

# KIC 007777397

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
007777397-01	OBS	6043.01	5.091152	135.176451	107.2	2.122	9.1	10.2	3.29	6705	3.97	4134.88
007777397-02	OBS	No	5.091171	132.749415	110.7	3.736	8.7	9.8	3.29	6705	6.89	4134.86

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
007777397-01	OBS	FP	0.00	0	1	1	1	MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE—CENT_UNRESOLVED_OFFSET—EPHEM_MATCH
007777397-02	OBS	FP	0.00	1	1	0	1	IS_SEC_TCE—CENT_FEW_DIFFS—EPHEM_MATCH

**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.

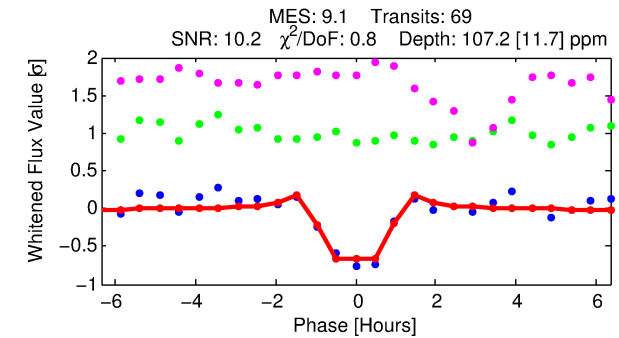
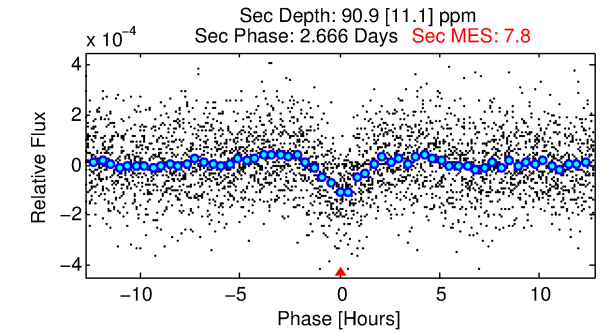
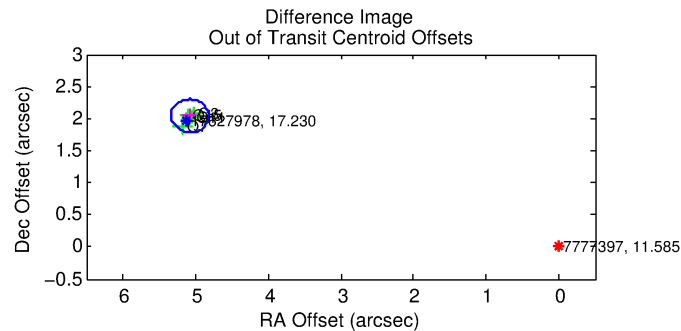
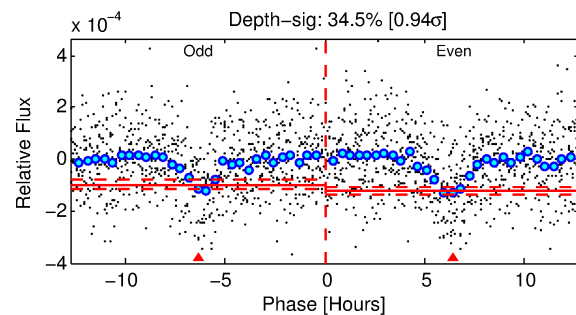
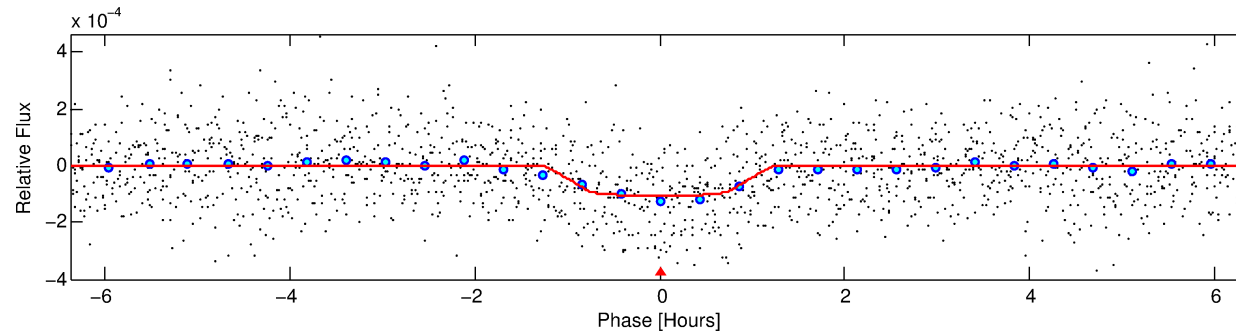
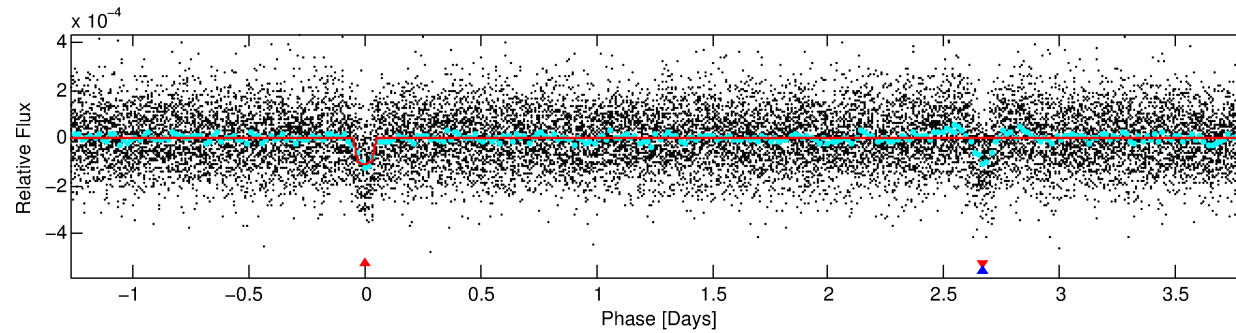
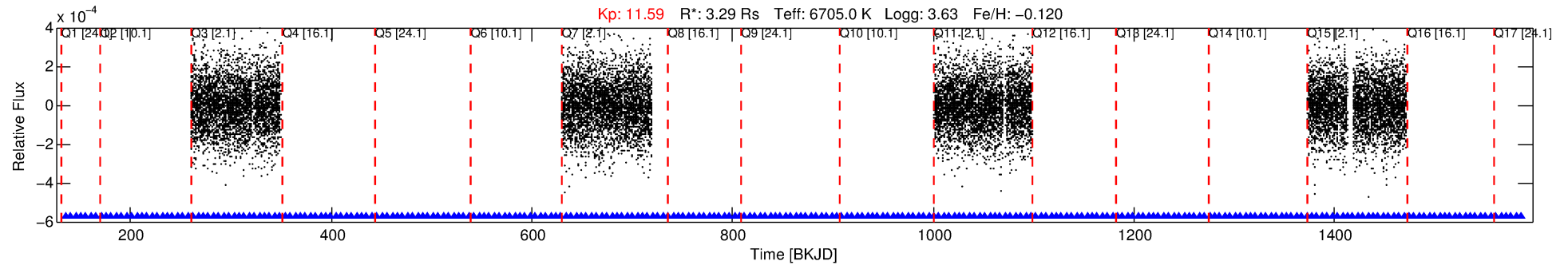
## Ephemeris Match Information For 007777397-01

TCE (1)	KIC	Parent (2)	Parent KIC	$P_1:P_2$	Dist ( $''$ )	$\Delta$ Row	$\Delta$ Col	$m_2$	$m_1$	$D_2/D_1$	Mechanism	Flag	$\sigma_P$	$\sigma_T$
007777397-01	7777397	007777416-02	7777416	2:1	9.7	-3	0	15.30	11.59	9.09	Direct-PRF	0	1.09	0.77

**Notes:**  $P_1:P_2$  is the period ratio. Dist is the distance in arcseconds.  $\Delta$ Row and  $\Delta$ Col are the number of pixels apart in row and column.  $m_2$  and  $m_1$  are the magnitudes of the parent and child.  $D_2/D_1$  is the parent's transit depth divided by the child's.  $\sigma_P$  and  $\sigma_T$  are the significance of the match in period and epoch. For a match to be considered significant  $\sigma_P < 5.0$  and  $\sigma_T < 5.0$ . Matches which have  $\sigma_P$  and  $\sigma_T$  very close to this cutoff should receive extra scrutiny, especially if the period ratio is very large.

# DV One-Page Summary

KIC: 7777397 Candidate: 1 of 2 Period: 5.091 d  
KOI: K06043.01 Corr: 0.939



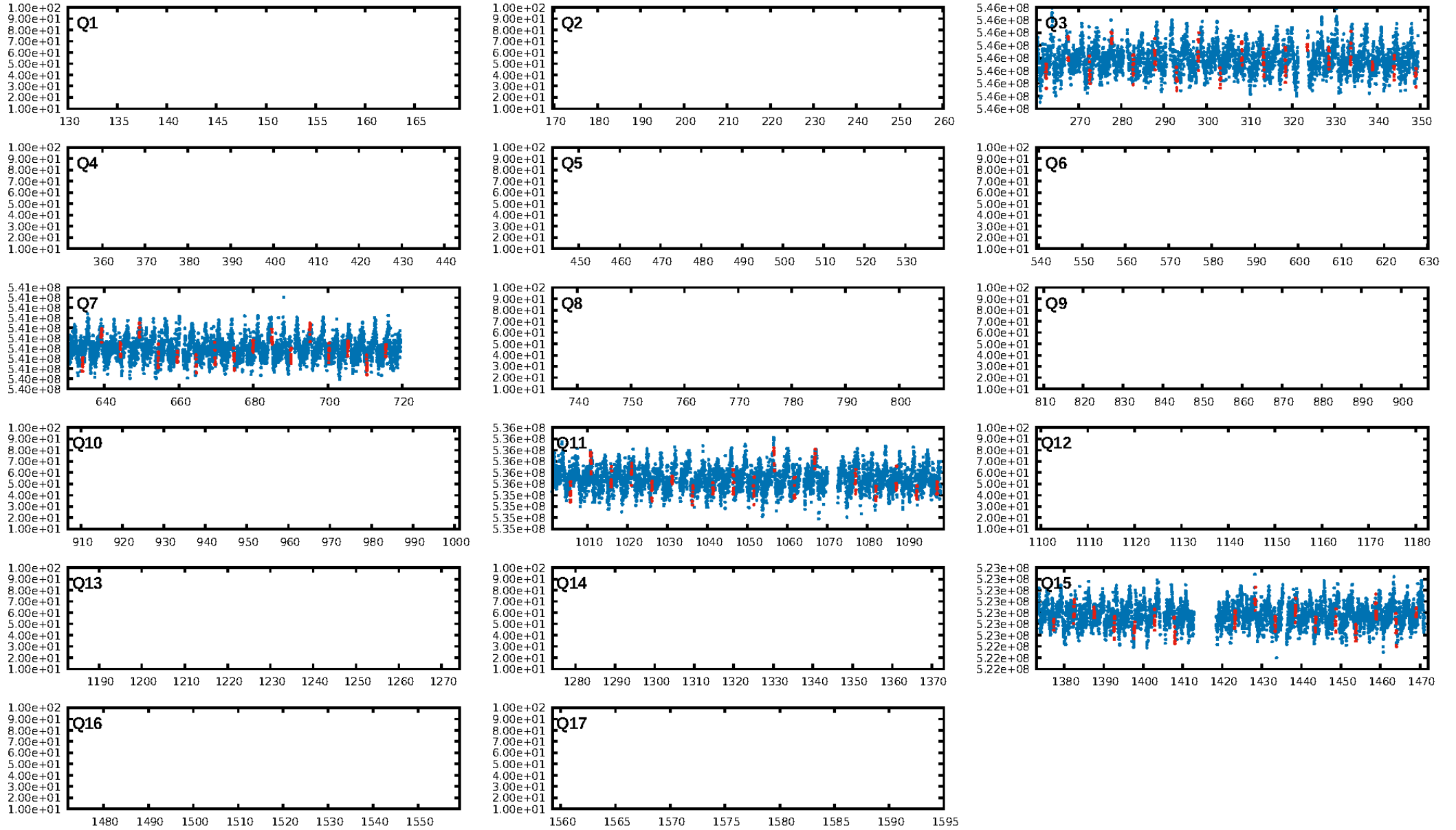
## DV Fit Results:

Period = 5.09115 [0.00002] d  
Epoch = 135.1765 [0.0028] BKJD  
Rp/R\* = 0.0110 [0.0043]  
a/R\* = 8.58 [19.45]  
b = 0.90 [0.50]  
Seff = 4134.88 [2218.18]  
Teq = 2045 [274] K  
Rp = 3.97 [2.13] Re  
a = 0.0689 [0.0232] AU  
Ag = 15.07 [14.17] [0.99 $\sigma$ ]  
Teff = 6229 [1242] K [3.29 $\sigma$ ]

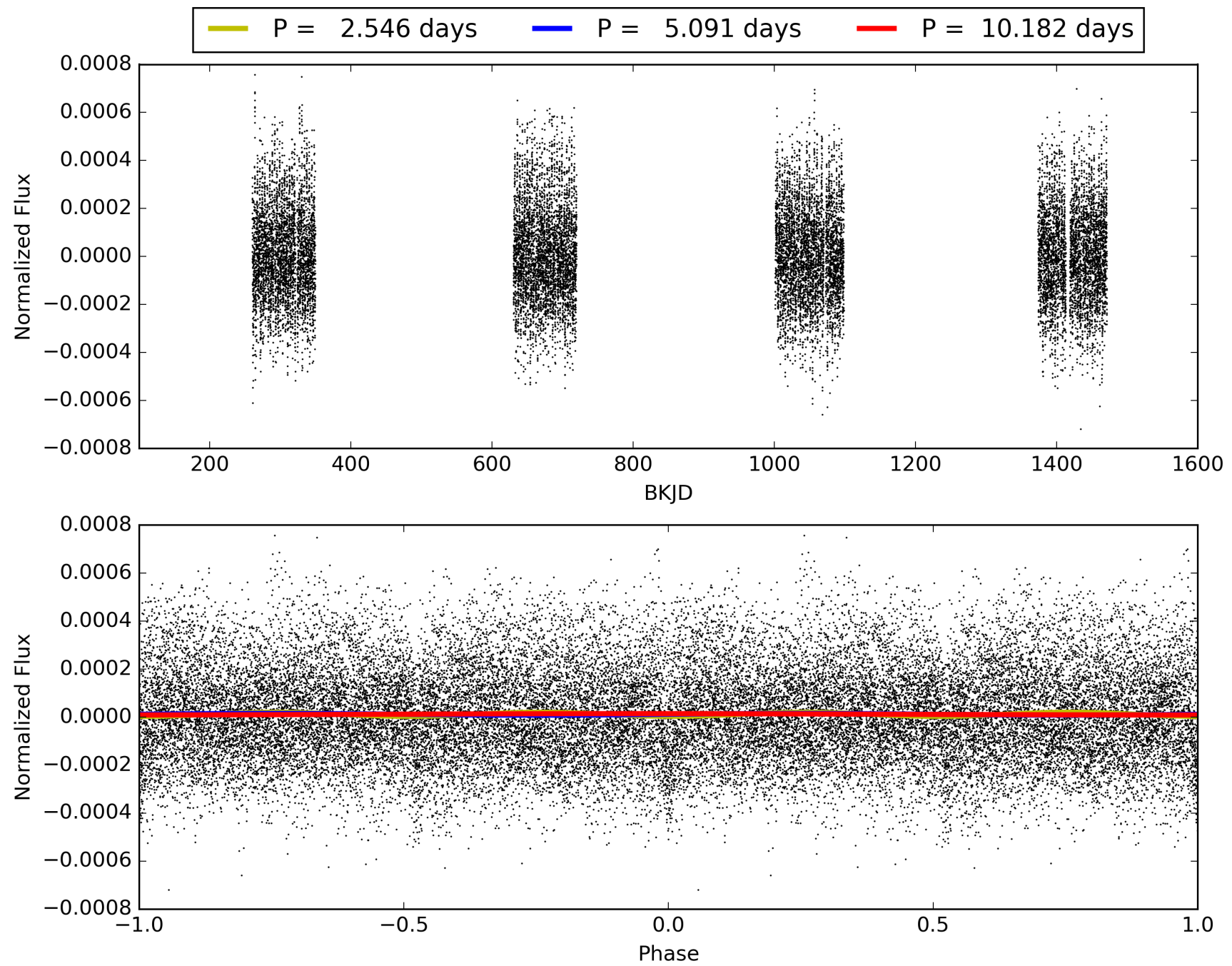
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00 $\sigma$ ]  
ModelChiSquare2-sig: 95.6%  
ModelChiSquareGoF-sig: 100.0%  
Bootstrap-pfa: 4.80e-18  
RollingBand-fgt: 1.00 [69/69]  
GhostDiagnostic-chr: 0.7034  
Centroid-sig: 0.0%  
Centroid-so: 5.076 arcsec [7.76 $\sigma$ ]  
OotOffset-rm: 5.473 arcsec [63.48 $\sigma$ ]  
KicOffset-rm: 5.428 arcsec [62.91 $\sigma$ ]  
OotOffset-st: 0/4/0/0 [4]  
KicOffset-st: 0/4/0/0 [4]  
DiffImageQuality-fgm: 1.00 [4/4]  
DiffImageOverlap-fno: 1.00 [4/4]

