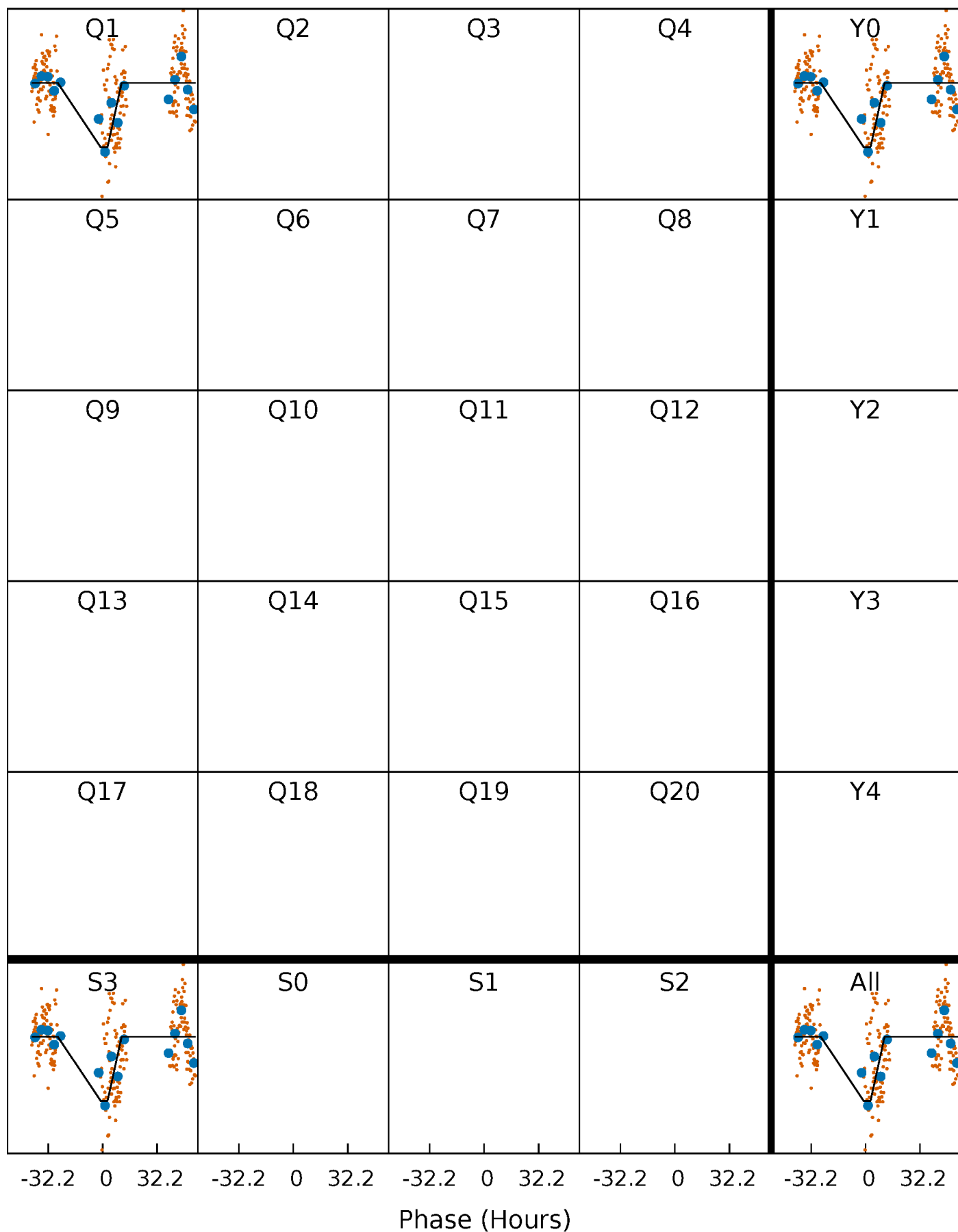
# DV Quarter-Phased Transit Curves

TCE 009405337-02     $P = 11.877729$  Days     $T_0 = 138.354152$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

