

# KIC 010386922

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010386922-01	OBS	0289.02	296.637498	403.672312	2769.4	16.477	149.9	155.6	1.42	5866	7.63	2.89
010386922-02	OBS	0289.01	26.629451	138.736381	490.5	8.052	76.5	76.1	1.42	5866	3.41	71.89

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010386922-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
010386922-02	OBS	PC	1.00	0	0	0	0	NO_COMMENT

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

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

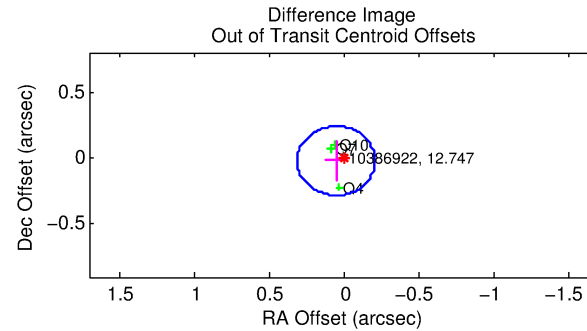
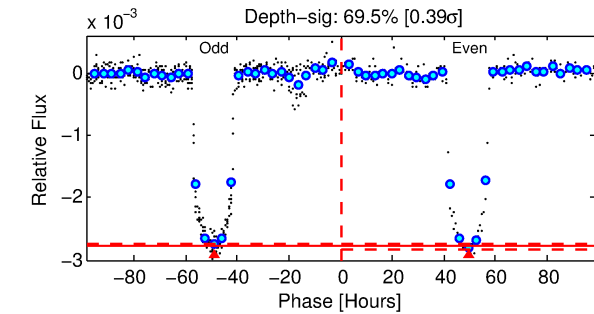
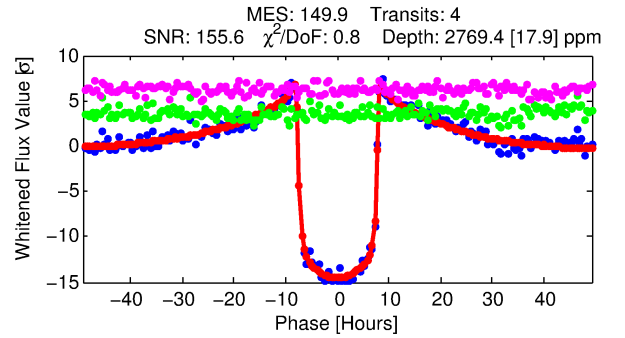
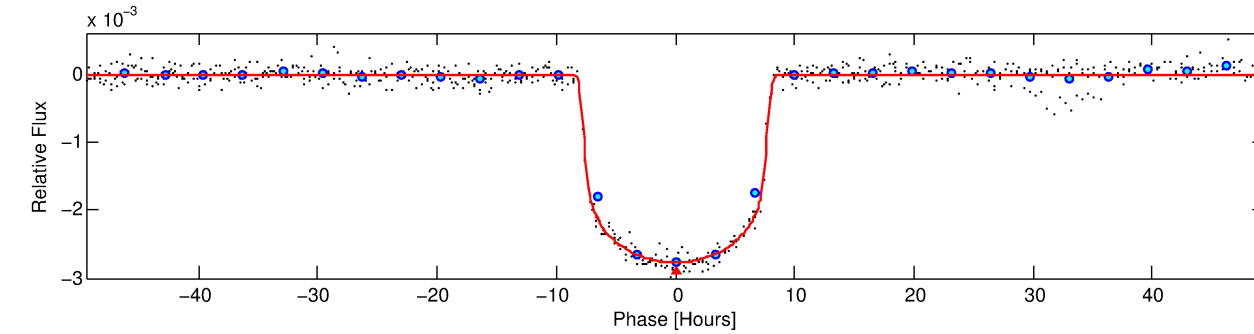
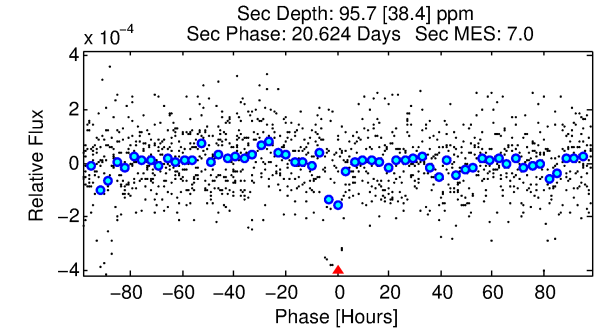
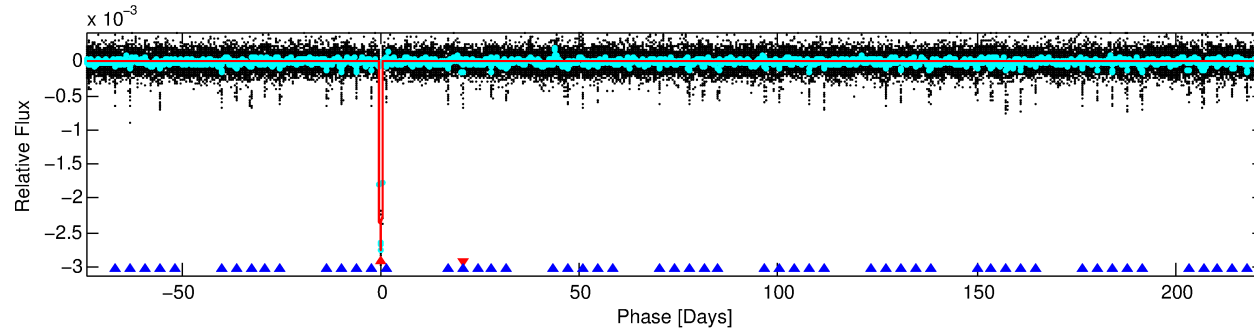
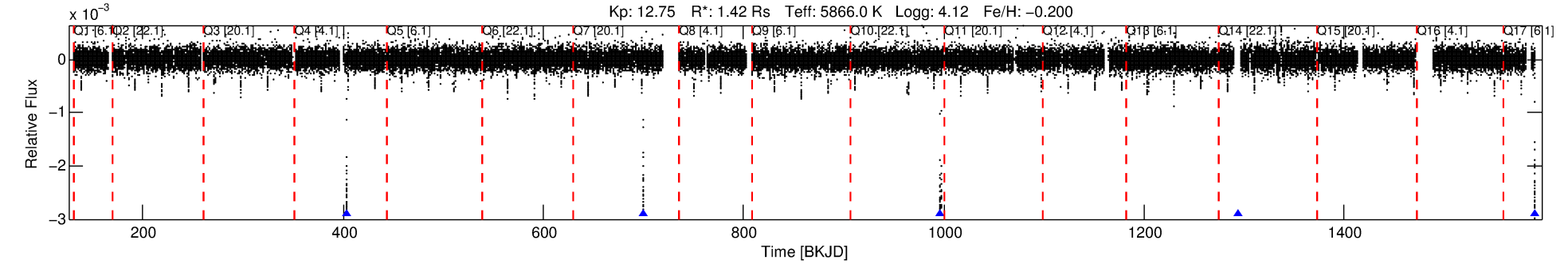
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 010386922-01

No Significant Match Found

# DV One-Page Summary

KIC: 10386922 Candidate: 1 of 2 Period: 296.637 d  
KOI: K00289.02 Corr: 0.993



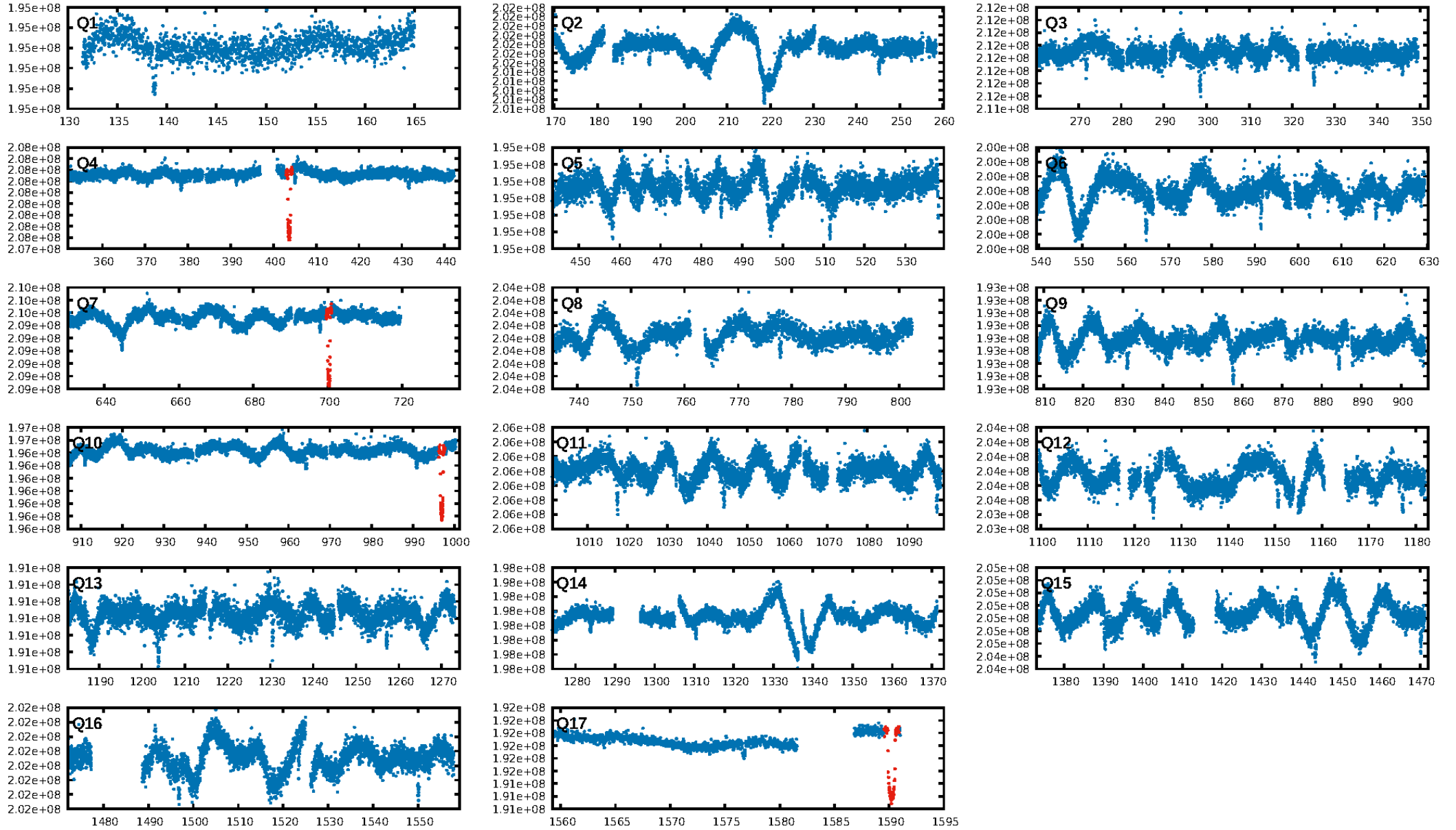
## DV Fit Results:

Period = 296.63750 [0.00043] d  
Epoch = 403.6723 [0.0010] BKJD  
Rp/R\* = 0.0494 [0.0005]  
a/R\* = 127.55 [6.00]  
b = 0.49 [0.07]  
Seff = 2.89 [0.98]  
Teq = 332 [28] K  
Rp = 7.63 [1.62] Re  
a = 0.8585 [0.1769] AU  
Ag = 665.61 [346.73] [1.92σ]  
Teffp = 2611 [267] K [8.50σ]

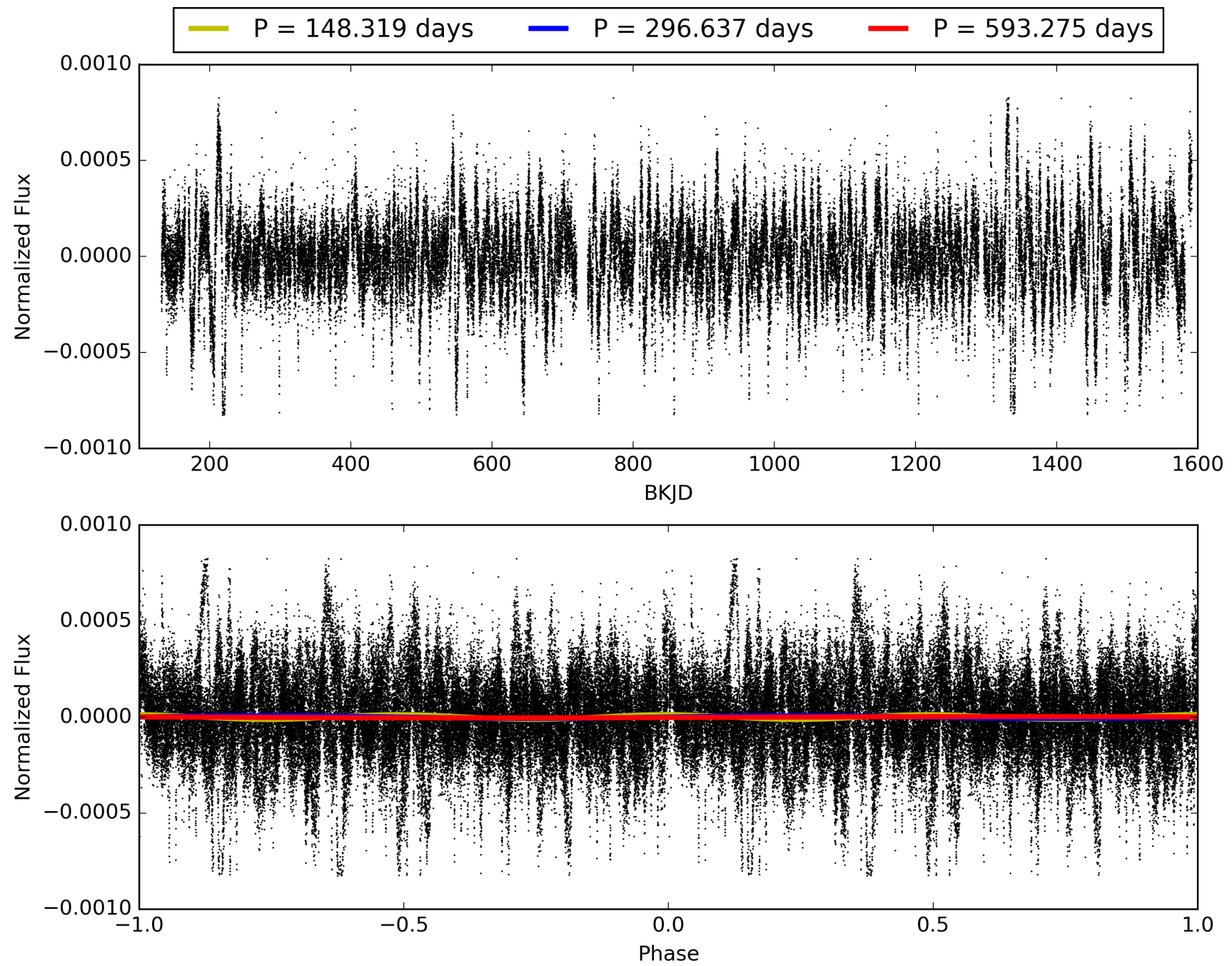
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [353.34σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 98.0%  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 7.638  
Centroid-sig: 0.3%  
Centroid-so: 0.107 arcsec [1.80σ]  
OotOffset-rm: 0.054 arcsec [0.62σ]  
KicOffset-rm: 0.115 arcsec [1.30σ]  
OotOffset-st: 1/1/1/0 [3]  
KicOffset-st: 1/1/1/0 [3]  
DiffImageQuality-fgm: 1.00 [3/3]  
DiffImageOverlap-fno: 1.00 [3/3]