# TCE 007777397-01, PDC Light Curves

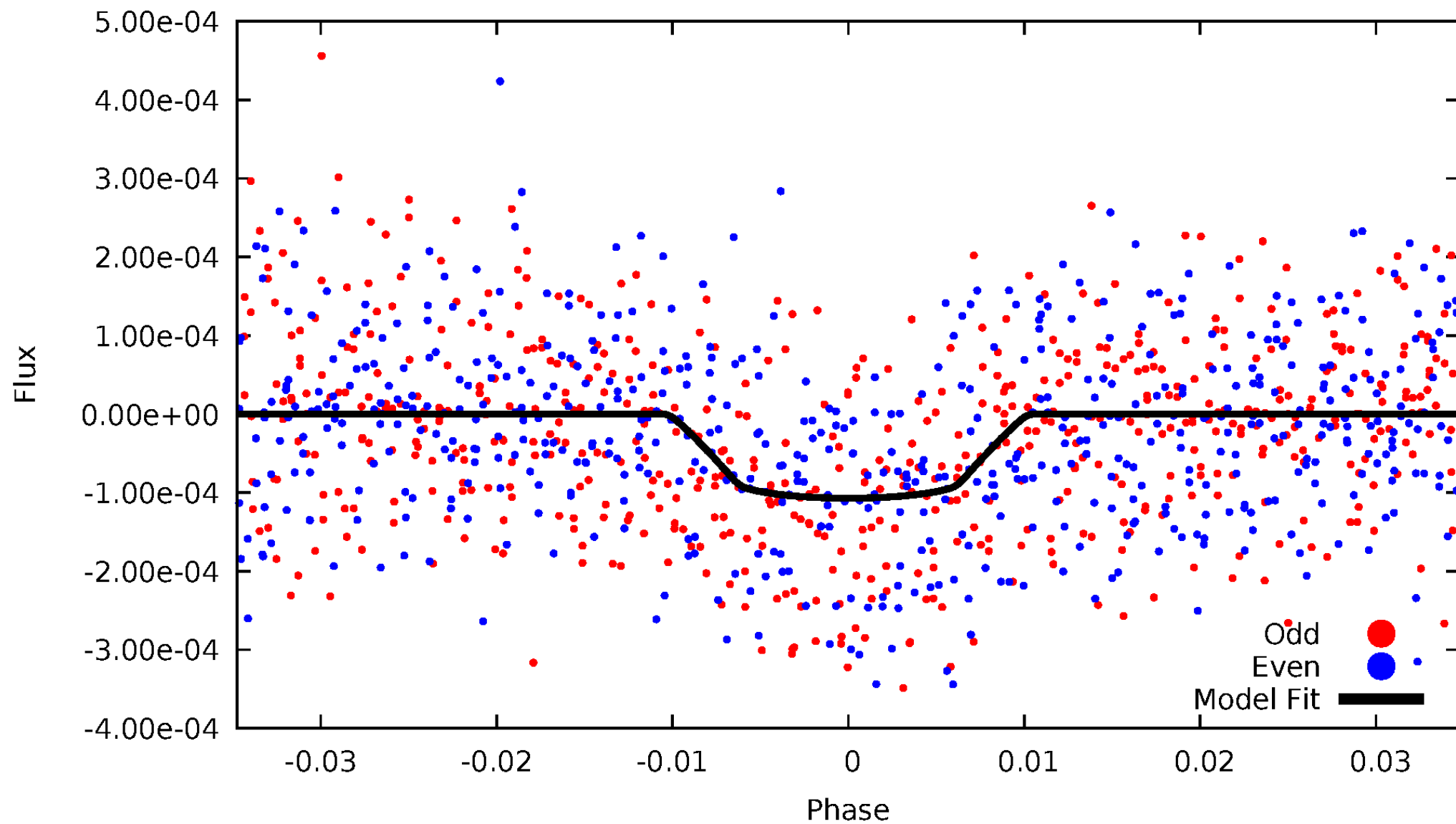


TCE 007777397-01



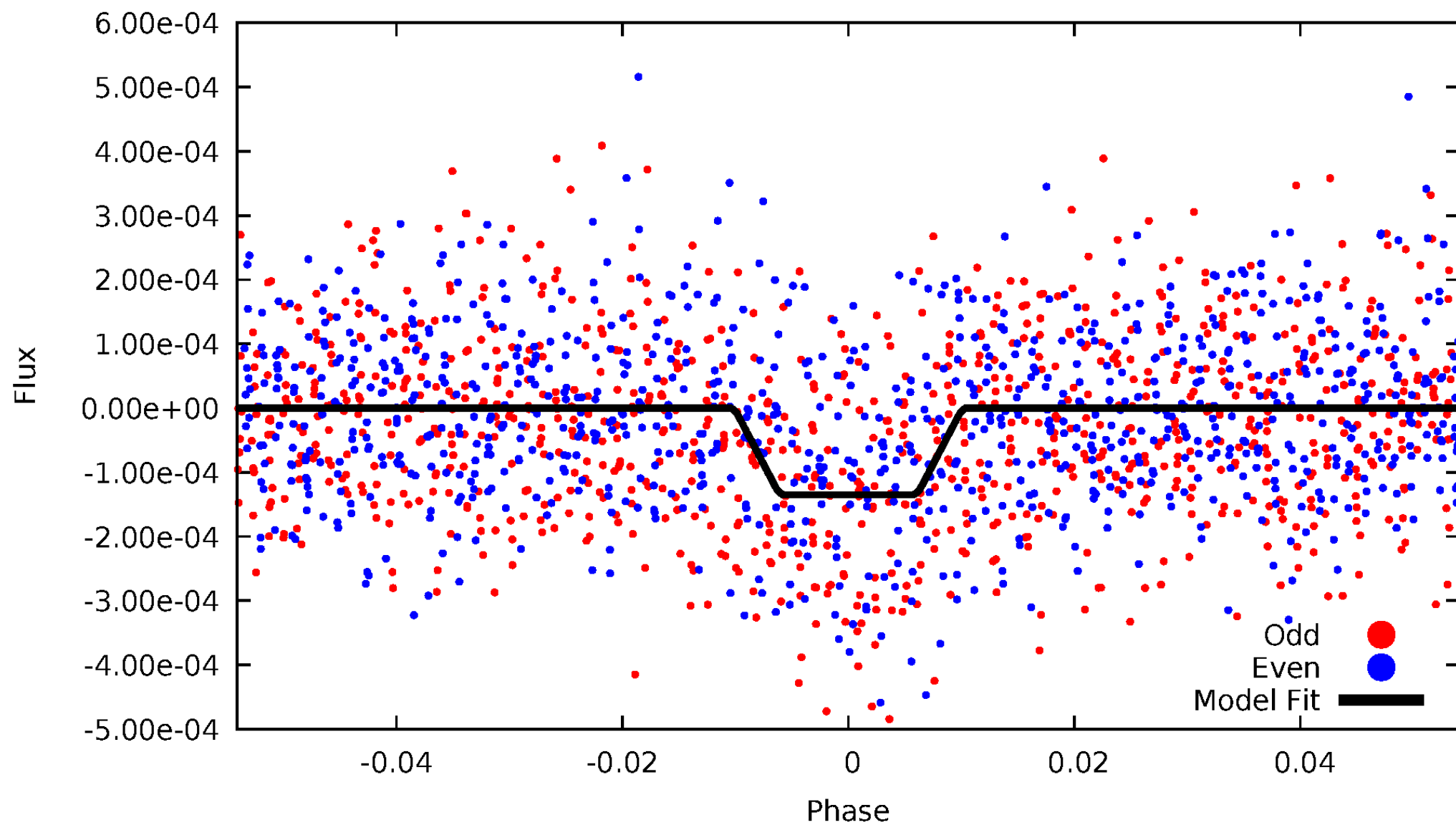
# DV Odd/Even

TCE 007777397-01



# ALT Odd/Even

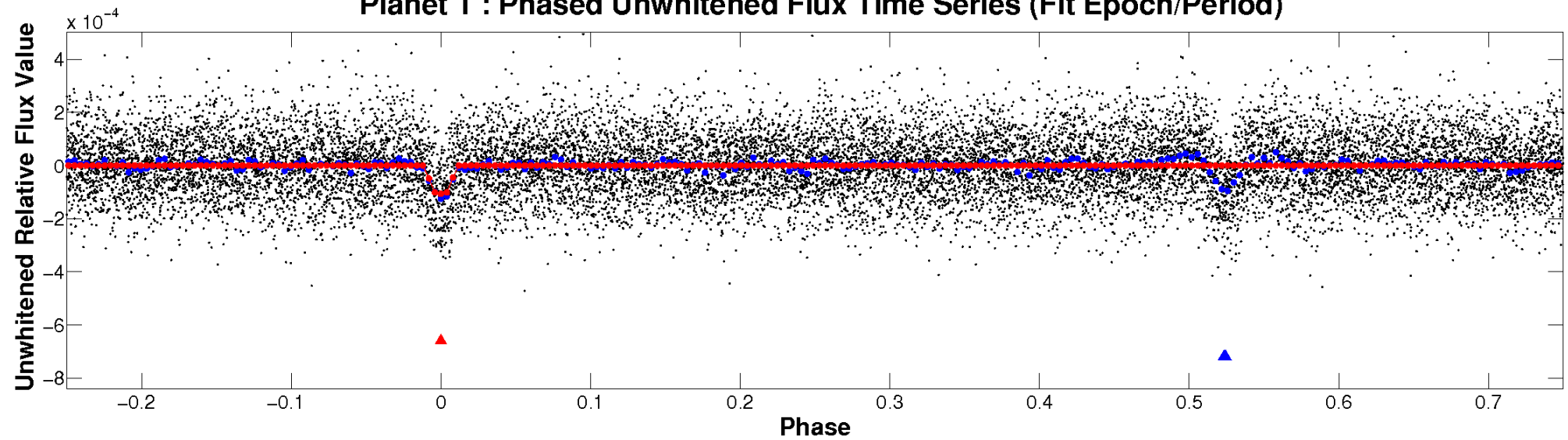
TCE 007777397-01



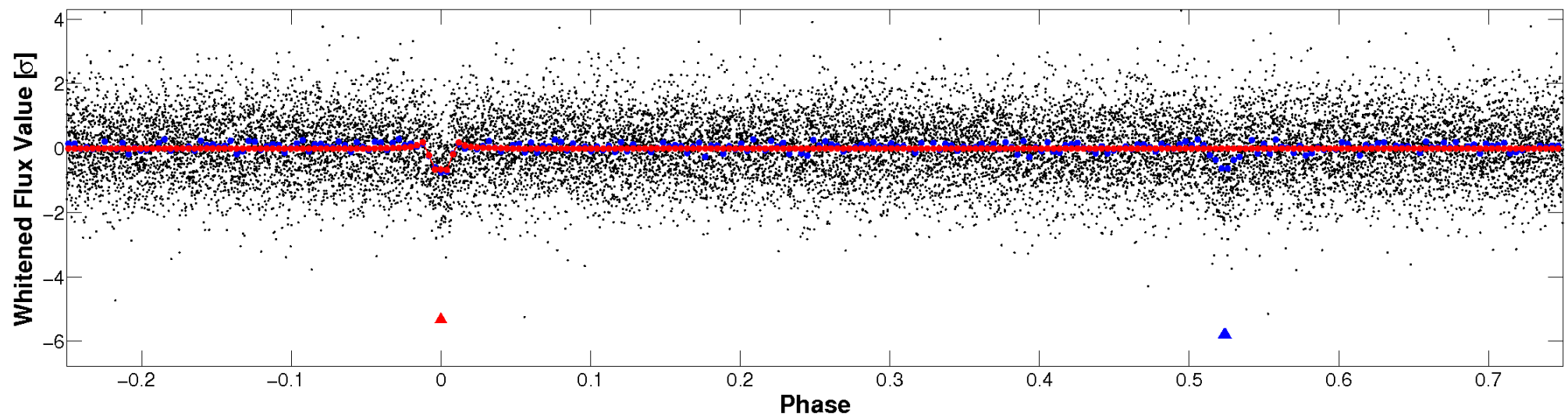


# Non-Whitened Vs. Whitened Light Curve

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

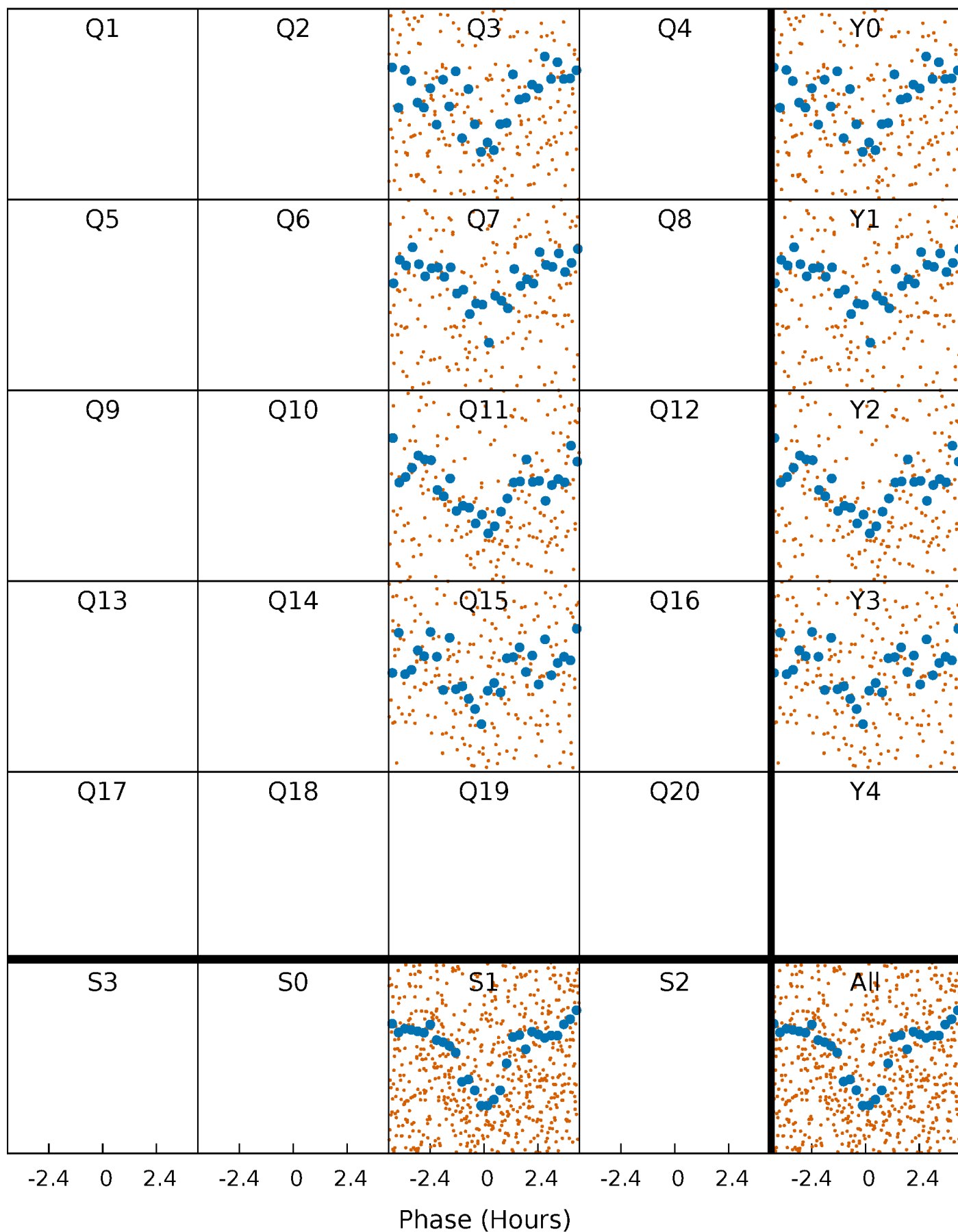


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

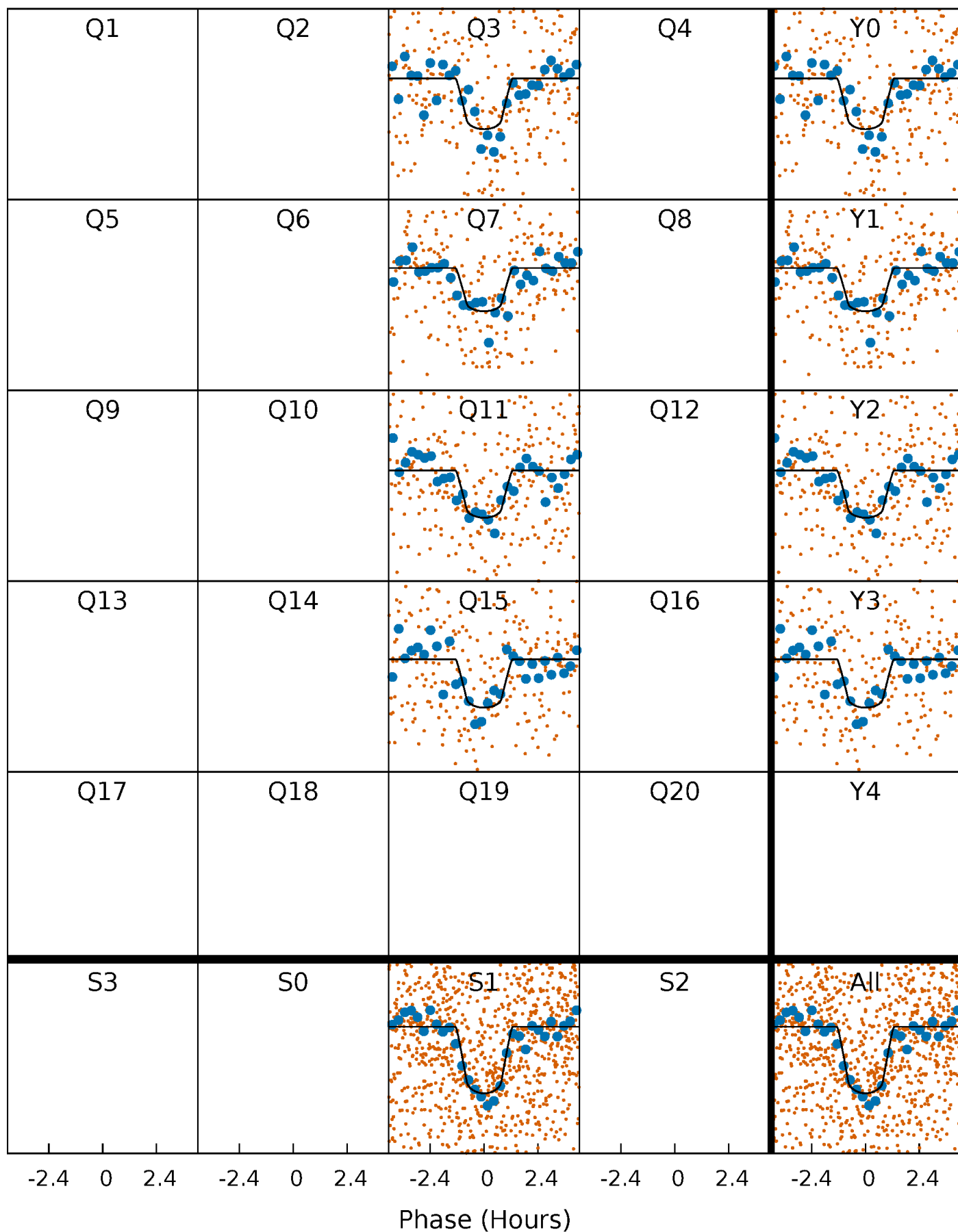
TCE 007777397-01 P= 5.091152 Days  $T_0=135.176451$  (BKJD)





