

# KIC 003757778

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
003757778-01	OBS	3402.01	36.514366	163.794492	111934.9	6.490	2339.2	1964.3	1.00	5811	33.24	21.12
003757778-02	OBS	No	36.514023	151.207540	4842.6	10.618	111.4	112.8	1.00	5811	7.84	21.12

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
003757778-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE
003757778-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE

**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.

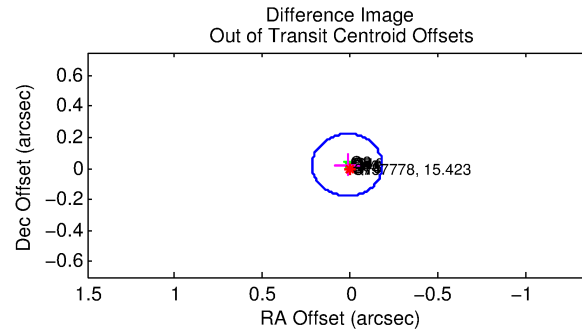
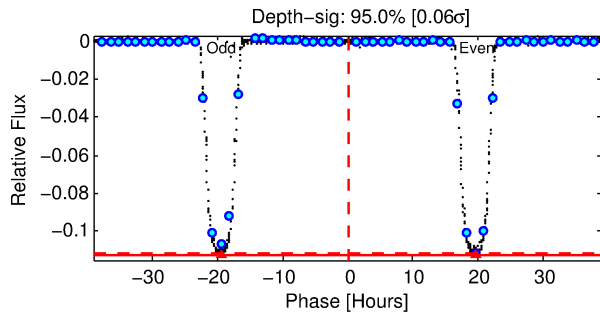
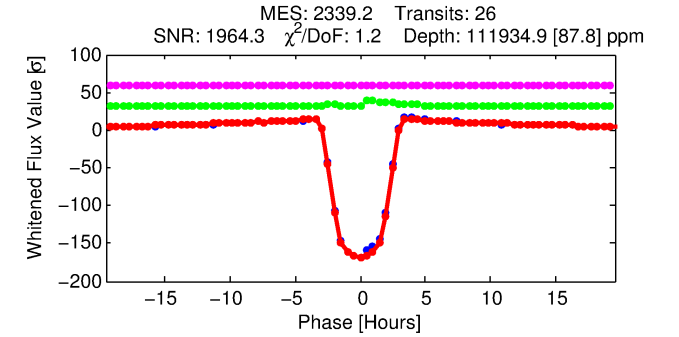
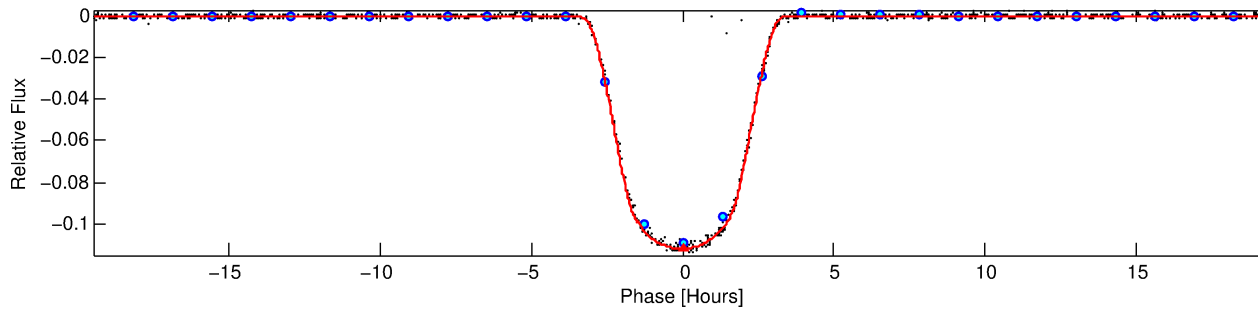
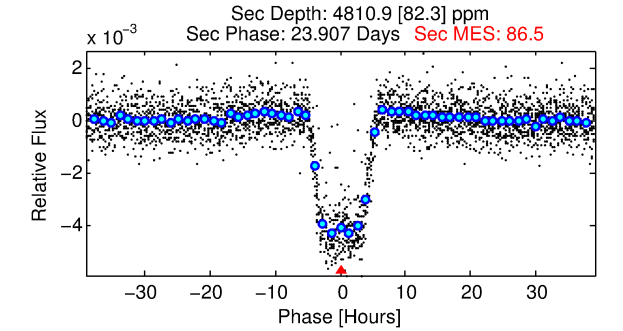
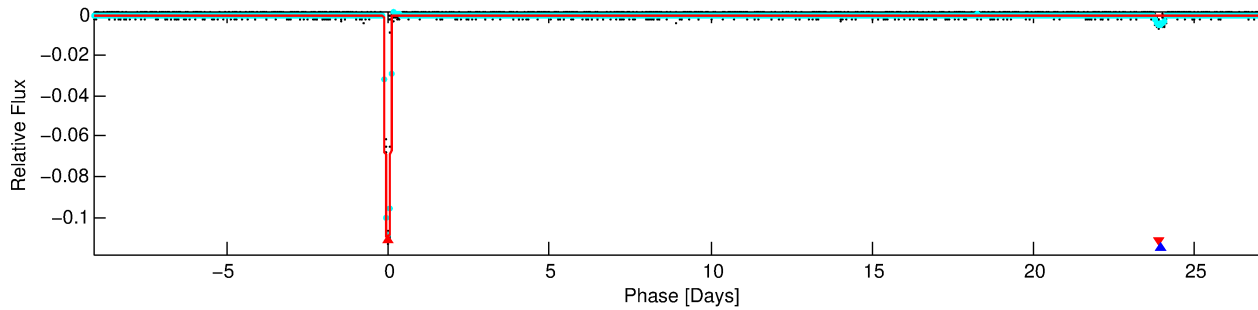
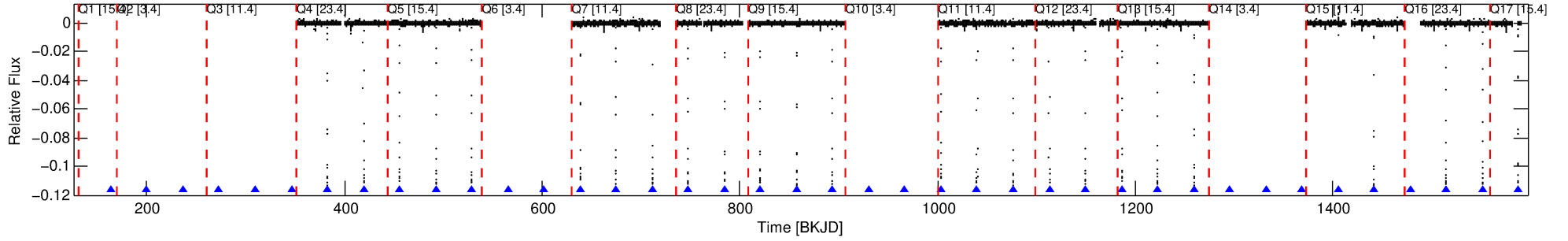
## Ephemeris Match Information For 003757778-01

No Significant Match Found

# DV One-Page Summary

KIC: 3757778 Candidate: 1 of 2 Period: 36.514 d  
KOI: K03402.01 Corr: 0.998

Kp: 15.42 R\*: 1.00 Rs Teff: 5811.0 K Logg: 4.46 Fe/H: 0.210



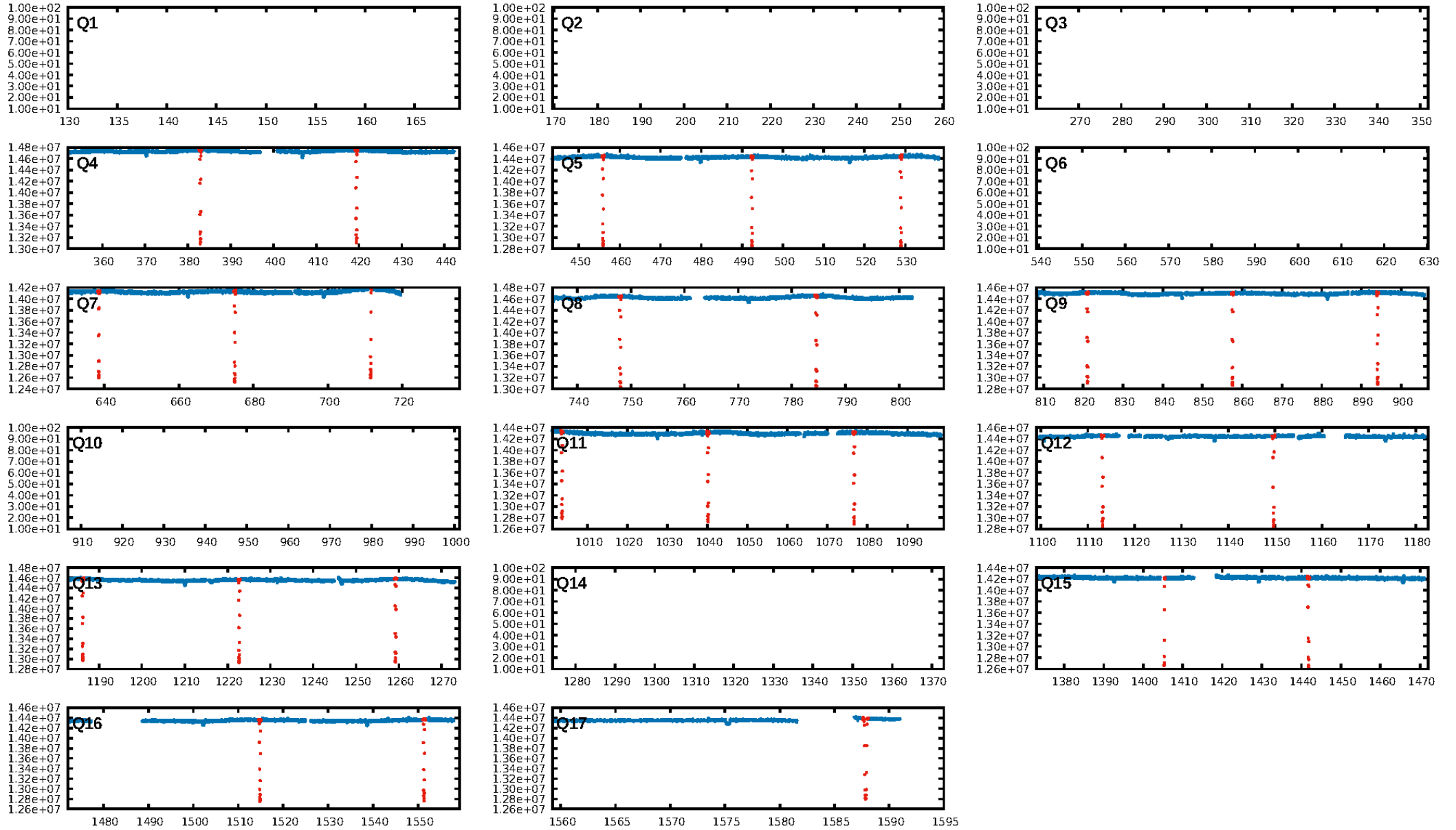
## DV Fit Results:

Period = 36.51437 [0.00000] d  
Epoch = 163.7945 [0.0001] BKJD  
Rp/R\* = 0.3046 [0.0002]  
a/R\* = 55.99 [0.12]  
b = 0.07 [0.03]  
Seff = 21.12 [8.73]  
Teq = 547 [56] K  
Rp = 33.24 [10.14] Re  
a = 0.2200 [0.0577] AU  
Ag = 115.91 [45.13] [2.55σ]  
Teffp = 2773 [98] K [19.74σ]

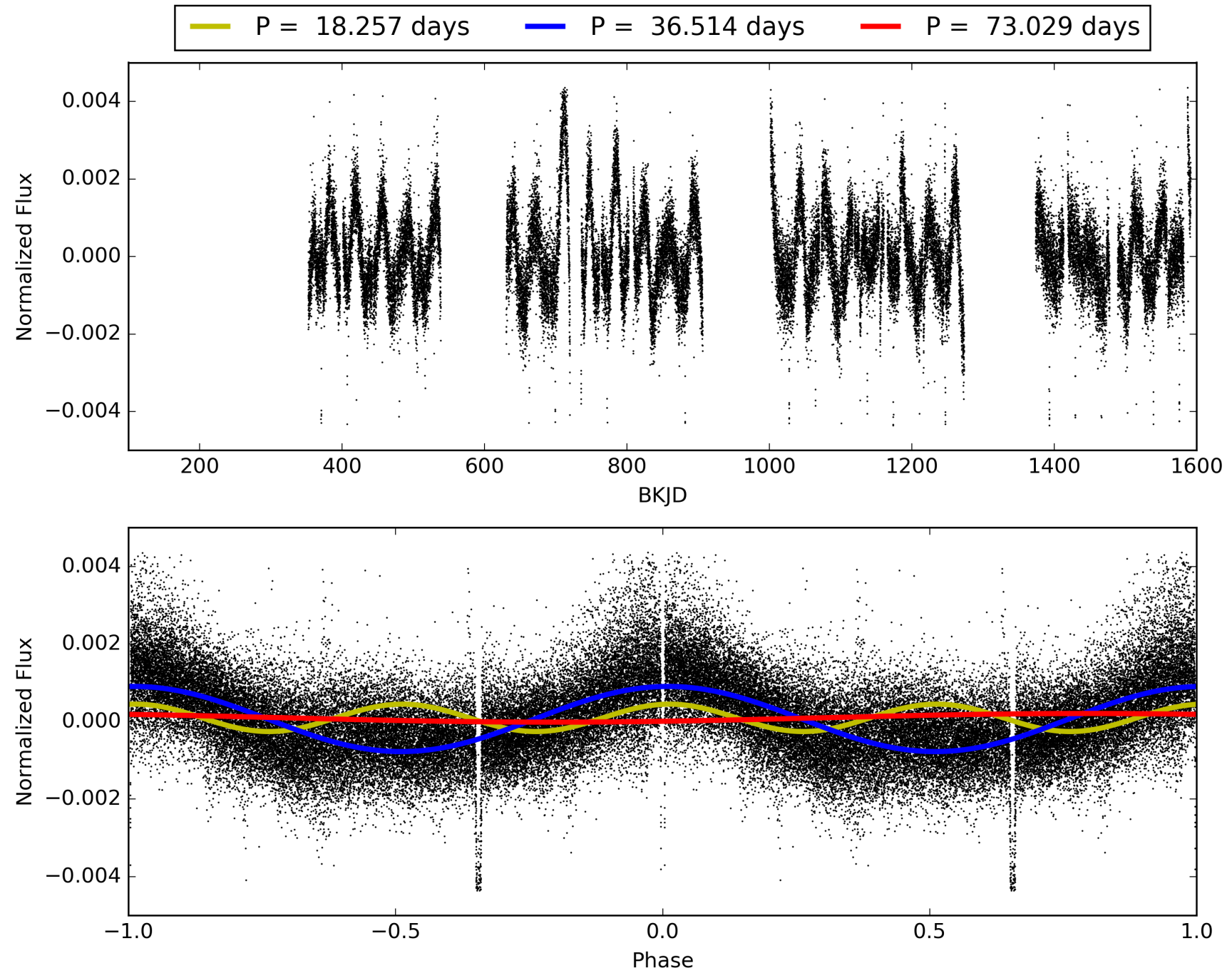
## DV Diagnostic Results:

ShortPeriod-sig: 0.1% [0.00σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 94.5%  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [25/25]  
GhostDiagnostic-chr: 4.776  
Centroid-sig: 0.0%  
Centroid-so: 0.396 arcsec [66.26σ]  
OotOffset-rm: 0.029 arcsec [0.43σ]  
KicOffset-rm: 0.179 arcsec [2.58σ]  
OotOffset-st: 0/3/4/3 [10]  
KicOffset-st: 0/3/4/3 [10]  
DiffImageQuality-fgm: 1.00 [10/10]  
DiffImageOverlap-fno: 1.00 [10/10]