# TCE 010386922-01, PDC Light Curves

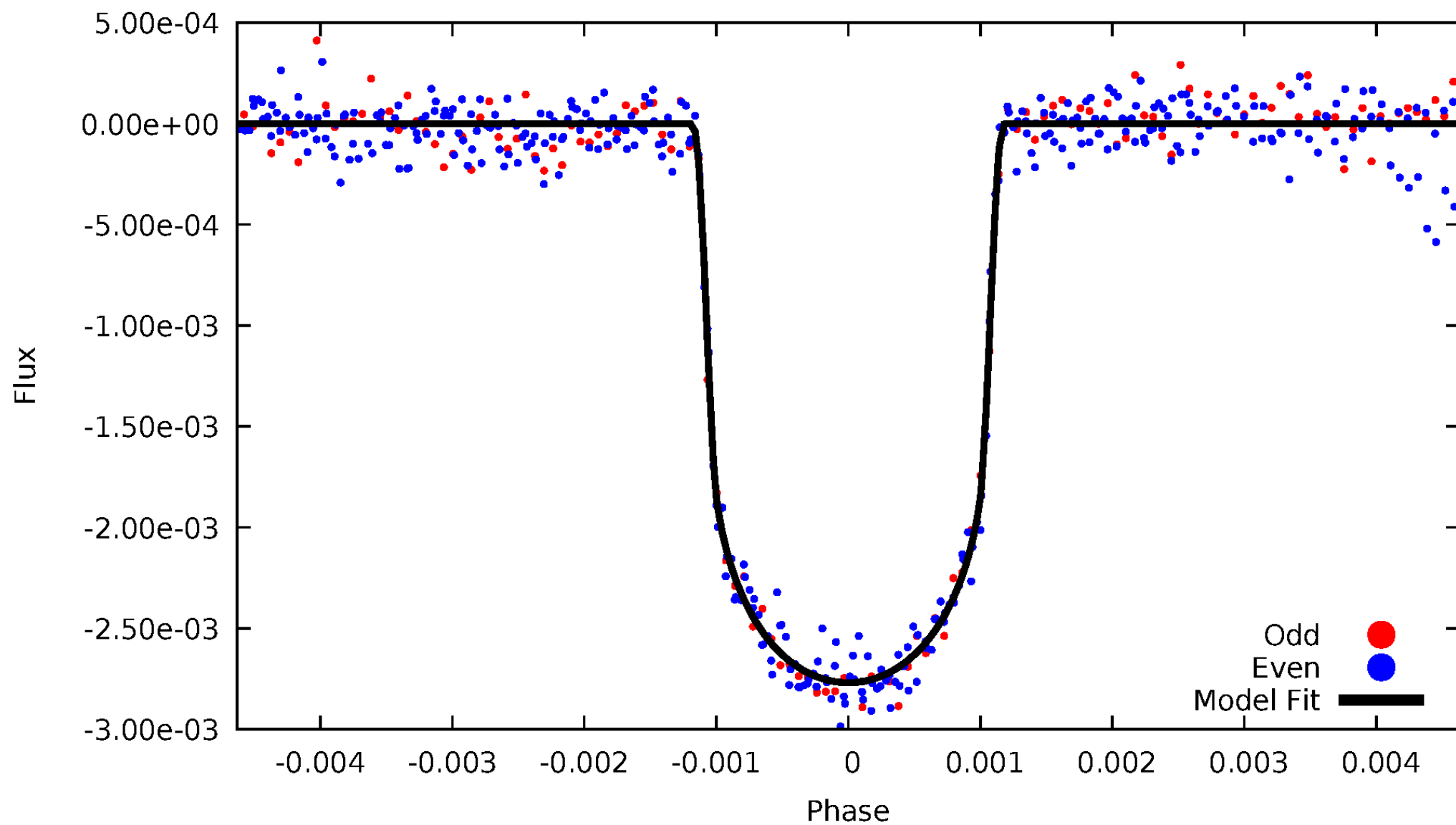


TCE 010386922-01



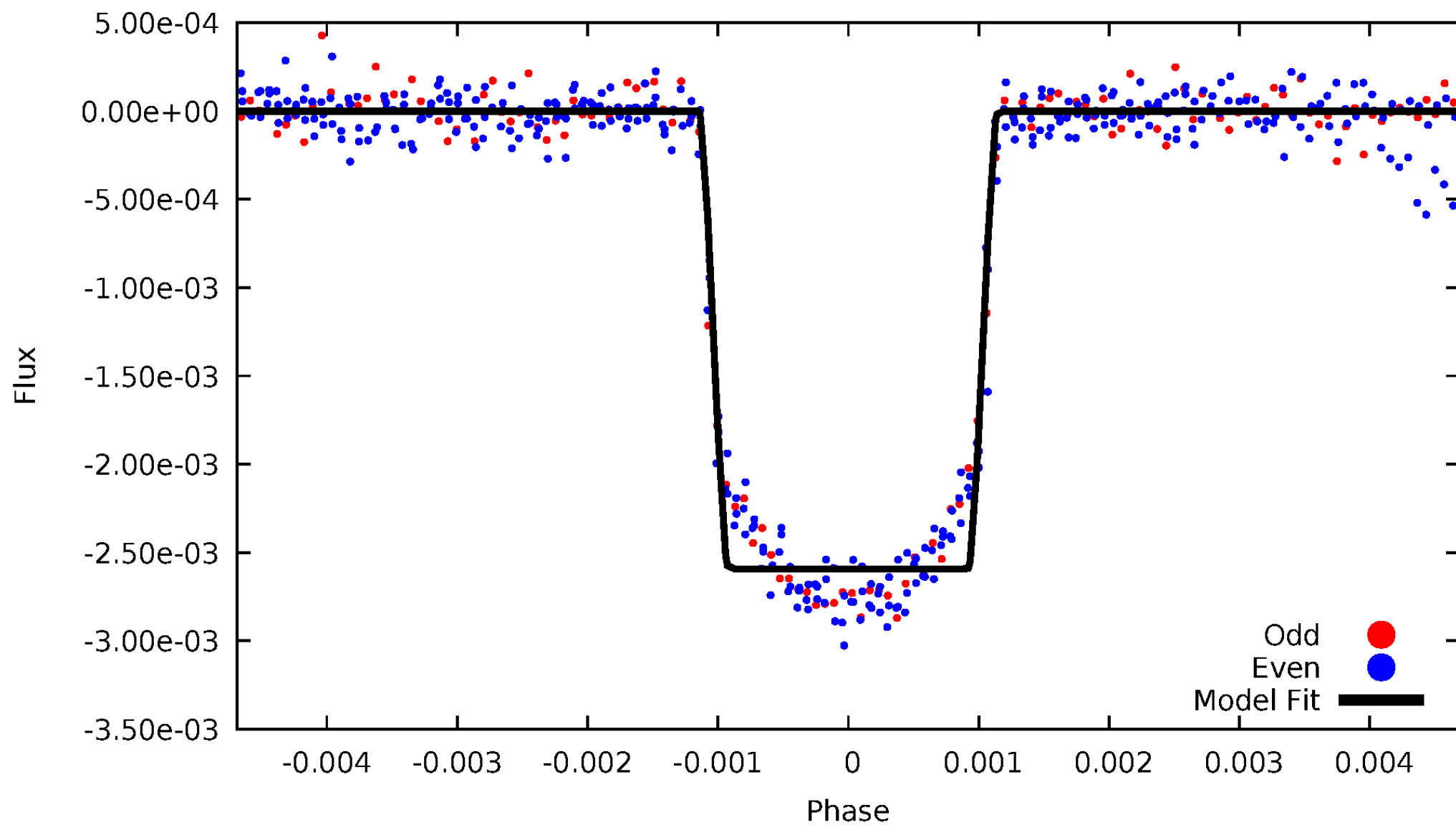
# DV Odd/Even

TCE 010386922-01



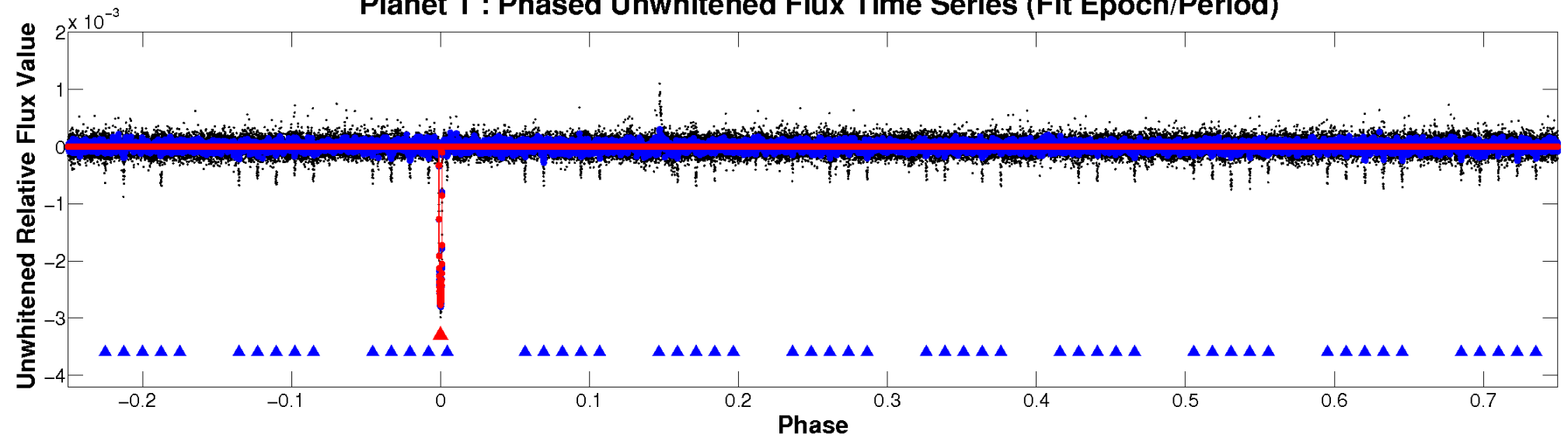
# ALT Odd/Even

TCE 010386922-01

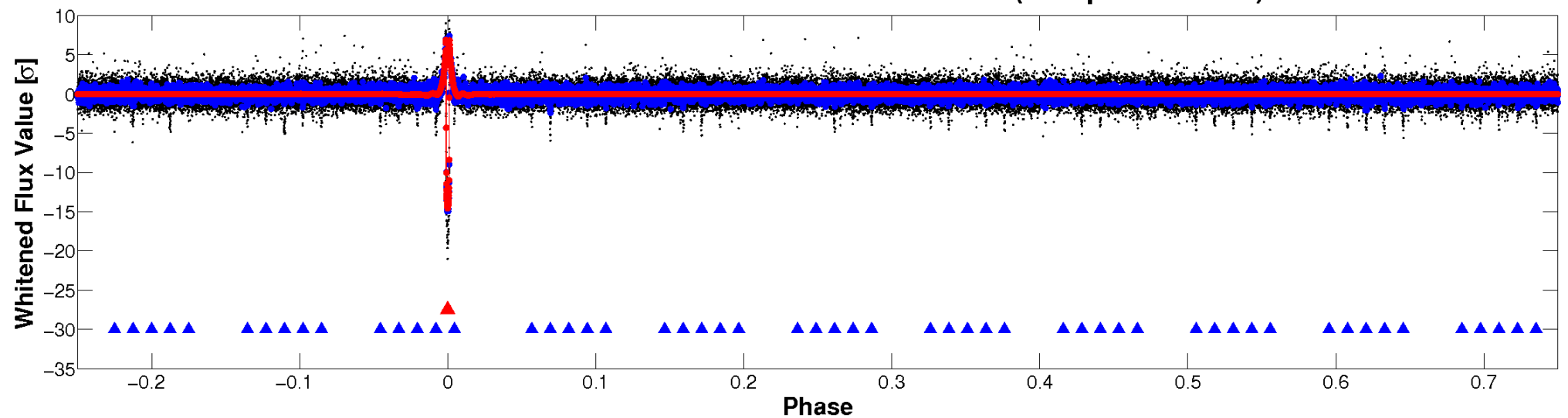


# Non-Whitened Vs. Whitened Light Curve

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

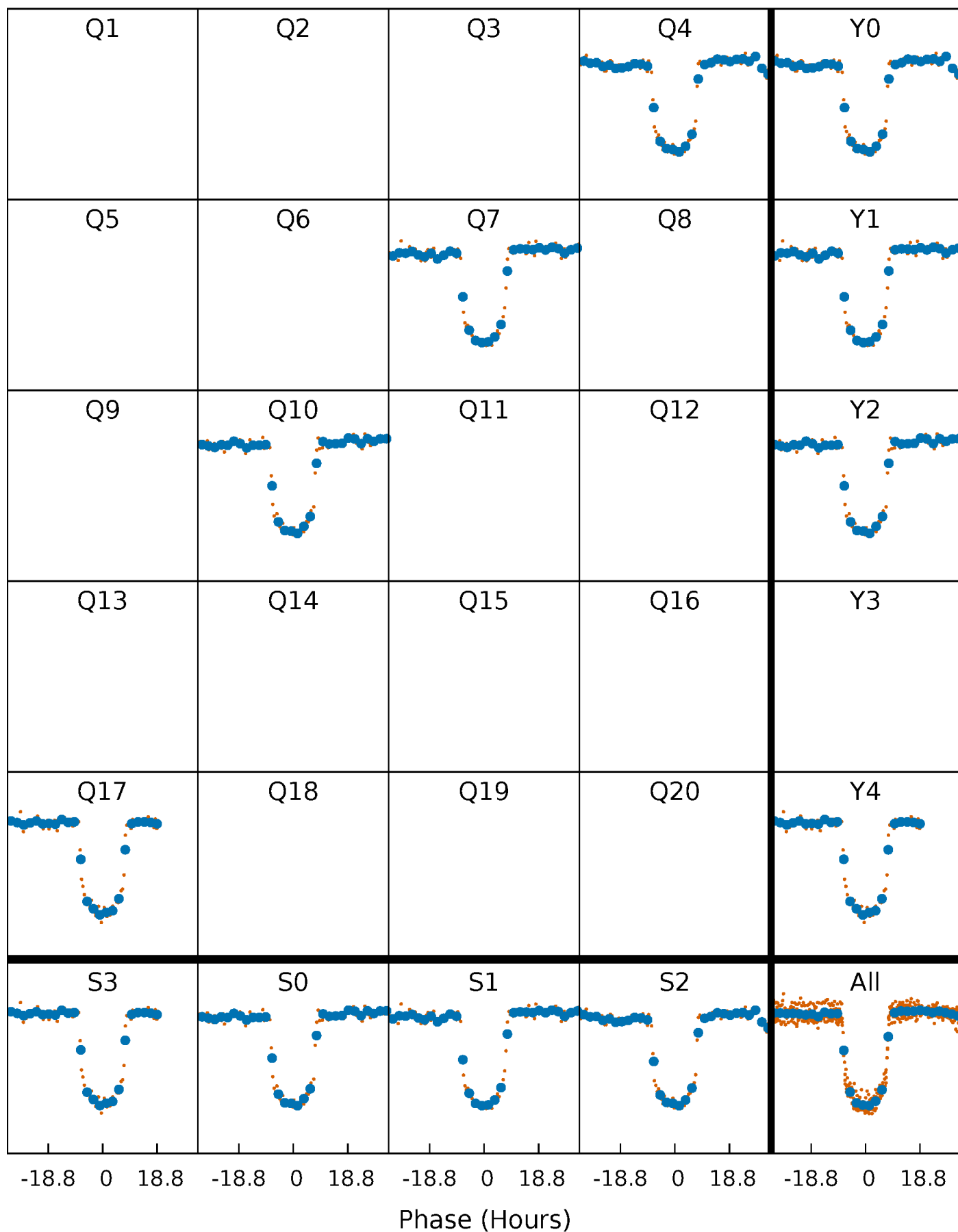


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

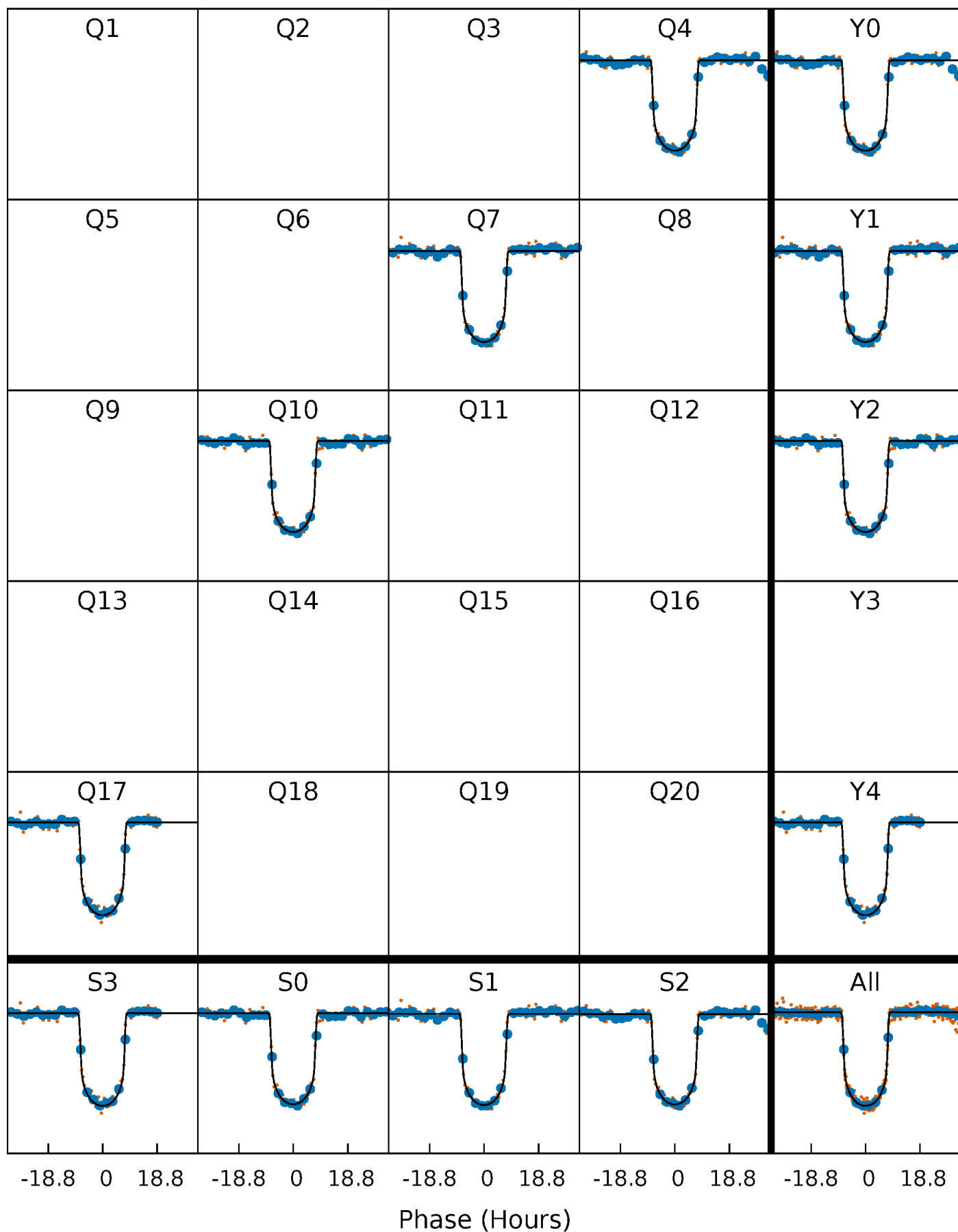
TCE 010386922-01 P=296.637498 Days  $T_0=403.672312$  (BKJD)