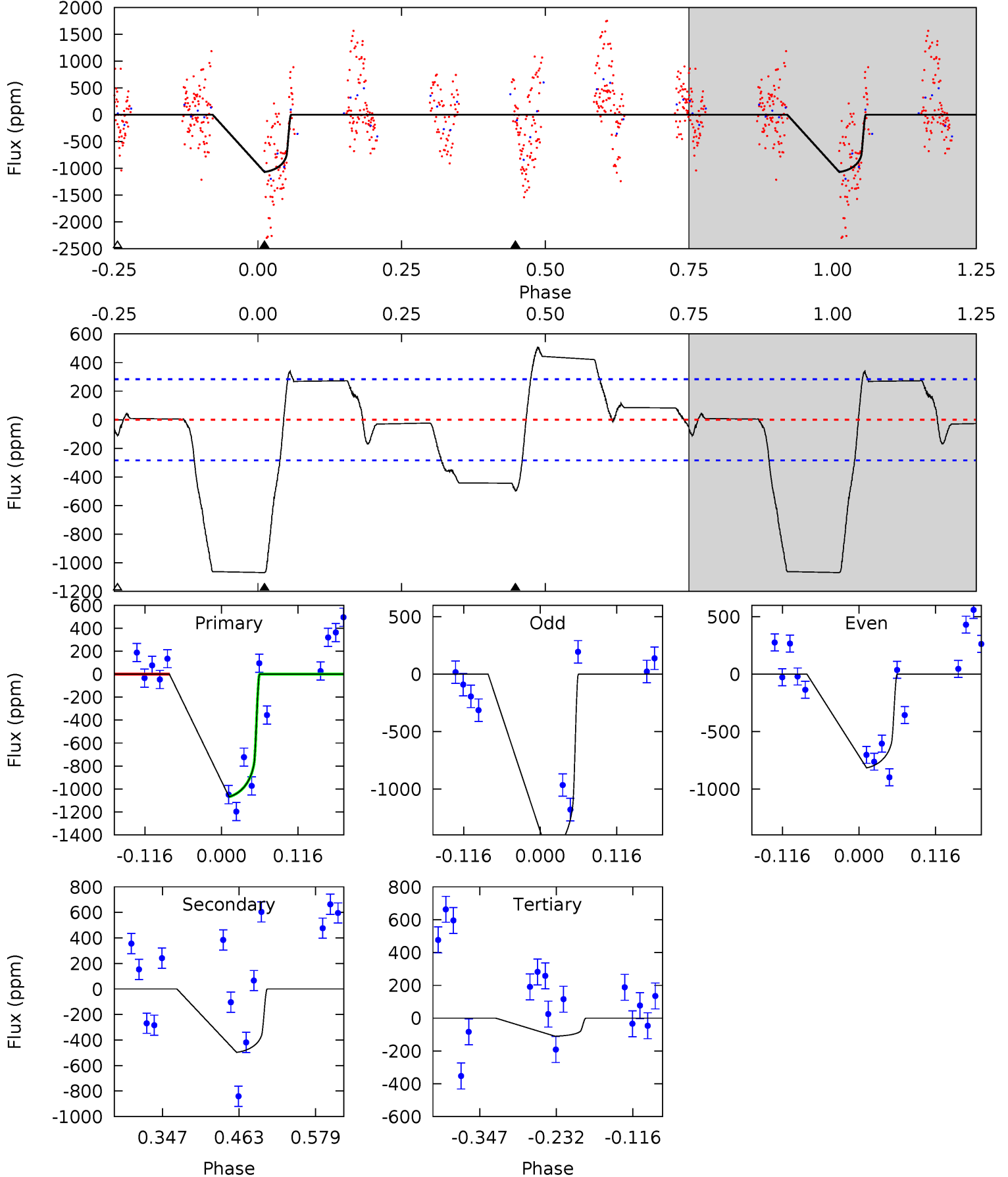
TCE 009405337-02 P= 11.885663 Days  $T_0=138.519966$  (BKJD)



