

# KIC 006028860

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
006028860-01	OBS	2950.01	0.844027	131.746867	296.2	1.019	29.2	53.6	0.78	5614	1.45	1957.89
006028860-02	OBS	No	0.844029	132.170109	440.5	0.700	40.0	67.2	0.78	5614	1.99	1957.89

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
006028860-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE
006028860-02	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 006028860-01

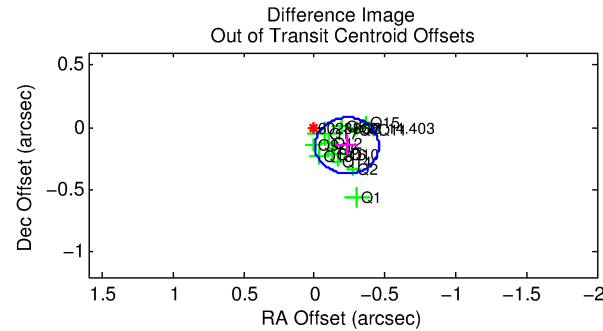
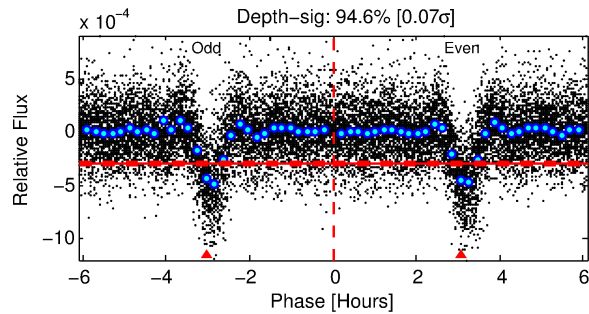
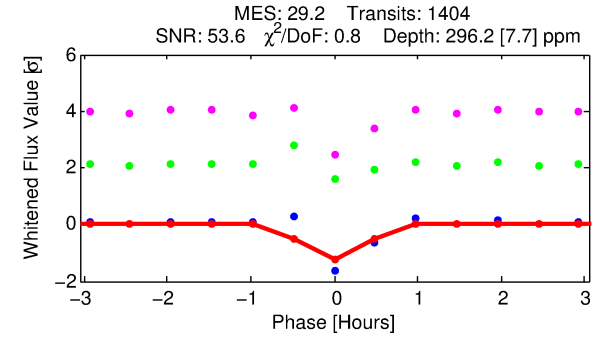
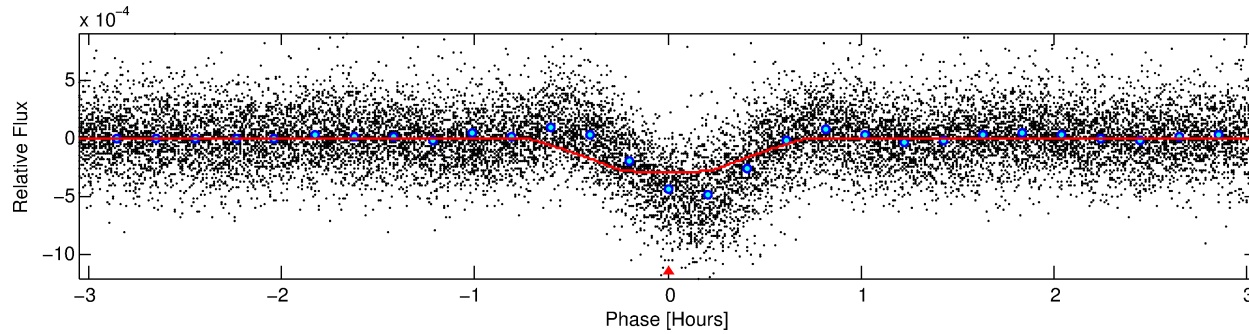
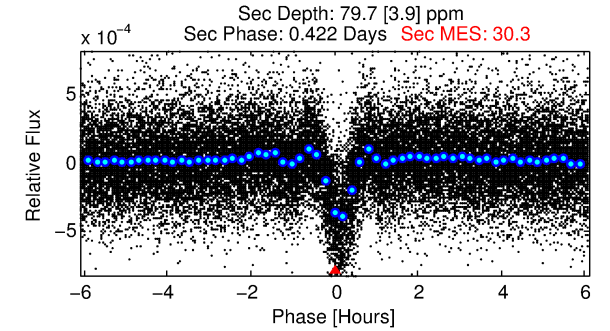
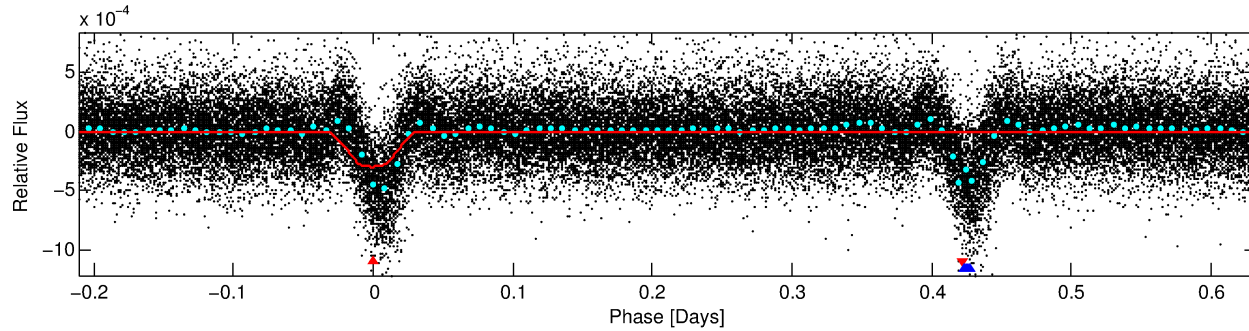
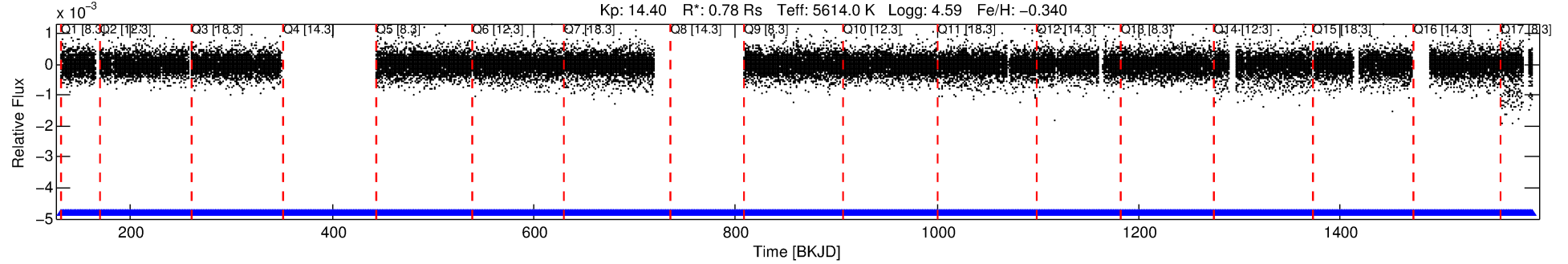
No Significant Match Found

# DV One-Page Summary

KIC: 6028860 Candidate: 1 of 2 Period: 0.844 d

KOI: K02950 Corr: No Ephemeris Match

Kp: 14.40 R\*: 0.78 Rs Teff: 5614.0 K Logg: 4.59 Fe/H: -0.340



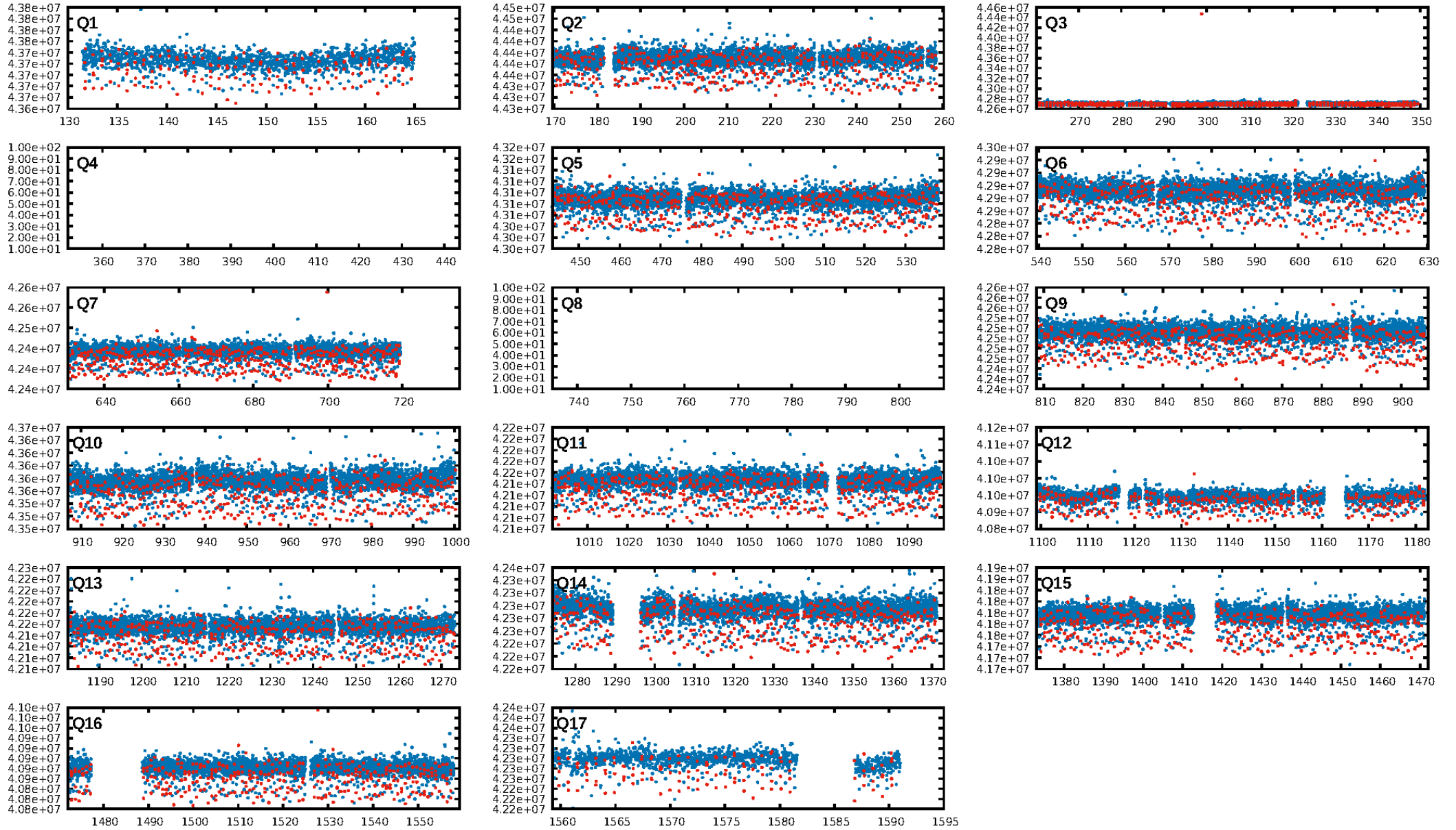
## DV Fit Results:

Period = 0.84403 [0.00000] d  
Epoch = 131.7469 [0.0003] BKJD  
Rp/R\* = 0.0171 [0.0019]  
a/R\* = 4.67 [2.21]  
b = 0.71 [0.35]  
Seff = 1957.90 [589.18]  
Teq = 1696 [128] K  
Rp = 1.45 [0.38] Re  
a = 0.0166 [0.0032] AU  
Ag = 5.75 [2.09] [2.27σ]  
Teffp = 4060 [259] K [8.19σ]

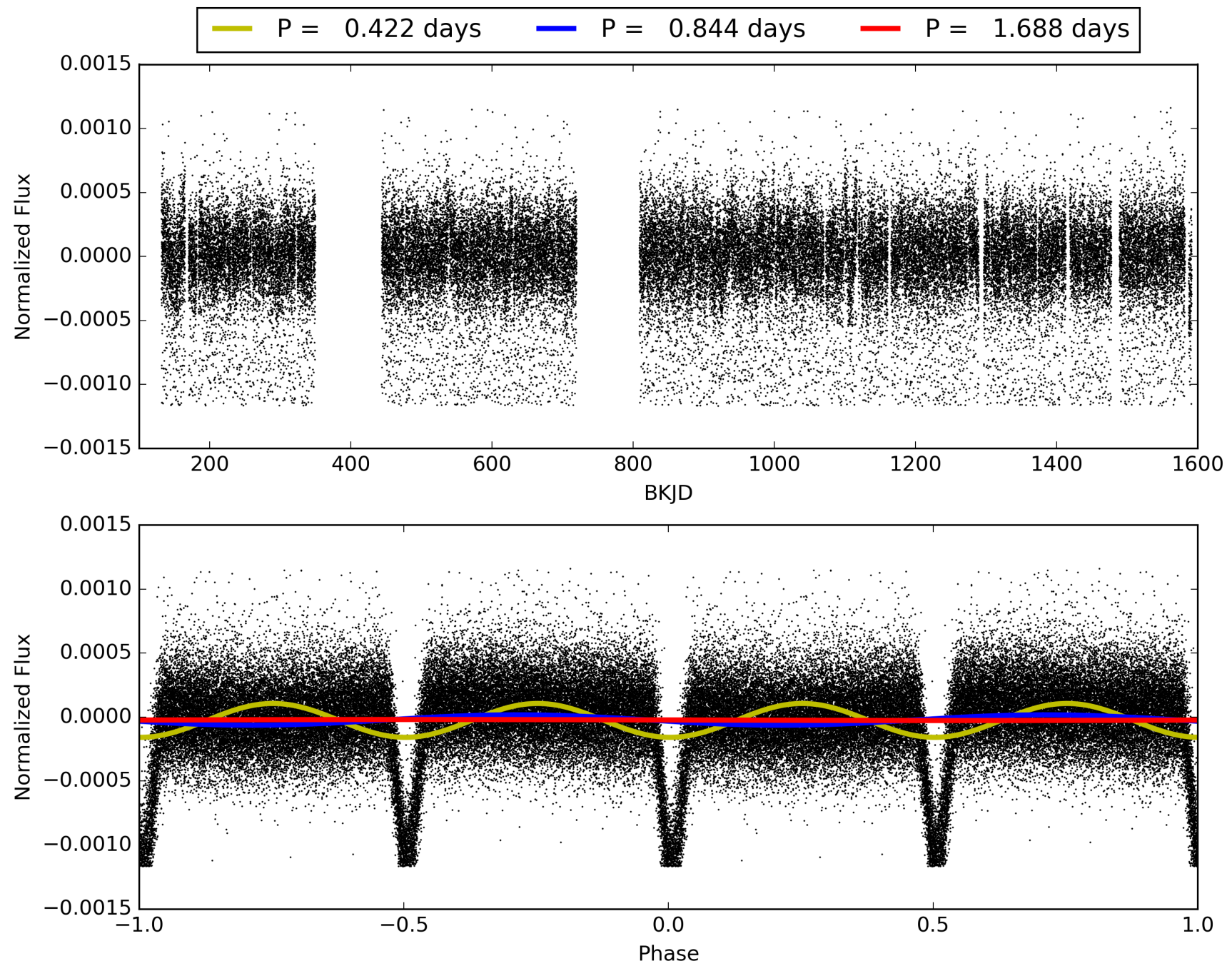
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 1.06e-189  
RollingBand-fgt: 1.00 [1333/1333]  
GhostDiagnostic-chr: 2.183  
Centroid-sig: 0.0%  
Centroid-so: 0.884 arcsec [3.75σ]  
OotOffset-rm: 0.272 arcsec [3.63σ]  
KicOffset-rm: 0.349 arcsec [4.72σ]  
OotOffset-st: 4/4/2/5 [15]  
KicOffset-st: 4/4/2/5 [15]  
DiffImageQuality-fgm: 1.00 [15/15]  
DiffImageOverlap-fno: 1.00 [15/15]