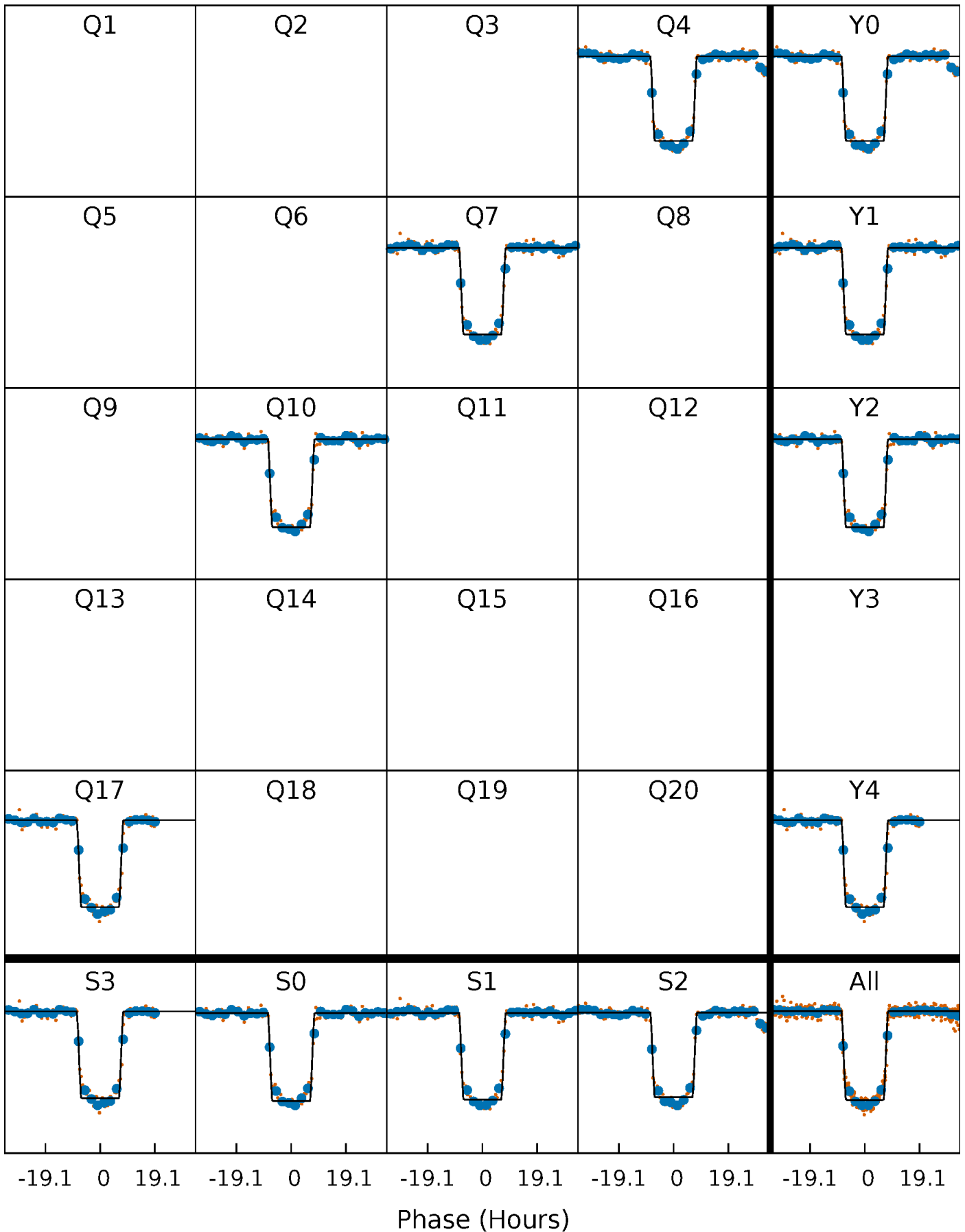
# DV Quarter-Phased Transit Curves

TCE 010386922-01 P=296.637498 Days  $T_0=403.672312$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

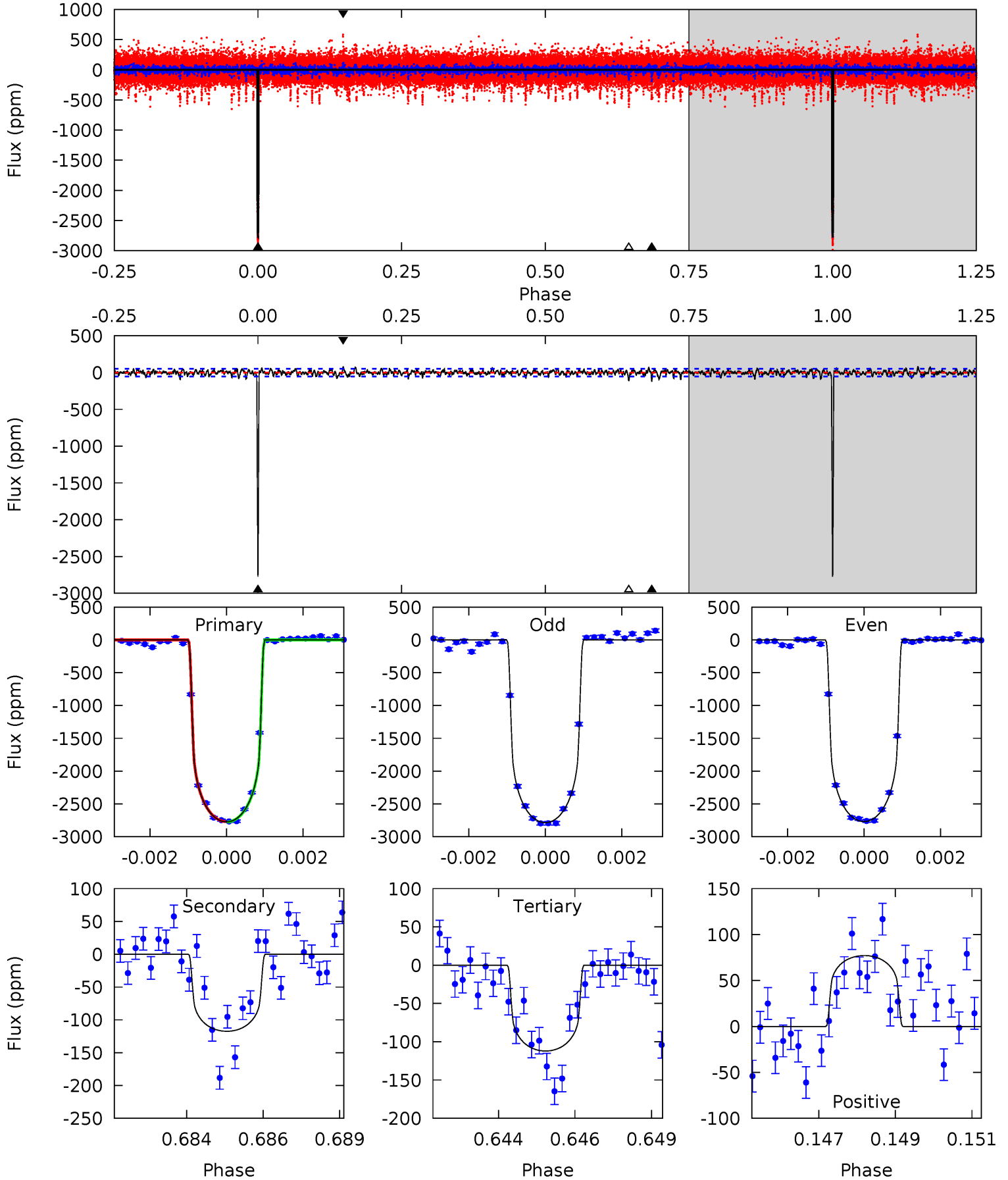
TCE 010386922-01     $P=296.633990$  Days     $T_0=403.678631$  (BKJD)



# DV Model-Shift Uniqueness Test

010386922-01, P = 296.637498 Days, E = 107.034814 Days

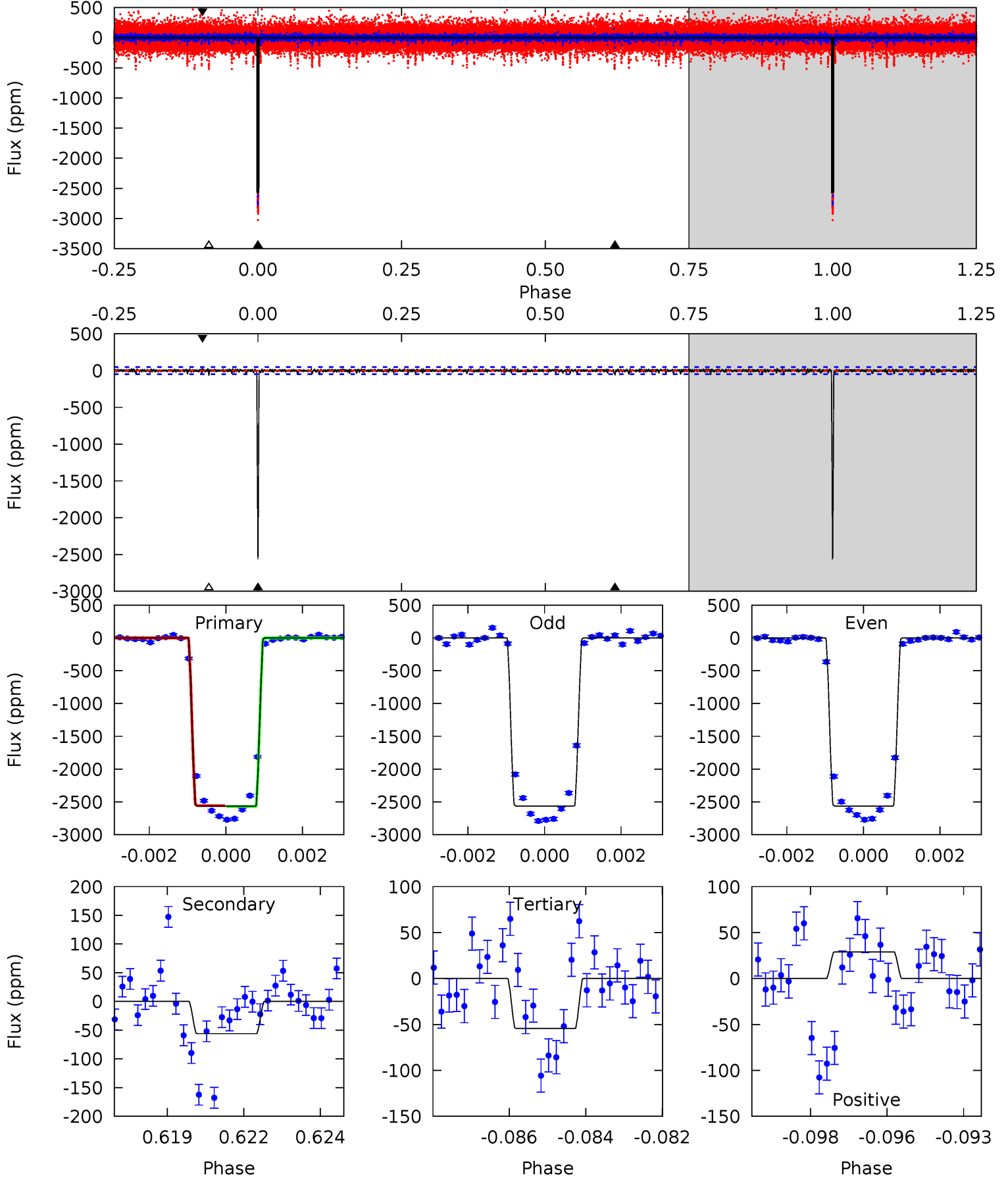
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
279.9	11.8	11.3	7.78	5.30	3.04	2.46	268.6	272.1	0.53	4.07	0.68	1.00	0.03	0.26



# Alt Model-Shift Uniqueness Test

010386922-01, P = 296.633990 Days, E = 107.044641 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
281.0	6.14	5.96	3.17	5.30	3.04	1.02	275.0	277.8	0.18	2.97	0.08	1.00	0.01	0.75



### Stellar Parameters For KIC 010386922

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5866^{+105}_{-105}$	$4.117^{+0.195}_{-0.105}$	$-0.200^{+0.150}_{-0.150}$	$1.417^{+0.219}_{-0.301}$	$0.958^{+0.083}_{-0.075}$	$0.474^{+0.484}_{-0.150}$
	+2%/-2%	+5%/-3%	+75%/-75%	+15%/-21%	+9%/-8%	+102%/-32%
Source	SPE59	SPE59	SPE59	DSEP		

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

### Secondary Eclipse Parameters for KIC 010386922-01 / KOI 0289.02

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-117 \pm 10$	$7.65^{+0.64}_{-0.91}$	$463^{+21}_{-27}$	$3303^{+61}_{-58}$	$825^{+232}_{-150}$
Alt.	$-56 \pm 9$	$7.86^{+0.75}_{-0.92}$	$463^{+21}_{-28}$	$2944^{+72}_{-76}$	$378^{+122}_{-85}$

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

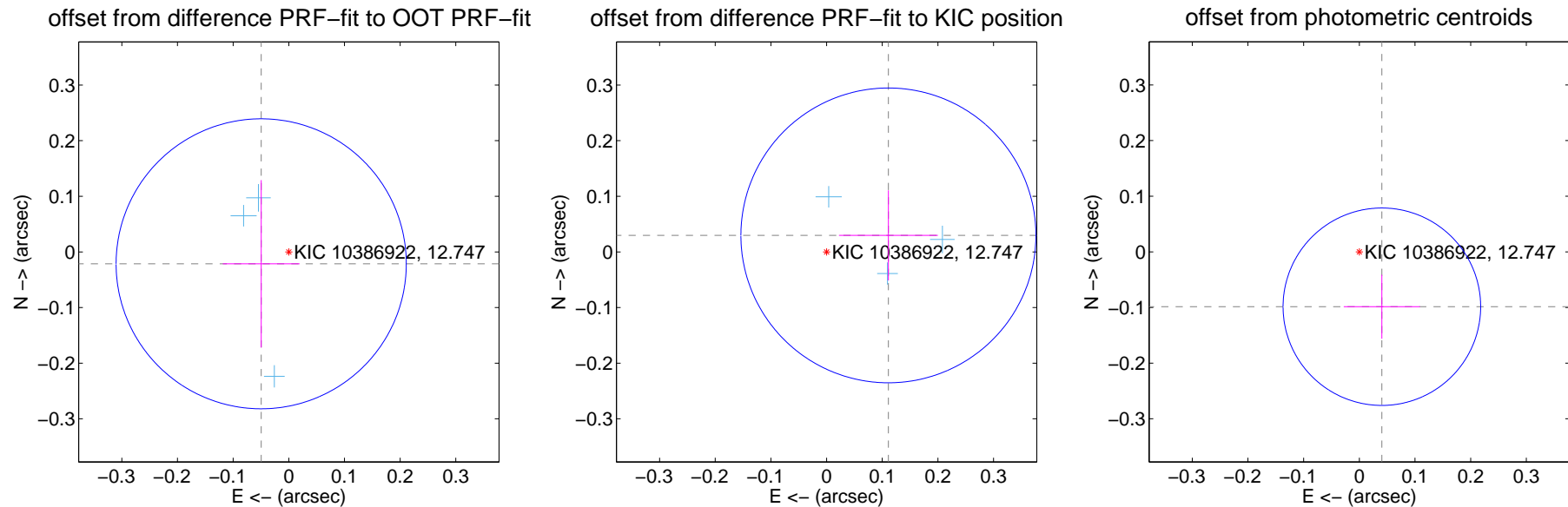
## DV Centroid Data

Supplemental centroid analysis for 010386922-01. Kepler magnitude: 12.75. Transit SNR 155.55

There are 3 quarters with good PRF difference image offsets

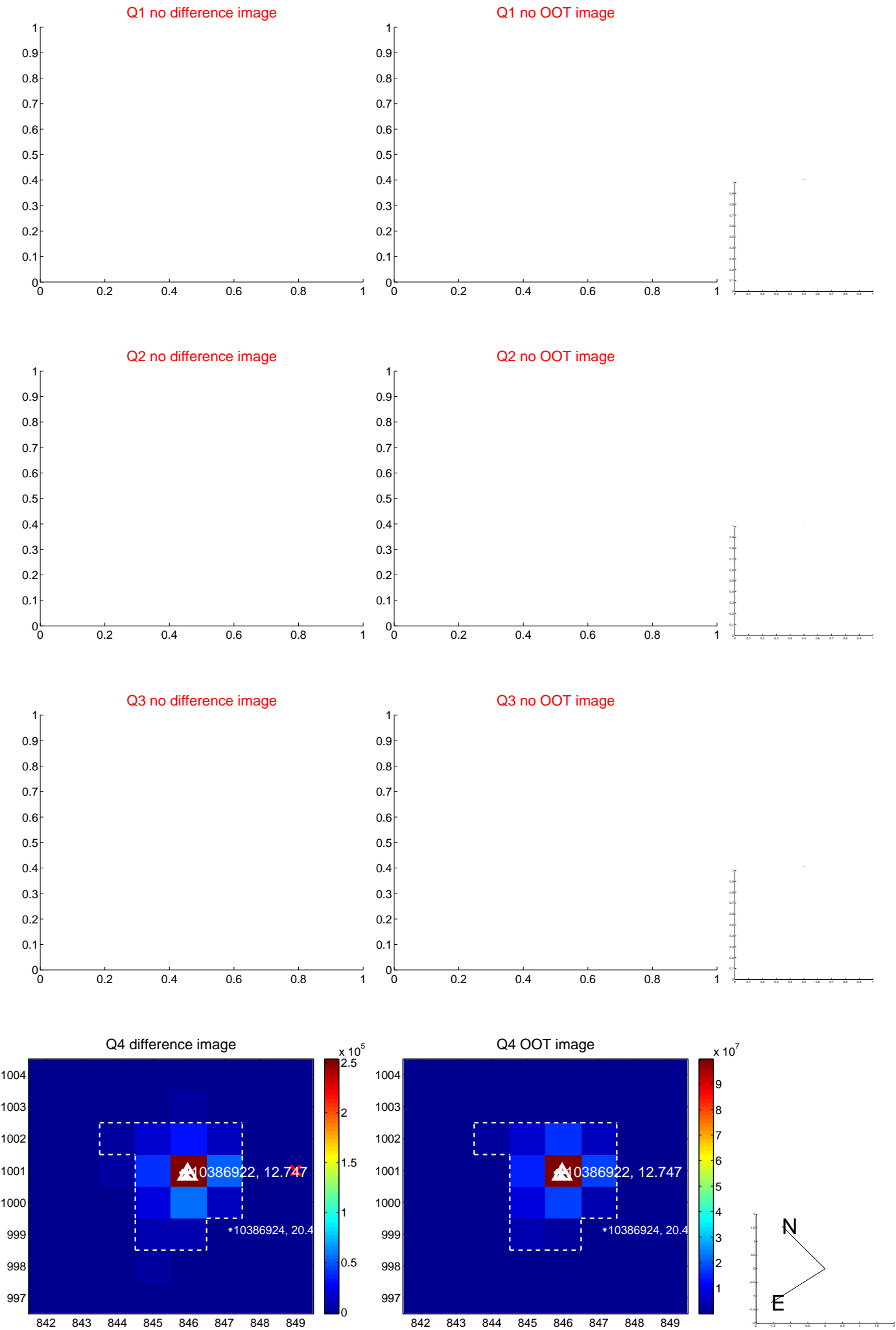
The direct PRF centroid is offset from the target star catalog position by about 0.27 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.054 \pm 0.087$	0.62	$0.050 \pm 0.069$	$-0.021 \pm 0.151$
PRF-fit source offset from KIC position	$0.115 \pm 0.088$	1.30	$-0.111 \pm 0.089$	$0.030 \pm 0.081$
photometric centroid source offset	$0.11 \pm 0.06$	1.80	$-0.04 \pm 0.07$	$-0.10 \pm 0.06$