# TCE 003757778-01, PDC Light Curves

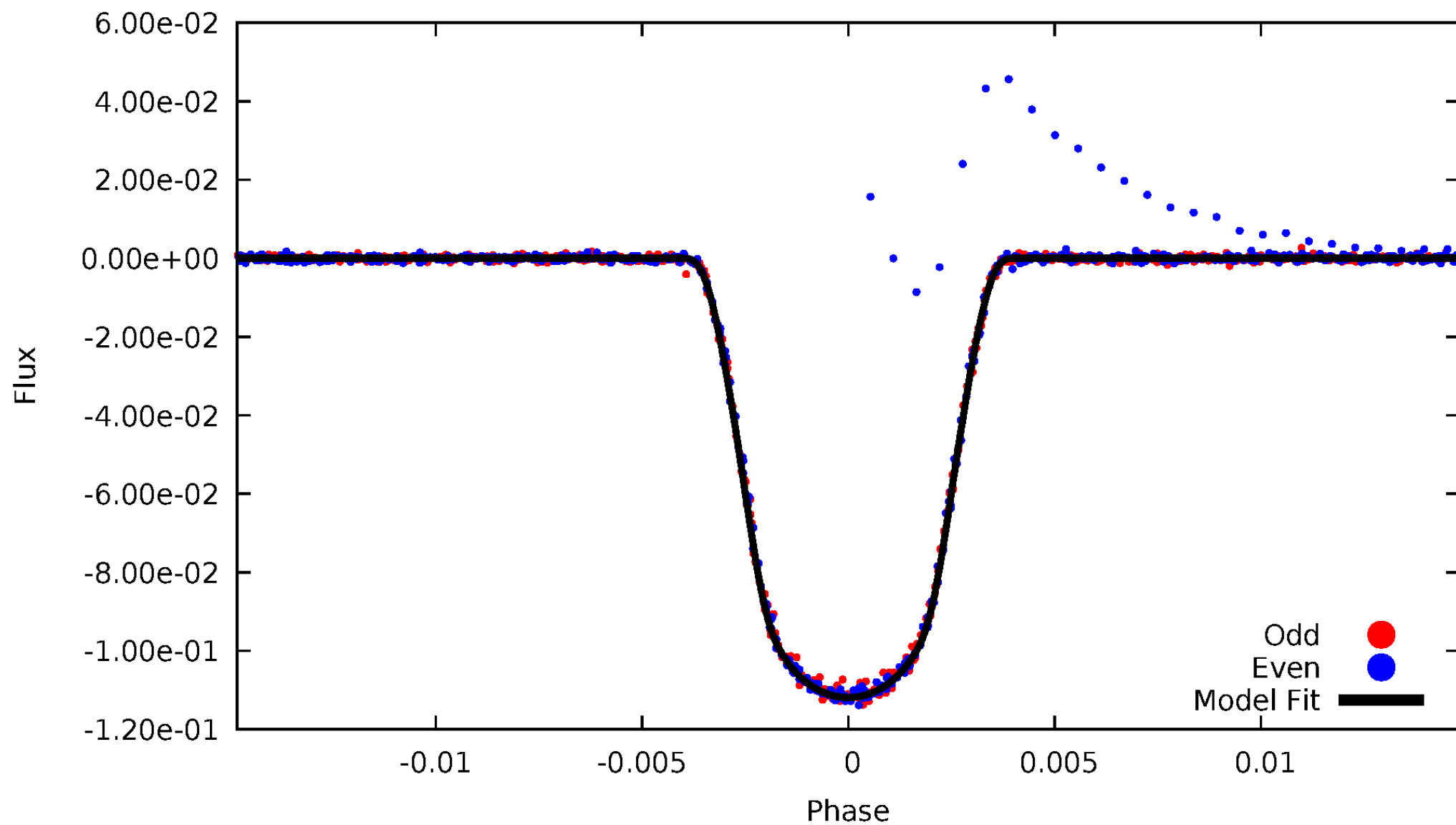


TCE 003757778-01



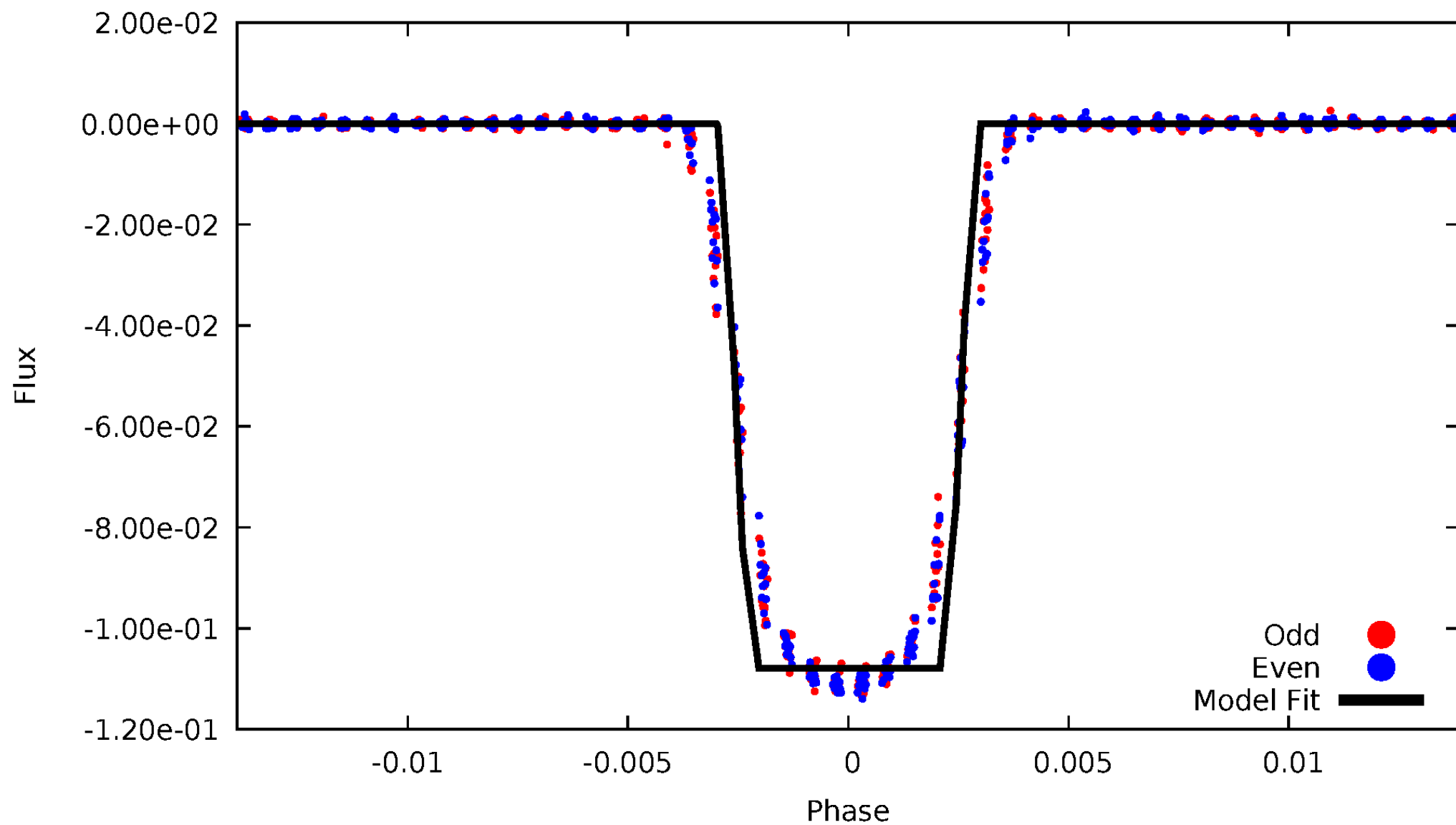
# DV Odd/Even

TCE 003757778-01



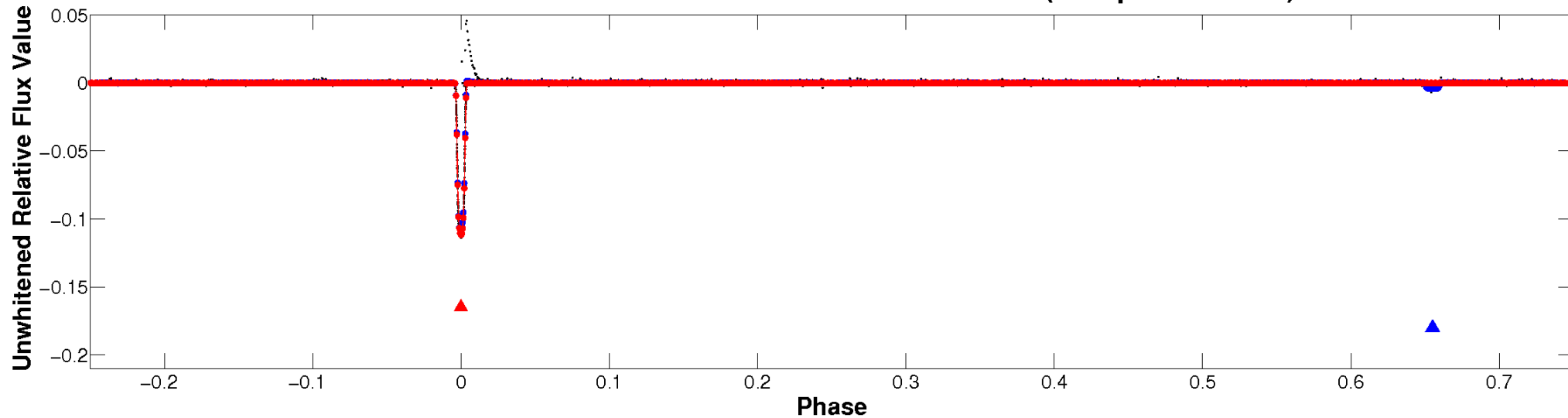
# ALT Odd/Even

TCE 003757778-01

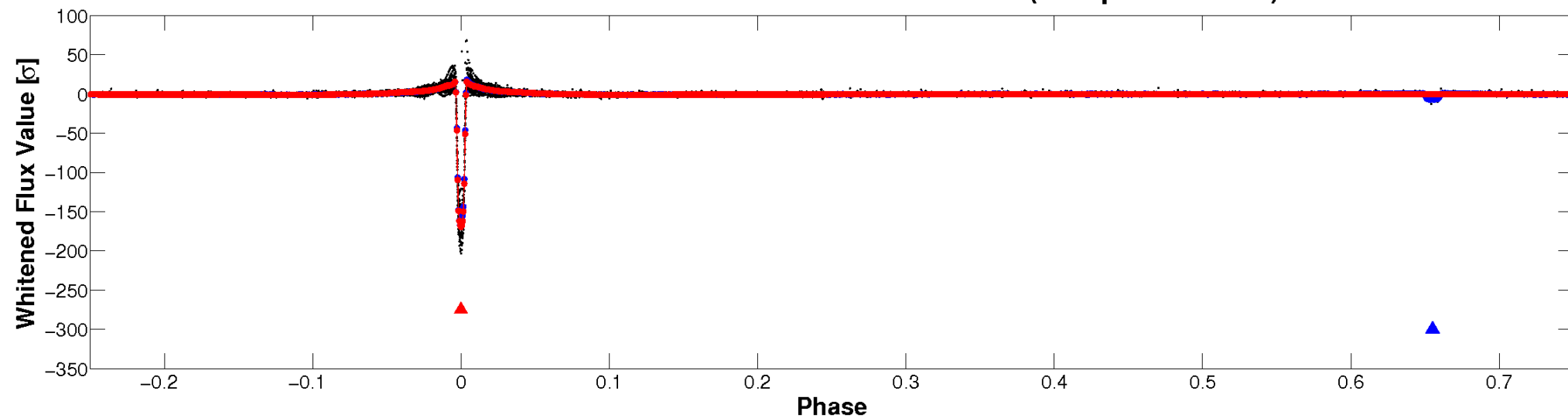


# Non-Whitened Vs. Whitened Light Curve

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

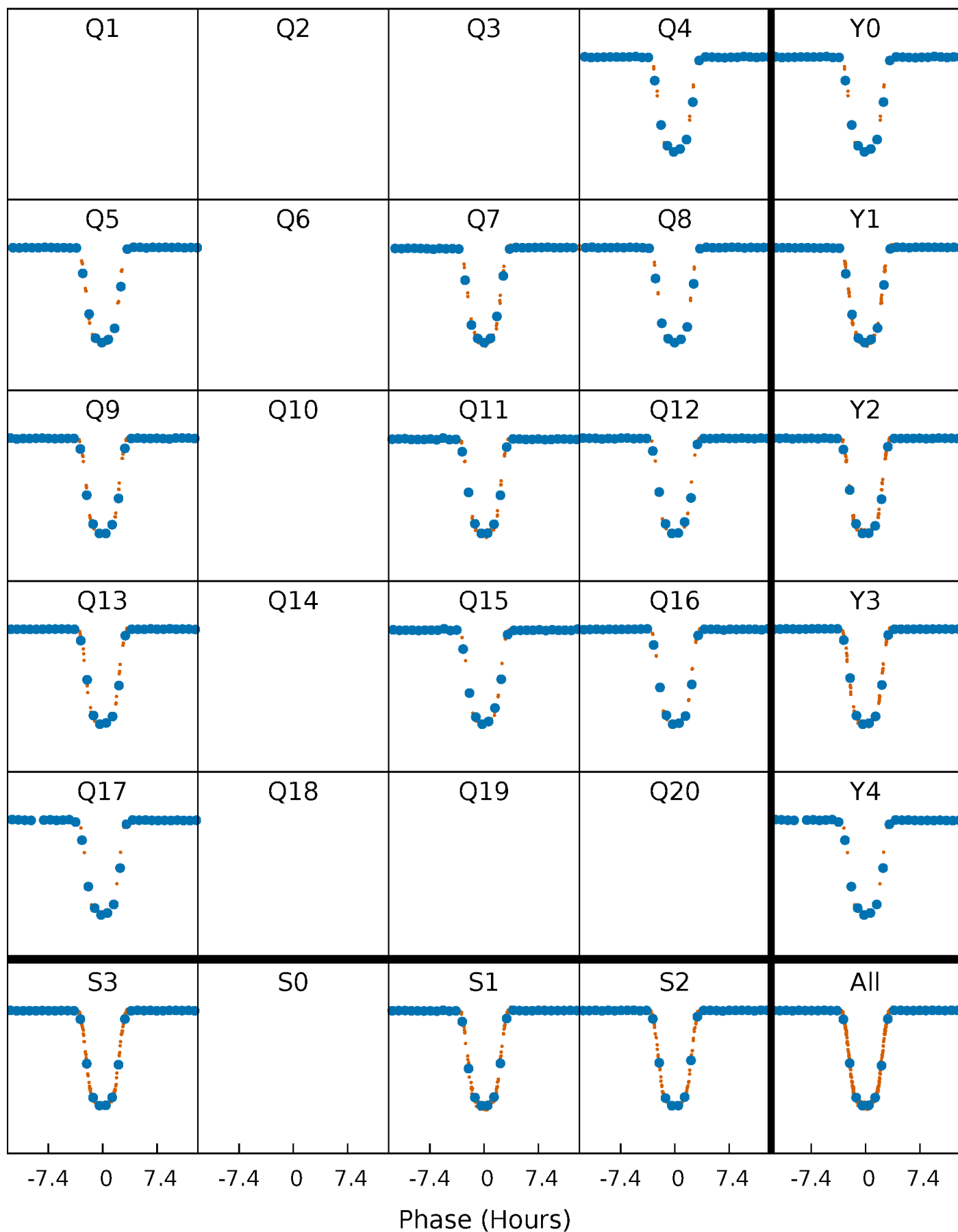


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

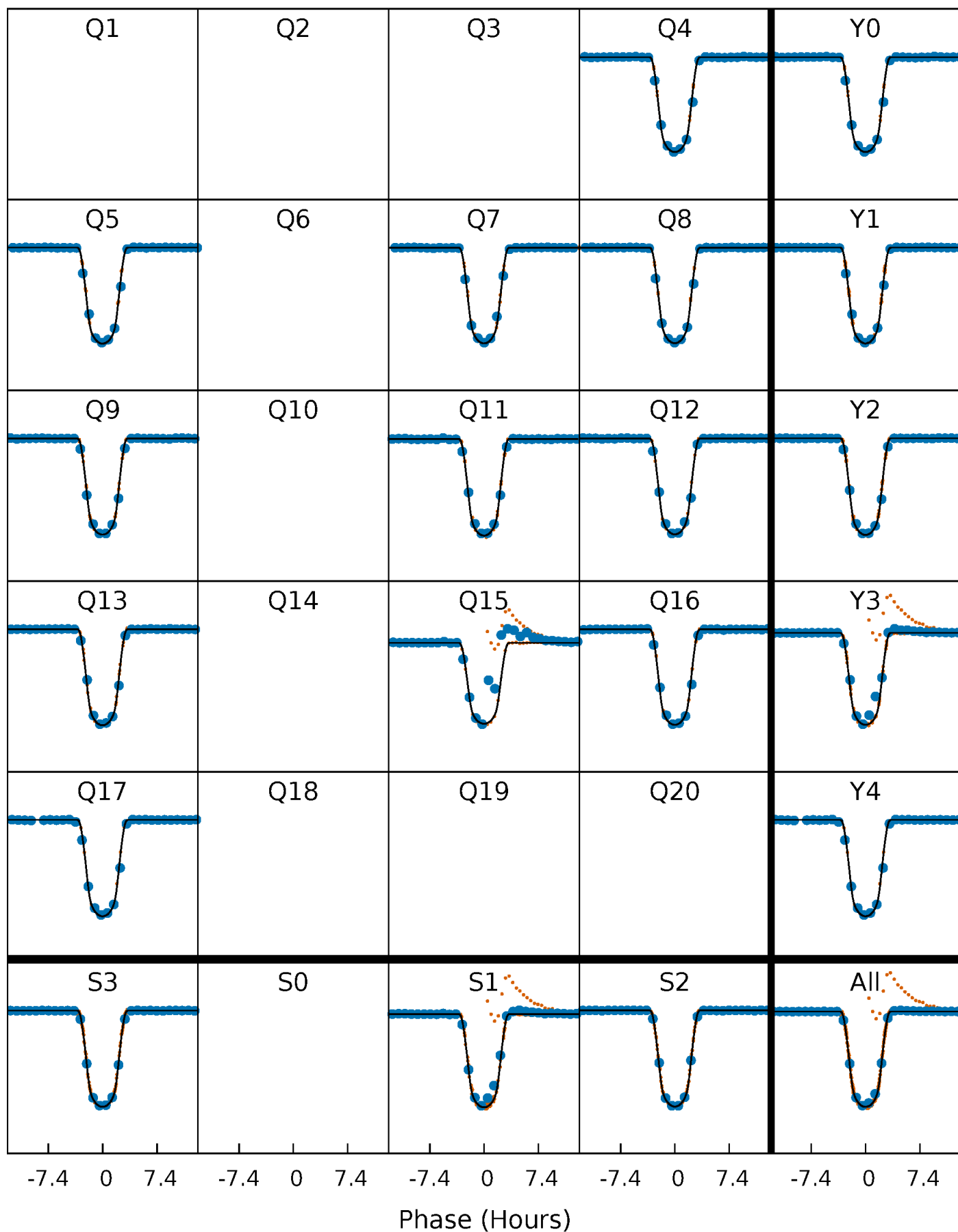
TCE 003757778-01 P= 36.514366 Days  $T_0=163.794492$  (BKJD)





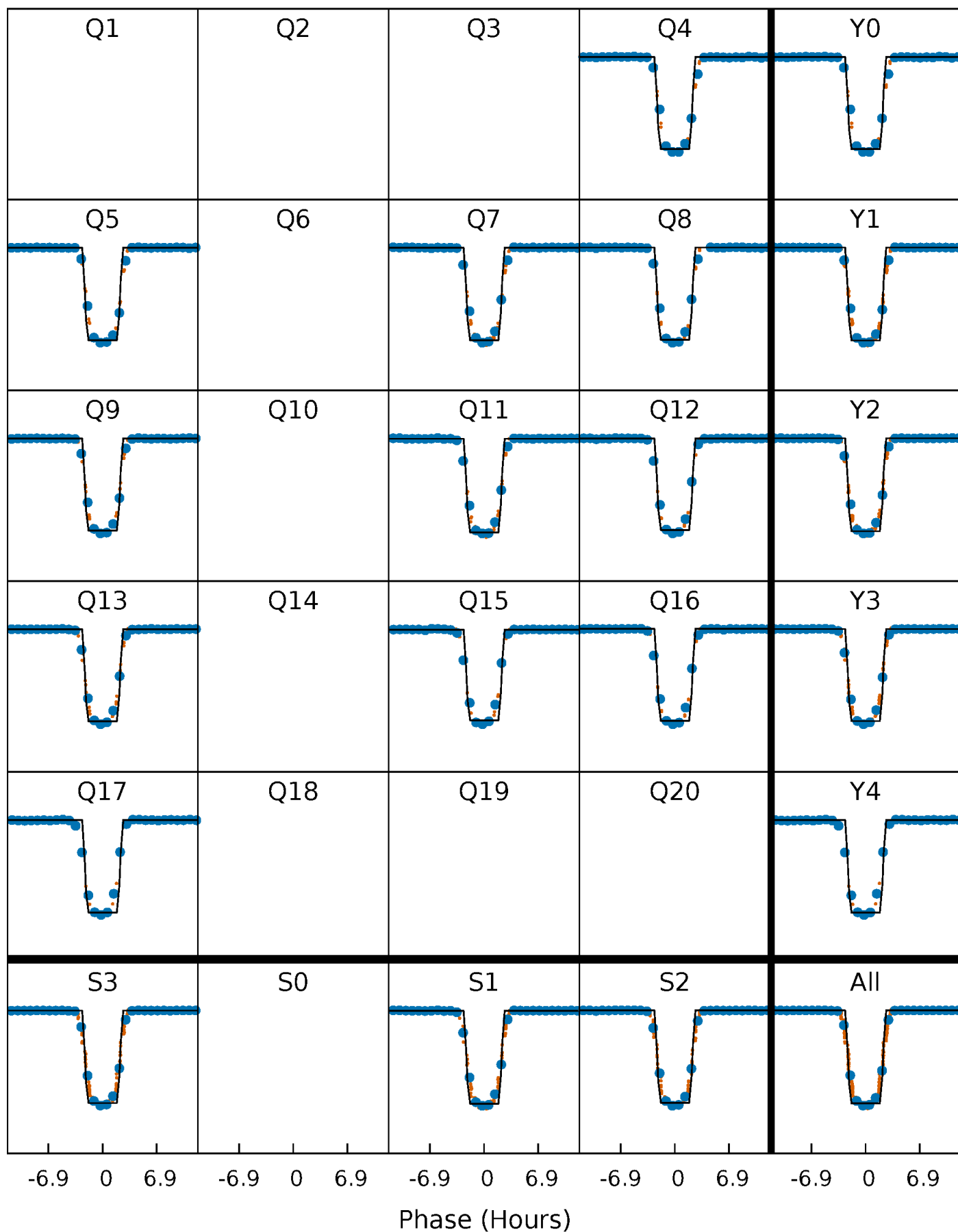
# DV Quarter-Phased Transit Curves

TCE 003757778-01 P= 36.514366 Days  $T_0=163.794492$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