# TCE 006028860-01, PDC Light Curves

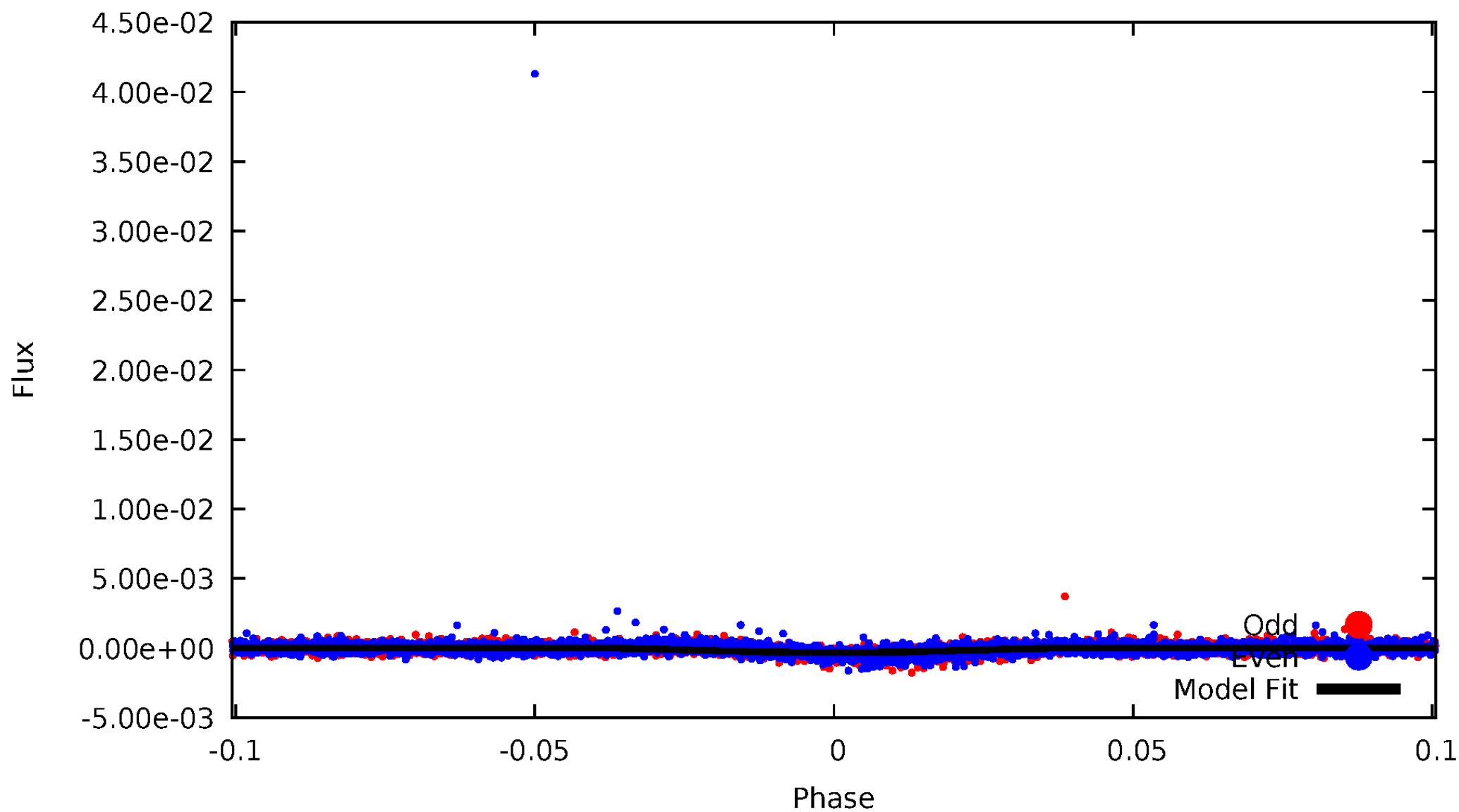


TCE 006028860-01



# DV Odd/Even

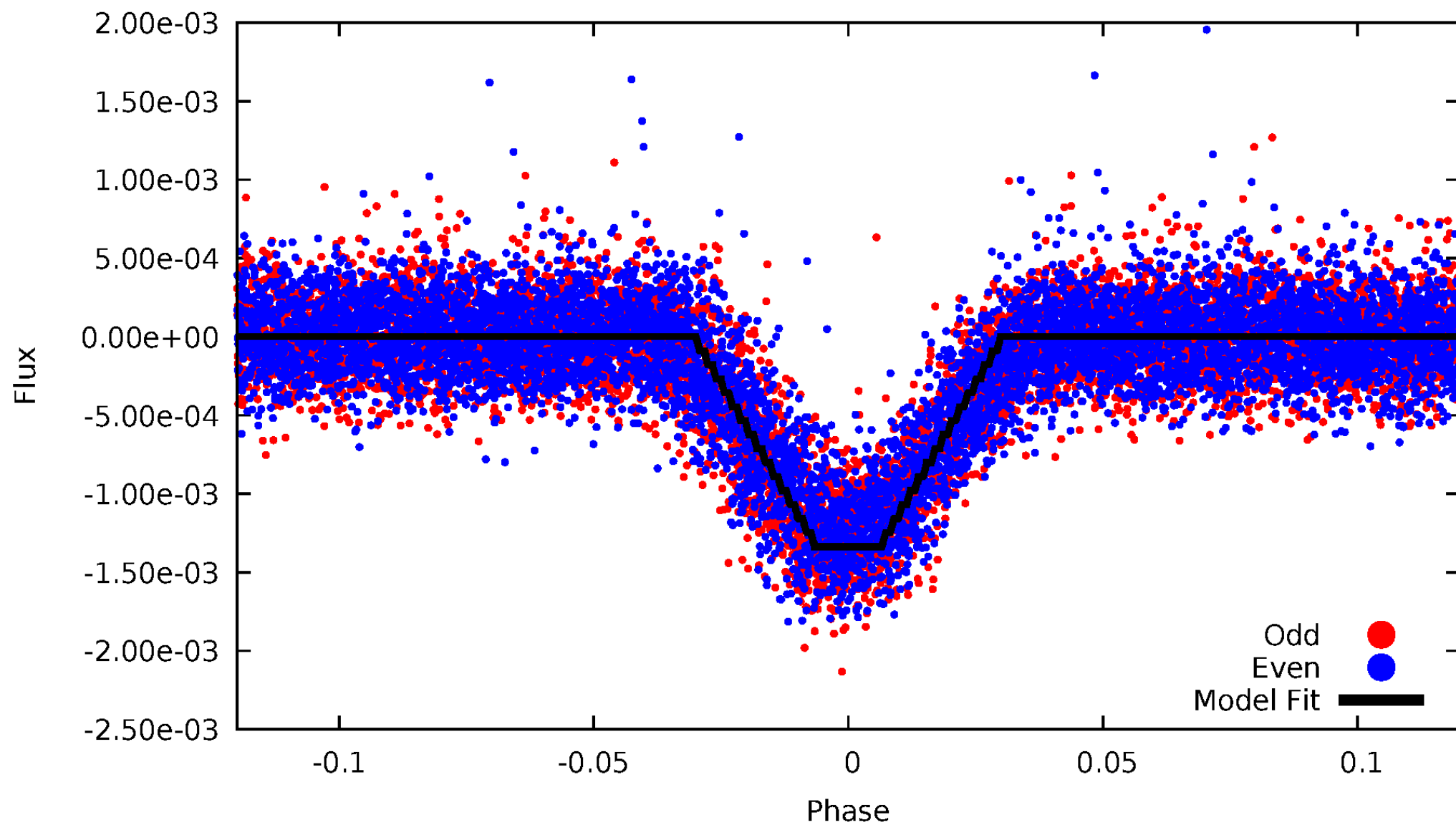
TCE 006028860-01





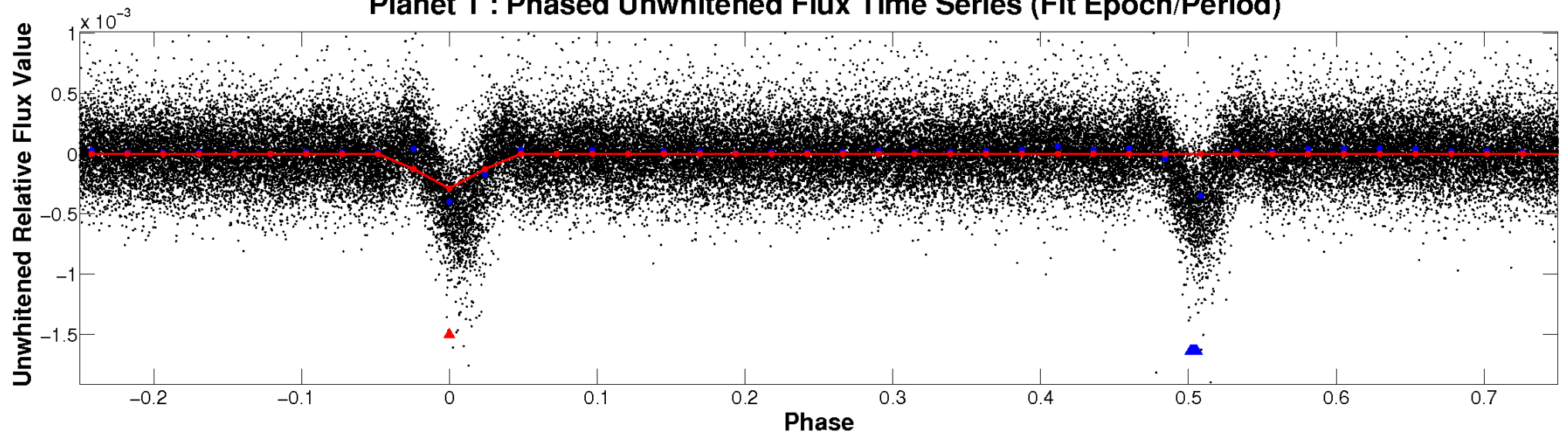
# ALT Odd/Even

TCE 006028860-01

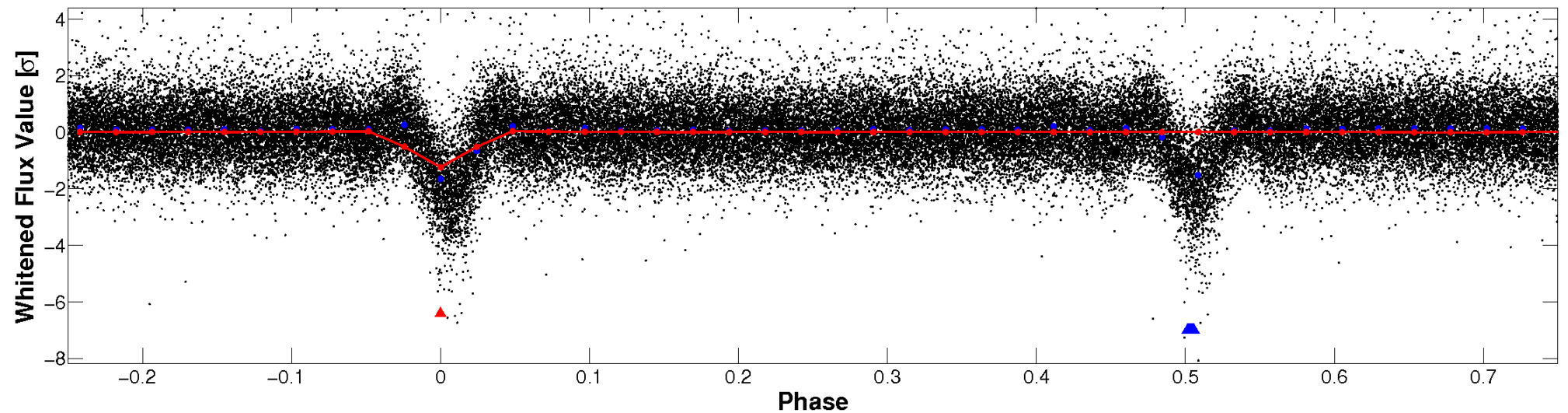


# Non-Whitened Vs. Whitened Light Curve

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

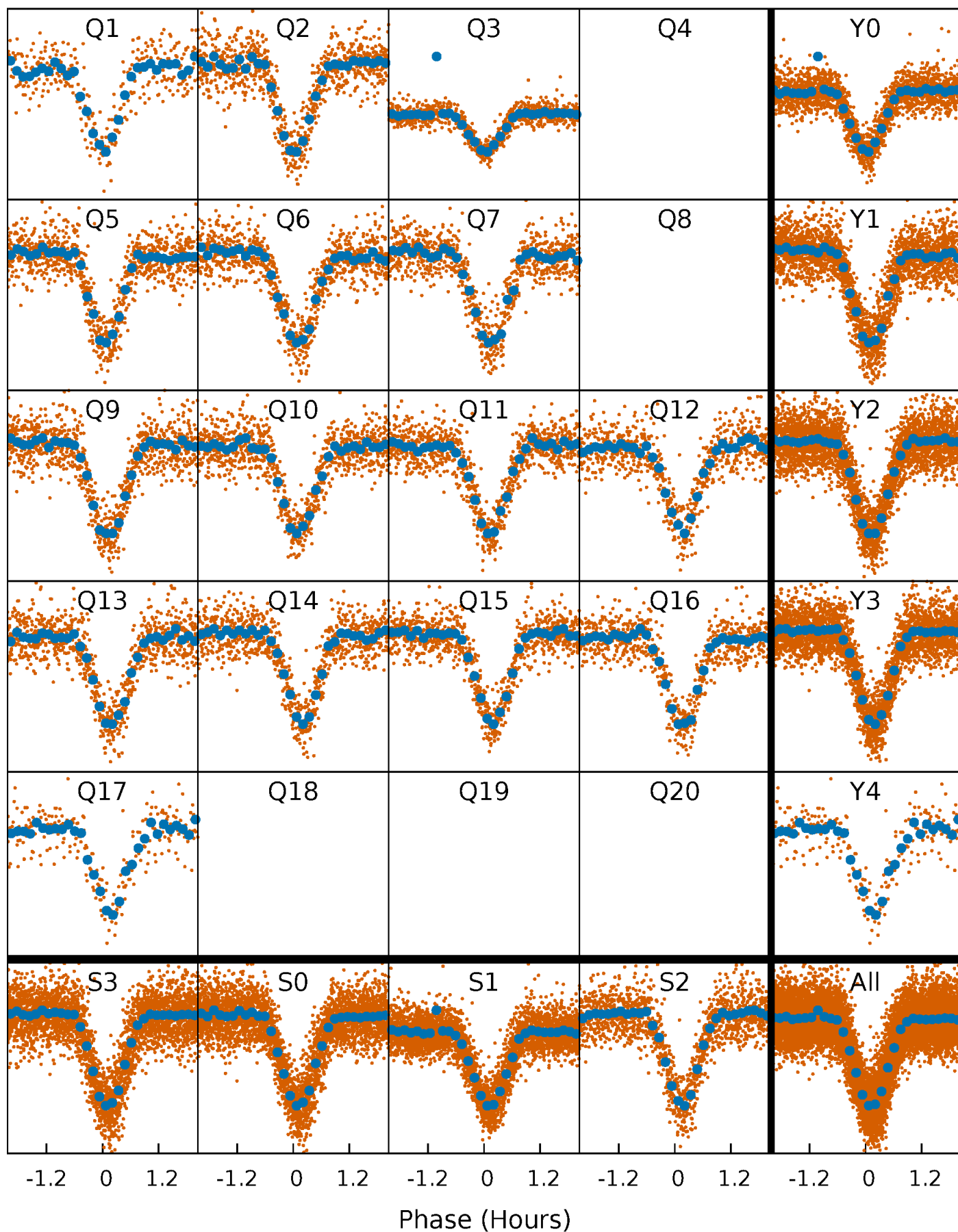


## Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

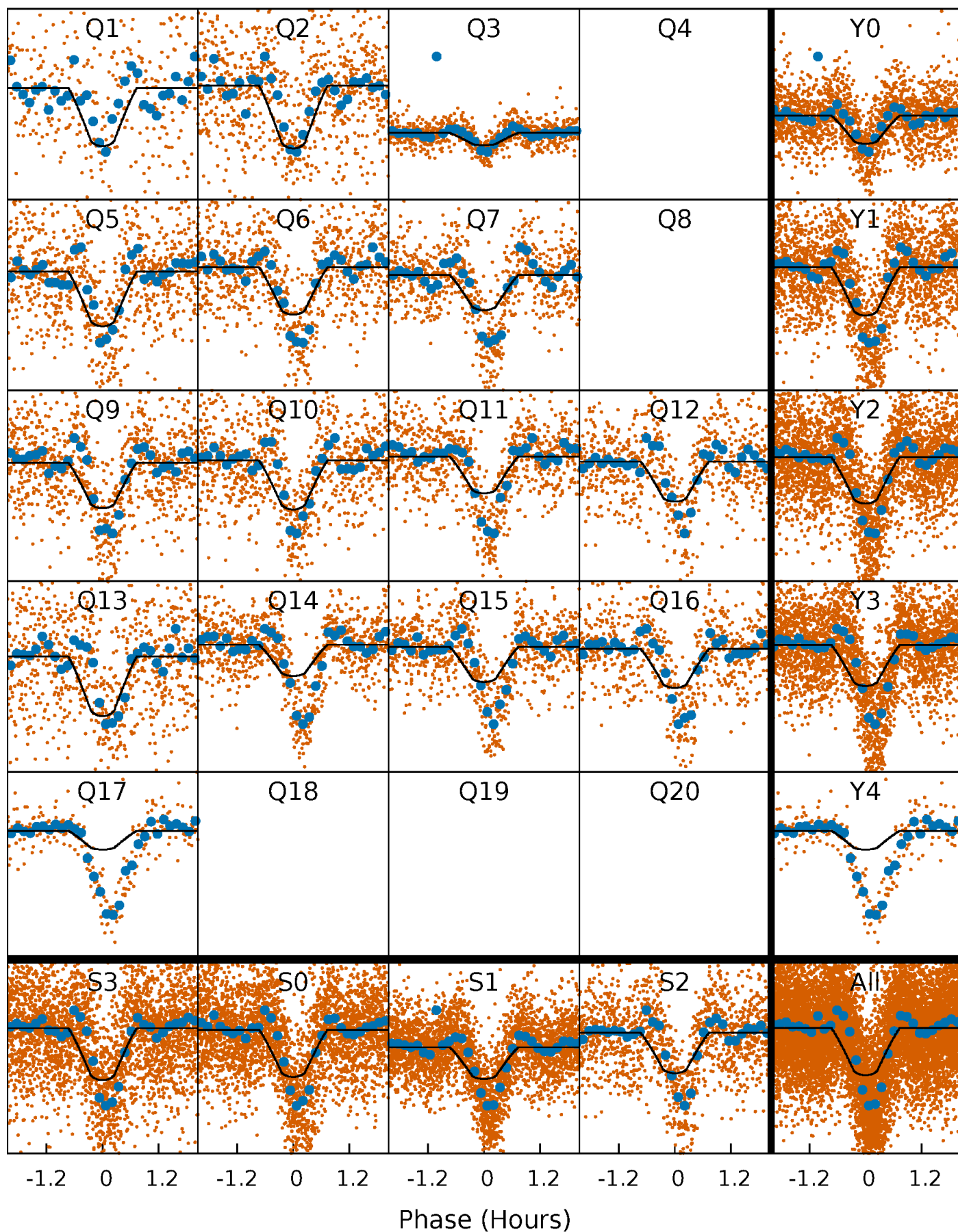
TCE 006028860-01   P= 0.844027 Days    $T_0=131.746867$  (BKJD)





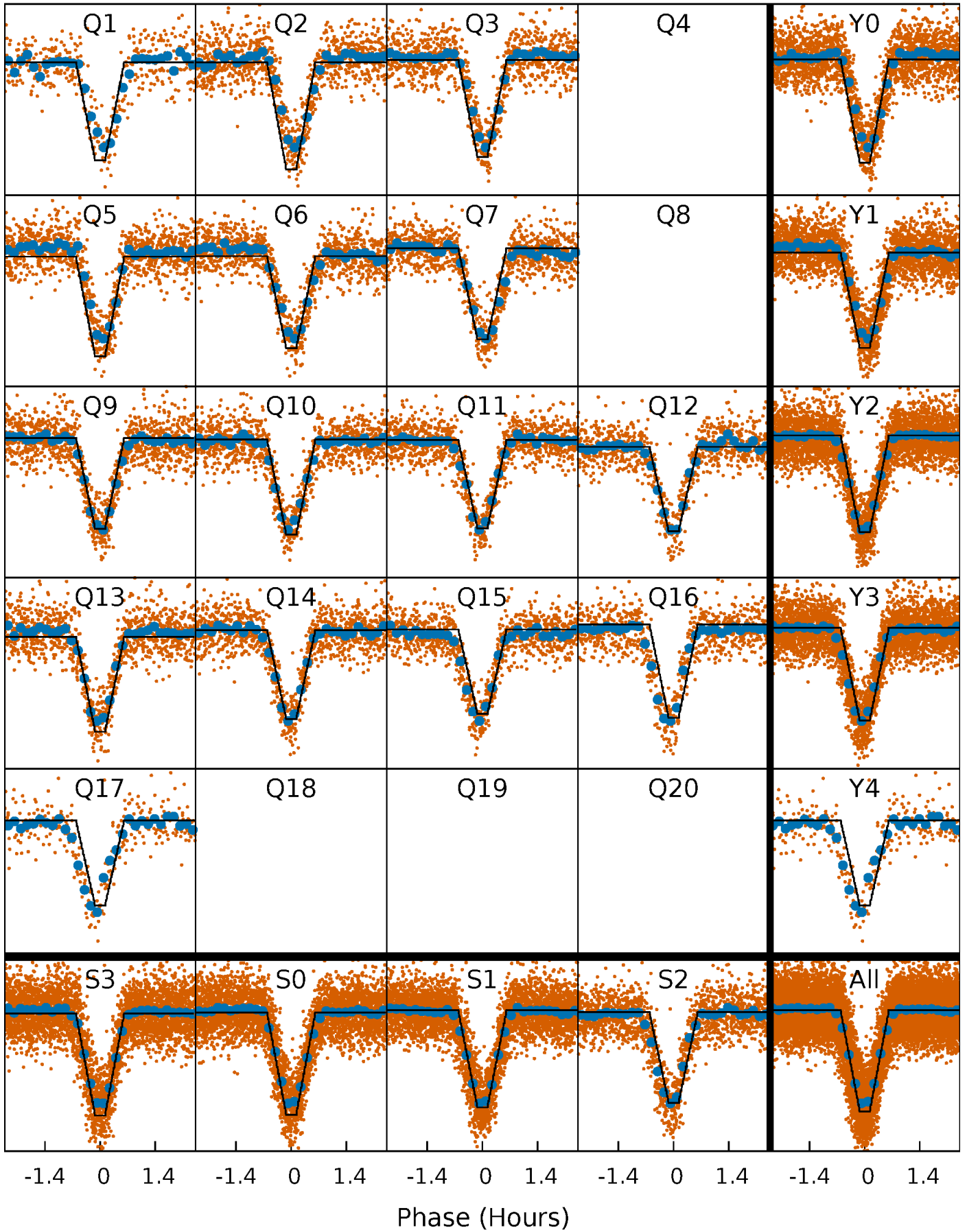
# DV Quarter-Phased Transit Curves

TCE 006028860-01   P= 0.844027 Days    $T_0=131.746867$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

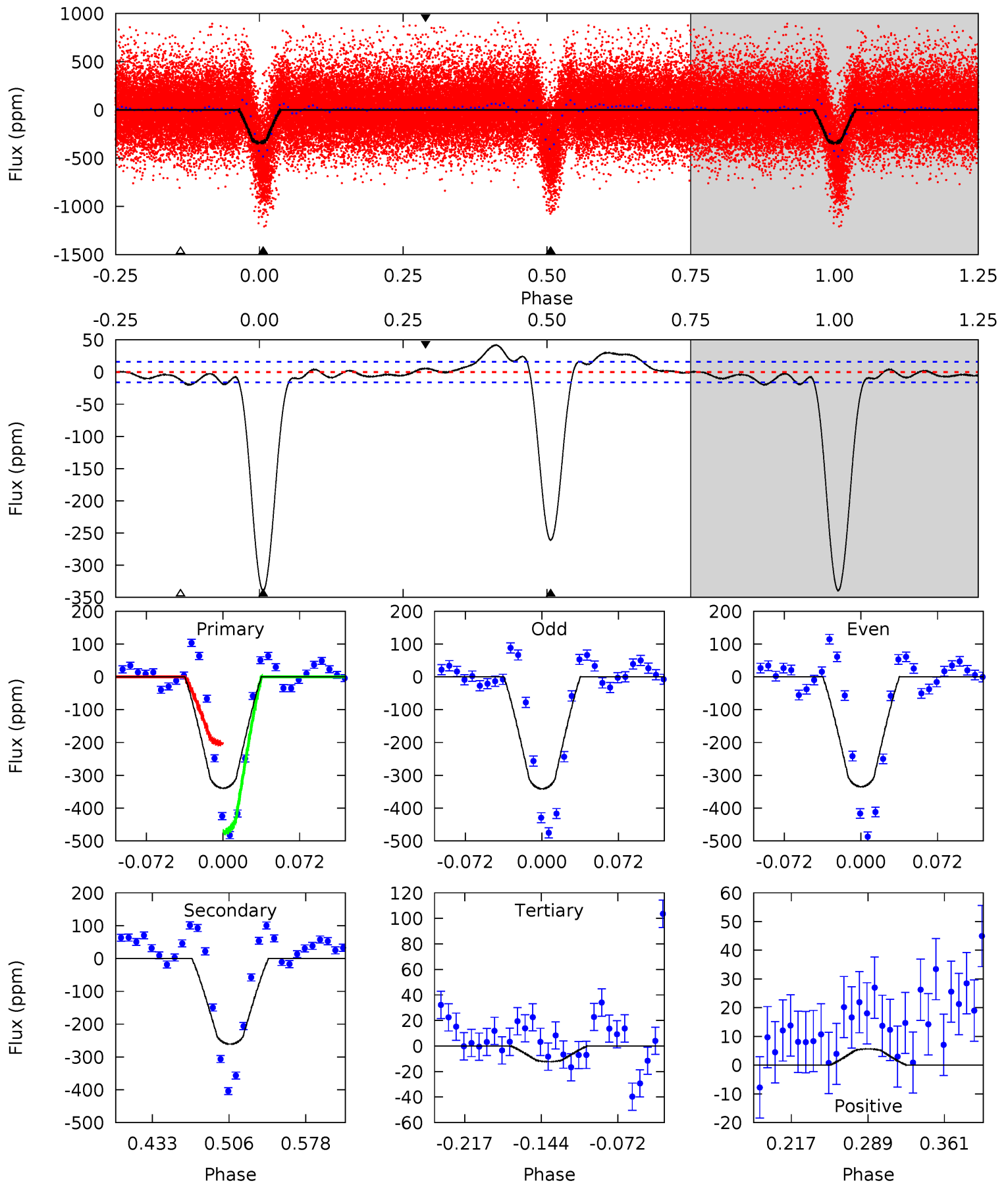
TCE 006028860-01   P= 0.844037 Days    $T_0=131.742758$  (BKJD)



## DV Model-Shift Uniqueness Test

006028860-01, P = 0.844027 Days, E = 130.902840 Days

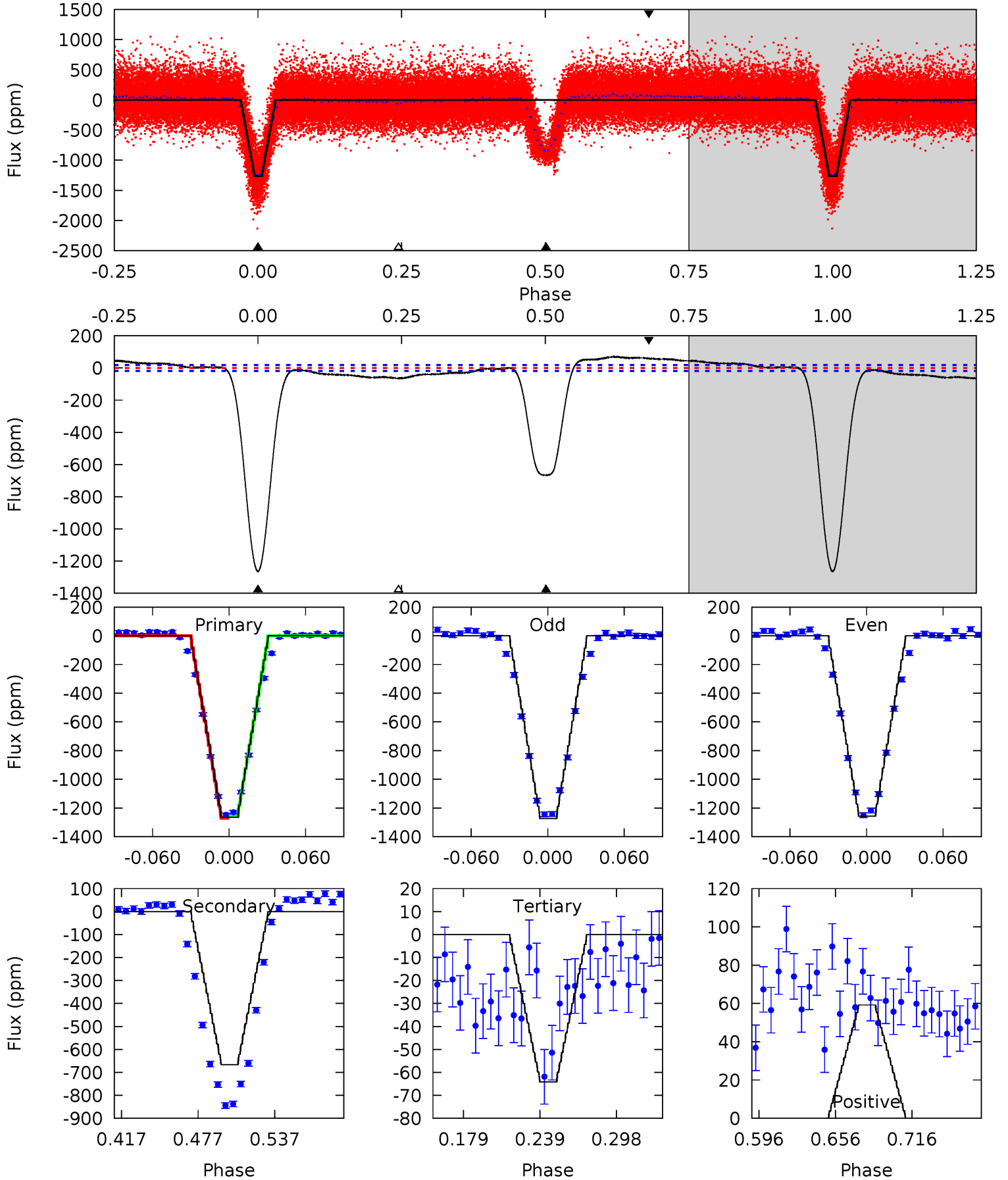
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
99.3	76.4	3.58	1.65	4.63	1.80	4.04	95.7	97.6	72.8	74.7	0.93	1.04	0.11	39.5