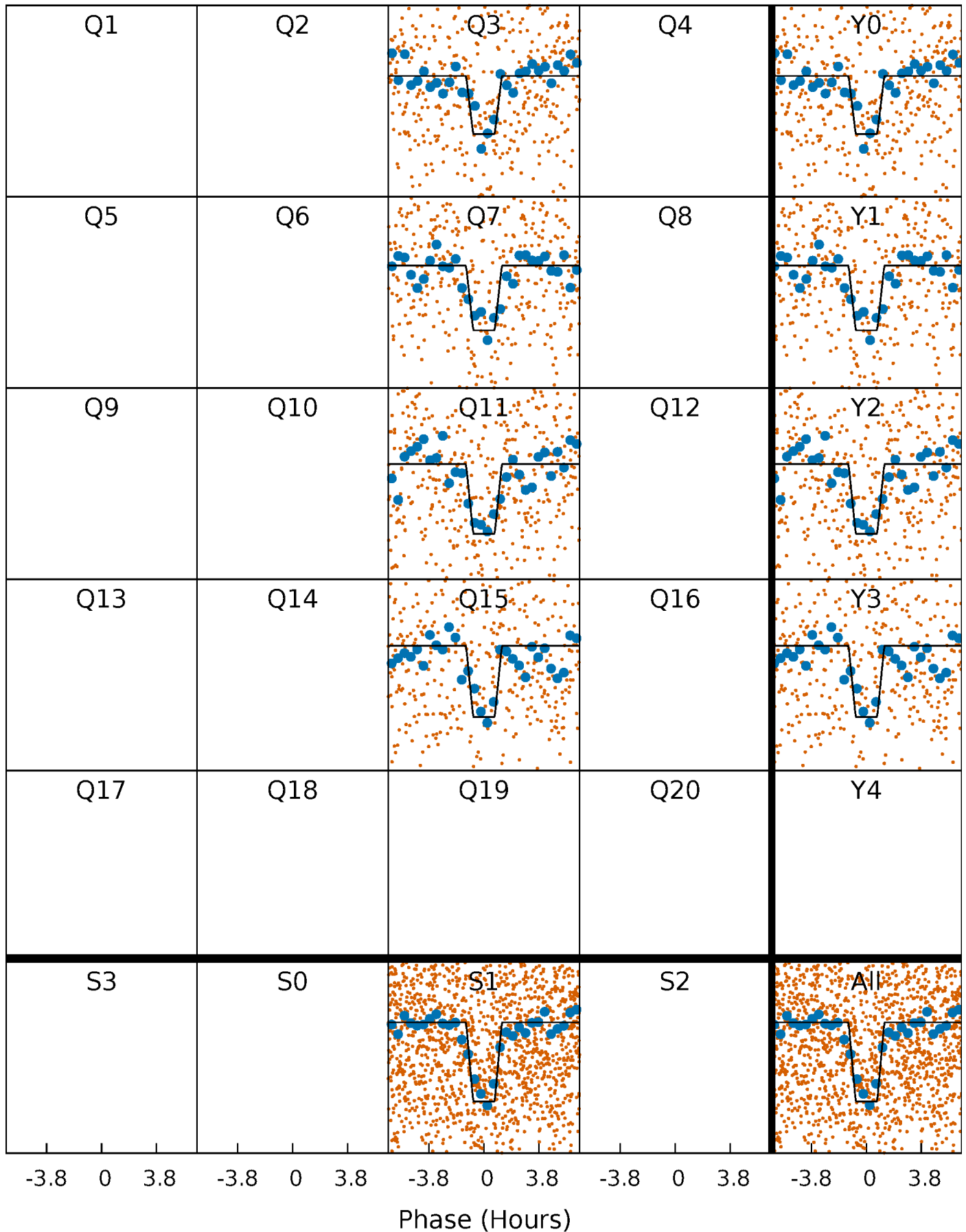
# DV Quarter-Phased Transit Curves

TCE 007777397-01 P= 5.091152 Days  $T_0=135.176451$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

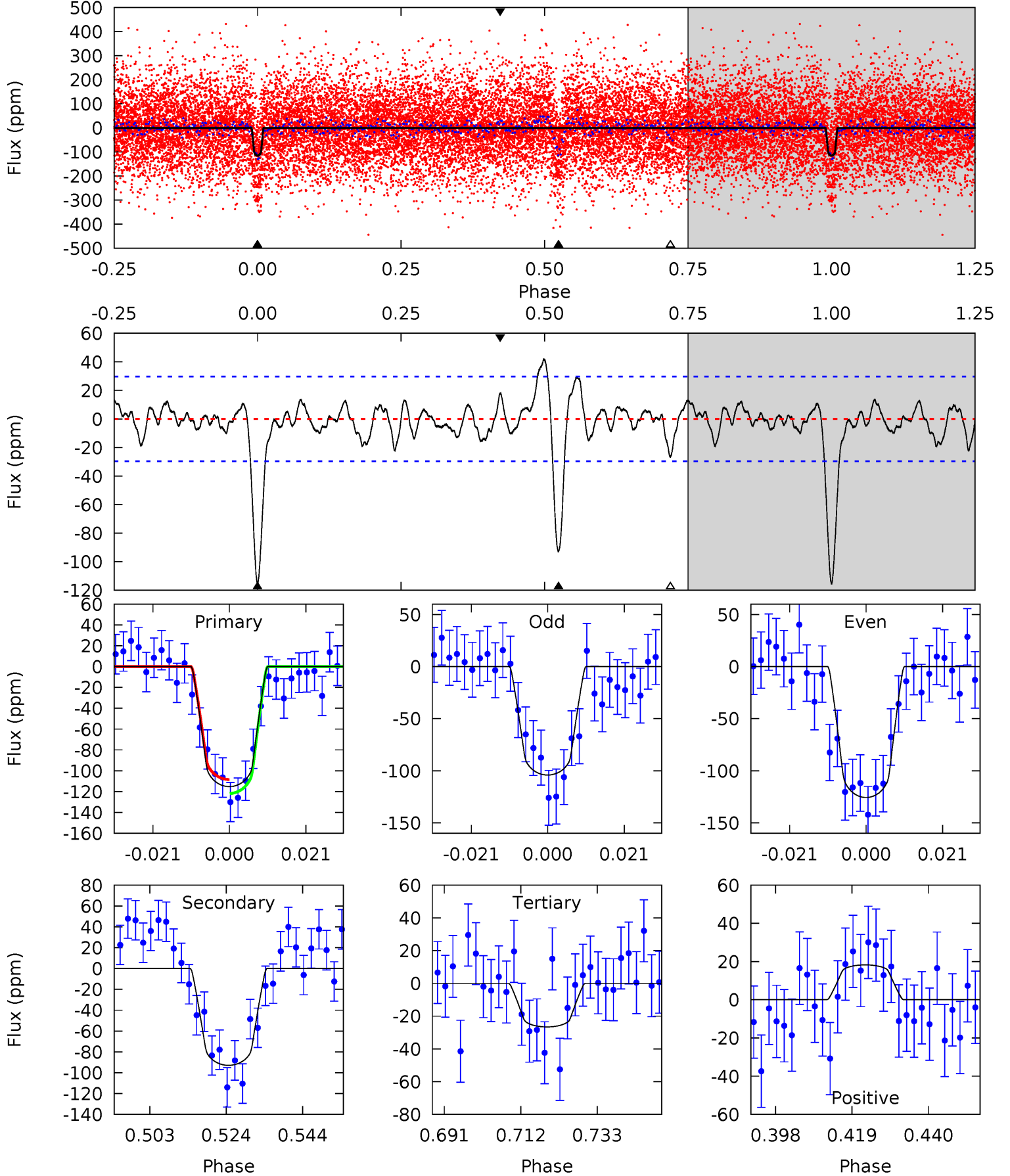
TCE 007777397-01   P= 5.091100 Days    $T_0=135.183381$  (BKJD)



# DV Model-Shift Uniqueness Test

007777397-01, P = 5.091152 Days, E = 135.176451 Days

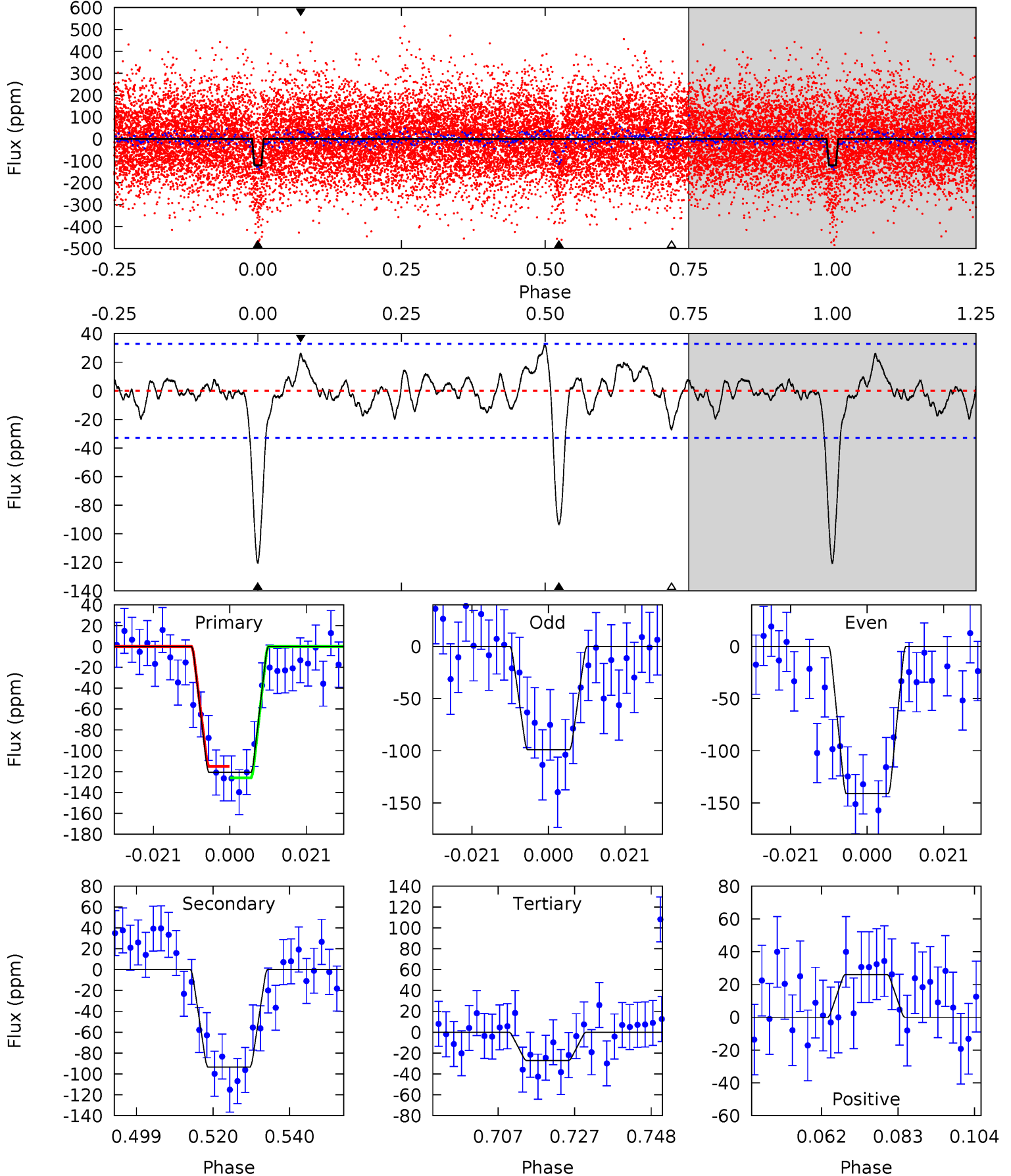
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
19.0	15.3	4.37	3.00	4.88	2.31	1.65	14.6	15.9	10.9	12.3	1.77	1.01	0.27	1.10



# Alt Model-Shift Uniqueness Test

007777397-01, P = 5.091100 Days, E = 135.183381 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
18.0	13.9	4.04	3.88	4.88	2.31	1.44	13.9	14.1	9.86	10.0	3.13	0.95	0.21	0.82



### Stellar Parameters For KIC 007777397

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6705^{+212}_{-236}$	$3.629^{+0.296}_{-0.056}$	$-0.120^{+0.300}_{-0.250}$	$3.293^{+0.408}_{-1.225}$	$1.682^{+0.212}_{-0.319}$	$0.066^{+0.134}_{-0.016}$
	+3%/-4%	+8%/-2%	+250%/-208%	+12%/-37%	+13%/-19%	+203%/-24%
Source	KIC0	FLK73	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 007777397-01 / KOI 6043.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-93 \pm 6$	$3.59^{+1.59}_{-1.50}$	$2786^{+143}_{-255}$	$6285^{+2081}_{-959}$	$19^{+34}_{-10}$
Alt.	$-93 \pm 7$	$3.94^{+1.54}_{-1.45}$	$2775^{+152}_{-245}$	$6013^{+1580}_{-804}$	$16^{+23}_{-8}$

$T_{\text{max}}$  = 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  $A_{\text{obs}} \gg 1.0$

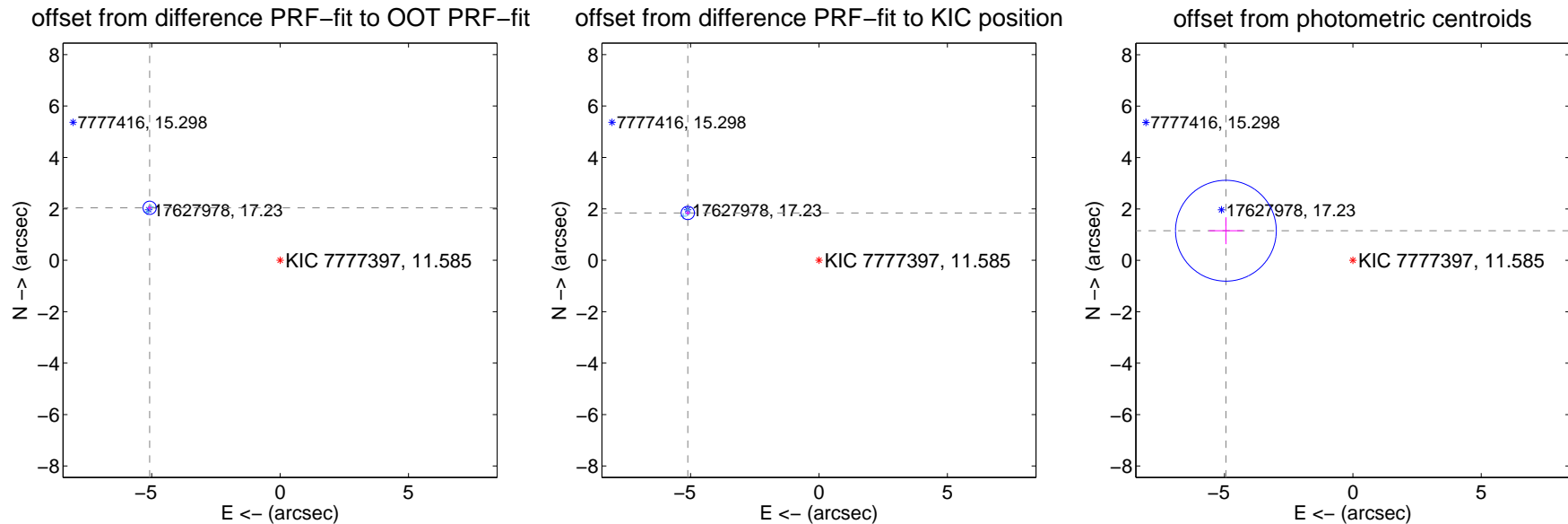
## DV Centroid Data

Supplemental centroid analysis for 007777397-01. **Kepler magnitude: 11.59.** Transit SNR 10.16

There are 4 quarters with good PRF difference image offsets

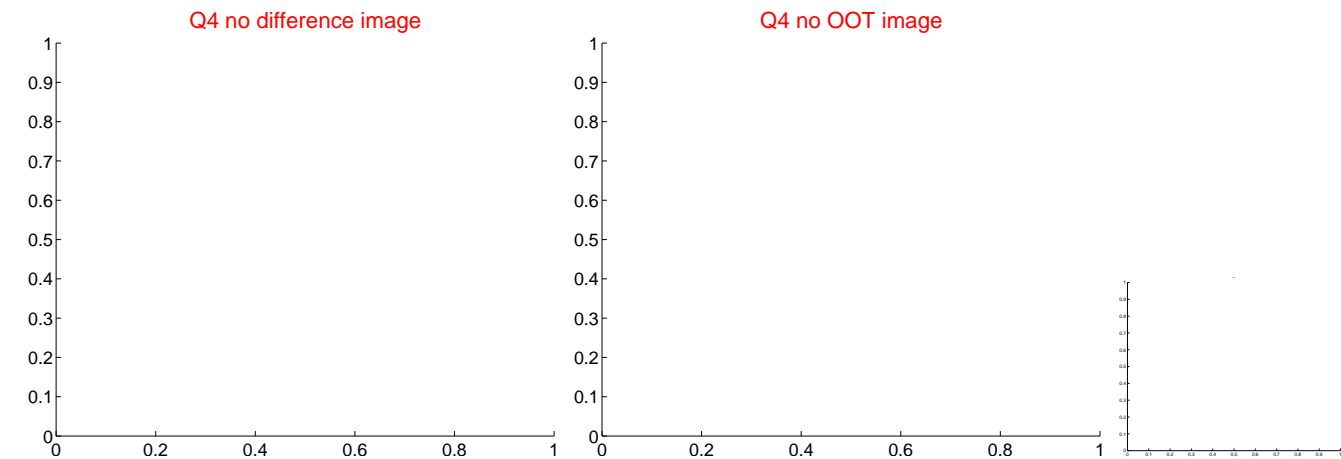
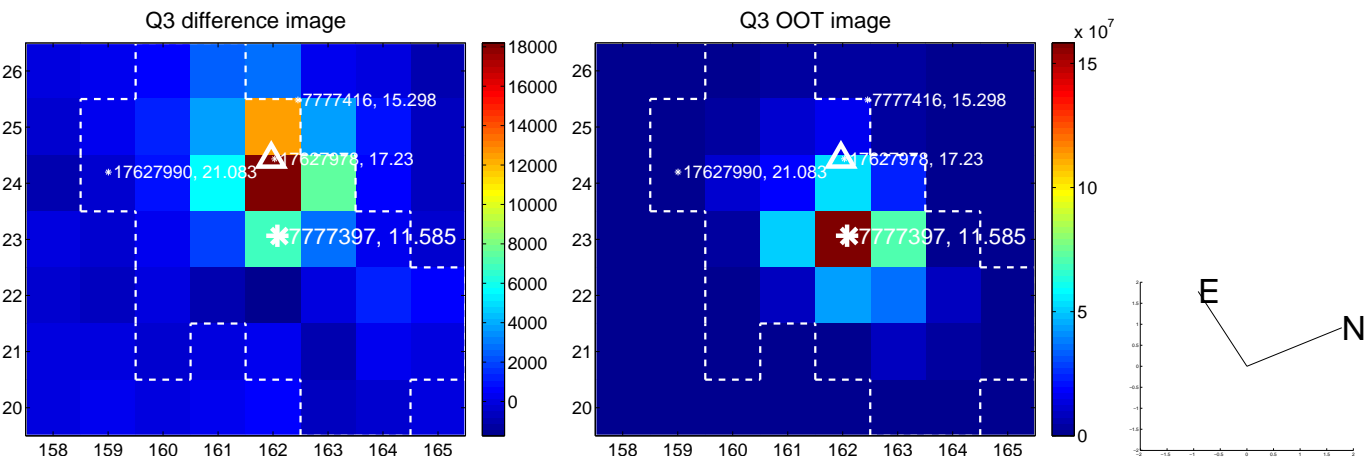
The direct PRF centroid is offset from the target star catalog position by about 0.21 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	<b>5.473 <math>\pm</math> 0.086</b>	<b>63.48</b>	5.077 $\pm$ 0.087	2.042 $\pm$ 0.083
PRF-fit source offset from KIC position	<b>5.428 <math>\pm</math> 0.086</b>	<b>62.91</b>	5.106 $\pm$ 0.087	1.842 $\pm$ 0.083
photometric centroid source offset	<b>5.08 <math>\pm</math> 0.65</b>	<b>7.76</b>	4.94 $\pm$ 0.66	1.15 $\pm$ 0.52



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.