# DV Model-Shift Uniqueness Test

009405337-02, P = 11.877729 Days, E = 126.476423 Days

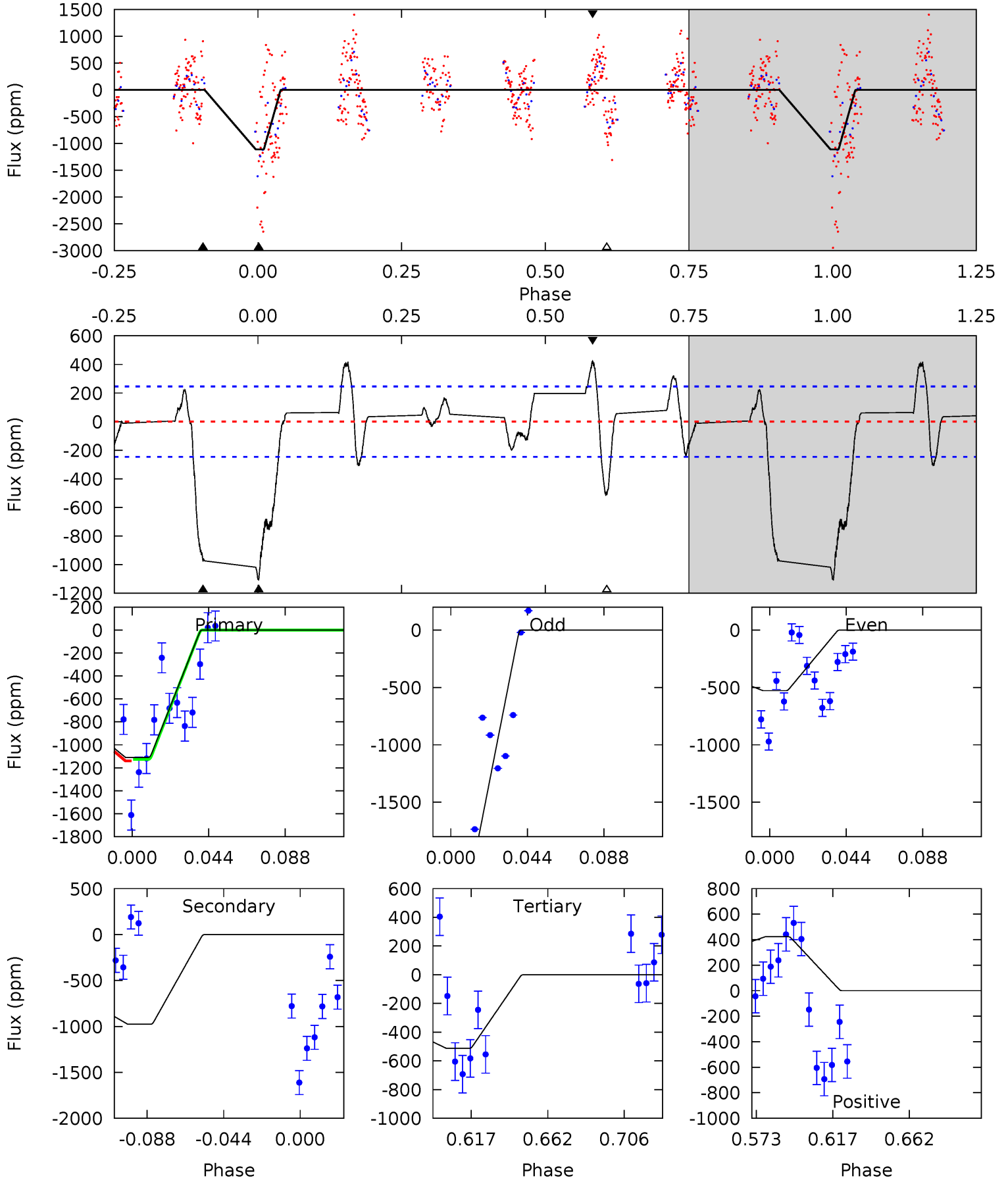
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
17.1	7.94	1.76	0	4.53	1.57	2.70	15.3	17.1	6.18	7.94	5.03	0.91	0.32	0