# Alt Model-Shift Uniqueness Test

006028860-01, P = 0.844037 Days, E = 130.898721 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
317.5	167.2	16.1	14.9	4.67	1.88	10.6	301.4	302.7	151.1	152.4	2.06	0.99	0.05	1.41



### Stellar Parameters For KIC 006028860

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5614^{+152}_{-152}$	$4.587^{+0.038}_{-0.152}$	$-0.340^{+0.300}_{-0.300}$	$0.777^{+0.182}_{-0.061}$	$0.858^{+0.089}_{-0.089}$	$2.573^{+0.496}_{-1.053}$
	+3%/-3%	+1%/-3%	+88%/-88%	+23%/-8%	+10%/-10%	+19%/-41%
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 006028860-01 / KOI 2950.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-261 \pm 3$	$1.50^{+0.25}_{-0.21}$	$2416^{+138}_{-95}$	$5460^{+344}_{-307}$	$17^{+6}_{-4}$
Alt.	$-666 \pm 4$	$3.19^{+0.41}_{-0.29}$	$2417^{+132}_{-98}$	$4809^{+155}_{-160}$	$9.792^{+1.743}_{-1.857}$

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



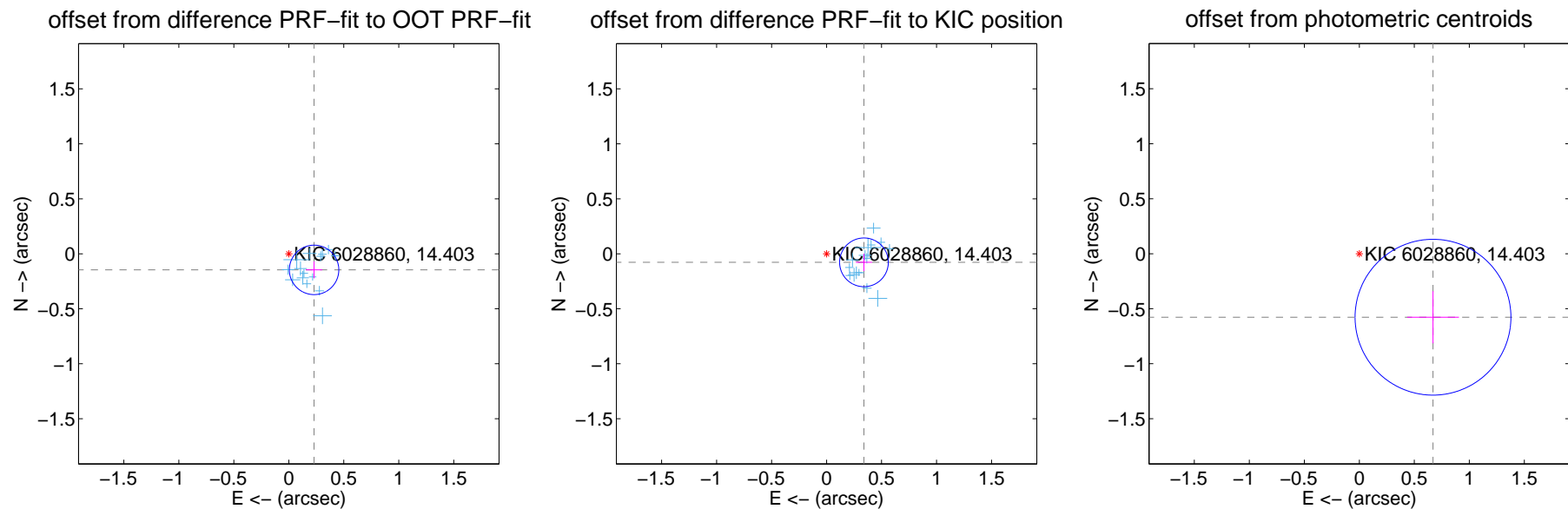
## DV Centroid Data

Supplemental centroid analysis for 006028860-01. Kepler magnitude: 14.40. Transit SNR 53.56

There are 15 quarters with good PRF difference image offsets

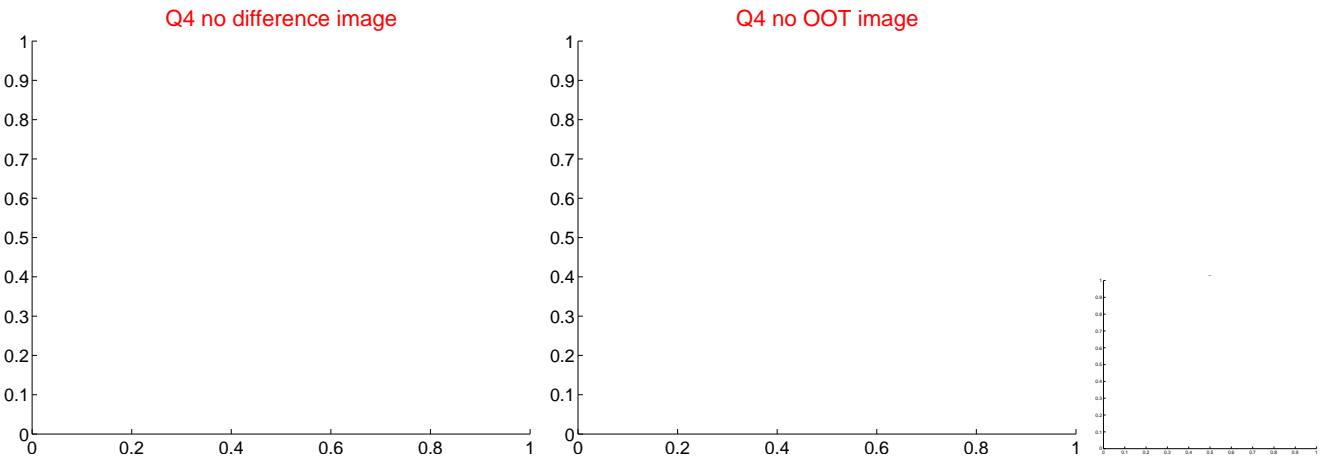
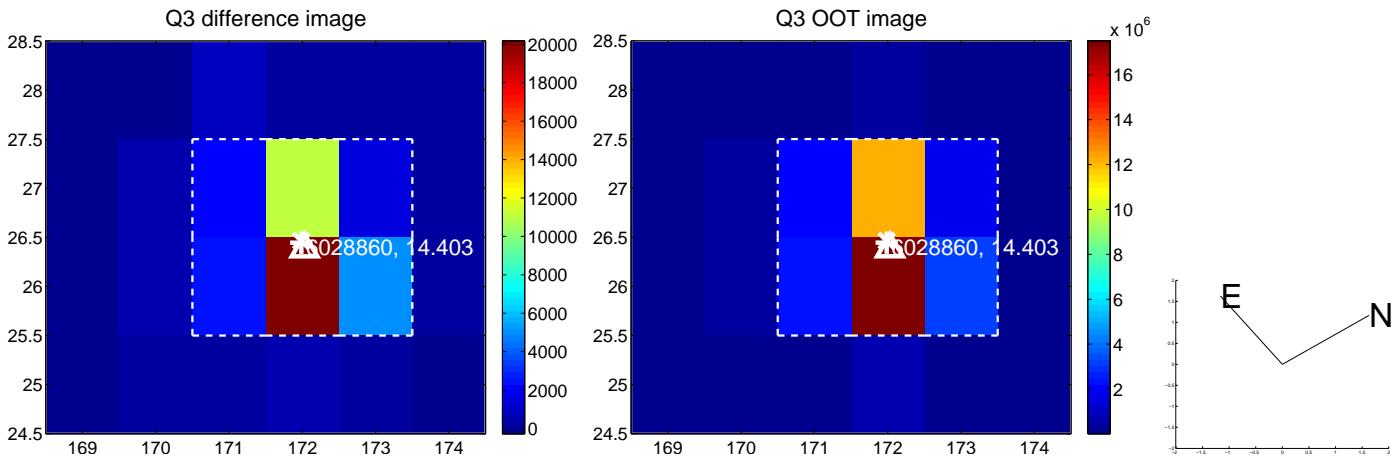
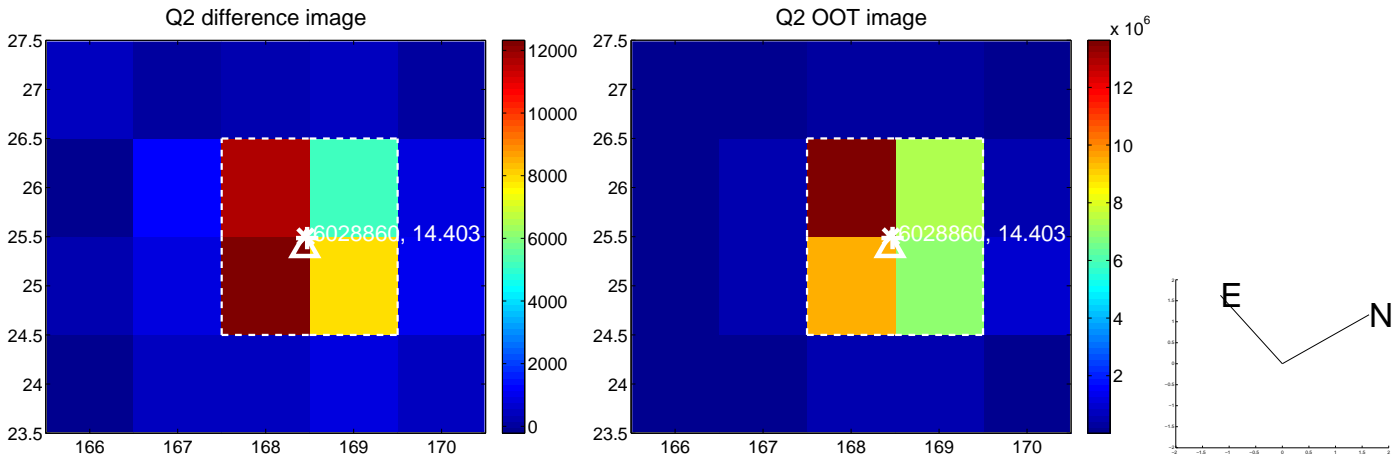
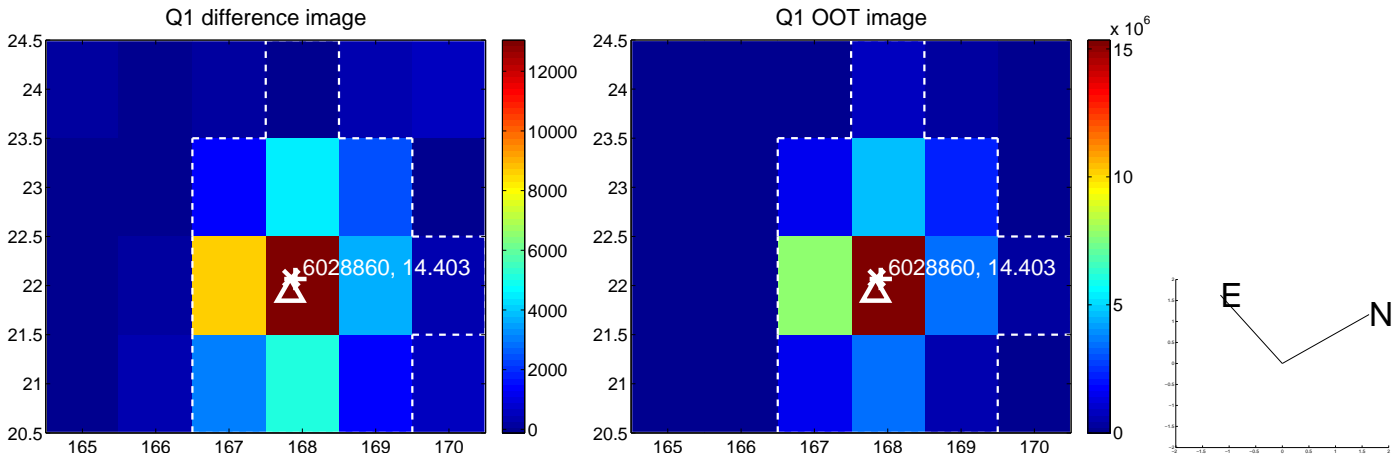
The direct PRF centroid is offset from the target star catalog position by about 0.32 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.272 \pm 0.075$	3.63	$-0.230 \pm 0.074$	$-0.146 \pm 0.077$
PRF-fit source offset from KIC position	$0.349 \pm 0.074$	4.72	$-0.340 \pm 0.074$	$-0.078 \pm 0.079$
photometric centroid source offset	$0.88 \pm 0.24$	3.75	$-0.67 \pm 0.24$	$-0.58 \pm 0.24$

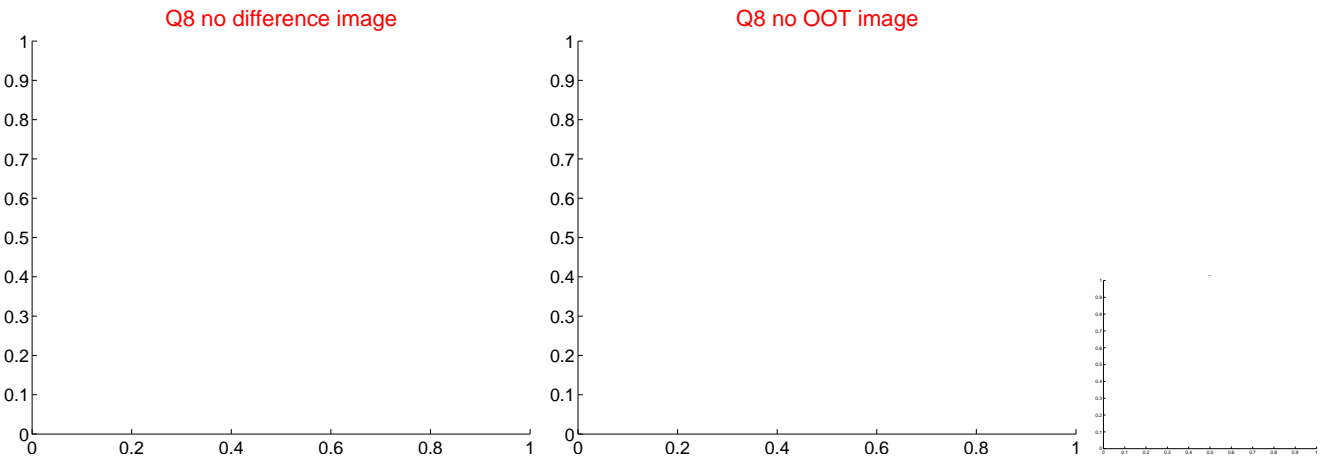
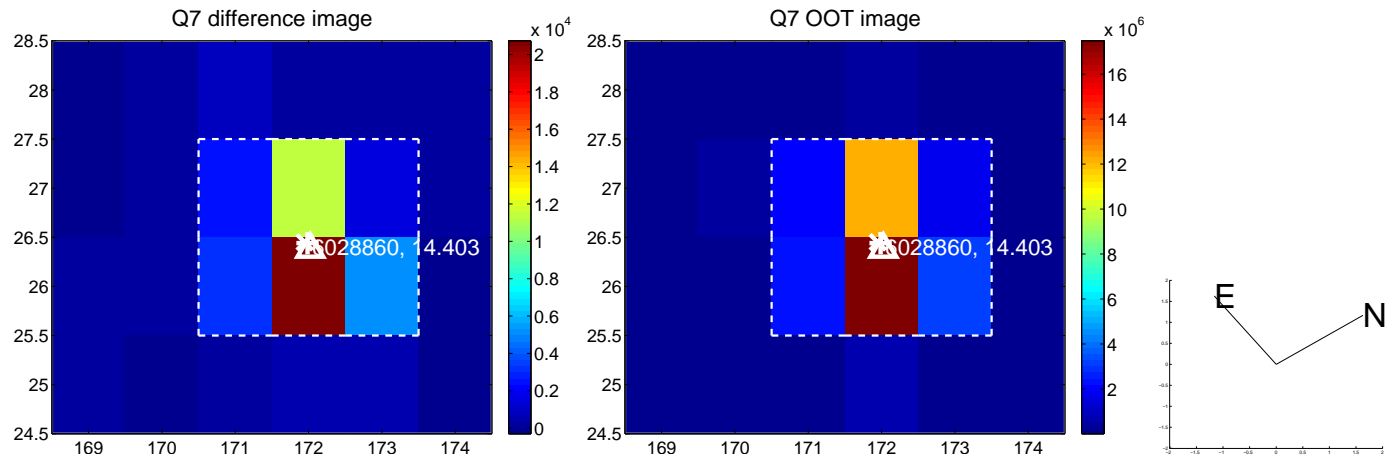
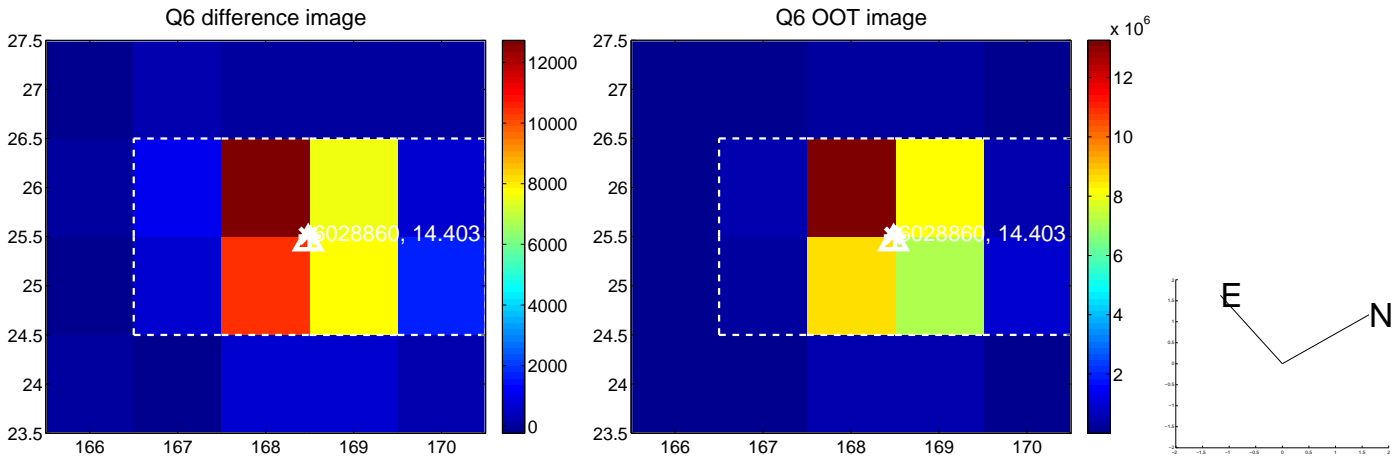
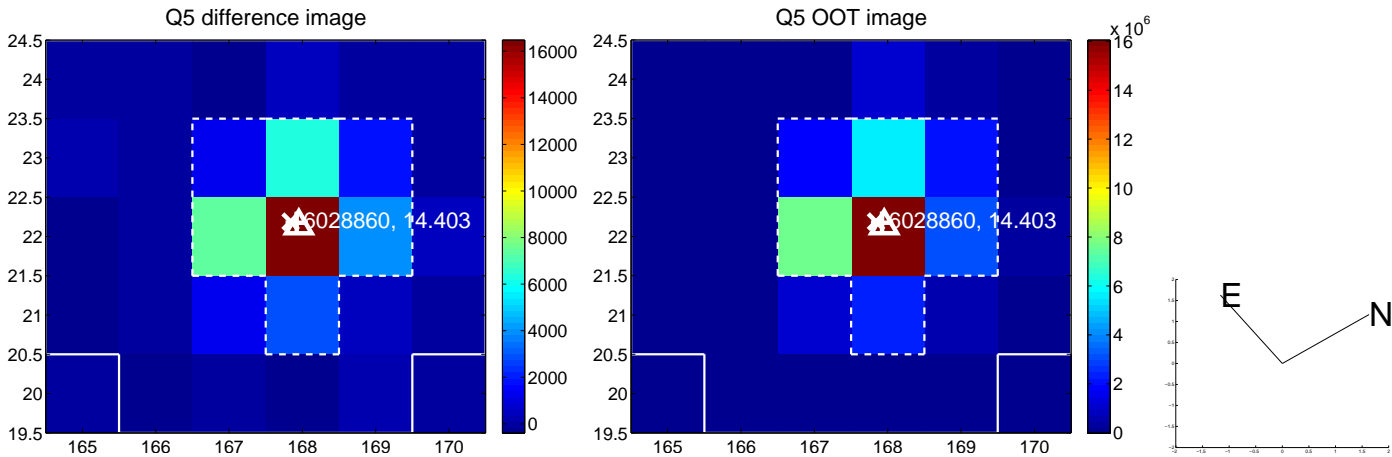


