

# KIC 008868907

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008868907-01	OBS	3539.01	157.322305	265.256199	119013.4	8.512	1936.0	1344.3	0.99	6109	35.94	3.61
008868907-02	OBS	No	157.322335	222.902452	154400.1	21.989	2024.7	2326.9	0.99	6109	57.63	3.61

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008868907-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_DV—HAS_SEC_TCE
008868907-02	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.

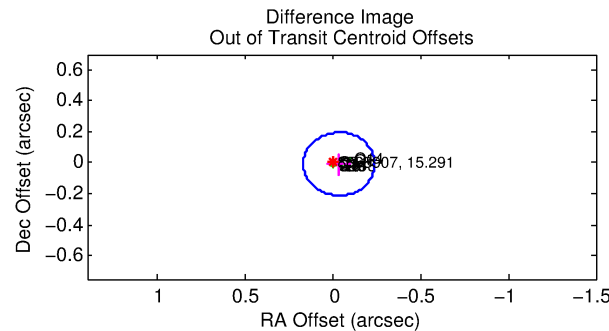
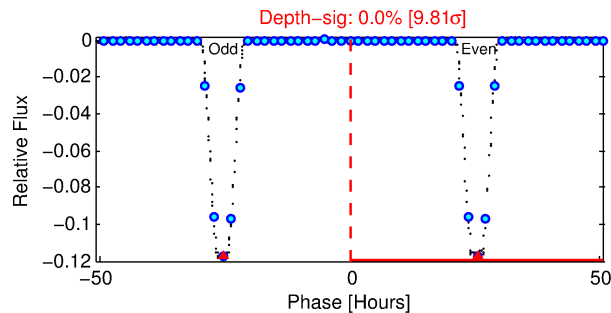
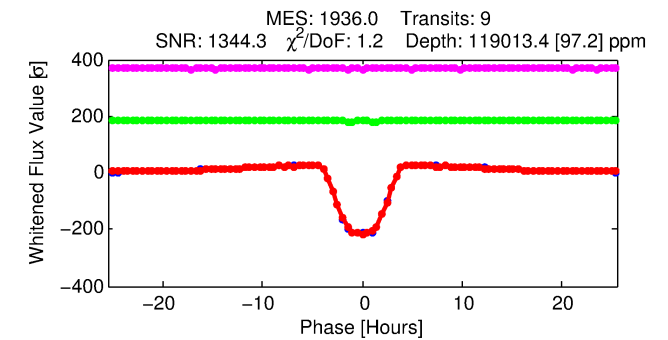
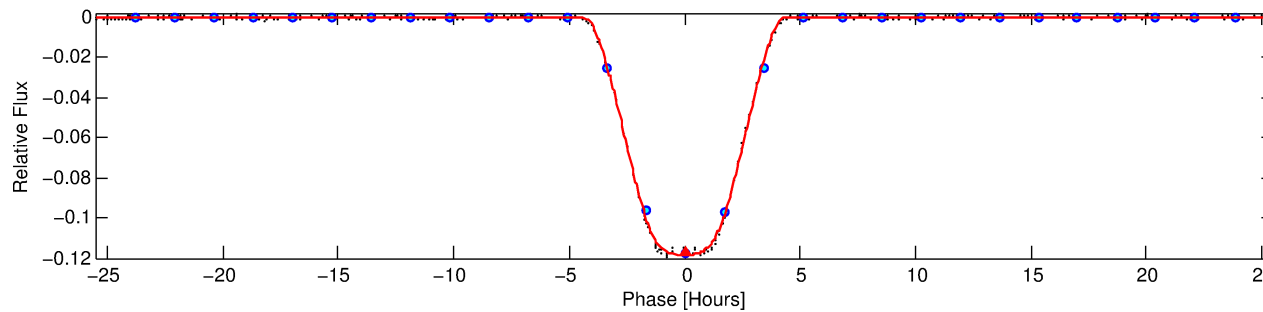
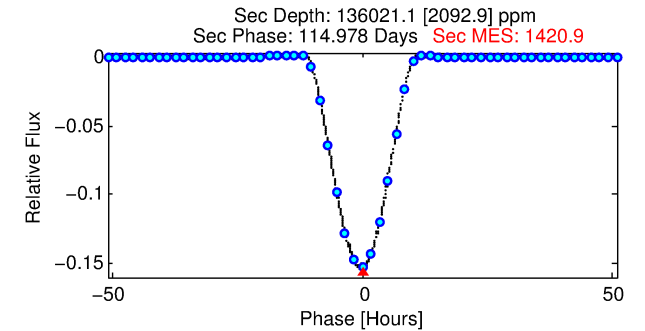
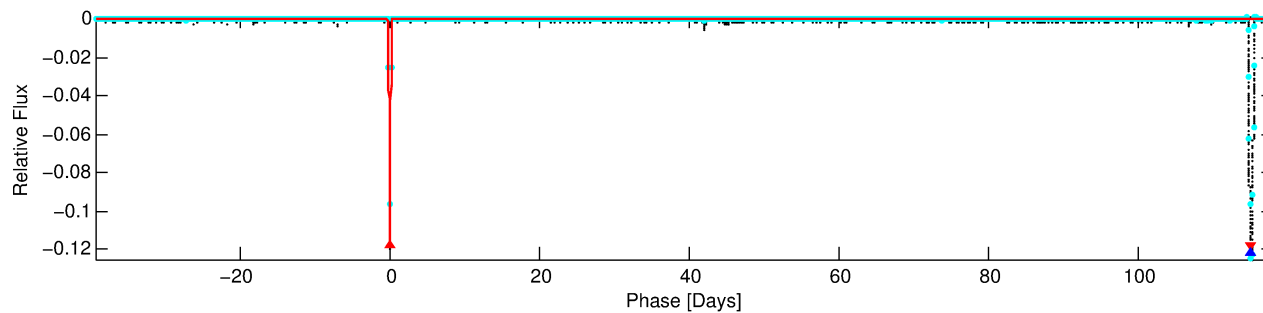
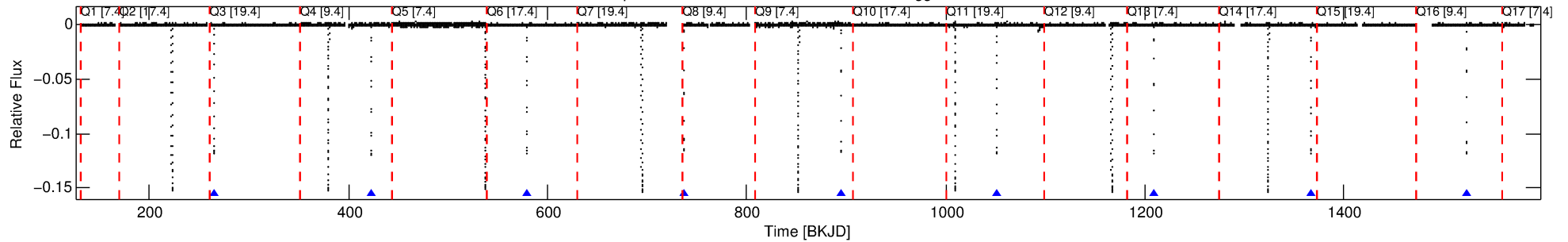
## Ephemeris Match Information For 008868907-01