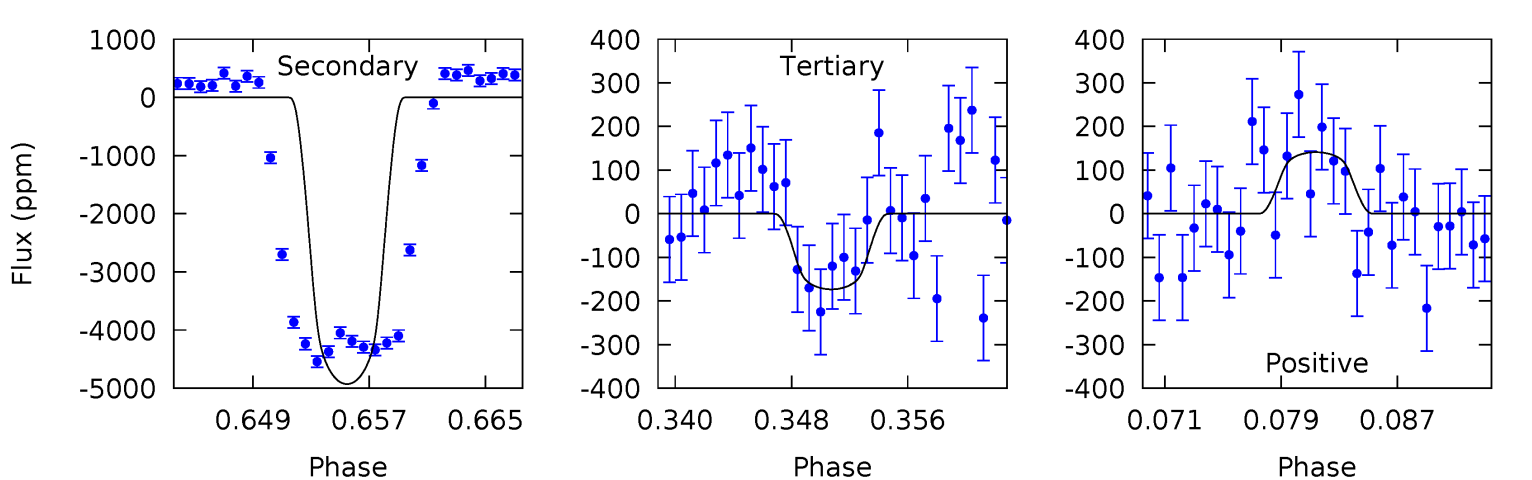
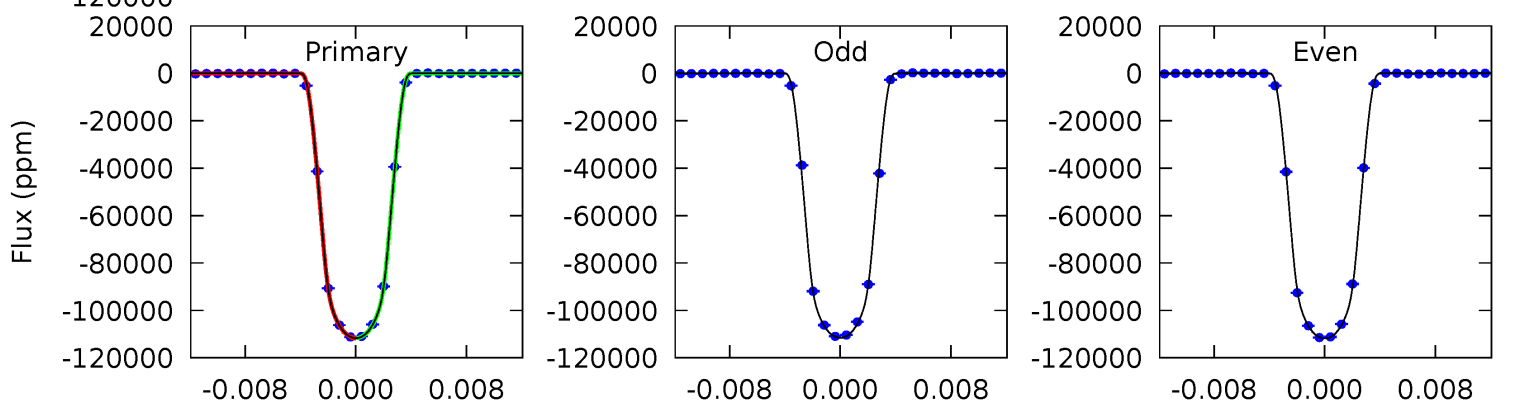
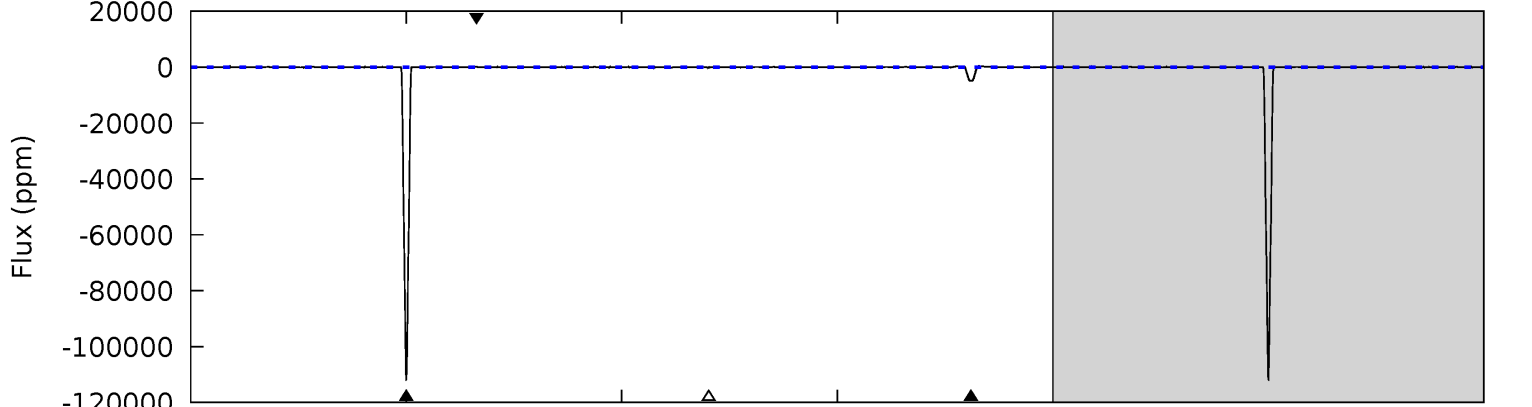
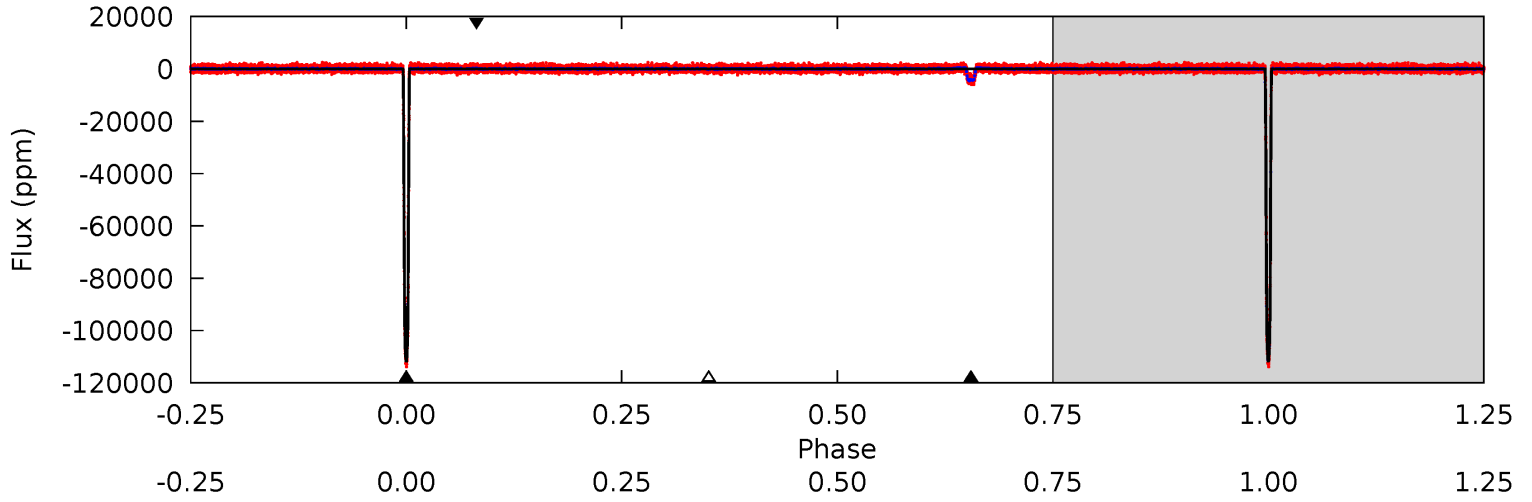
TCE 003757778-01 P= 36.514734 Days  $T_0=163.786925$  (BKJD)



# DV Model-Shift Uniqueness Test

003757778-01, P = 36.514366 Days, E = 163.794492 Days

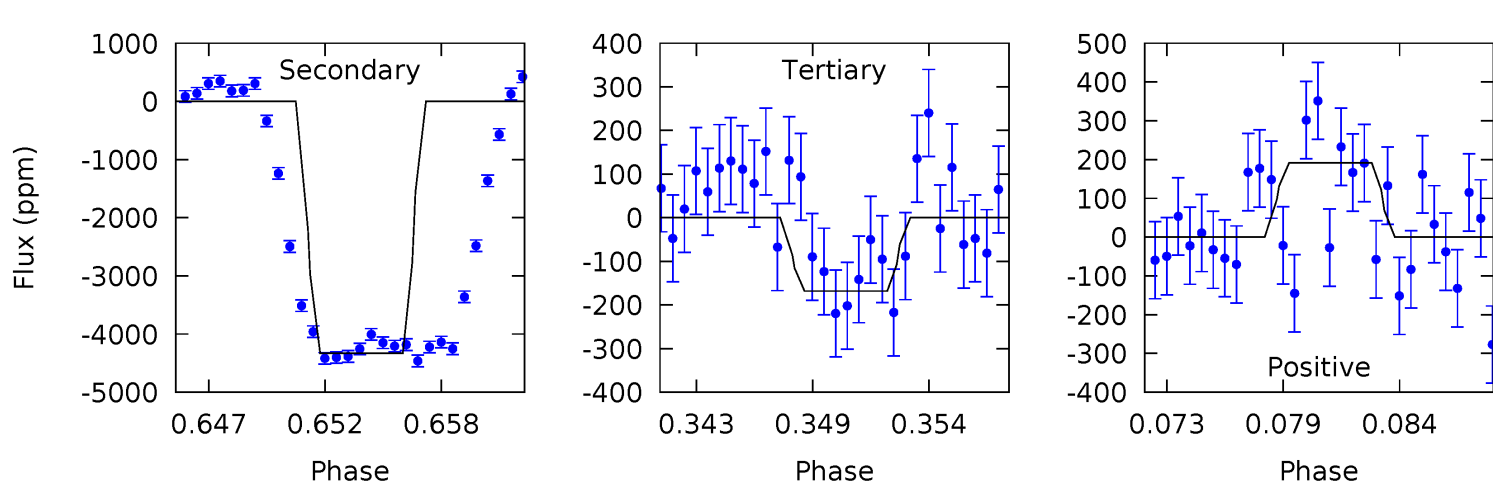
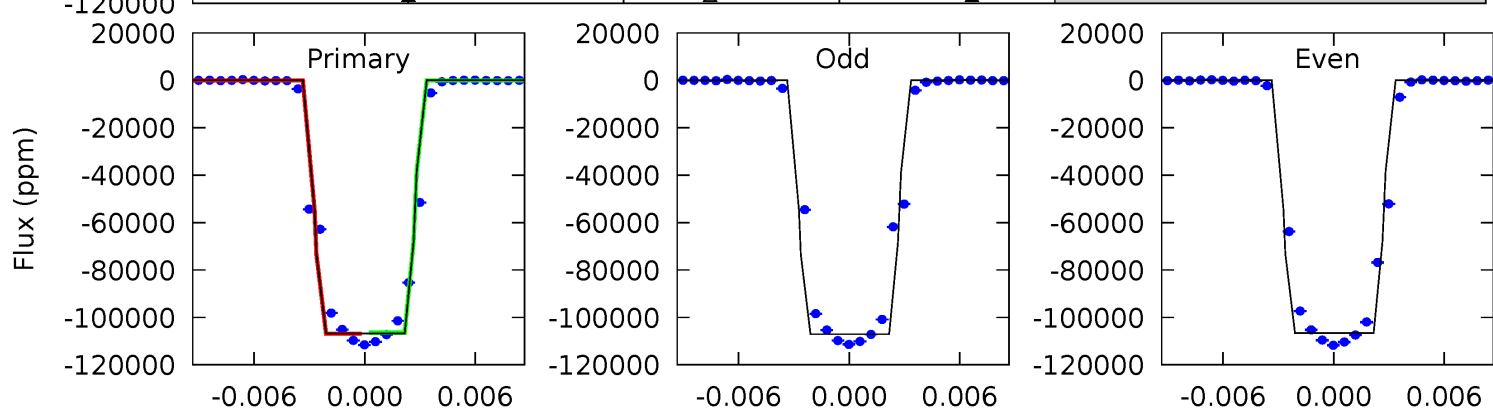
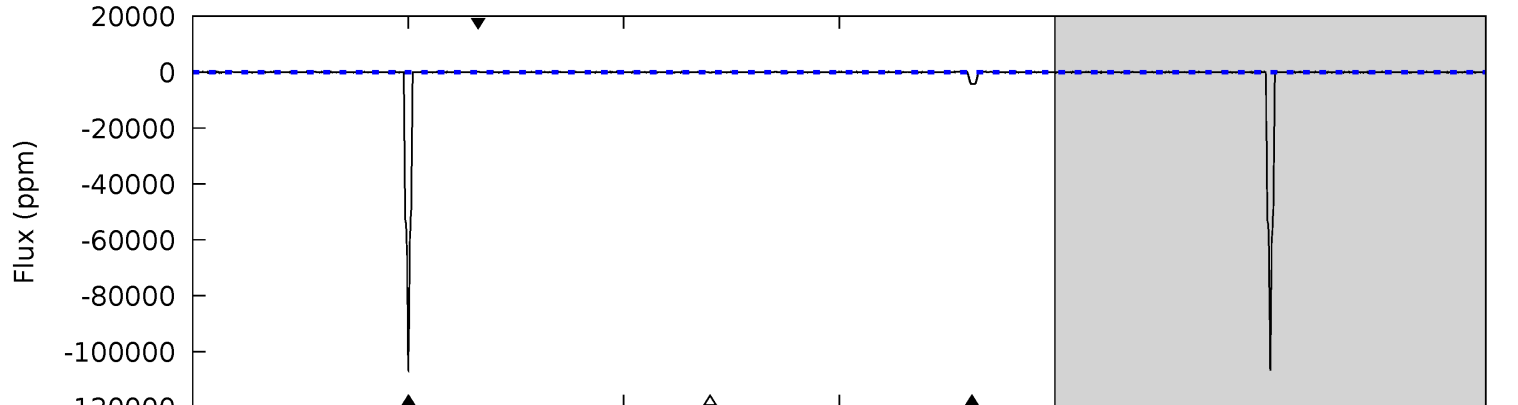
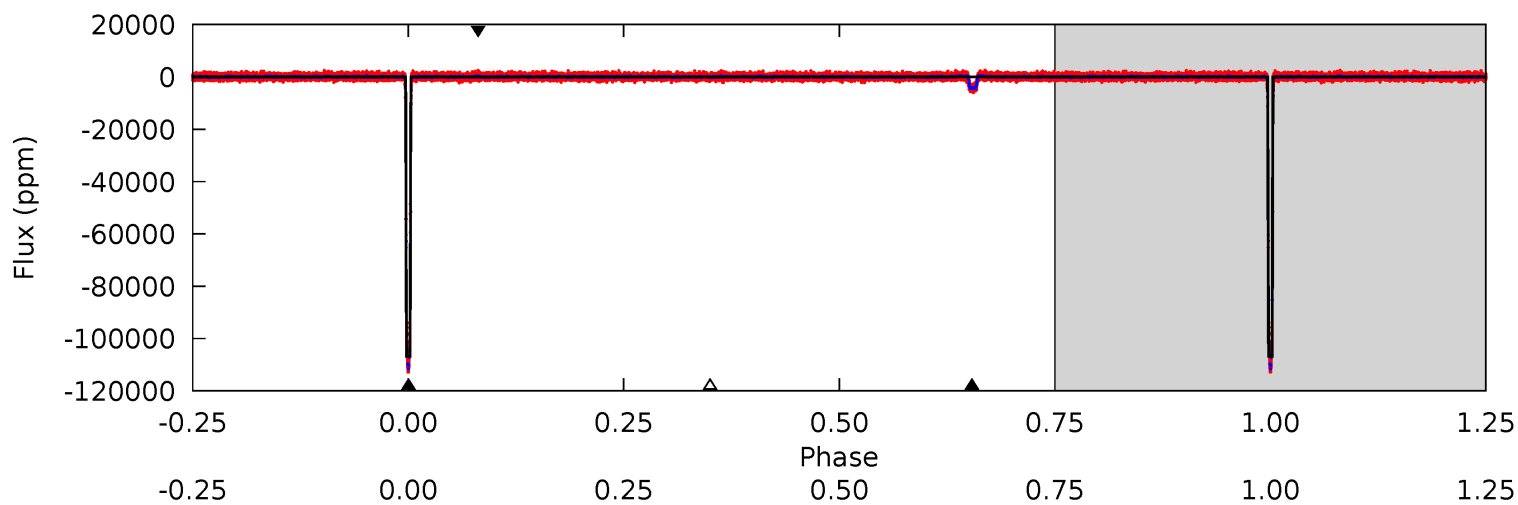
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
3297	145.4	5.12	4.16	5.07	2.66	1.83	3292	3293	140.3	141.3	4.04	0.96	0.00	0.47



# Alt Model-Shift Uniqueness Test

003757778-01, P = 36.514734 Days, E = 163.786925 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
2296	93.2	3.62	4.12	5.14	2.77	1.93	2293	2292	89.6	89.1	4.52	1.00	0.00	0



### Stellar Parameters For KIC 003757778

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5811^{+162}_{-203}$	$4.465^{+0.054}_{-0.216}$	$0.210^{+0.200}_{-0.300}$	$1.000^{+0.305}_{-0.102}$	$1.066^{+0.112}_{-0.137}$	$1.500^{+0.416}_{-0.819}$
	+3%/-3%	+1%/-5%	+95%/-143%	+30%/-10%	+11%/-13%	+28%/-55%
Source	KIC0	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 003757778-01 / KOI 3402.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-4928 \pm 34$	$34.25^{+5.83}_{-2.69}$	$783^{+58}_{-39}$	$3340^{+53}_{-78}$	$111^{+16}_{-29}$
Alt.	$-4331 \pm 46$	$36.92^{+5.52}_{-2.87}$	$779^{+57}_{-39}$	$3197^{+54}_{-72}$	$83^{+13}_{-19}$

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

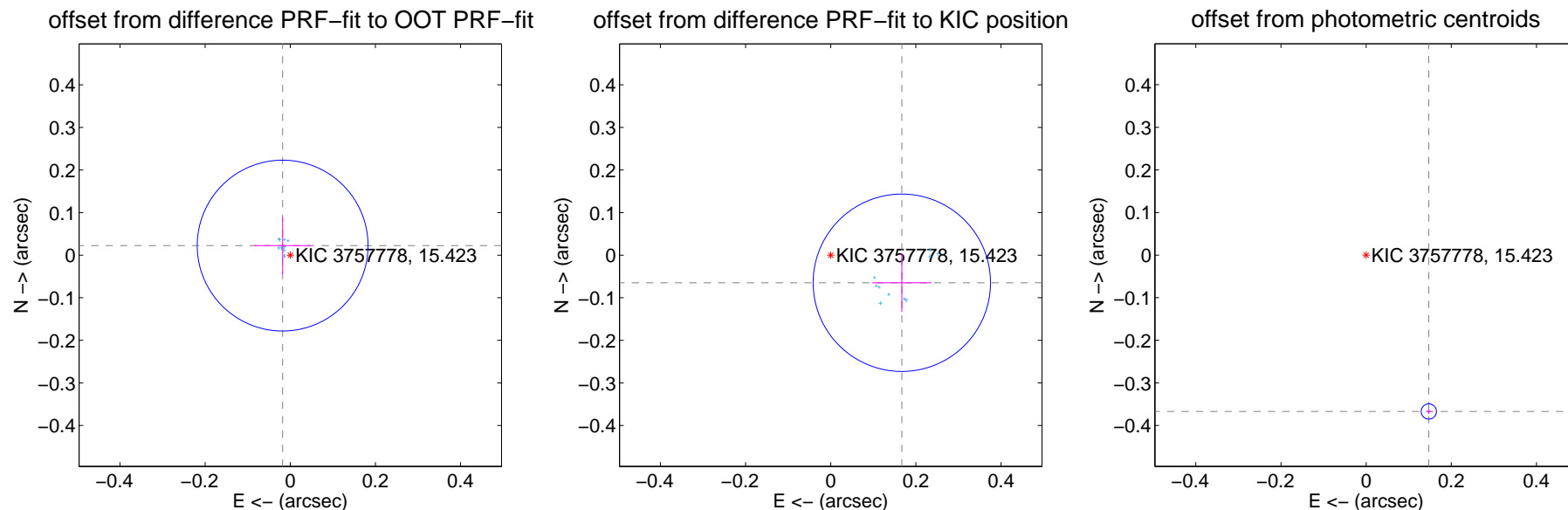
## DV Centroid Data

Supplemental centroid analysis for 003757778-01. Kepler magnitude: 15.42. Transit SNR 1964.35

There are 10 quarters with good PRF difference image offsets

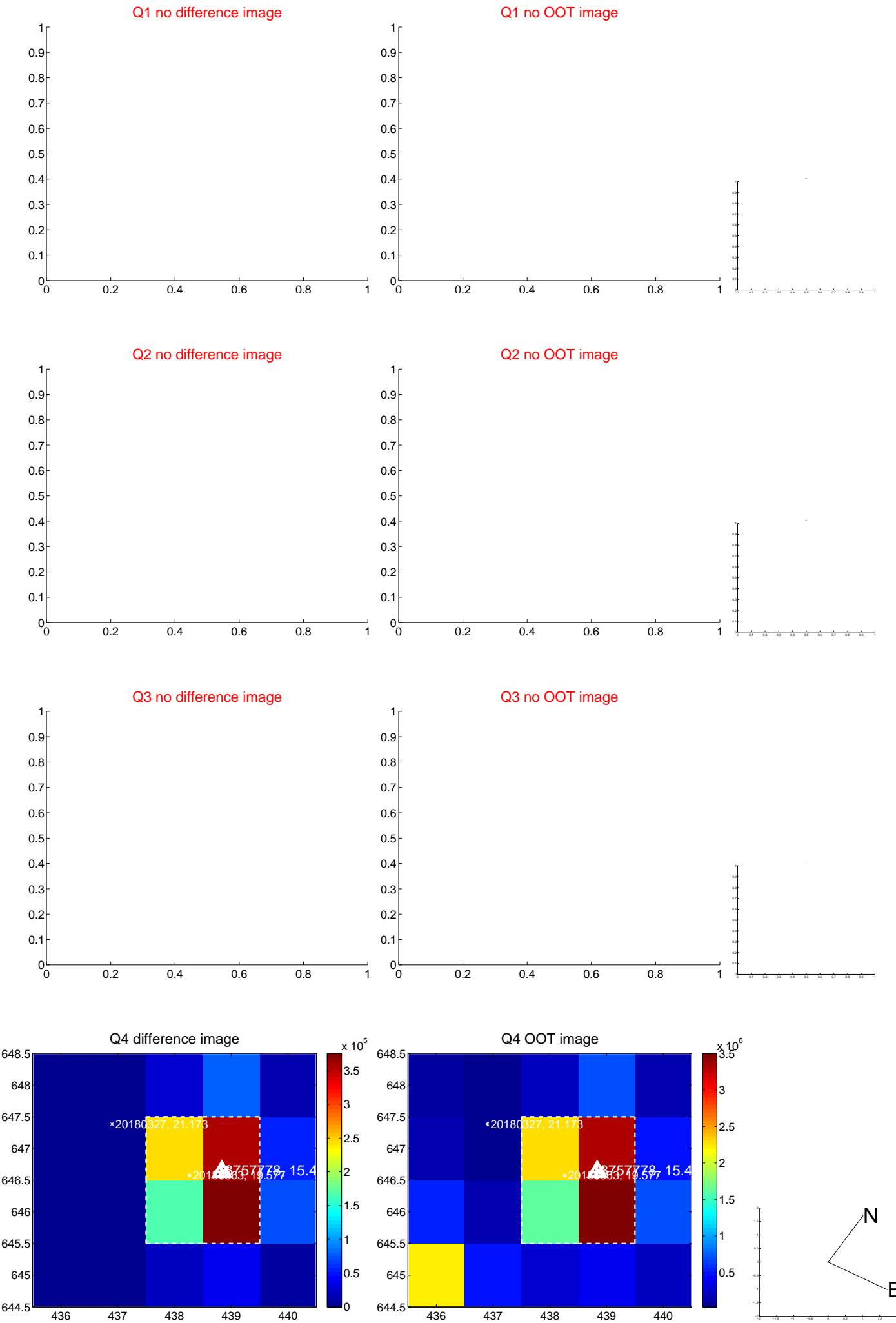
The direct PRF centroid is offset from the target star catalog position by about 0.16 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.029 \pm 0.067$	0.43	$0.018 \pm 0.067$	$0.022 \pm 0.067$
PRF-fit source offset from KIC position	$0.179 \pm 0.069$	2.58	$-0.167 \pm 0.070$	$-0.065 \pm 0.068$
photometric centroid source offset	$0.40 \pm 0.01$	66.26	$-0.15 \pm 0.01$	$-0.37 \pm 0.01$