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

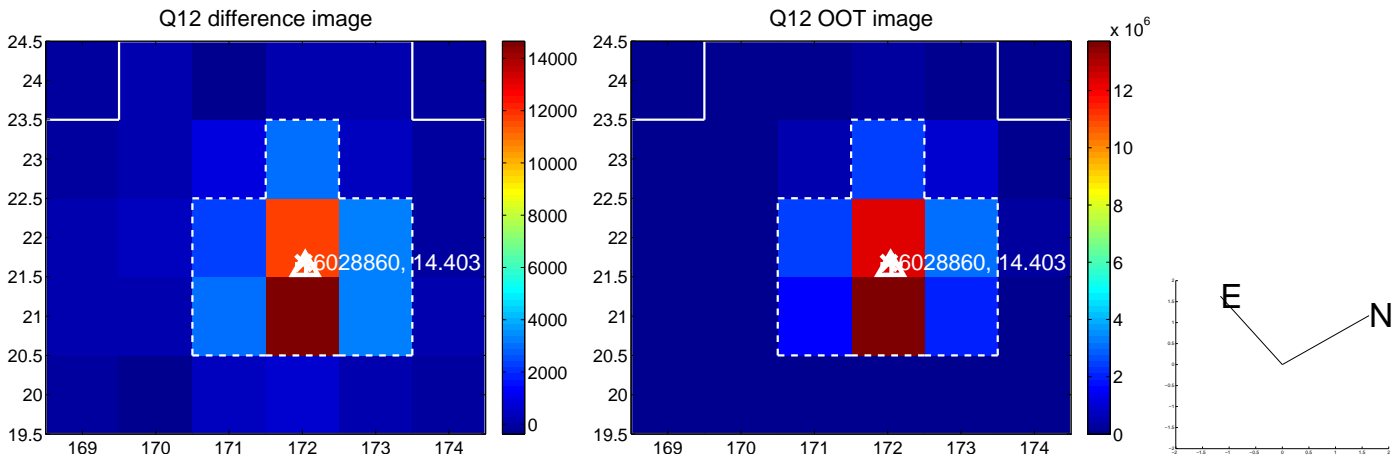
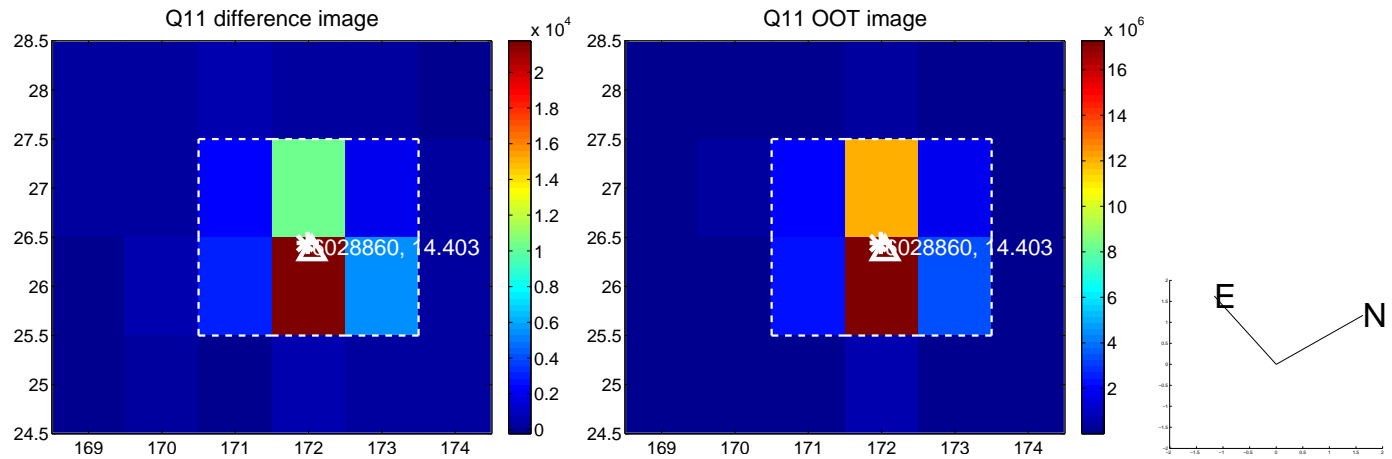
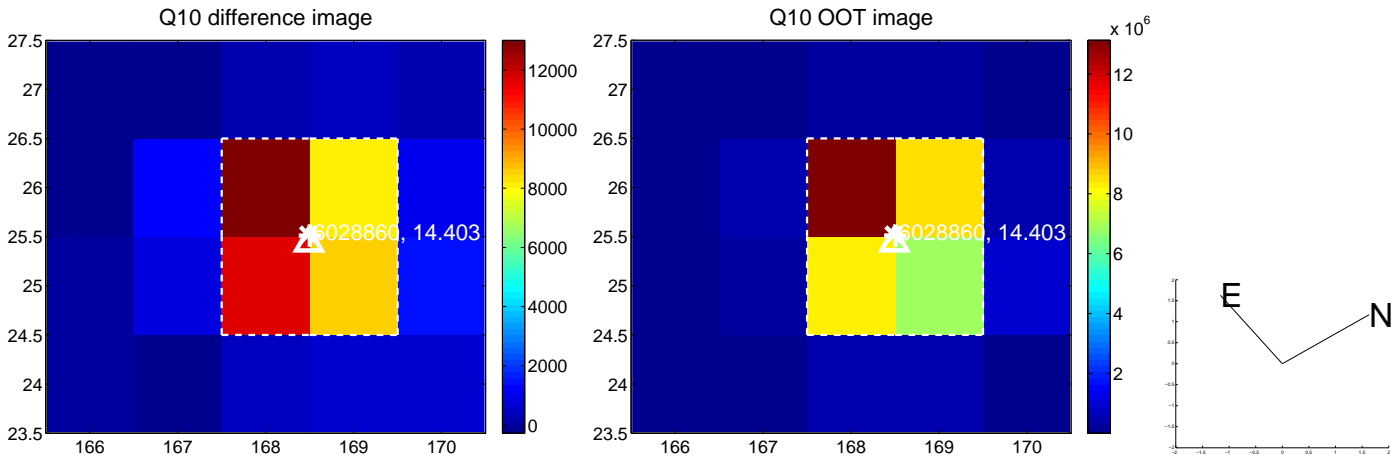
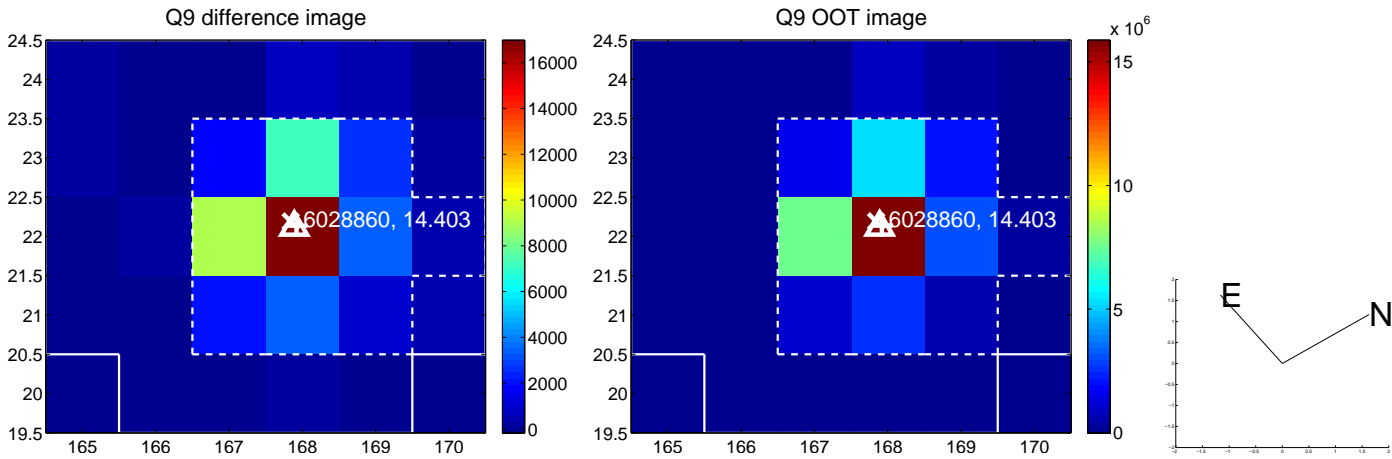
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



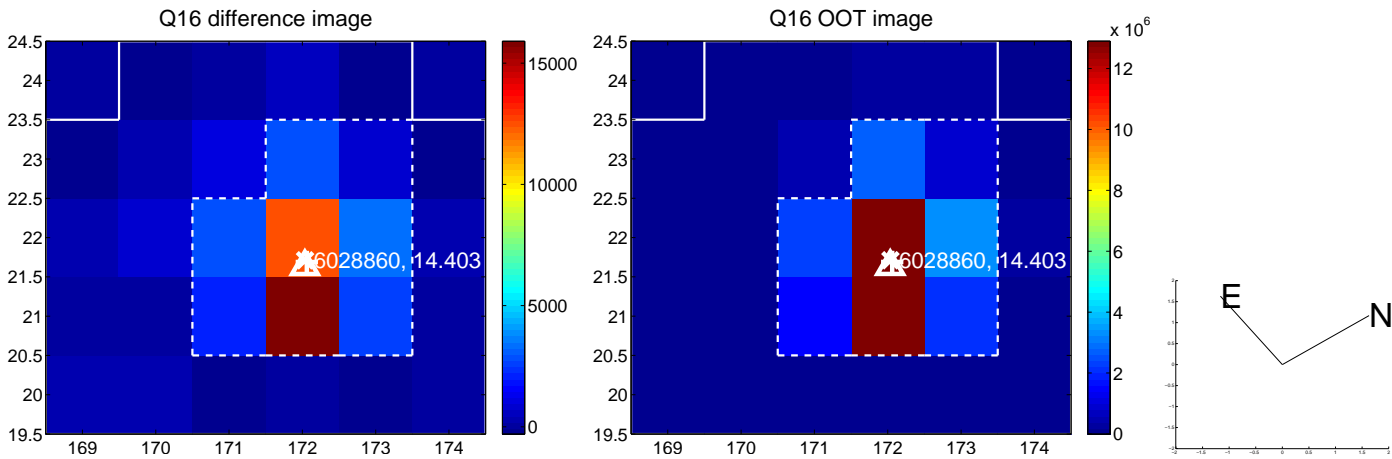
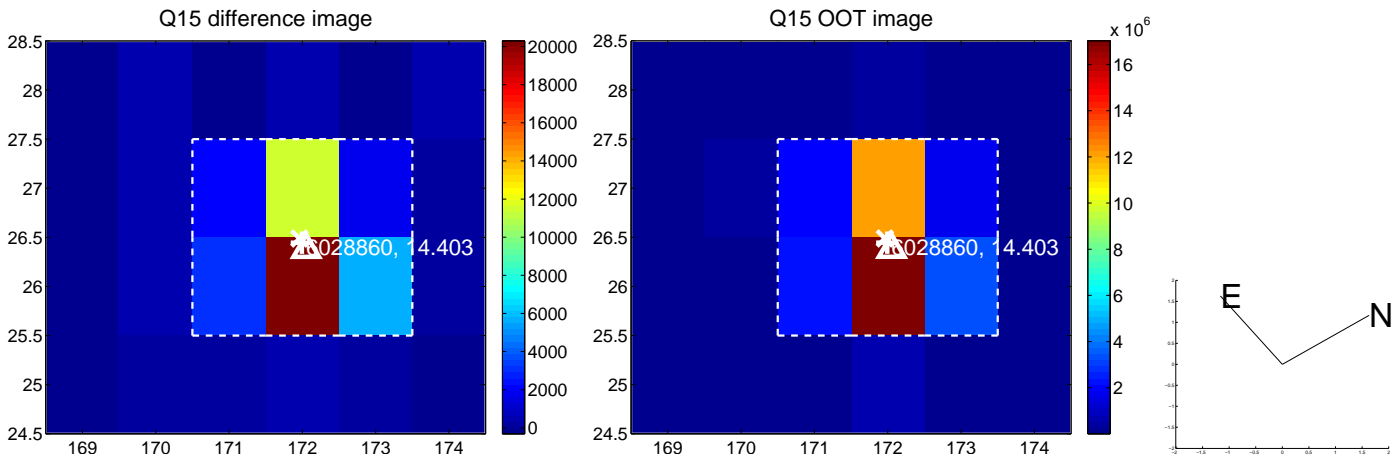
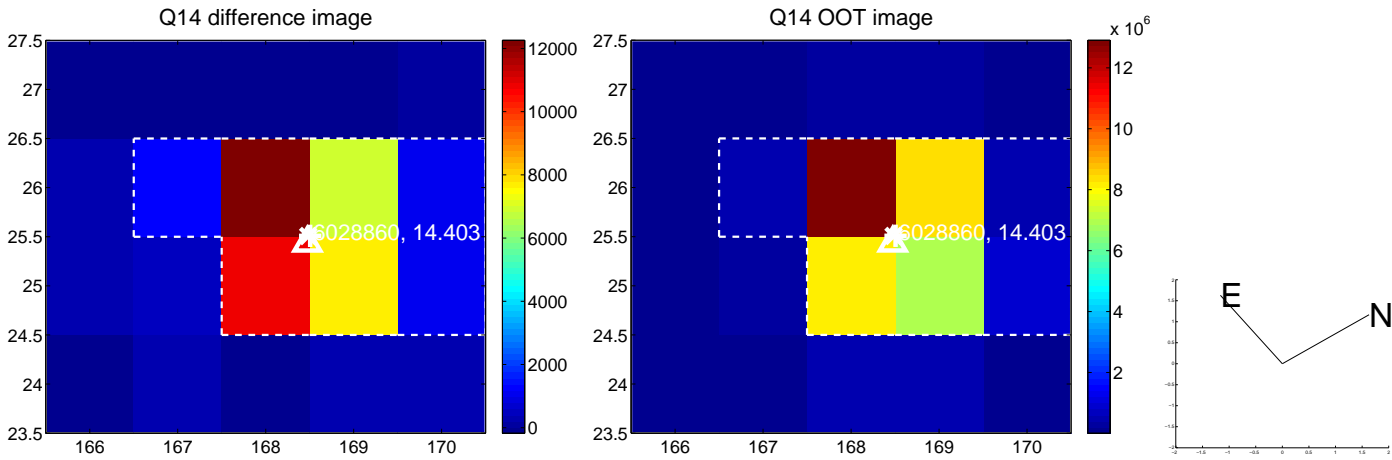
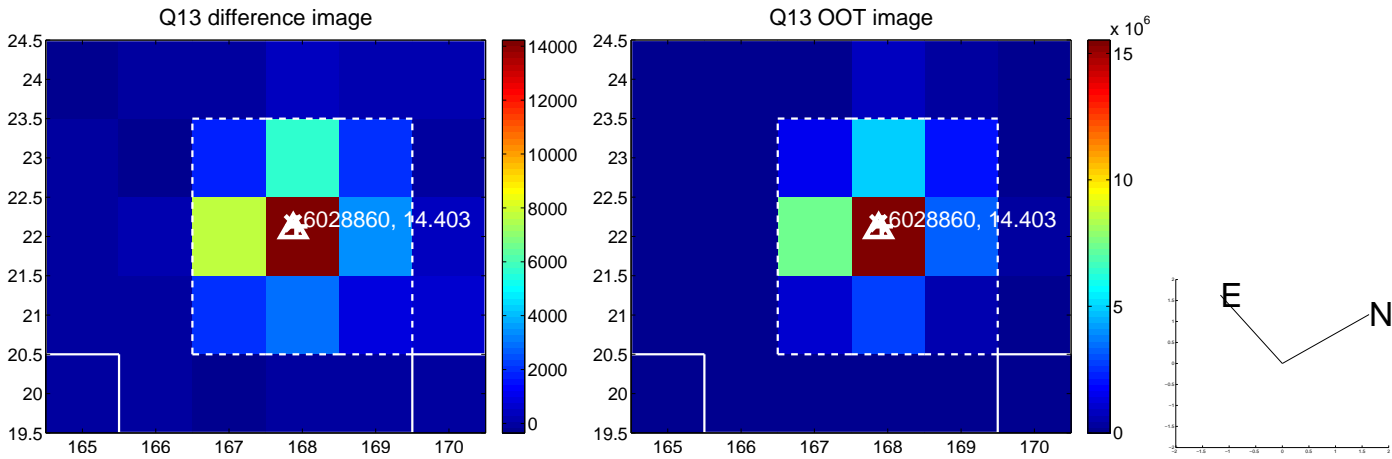
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

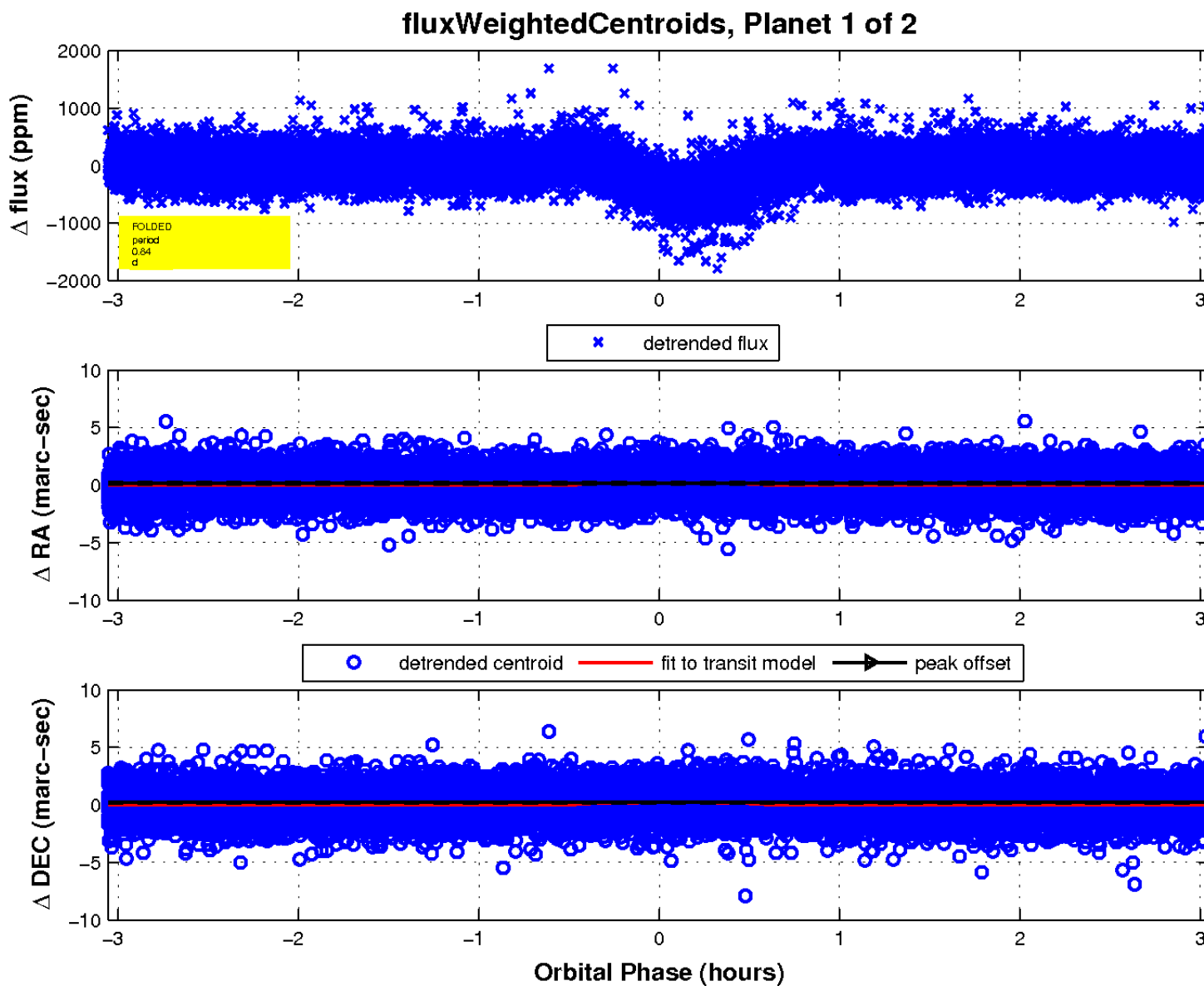
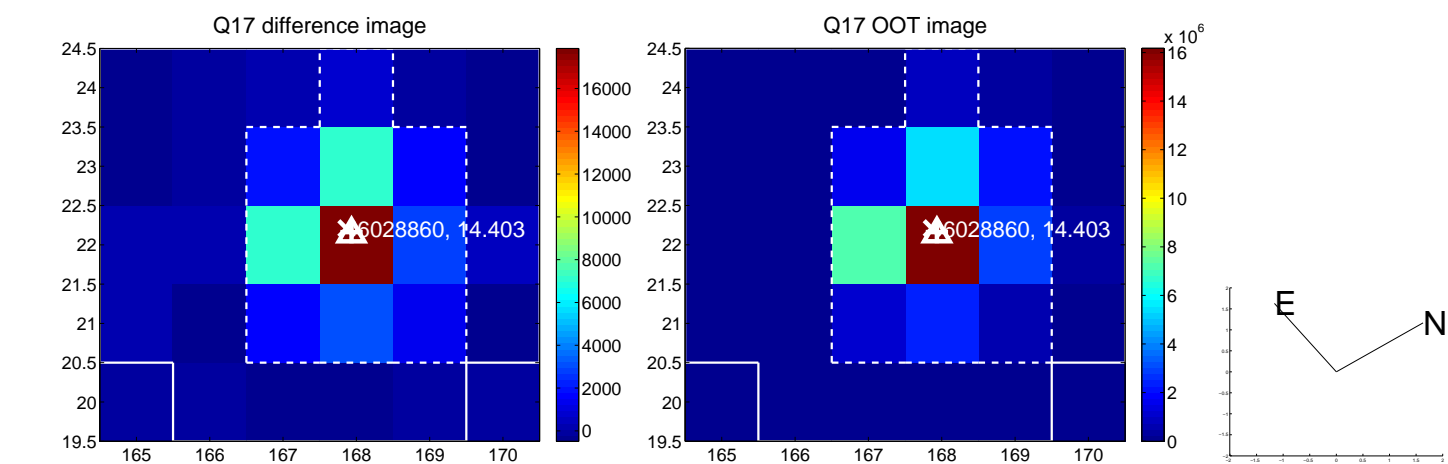