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



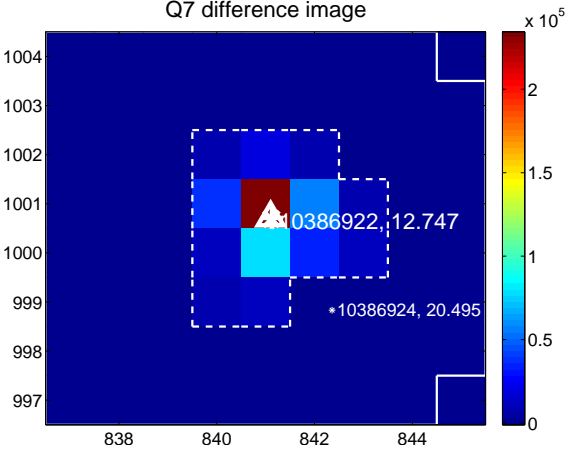
Q6 no difference image



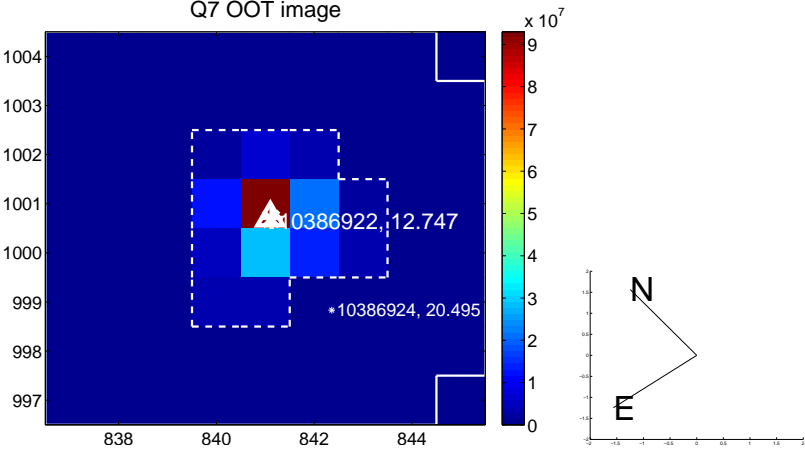
Q6 no OOT image



Q7 difference image



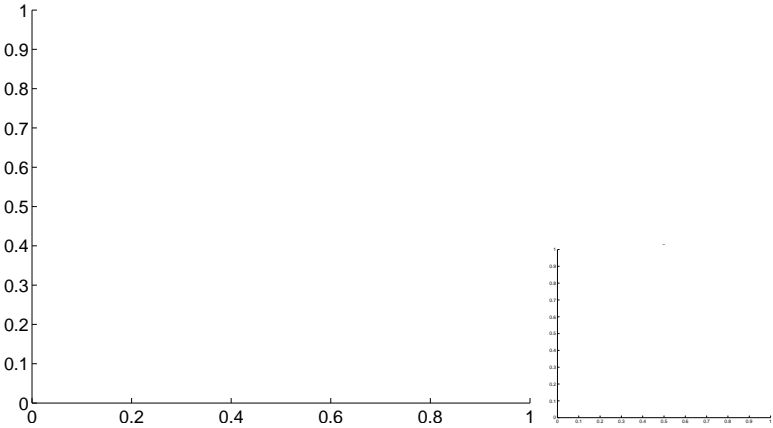
Q7 OOT image



Q8 no difference image



Q8 no OOT image



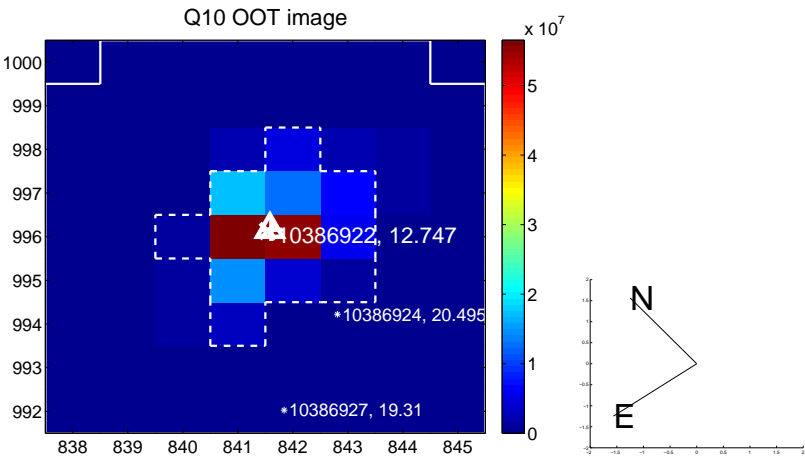
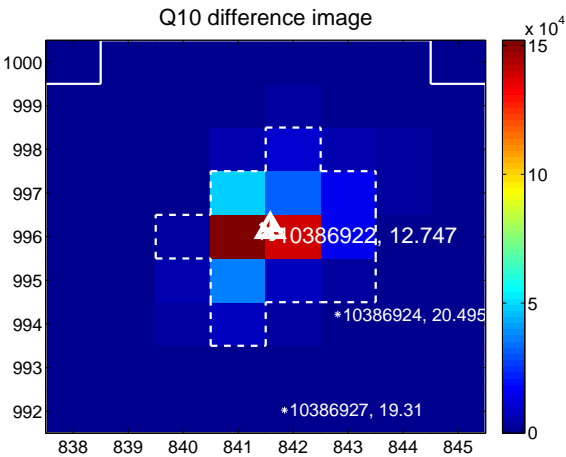


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

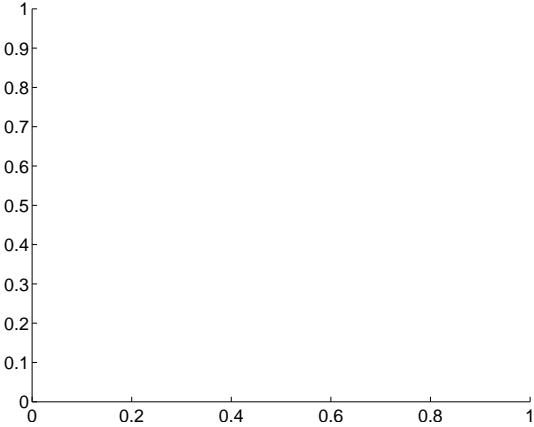
Q9 no difference image



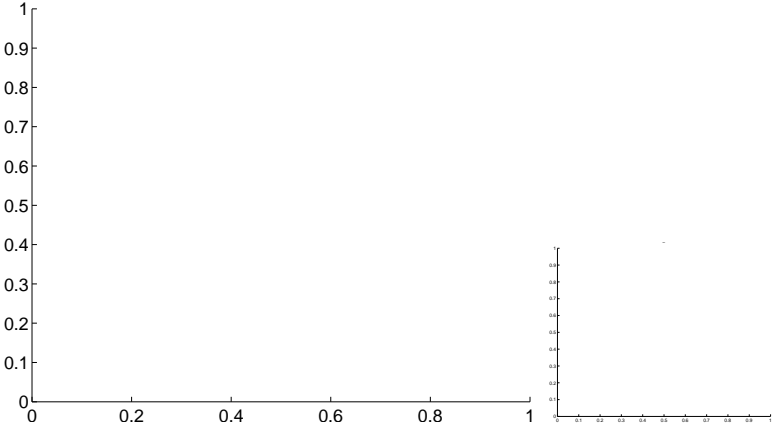
Q9 no OOT image



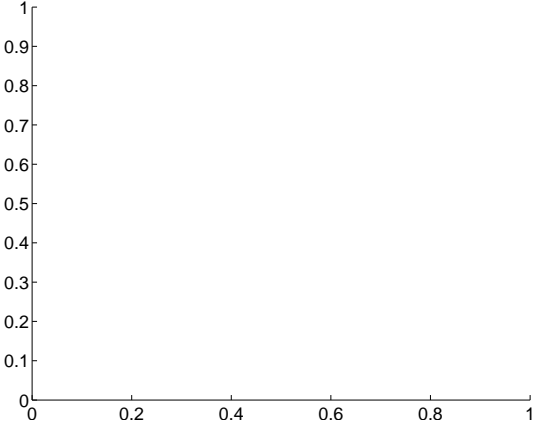
Q11 no difference image



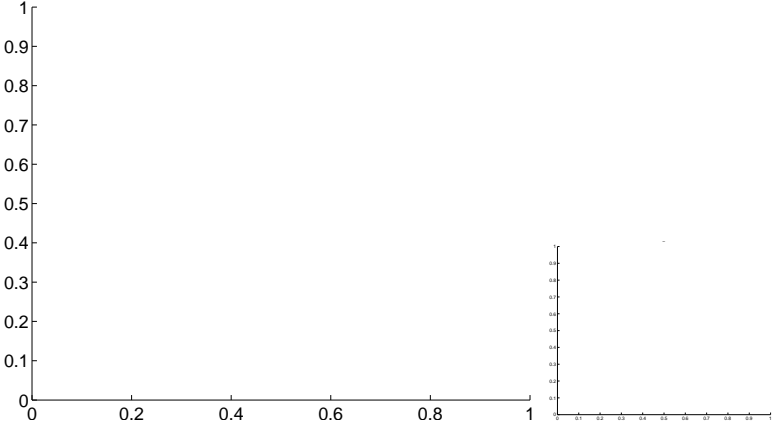
Q11 no OOT image



Q12 no difference image



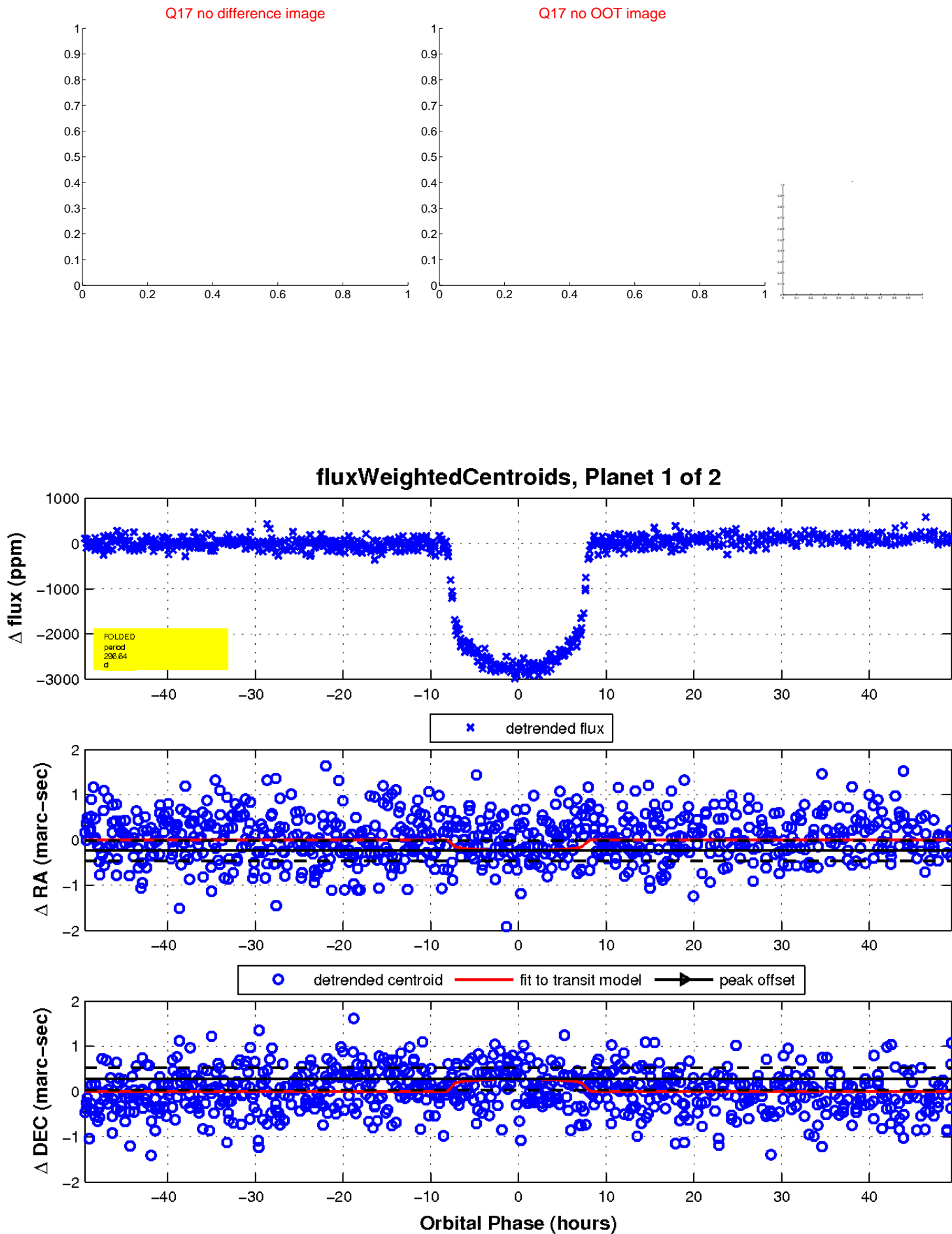
Q12 no OOT image



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

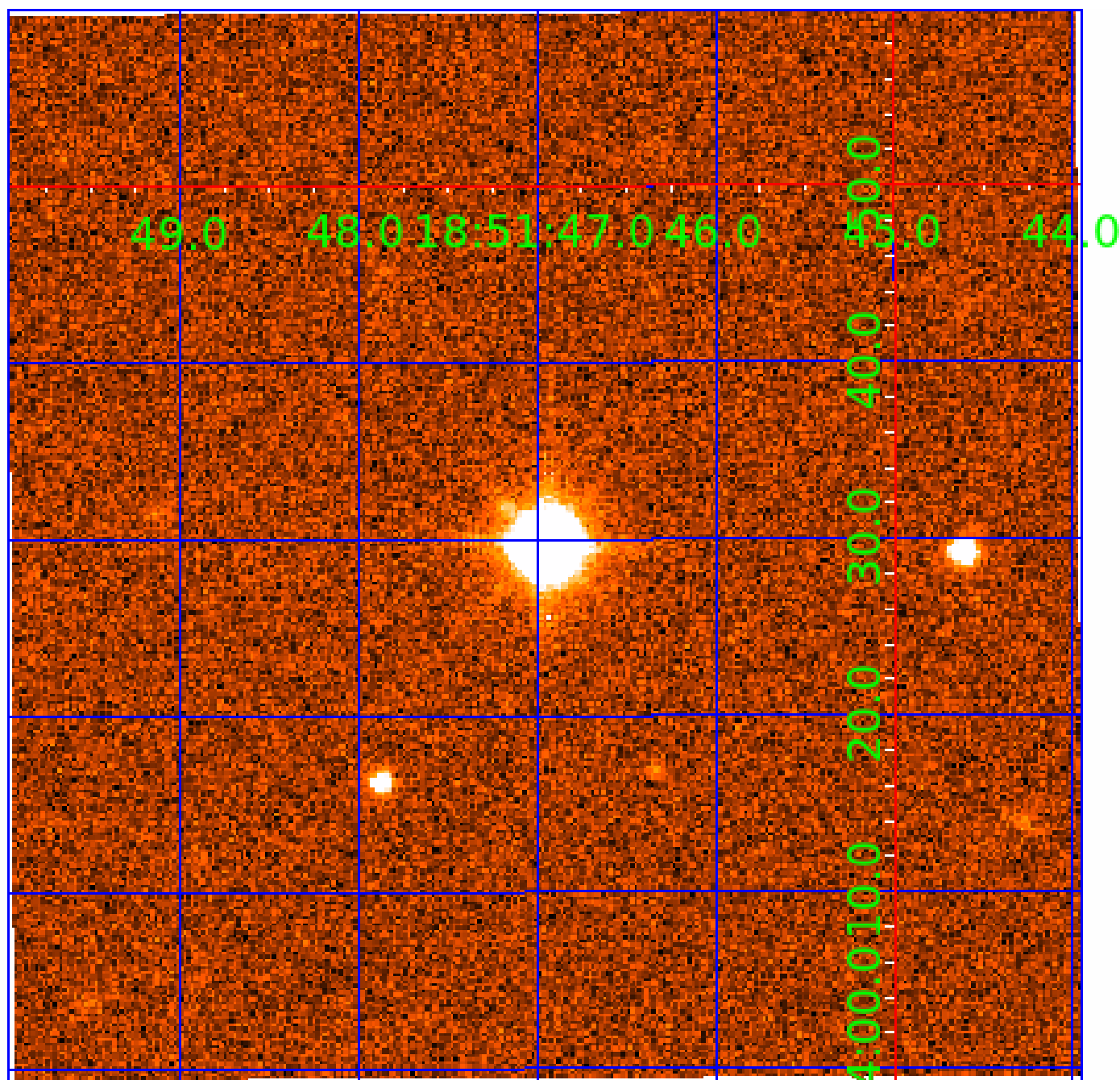


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 010386922

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010386922-01	OBS	0289.02	296.637498	403.672312	2769.4	16.477	149.9	155.6	1.42	5866	7.63	2.89
010386922-02	OBS	0289.01	26.629451	138.736381	490.5	8.052	76.5	76.1	1.42	5866	3.41	71.89

