

# KIC 008739906

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008739906-01	OBS	No	366.989967	240.242852	907.3	27.854	8.9	7.8	1.12	6298	6.25	1.55
008739906-02	OBS	No	367.167848	233.693886	1038.7	25.804	7.2	9.5	1.12	6298	6.86	1.54

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008739906-01	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—CENT_FEW_DIFFS—HALO_GHOST
008739906-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_SKYE—ALL_TRANS_CHASES—CENT_FEW_DIFFS

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

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

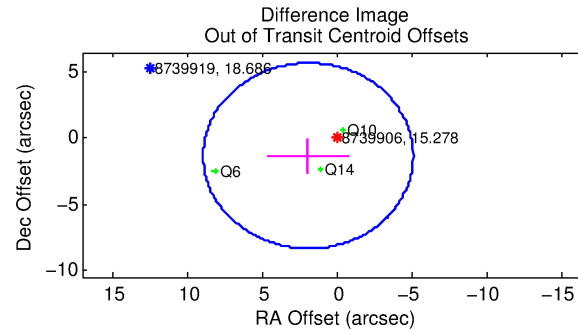
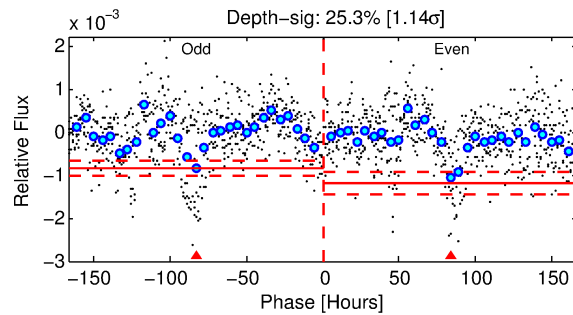
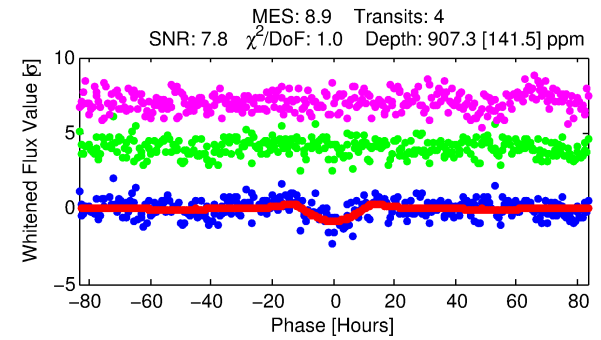
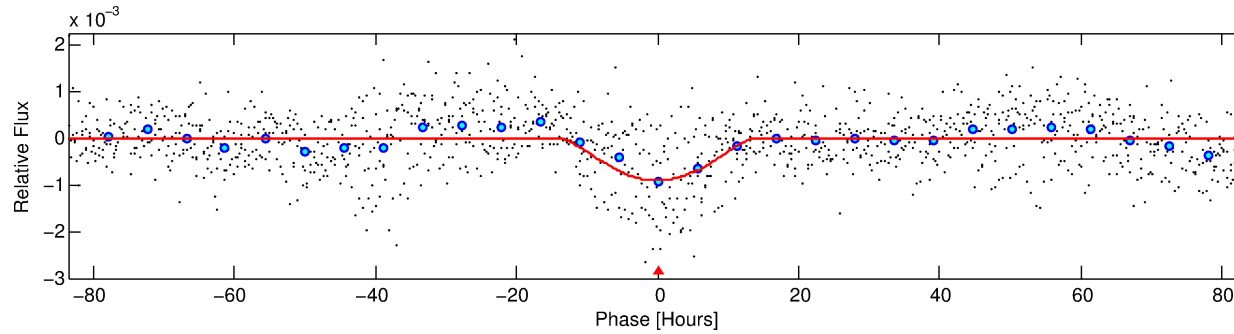
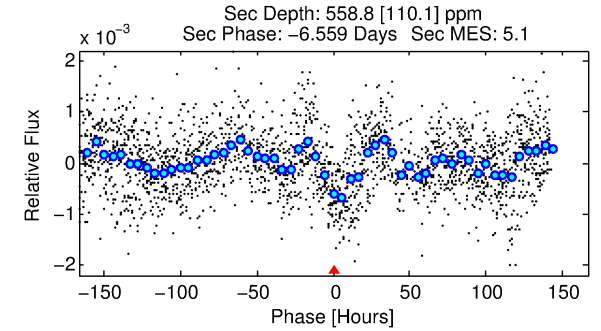
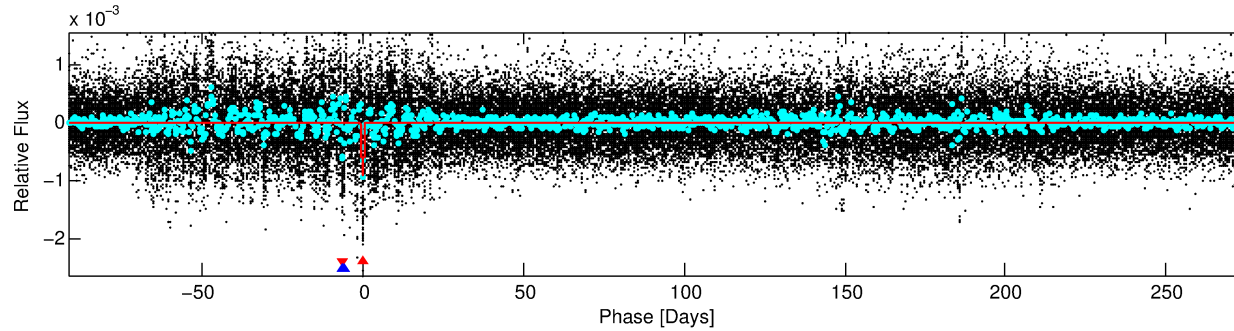
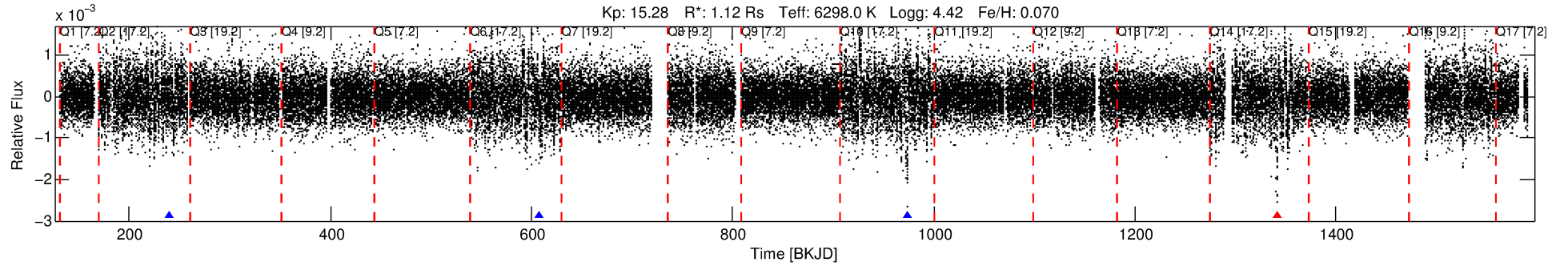
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 008739906-01

No Significant Match Found

# DV One-Page Summary

KIC: 8739906 Candidate: 1 of 2 Period: 366.990 d



## DV Fit Results:

Period = 366.98997 [0.02779] d  
Epoch = 240.2429 [0.0544] BKJD  
Rp/R\* = 0.0513 [0.1182]  
a/R\* = 33.37 [19.09]  
b = 1.00 [0.18]  
Seff = 1.55 [0.60]  
Teq = 284 [28] K  
Rp = 6.25 [14.52] Re  
a = 1.0656 [0.2687] AU  
Ag = 8945.51 [41392.51] [0.22σ]  
Teffp = 4275 [4932] K [0.81σ]

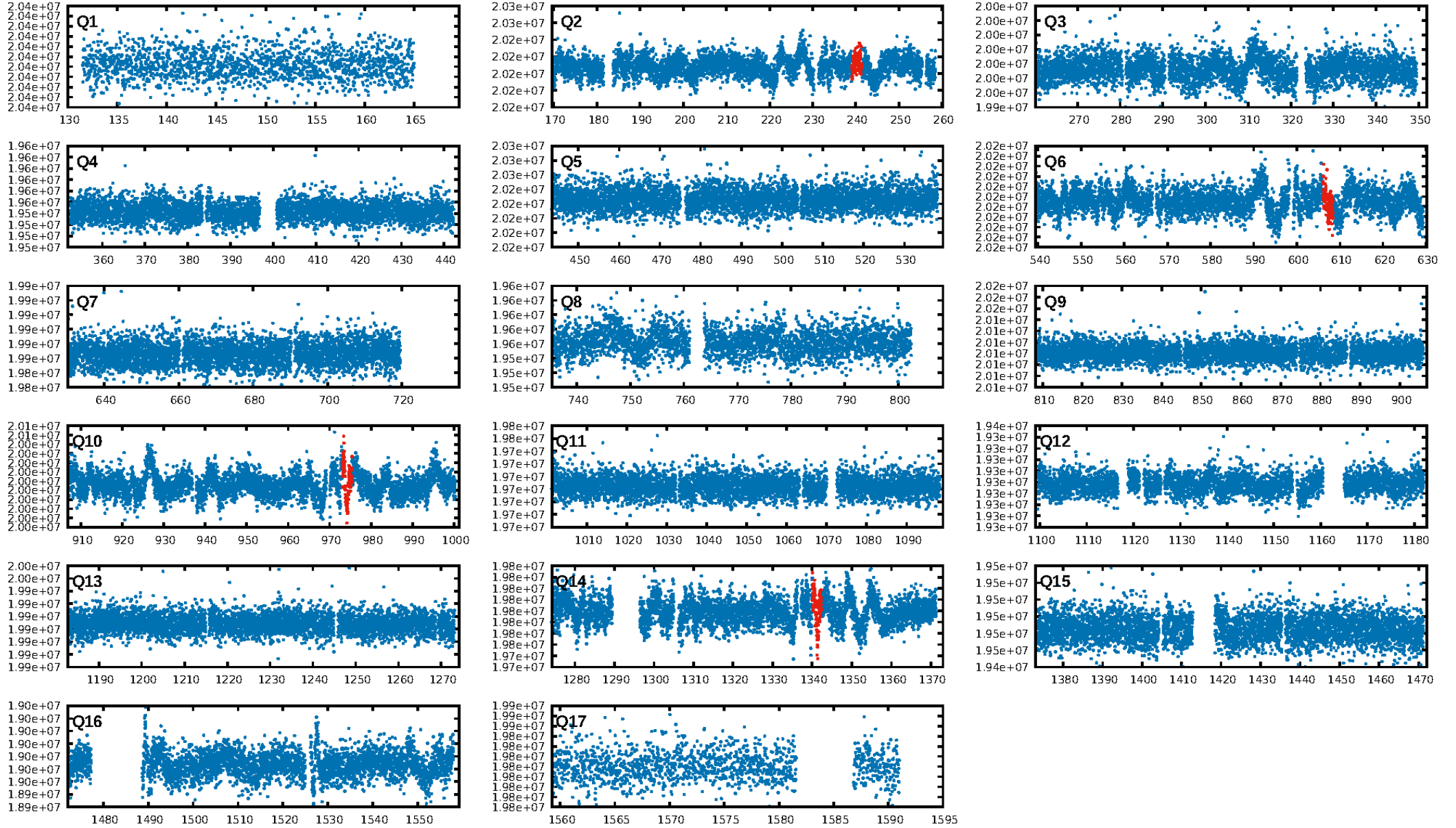
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 9.0% [0.11σ]  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 4.21e-17  
RollingBand-fgt: 0.75 [3/4]  
GhostDiagnostic-chr: -0.1443  
Centroid-sig: 95.9%  
Centroid-so: 0.554 arcsec [0.22σ]  
OotOffset-rm: 2.309 arcsec [0.99σ]  
KicOffset-rm: 2.436 arcsec [1.03σ]  
OotOffset-st: 3/0/0/0 [3]  
KicOffset-st: 3/0/0/0 [3]  
DiffImageQuality-fgm: 0.00 [0/3]  
DiffImageOverlap-fno: 1.00 [4/4]

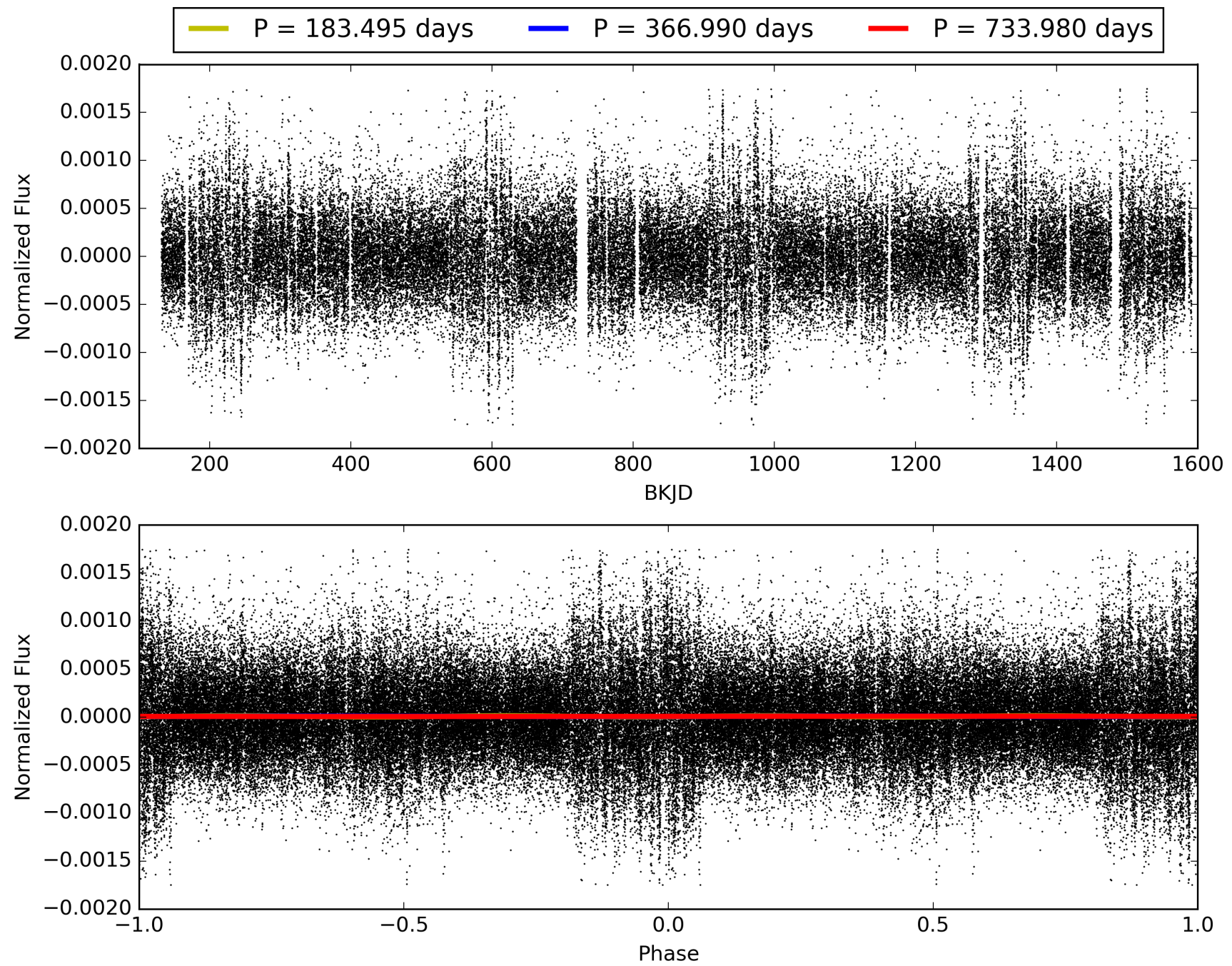
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 00:16:07 Z