No Significant Match Found

# DV One-Page Summary

KIC: 8868907 Candidate: 1 of 2 Period: 157.322 d  
KOI: K03539 Corr: No Ephemeris Match

Kp: 15.29 R\*: 0.99 Rs Teff: 6109.0 K Logg: 4.47 Fe/H: -0.120



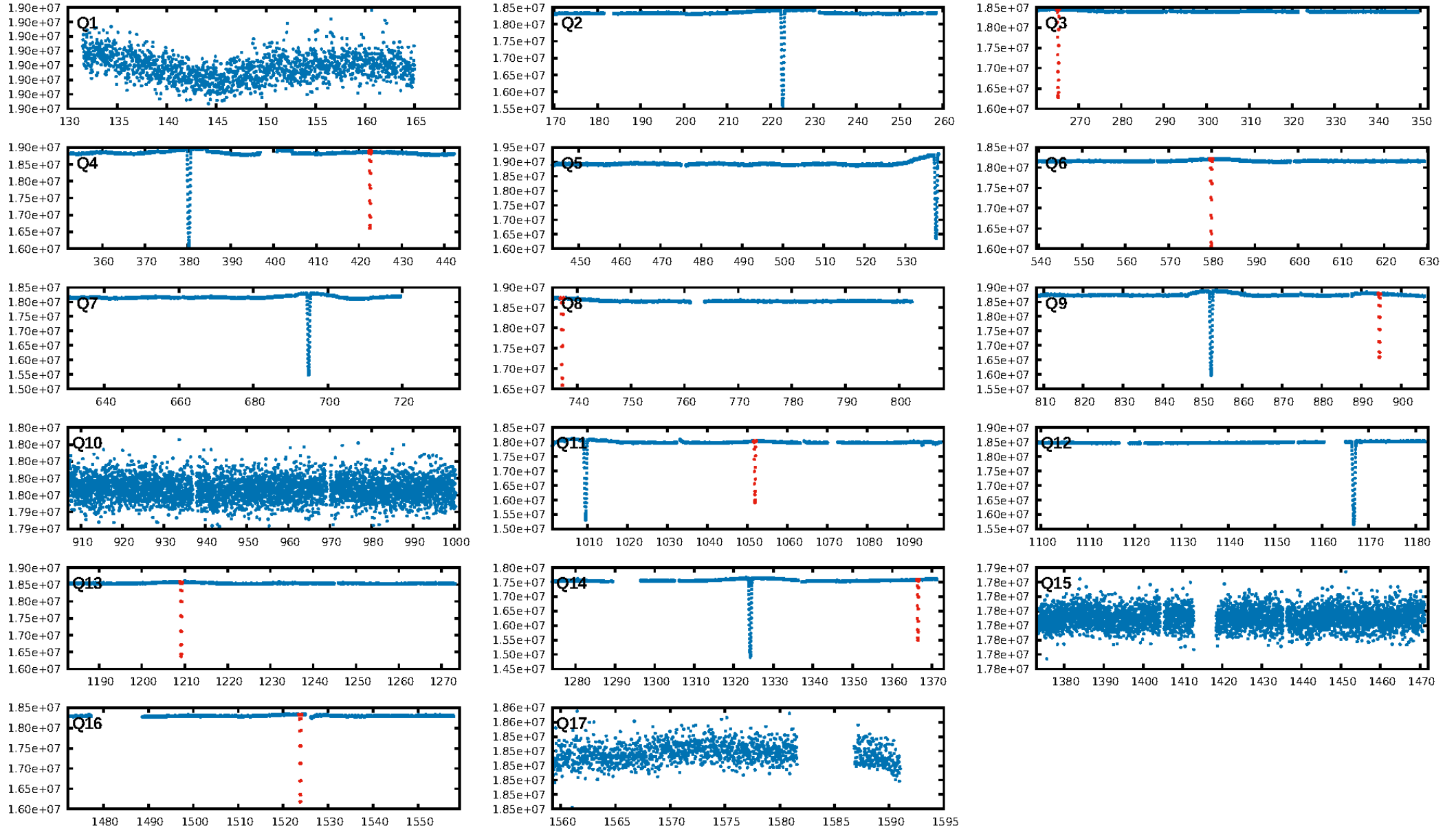
## DV Fit Results:

Period = 157.32231 [0.00002] d  
Epoch = 265.2562 [0.0001] BKJD  
Rp/R\* = 0.3330 [0.0002]  
a/R\* = 169.90 [0.20]  
b = 0.57 [0.00]  
Seff = 3.61 [1.49]  
Teff = 352 [36] K  
Rp = 35.94 [11.34] Re  
a = 0.5812 [0.1557] AU  
Ag = 19569.55 [7689.87] [2.54 sigma]  
Teffp = 6429 [204] K [29.39 sigma]