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010386922-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
010386922-02	OBS	PC	1.00	0	0	0	0	NO_COMMENT

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

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

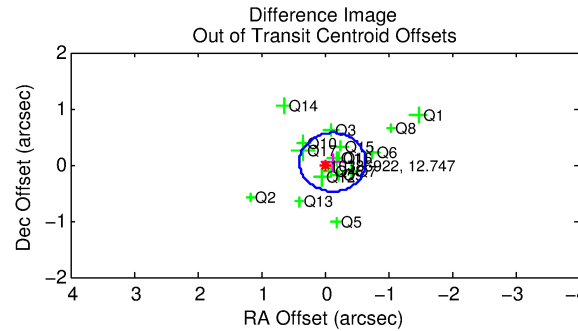
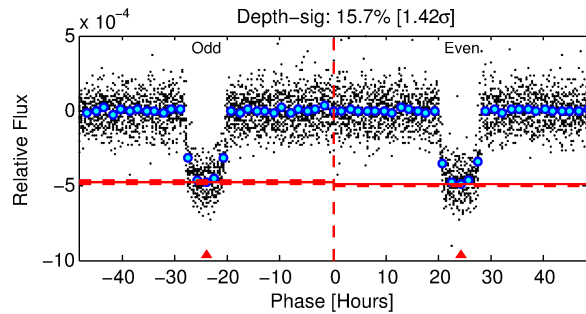
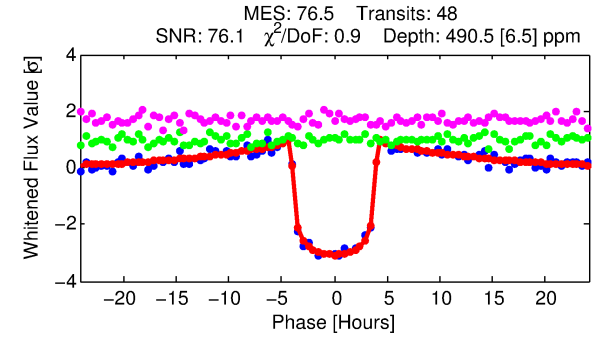
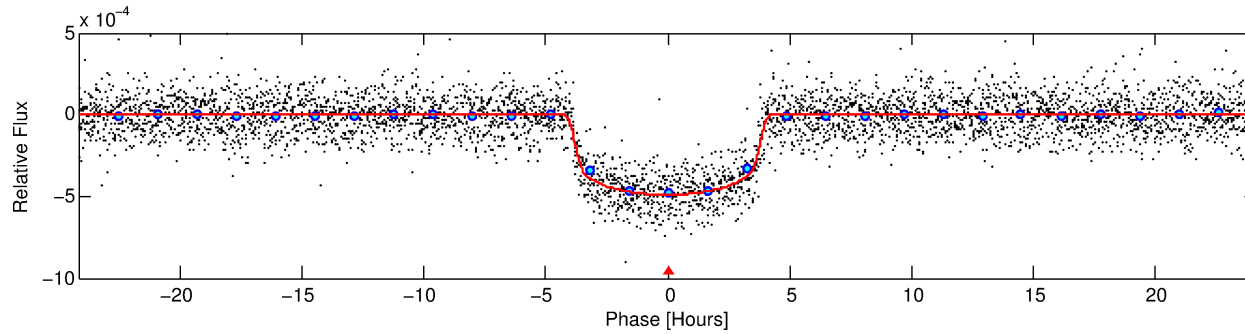
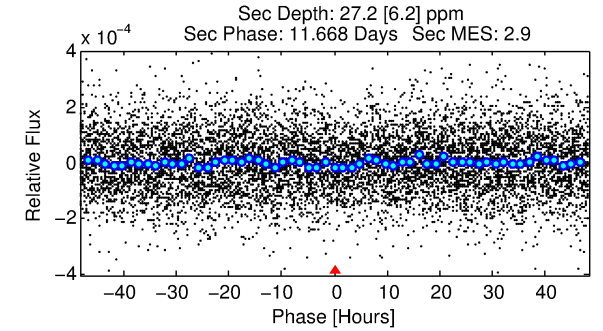
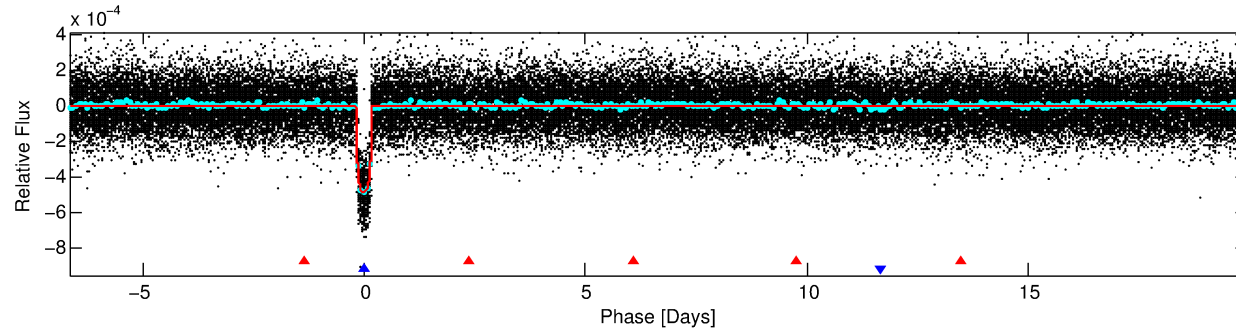
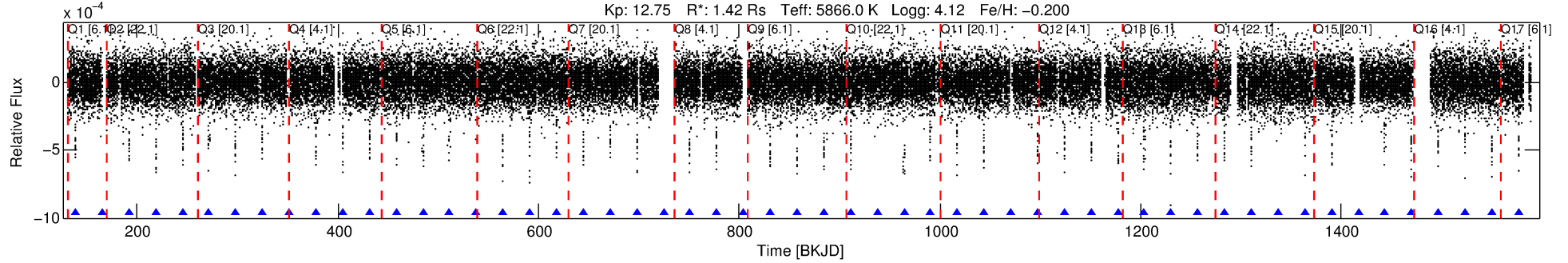
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 010386922-02

No Significant Match Found

# DV One-Page Summary

KIC: 10386922 Candidate: 2 of 2 Period: 26.629 d  
KOI: K00289.01 Corr: 0.986



## DV Fit Results:

Period = 26.62945 [0.00005] d  
Epoch = 138.7364 [0.0015] BKJD  
Rp/R\* = 0.0221 [0.0010]  
a/R\* = 17.47 [3.70]  
b = 0.75 [0.12]  
Seff = 71.89 [24.36]  
Teq = 743 [63] K  
Rp = 3.41 [0.74] Re  
a = 0.1721 [0.0355] AU  
Ag = 38.05 [15.73] [2.36σ]  
Teffp = 2851 [184] K [10.87σ]

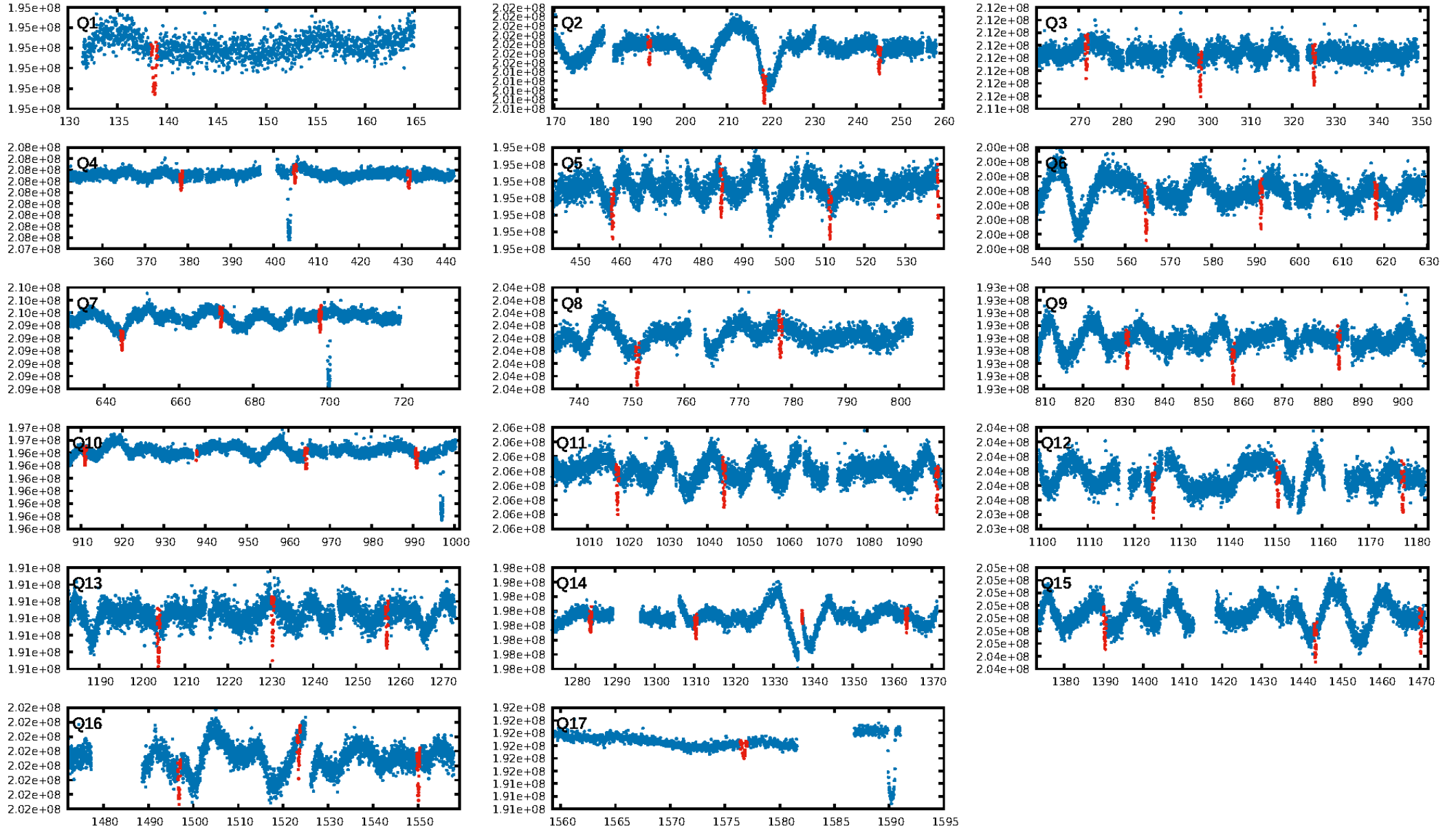
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [353.34σ]  
ModelChiSquare2-sig: 19.8%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [46/46]  
GhostDiagnostic-chr: 4.756  
Centroid-sig: 86.2%  
Centroid-so: 0.098 arcsec [0.67σ]  
OotOffset-rm: 0.129 arcsec [0.74σ]  
KicOffset-rm: 0.370 arcsec [2.34σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 1.00 [17/17]  
DiffImageOverlap-fno: 1.00 [17/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 00:44:10 Z

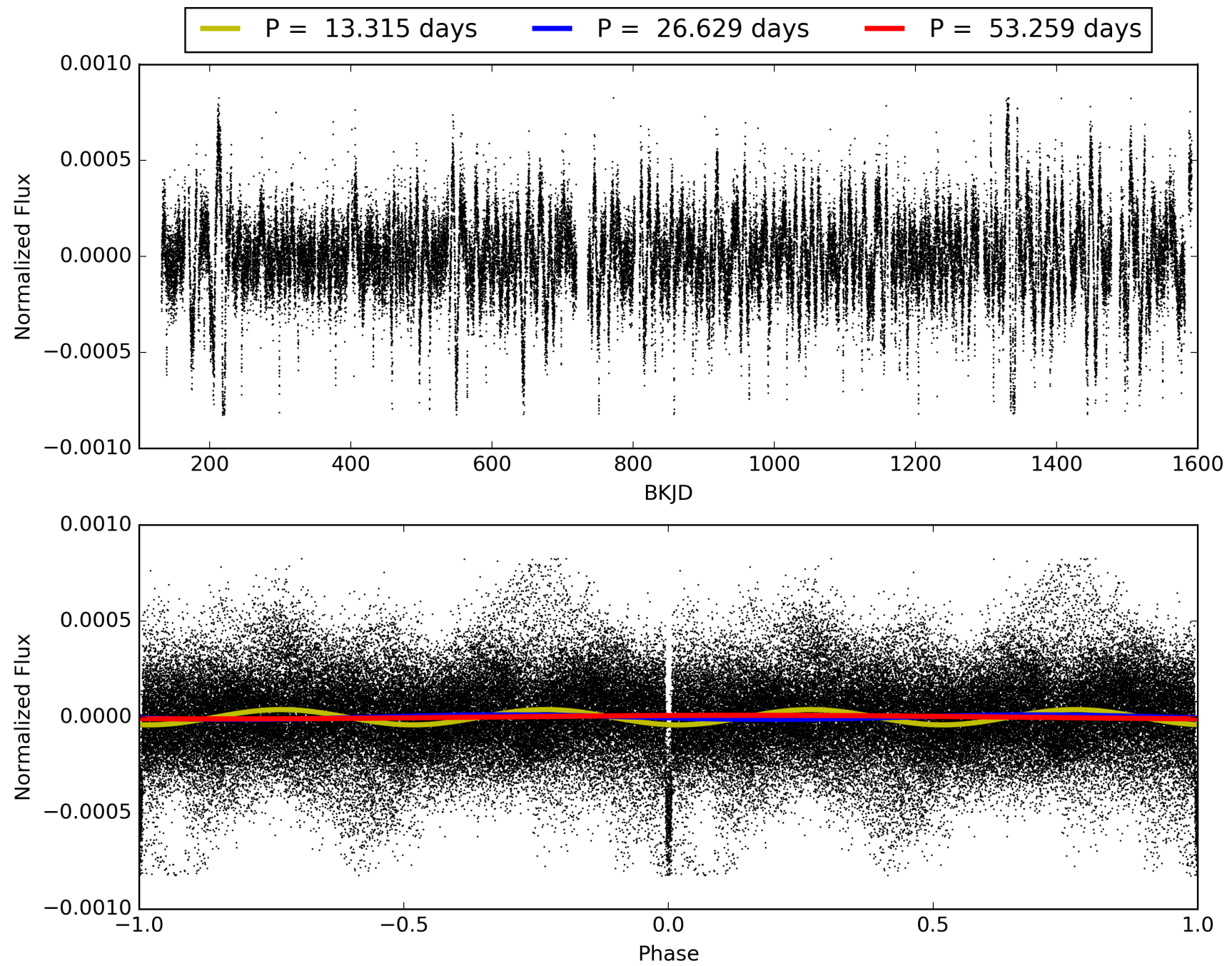
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 010386922-02, PDC Light Curves