Q5 no difference image



Q5 no OOT image



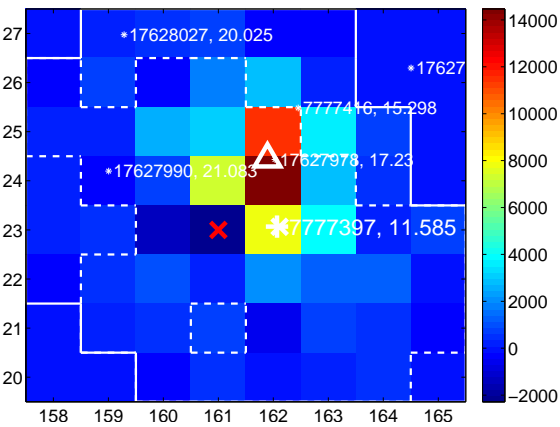
Q6 no difference image



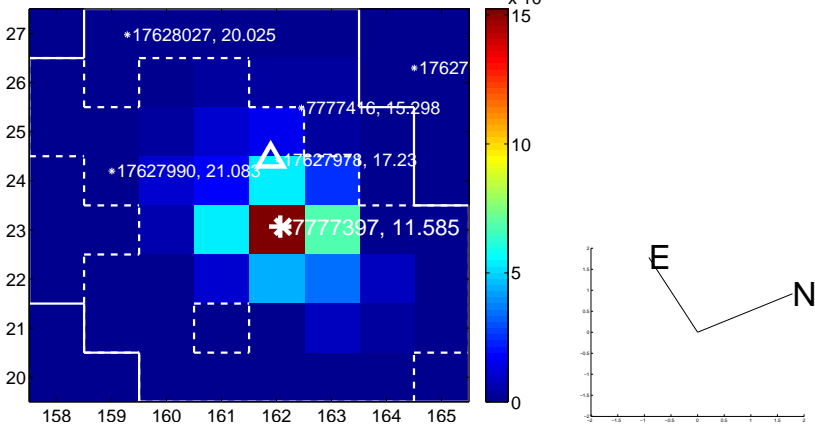
Q6 no OOT image



Q7 difference image



Q7 OOT image



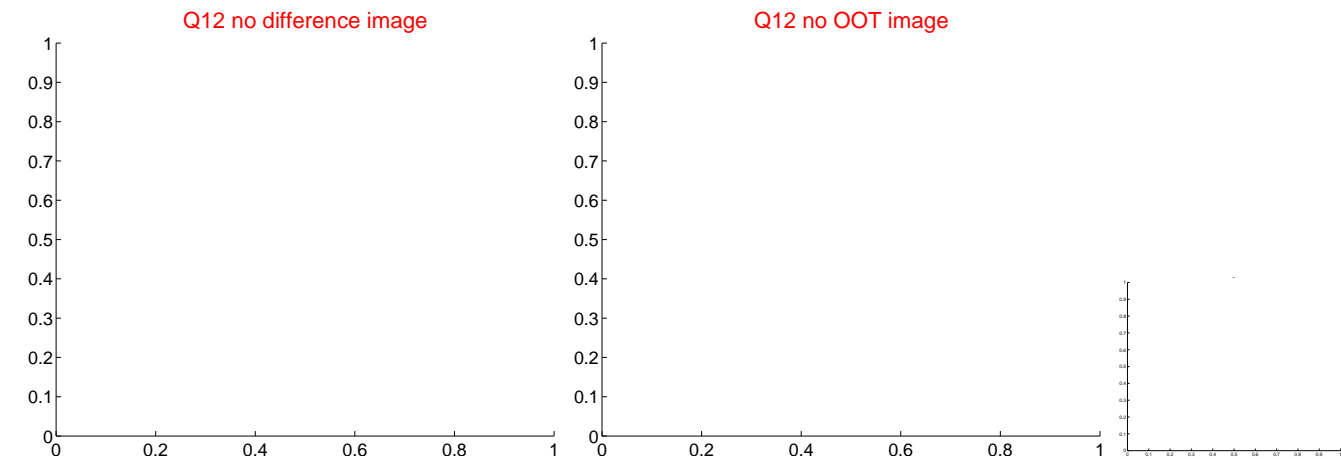
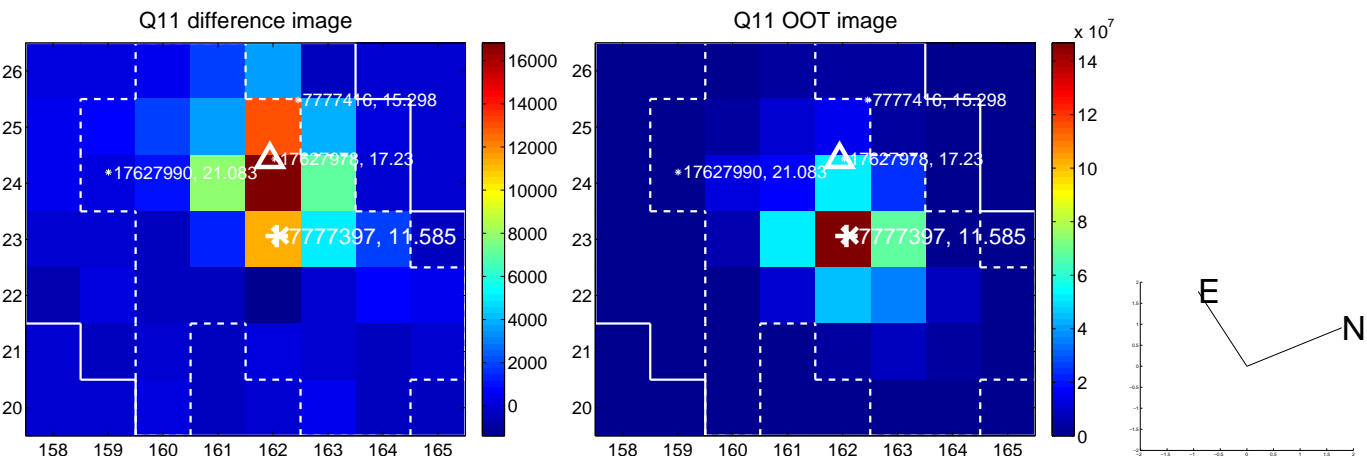
Q8 no difference image



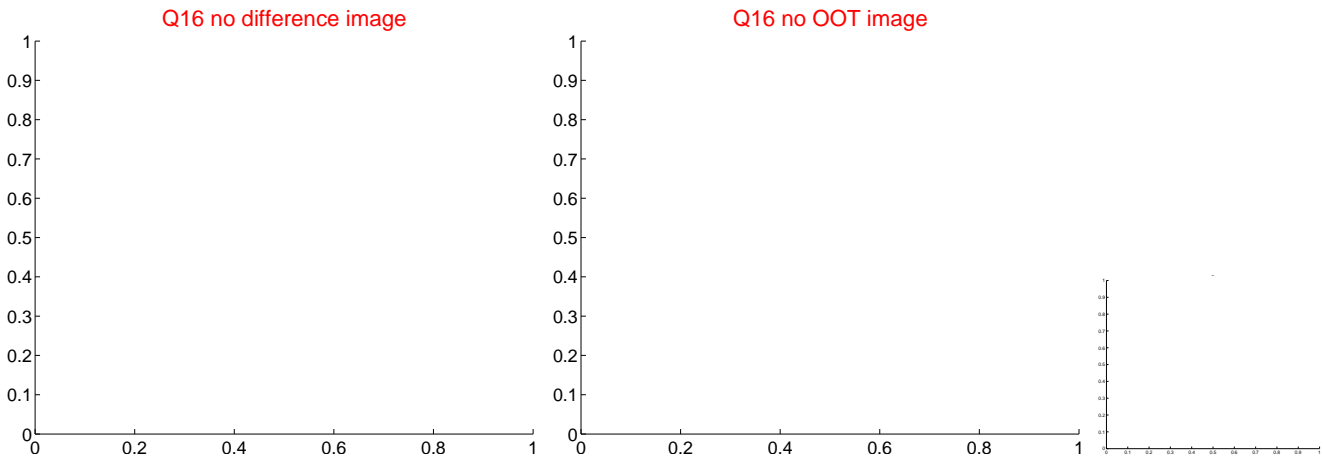
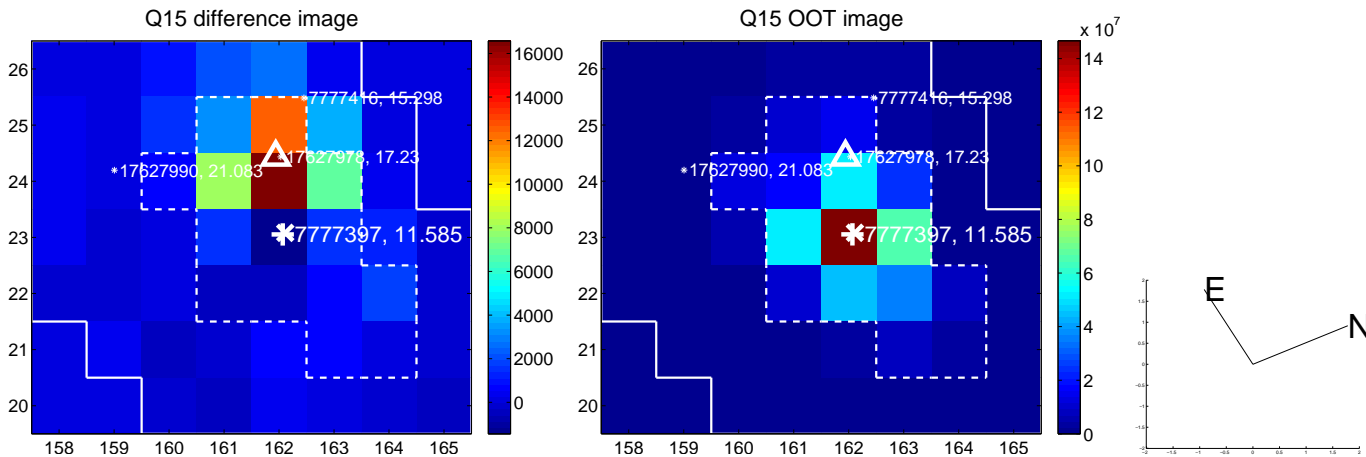
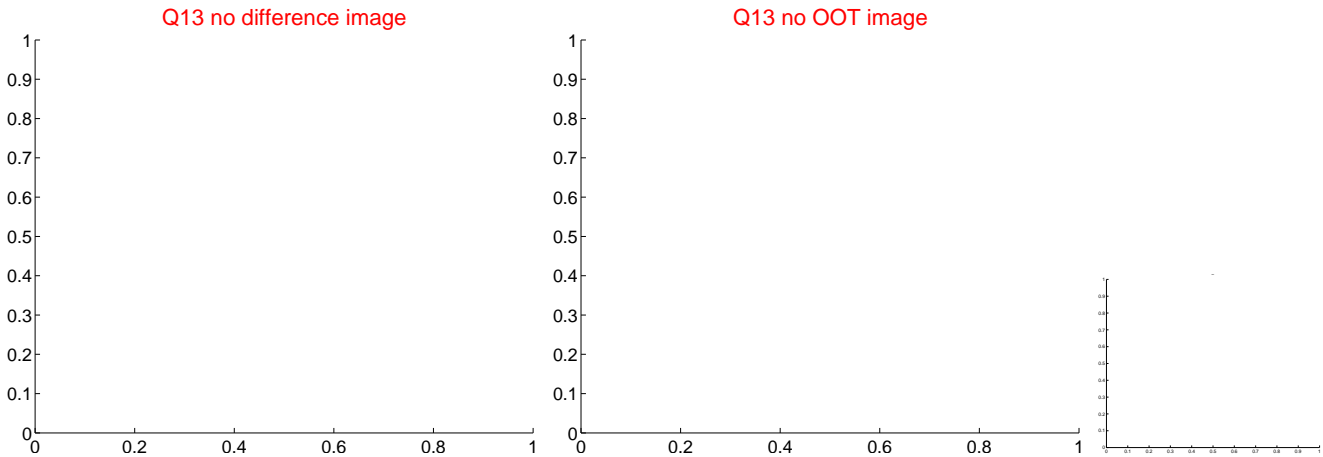
Q8 no OOT image



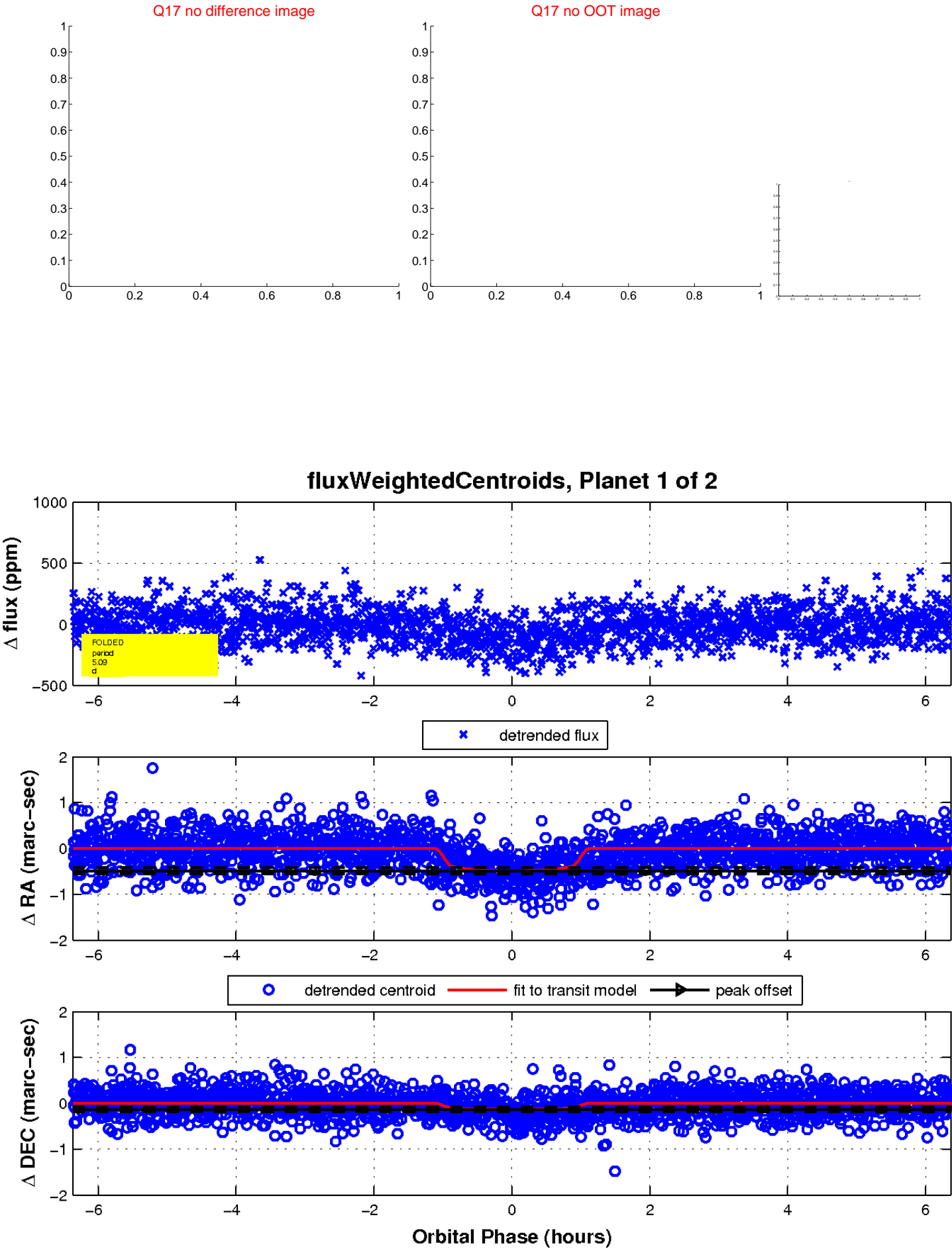
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