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

# TCE 008739906-01, PDC Light Curves

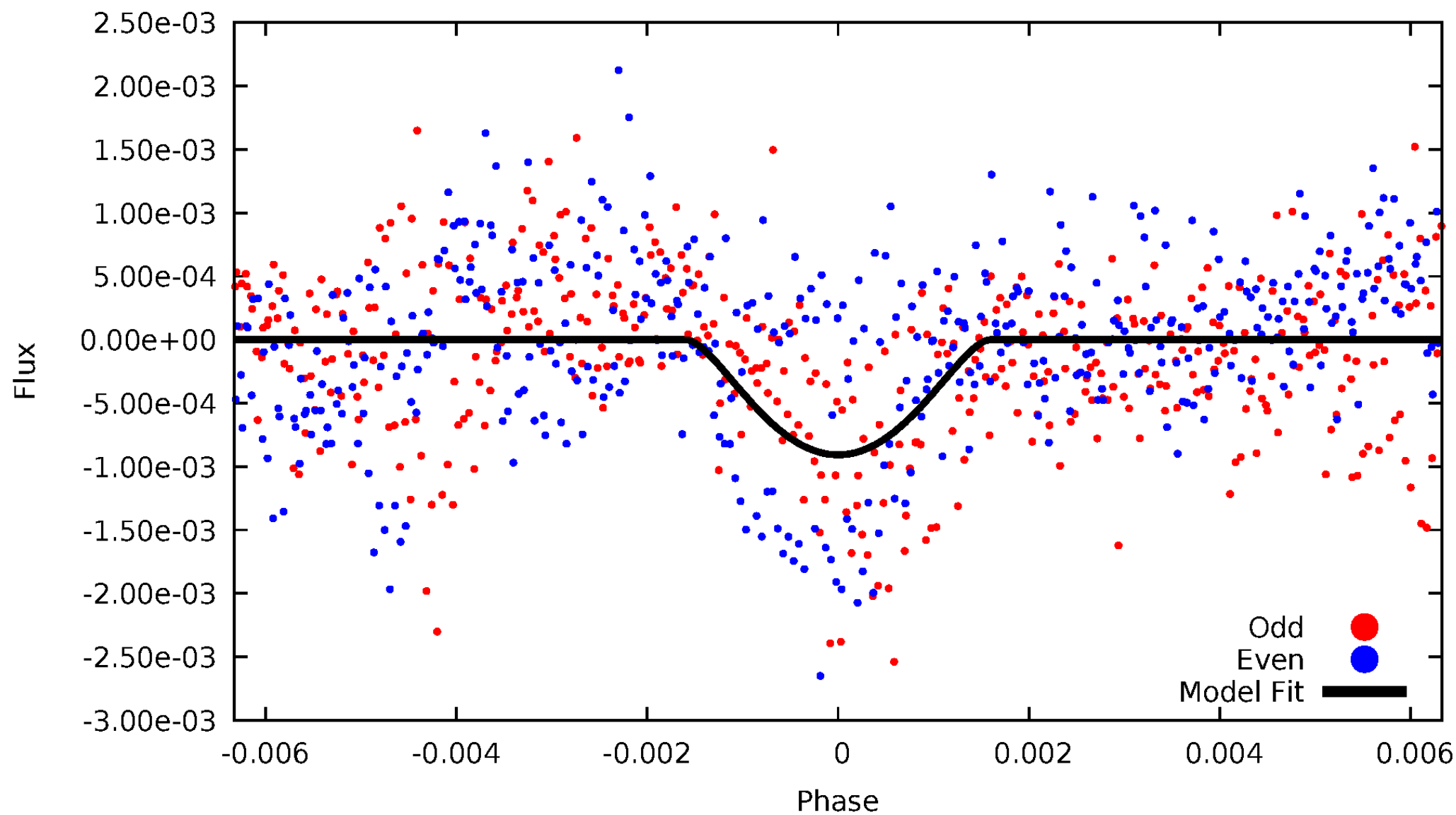


TCE 008739906-01



# DV Odd/Even

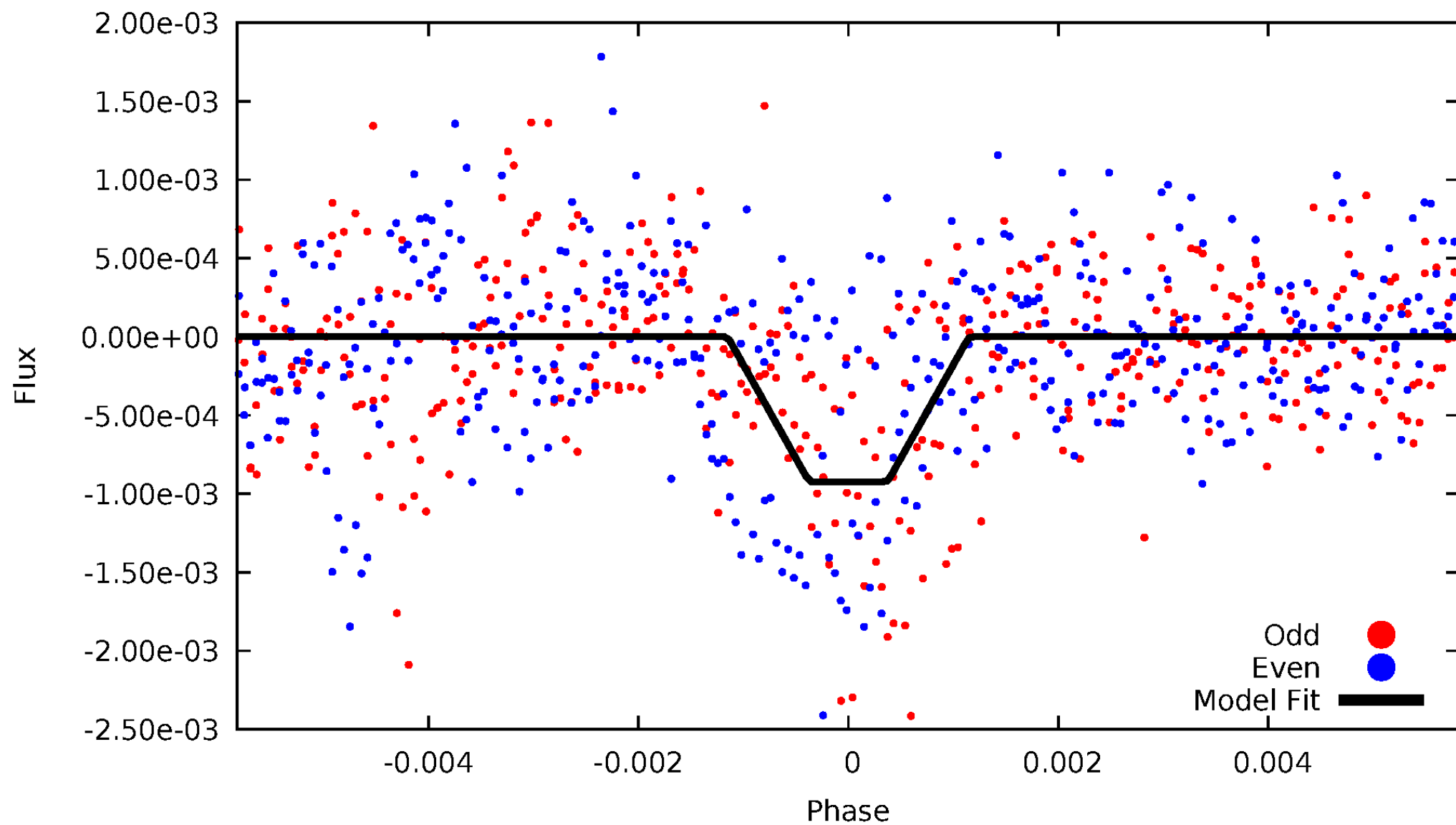
TCE 008739906-01





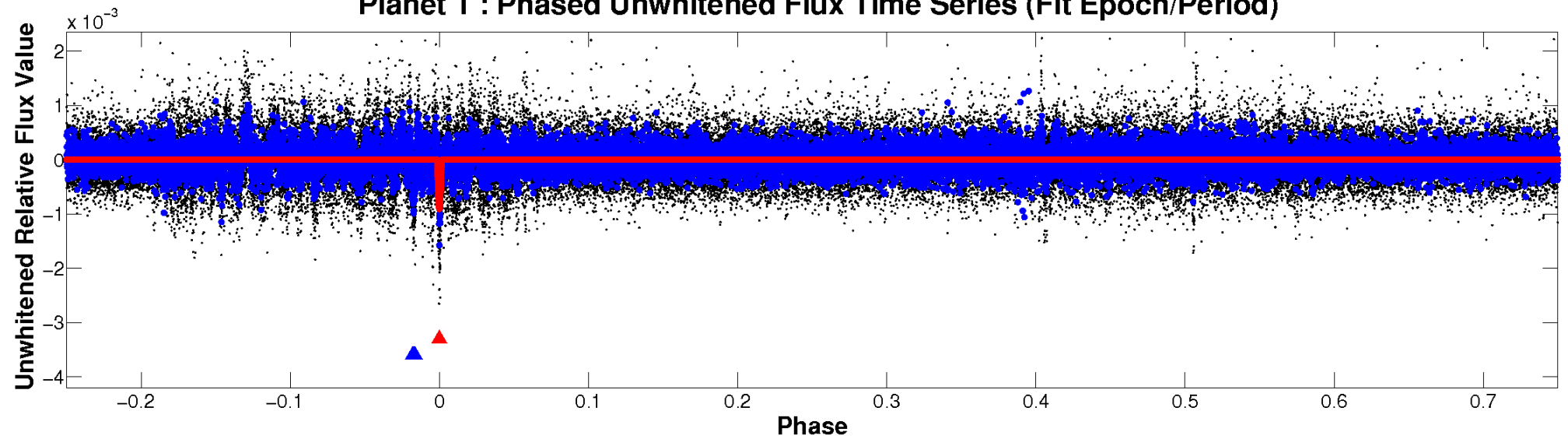
# ALT Odd/Even

TCE 008739906-01

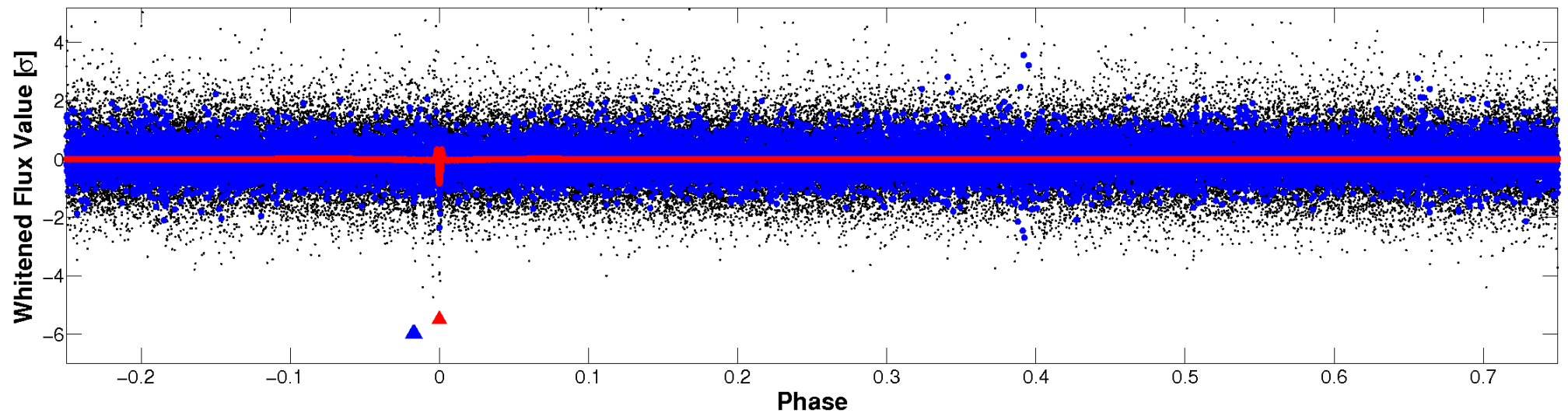


# Non-Whitened Vs. Whitened Light Curve

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

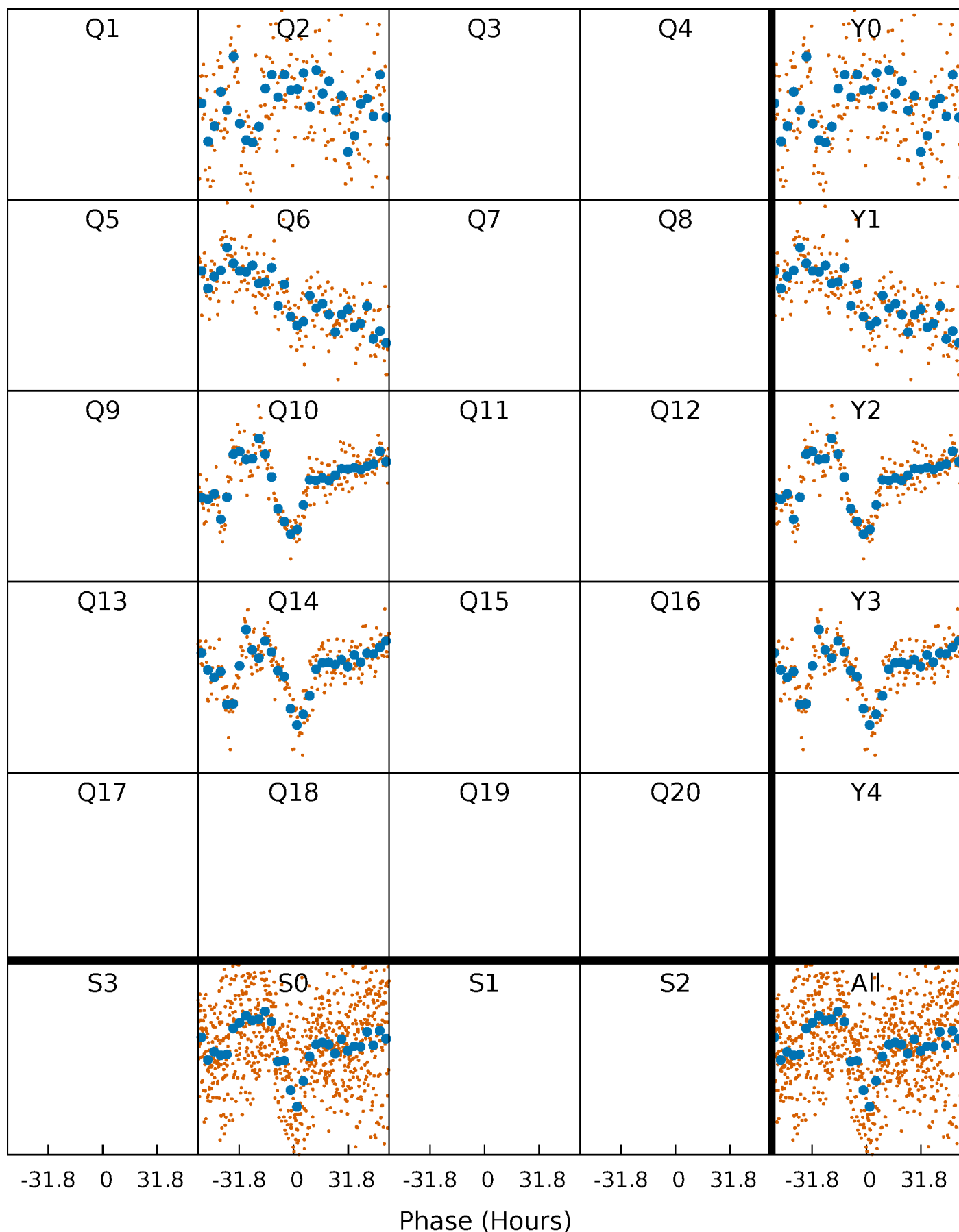


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

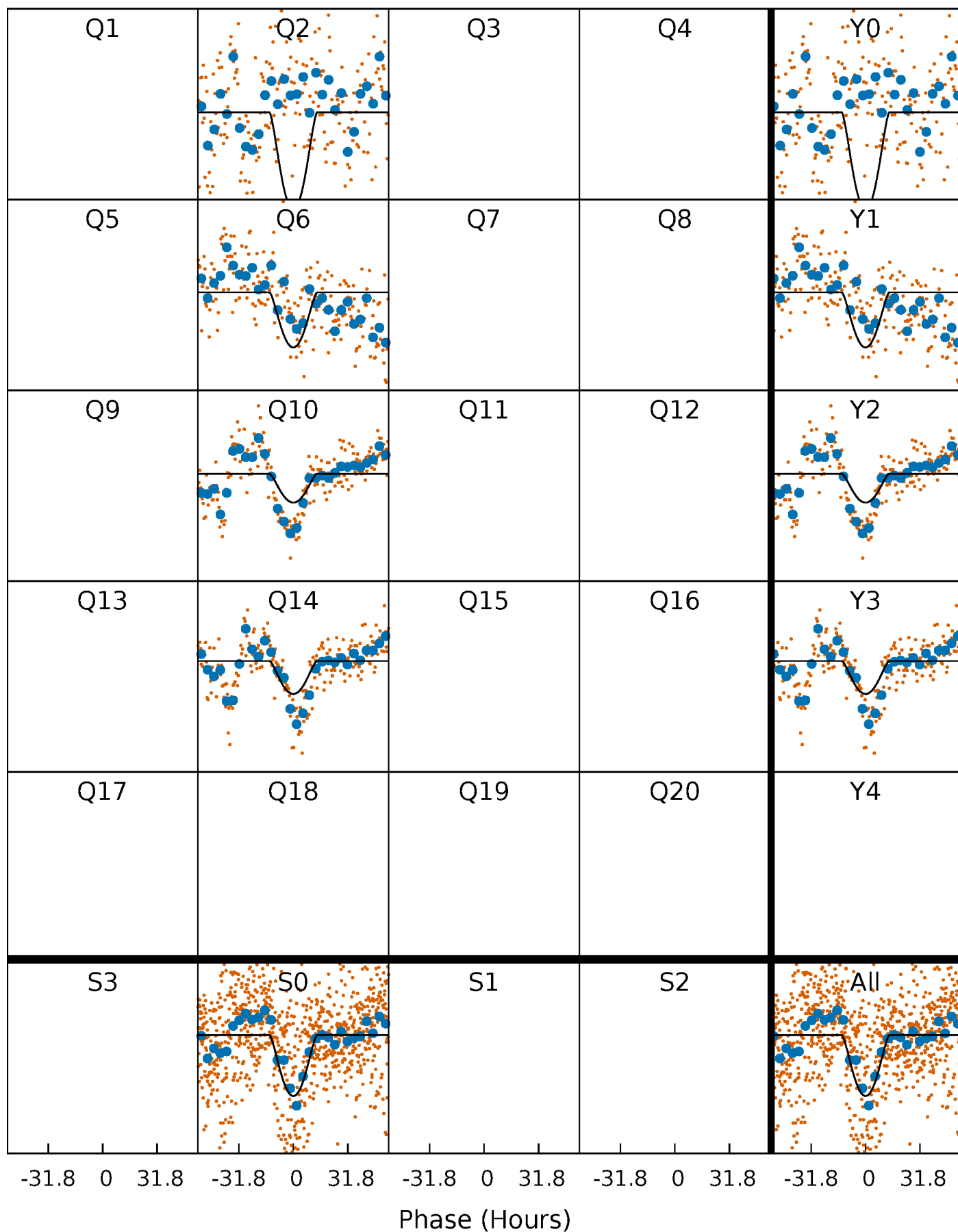
TCE 008739906-01 P=366.989967 Days  $T_0=240.242852$  (BKJD)