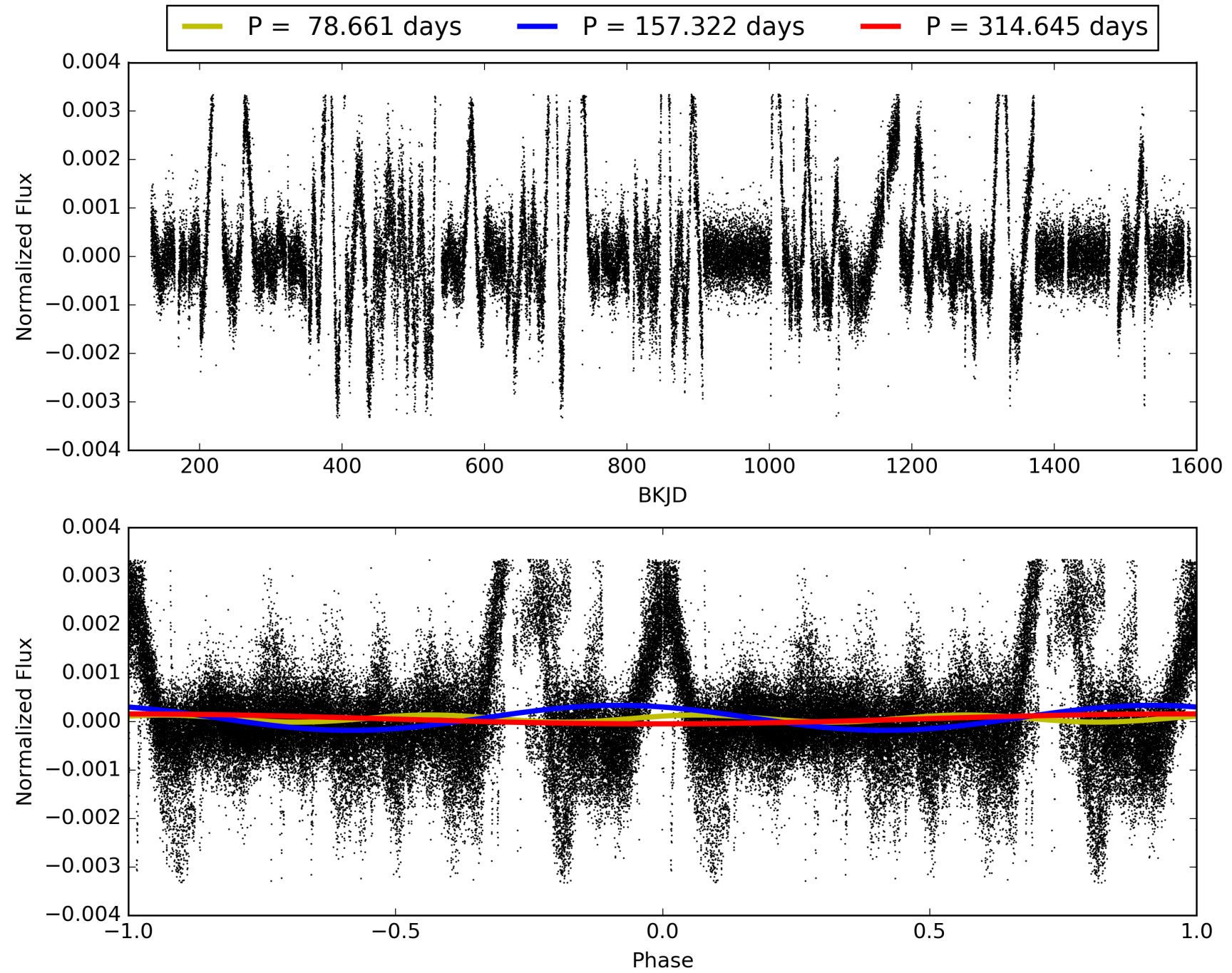
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00 sigma]  
ModelChiSquare2-sig: 47.4%  
ModelChiSquareGof-sig: 18.1%  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [9/9]  
GhostDiagnostic-chr: 5.002  
Centroid-sig: 0.0%  
Centroid-so: 0.132 arcsec [27.36 sigma]  
OotOffset-rm: 0.035 arcsec [0.52 sigma]  
OotOffset-st: 2/2/3/2 [9]  
KicOffset-rm: 0.131 arcsec [1.82 sigma]  
KicOffset-st: 2/2/3/2 [9]  
DiffImageQuality-fgm: 1.00 [9/9]  
DiffImageOverlap-fno: 1.00 [9/9]