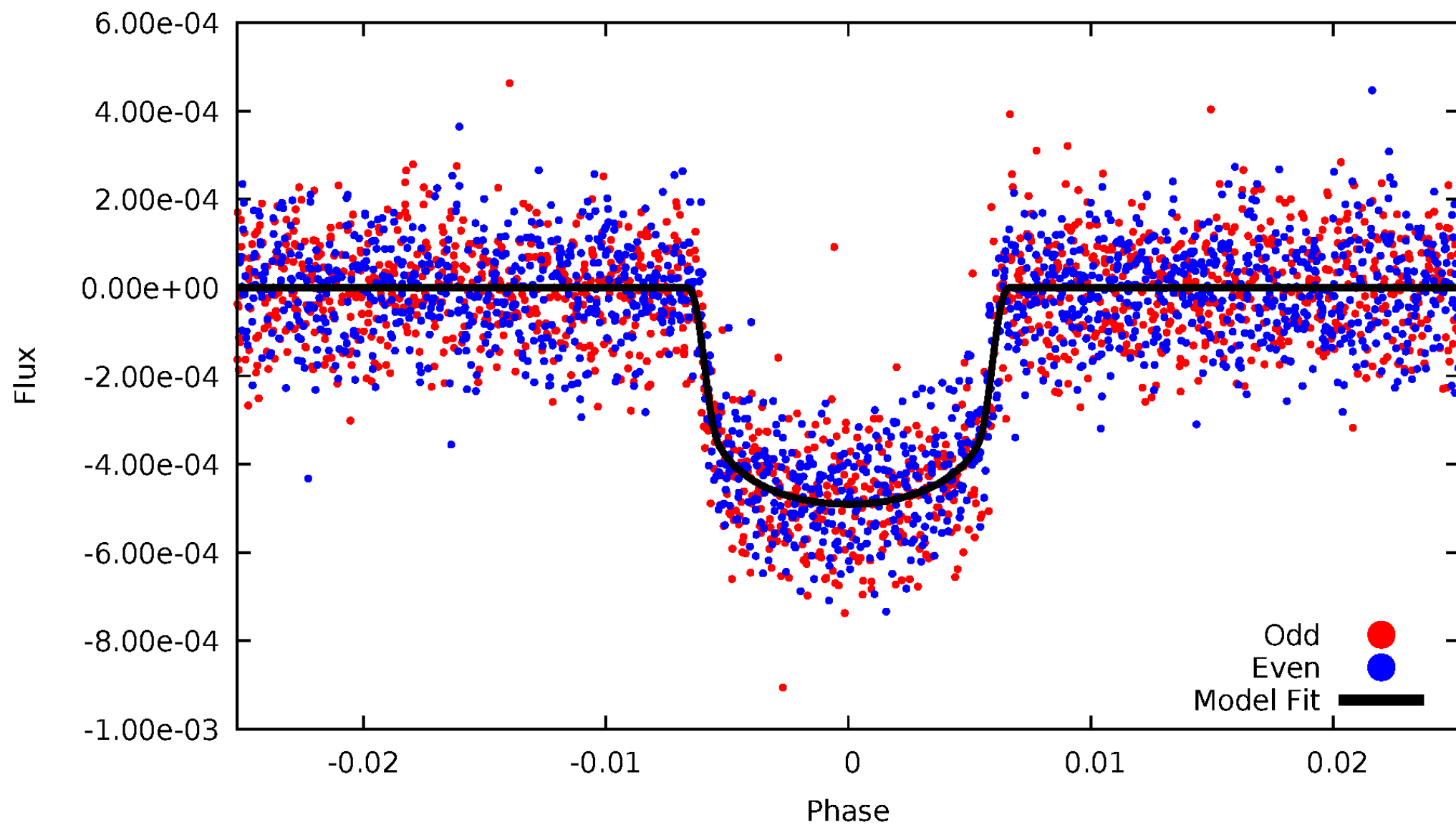
TCE 010386922-02





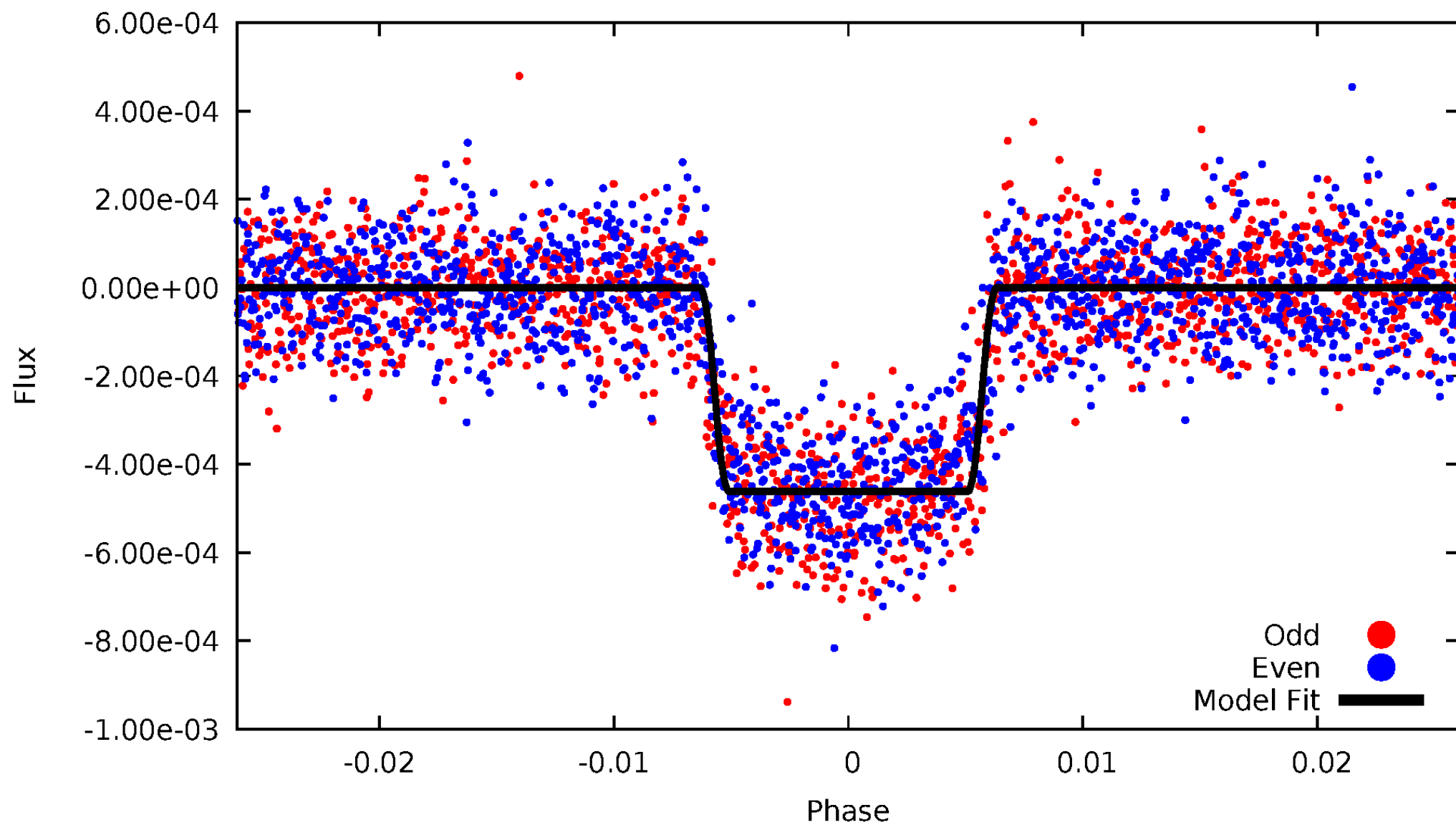
# DV Odd/Even

TCE 010386922-02



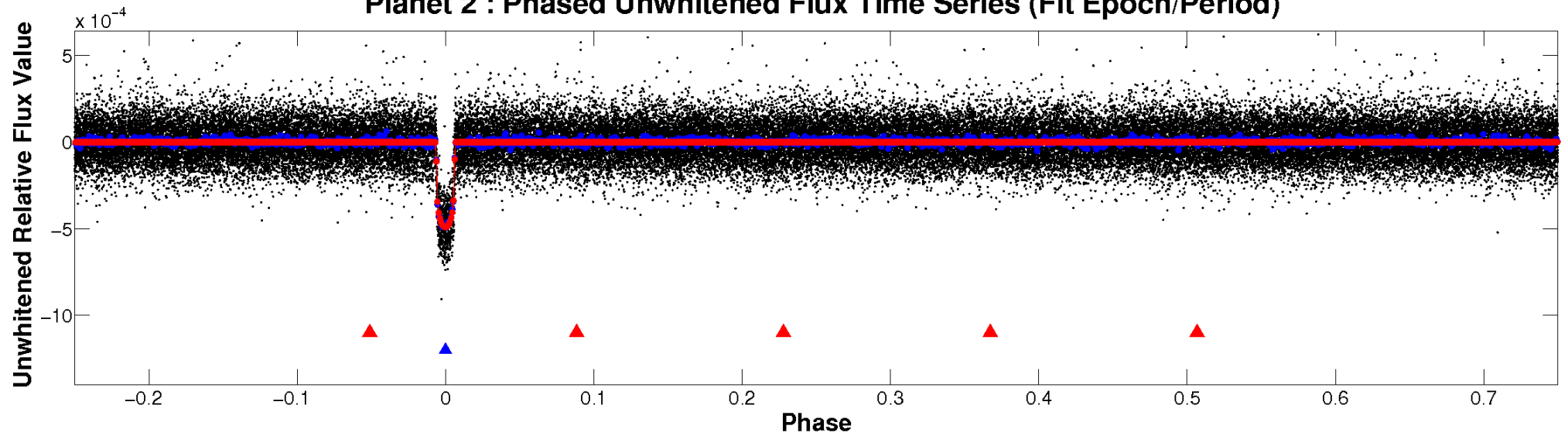
# ALT Odd/Even

TCE 010386922-02

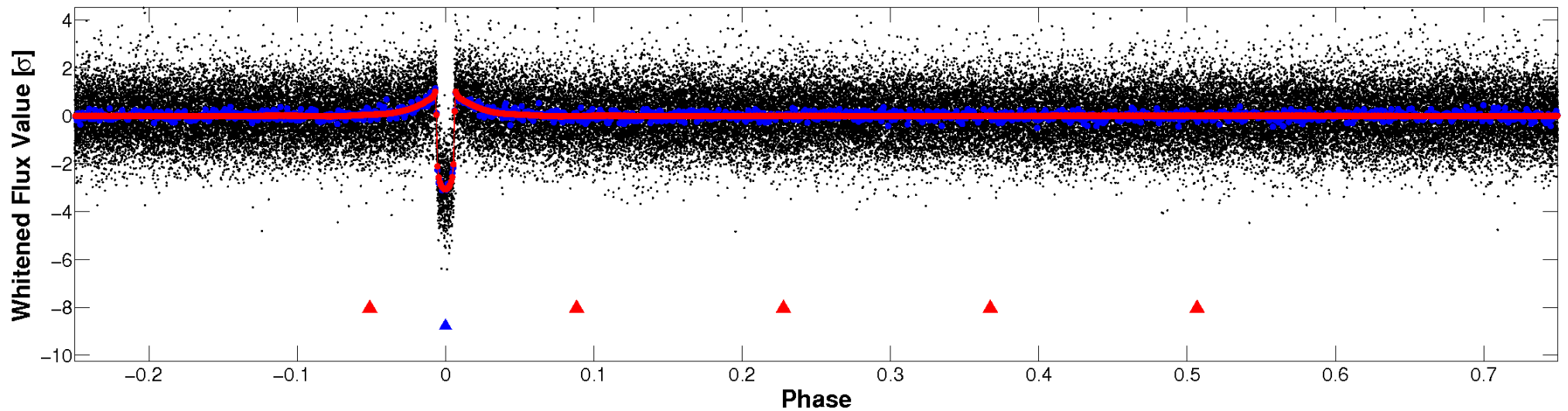


# Non-Whitened Vs. Whitened Light Curve

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

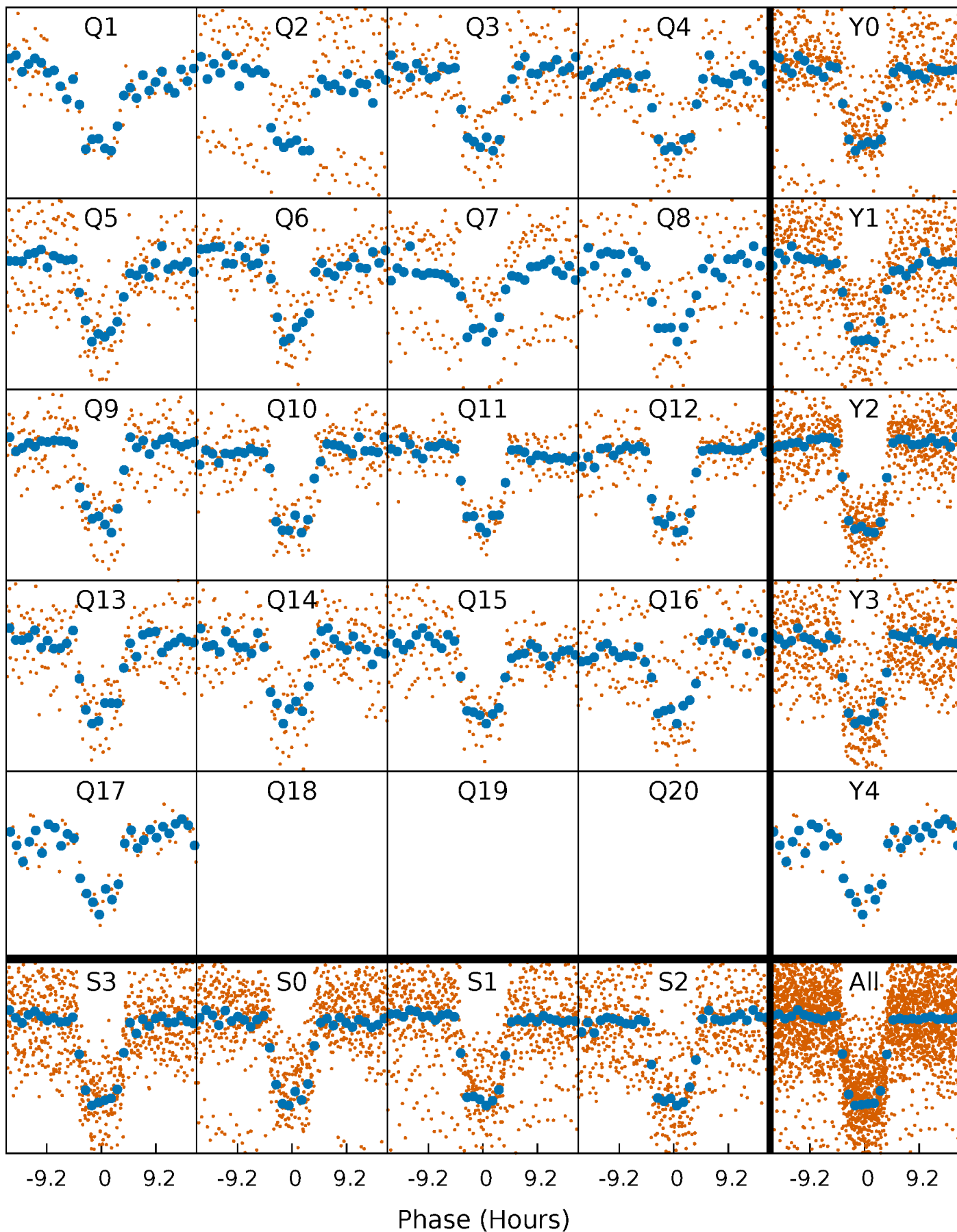


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



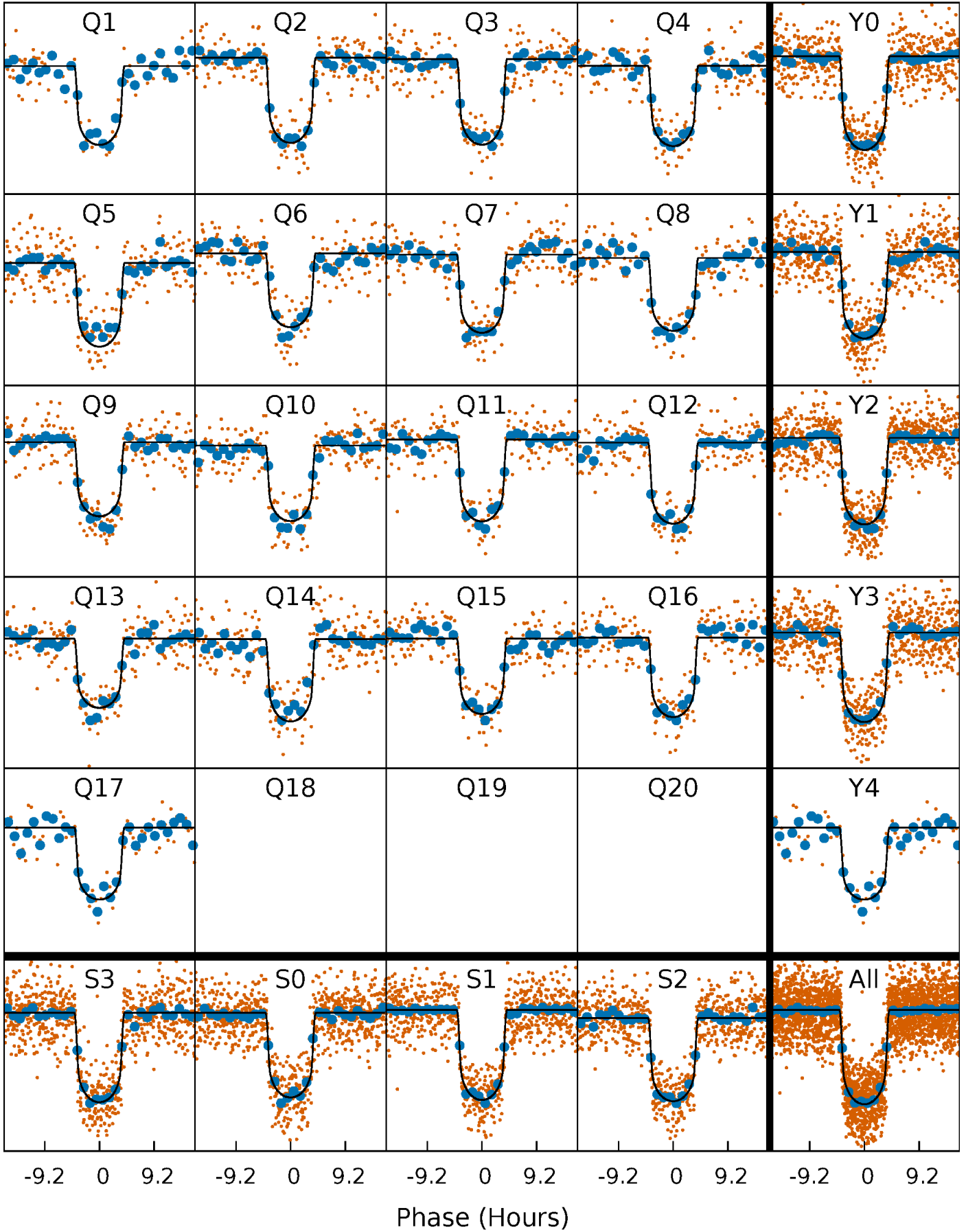
# PDC Quarter-Phased Transit Curves

TCE 010386922-02 P= 26.629451 Days  $T_0=138.736381$  (BKJD)