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



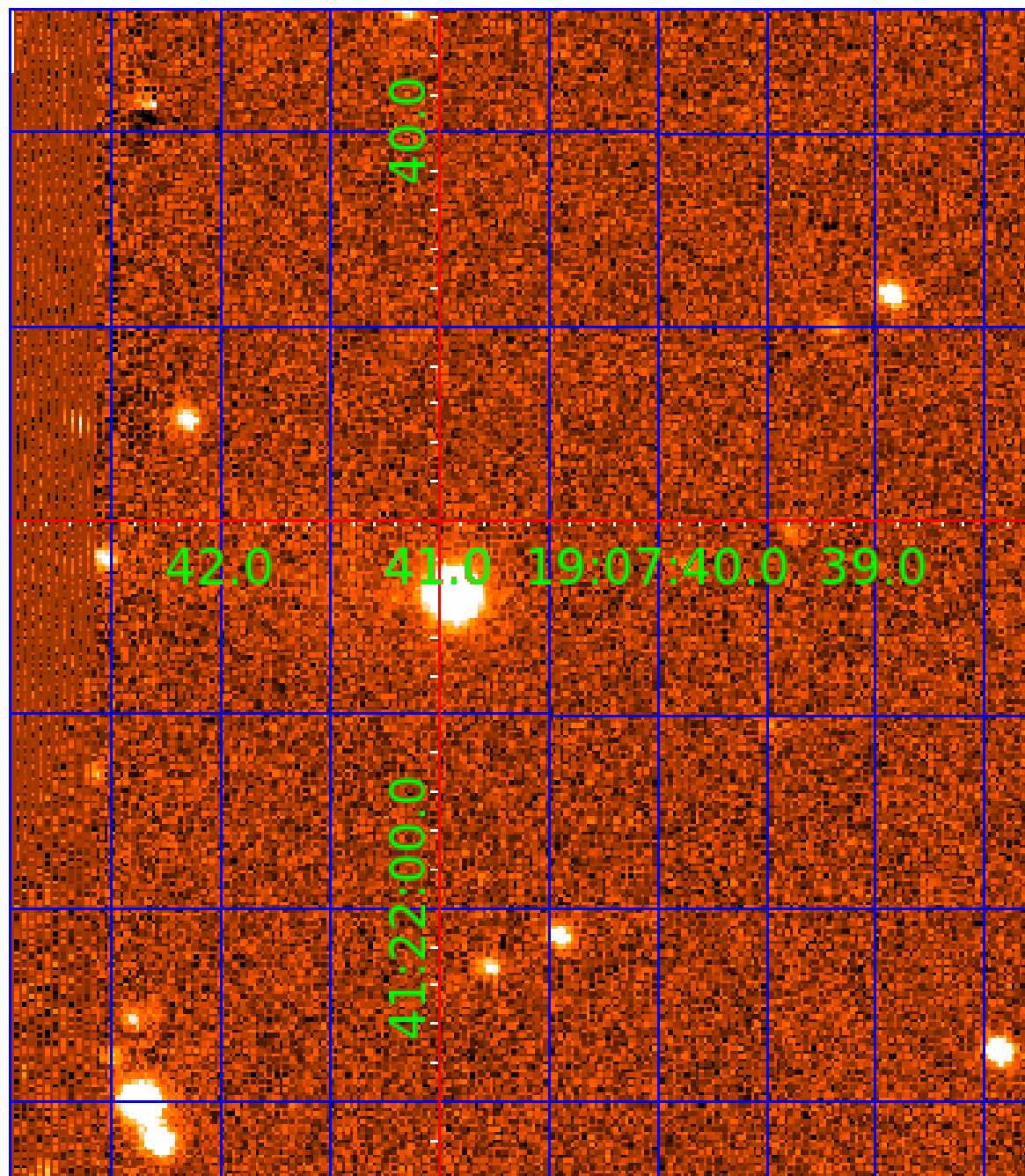


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 006028860

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
006028860-01	OBS	2950.01	0.844027	131.746867	296.2	1.019	29.2	53.6	0.78	5614	1.45	1957.89
006028860-02	OBS	No	0.844029	132.170109	440.5	0.700	40.0	67.2	0.78	5614	1.99	1957.89

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
006028860-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE
006028860-02	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 006028860-02

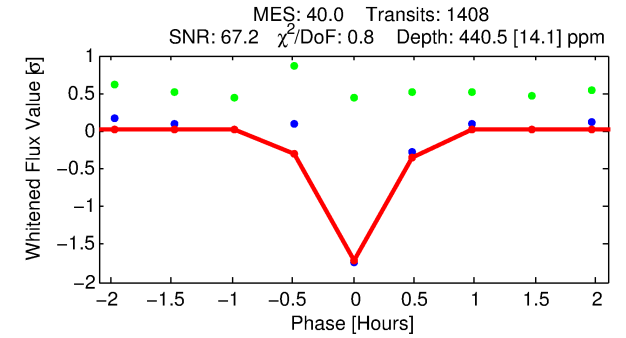
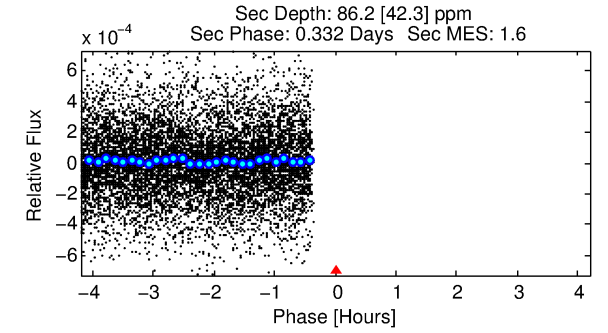
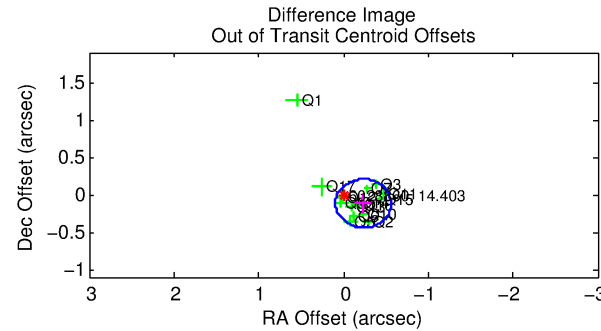
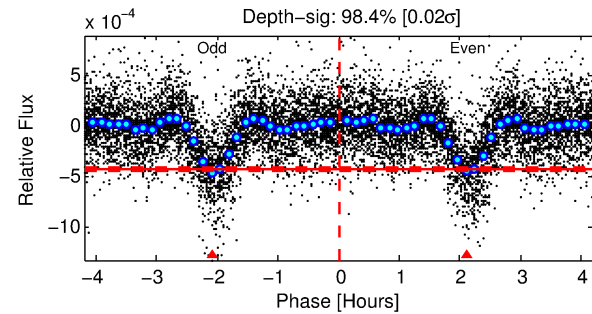
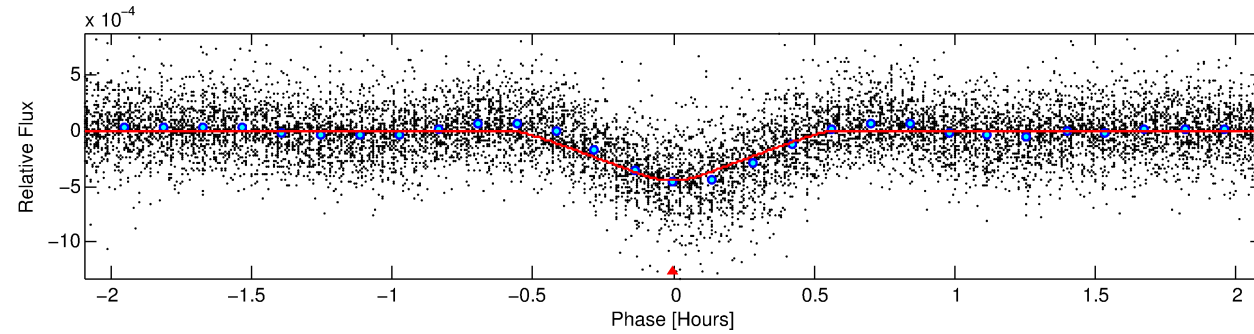
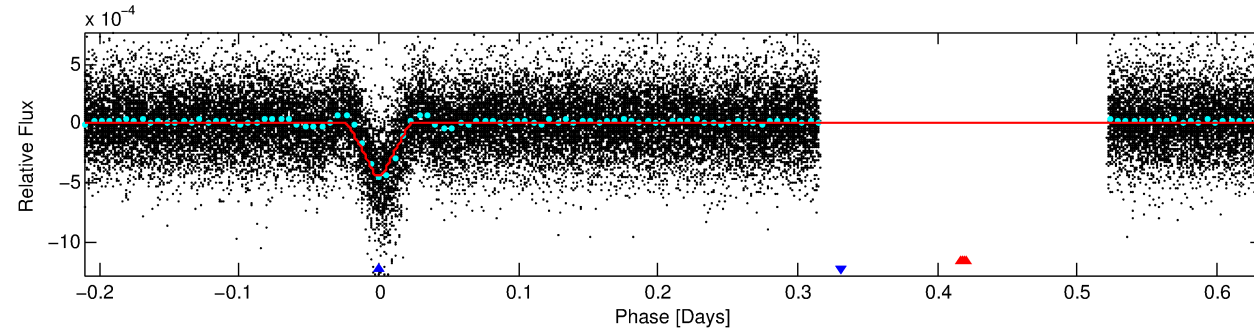
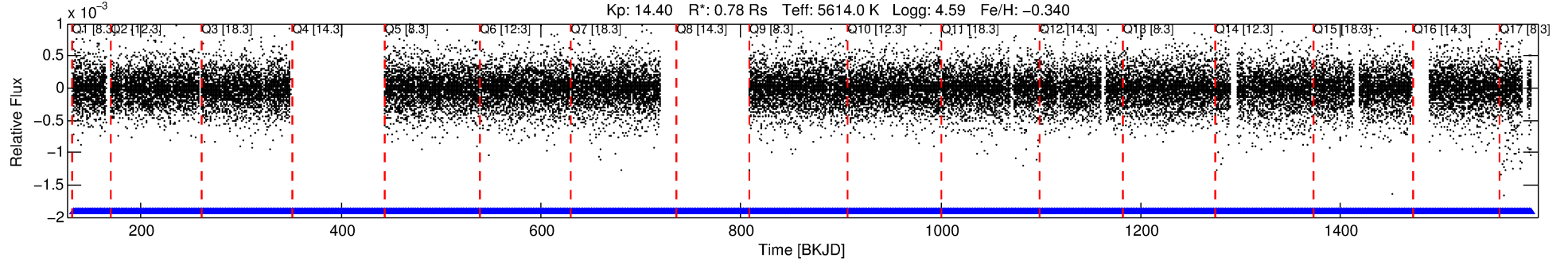
No Significant Match Found

# DV One-Page Summary

KIC: 6028860 Candidate: 2 of 2 Period: 0.844 d

KOI: K02950 Corr: No Ephemeris Match

Kp: 14.40 R\*: 0.78 Rs Teff: 5614.0 K Logg: 4.59 Fe/H: -0.340



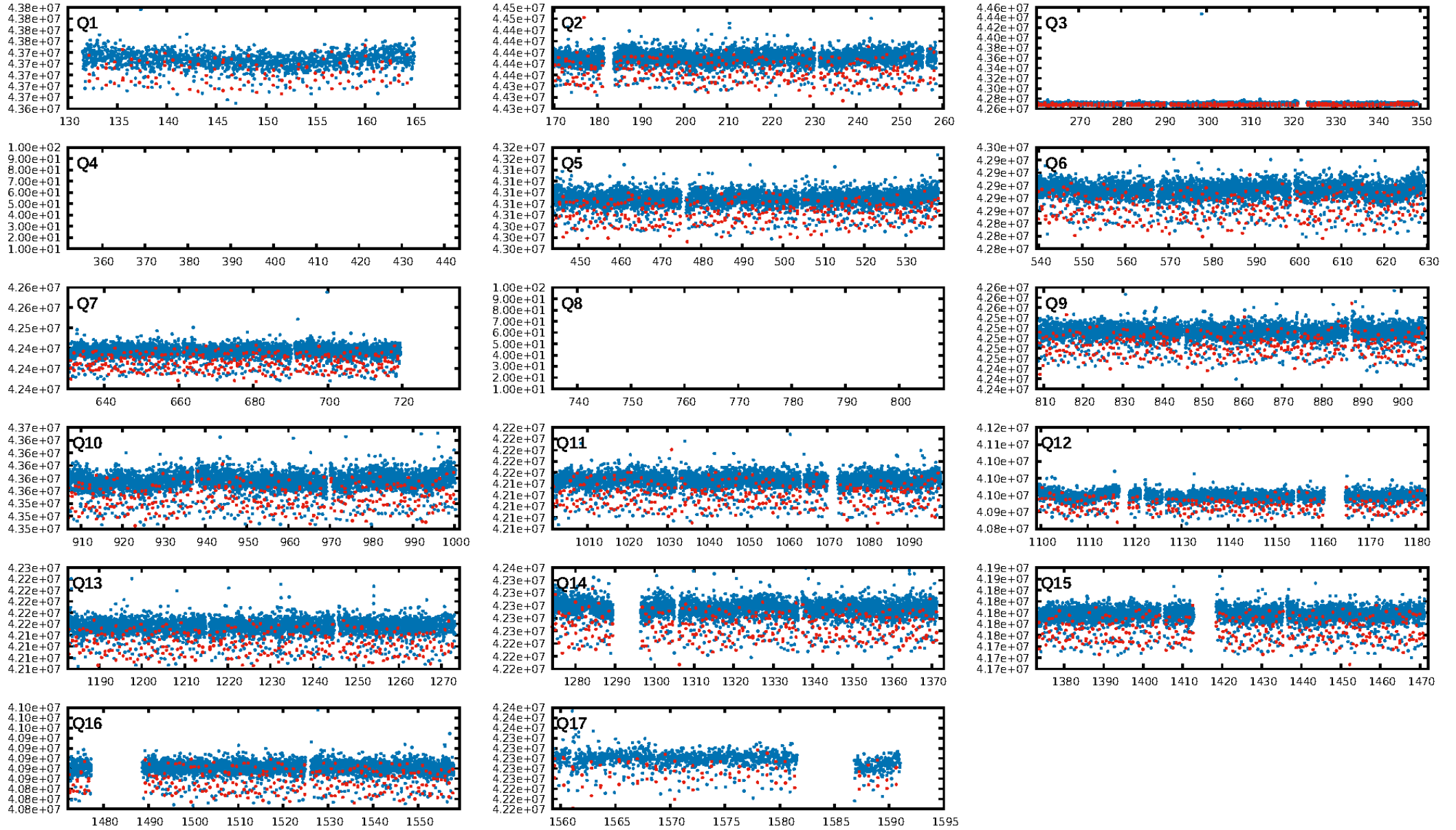
## DV Fit Results:

Period = 0.84403 [0.00000] d  
Epoch = 132.1701 [0.0002] BKJD  
Rp/R\* = 0.0235 [0.0027]  
a/R\* = 4.54 [2.26]  
b = 0.90 [0.11]  
Seff = 1957.89 [589.18]  
Teq = 1696 [128] K  
Rp = 1.99 [0.52] Re  
a = 0.0166 [0.0032] AU  
Ag = 3.27 [2.00] [1.14σ]  
Teffp = 3527 [488] K [3.63σ]

## DV Diagnostic Results:

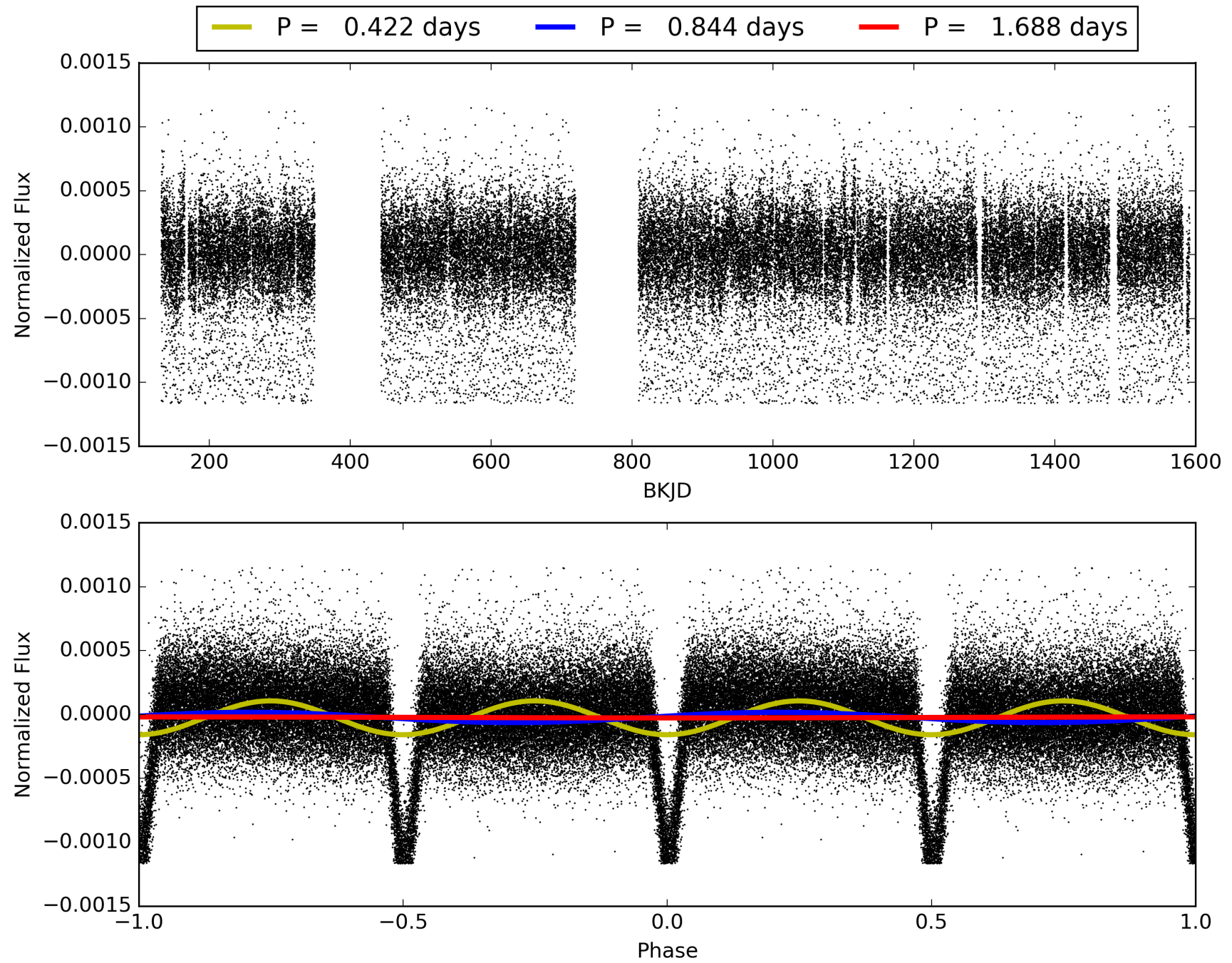
ShortPeriod-sig: 0.0% [0.00σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [1337/1337]  
GhostDiagnostic-chr: 2.556  
Centroid-sig: 0.0%  
Centroid-so: 0.853 arcsec [4.25σ]  
OotOffset-rm: 0.260 arcsec [2.39σ]  
KicOffset-rm: 0.351 arcsec [3.75σ]  
OotOffset-st: 4/4/2/5 [15]  
KicOffset-st: 4/4/2/5 [15]  
DiffImageQuality-fgm: 1.00 [15/15]  
DiffImageOverlap-fno: 1.00 [15/15]