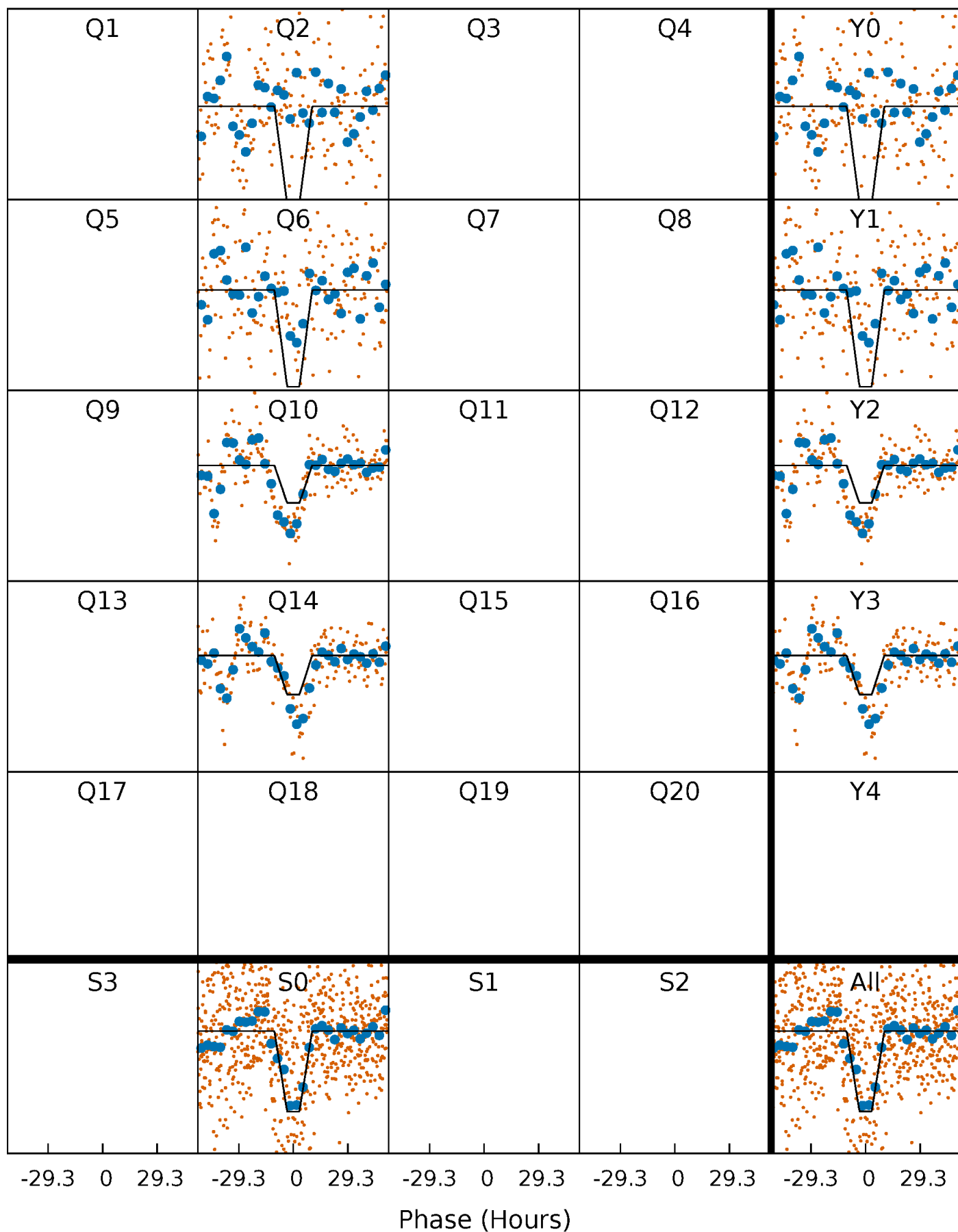
# DV Quarter-Phased Transit Curves

TCE 008739906-01 P=366.989967 Days  $T_0=240.242852$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

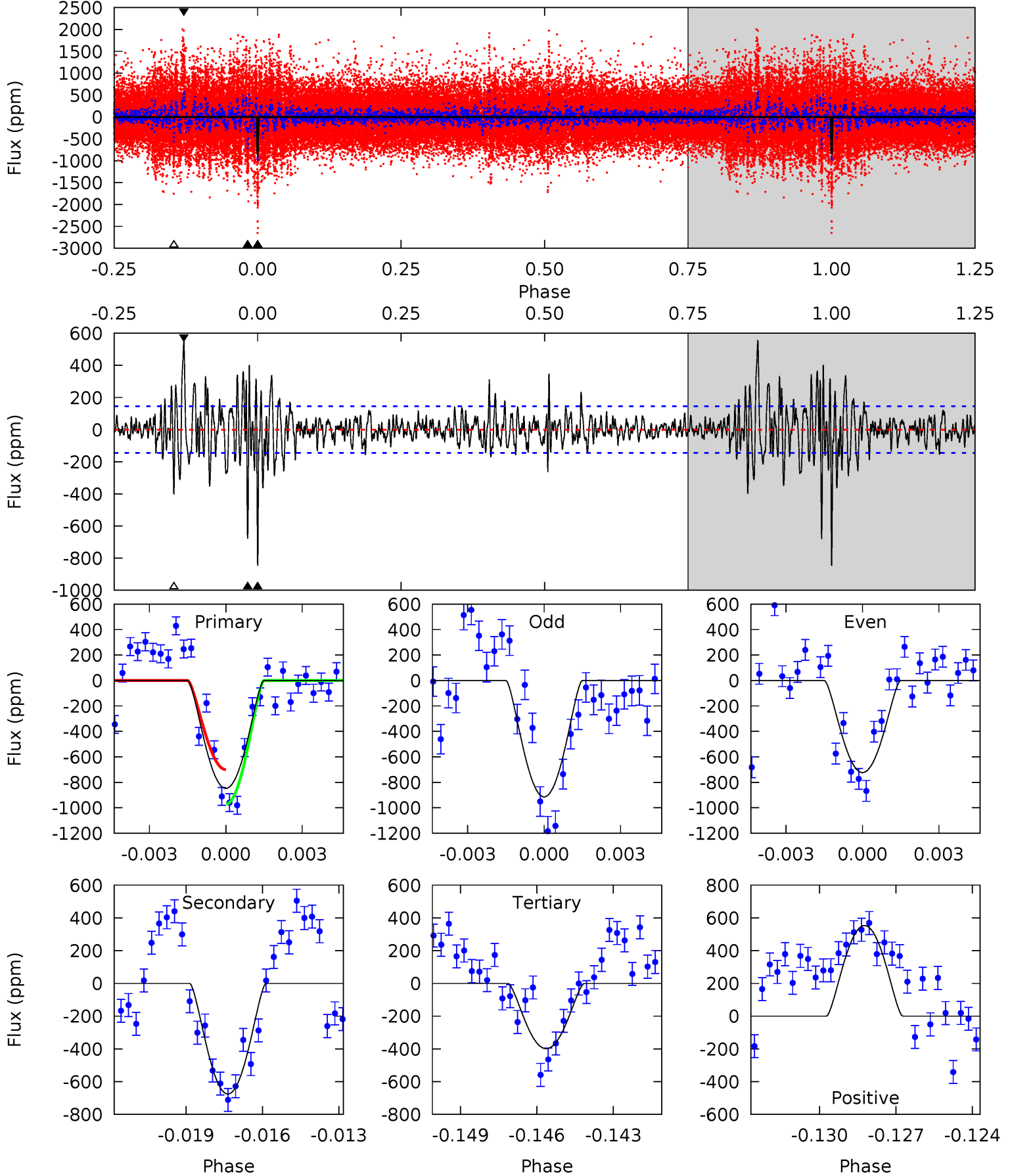
TCE 008739906-01 P=366.966304 Days  $T_0=240.309980$  (BKJD)



# DV Model-Shift Uniqueness Test

008739906-01, P = 366.989967 Days, E = 240.242852 Days

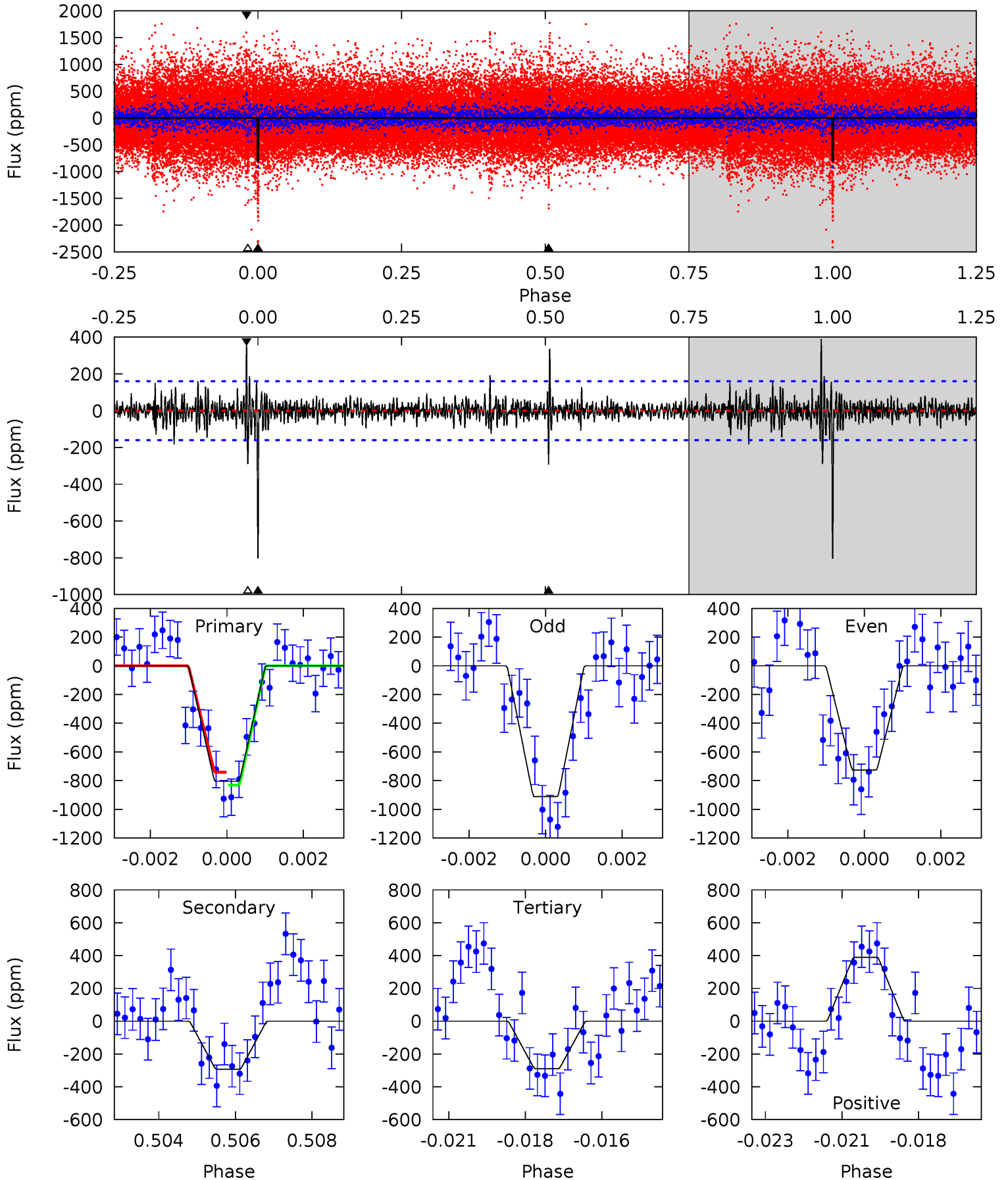
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
30.6	24.4	14.4	20.0	5.24	2.95	3.52	16.2	10.6	10.0	4.43	3.47	0.90	0.39	4.91



# Alt Model-Shift Uniqueness Test

008739906-01, P = 366.966304 Days, E = 240.309980 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
26.7	9.72	9.60	12.9	5.30	3.05	1.39	17.1	13.8	0.12	-3.17	3.07	0.91	0.33	1.48



### Stellar Parameters For KIC 008739906

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6298^{+168}_{-205}$	$4.421^{+0.050}_{-0.200}$	$0.070^{+0.250}_{-0.350}$	$1.116^{+0.335}_{-0.134}$	$1.198^{+0.141}_{-0.173}$	$1.214^{+0.321}_{-0.612}$
	+3%/-3%	+1%/-5%	+357%/-500%	+30%/-12%	+12%/-14%	+26%/-50%
Source	PHO1	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 008739906-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-676 \pm 28$	$13.19^{+12.93}_{-9.04}$	$405^{+27}_{-20}$	$3573^{+2127}_{-641}$	$2355^{+22492}_{-1762}$
Alt.	$-294 \pm 30$	$12.11^{+12.06}_{-8.50}$	$408^{+28}_{-20}$	$3260^{+1687}_{-565}$	$1192^{+11211}_{-892}$

$T_{max}$  = Theoretical Maximum Planetary Temperature

$T_{obs}$  = Observed Planetary Temperature (Assuming A=0.3)

$A_{obs}$  = Observed Albedo (Assuming T=0)

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

## DV Centroid Data

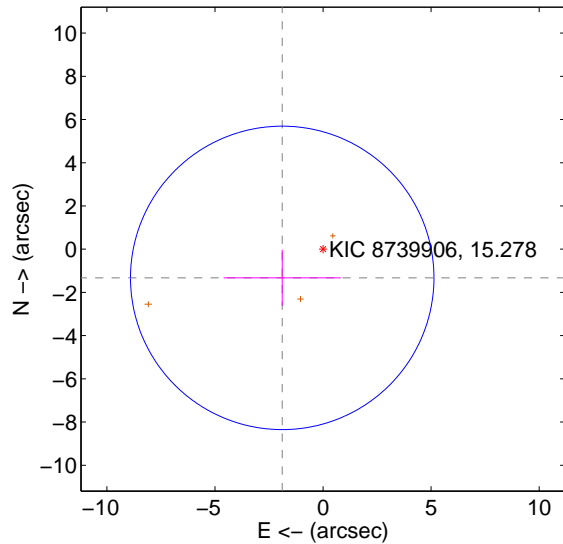
Supplemental centroid analysis for 008739906-01. Kepler magnitude: 15.28. Transit SNR 7.79

There are 0 quarters with good PRF difference image offsets

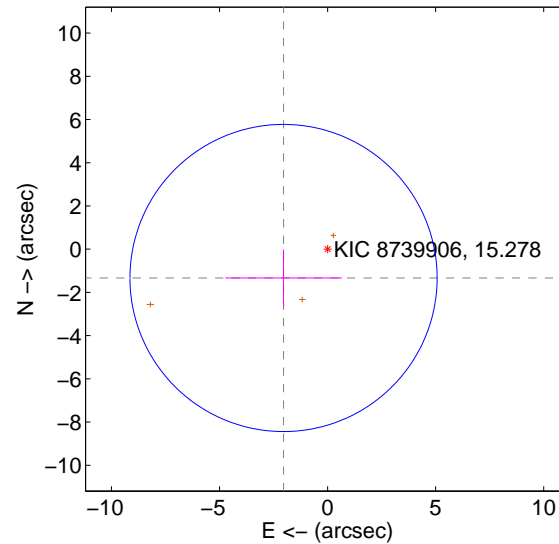
The direct PRF centroid is offset from the target star catalog position by about 0.13 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$2.309 \pm 2.340$	0.99	$1.889 \pm 2.712$	$-1.329 \pm 1.298$
PRF-fit source offset from KIC position	$2.436 \pm 2.369$	1.03	$2.038 \pm 2.696$	$-1.334 \pm 1.319$
photometric centroid source offset	$0.55 \pm 2.49$	0.22	$0.33 \pm 2.17$	$-0.45 \pm 2.64$

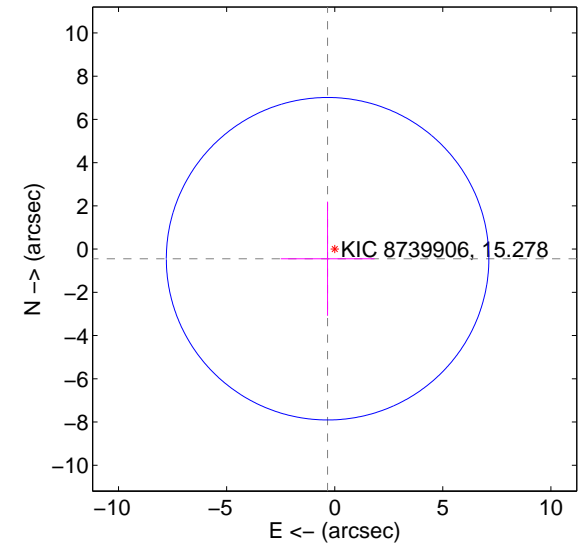
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