# Alt Model-Shift Uniqueness Test

009405337-02, P = 11.885663 Days, E = 126.634303 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
21.3	18.8	9.86	8.13	4.73	2.01	4.49	11.5	13.2	8.91	10.6	15.3	0.85	0.28	0.06





### Stellar Parameters For KIC 009405337

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$6964^{+195}_{-318}$	$3.724^{+0.424}_{-0.106}$	$0.070^{+0.200}_{-0.300}$	$2.998^{+0.566}_{-1.322}$	$1.735^{+0.170}_{-0.369}$	$0.091^{+0.385}_{-0.029}$
	+3%/-5%	+11%/-3%	+286%/-429%	+19%/-44%	+10%/-21%	+424%/-32%
Source	PHO54	PHO54	PHO54	DSEP		

KIC = Kepler Input Catalog; PHO = Photometry; SPE = Spectroscopy; AST = Asteroseismology  
 TRA = Transits; DESP = Dartmouth Models; MULT = Multiple Models

### Secondary Eclipse Parameters for KIC 009405337-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-497 \pm 63$	$12.25^{+2.41}_{-2.87}$	$2063^{+150}_{-240}$	$5193^{+351}_{-303}$	$28^{+18}_{-9}$
Alt.	$-976 \pm 52$	$10.91^{+2.31}_{-2.48}$	$2069^{+140}_{-223}$	$6461^{+561}_{-433}$	$68^{+39}_{-22}$

$T_{\text{max}}$  = Theoretical Maximum Planetary Temperature  
 $T_{\text{obs}}$  = Observed Planetary Temperature (Assuming  $A=0.3$ )  
 $A_{\text{obs}}$  = Observed Albedo (Assuming  $T=0$ )

If a secondary eclipse is present, the system is likely an EB if  $T_{\text{obs}} \gg T_{\text{max}}$  AND  $A_{\text{obs}} \gg 1.0$