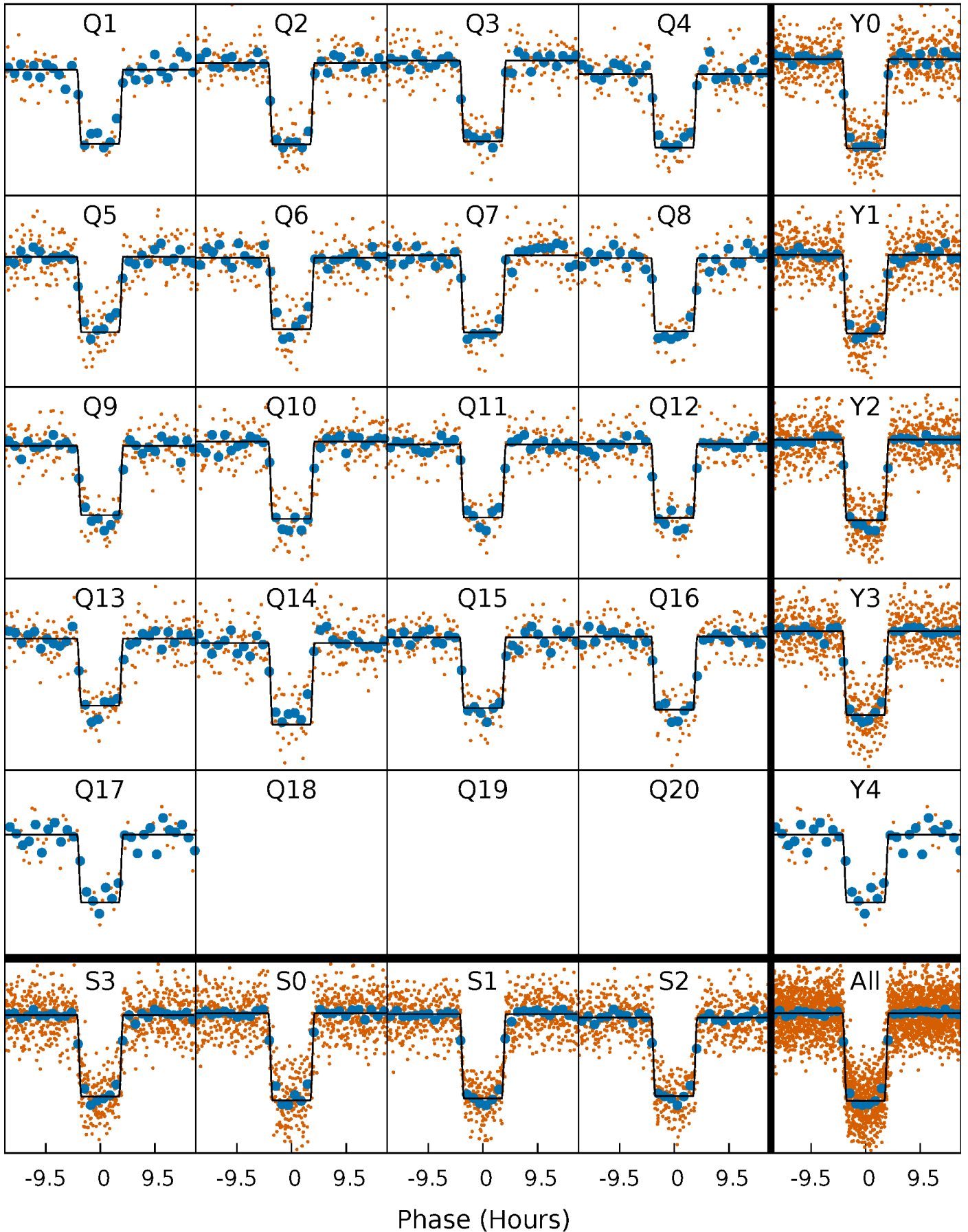
# DV Quarter-Phased Transit Curves

TCE 010386922-02   P= 26.629451 Days    $T_0=138.736381$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 010386922-02   P= 26.629246 Days    $T_0=138.741795$  (BKJD)

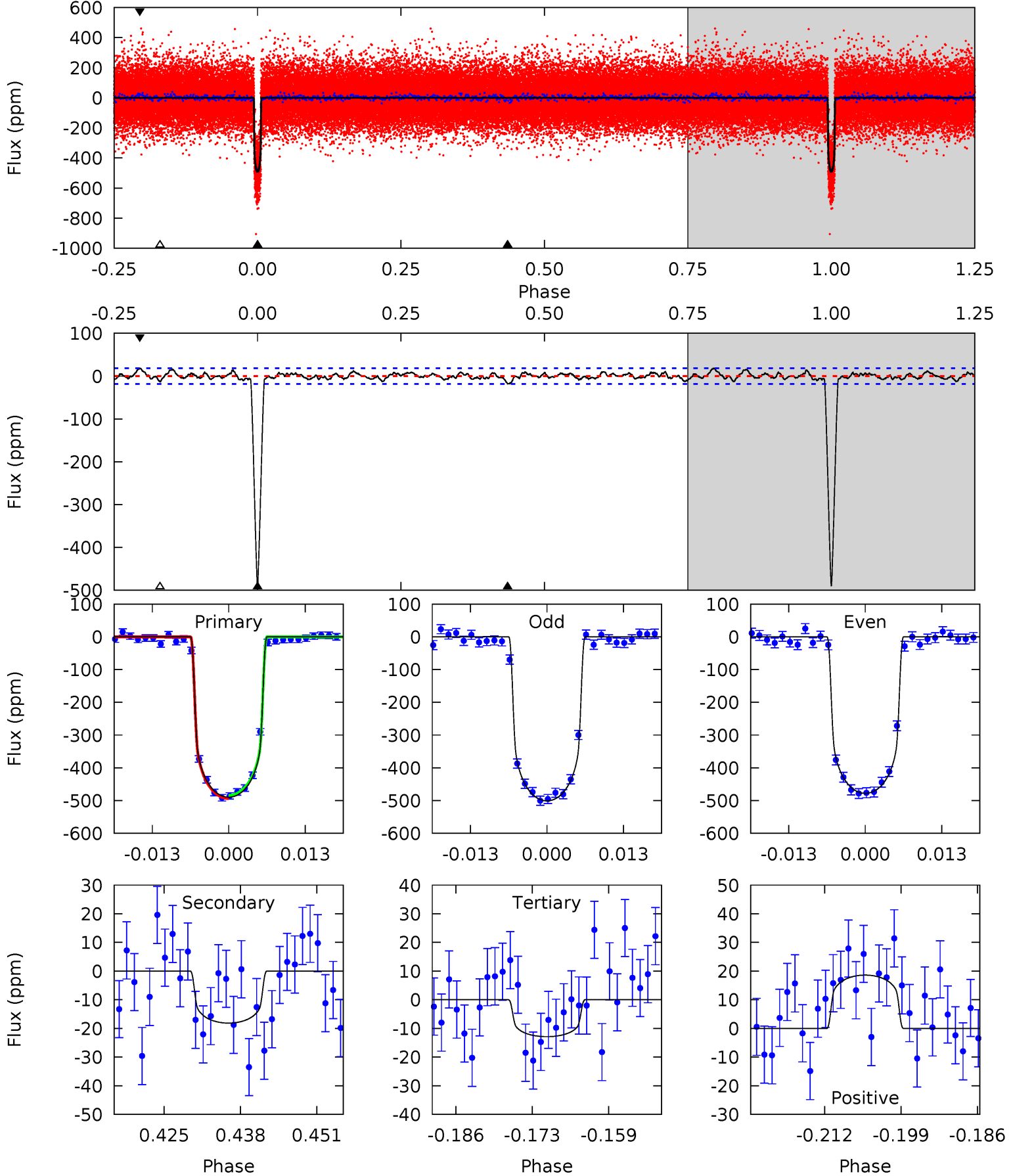




# DV Model-Shift Uniqueness Test

010386922-02,  $P = 26.629451$  Days,  $E = 112.106930$  Days

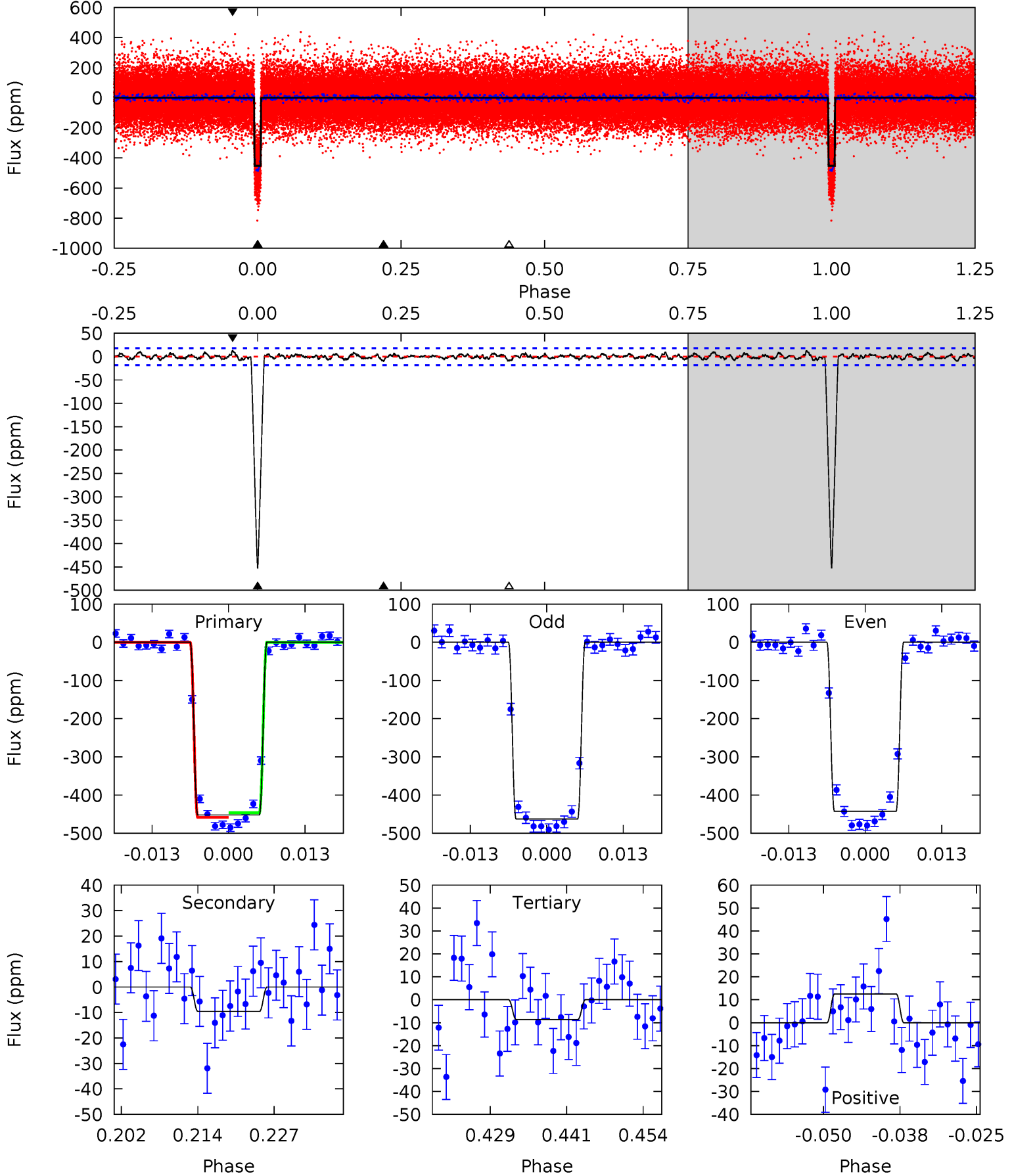
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
132.1	4.89	3.47	5.02	4.97	2.48	1.47	128.6	127.0	1.42	-0.12	3.09	0.96	0.04	1.25



# Alt Model-Shift Uniqueness Test

010386922-02, P = 26.629246 Days, E = 112.112549 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
124.0	2.62	2.36	3.43	4.98	2.49	0.96	121.6	120.5	0.27	-0.81	2.73	0.98	0.03	1.63





### Stellar Parameters For KIC 010386922

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5866^{+105}_{-105}$	$4.117^{+0.195}_{-0.105}$	$-0.200^{+0.150}_{-0.150}$	$1.417^{+0.219}_{-0.301}$	$0.958^{+0.083}_{-0.075}$	$0.474^{+0.484}_{-0.150}$
	+2%/-2%	+5%/-3%	+75%/-75%	+15%/-21%	+9%/-8%	+102%/-32%
Source	SPE59	SPE59	SPE59	DSEP		

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

### Secondary Eclipse Parameters for KIC 010386922-02 / KOI 0289.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-18 \pm 4$	$3.39^{+0.36}_{-0.39}$	$1033^{+49}_{-59}$	$3177^{+103}_{-111}$	$26^{+9}_{-7}$
Alt.	$-10 \pm 4$	$3.30^{+0.36}_{-0.39}$	$1033^{+52}_{-61}$	$2920^{+141}_{-190}$	$15^{+7}_{-6}$

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

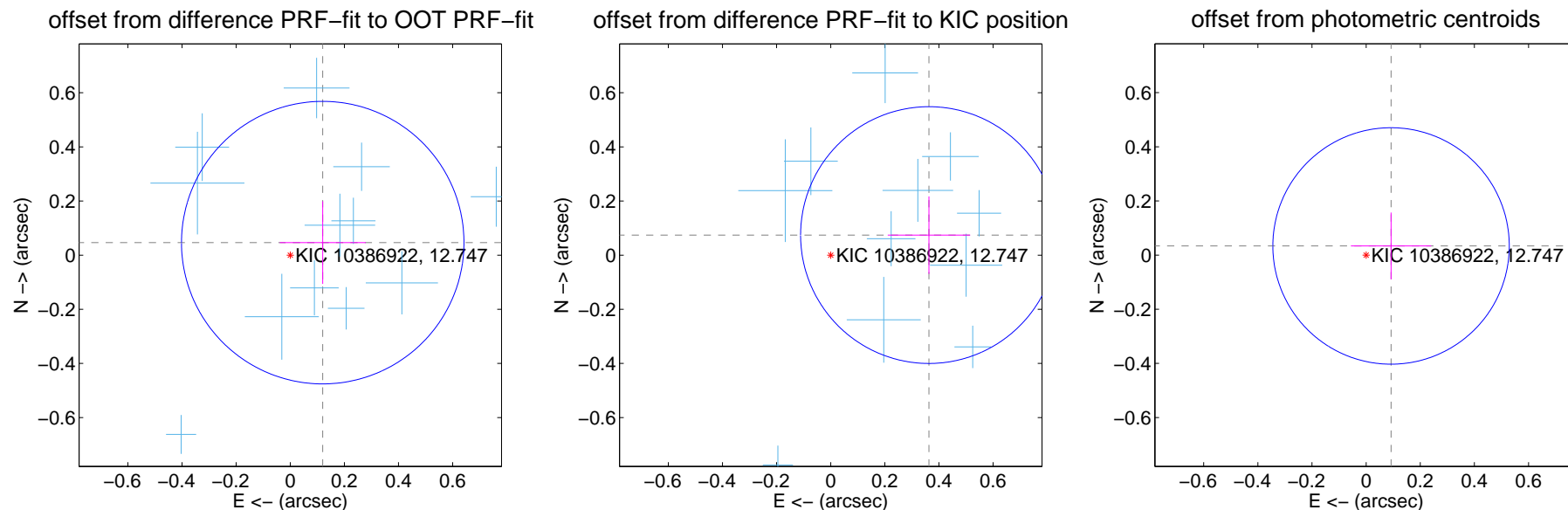
## DV Centroid Data

Supplemental centroid analysis for 010386922-02. Kepler magnitude: 12.75. Transit SNR 76.08

There are 17 quarters with good PRF difference image offsets

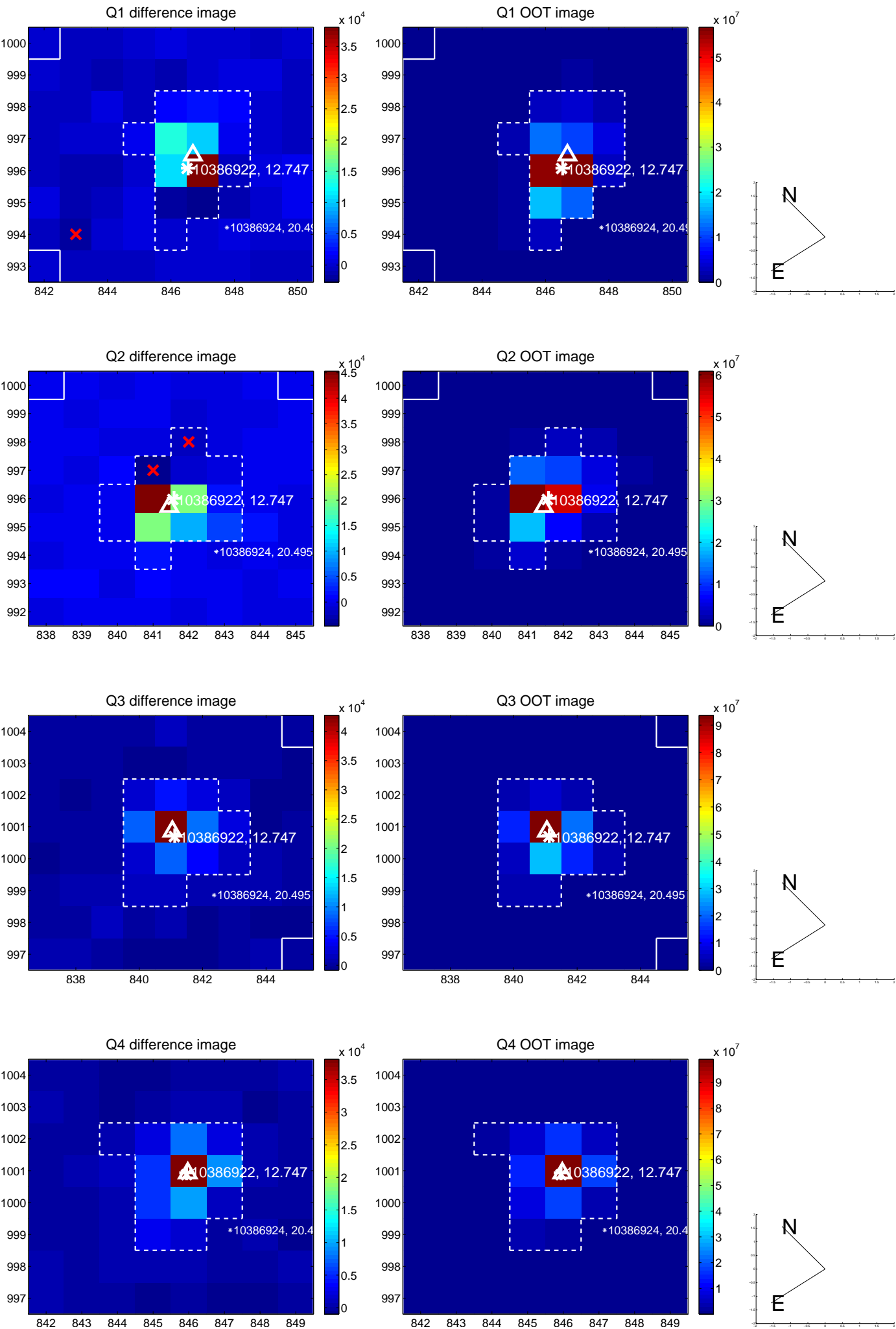
The direct PRF centroid is offset from the target star catalog position by about 0.18 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.129 \pm 0.174$	0.74	$-0.120 \pm 0.159$	$0.046 \pm 0.153$
PRF-fit source offset from KIC position	$0.370 \pm 0.158$	2.34	$-0.363 \pm 0.152$	$0.074 \pm 0.143$
photometric centroid source offset	$0.10 \pm 0.15$	0.67	$-0.09 \pm 0.15$	$0.03 \pm 0.12$