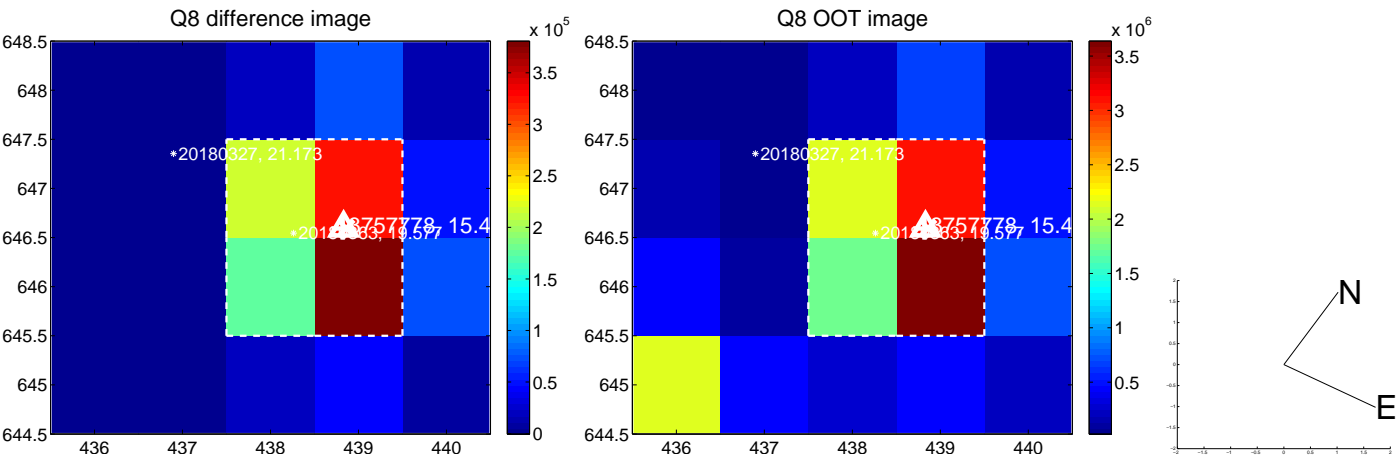
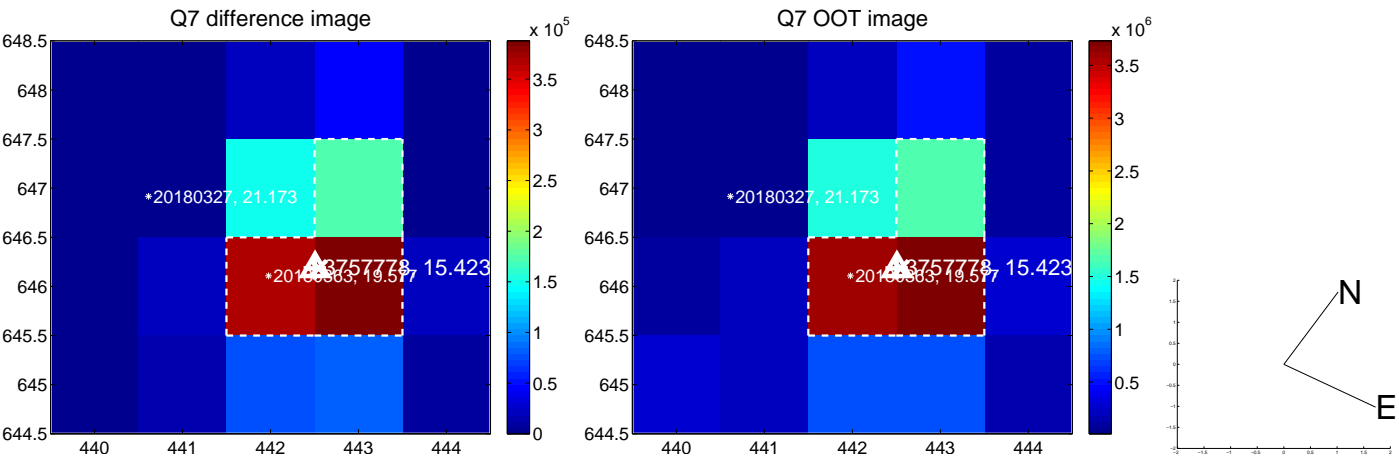
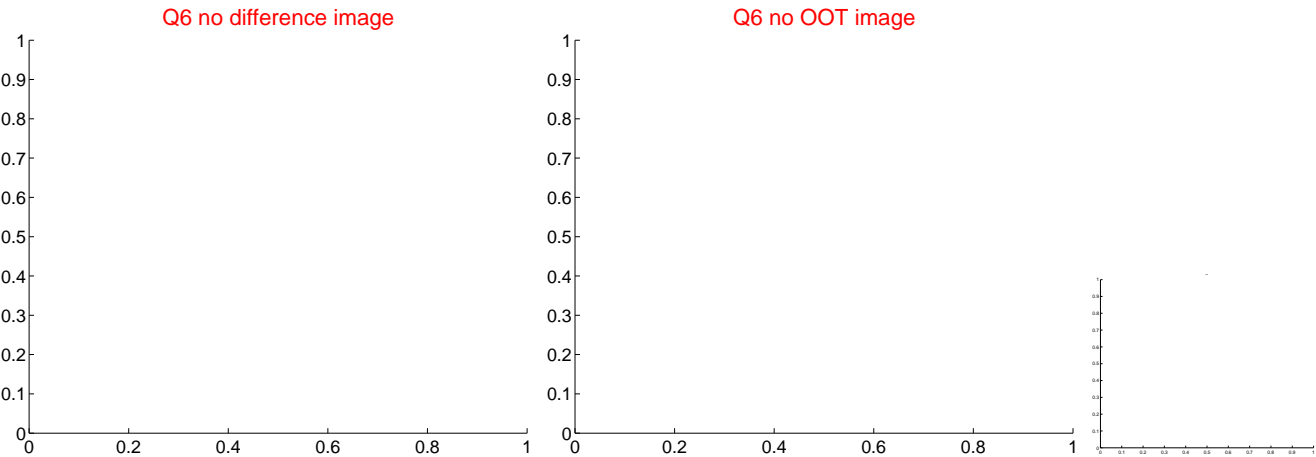
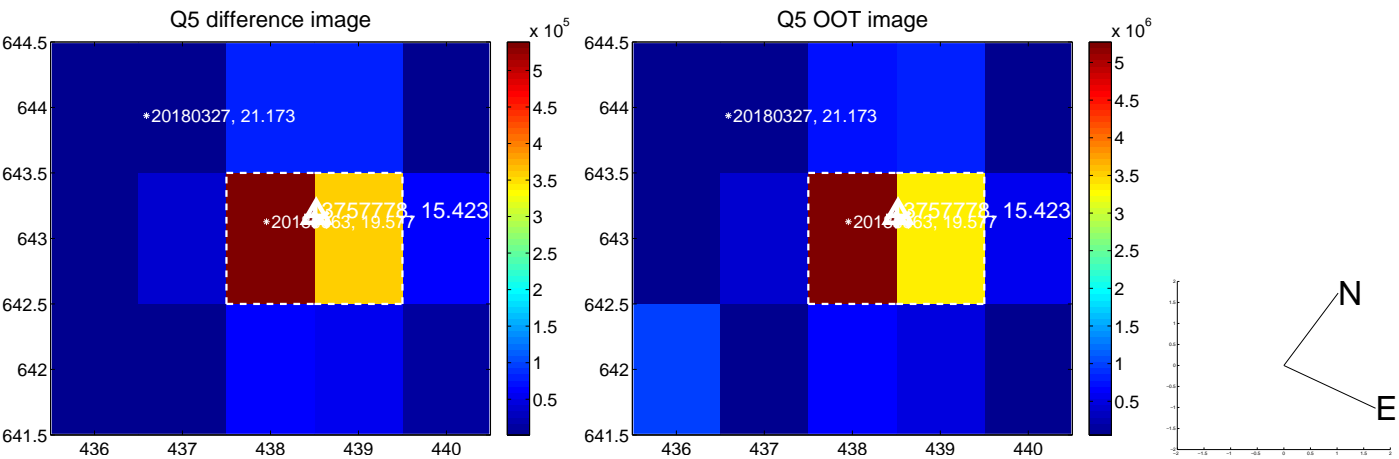


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: 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.

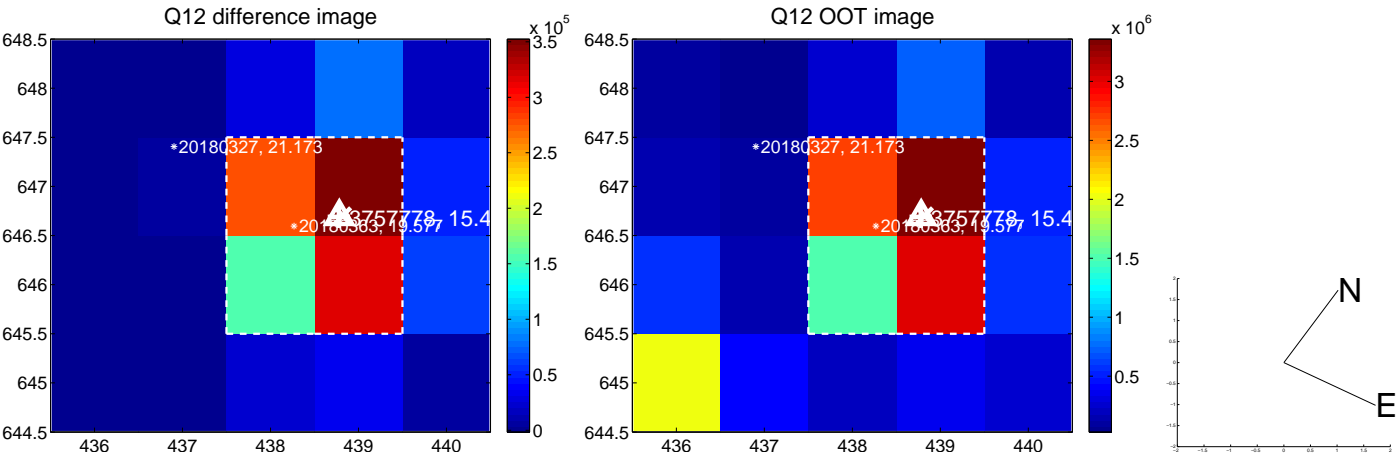
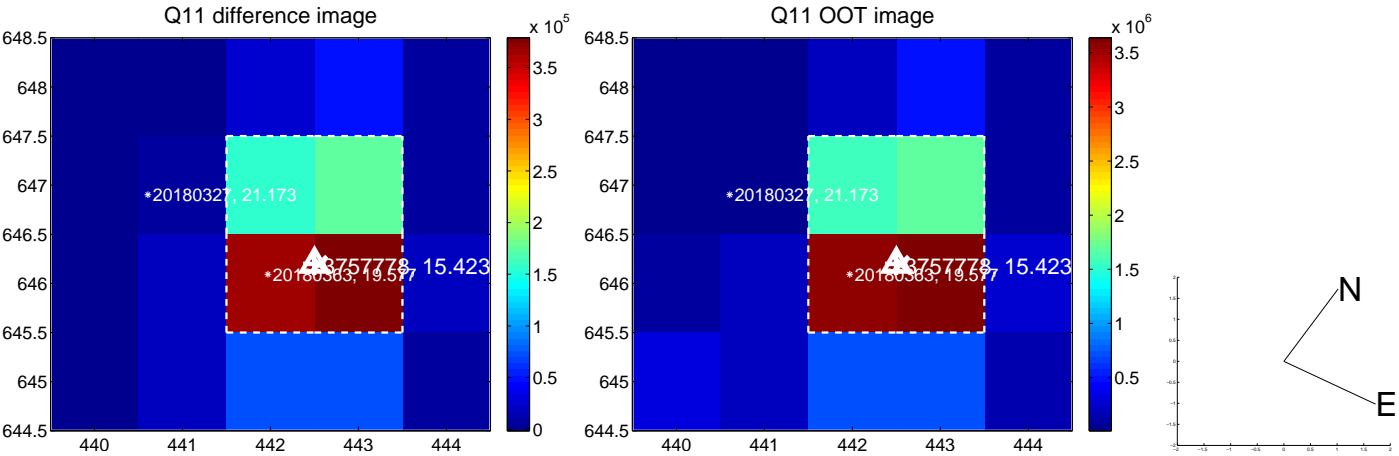
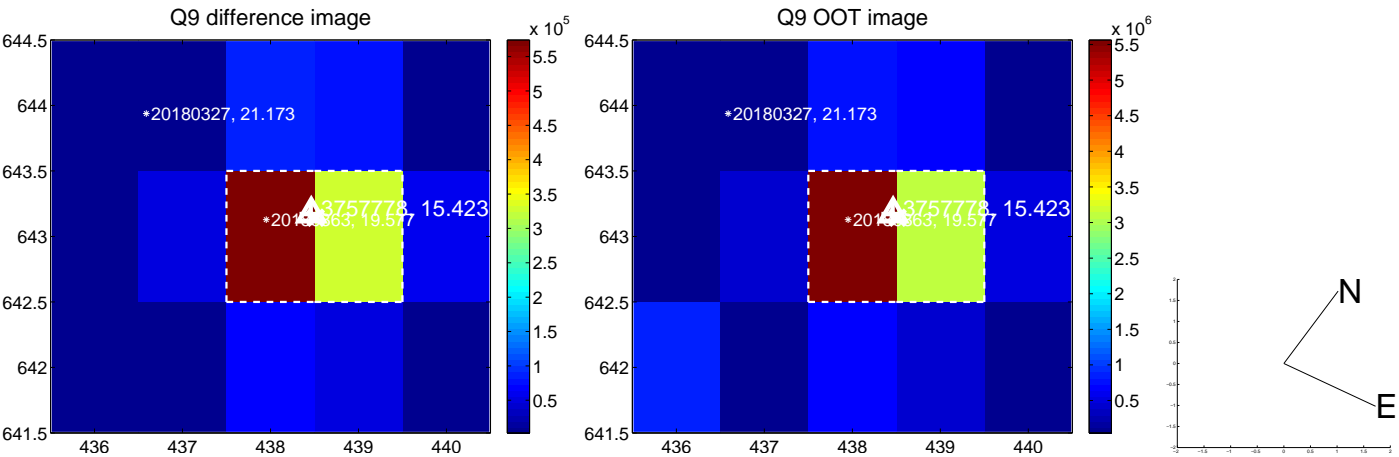


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

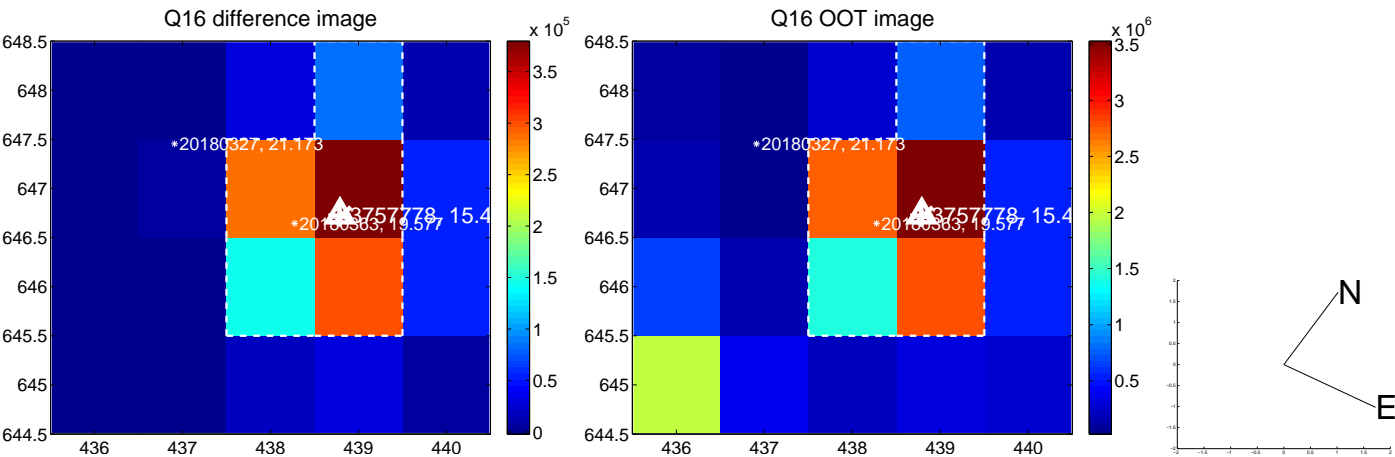
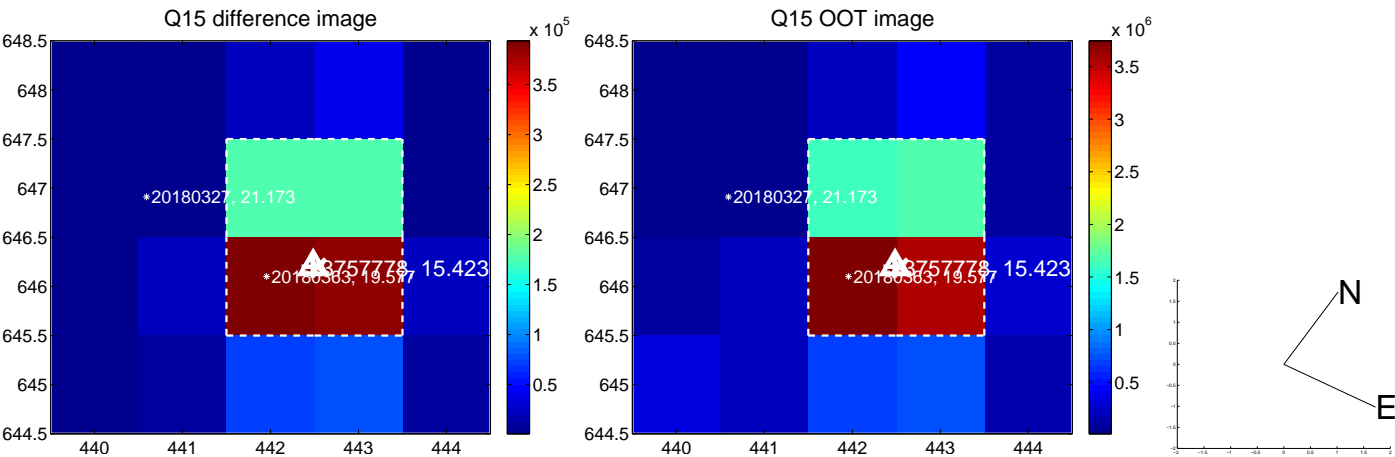
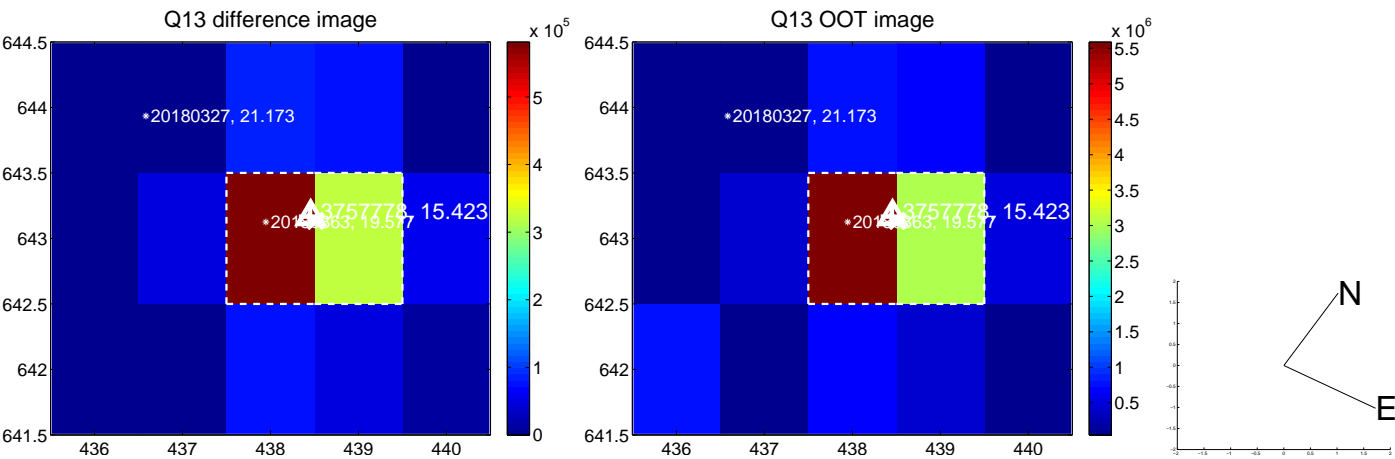