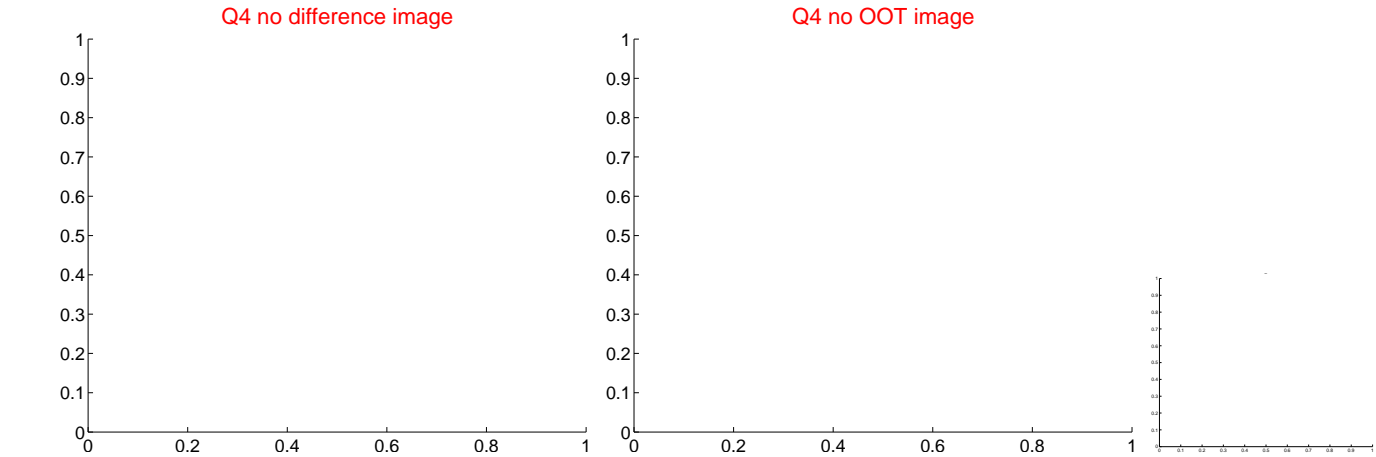
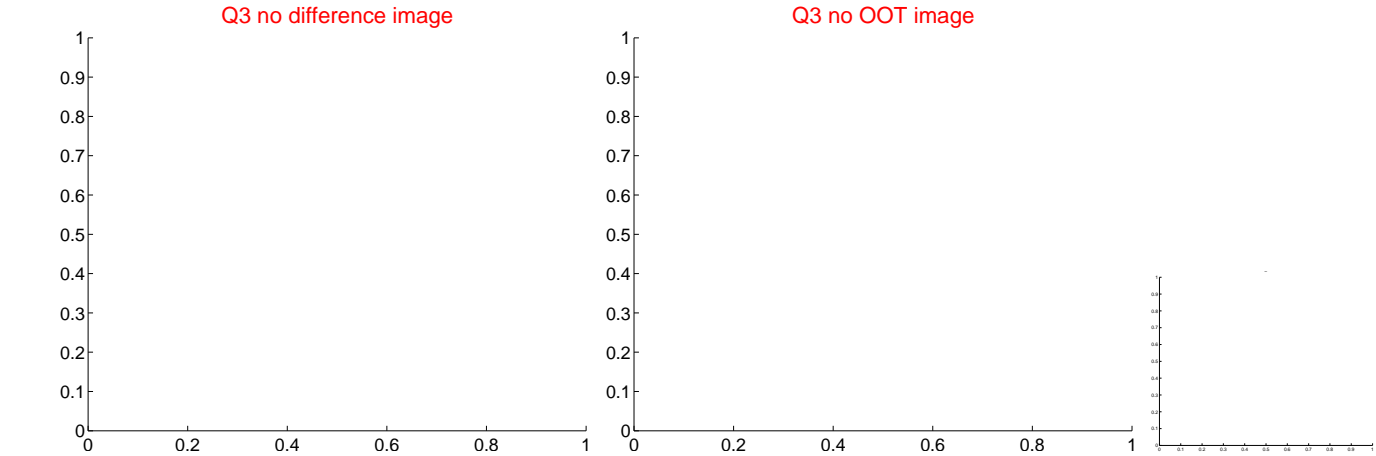
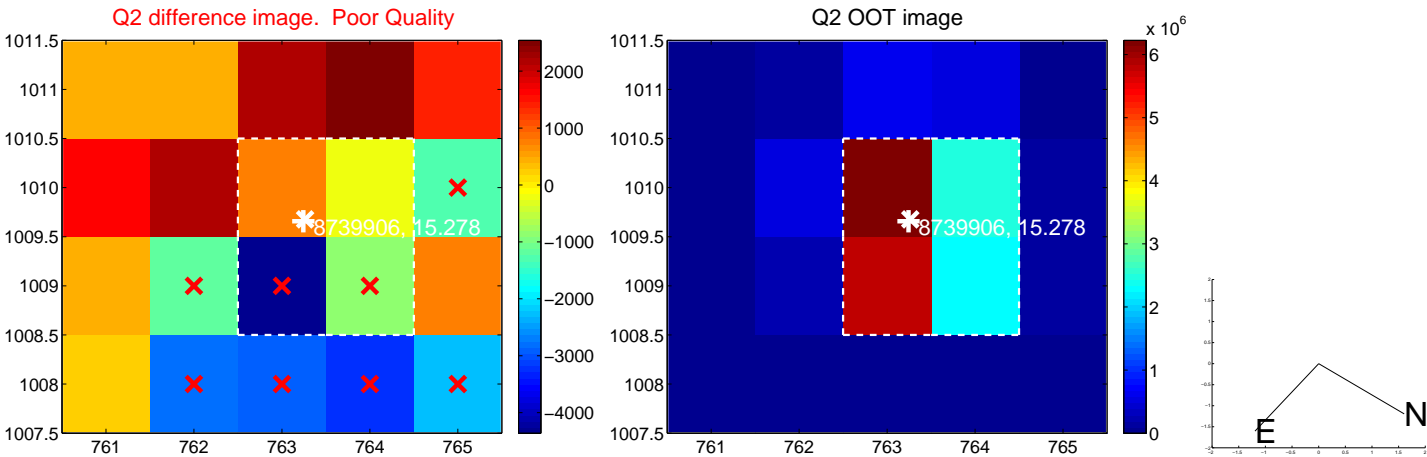
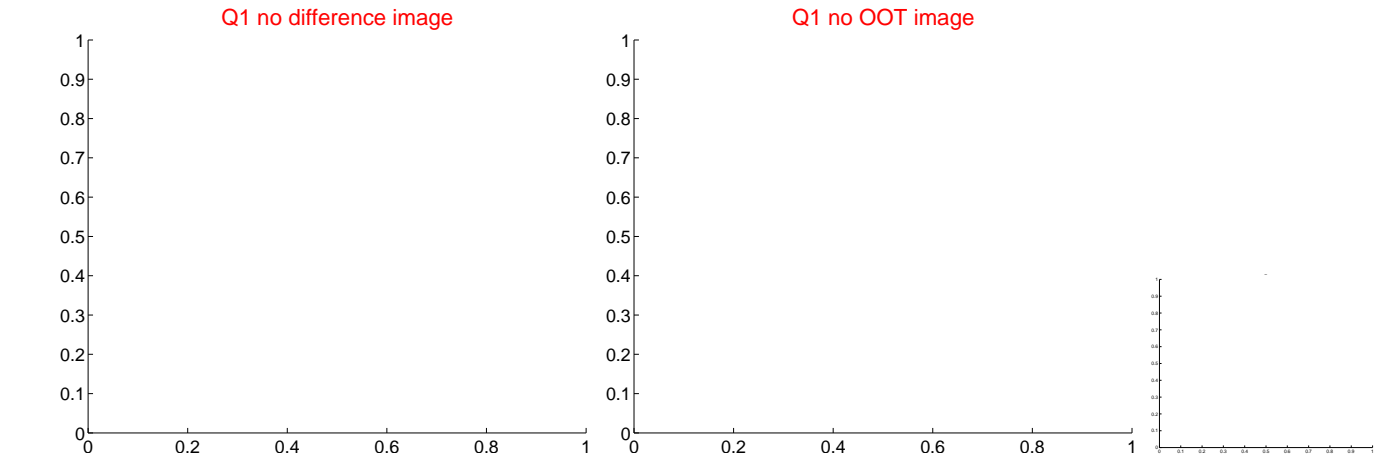
offset from photometric centroids



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 ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.

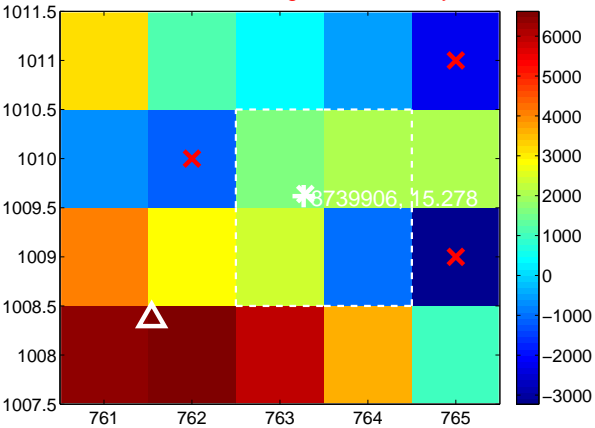
Q5 no difference image



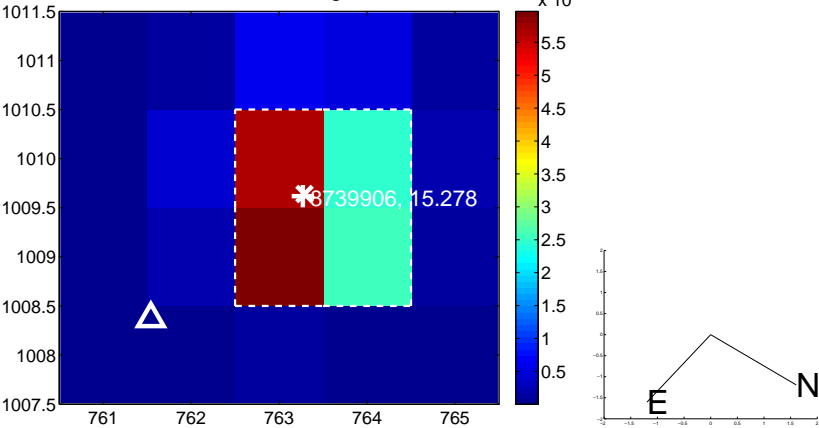
Q5 no OOT image



Q6 difference image. Poor Quality



Q6 OOT image



Q7 no difference image



Q7 no OOT image



Q8 no difference image



Q8 no OOT image



white ×: KIC target position; +: OOT centroid; △: difference centroid. red ×: large negative pixel value.

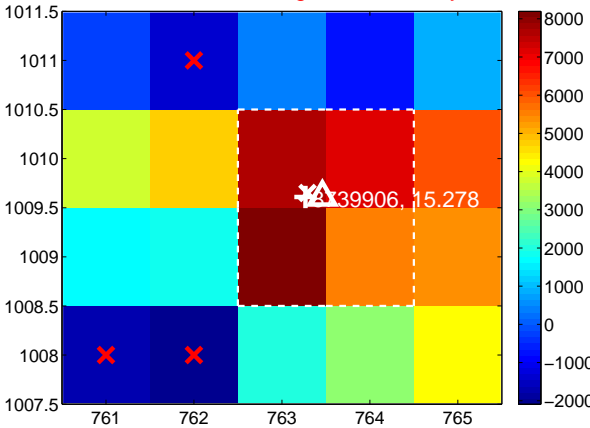
Q9 no difference image



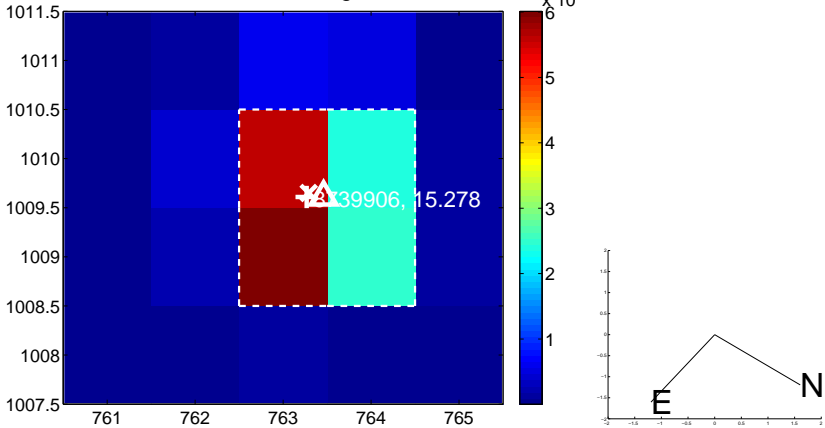
Q9 no OOT image



Q10 difference image. Poor Quality



Q10 OOT image



Q11 no difference image



Q11 no OOT image



Q12 no difference image



Q12 no OOT image

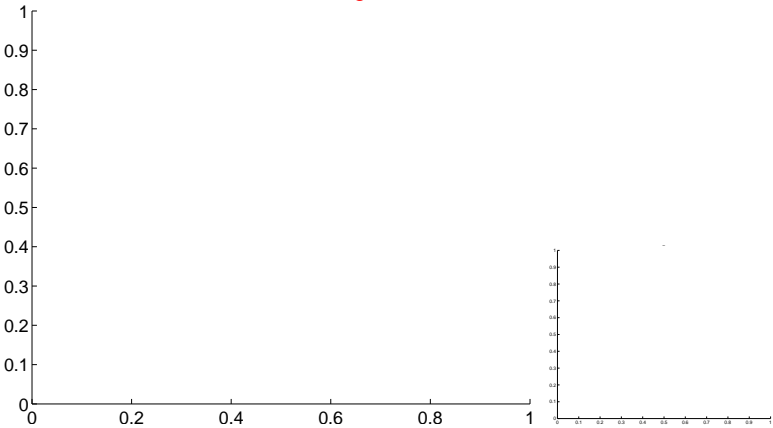


white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.