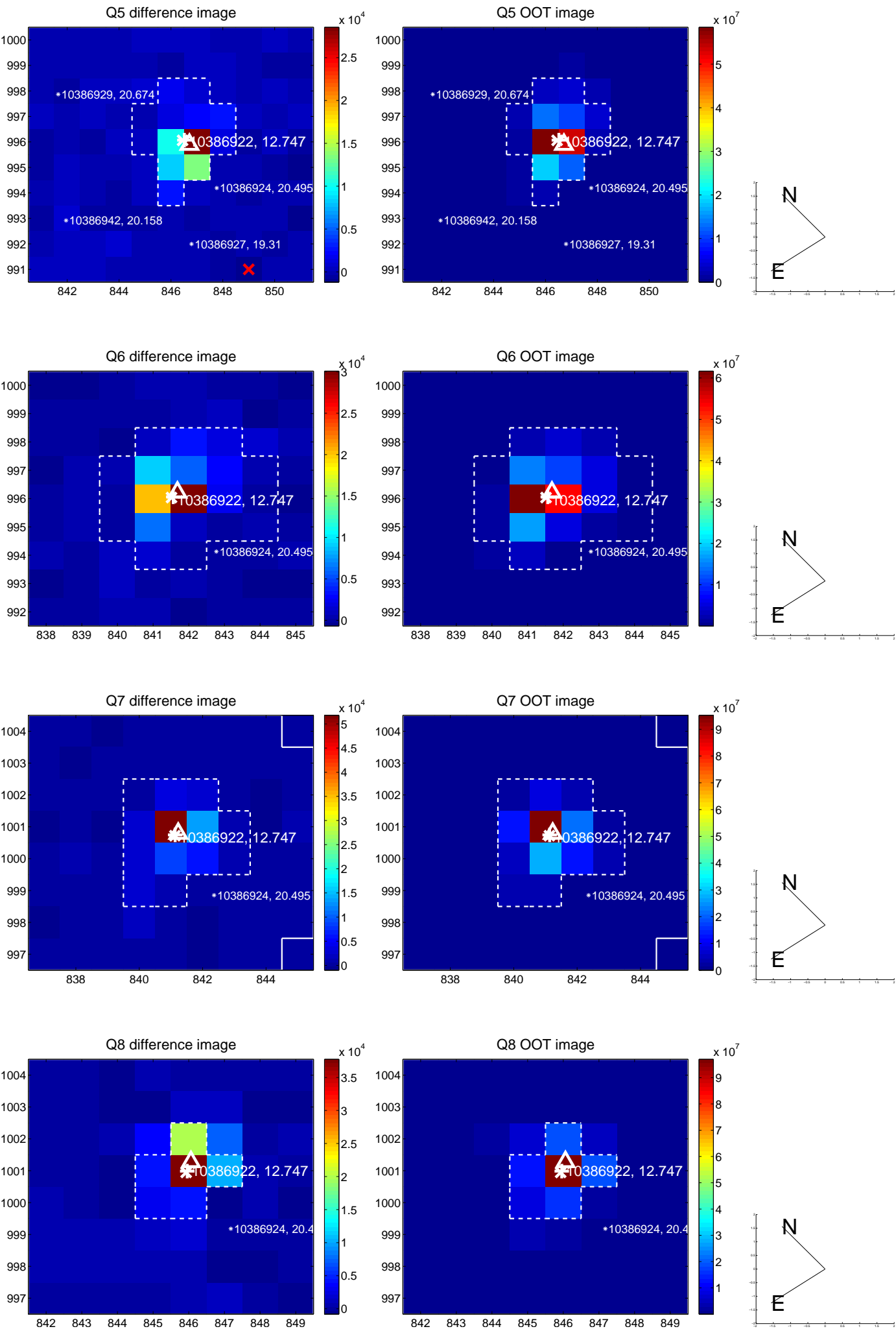


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets**; **Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

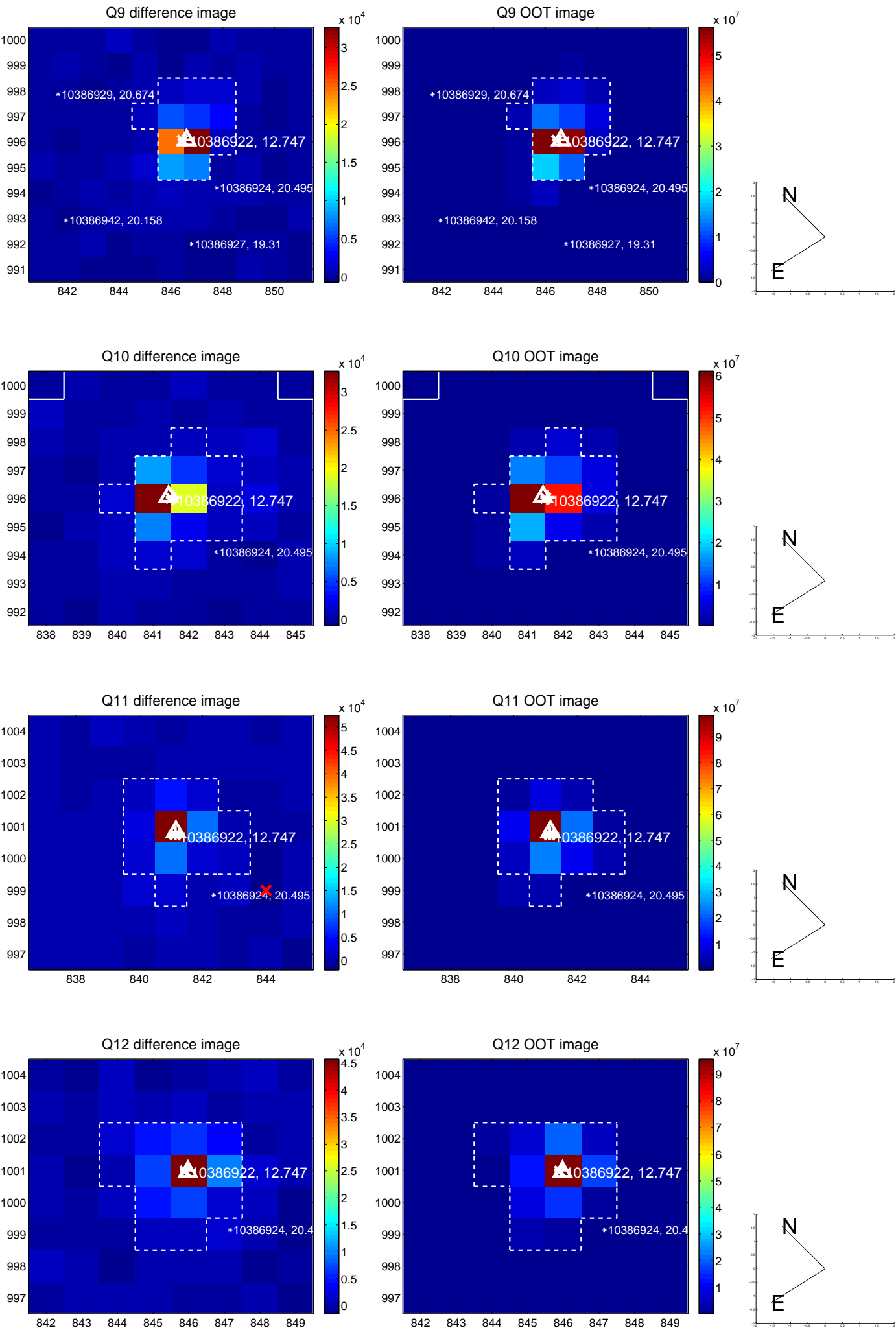
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



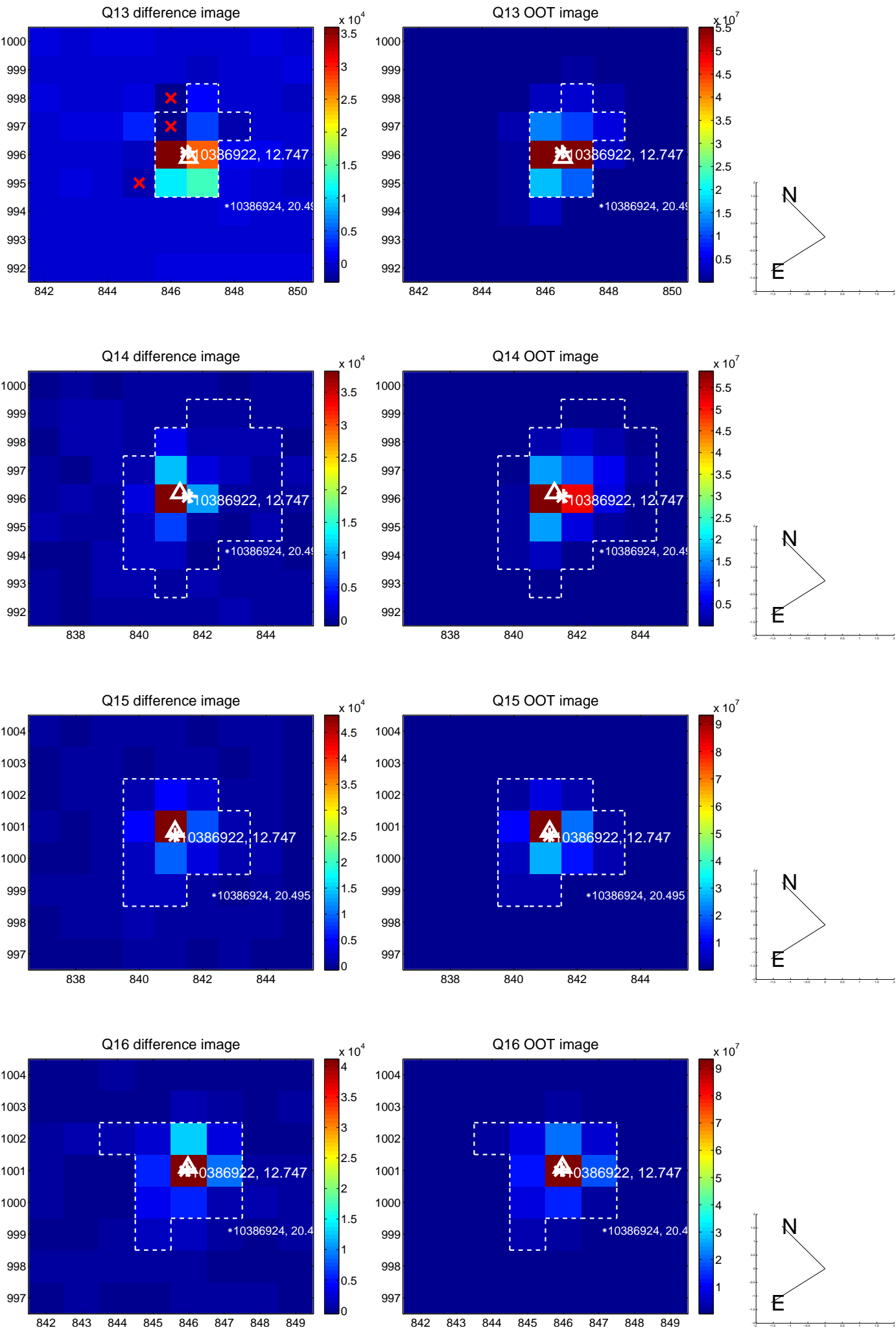
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



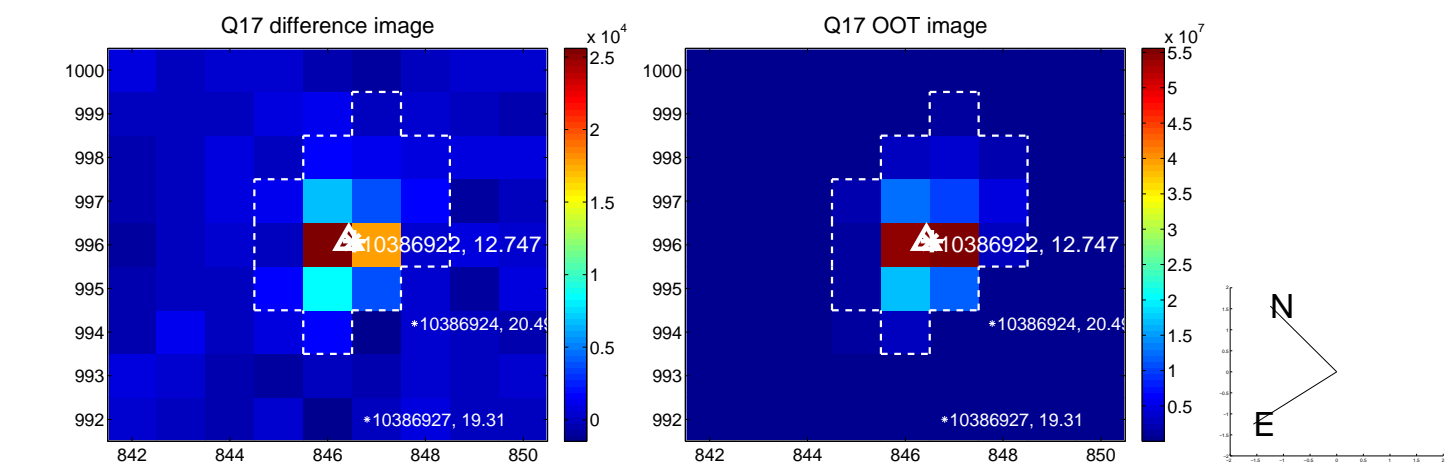
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



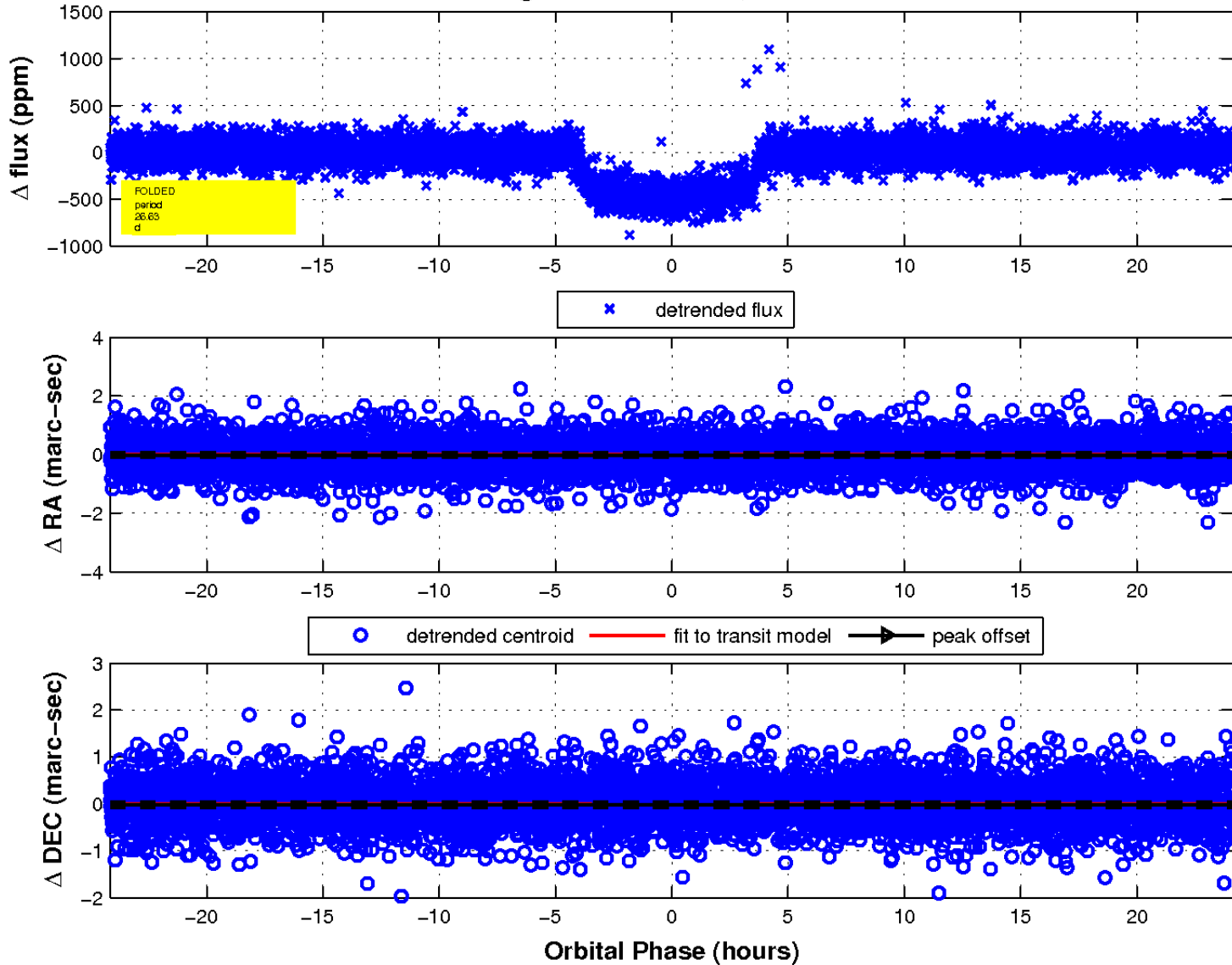
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



### fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

Declination