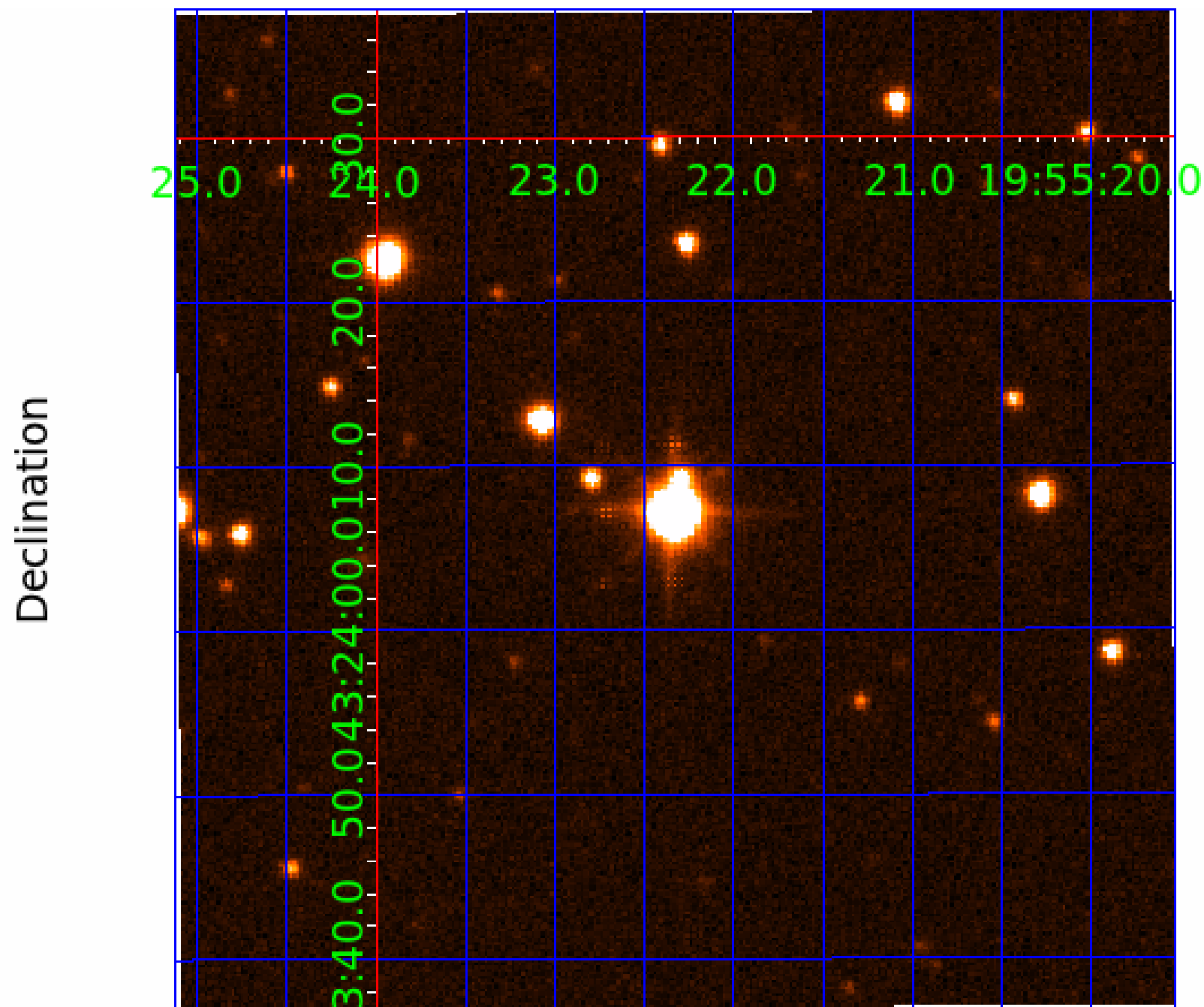
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value



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



UKIRT Image



# KIC 007777397

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
007777397-01	OBS	6043.01	5.091152	135.176451	107.2	2.122	9.1	10.2	3.29	6705	3.97	4134.88
007777397-02	OBS	No	5.091171	132.749415	110.7	3.736	8.7	9.8	3.29	6705	6.89	4134.86

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
007777397-01	OBS	FP	0.00	0	1	1	1	MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE—CENT_UNRESOLVED_OFFSET—EPHEM_MATCH
007777397-02	OBS	FP	0.00	1	1	0	1	IS_SEC_TCE—CENT_FEW_DIFFS—EPHEM_MATCH

**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 007777397-02

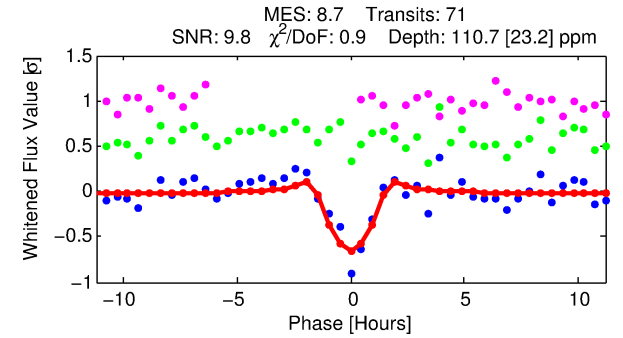
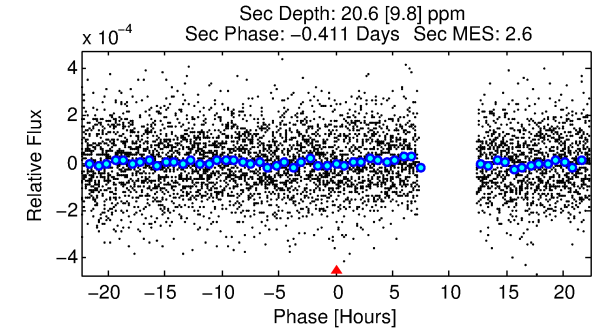
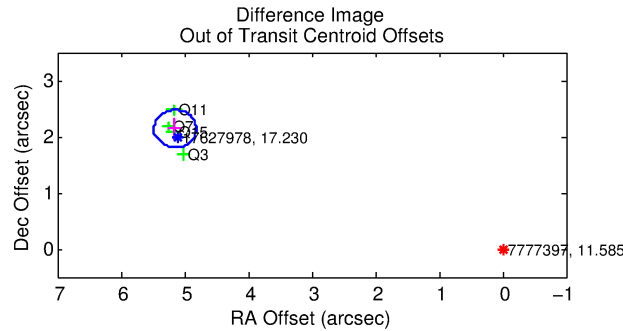
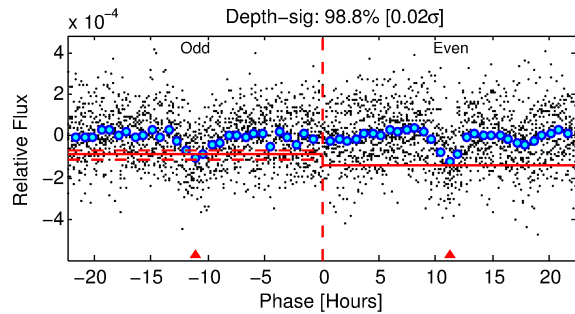
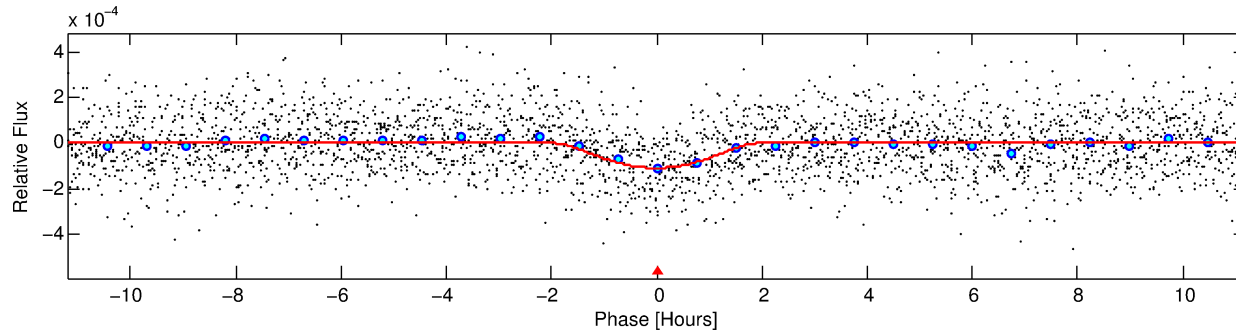
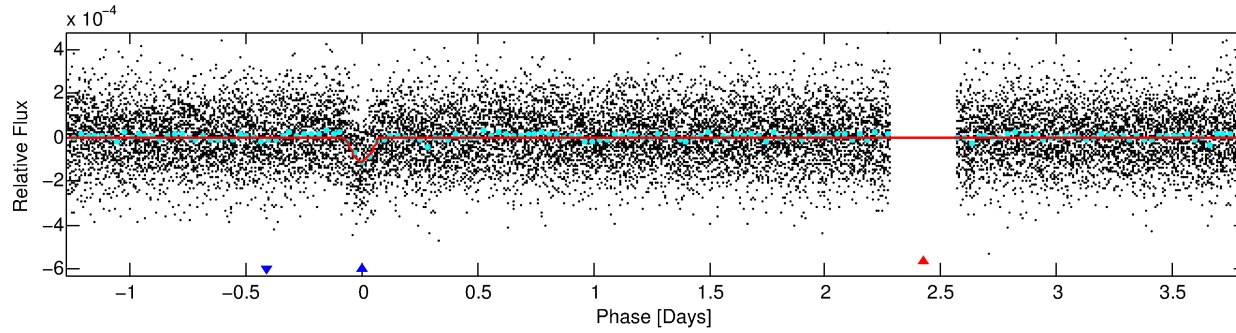
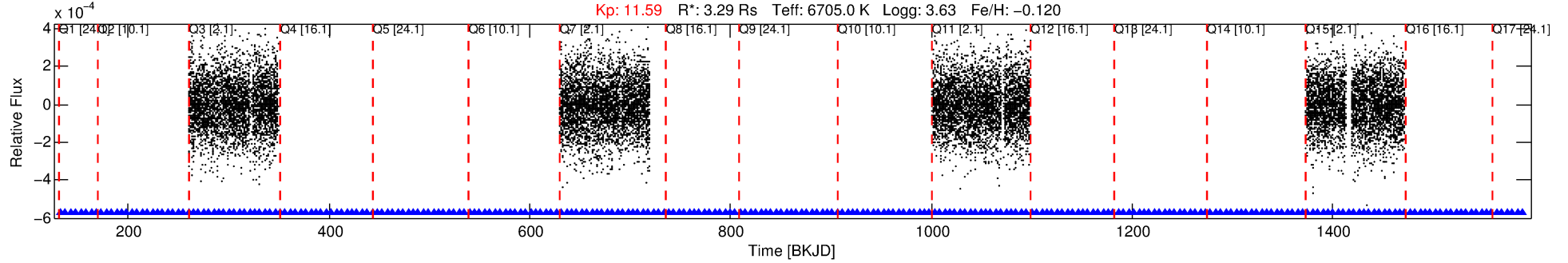
TCE (1)	KIC	Parent (2)	Parent KIC	$P_1:P_2$	Dist ( $''$ )	$\Delta$ Row	$\Delta$ Col	$m_2$	$m_1$	$D_2/D_1$	Mechanism	Flag	$\sigma_P$	$\sigma_T$
007777397-02	7777397	007777416-01	7777416	1:1	9.7	-3	0	15.30	11.59	8.50	Direct-PRF	0	0.07	0.14

**Notes:**  $P_1:P_2$  is the period ratio. Dist is the distance in arcseconds.  $\Delta$ Row and  $\Delta$ Col are the number of pixels apart in row and column.  $m_2$  and  $m_1$  are the magnitudes of the parent and child.  $D_2/D_1$  is the parent's transit depth divided by the child's.  $\sigma_P$  and  $\sigma_T$  are the significance of the match in period and epoch. For a match to be considered significant  $\sigma_P < 5.0$  and  $\sigma_T < 5.0$ . Matches which have  $\sigma_P$  and  $\sigma_T$  very close to this cutoff should receive extra scrutiny, especially if the period ratio is very large.

# DV One-Page Summary

KIC: 7777397 Candidate: 2 of 2 Period: 5.091 d  
KOI: K06043 Corr: No Ephemeris Match

Kp: 11.59 R\*: 3.29 Rs Teff: 6705.0 K Logg: 3.63 Fe/H: -0.120



## DV Fit Results:

Period = 5.09117 [0.00005] d  
Epoch = 132.7494 [0.0072] BKJD  
Rp/R\* = 0.0192 [0.0428]  
a/R\* = 2.29 [1.14]  
b = 1.00 [0.07]  
Seff = 4134.86 [2218.17]  
Teq = 2045 [274] K  
Rp = 6.89 [15.59] Re  
a = 0.0689 [0.0232] AU  
Ag = 1.14 [5.13] [0.03σ]  
Teffp = 3264 [3665] K [0.33σ]

## DV Diagnostic Results:

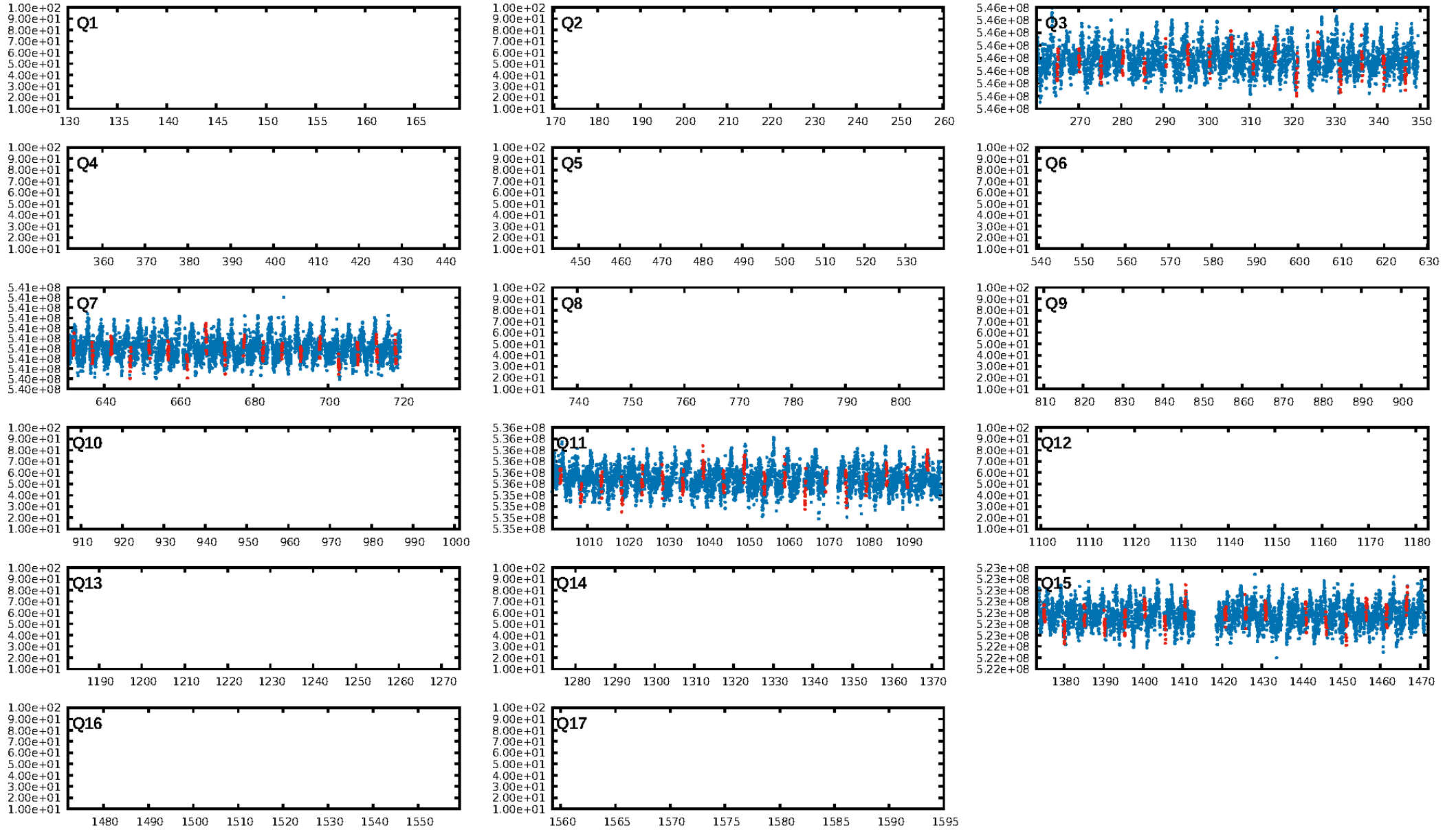
ShortPeriod-sig: 0.0% [0.00σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 81.0%  
ModelChiSquareGoF-sig: 100.0%  
Bootstrap-pfa: 3.44e-16  
RollingBand-fgt: 1.00 [71/71]  
GhostDiagnostic-chr: 0.6336  
Centroid-sig: 0.0%  
Centroid-so: 5.354 arcsec [8.58σ]  
OotOffset-rm: 5.577 arcsec [50.36σ]  
KicOffset-rm: 5.558 arcsec [53.12σ]  
OotOffset-st: 0/4/0/0 [4]  
KicOffset-st: 0/4/0/0 [4]  
DiffImageQuality-fgm: 1.00 [4/4]  
DiffImageOverlap-fno: 1.00 [4/4]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 19:22:13 Z

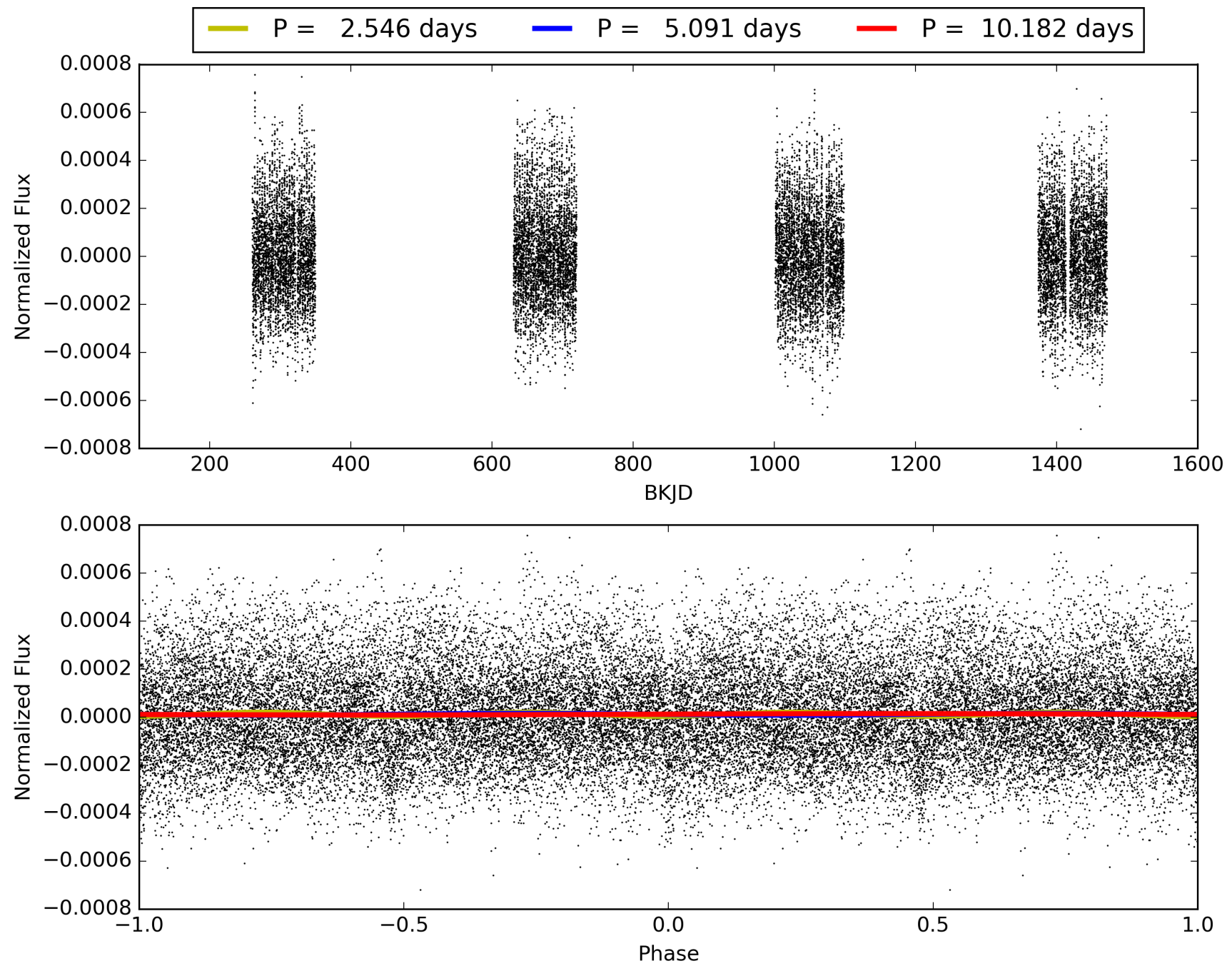
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center



# TCE 007777397-02, PDC Light Curves

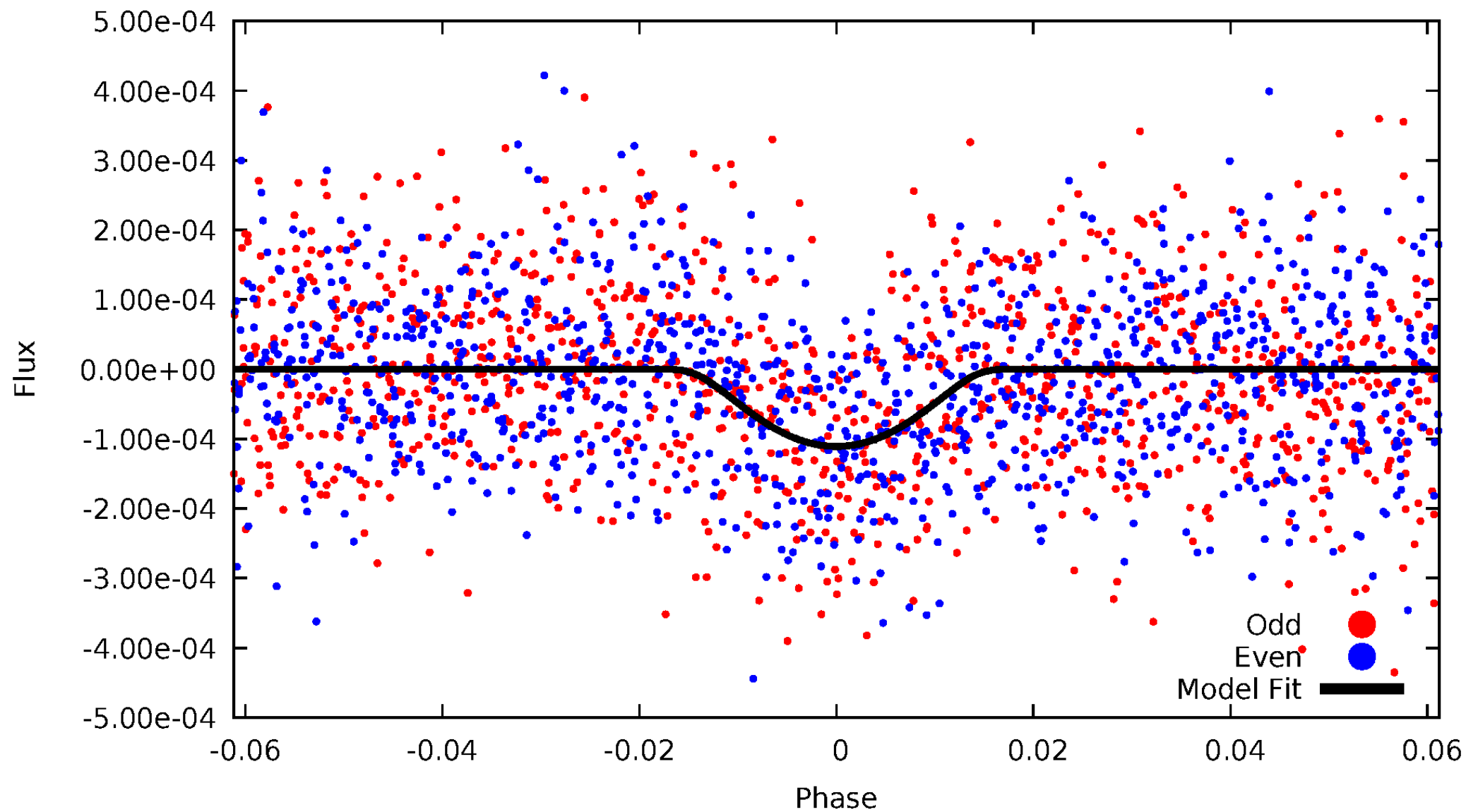


TCE 007777397-02



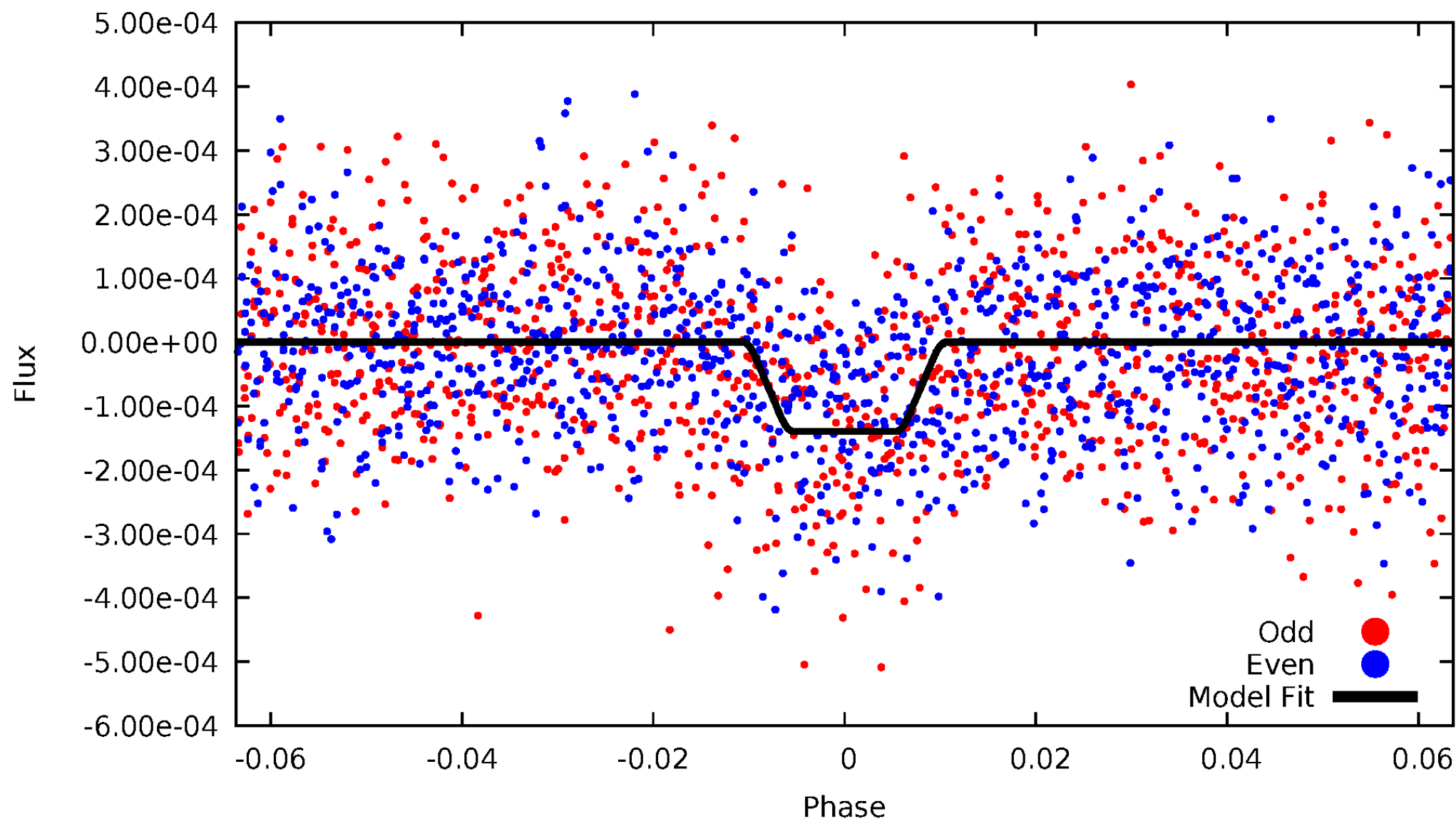
# DV Odd/Even

TCE 007777397-02



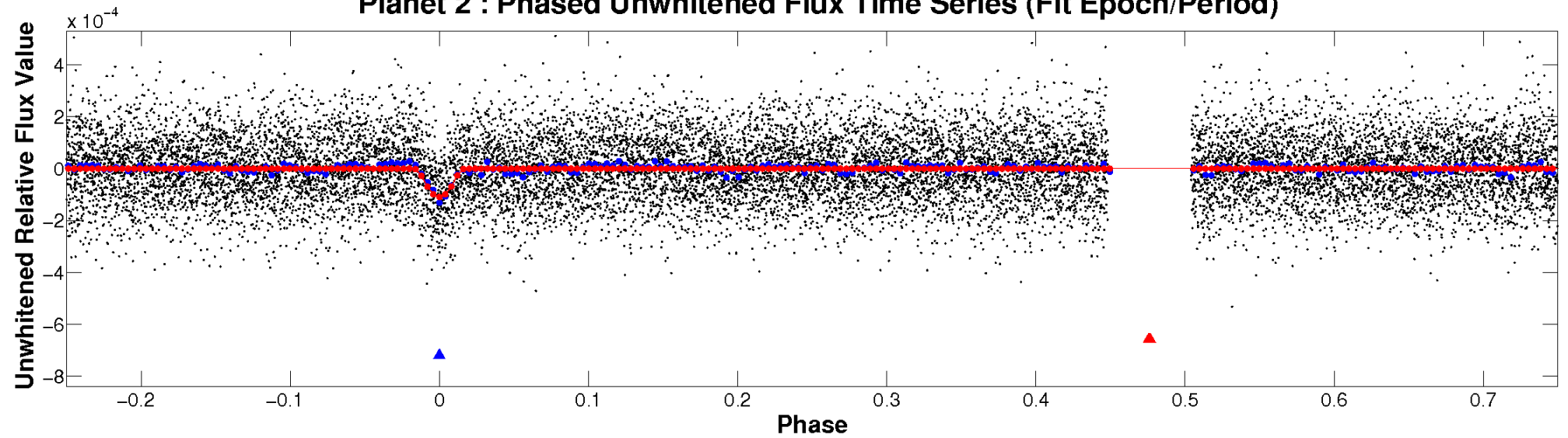
# ALT Odd/Even

TCE 007777397-02

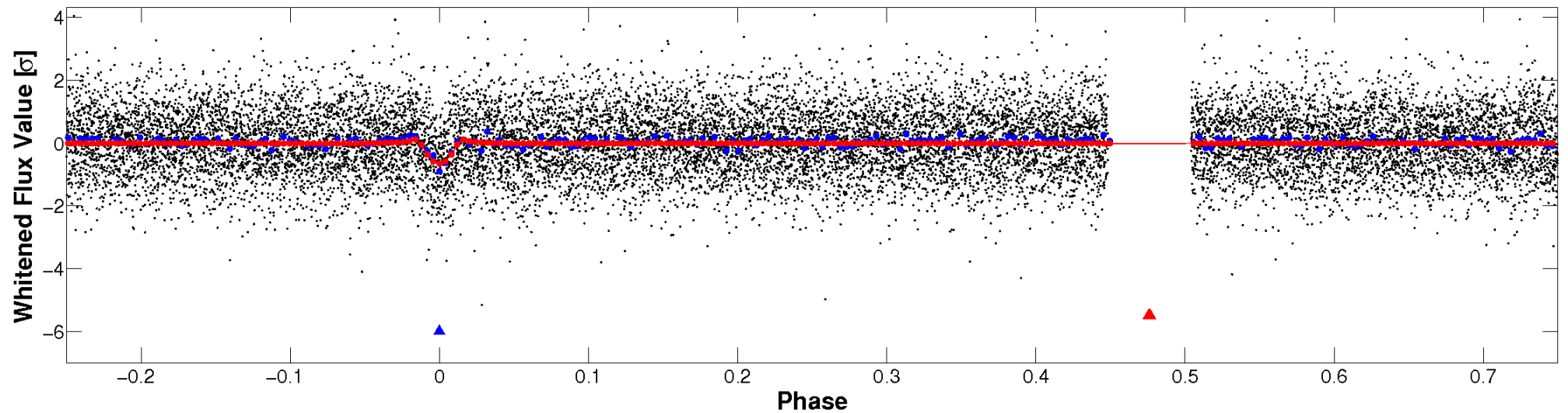


# Non-Whitened Vs. Whitened Light Curve

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

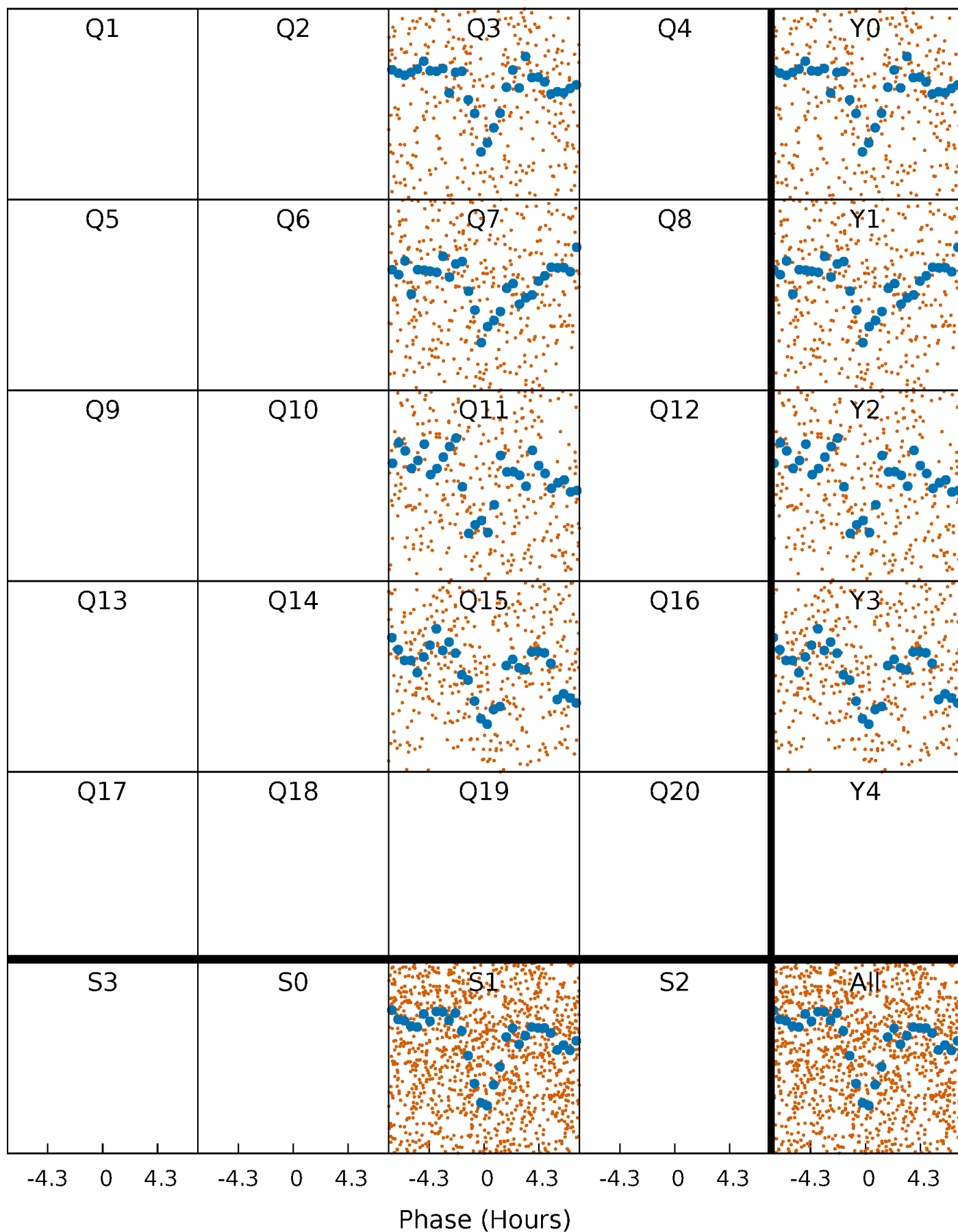


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

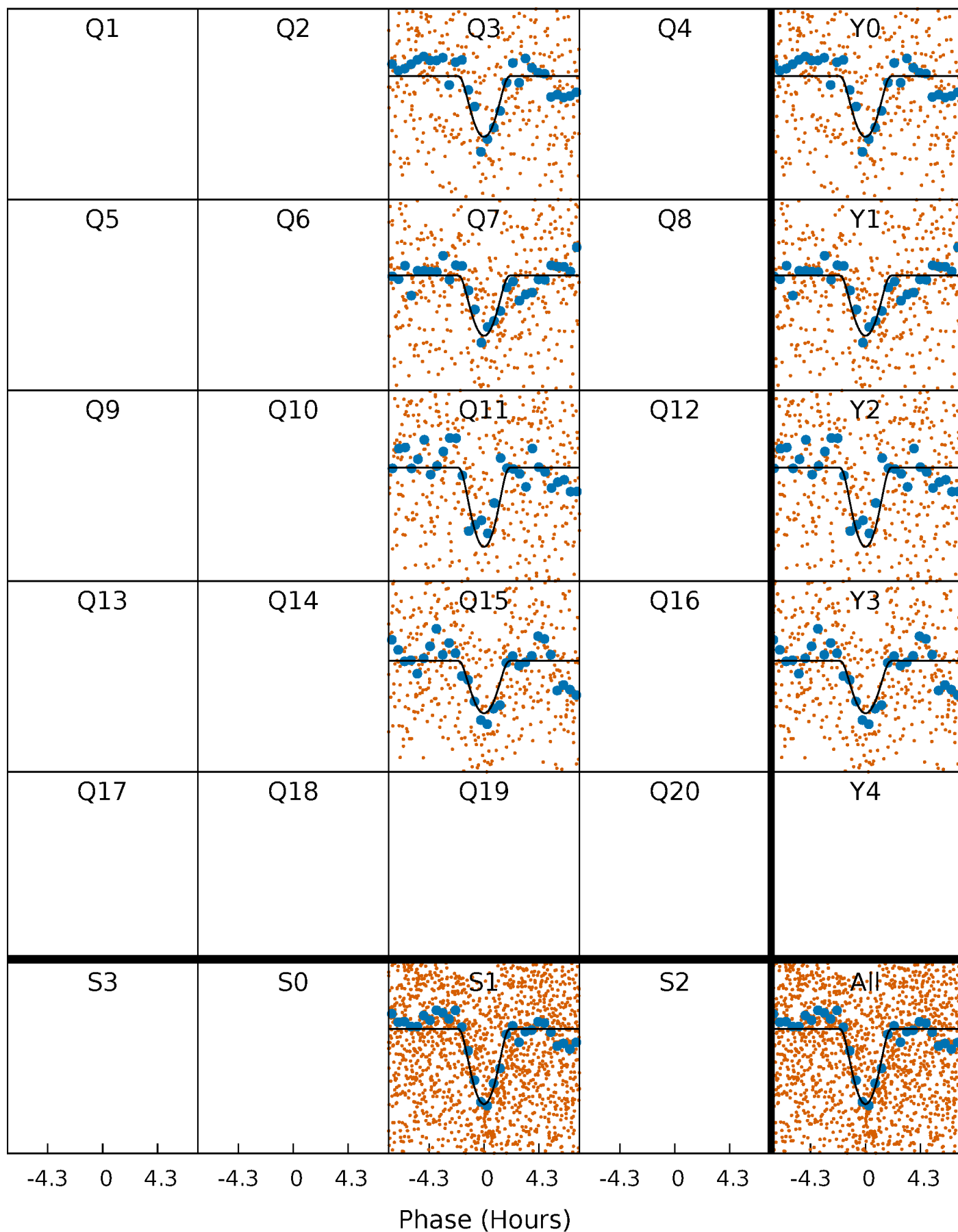
TCE 007777397-02   P= 5.091171 Days    $T_0=132.749415$  (BKJD)





# DV Quarter-Phased Transit Curves

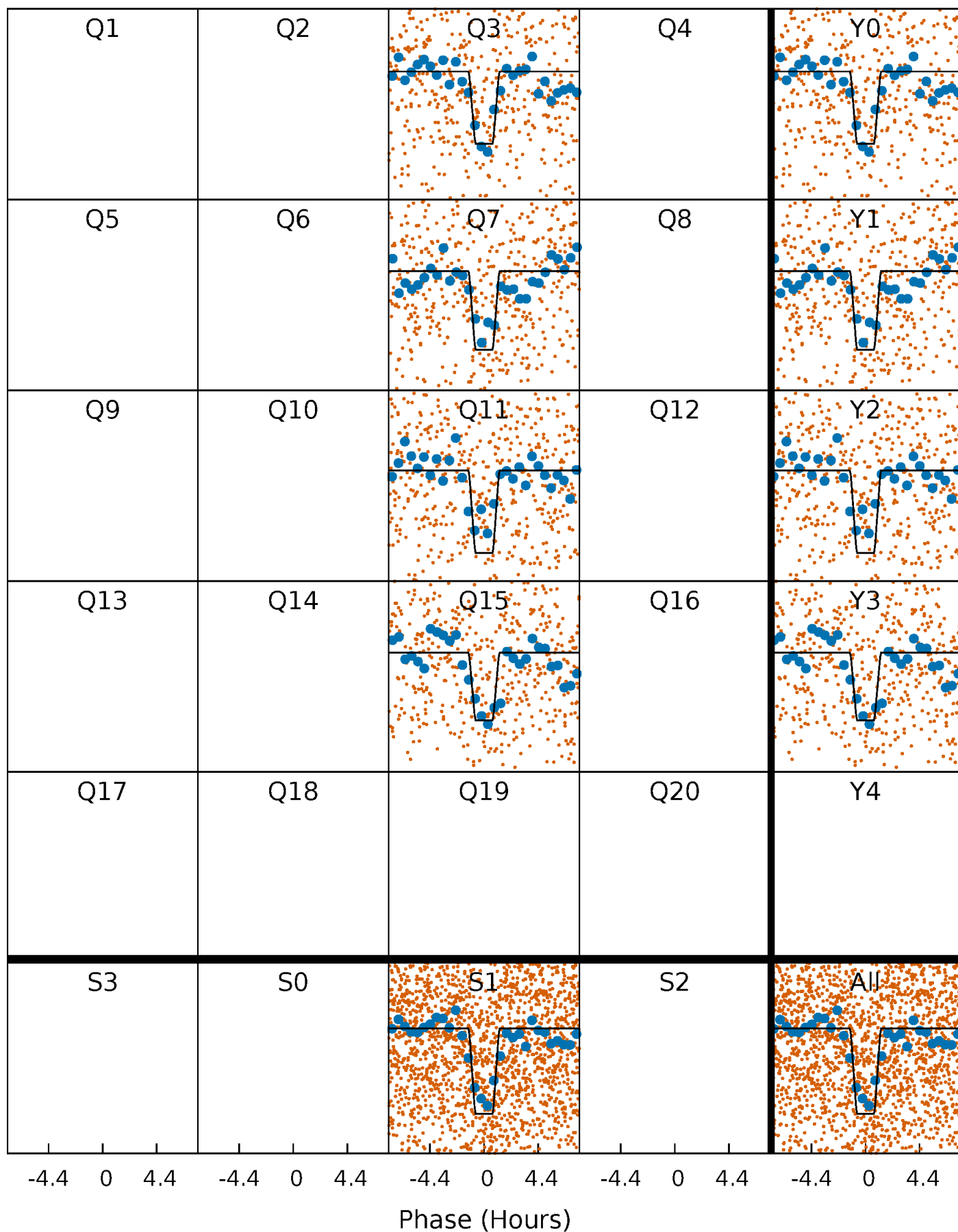
TCE 007777397-02   P= 5.091171 Days    $T_0=132.749415$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

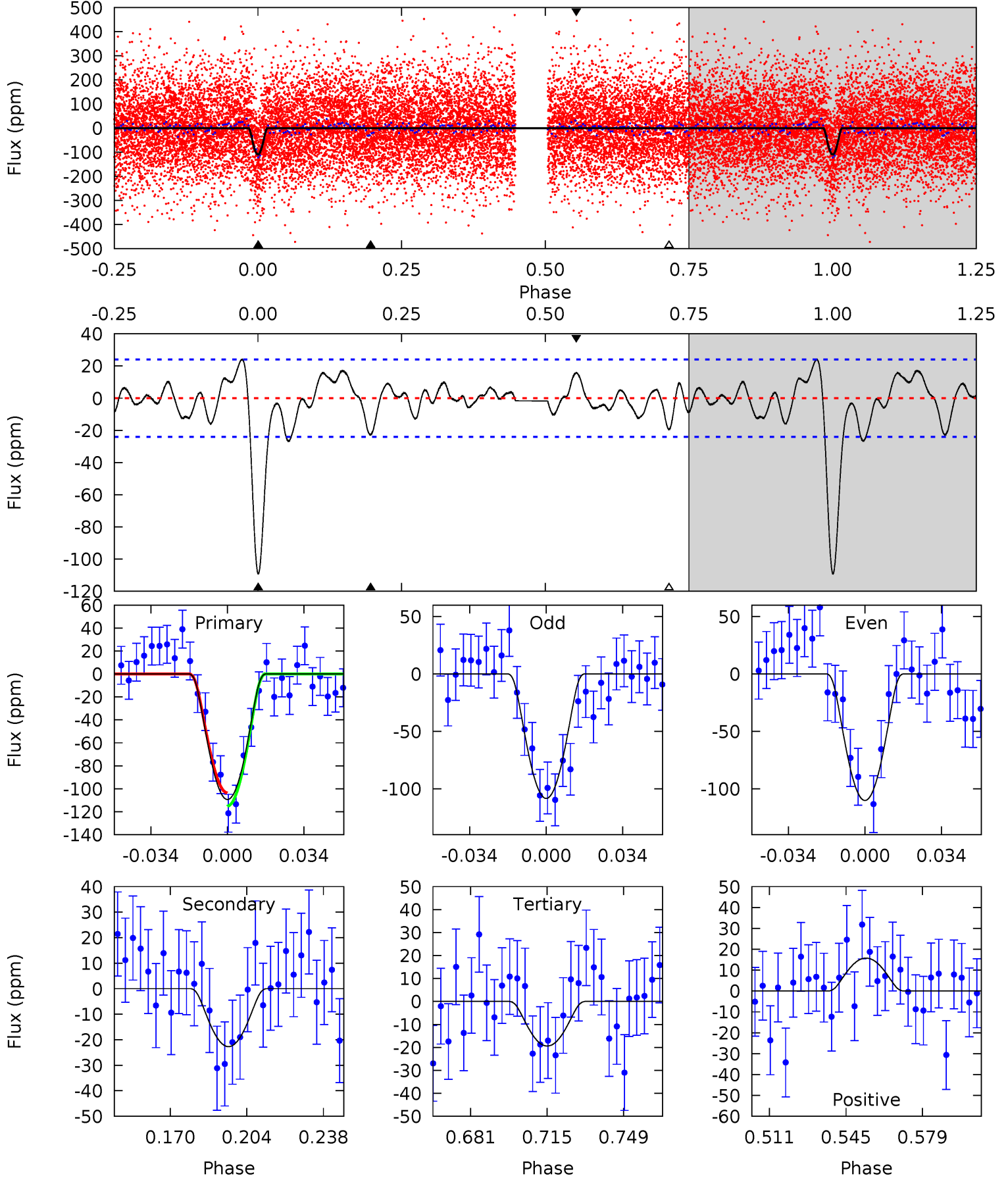
TCE 007777397-02 P= 5.091117 Days  $T_0=132.759630$  (BKJD)



# DV Model-Shift Uniqueness Test

007777397-02, P = 5.091171 Days, E = 132.749415 Days

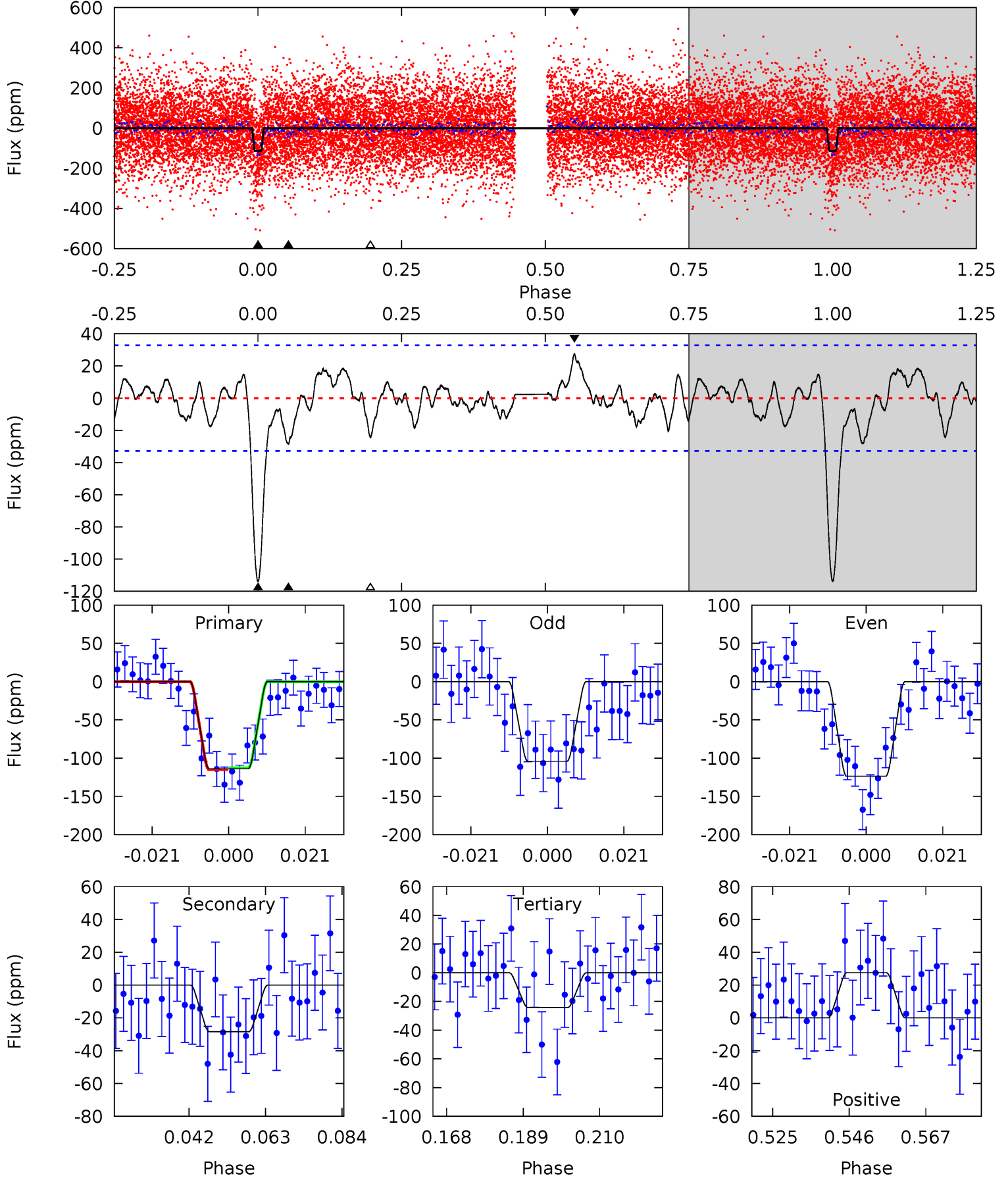
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
21.7	4.51	3.86	3.14	4.79	2.12	1.66	17.9	18.6	0.66	1.38	0.18	1.07	0.18	1.15



# Alt Model-Shift Uniqueness Test

007777397-02, P = 5.091117 Days, E = 132.759630 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
16.9	4.23	3.62	4.11	4.88	2.31	1.36	13.3	12.8	0.61	0.12	1.46	1.05	0.20	0.17



### Stellar Parameters For KIC 007777397

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$\rho_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6705^{+212}_{-236}$	$3.629^{+0.296}_{-0.056}$	$-0.120^{+0.300}_{-0.250}$	$3.293^{+0.408}_{-1.225}$	$1.682^{+0.212}_{-0.319}$	$0.066^{+0.134}_{-0.016}$
	+3%/-4%	+8%/-2%	+250%/-208%	+12%/-37%	+13%/-19%	+203%/-24%
Source	KIC0	FLK73	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 007777397-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-23 \pm 5$	$12.34^{+11.98}_{-8.64}$	$2785^{+163}_{-238}$	$2508^{+1975}_{-5317}$	$0.399^{+3.933}_{-0.305}$
Alt.	$-28 \pm 7$	$11.45^{+12.18}_{-8.01}$	$2773^{+168}_{-234}$	$2901^{+1838}_{-5647}$	$0.570^{+5.714}_{-0.442}$

$T_{\text{max}}$  = 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

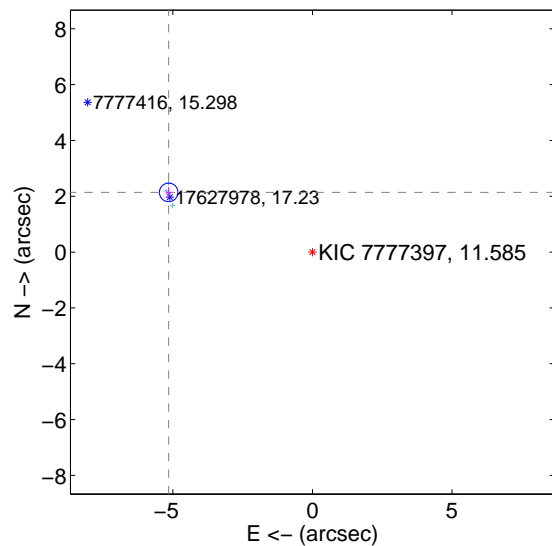
Supplemental centroid analysis for 007777397-02. **Kepler magnitude: 11.59.** Transit SNR 9.75

There are 4 quarters with good PRF difference image offsets

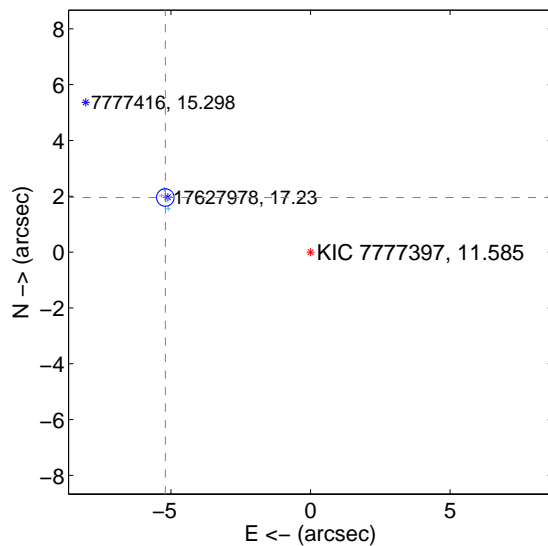
The direct PRF centroid is offset from the target star catalog position by about 0.21 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	<b><math>5.577 \pm 0.111</math></b>	<b>50.36</b>	$5.150 \pm 0.090$	$2.139 \pm 0.192$
PRF-fit source offset from KIC position	<b><math>5.558 \pm 0.105</math></b>	<b>53.12</b>	$5.202 \pm 0.092$	$1.956 \pm 0.170$
photometric centroid source offset	<b><math>5.35 \pm 0.62</math></b>	<b>8.58</b>	$5.18 \pm 0.63$	$1.34 \pm 0.49$