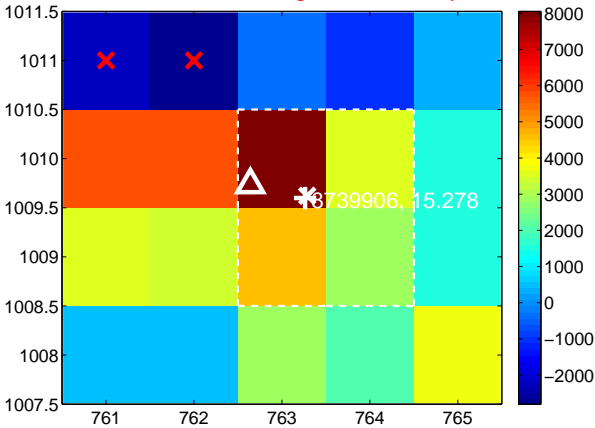
Q13 no difference image



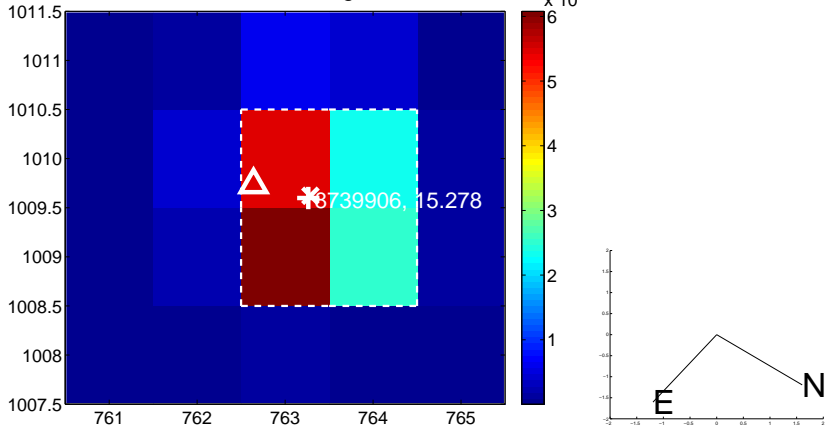
Q13 no OOT image



Q14 difference image. Poor Quality



Q14 OOT image



Q15 no difference image



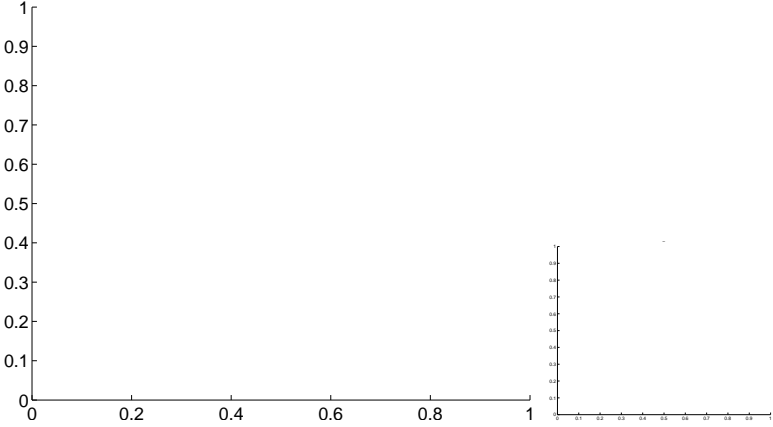
Q15 no OOT image



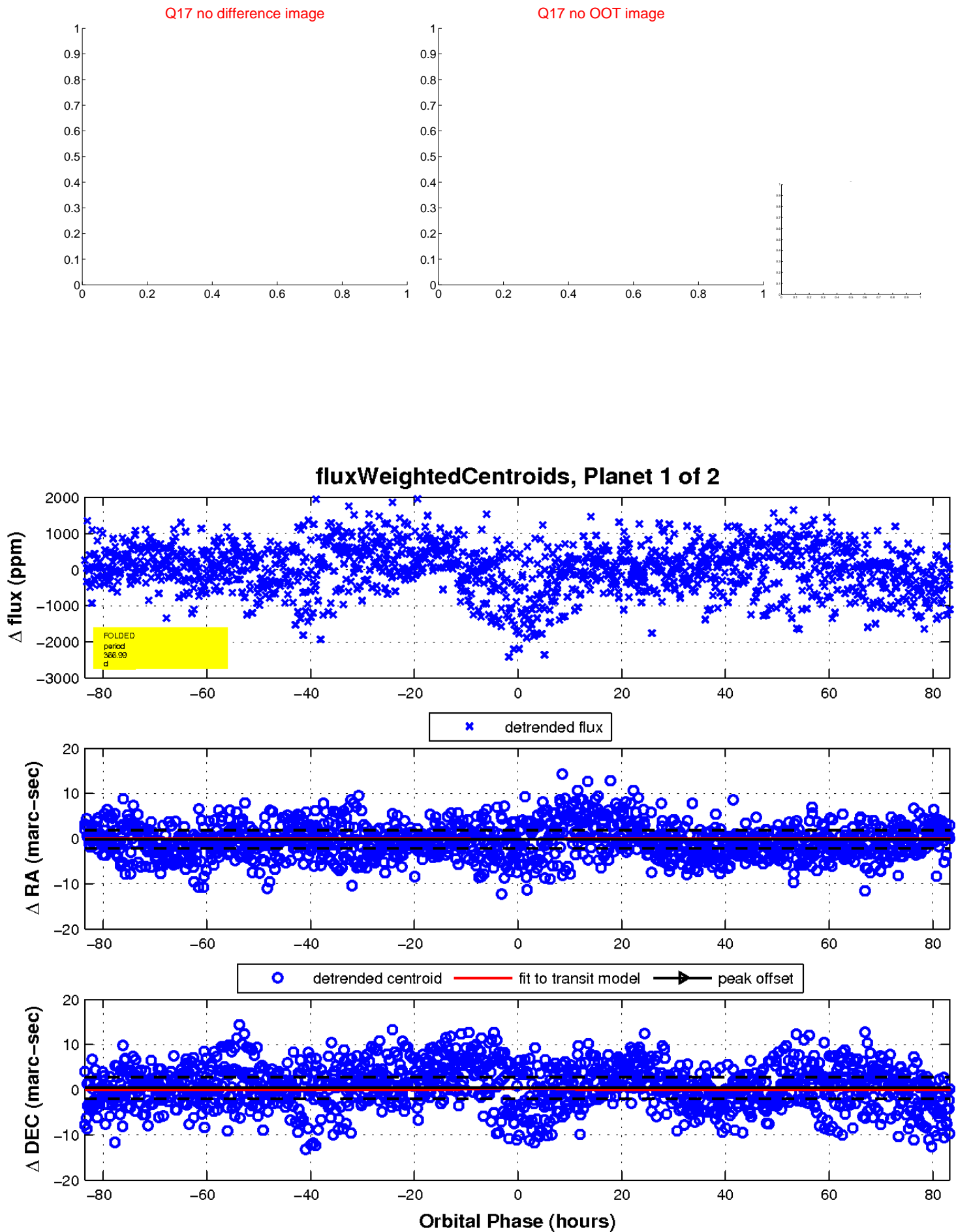
Q16 no difference image



Q16 no OOT image

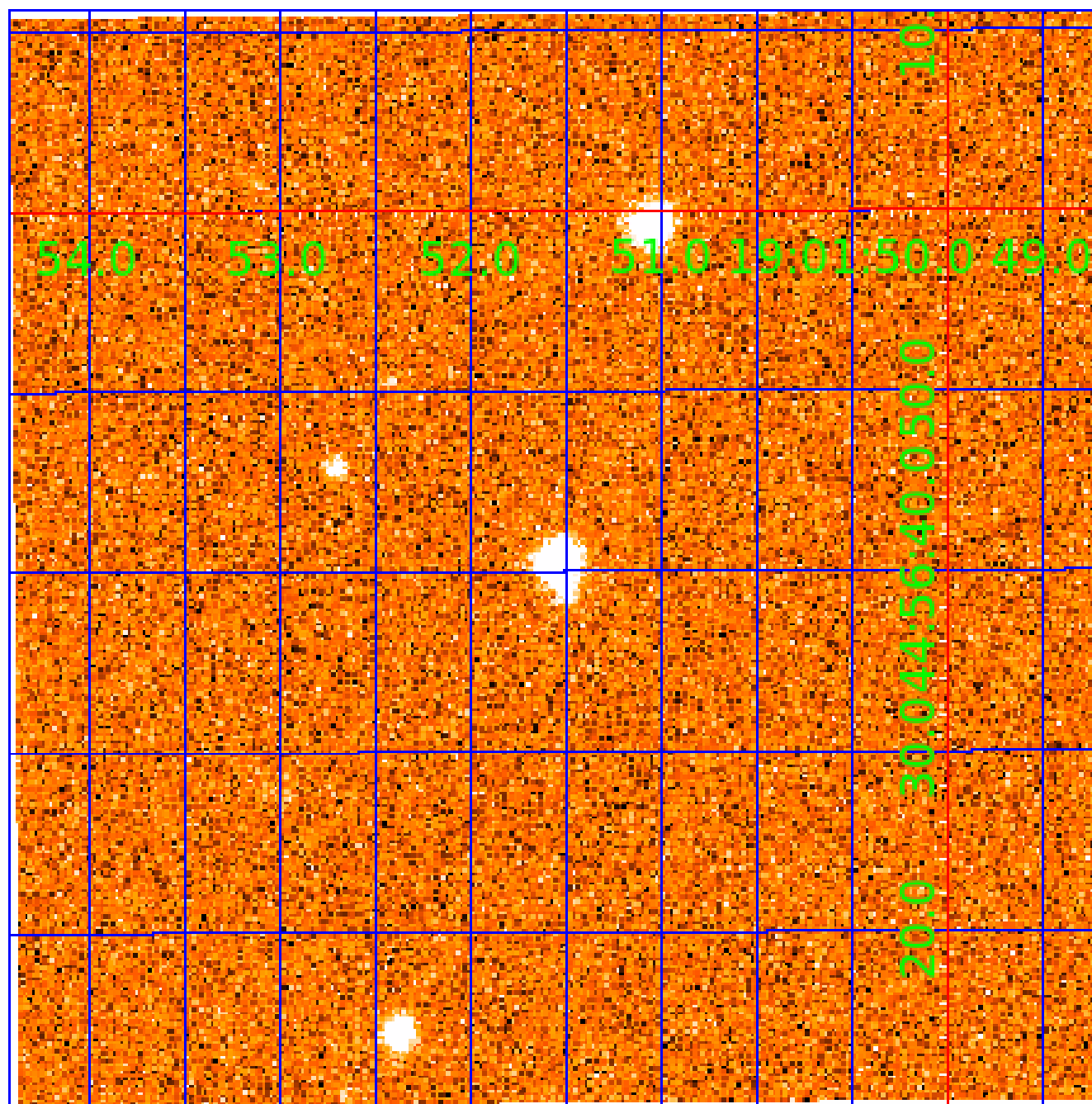


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



# UKIRT Image

Declination





# KIC 008739906

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008739906-01	OBS	No	366.989967	240.242852	907.3	27.854	8.9	7.8	1.12	6298	6.25	1.55
008739906-02	OBS	No	367.167848	233.693886	1038.7	25.804	7.2	9.5	1.12	6298	6.86	1.54

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008739906-01	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—CENT_FEW_DIFFS—HALO_GHOST
008739906-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_SKYE—ALL_TRANS_CHASES—CENT_FEW_DIFFS

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

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

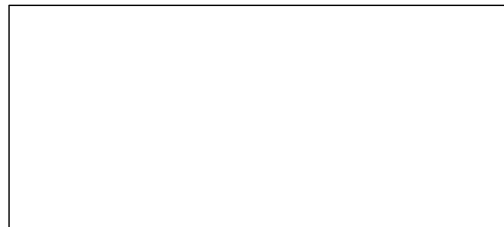
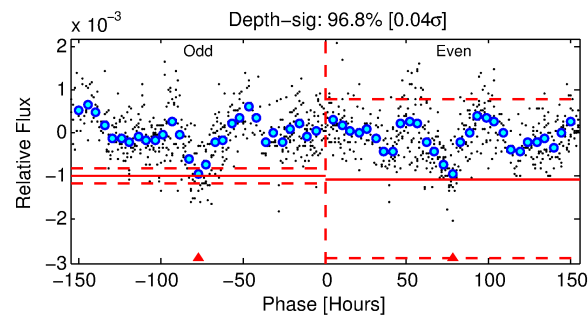
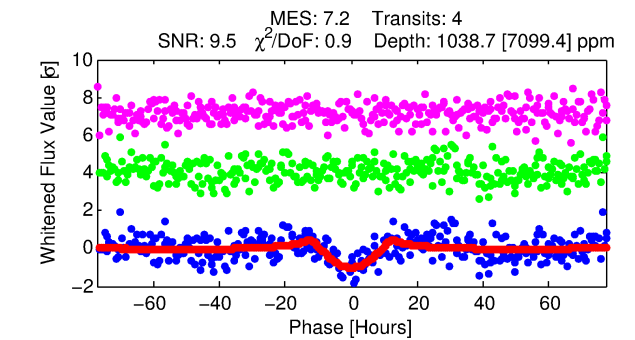
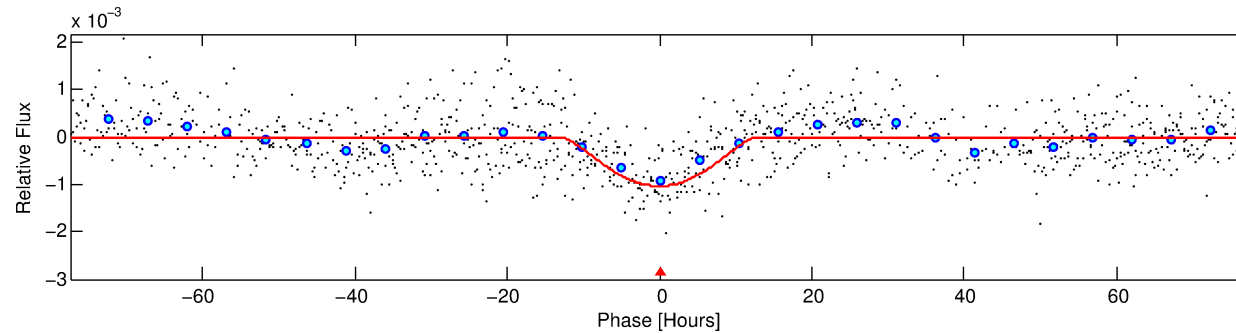
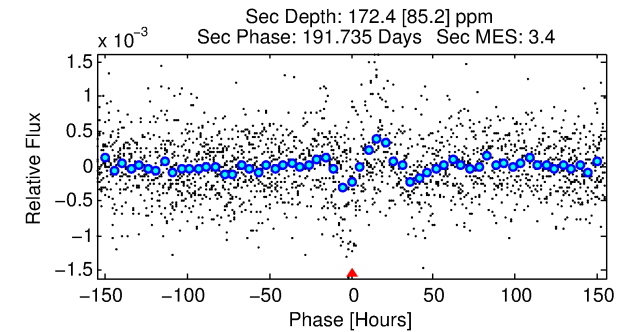
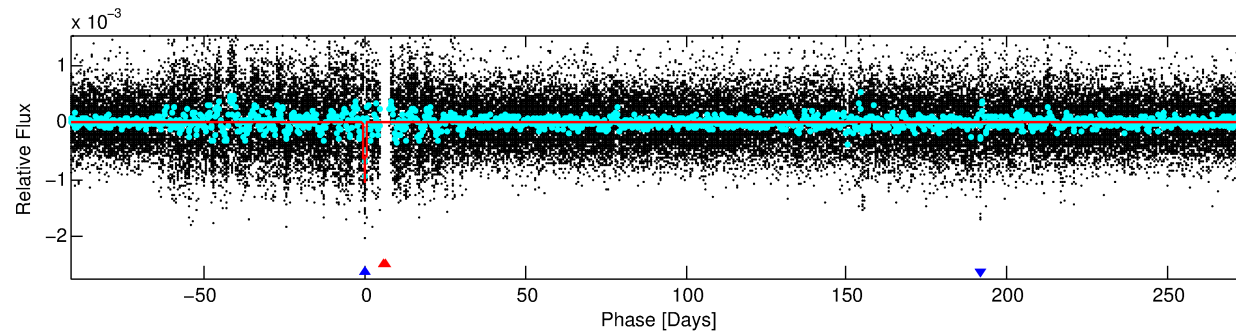
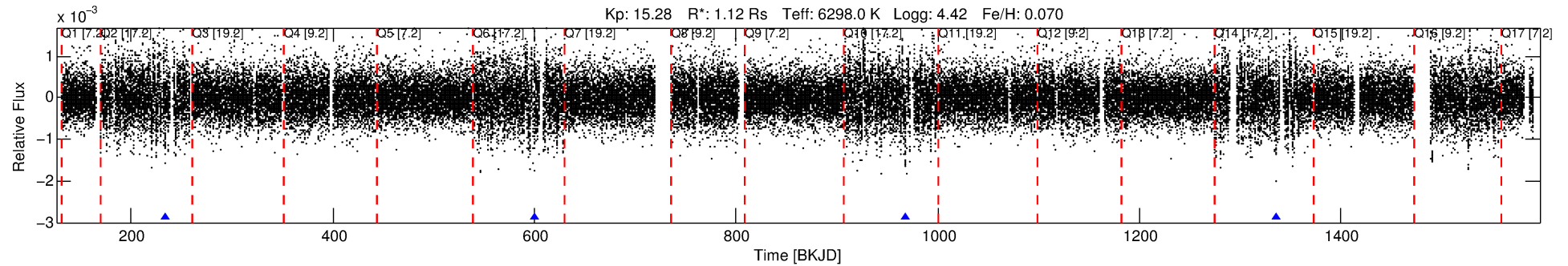
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 008739906-02

No Significant Match Found

# DV One-Page Summary

KIC: 8739906 Candidate: 2 of 2 Period: 367.168 d



## DV Fit Results:

Period = 367.16785 [0.02091] d  
Epoch = 233.6939 [0.0398] BKJD  
Rp/R\* = 0.0563 [0.1264]  
a/R\* = 37.00 [19.66]  
b = 1.00 [0.08]  
Seff = 1.55 [0.60]  
Teq = 284 [28] K  
Rp = 6.86 [15.54] Re  
a = 1.0659 [0.2688] AU  
Ag = 2292.37 [10392.40] [0.22σ]  
Teffp = 3041 [3437] K [0.80σ]

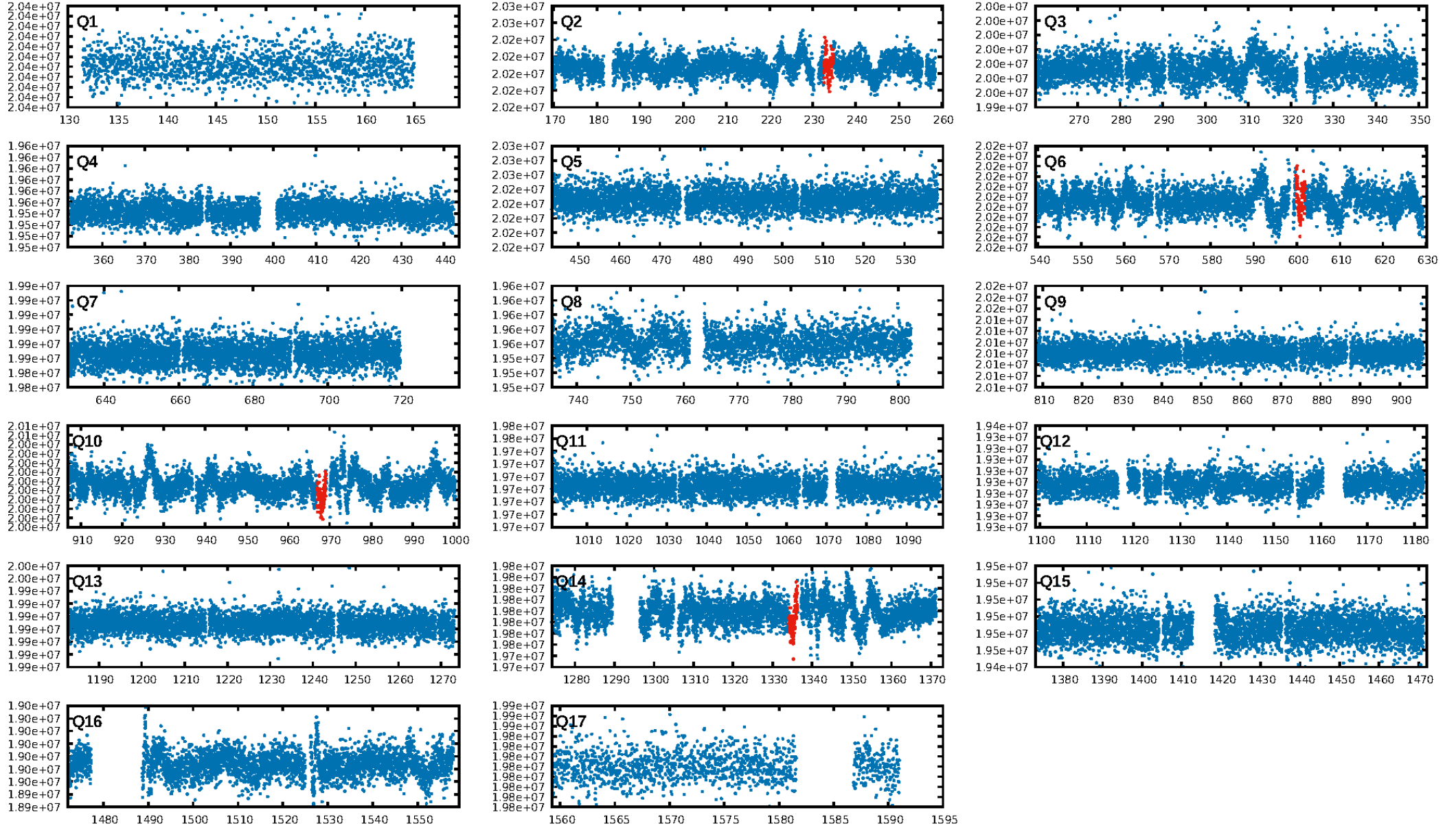
## DV Diagnostic Results:

ShortPeriod-sig: 9.0% [0.11σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 86.7%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 2.94e-11**  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: 19.88  
**Centroid-sig: 0.0%**  
**Centroid-so: 6.734 arcsec [3.09σ]**  
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: N/A

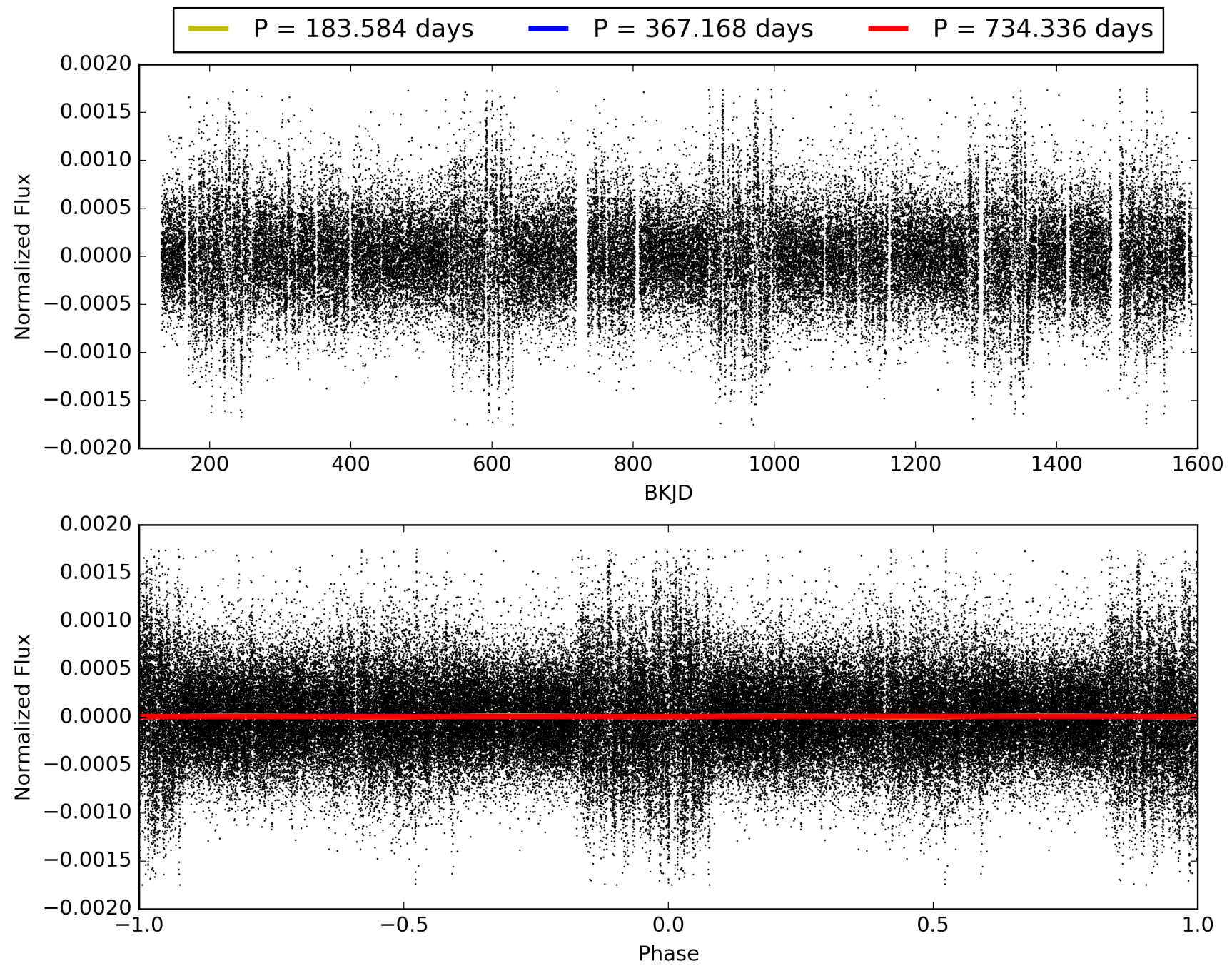
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 00:16:15 Z