# TCE 006028860-02, PDC Light Curves



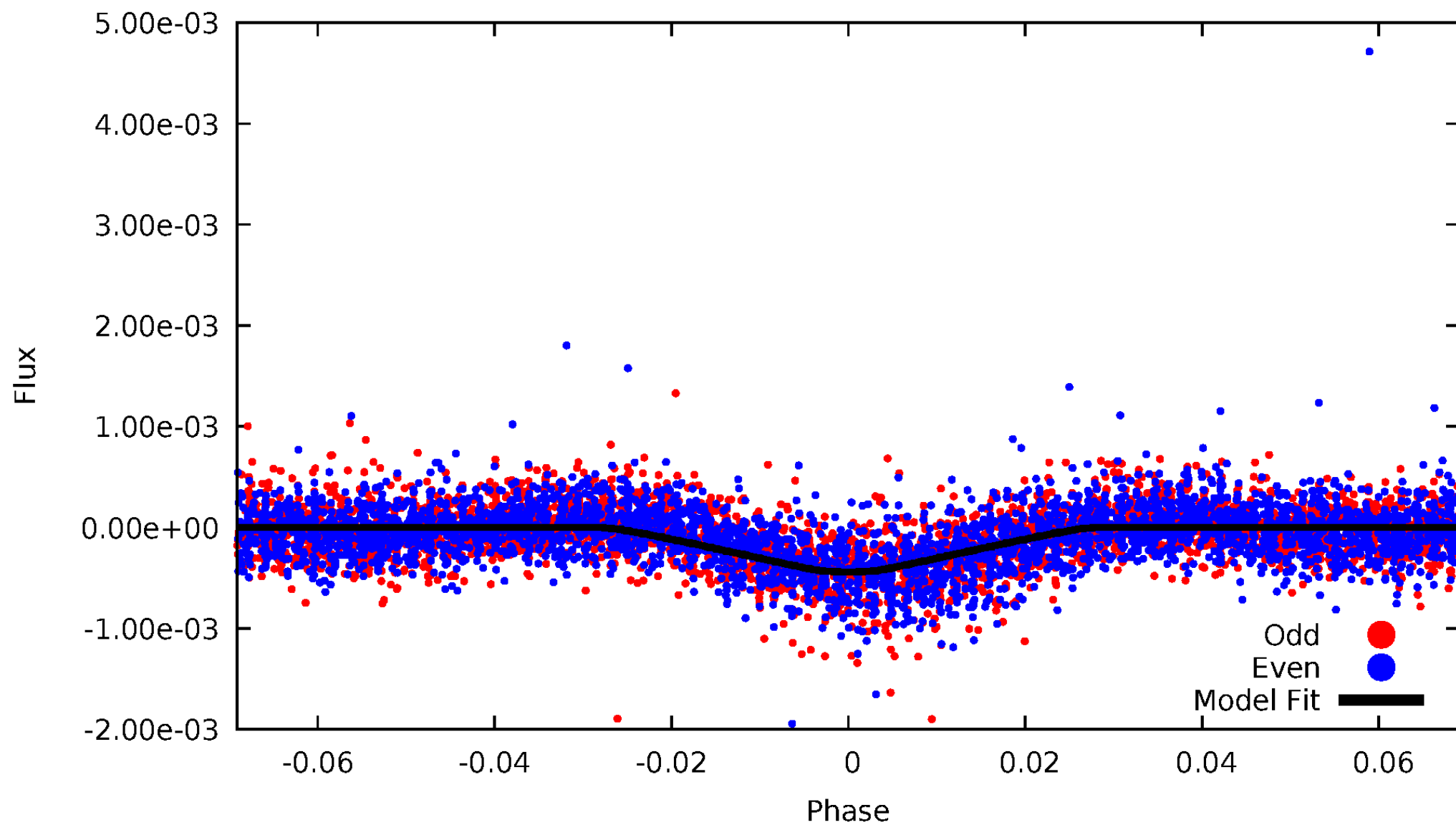


TCE 006028860-02



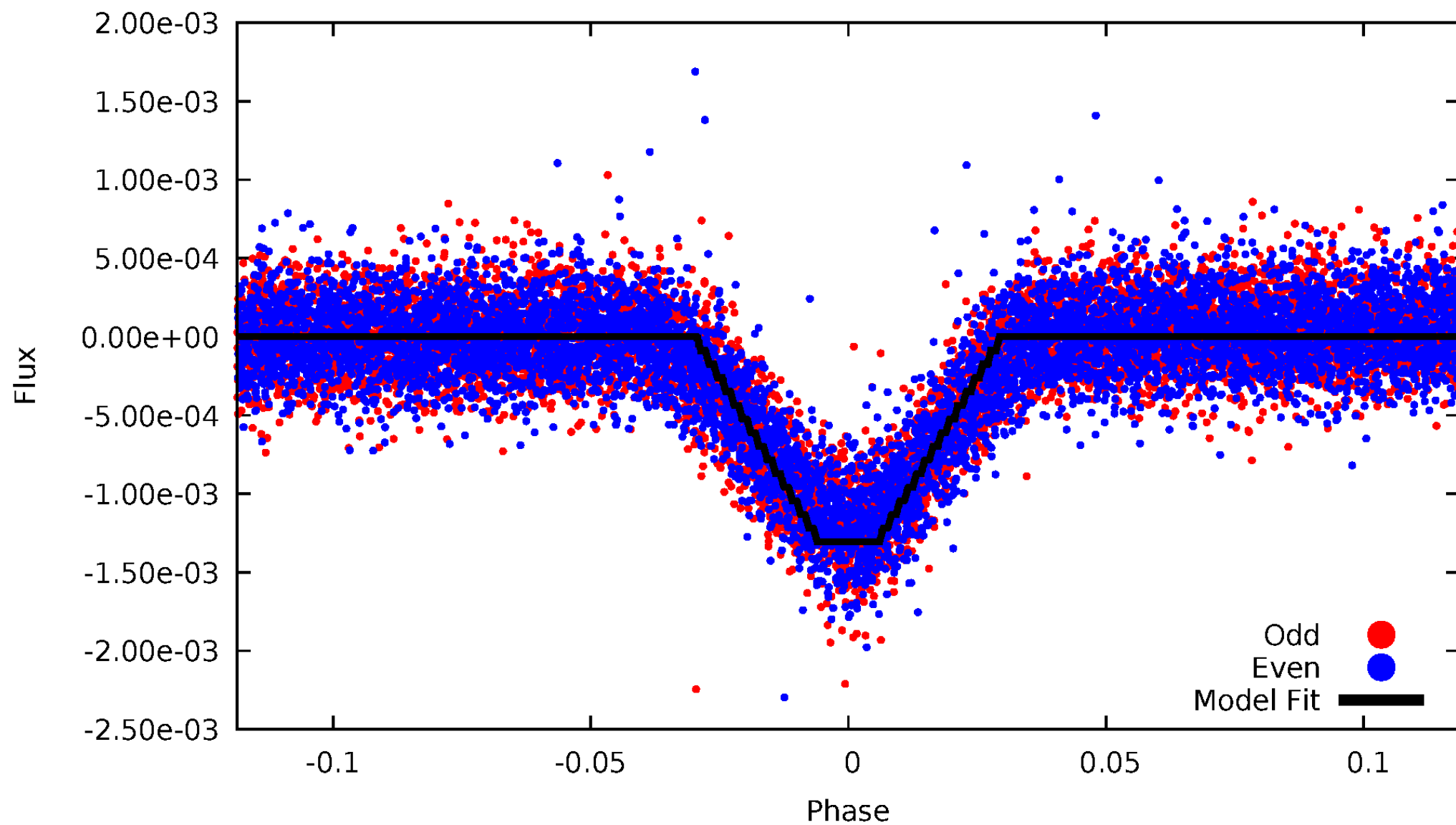
# DV Odd/Even

TCE 006028860-02



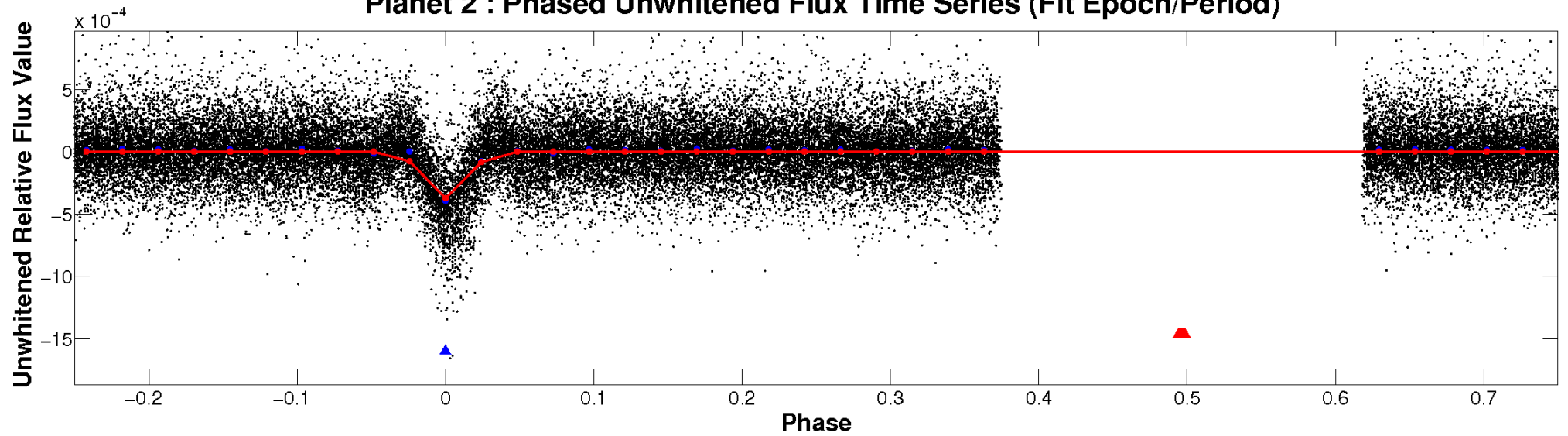
# ALT Odd/Even

TCE 006028860-02

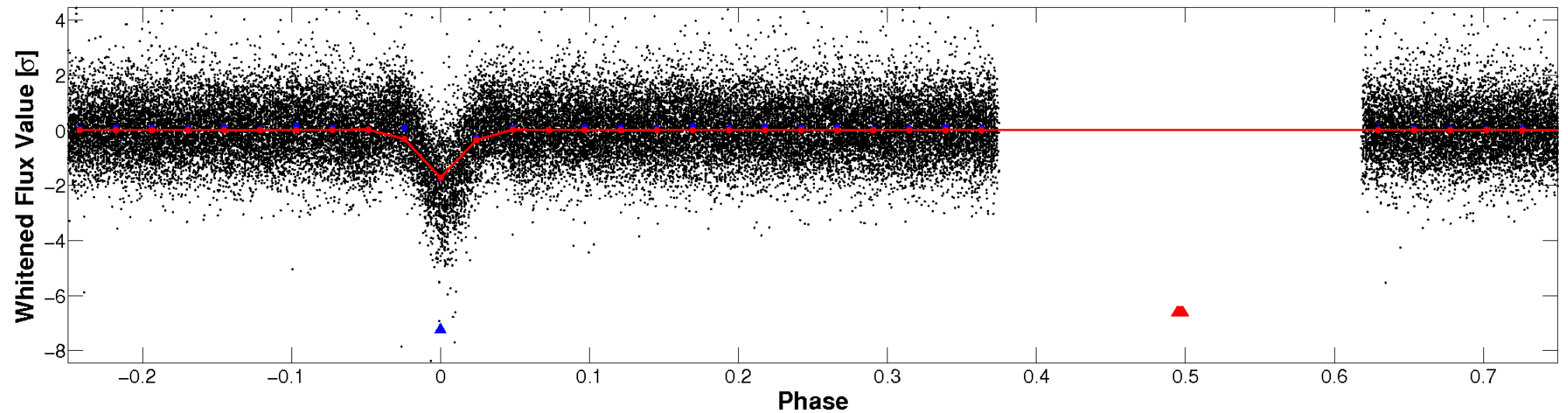


# Non-Whitened Vs. Whitened Light Curve

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

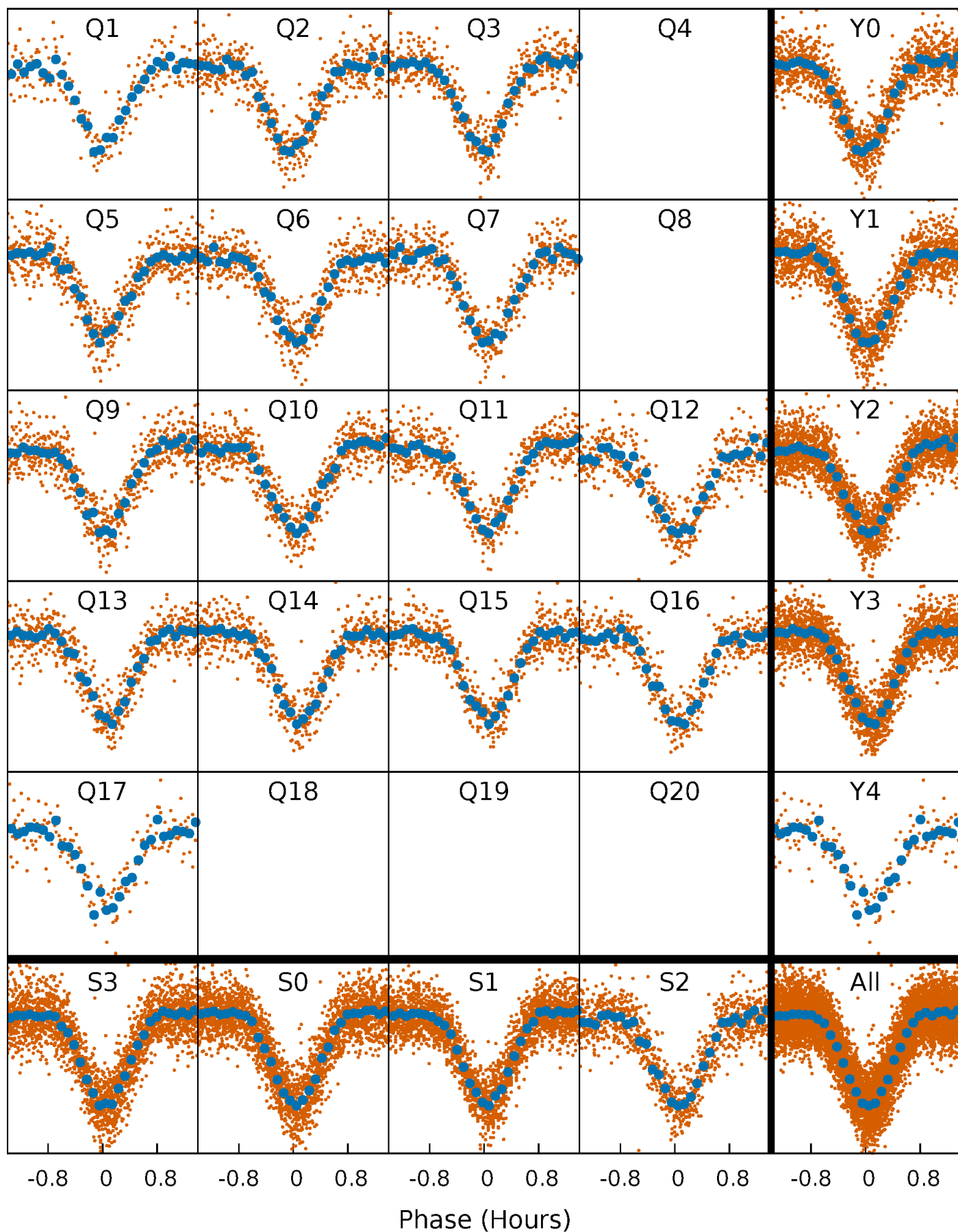


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

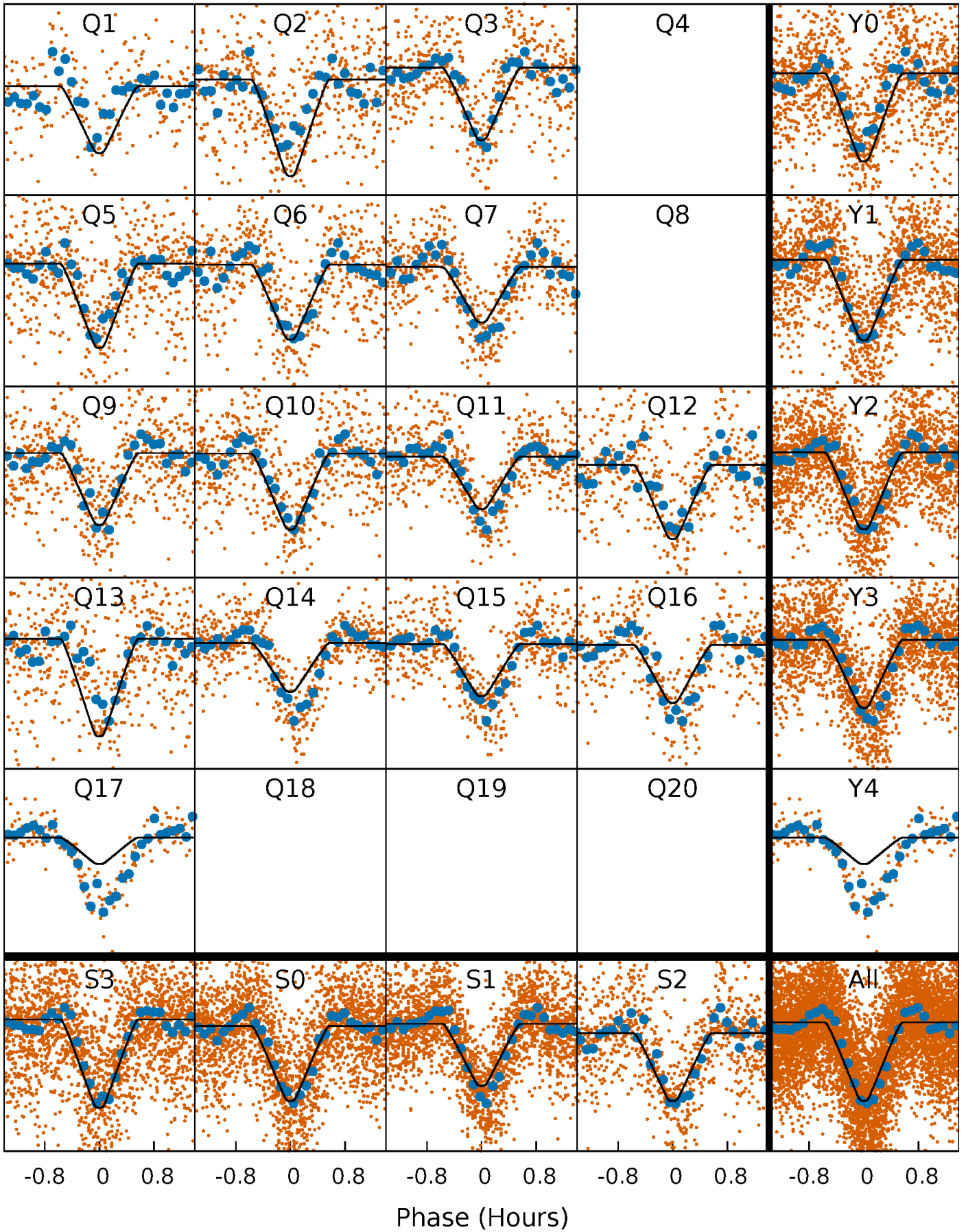
TCE 006028860-02   P= 0.844029 Days    $T_0=132.170109$  (BKJD)





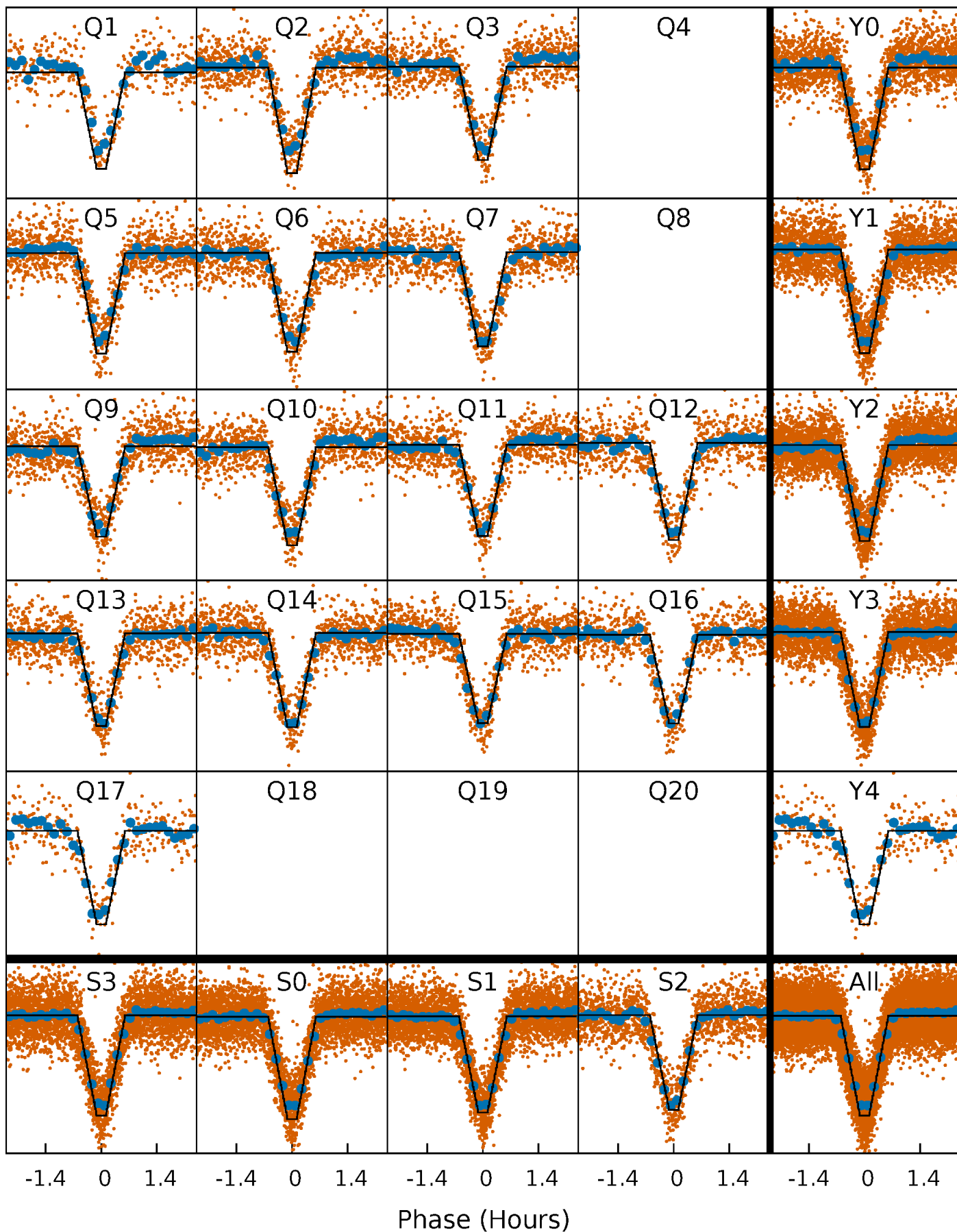
# DV Quarter-Phased Transit Curves

TCE 006028860-02   P= 0.844029 Days    $T_0=132.170109$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

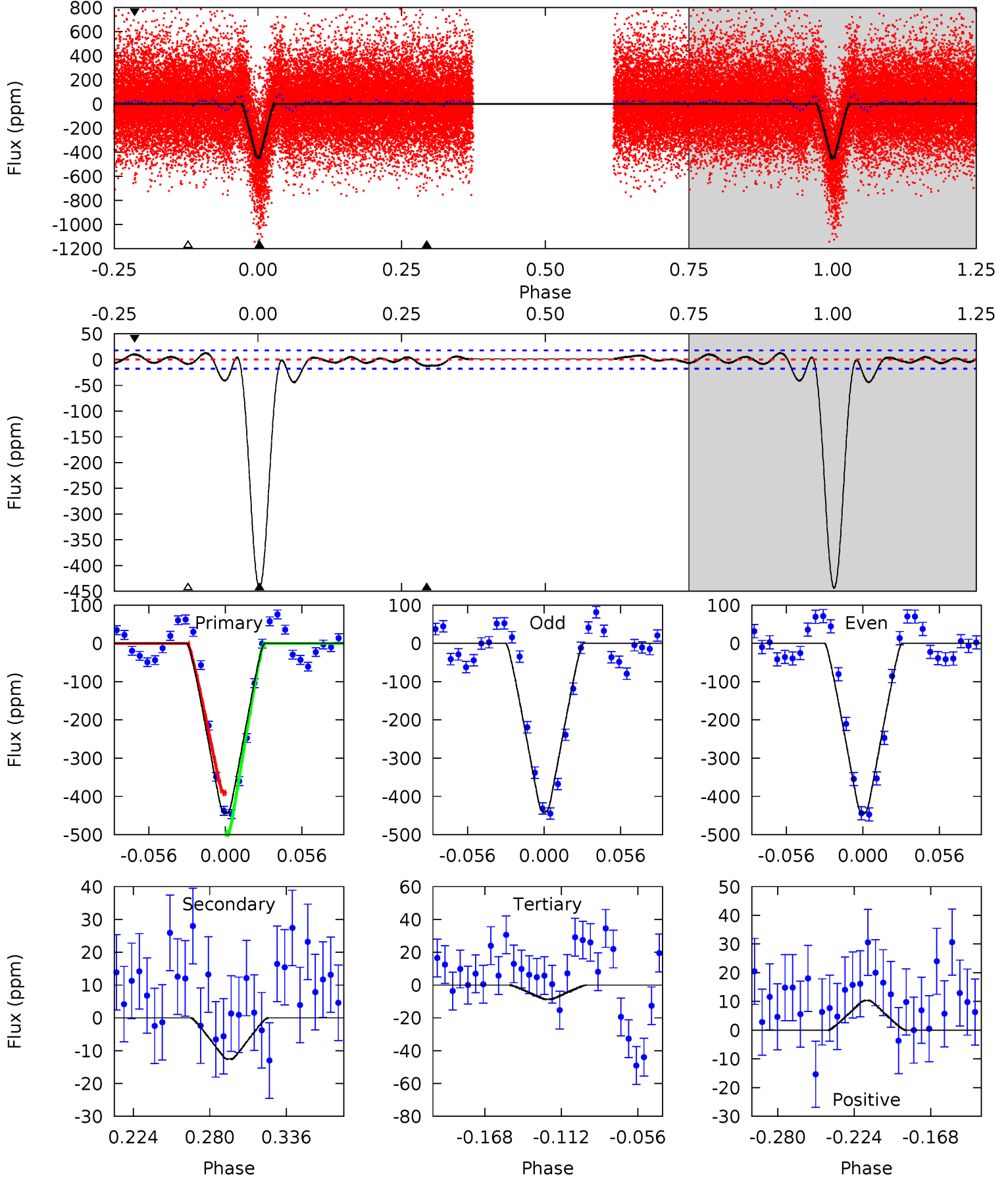
TCE 006028860-02     $P = 0.844033$  Days     $T_0 = 132.168036$  (BKJD)