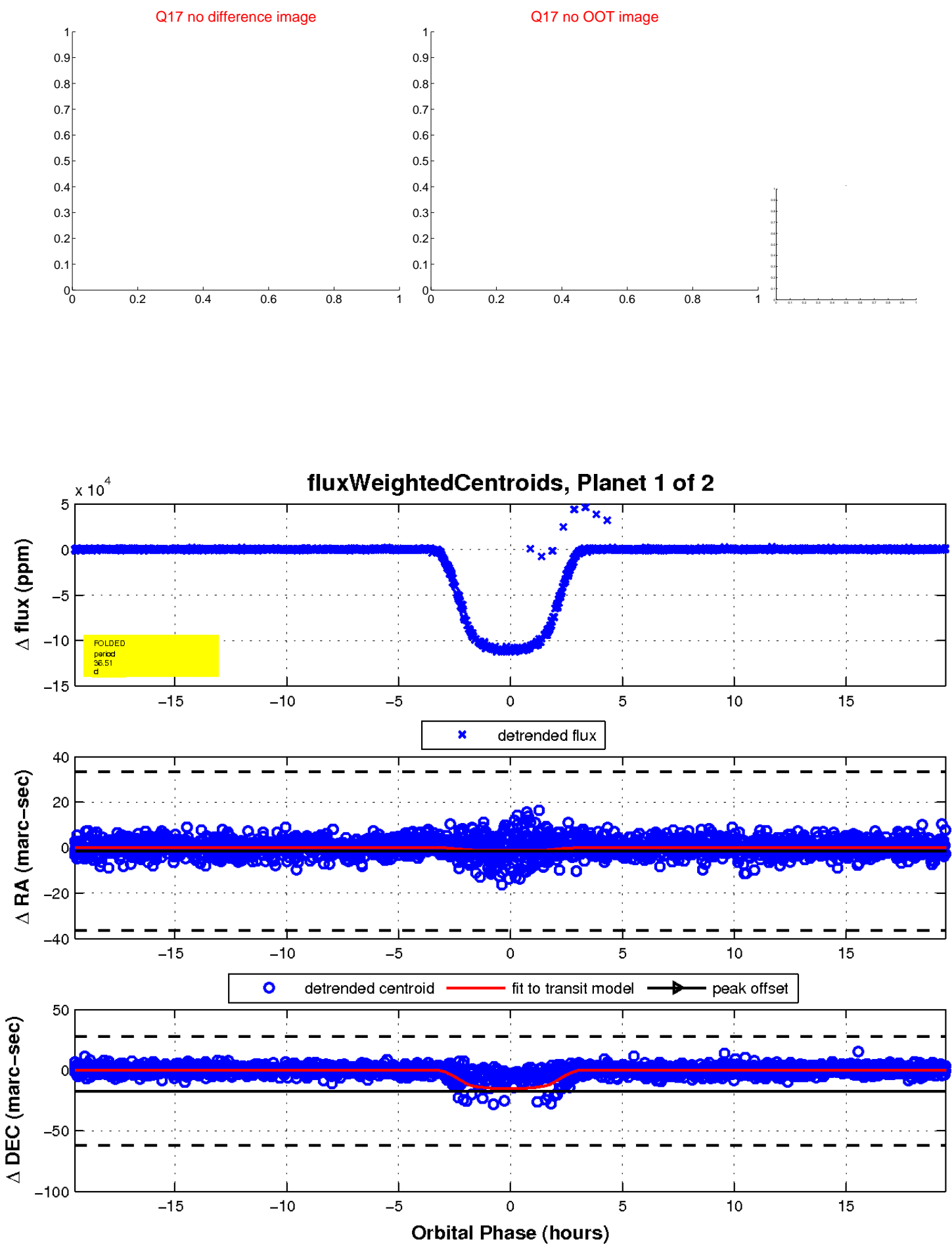
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

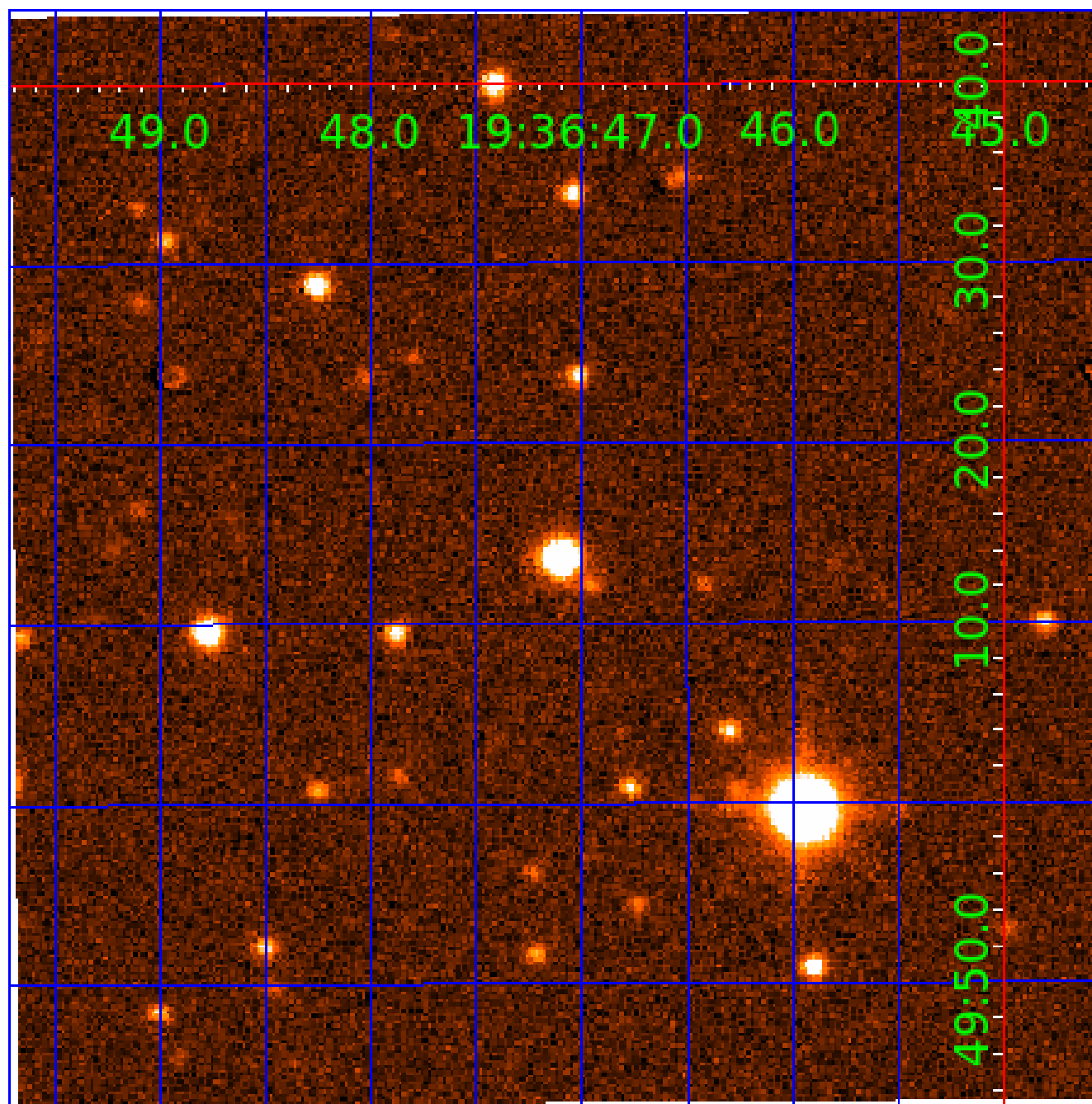


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 003757778

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
003757778-01	OBS	3402.01	36.514366	163.794492	111934.9	6.490	2339.2	1964.3	1.00	5811	33.24	21.12
003757778-02	OBS	No	36.514023	151.207540	4842.6	10.618	111.4	112.8	1.00	5811	7.84	21.12

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
003757778-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE
003757778-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE

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

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

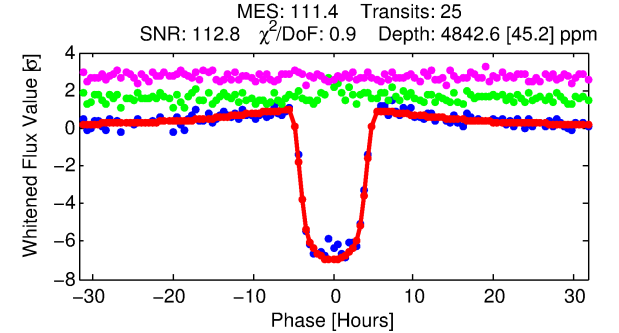
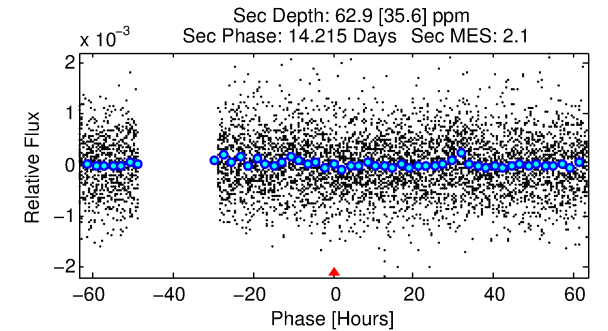
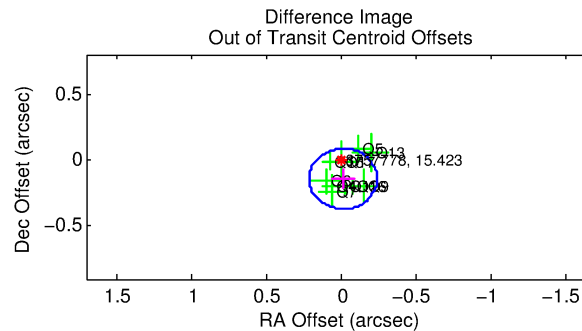
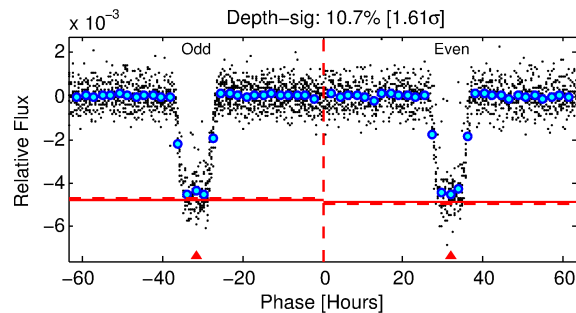
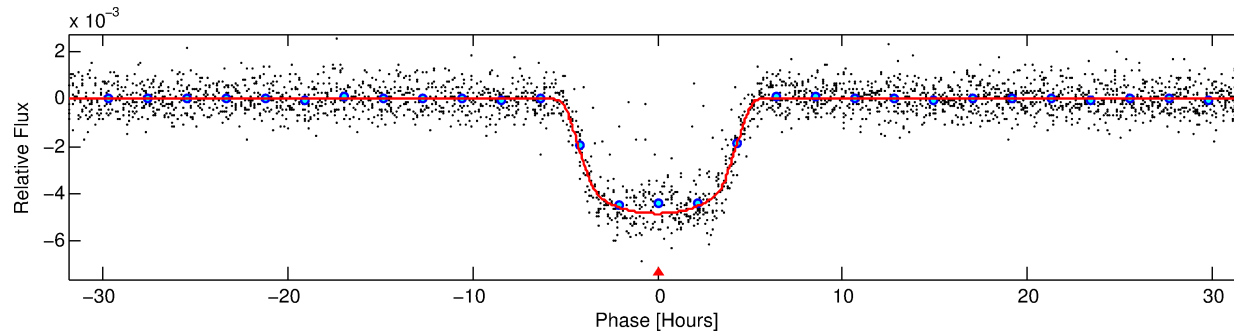
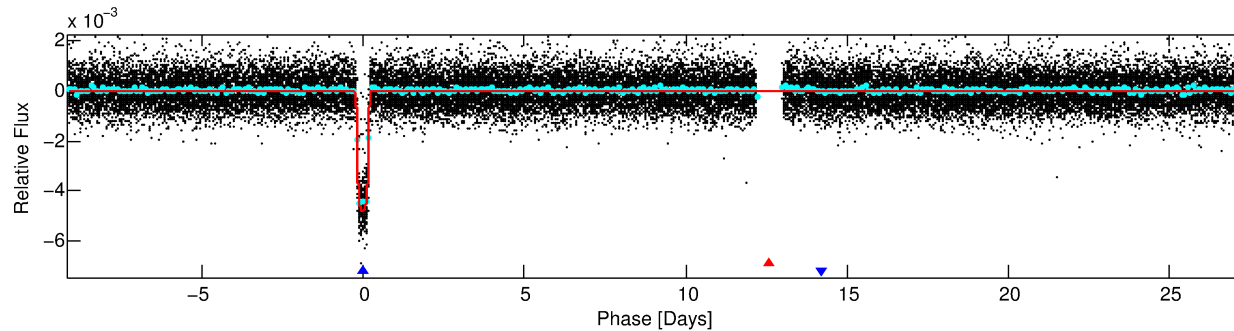
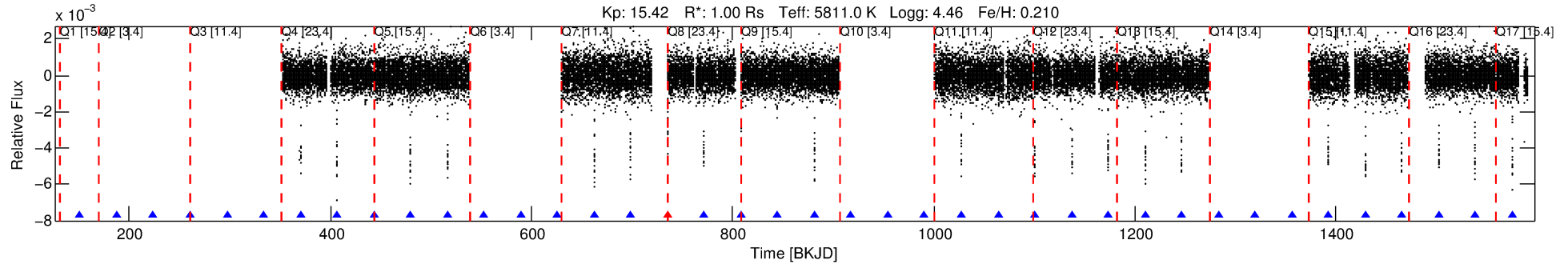
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 003757778-02

No Significant Match Found

# DV One-Page Summary

KIC: 3757778 Candidate: 2 of 2 Period: 36.514 d  
KOI: K03402 Corr: No Ephemeris Match



## DV Fit Results:

Period = 36.51402 [0.00009] d  
Epoch = 151.2075 [0.0023] BKJD  
Rp/R\* = 0.0718 [0.0007]  
a/R\* = 18.08 [0.55]  
b = 0.82 [0.01]  
Seff = 21.12 [8.73]  
Teq = 547 [56] K  
Rp = 7.84 [2.39] Re  
a = 0.2200 [0.0577] AU  
Ag = 27.25 [18.74] [1.40 $\sigma$ ]  
Teffp = 1931 [282] K [4.81 $\sigma$ ]

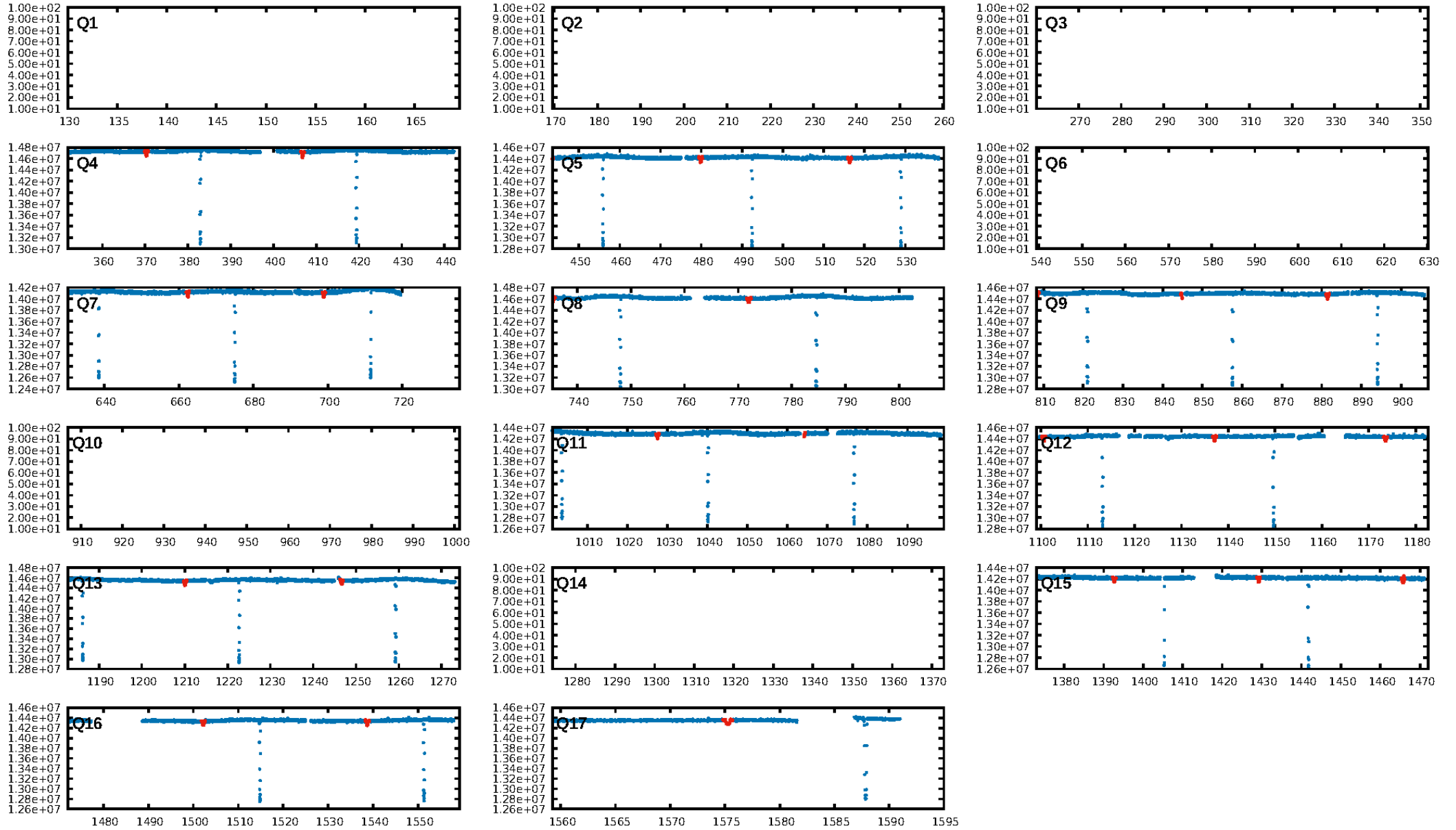
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.1% [0.00 $\sigma$ ]  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 0.96 [23/24]  
GhostDiagnostic-chr: 4.108  
Centroid-sig: 0.0%  
Centroid-so: 0.199 arcsec [1.77 $\sigma$ ]  
OotOffset-rm: 0.143 arcsec [1.88 $\sigma$ ]  
OotOffset-st: 0/2/4/4 [10]  
KicOffset-rm: 0.302 arcsec [3.73 $\sigma$ ]  
KicOffset-st: 0/2/4/4 [10]  
DiffImageQuality-fgm: 1.00 [10/10]  
DiffImageOverlap-fno: 1.00 [10/10]