# TCE 008868907-01, PDC Light Curves

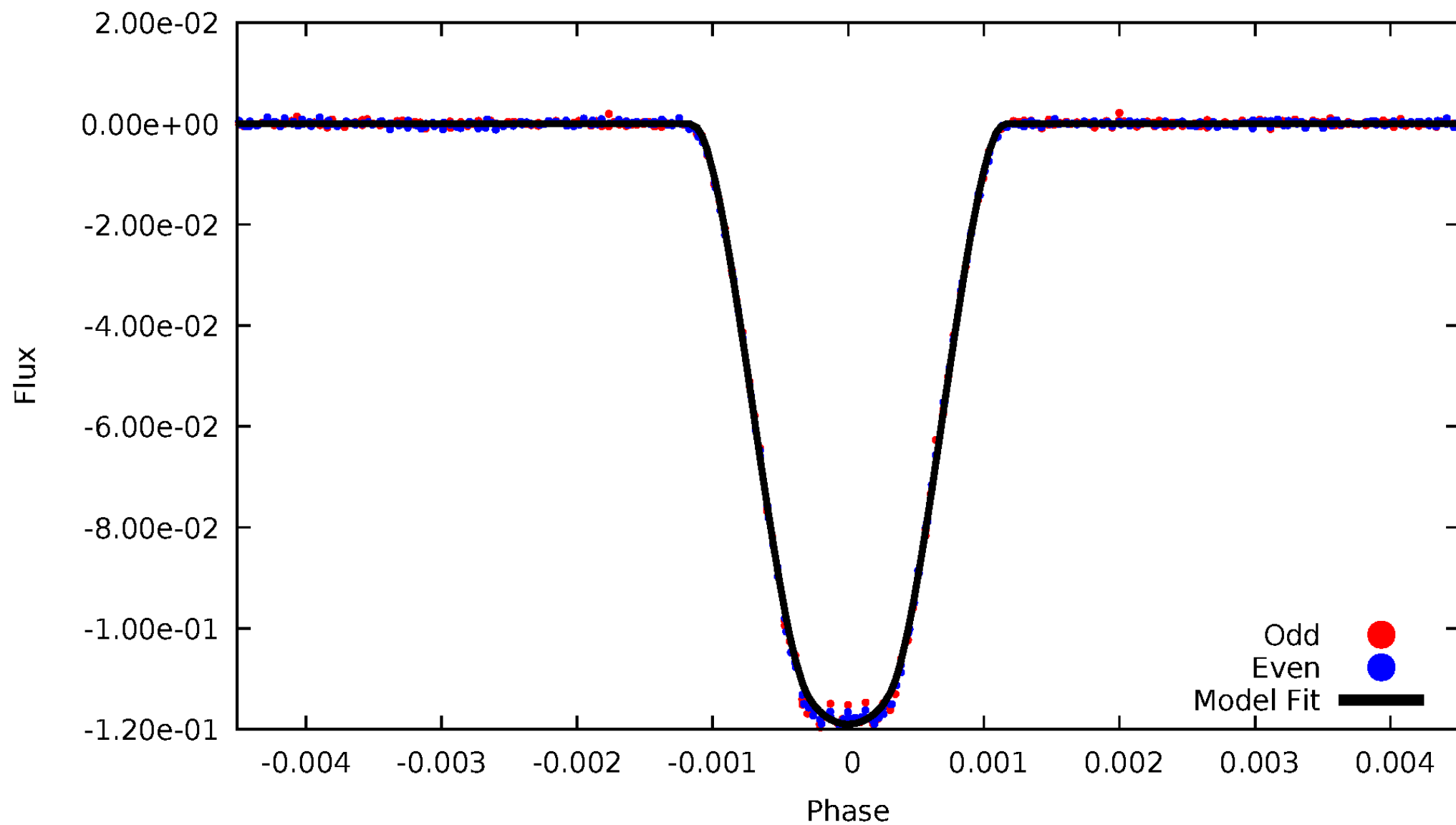