# DV Model-Shift Uniqueness Test

006028860-02, P = 0.844029 Days, E = 131.326080 Days

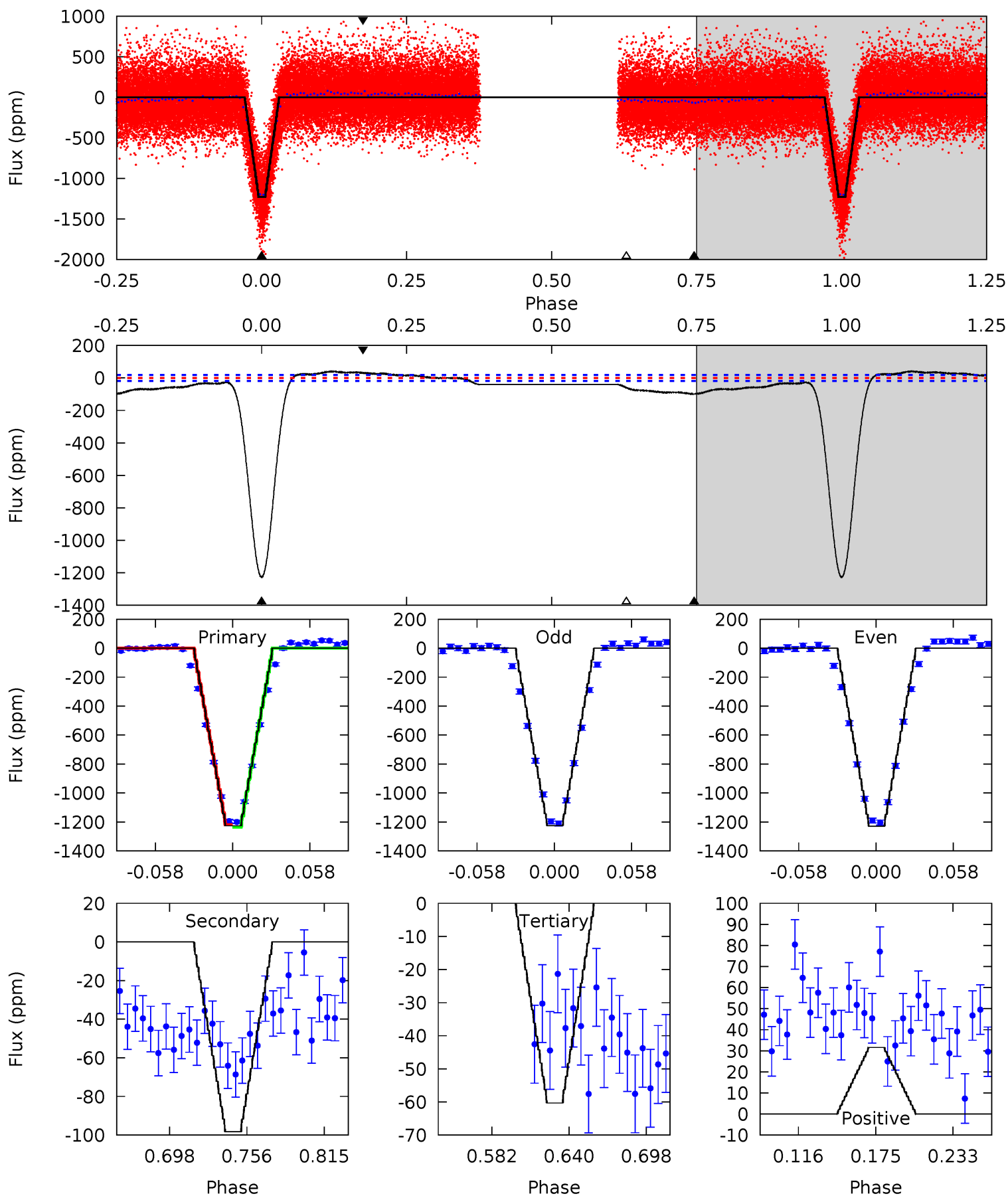
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
117.6	3.34	2.30	2.74	4.69	1.91	2.80	115.3	114.9	1.04	0.60	0.35	1.03	0.03	14.3



# Alt Model-Shift Uniqueness Test

006028860-02, P = 0.844033 Days, E = 131.324003 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
306.5	24.6	15.1	7.89	4.68	1.89	9.93	291.4	298.6	9.49	16.7	0.53	1.00	0.03	2.07



### Stellar Parameters For KIC 006028860

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$\rho_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5614^{+152}_{-152}$	$4.587^{+0.038}_{-0.152}$	$-0.340^{+0.300}_{-0.300}$	$0.777^{+0.182}_{-0.061}$	$0.858^{+0.089}_{-0.089}$	$2.573^{+0.496}_{-1.053}$
	+3%/-3%	+1%/-3%	+88%/-88%	+23%/-8%	+10%/-10%	+19%/-41%
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 006028860-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-13 \pm 4$	$2.06^{+0.35}_{-0.27}$	$2412^{+132}_{-95}$	$2461^{+307}_{-4490}$	$0.427^{+0.201}_{-0.147}$
Alt.	$-98 \pm 4$	$3.16^{+0.45}_{-0.32}$	$2410^{+138}_{-95}$	$3315^{+126}_{-119}$	$1.466^{+0.328}_{-0.300}$

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

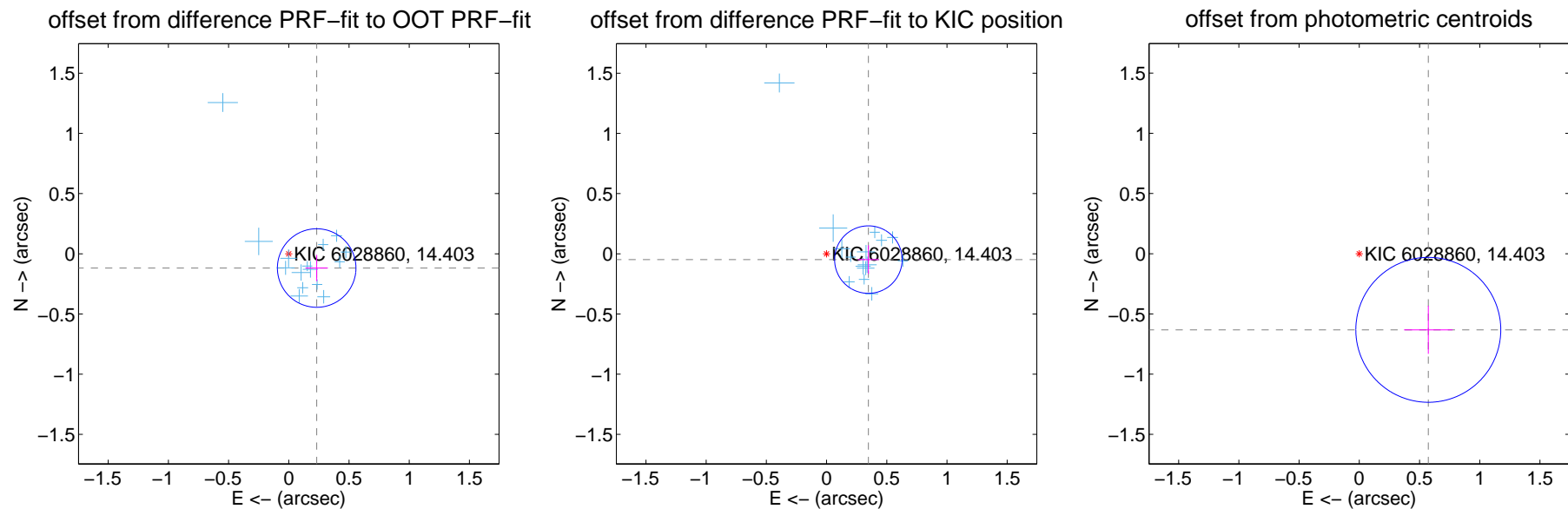
## DV Centroid Data

Supplemental centroid analysis for 006028860-02. Kepler magnitude: 14.40. Transit SNR 67.22

There are 15 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.32 arcsec

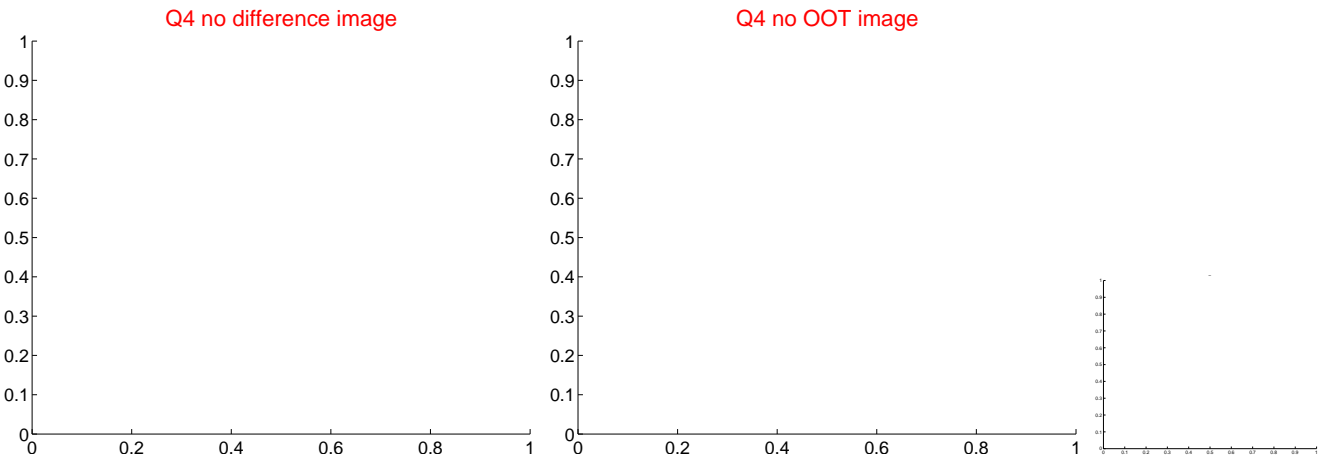
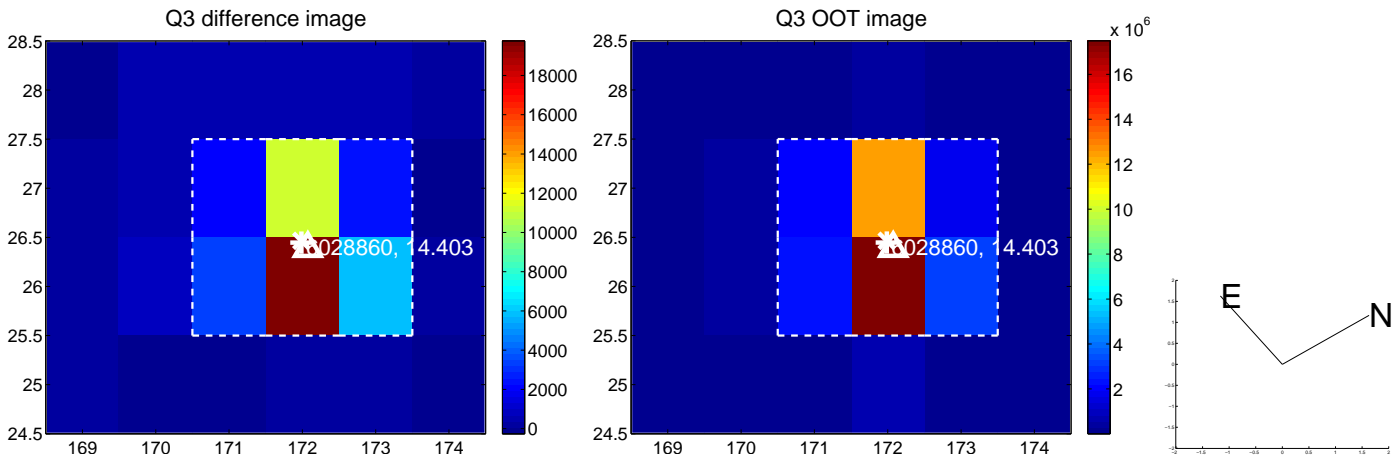
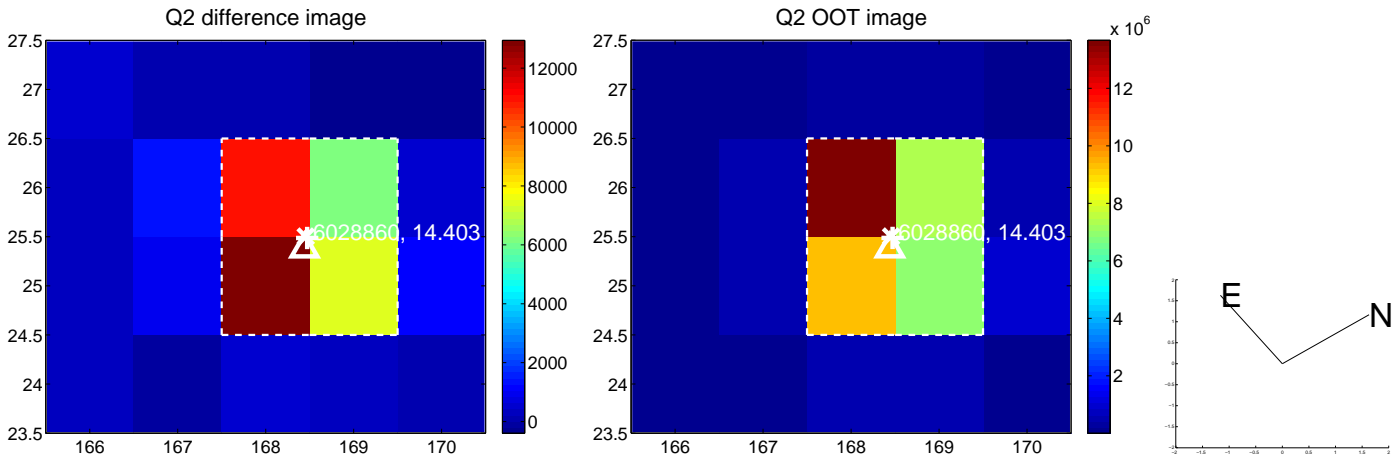
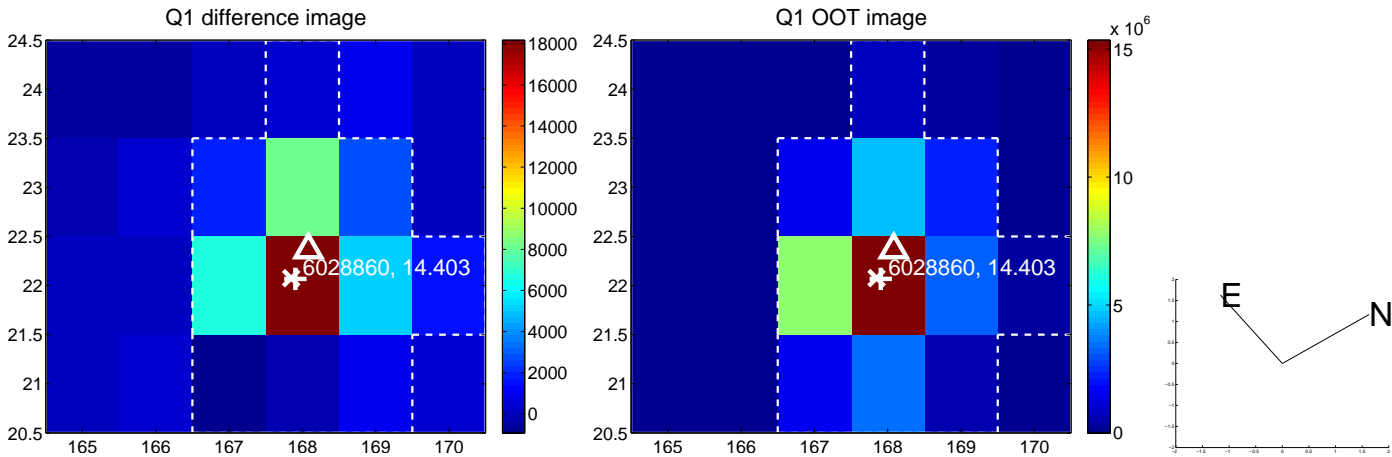
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.260 \pm 0.109$	2.39	$-0.232 \pm 0.093$	$-0.118 \pm 0.110$
PRF-fit source offset from KIC position	$0.351 \pm 0.093$	3.75	$-0.347 \pm 0.087$	$-0.048 \pm 0.119$
photometric centroid source offset	$0.85 \pm 0.20$	4.25	$-0.57 \pm 0.20$	$-0.63 \pm 0.20$



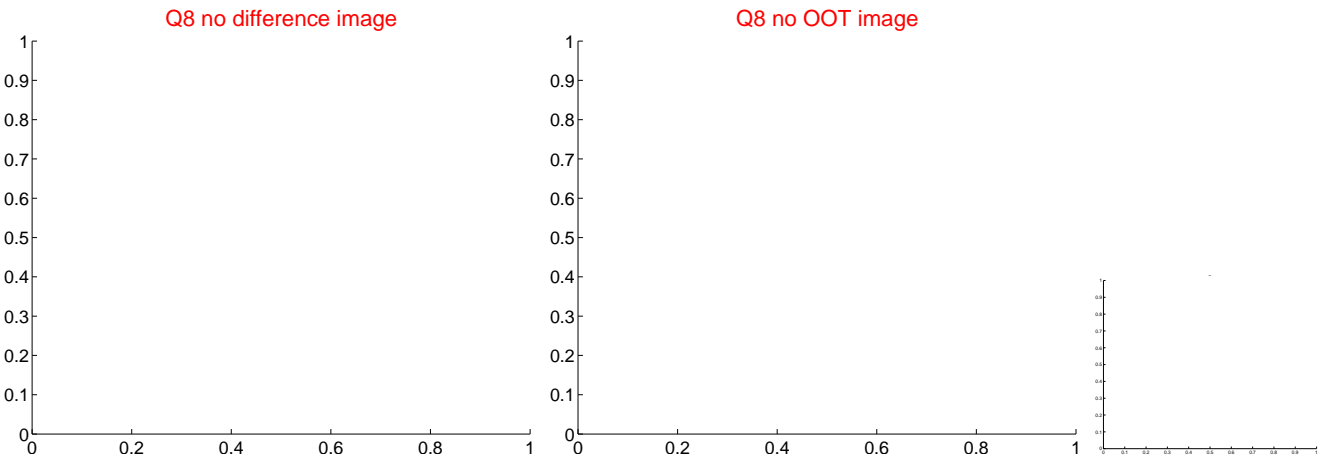
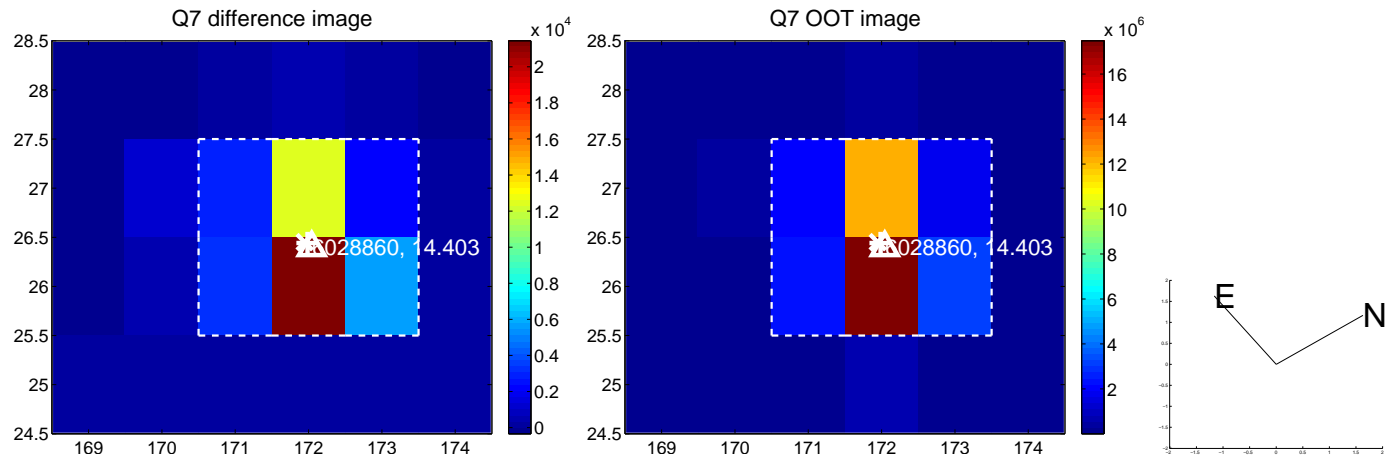
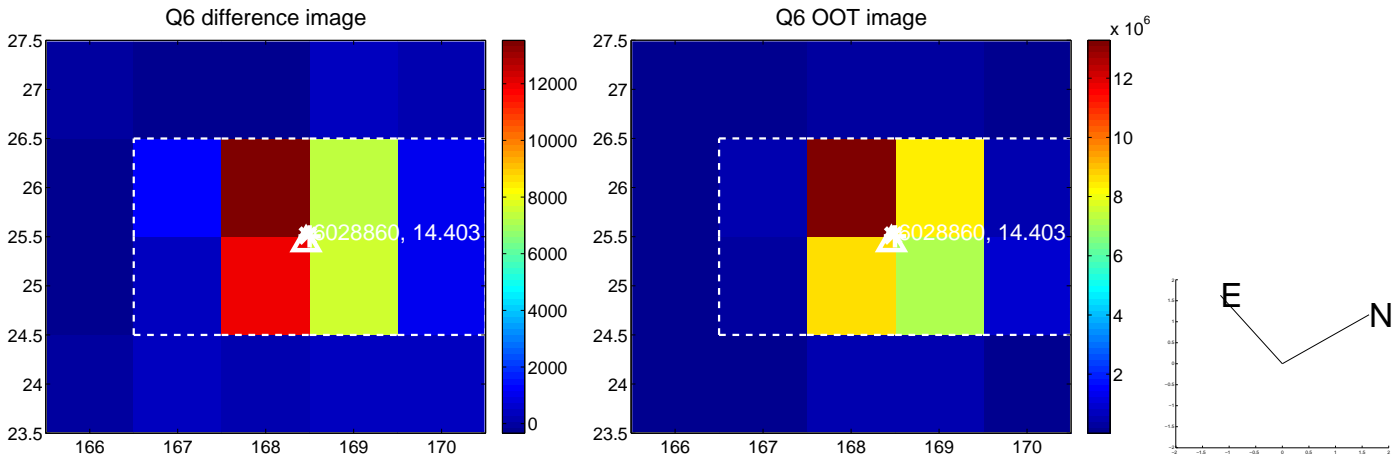
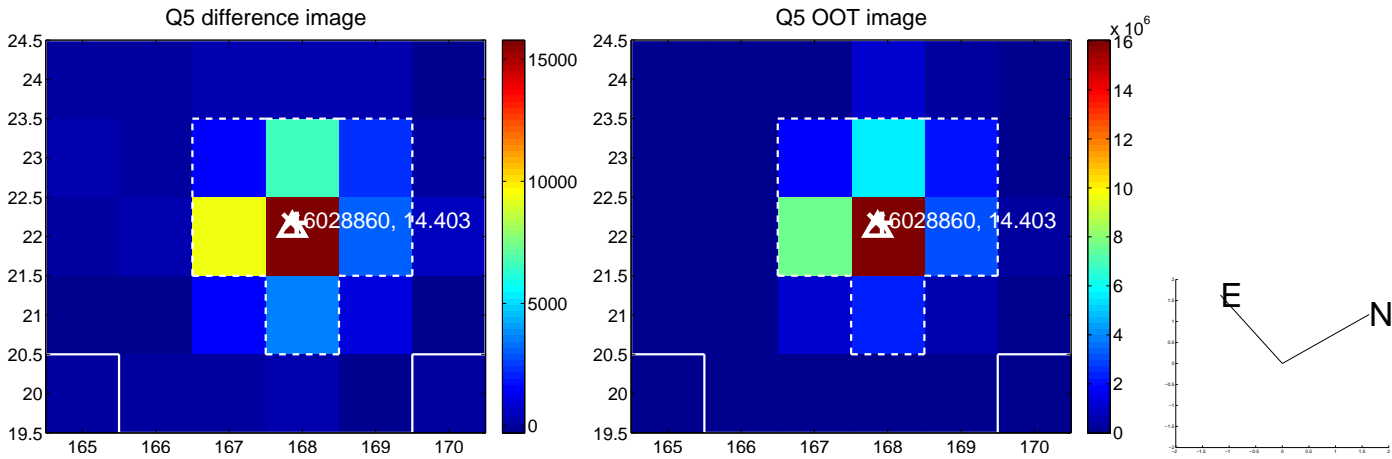
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