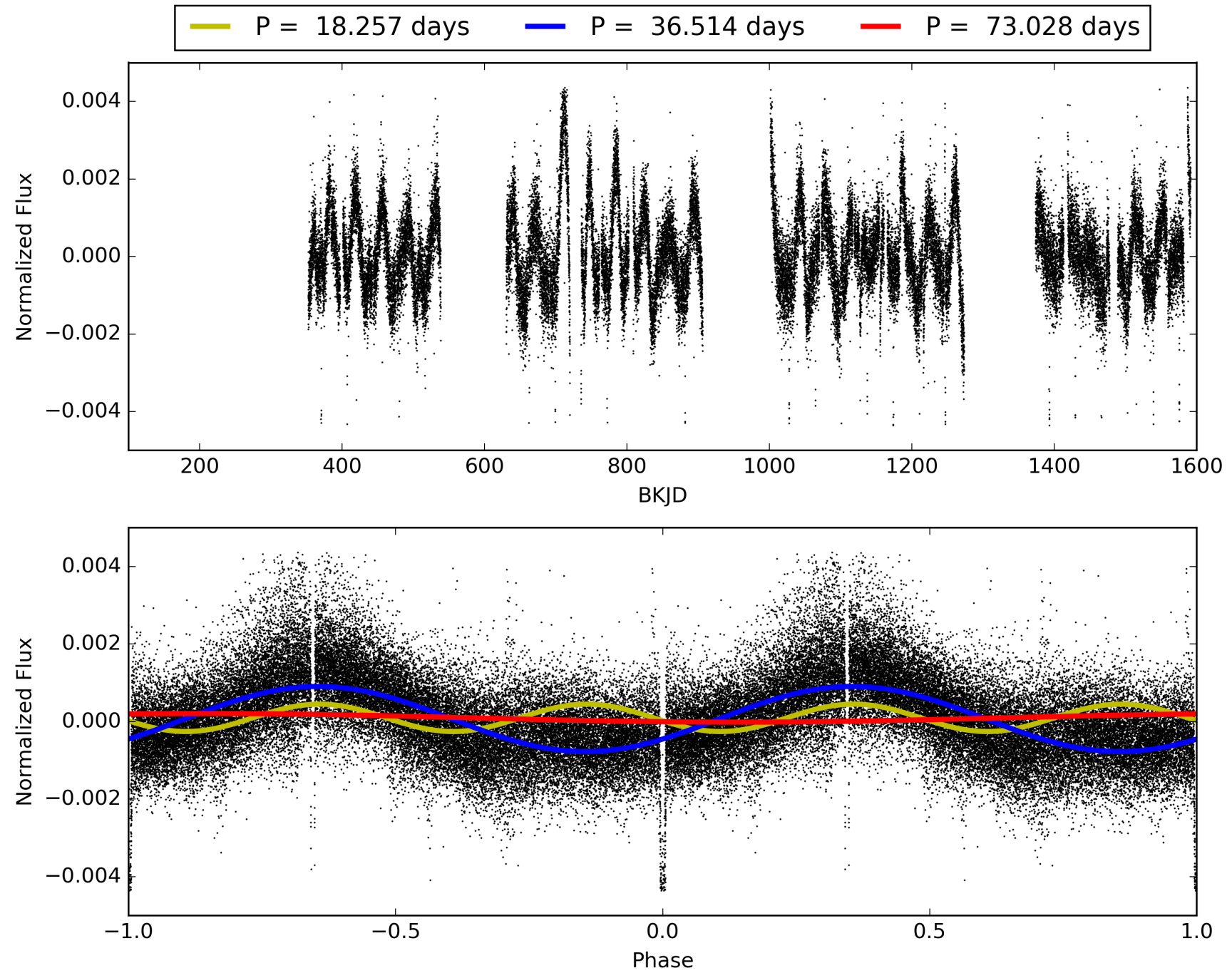
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 19:33:22 Z

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

# TCE 003757778-02, PDC Light Curves



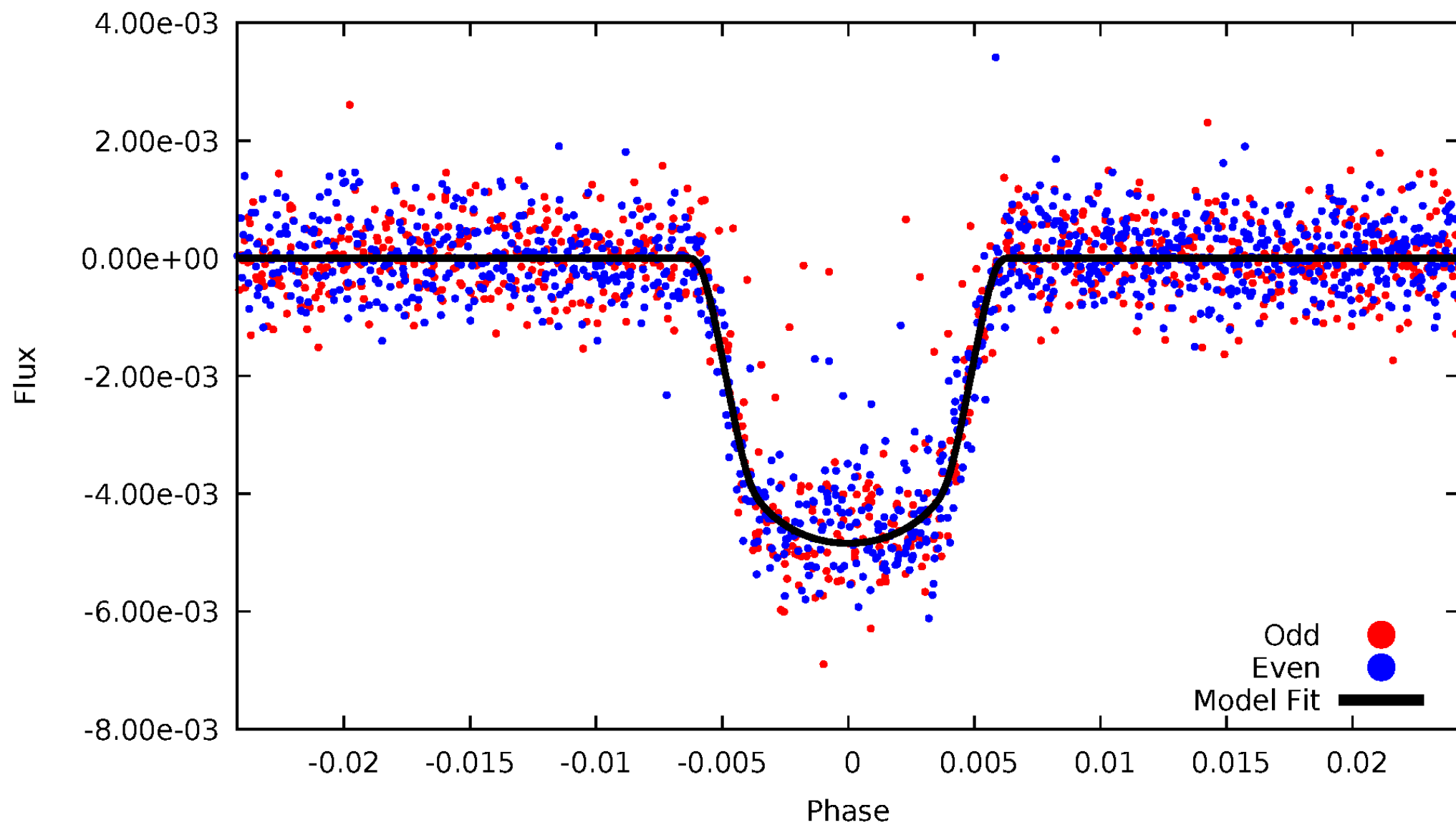
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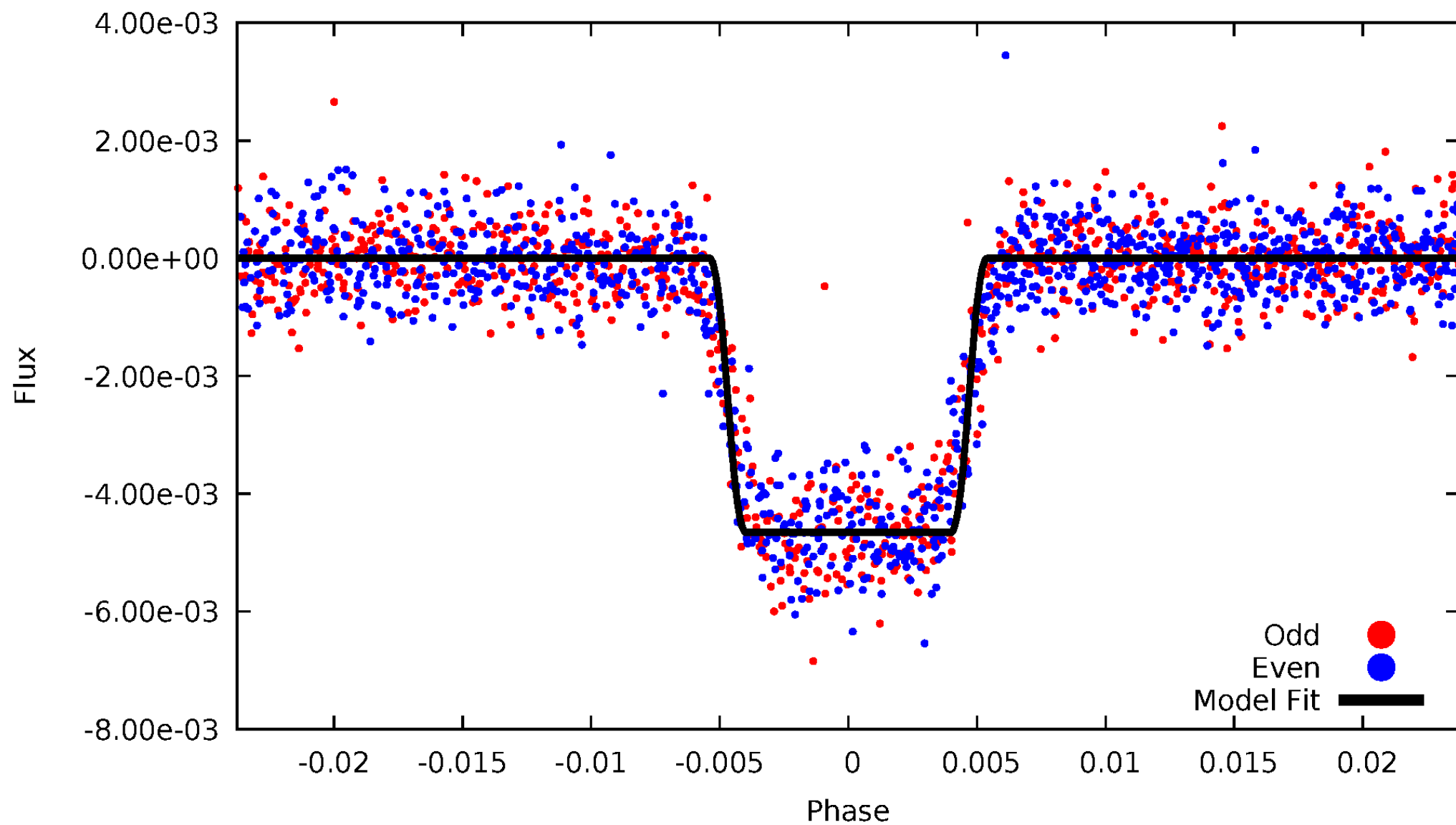
# DV Odd/Even

TCE 003757778-02



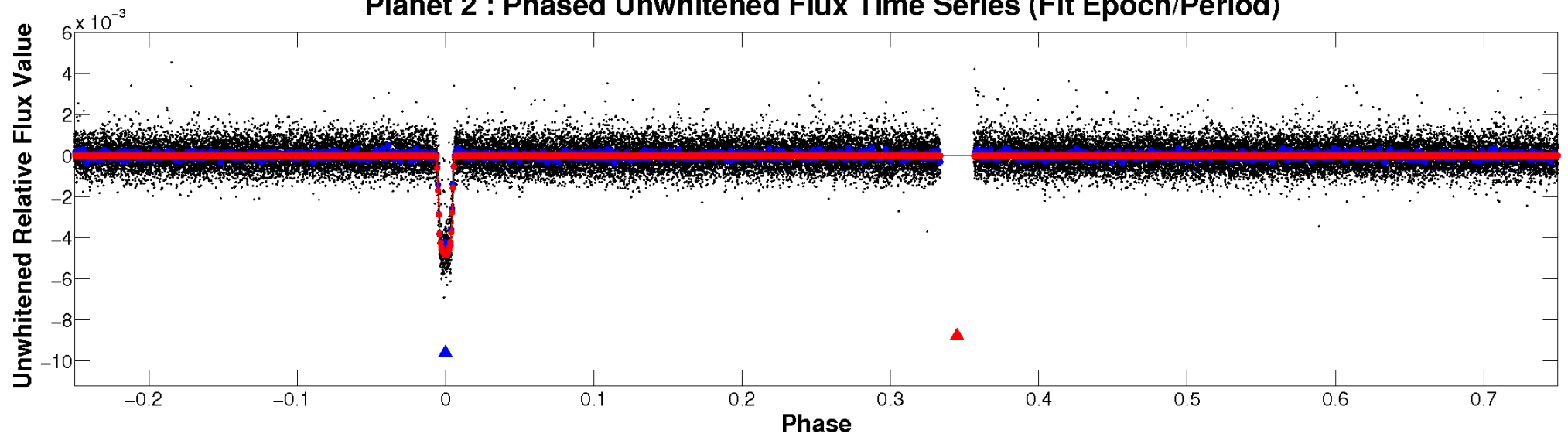
# ALT Odd/Even

TCE 003757778-02

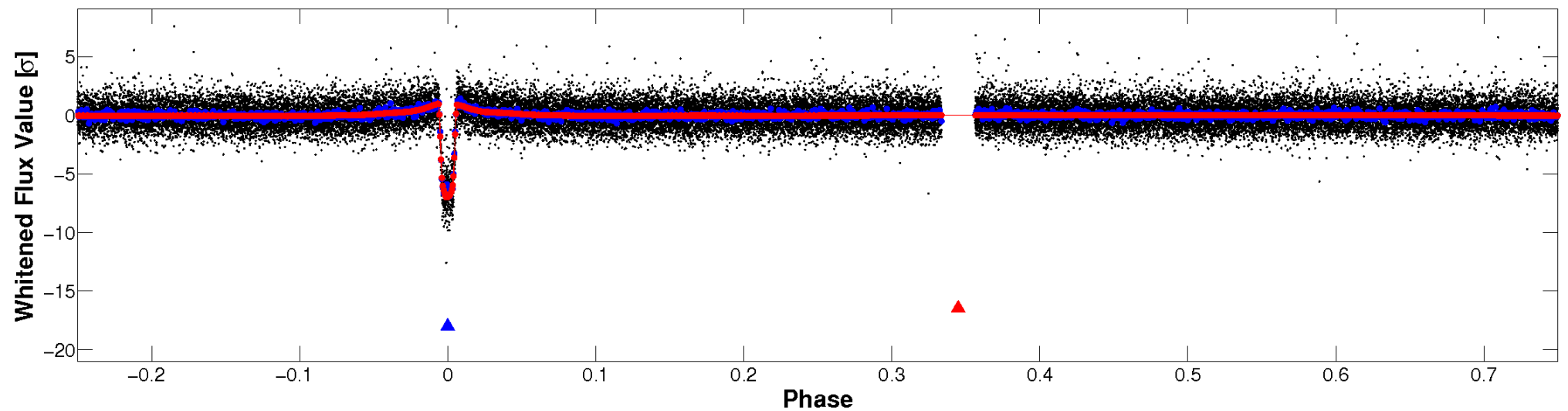


# Non-Whitened Vs. Whitened Light Curve

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

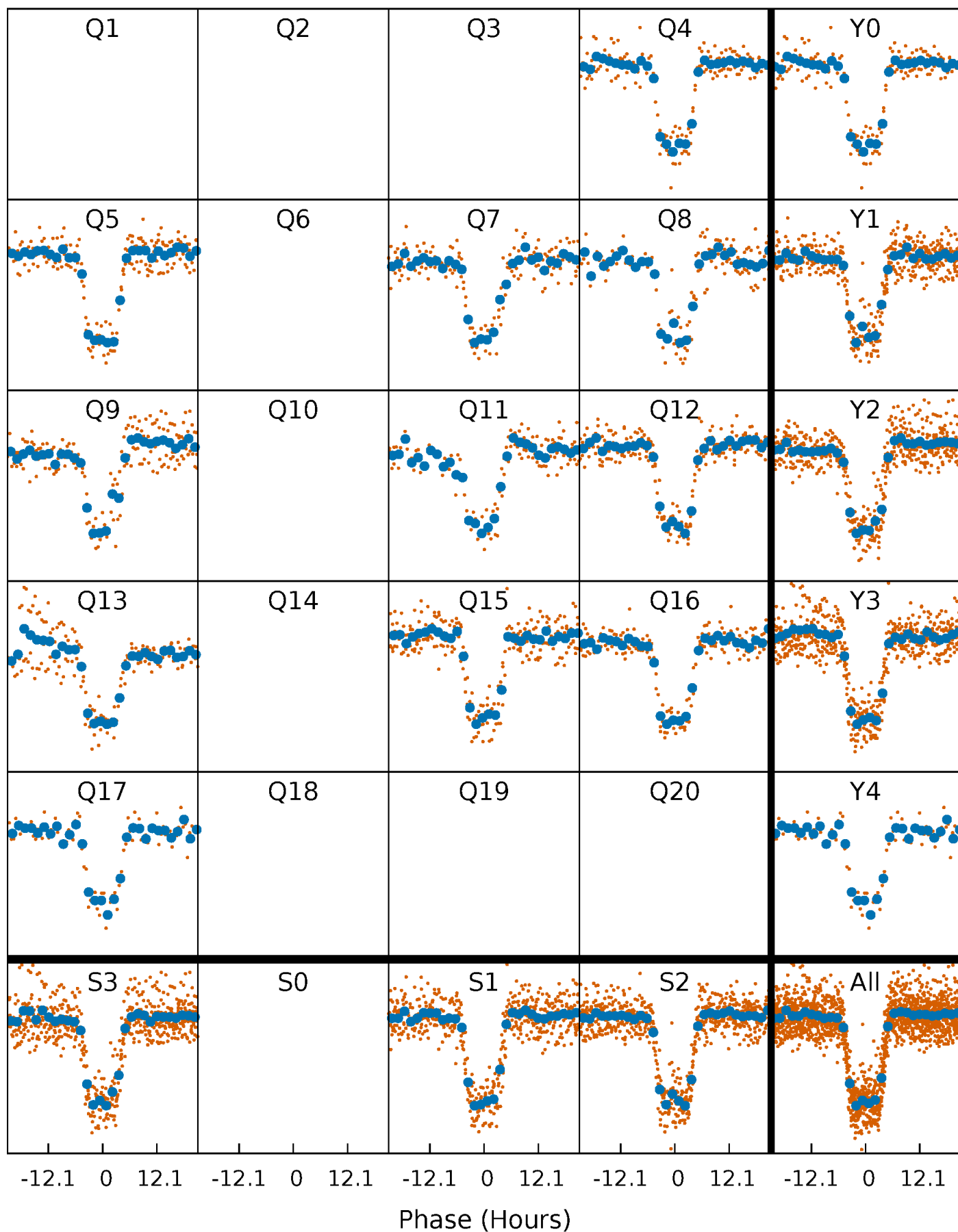


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



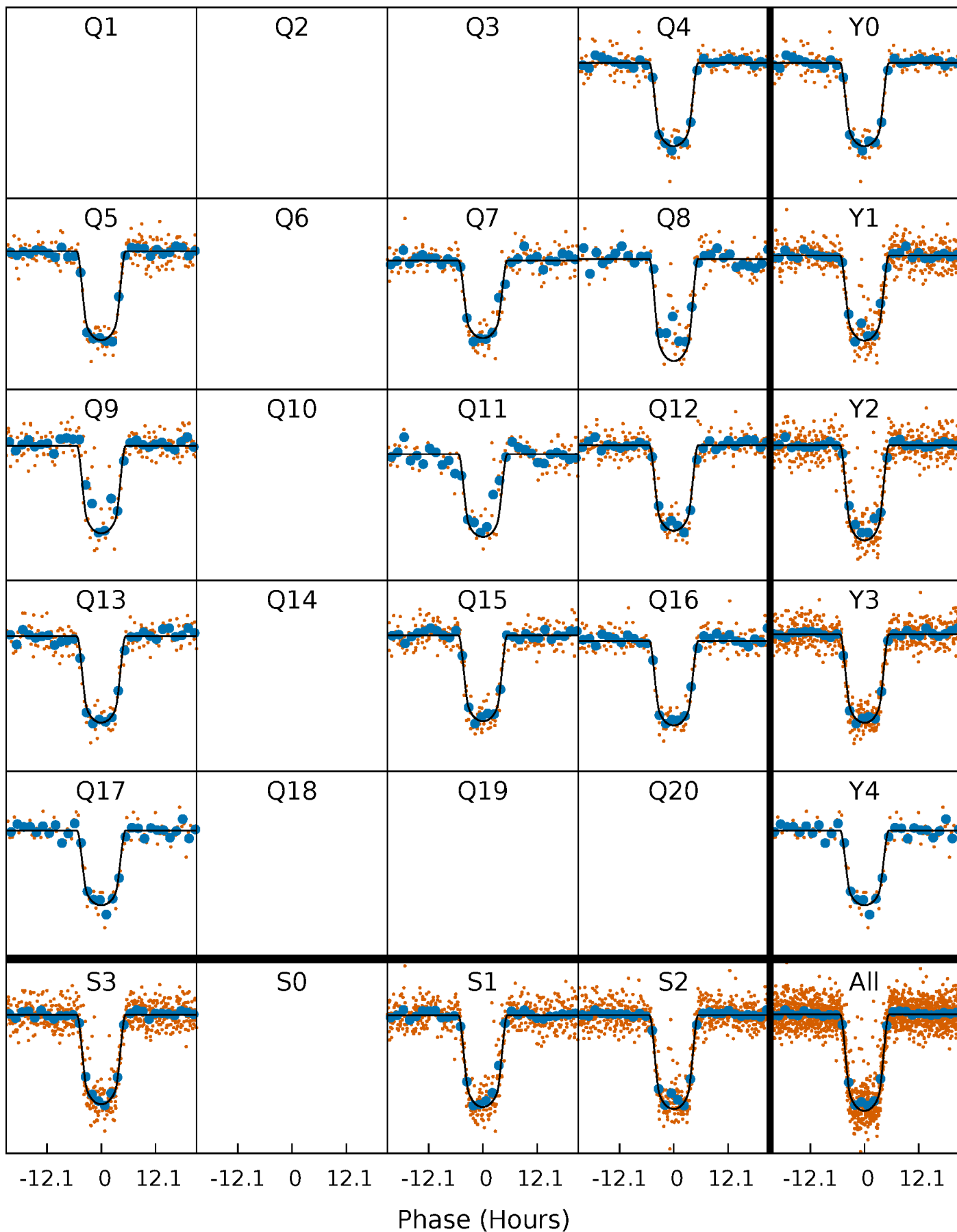
# PDC Quarter-Phased Transit Curves

TCE 003757778-02 P= 36.514023 Days  $T_0=151.207540$  (BKJD)