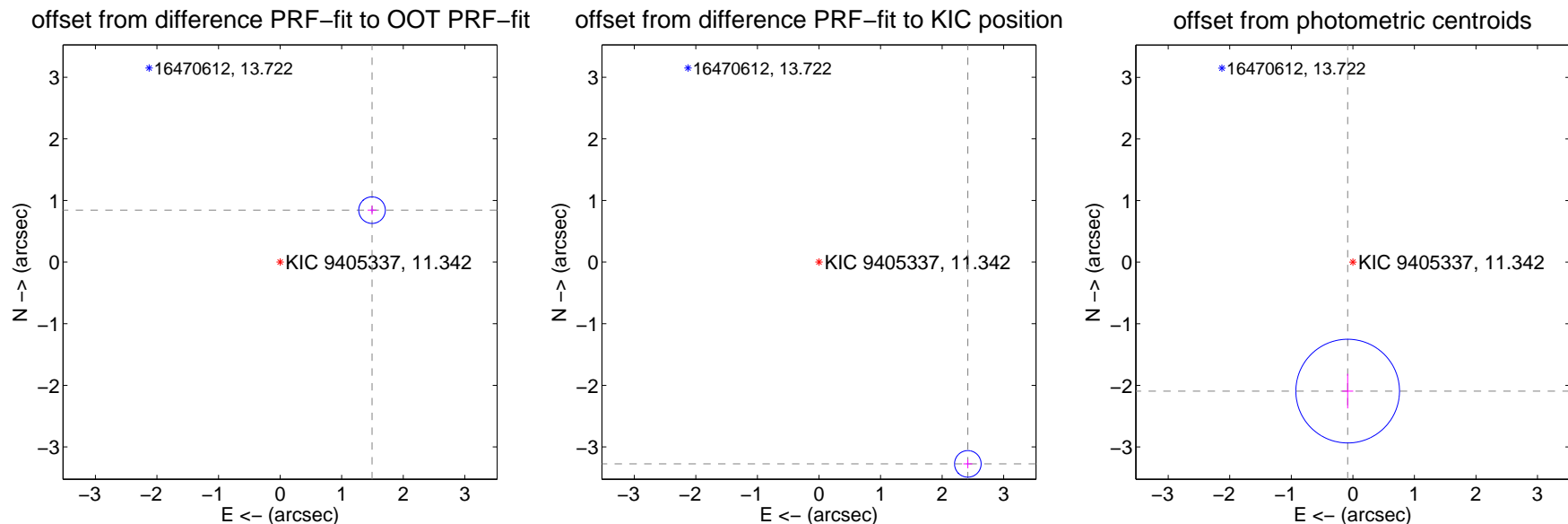
## DV Centroid Data

Supplemental centroid analysis for 009405337-02. **Kepler magnitude: 11.34.** Transit SNR 6.67

There are 1 quarters with good PRF difference image offsets

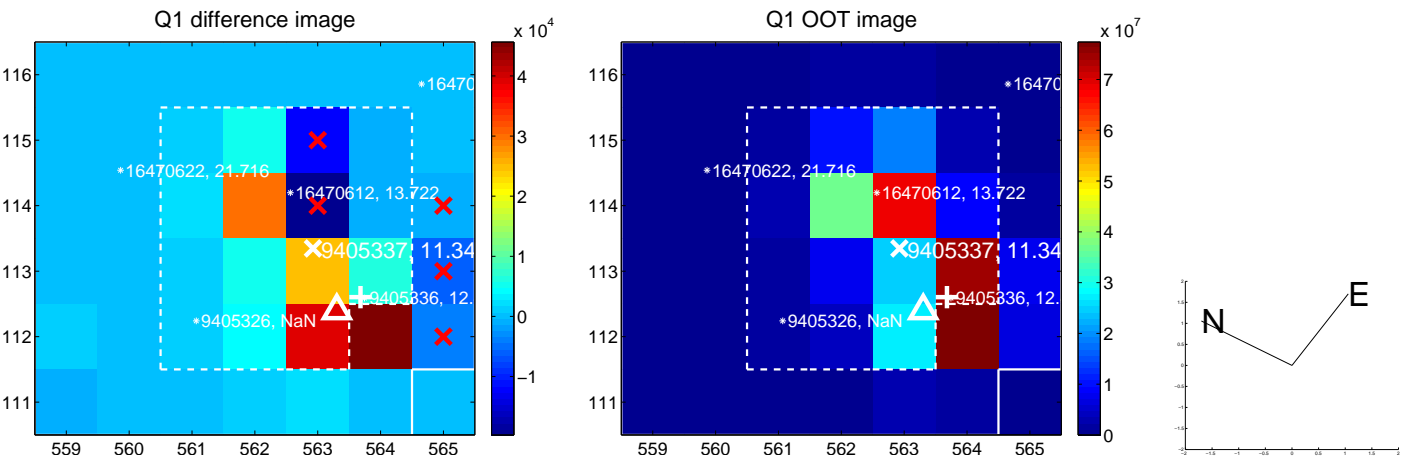
The OOT PRF centroid is offset from the target star catalog position by about 4.22 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.715 \pm 0.072$	23.83	$-1.493 \pm 0.072$	$0.843 \pm 0.072$
PRF-fit source offset from KIC position	$4.071 \pm 0.072$	56.59	$-2.418 \pm 0.072$	$-3.275 \pm 0.072$
photometric centroid source offset	$2.09 \pm 0.28$	7.47	$0.08 \pm 0.09$	$-2.09 \pm 0.28$



Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three- $\sigma$ . Red \*: target star. Blue \*: Other stars. Text next to a star gives its KIC ID and kepmag. KIC IDs > 15,000,000 are from the UKIRT catalog.