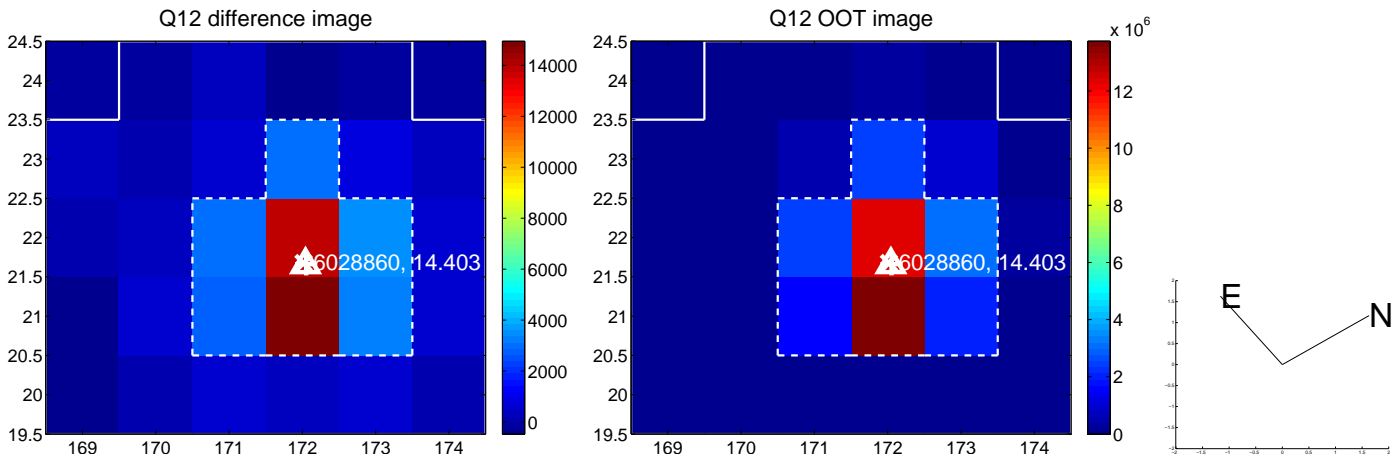
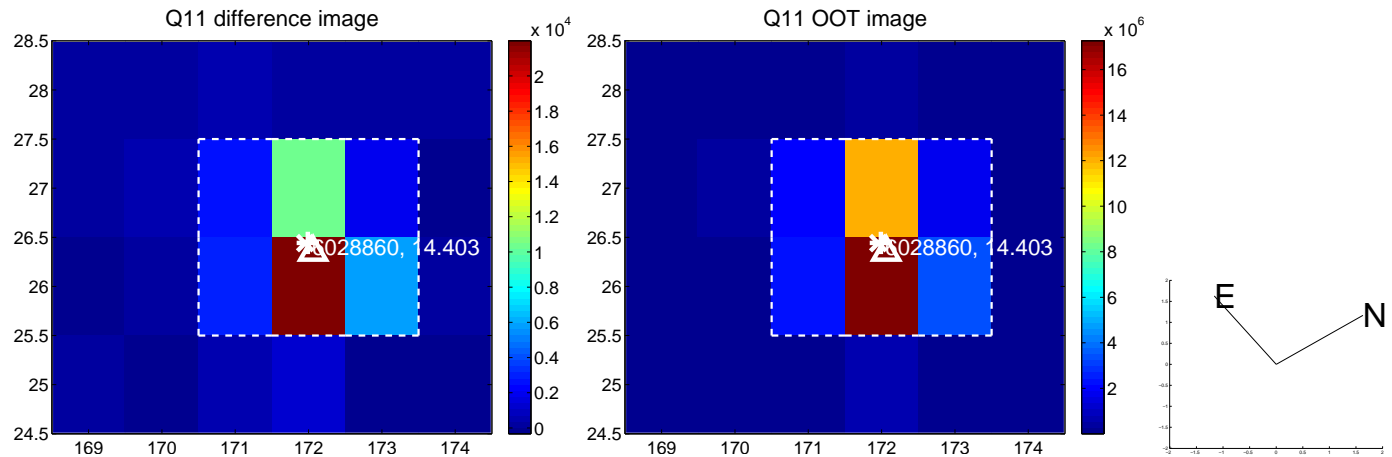
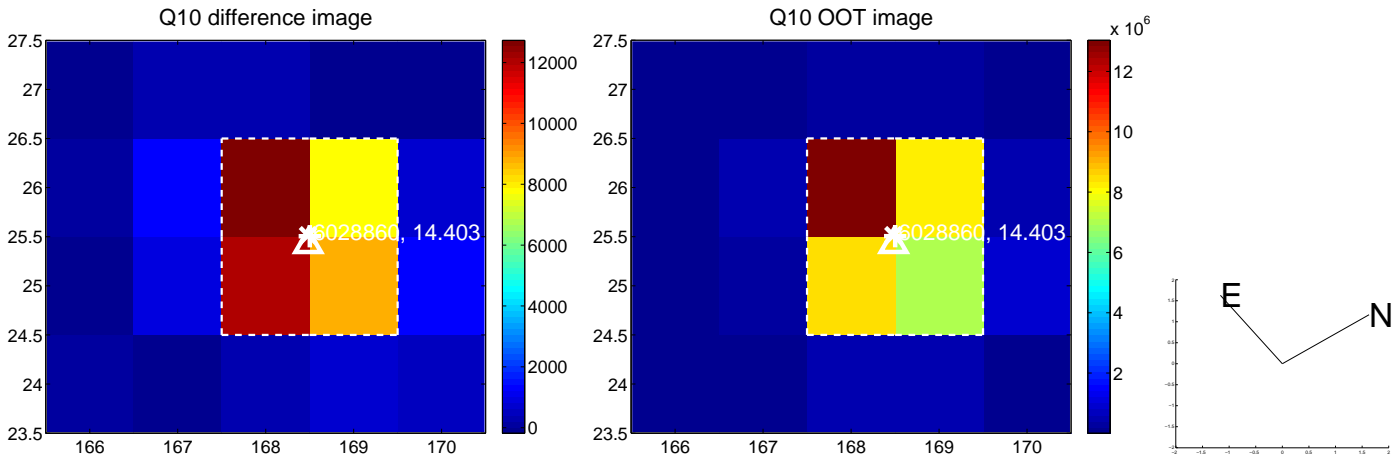
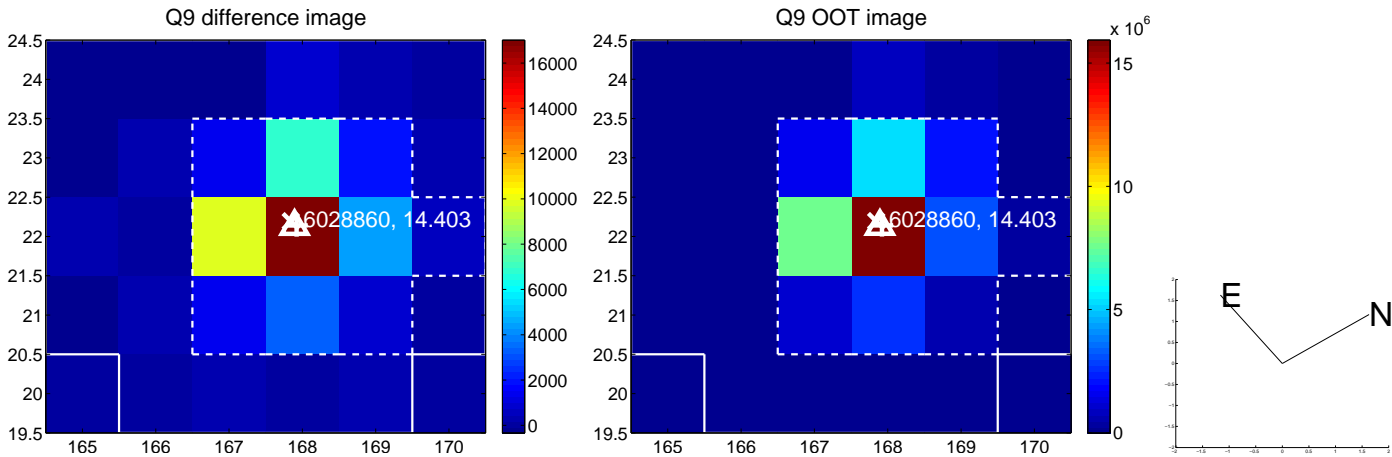
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



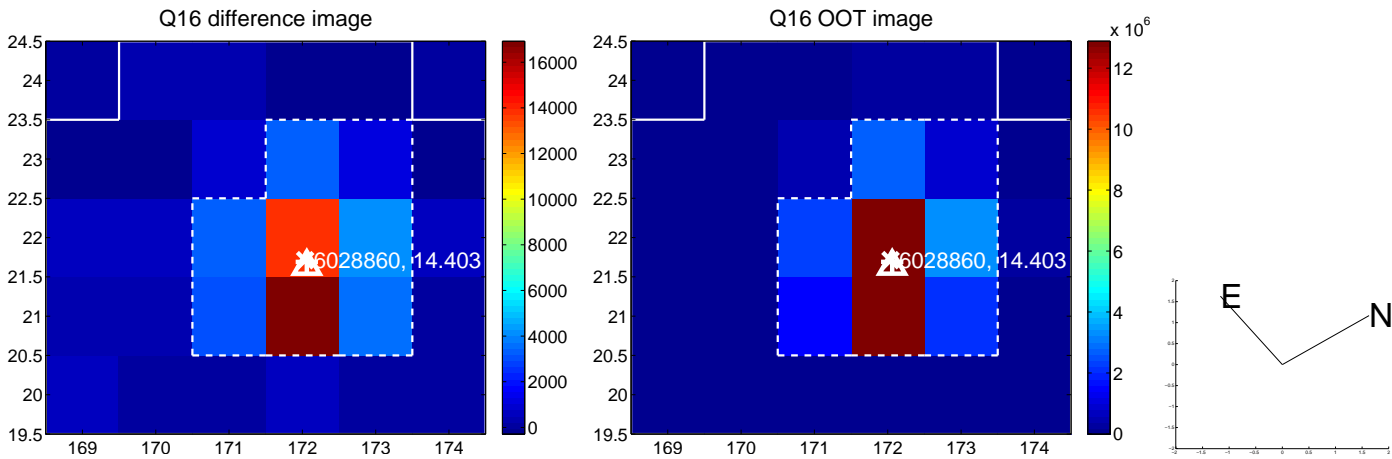
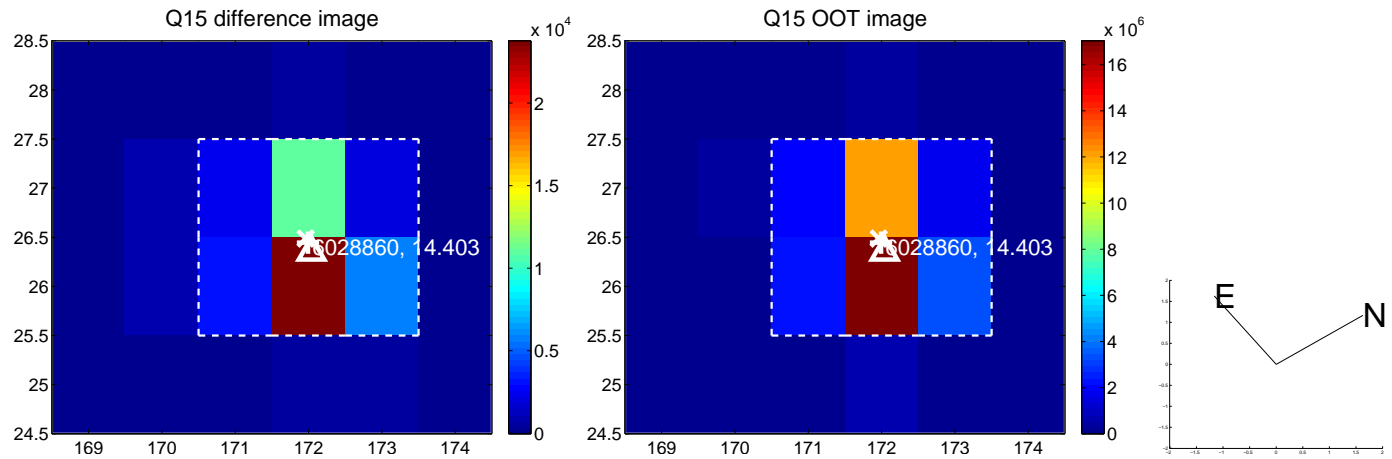
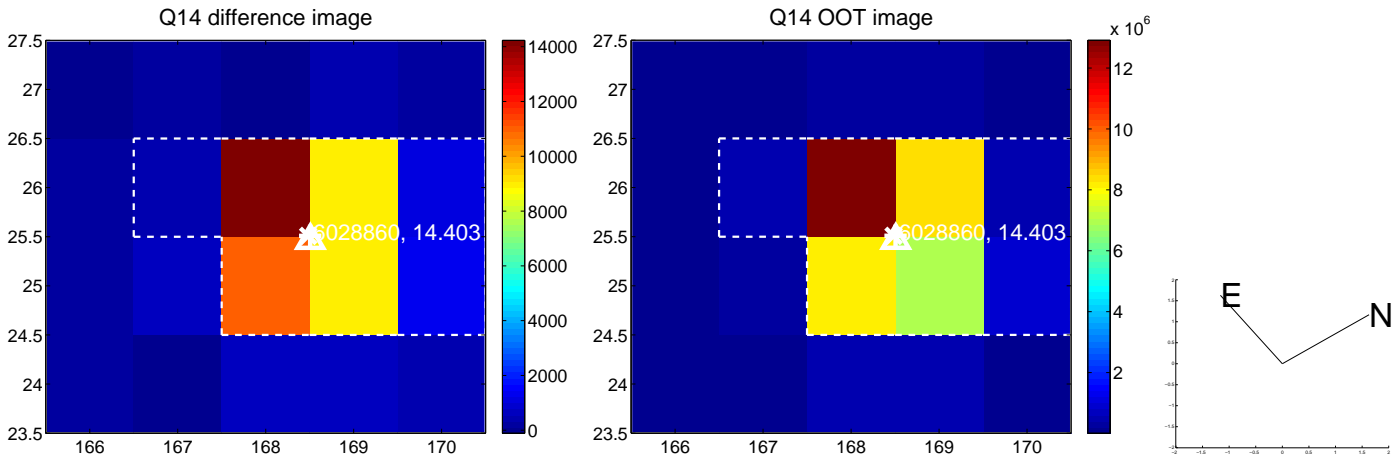
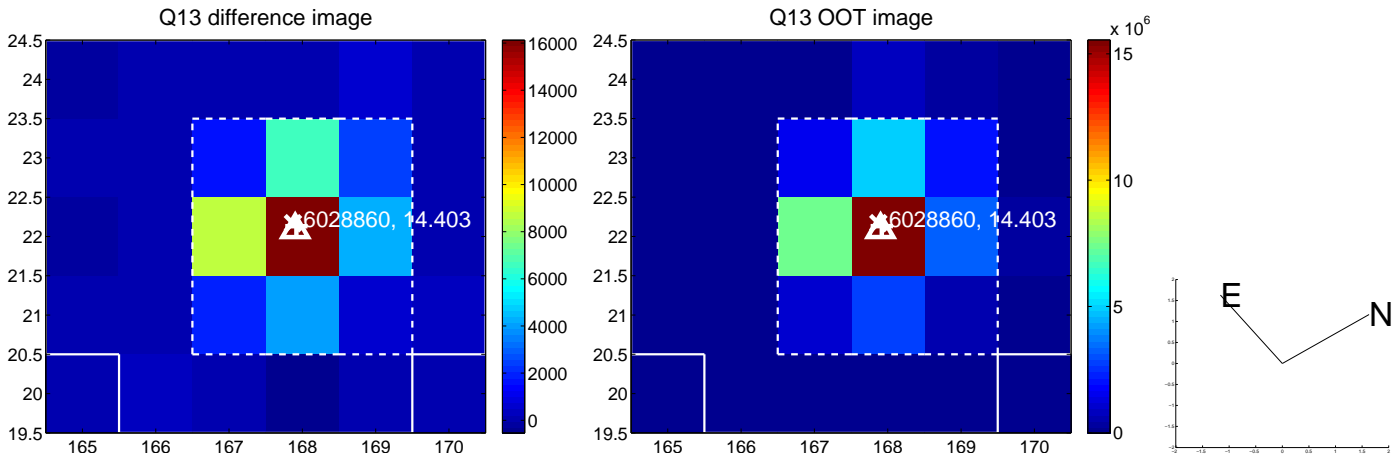
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



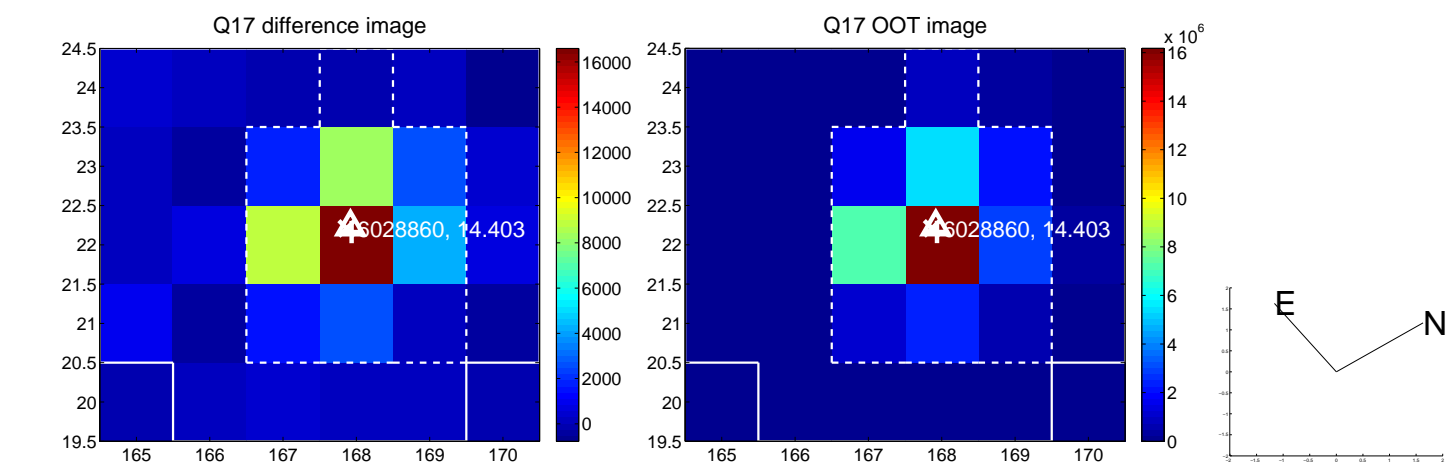
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



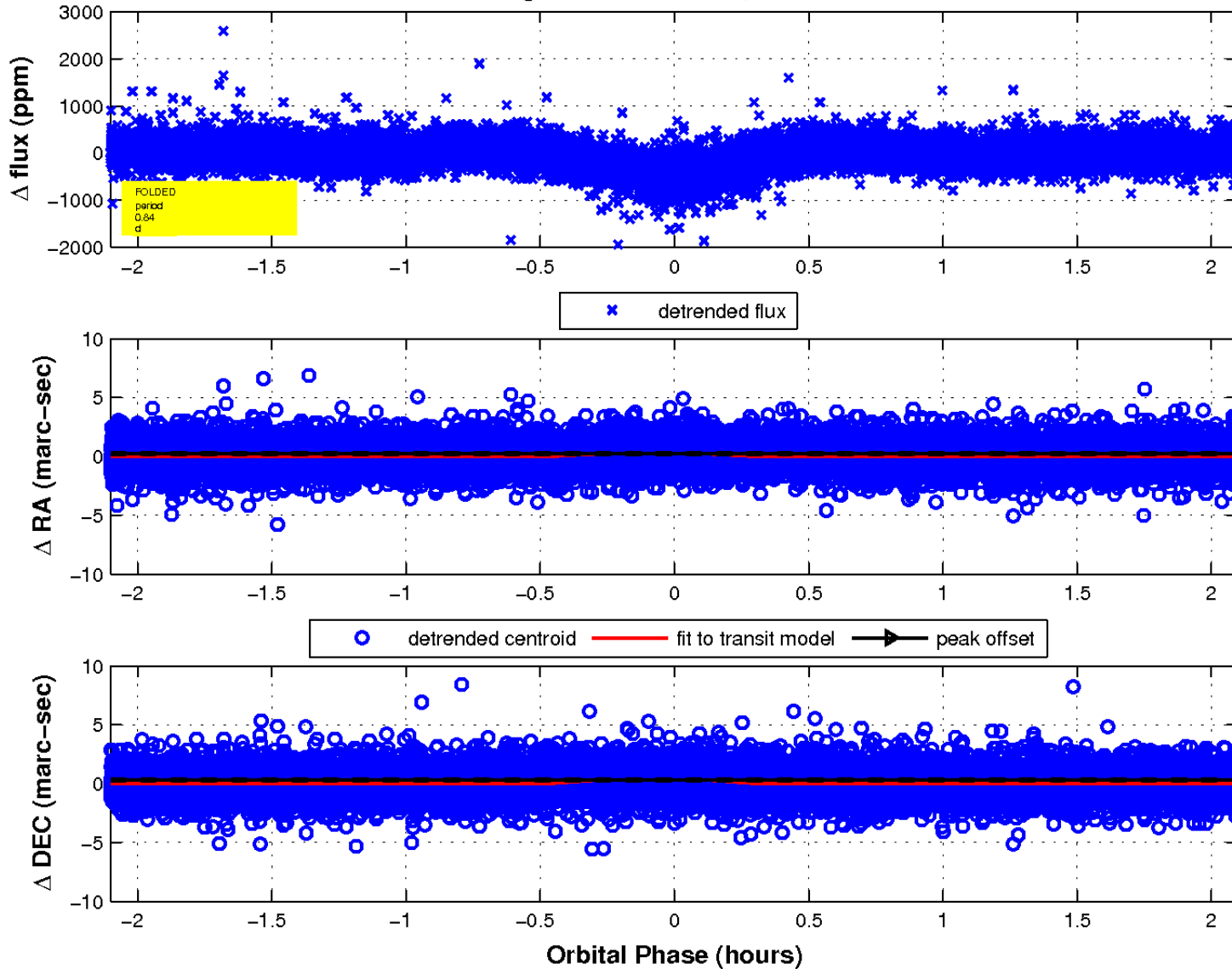
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

Declination