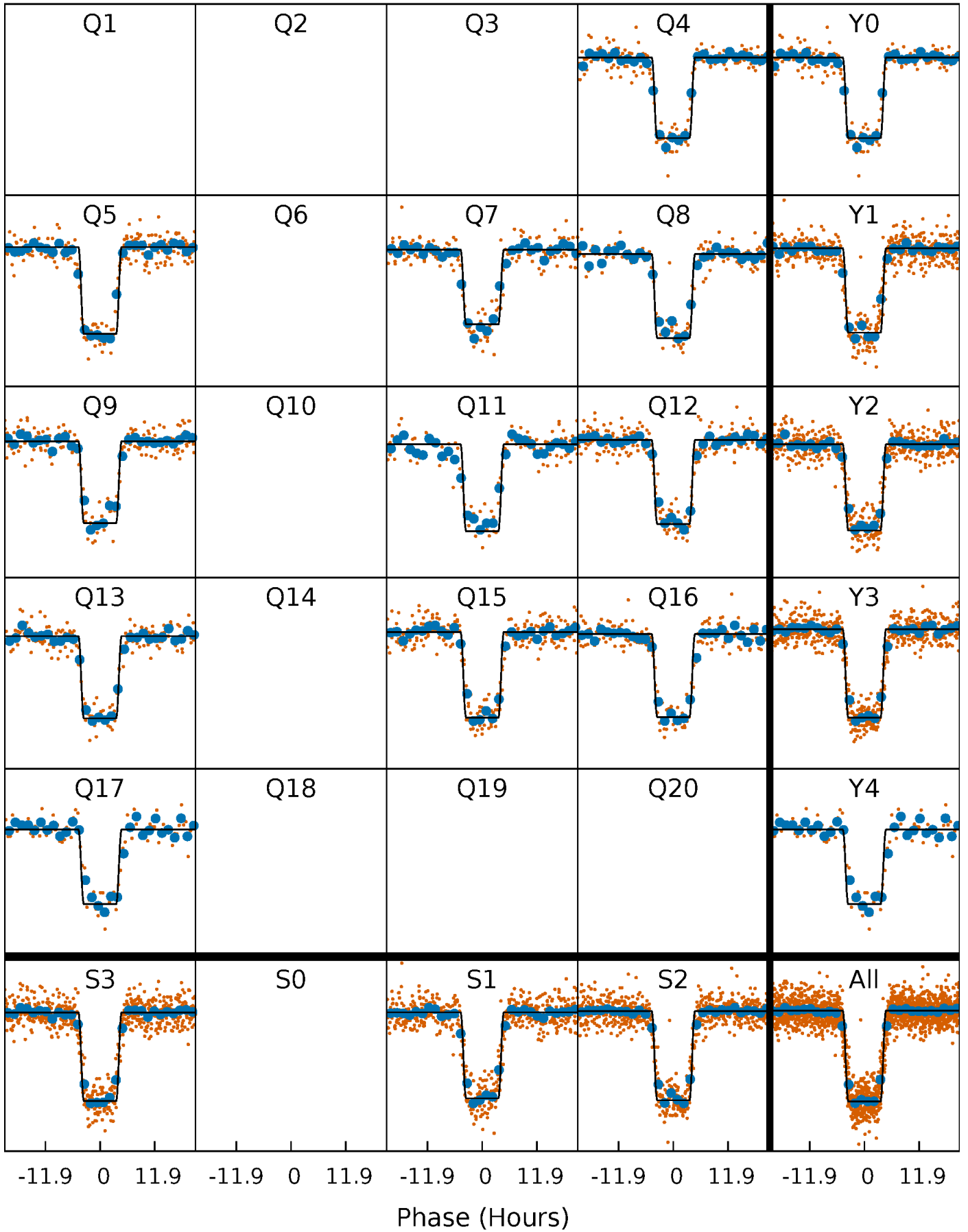
# DV Quarter-Phased Transit Curves

TCE 003757778-02   P= 36.514023 Days    $T_0=151.207540$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

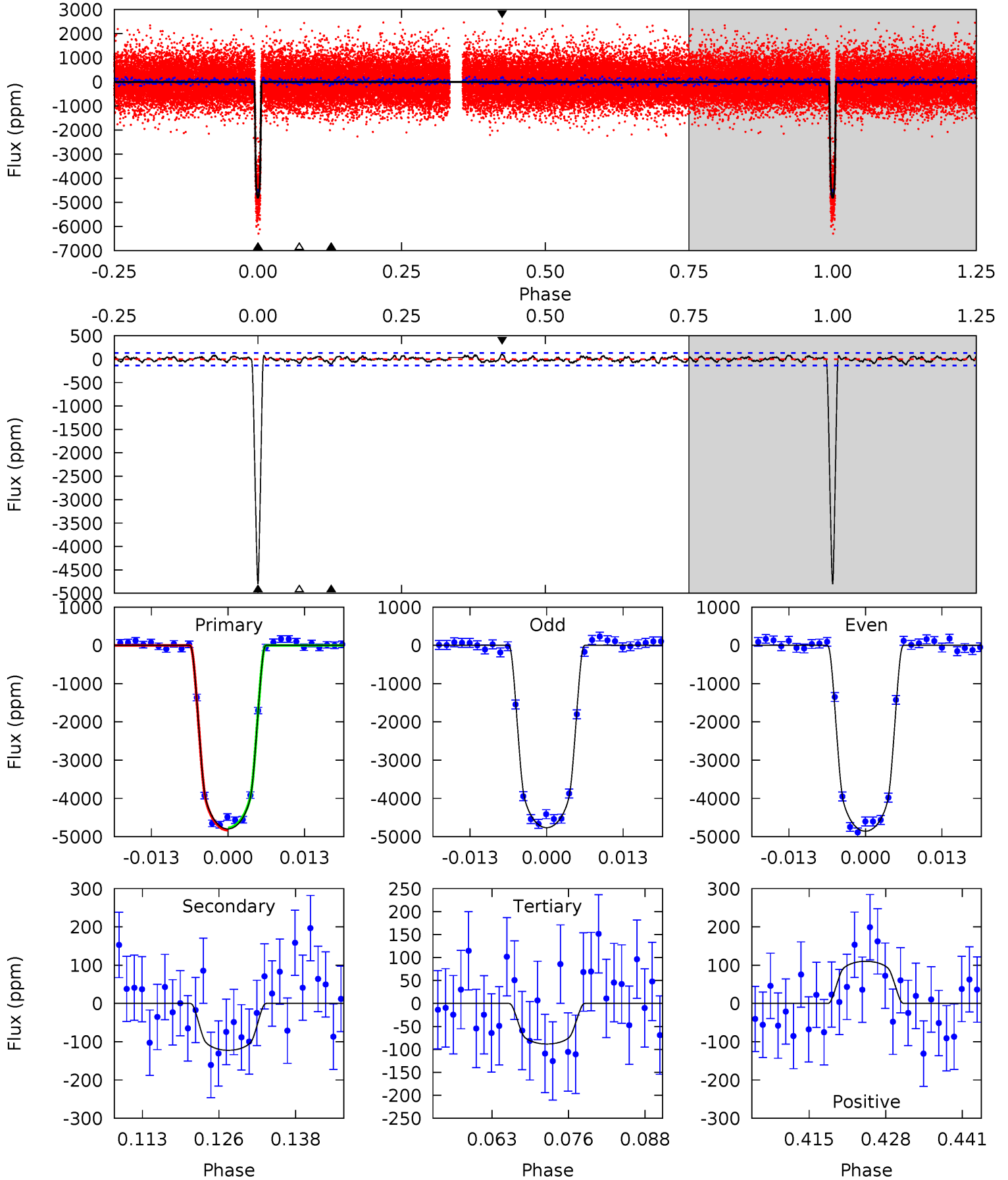
TCE 003757778-02   P= 36.513210 Days    $T_0=151.227205$  (BKJD)



# DV Model-Shift Uniqueness Test

003757778-02, P = 36.514023 Days, E = 151.207540 Days

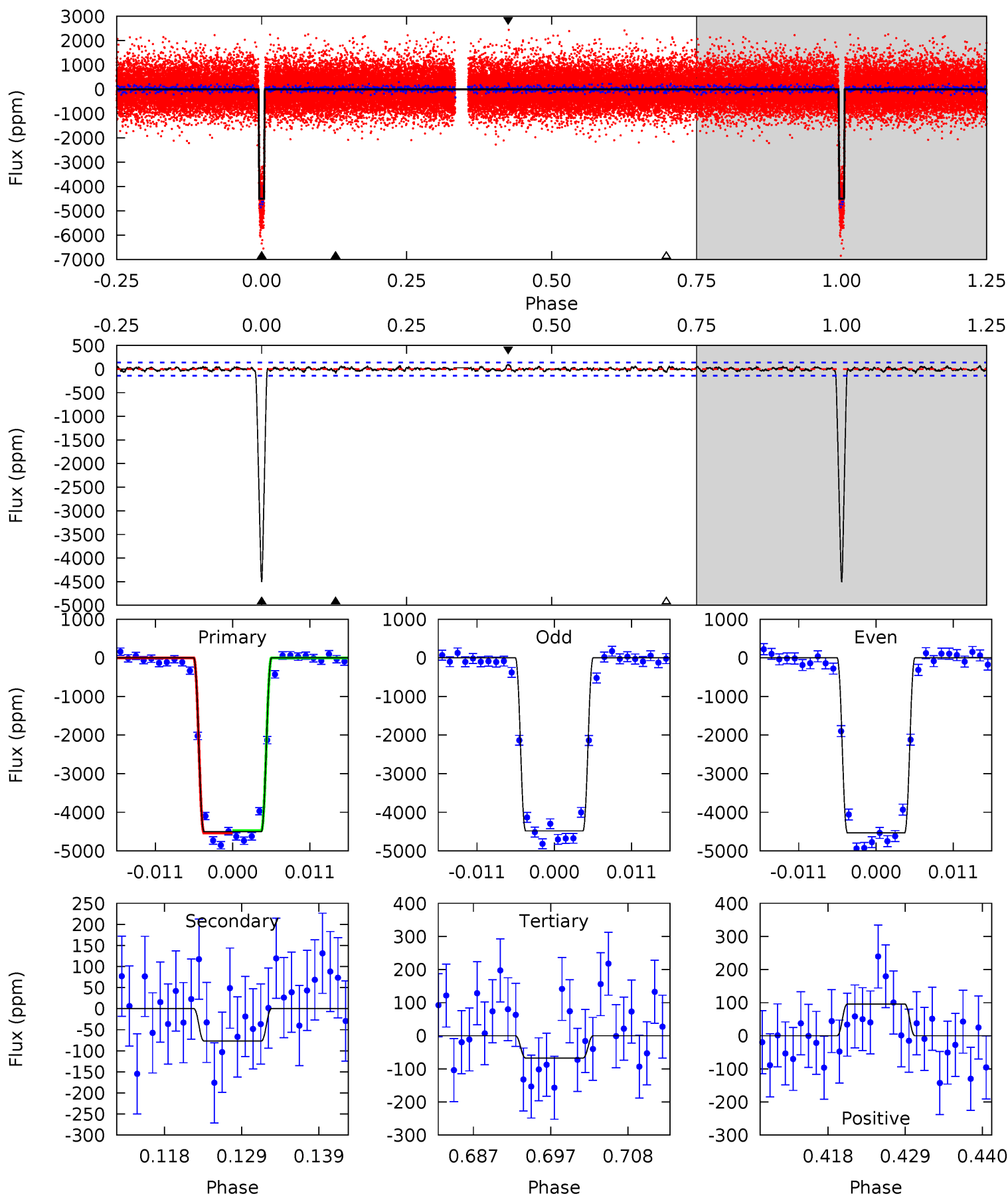
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
178.8	4.56	3.29	4.11	4.98	2.50	1.35	175.5	174.7	1.27	0.46	1.71	0.90	0.02	1.07



# Alt Model-Shift Uniqueness Test

003757778-02, P = 36.513210 Days, E = 151.227205 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
161.3	2.75	2.41	3.43	5.01	2.55	0.85	158.9	157.8	0.34	-0.68	0.88	0.98	0.02	1.04





### Stellar Parameters For KIC 003757778

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5811^{+162}_{-203}$	$4.465^{+0.054}_{-0.216}$	$0.210^{+0.200}_{-0.300}$	$1.000^{+0.305}_{-0.102}$	$1.066^{+0.112}_{-0.137}$	$1.500^{+0.416}_{-0.819}$
	+3%/-3%	+1%/-5%	+95%/-143%	+30%/-10%	+11%/-13%	+28%/-55%
Source	KIC0	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 003757778-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-122 \pm 27$	$7.94^{+1.42}_{-0.55}$	$777^{+60}_{-37}$	$2953^{+103}_{-114}$	$47^{+16}_{-15}$
Alt.	$-77 \pm 28$	$7.71^{+1.27}_{-0.61}$	$779^{+61}_{-39}$	$2797^{+148}_{-166}$	$32^{+14}_{-13}$

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

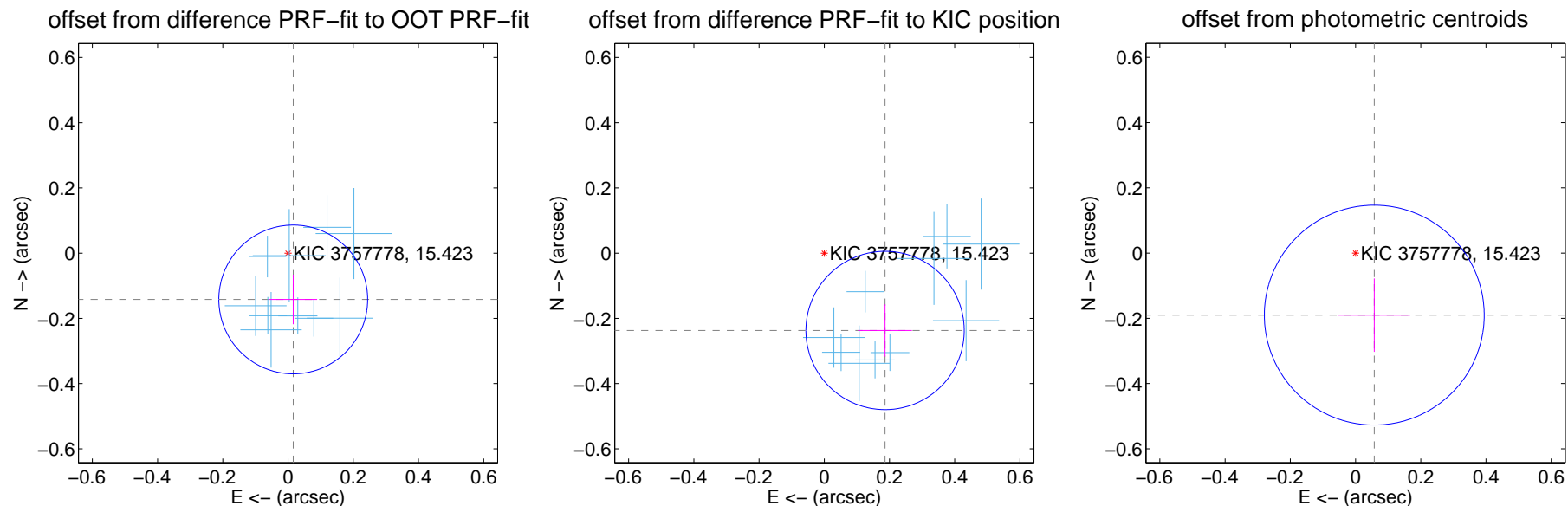
## DV Centroid Data

Supplemental centroid analysis for 003757778-02. Kepler magnitude: 15.42. Transit SNR 112.79

There are 10 quarters with good PRF difference image offsets

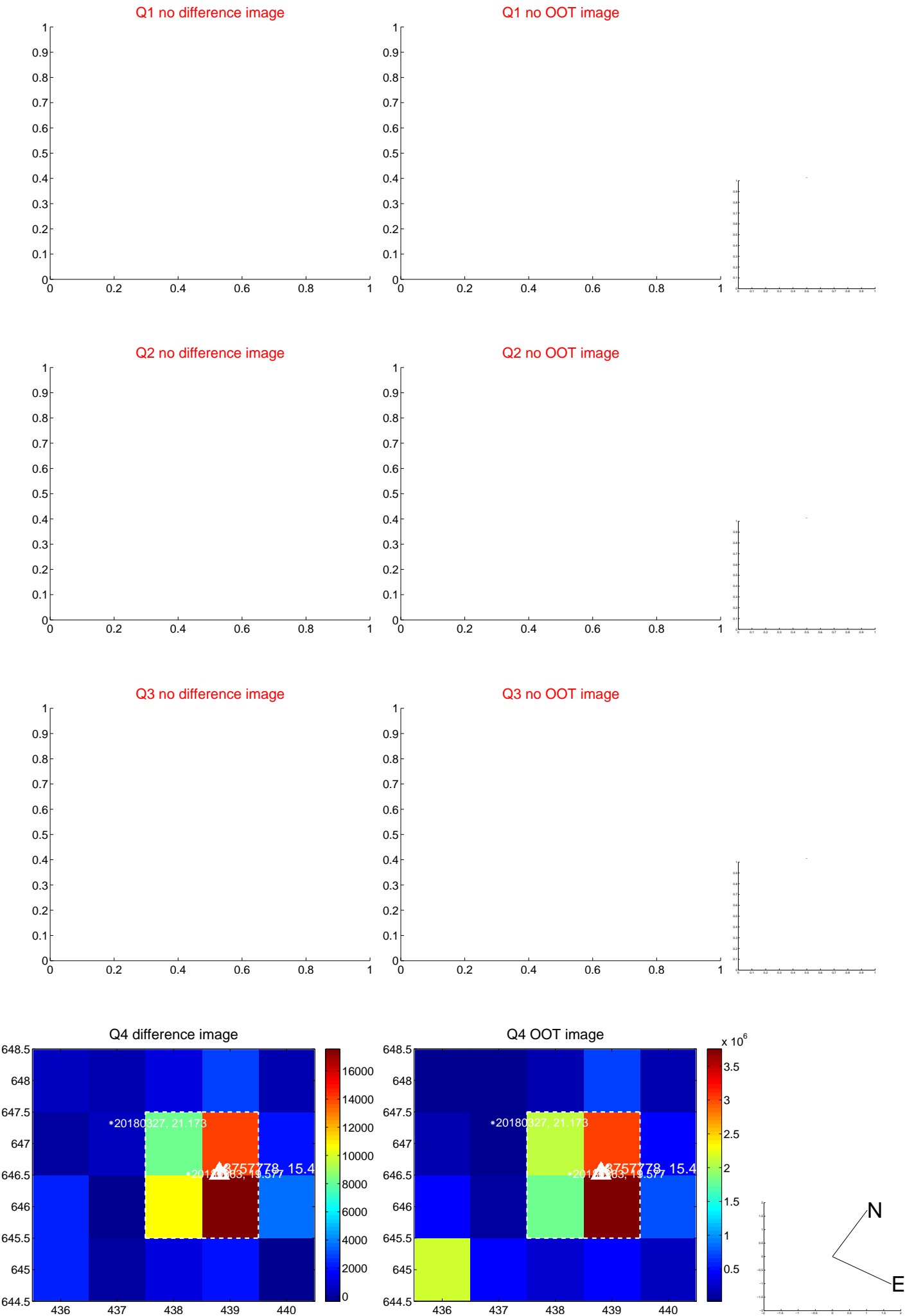
The direct PRF centroid is offset from the target star catalog position by about 0.33 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.143 \pm 0.076$	1.88	$-0.016 \pm 0.073$	$-0.142 \pm 0.076$
PRF-fit source offset from KIC position	$0.302 \pm 0.081$	3.73	$-0.186 \pm 0.082$	$-0.237 \pm 0.080$
photometric centroid source offset	$0.20 \pm 0.11$	1.77	$-0.06 \pm 0.11$	$-0.19 \pm 0.11$