white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



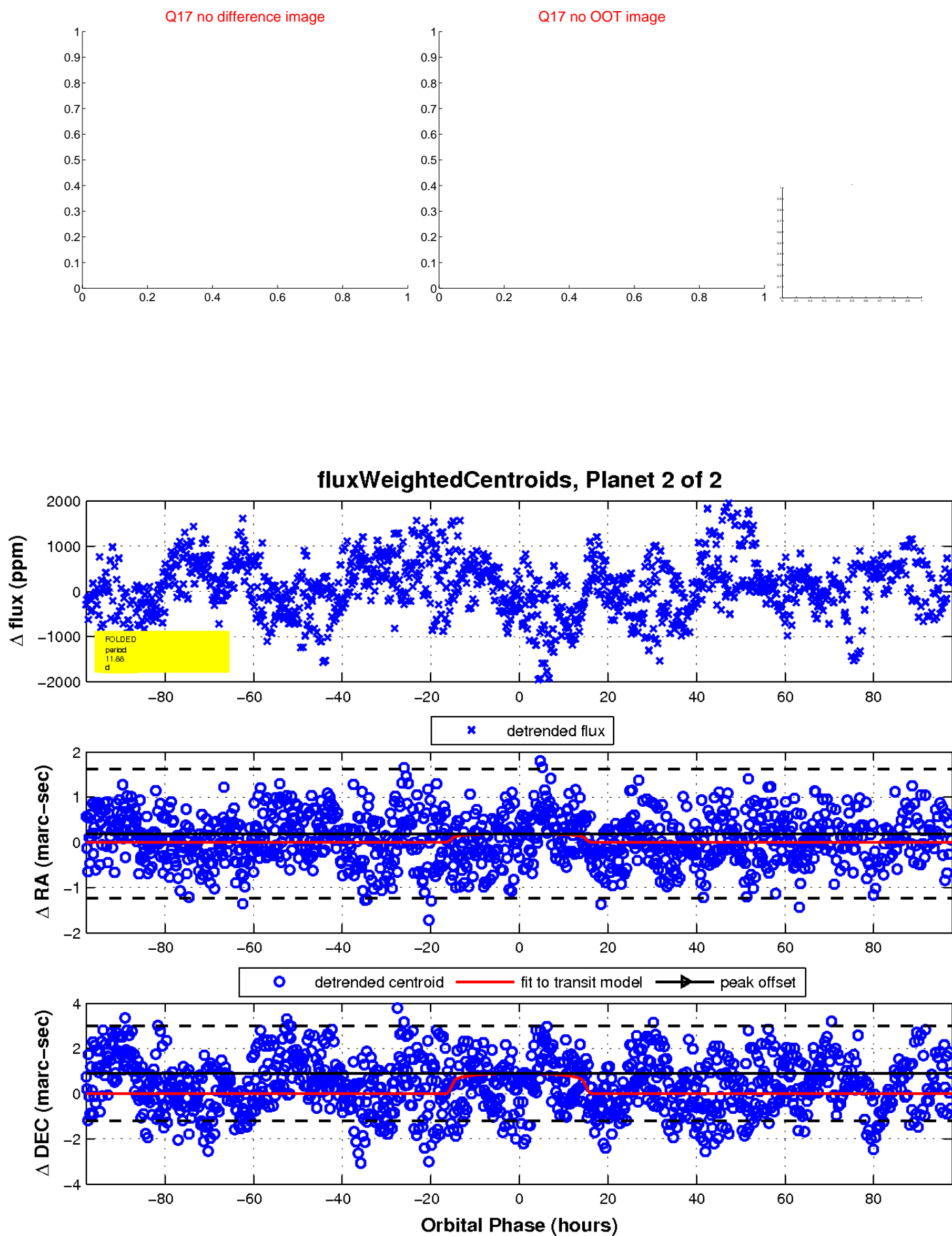
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination