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

# TCE 008739906-02, PDC Light Curves

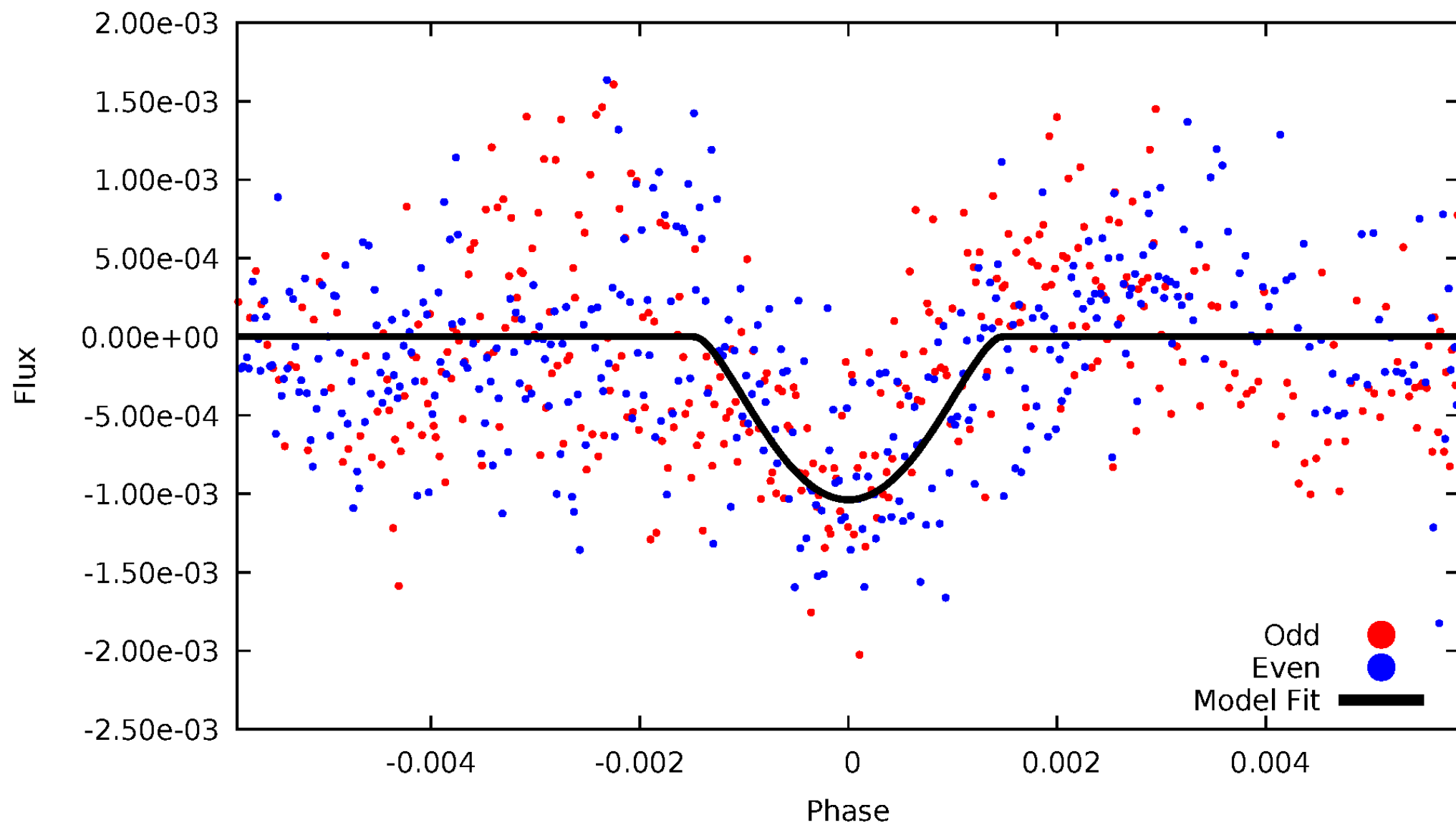


TCE 008739906-02



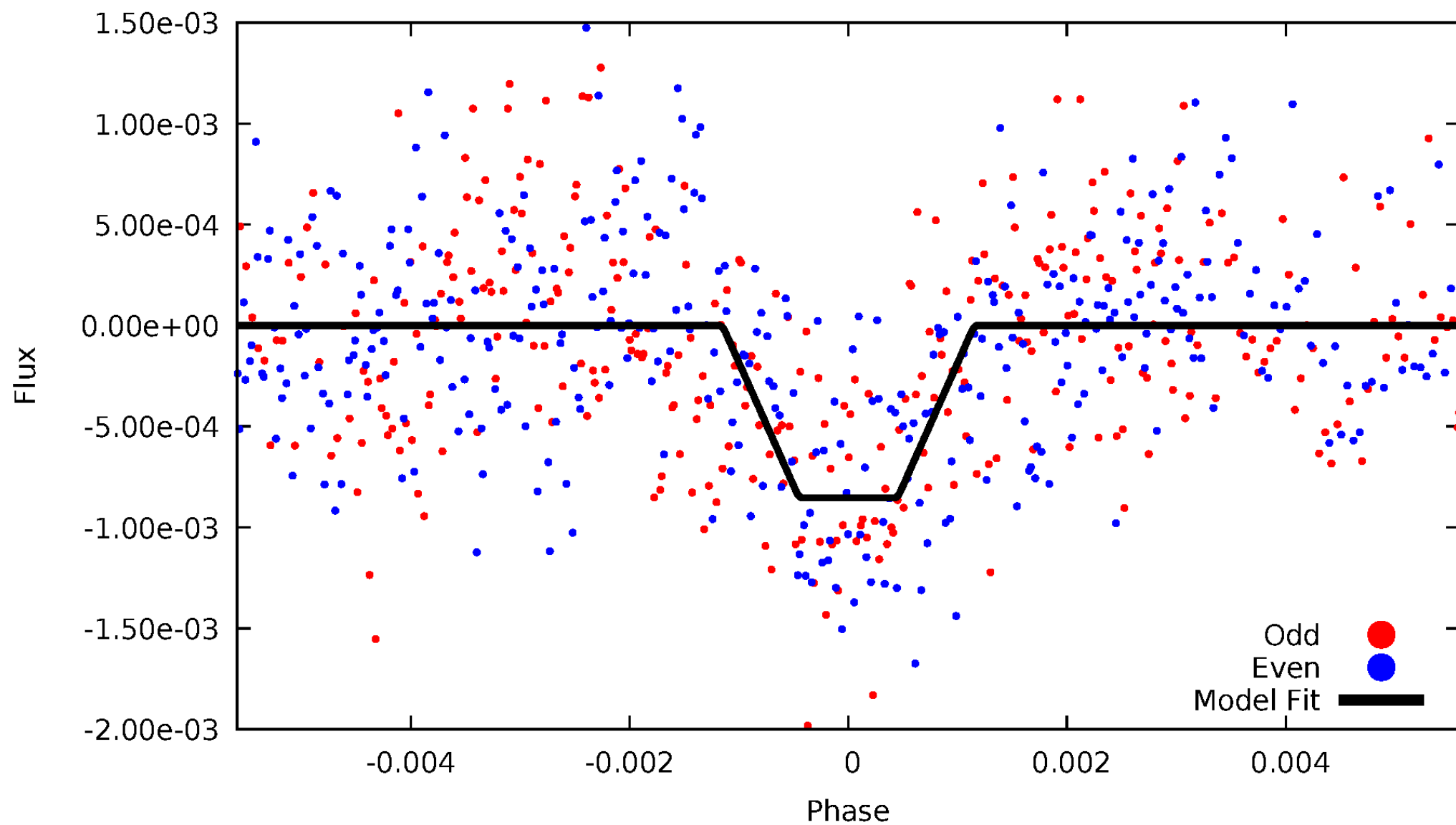
# DV Odd/Even

TCE 008739906-02



# ALT Odd/Even

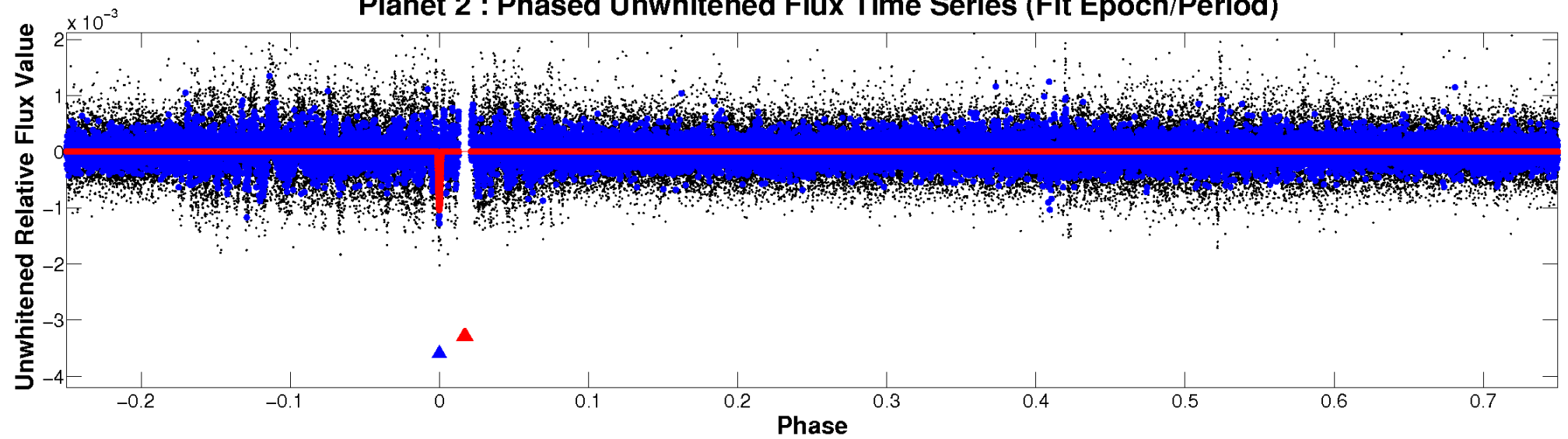
TCE 008739906-02



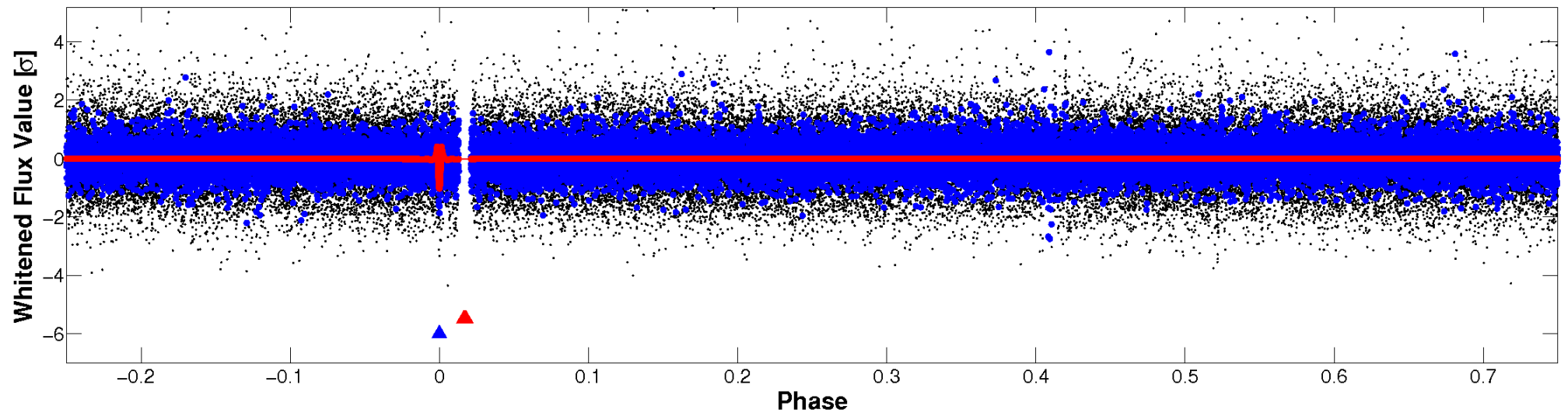


# Non-Whitened Vs. Whitened Light Curve

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

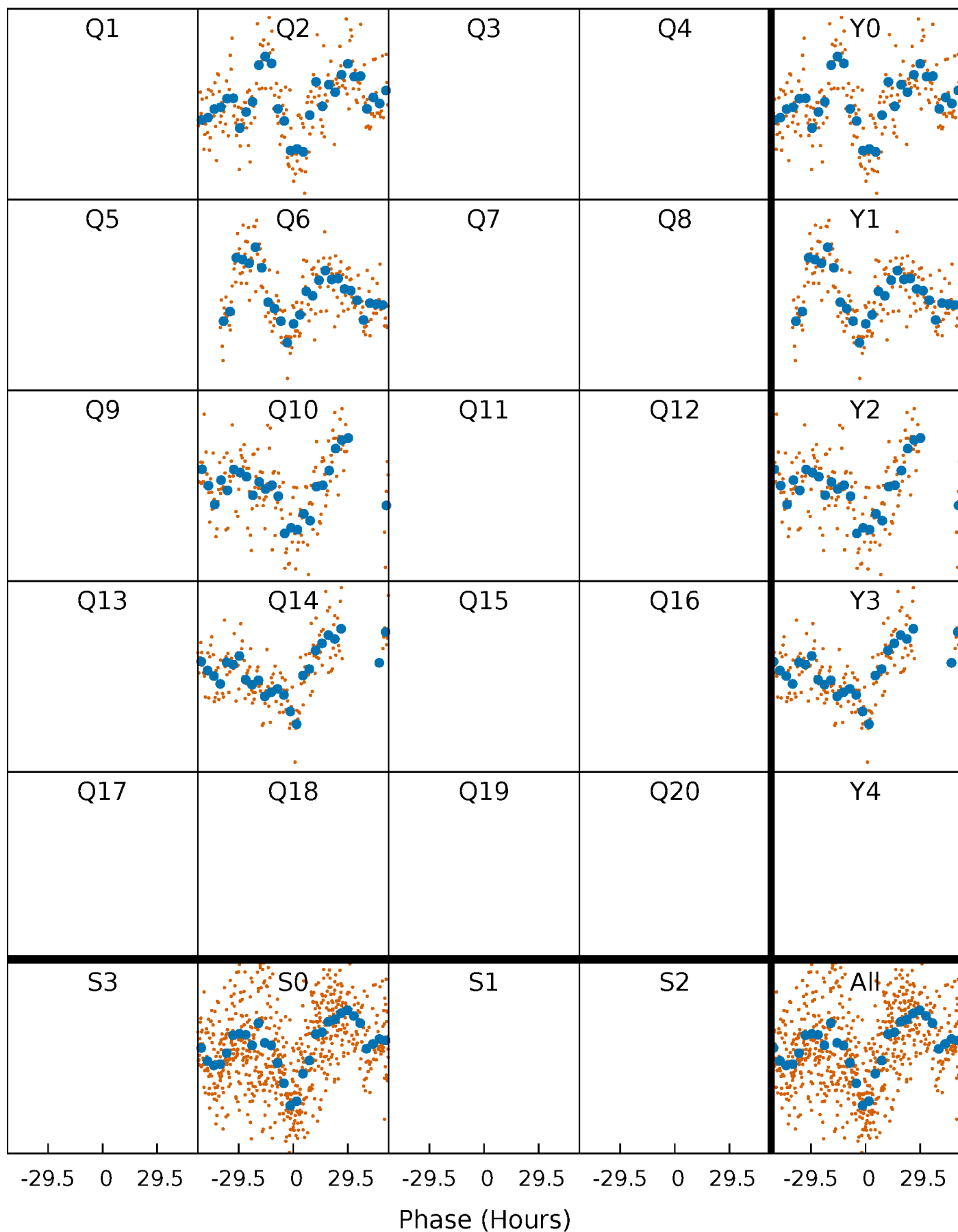


**Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



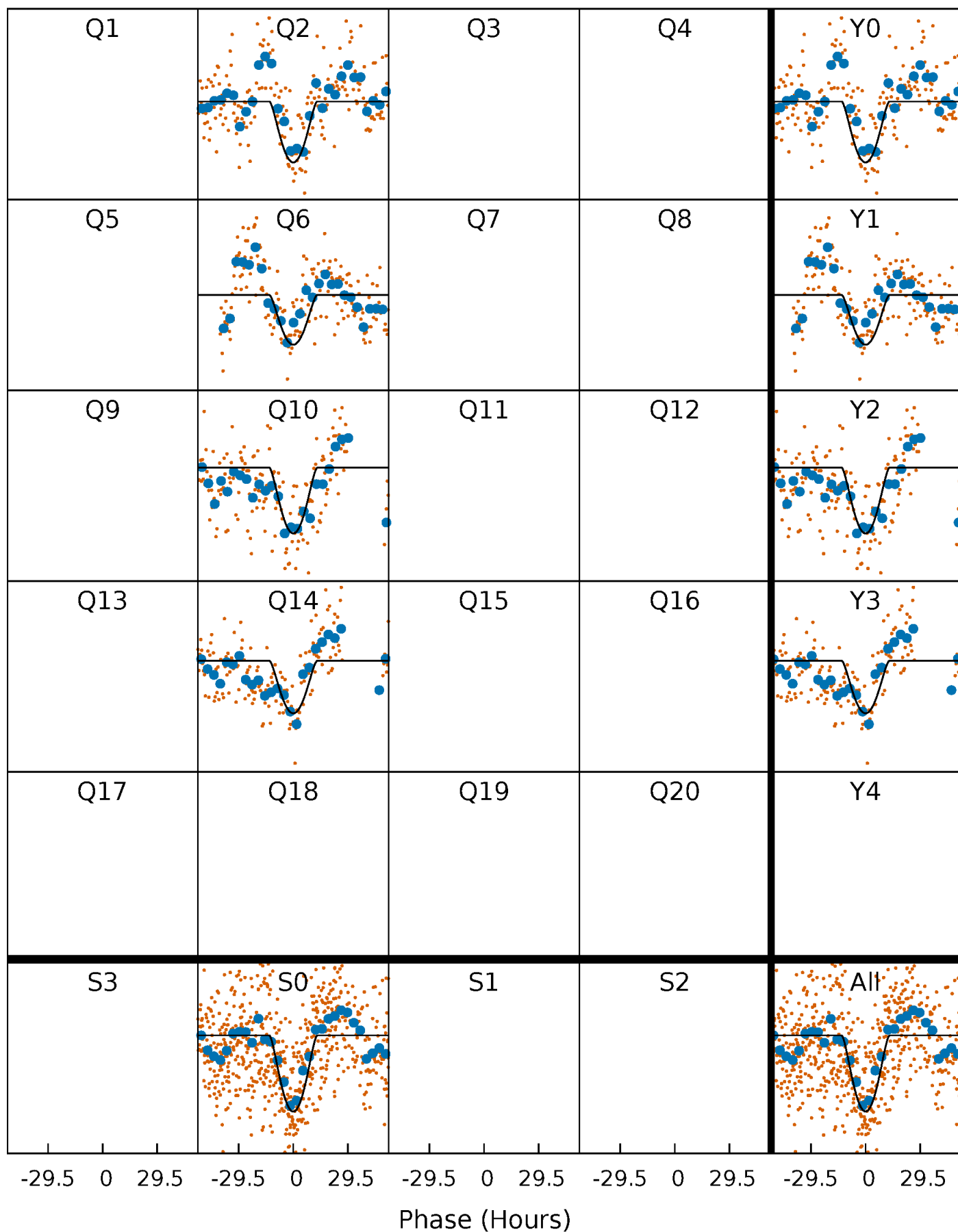
# PDC Quarter-Phased Transit Curves

TCE 008739906-02 P=367.167848 Days  $T_0=233.693886$  (BKJD)



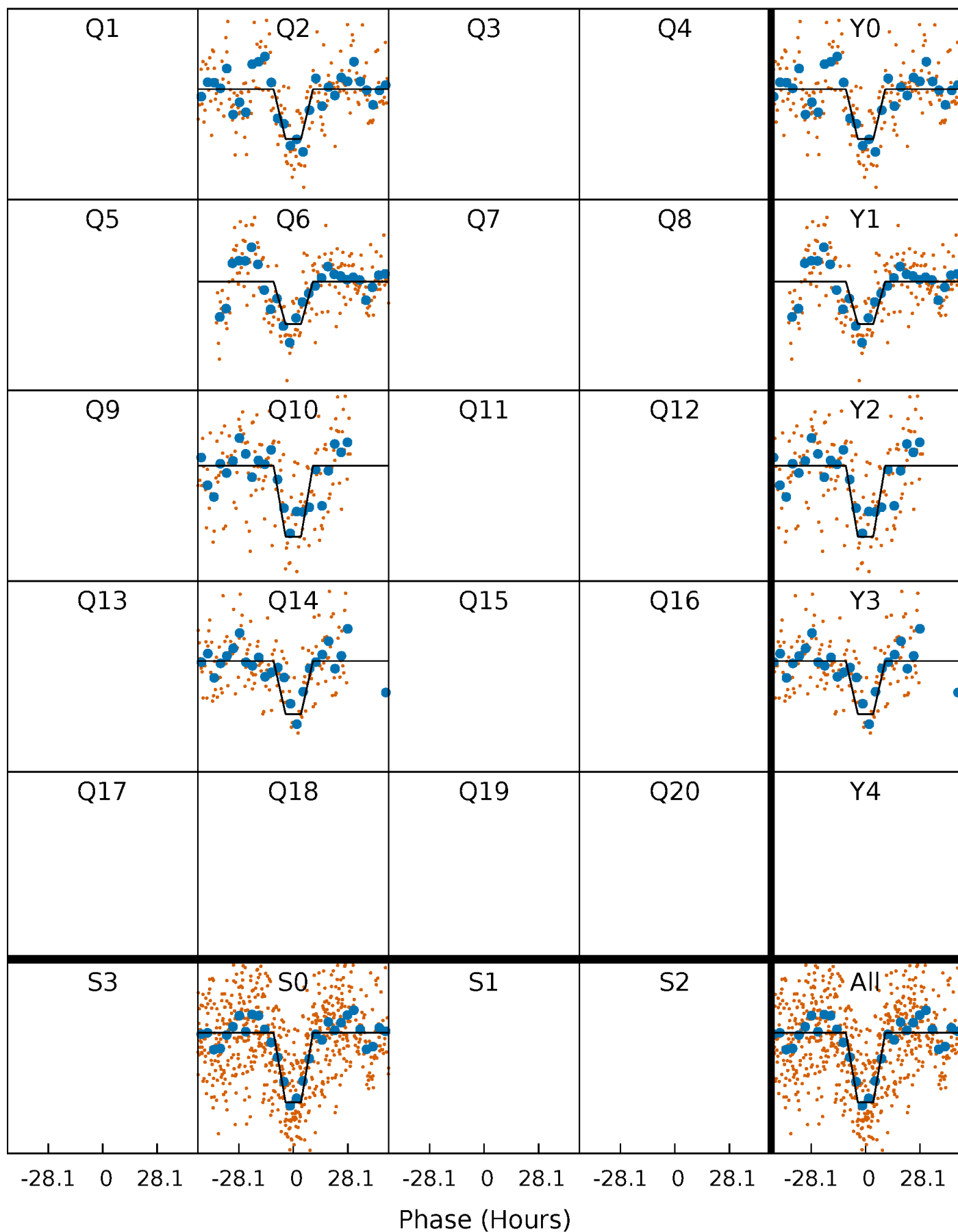
# DV Quarter-Phased Transit Curves

TCE 008739906-02 P=367.167848 Days  $T_0=233.693886$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

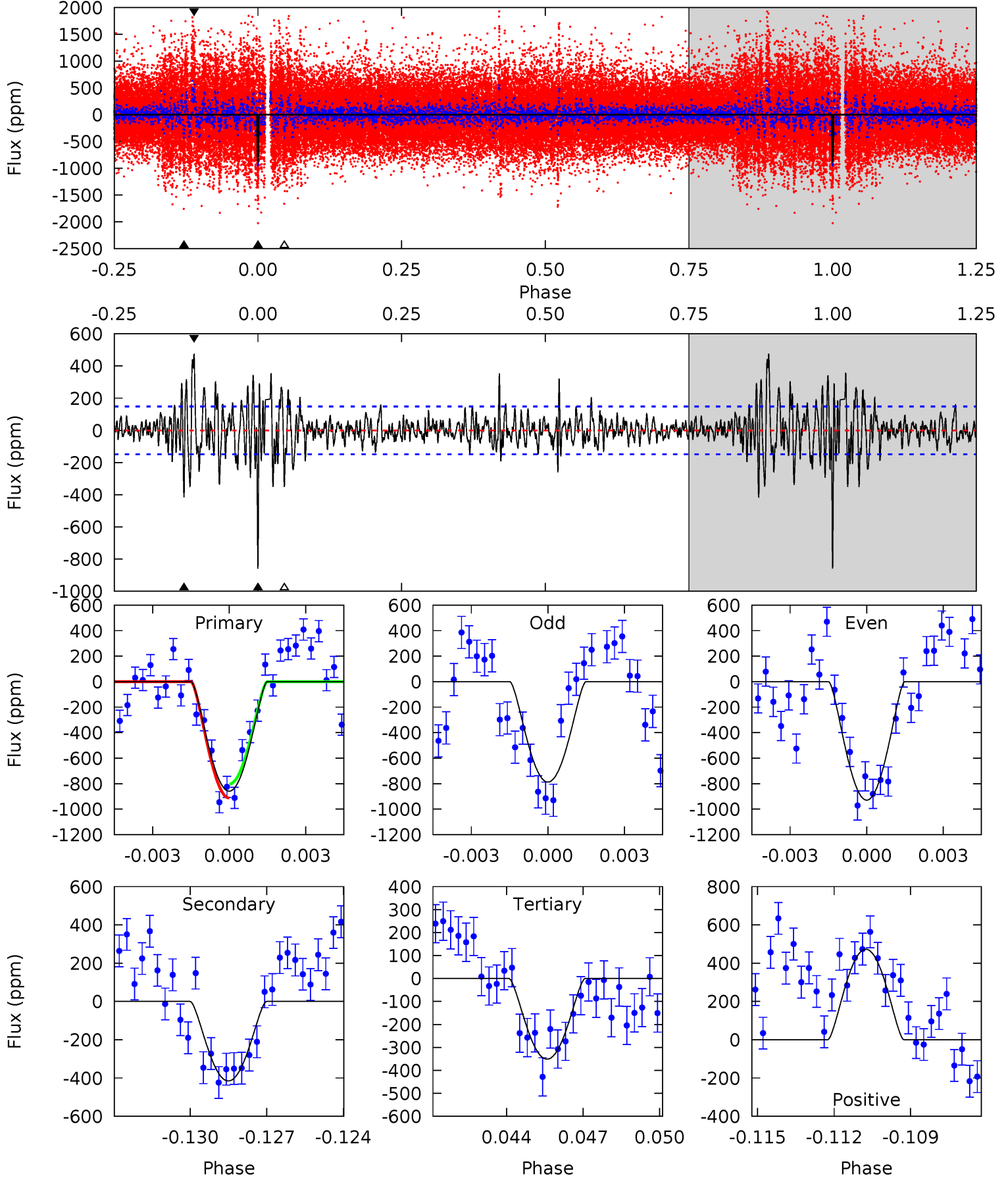
TCE 008739906-02 P=367.143395 Days  $T_0=233.723214$  (BKJD)



# DV Model-Shift Uniqueness Test

008739906-02, P = 367.167848 Days, E = 233.693886 Days

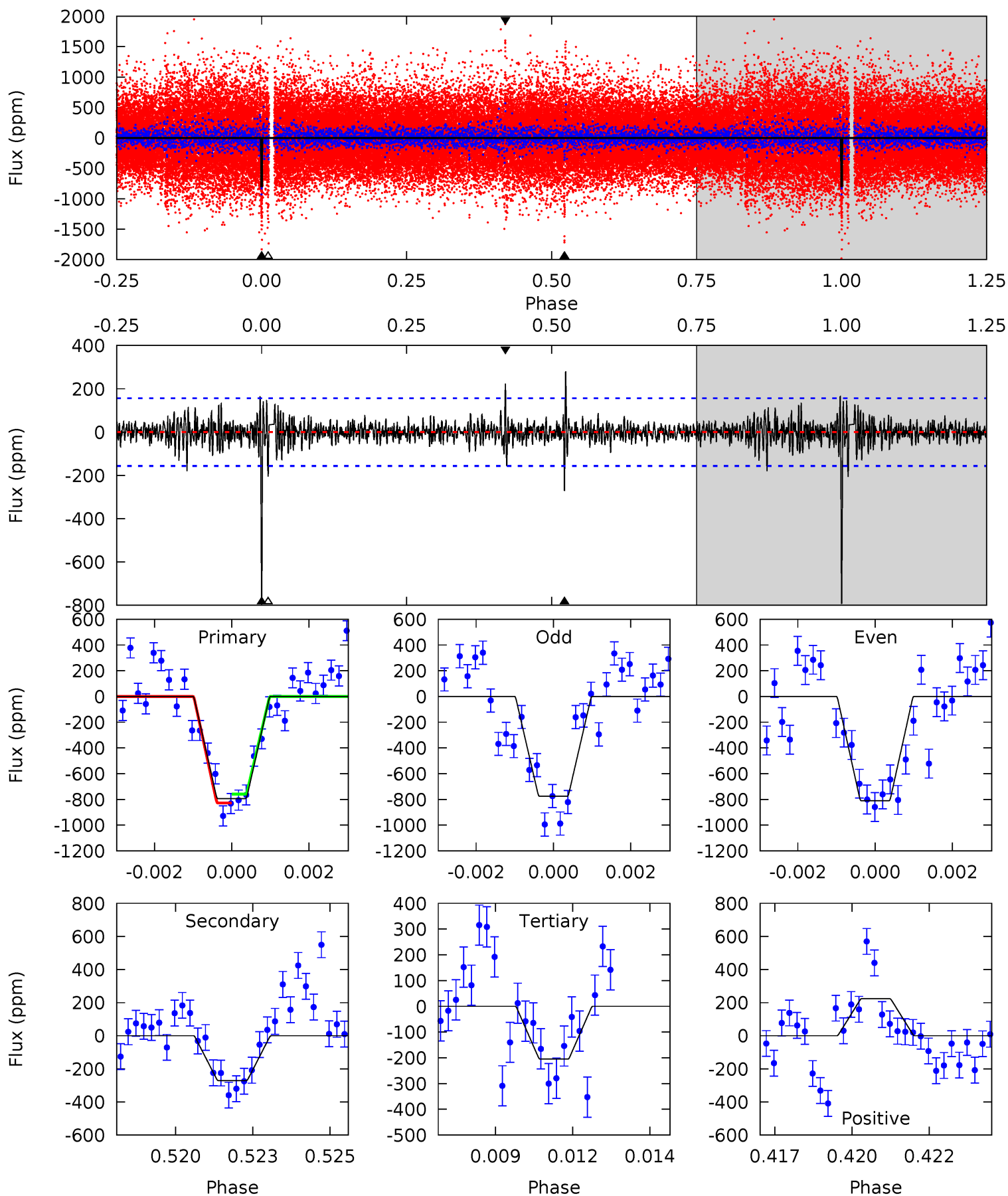
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
30.5	14.7	12.5	16.8	5.26	2.97	3.28	18.0	13.7	2.28	-2.04	2.51	1.01	0.36	1.94