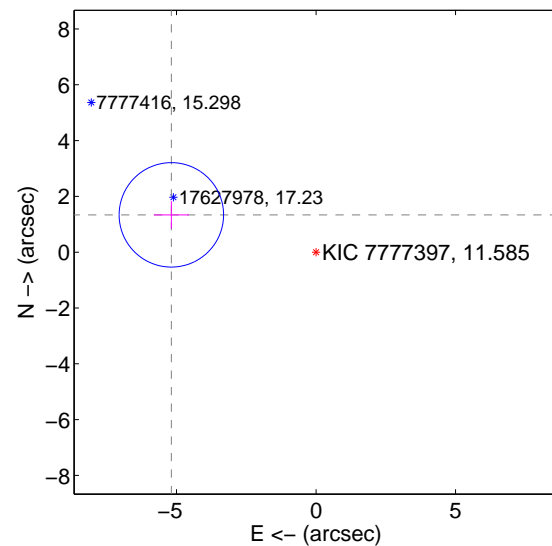
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

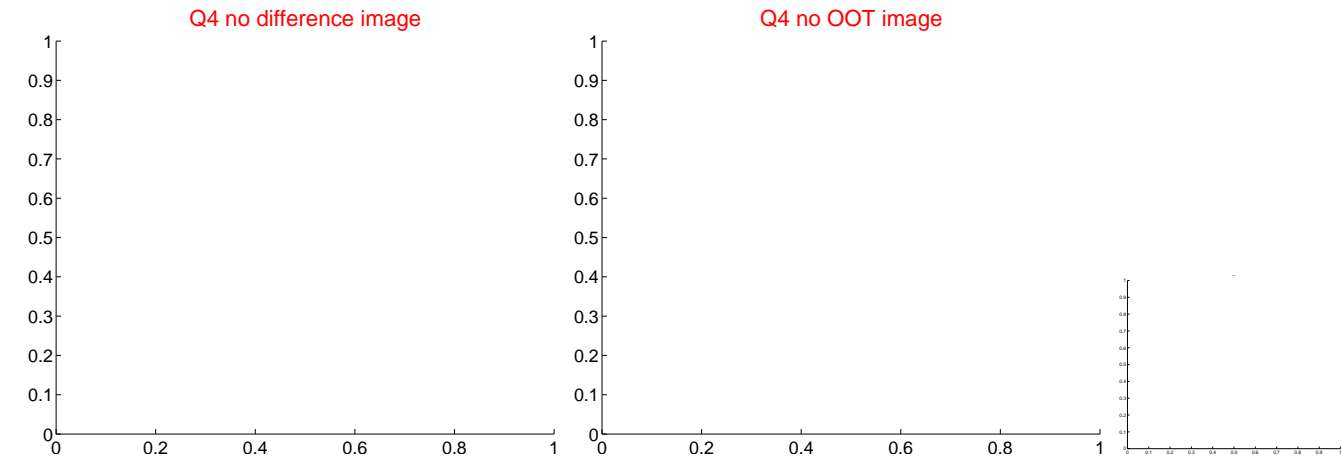
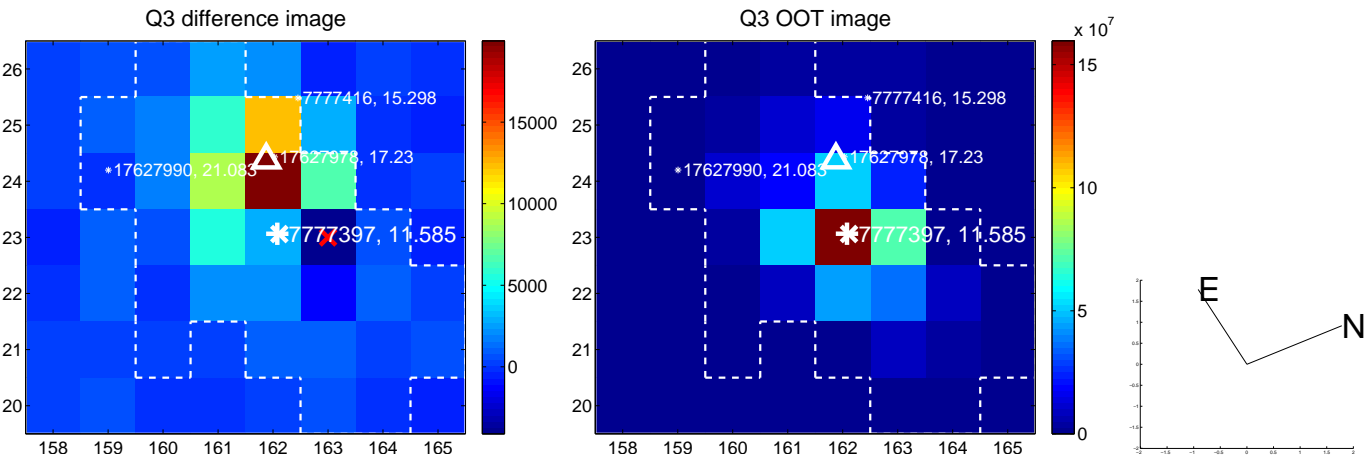
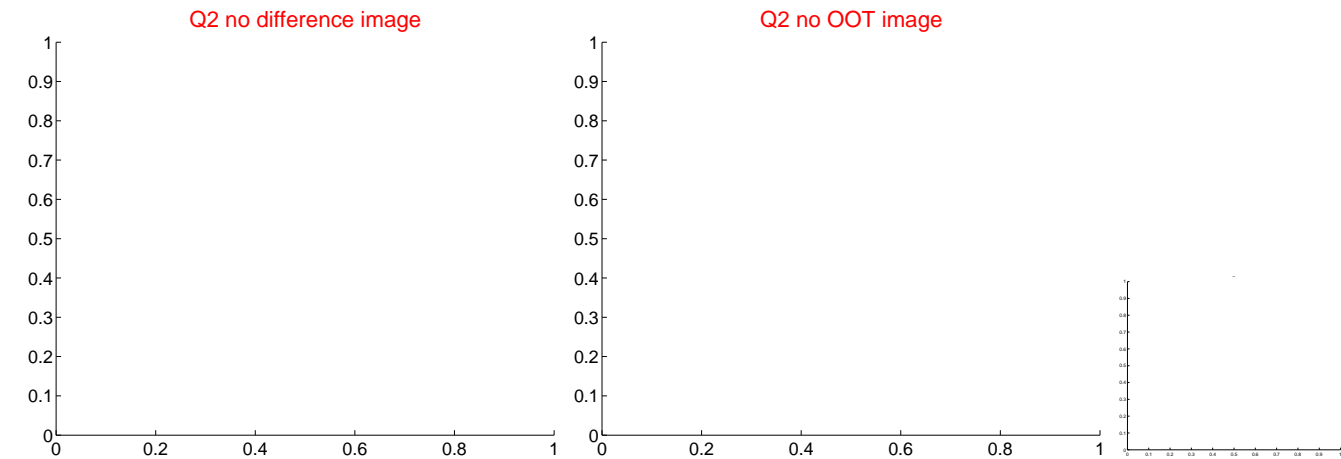
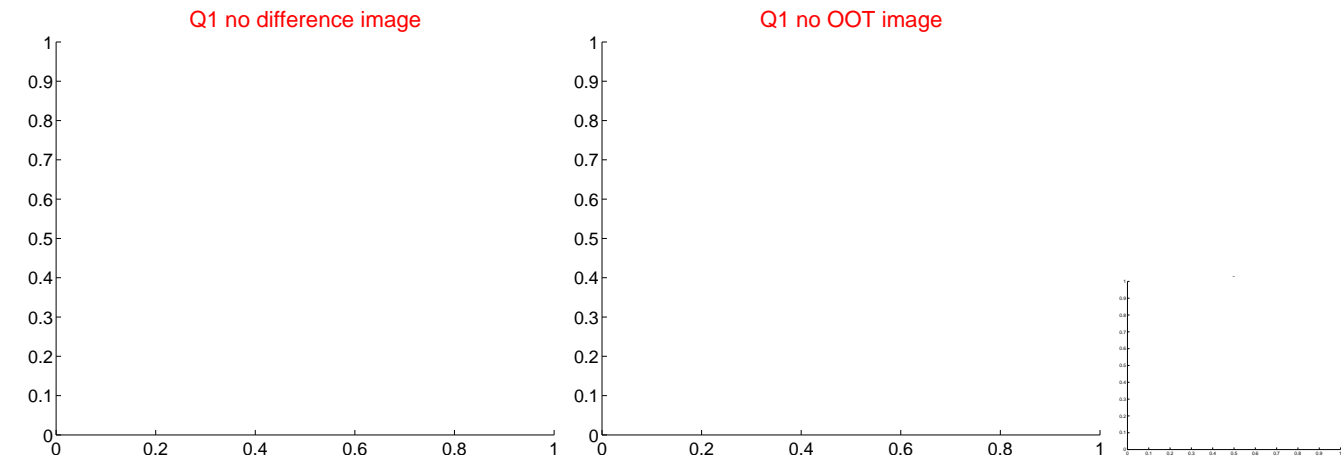


offset from photometric centroids



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  $\times$ : 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.

Q5 no difference image



Q5 no OOT image



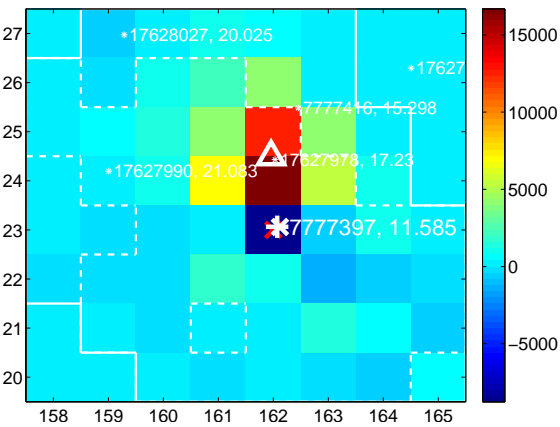
Q6 no difference image



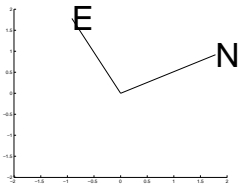
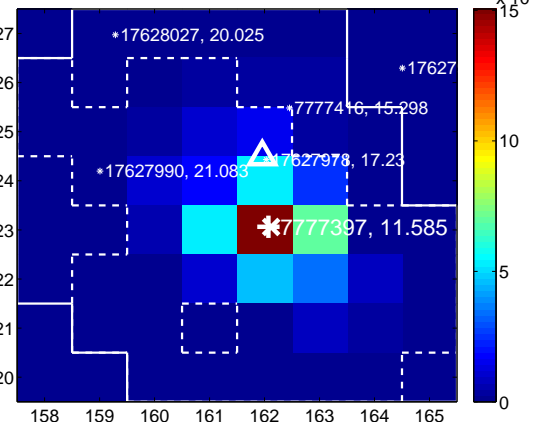
Q6 no OOT image



Q7 difference image



Q7 OOT image



Q8 no difference image

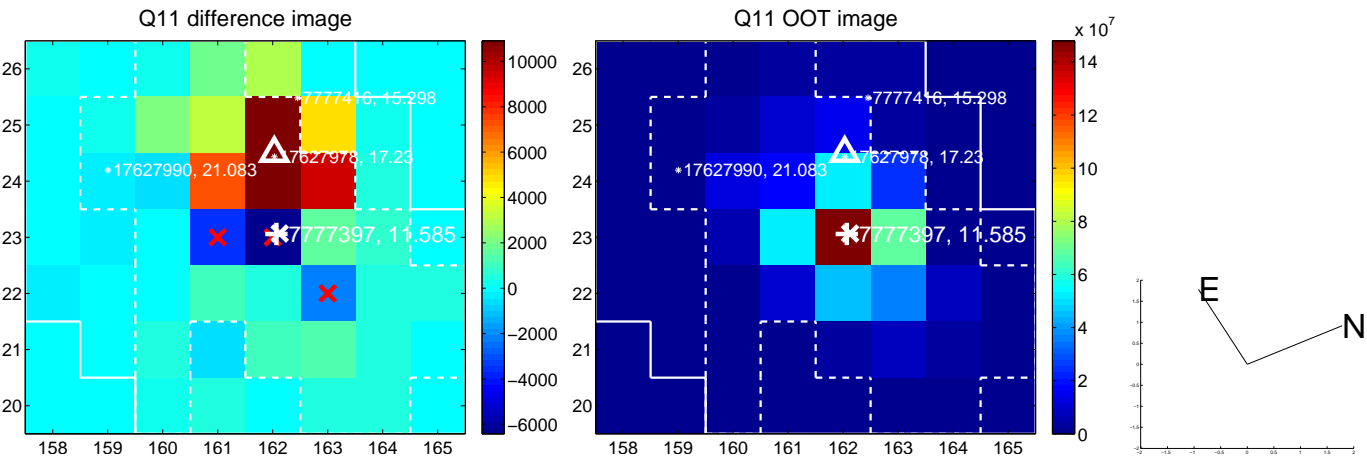


Q8 no OOT image

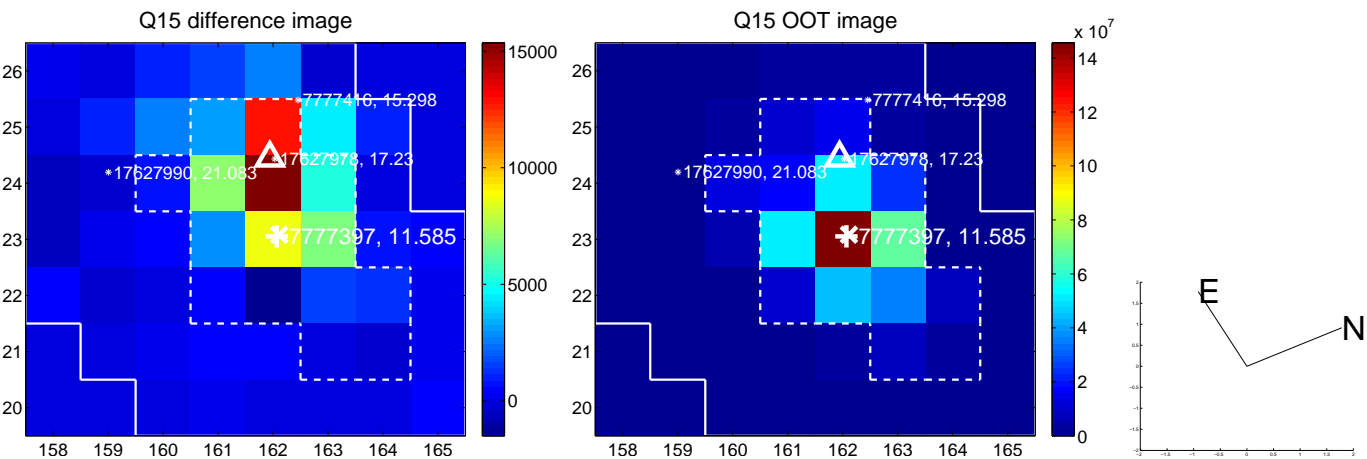




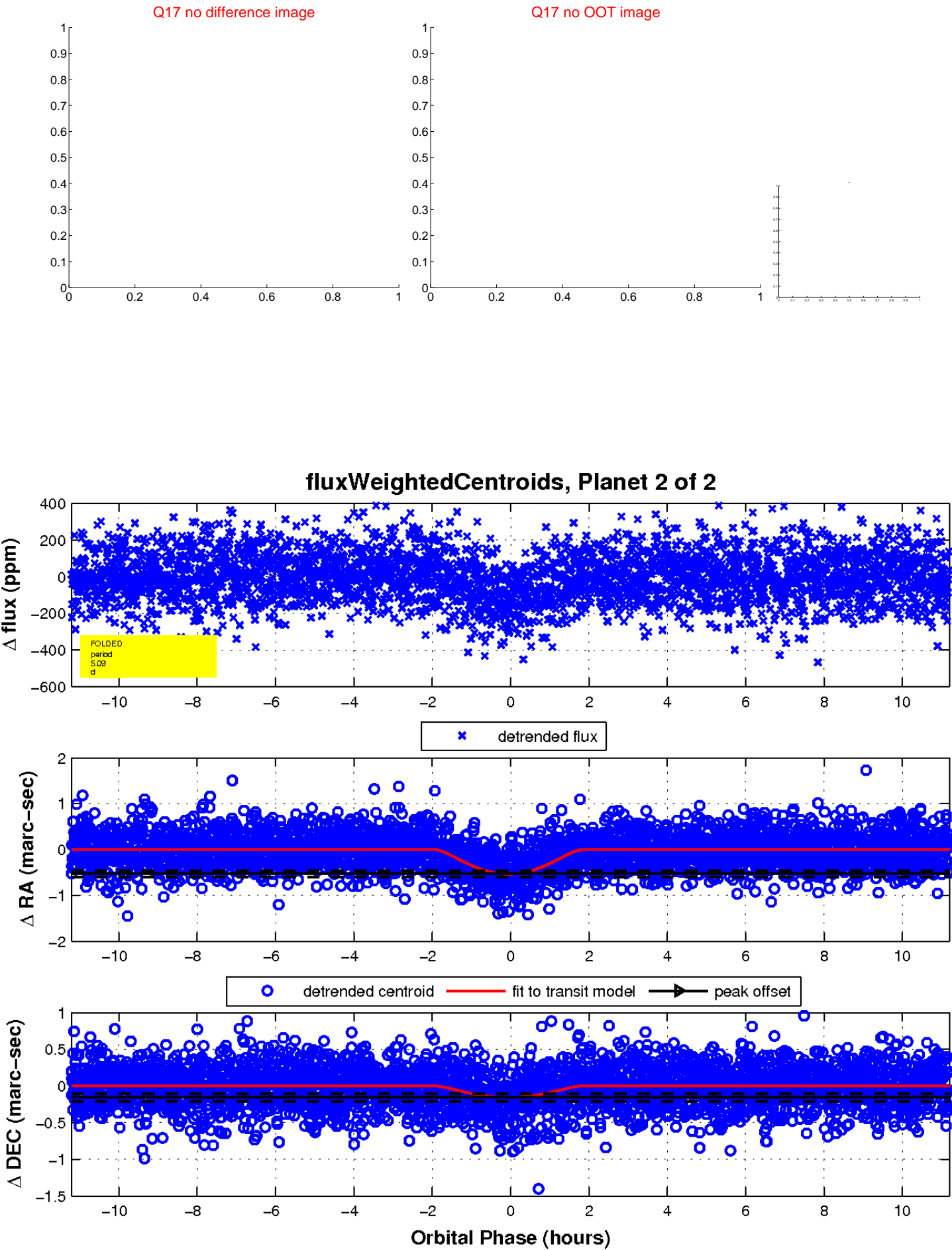
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