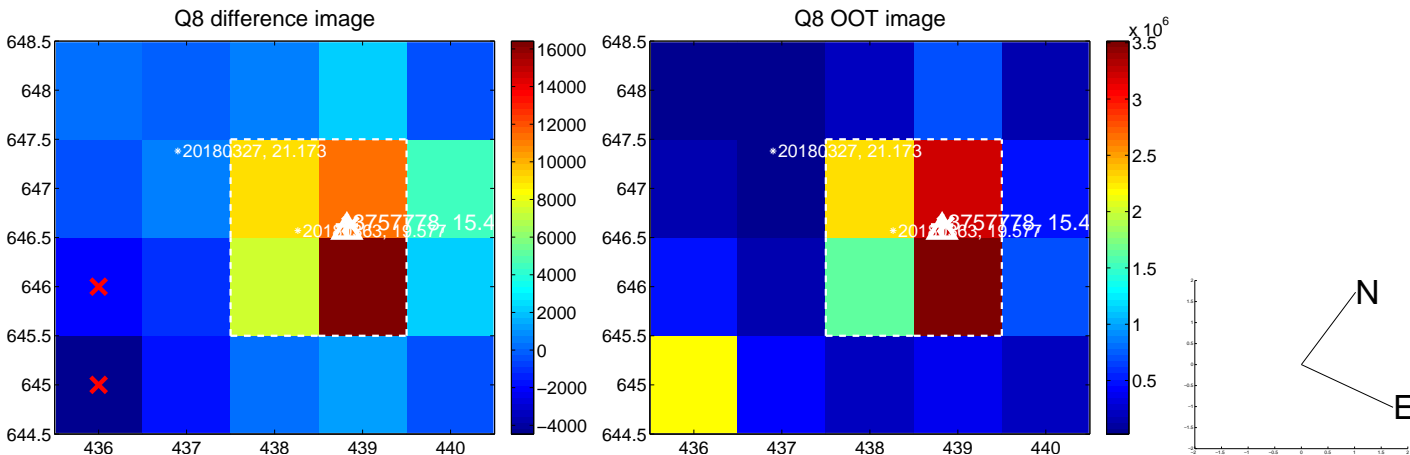
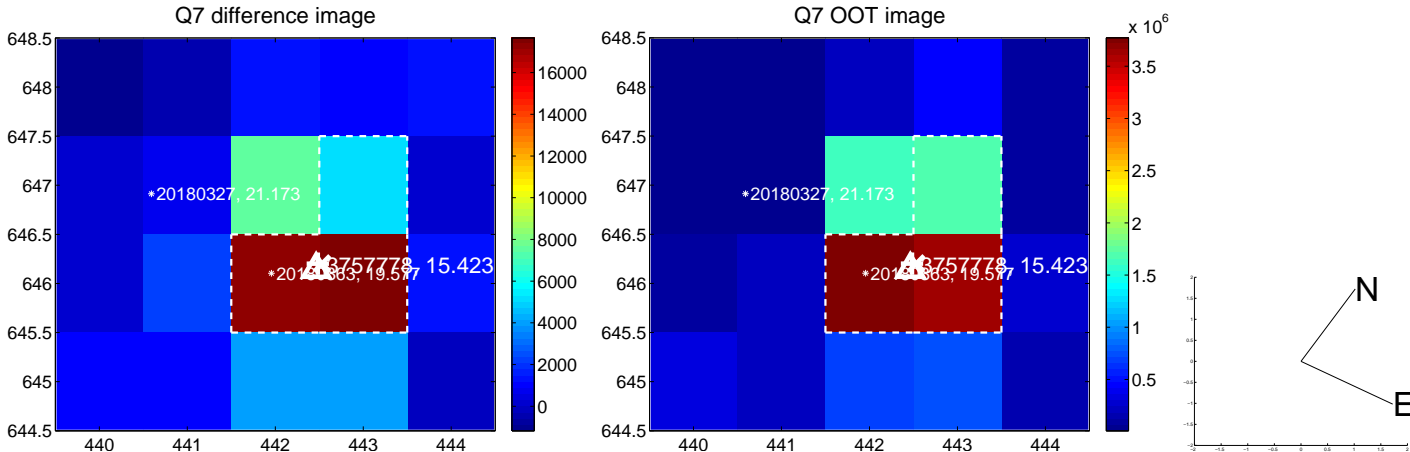
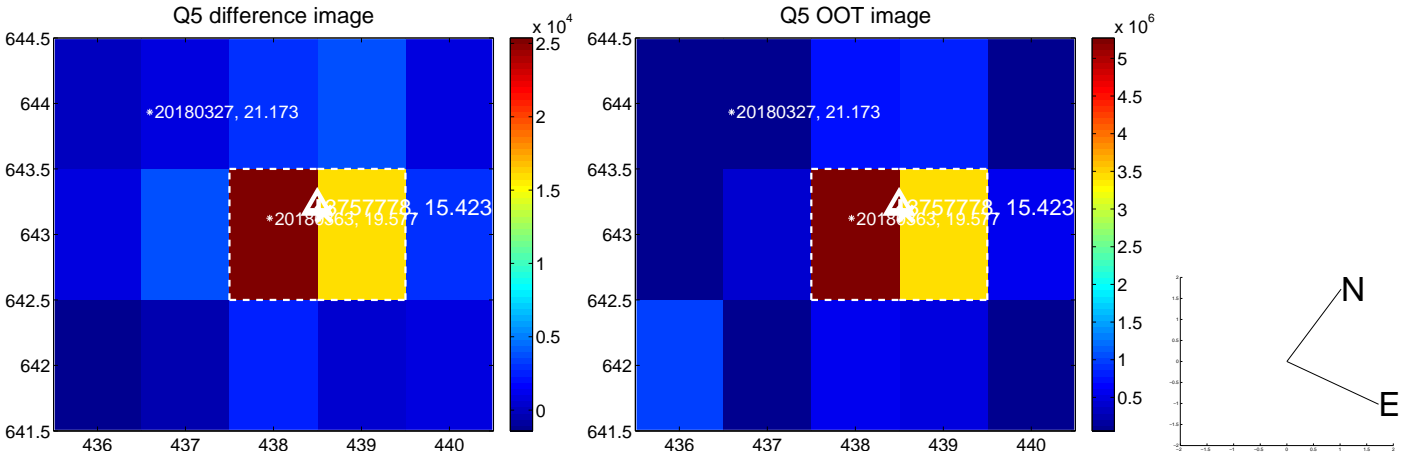


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: 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.

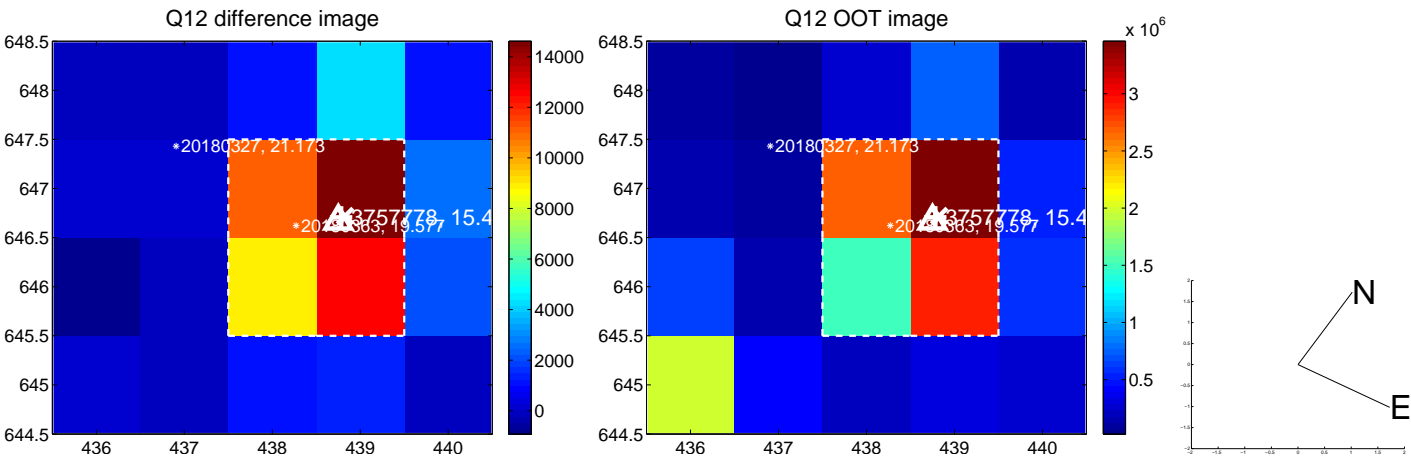
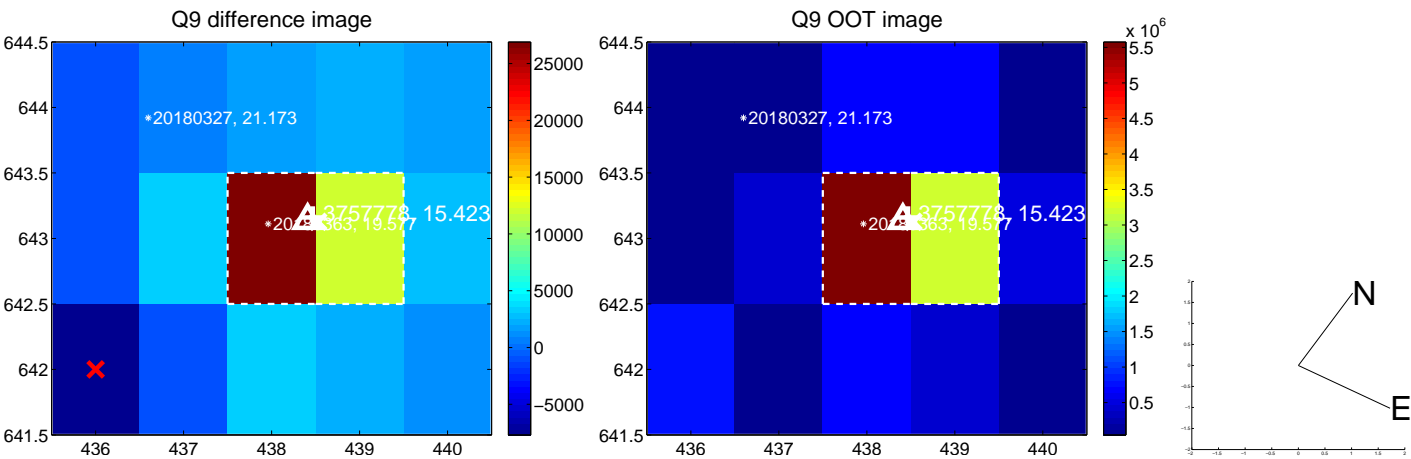
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



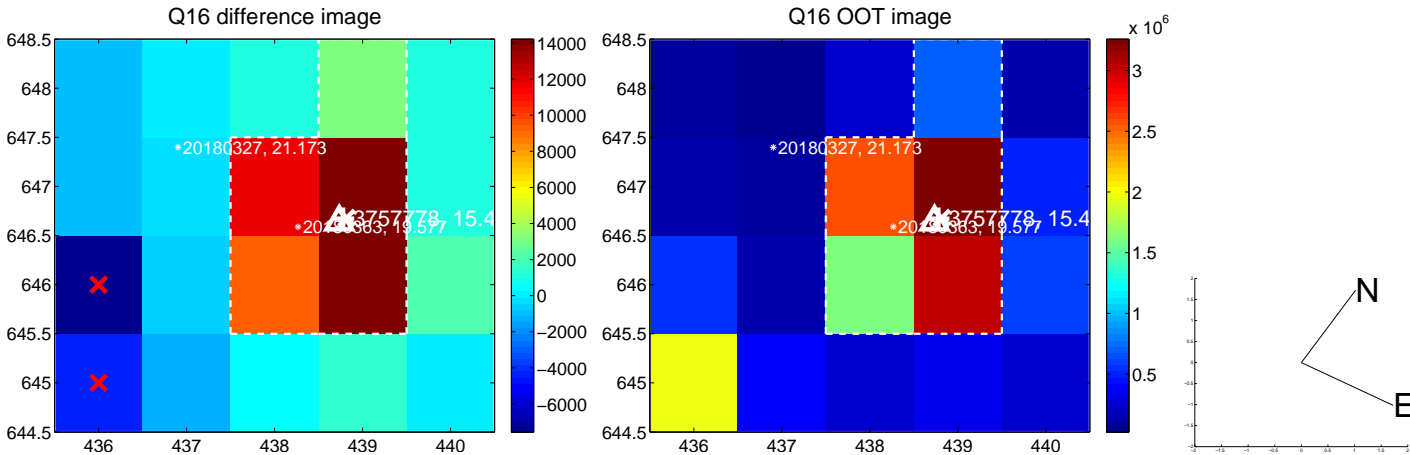
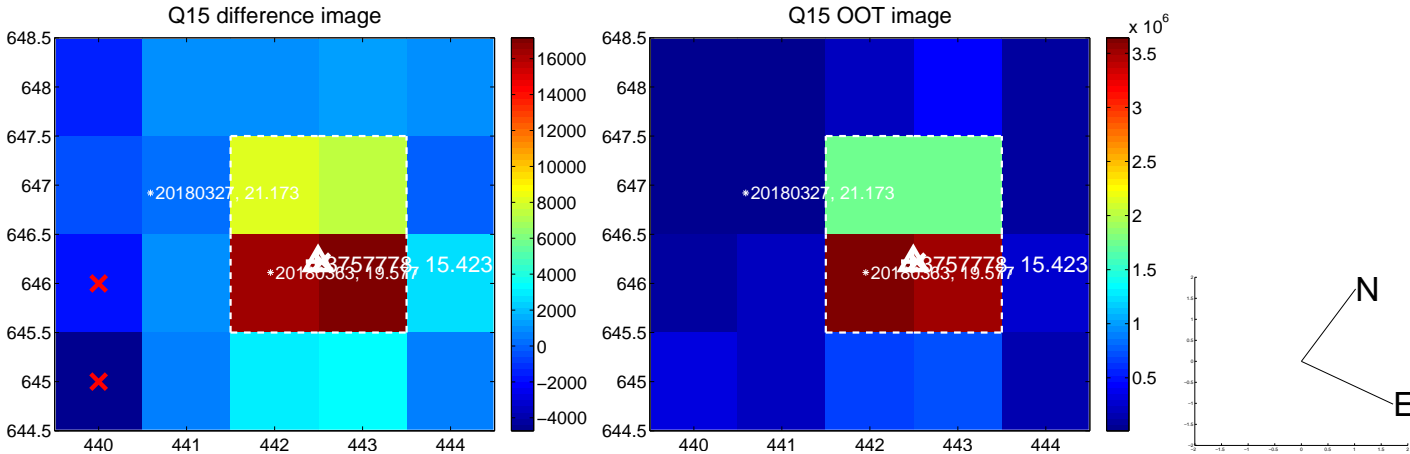
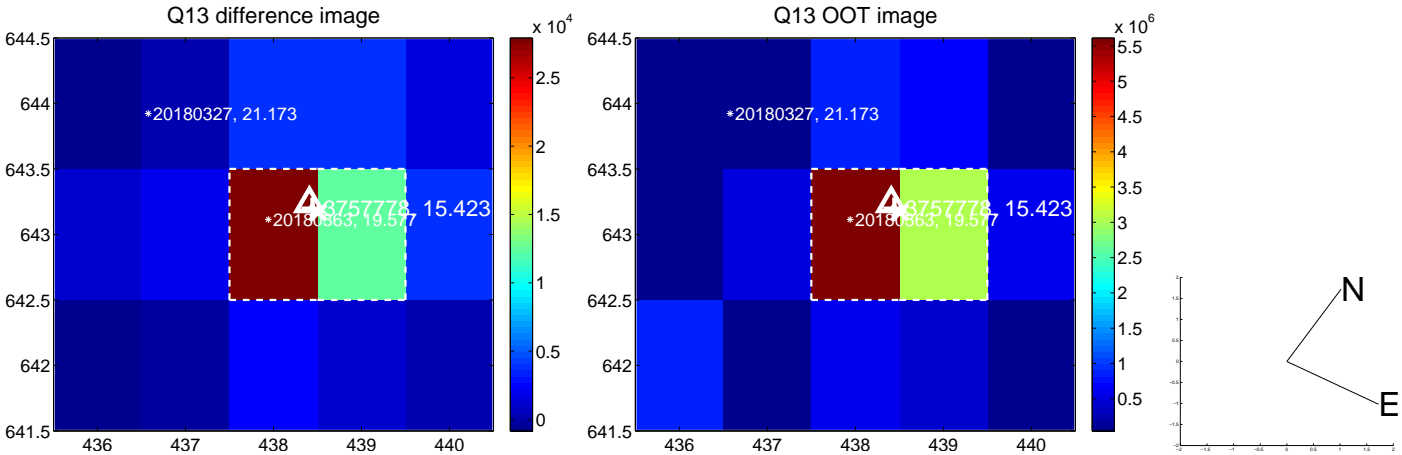
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



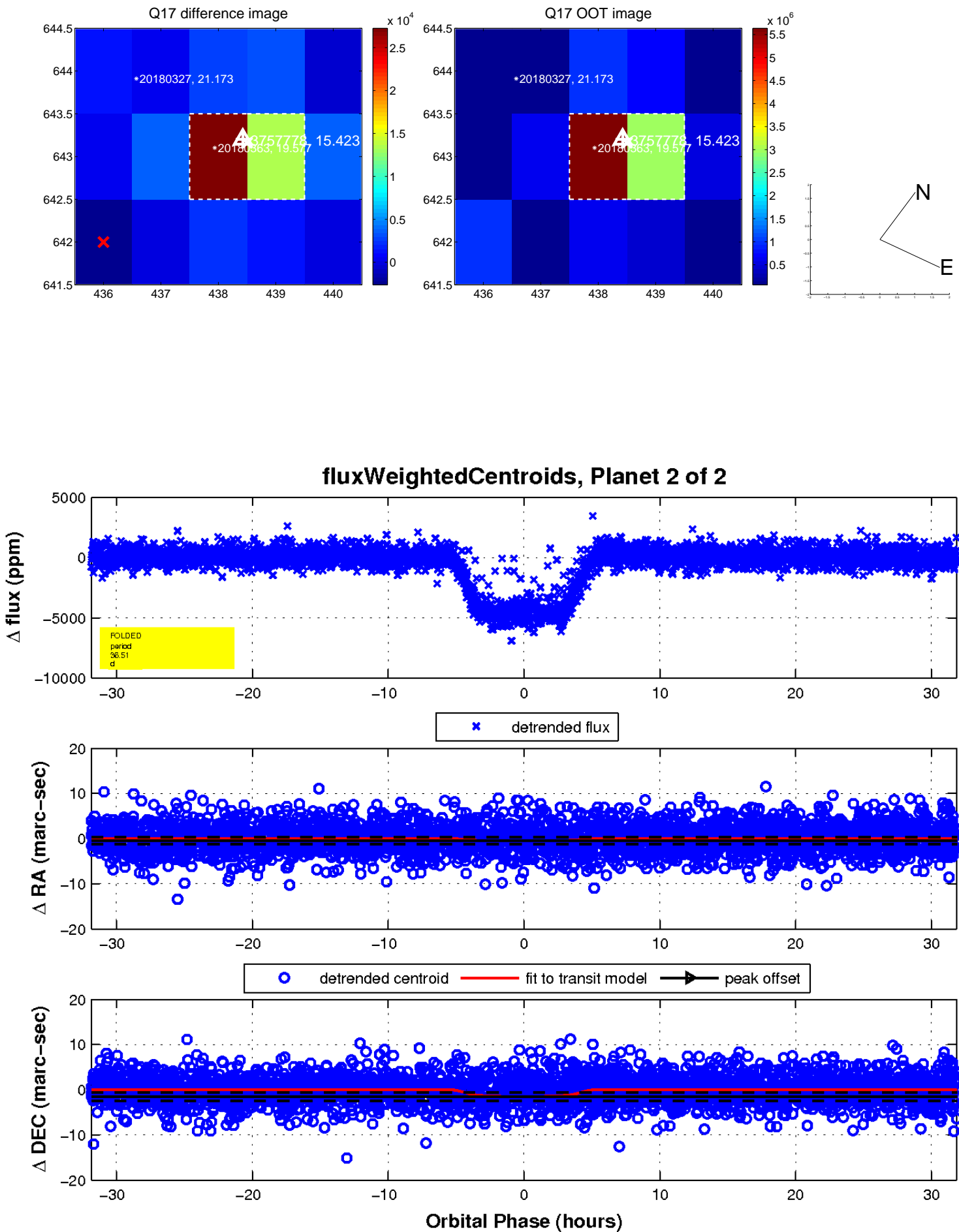
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