# Alt Model-Shift Uniqueness Test

008739906-02, P = 367.143395 Days, E = 233.723214 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
26.8	9.18	6.94	7.58	5.30	3.04	1.27	19.9	19.3	2.24	1.60	0.59	1.02	0.26	1.16





### Stellar Parameters For KIC 008739906

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6298^{+168}_{-205}$	$4.421^{+0.050}_{-0.200}$	$0.070^{+0.250}_{-0.350}$	$1.116^{+0.335}_{-0.134}$	$1.198^{+0.141}_{-0.173}$	$1.214^{+0.321}_{-0.612}$
	+3%/-3%	+1%/-5%	+357%/-500%	+30%/-12%	+12%/-14%	+26%/-50%
Source	PHO1	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 008739906-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-415 \pm 28$	$15.06^{+12.48}_{-10.06}$	$407^{+29}_{-21}$	$3204^{+1525}_{-493}$	$1100^{+8851}_{-777}$
Alt.	$-271 \pm 30$	$13.20^{+13.13}_{-8.98}$	$406^{+32}_{-20}$	$3134^{+1530}_{-533}$	$952^{+8627}_{-719}$

$T_{max}$  = Theoretical Maximum Planetary Temperature

$T_{obs}$  = Observed Planetary Temperature (Assuming  $A=0.3$ )

$A_{obs}$  = Observed Albedo (Assuming  $T=0$ )

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

## DV Centroid Data

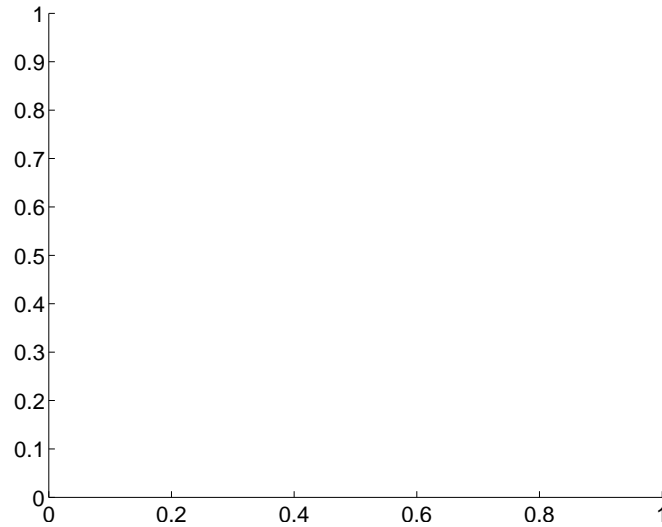
Supplemental centroid analysis for 008739906-02. Kepler magnitude: 15.28. Transit SNR 9.50

There are 0 quarters with good PRF difference image offsets

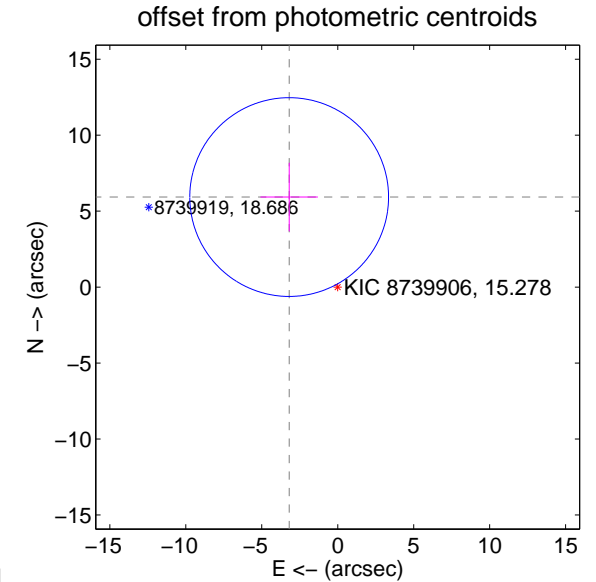
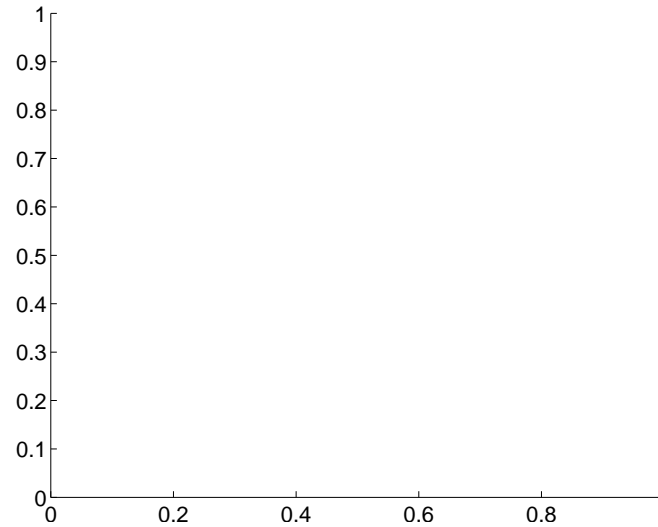
The direct PRF centroid is offset from the target star catalog position by about NaN arcsec

	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	$6.73 \pm 2.18$	3.09	$3.20 \pm 1.89$	$5.93 \pm 2.26$

There is no PRF-fit offset from OOT-fit

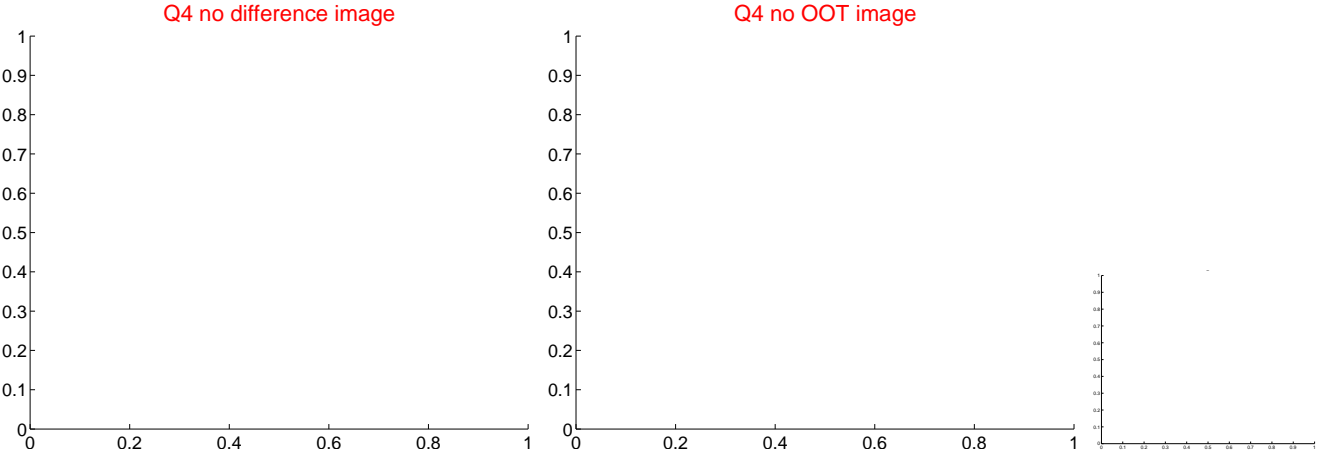
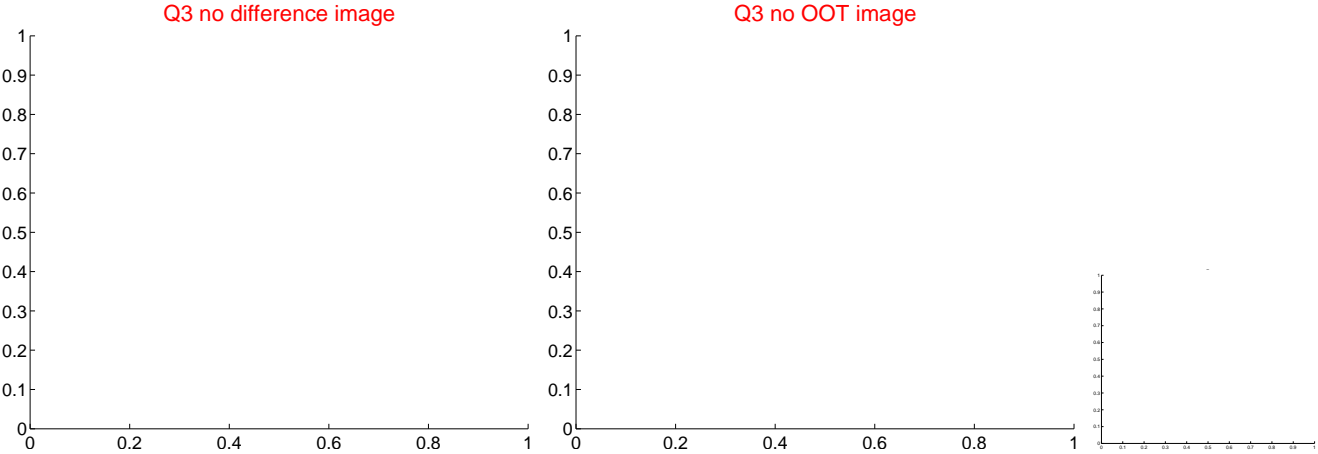
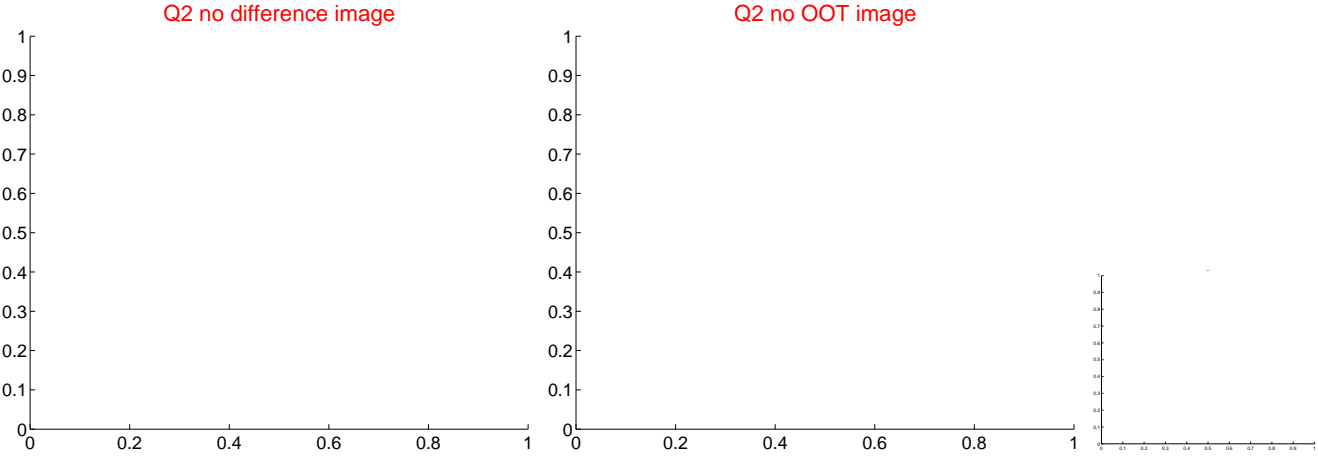
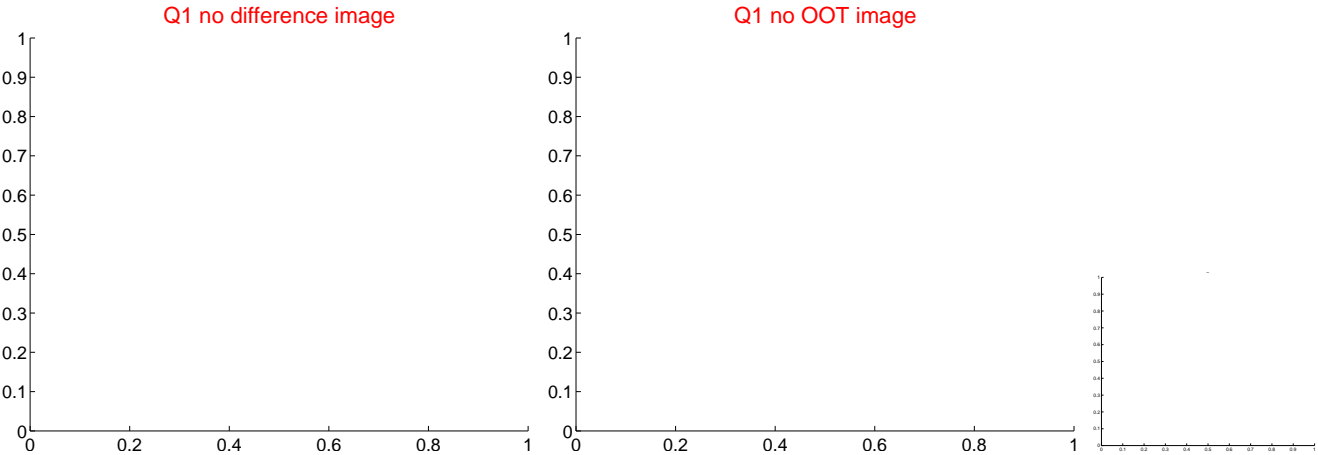


There is no PRF-fit offset from KIC



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.



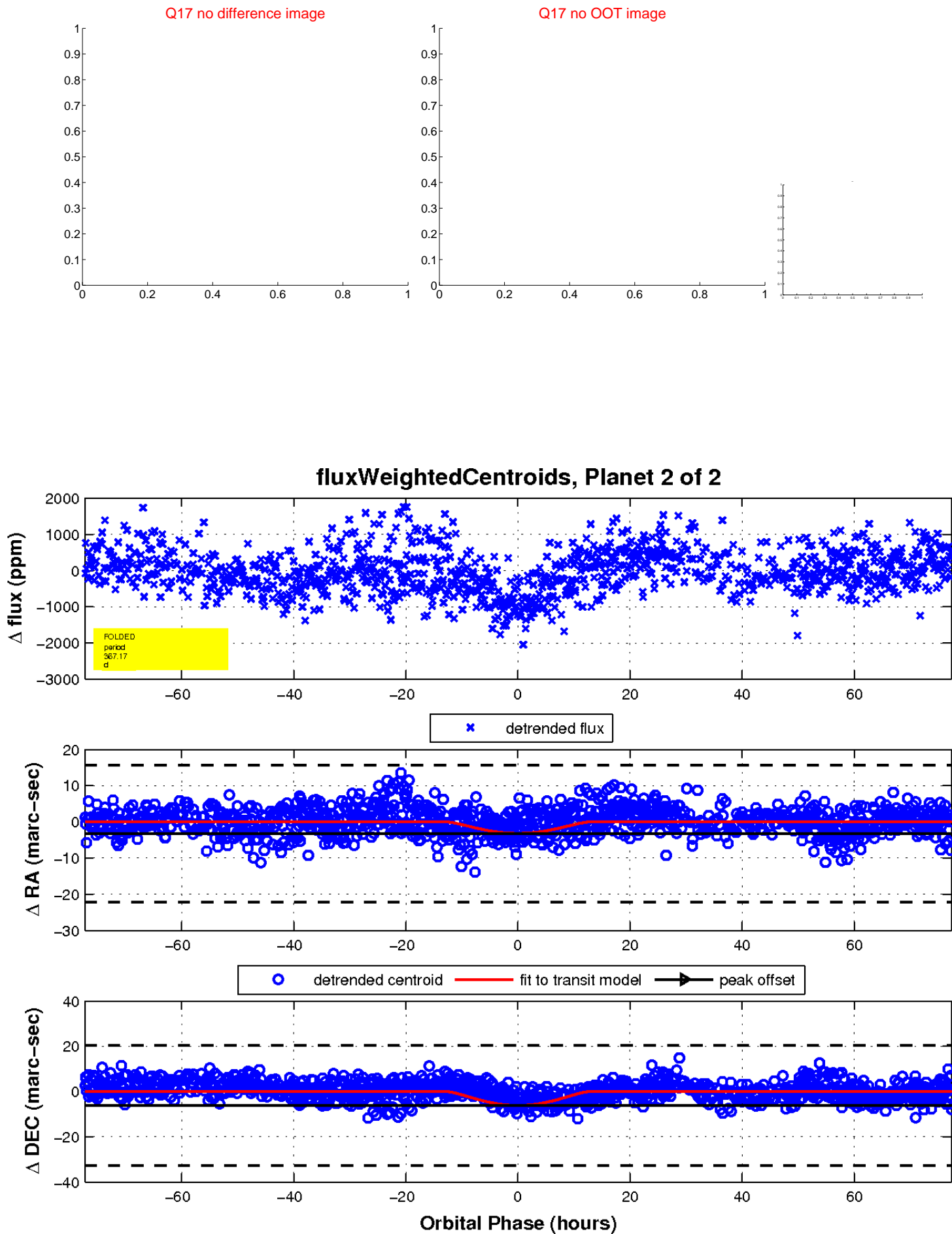
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