TCE 008868907-01



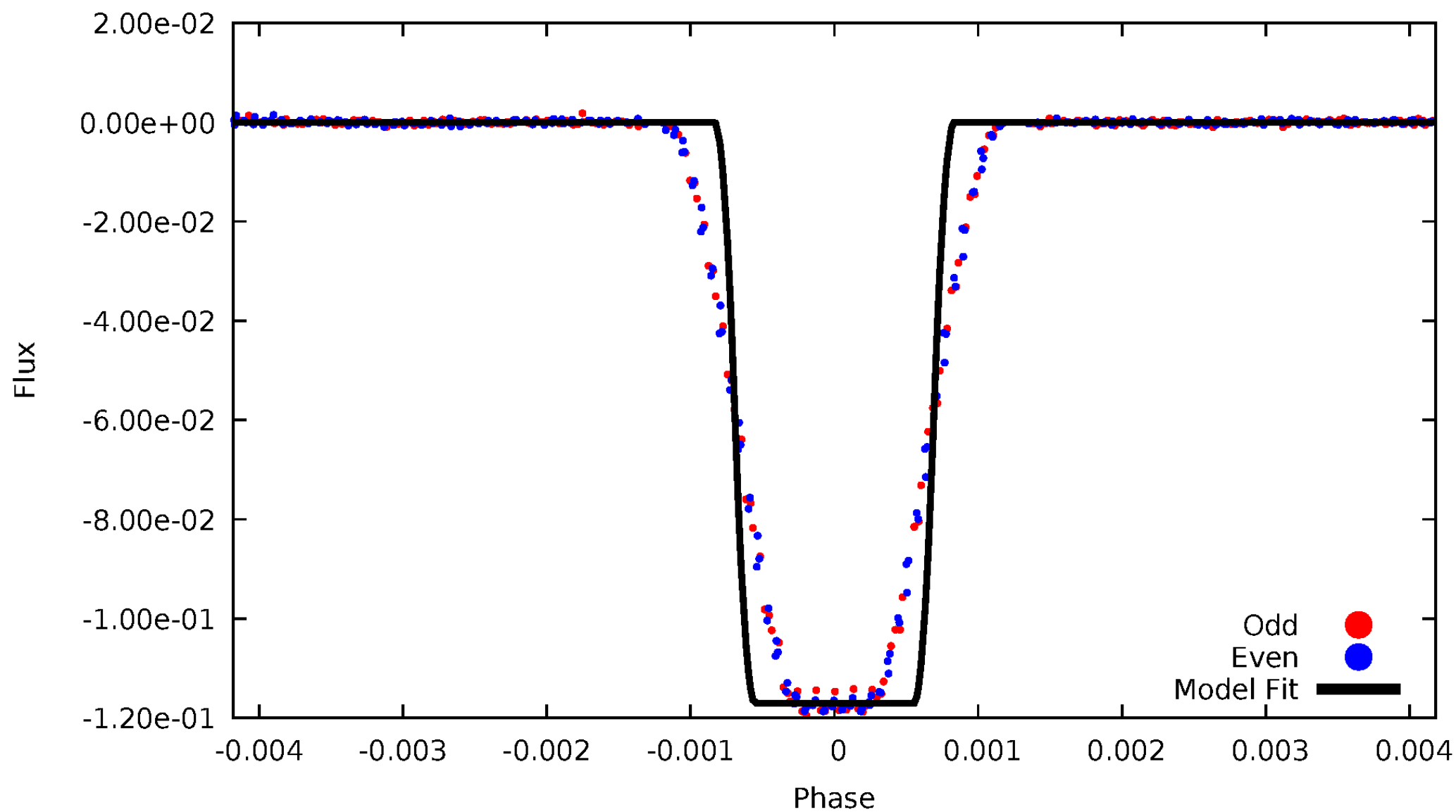
# DV Odd/Even

TCE 008868907-01



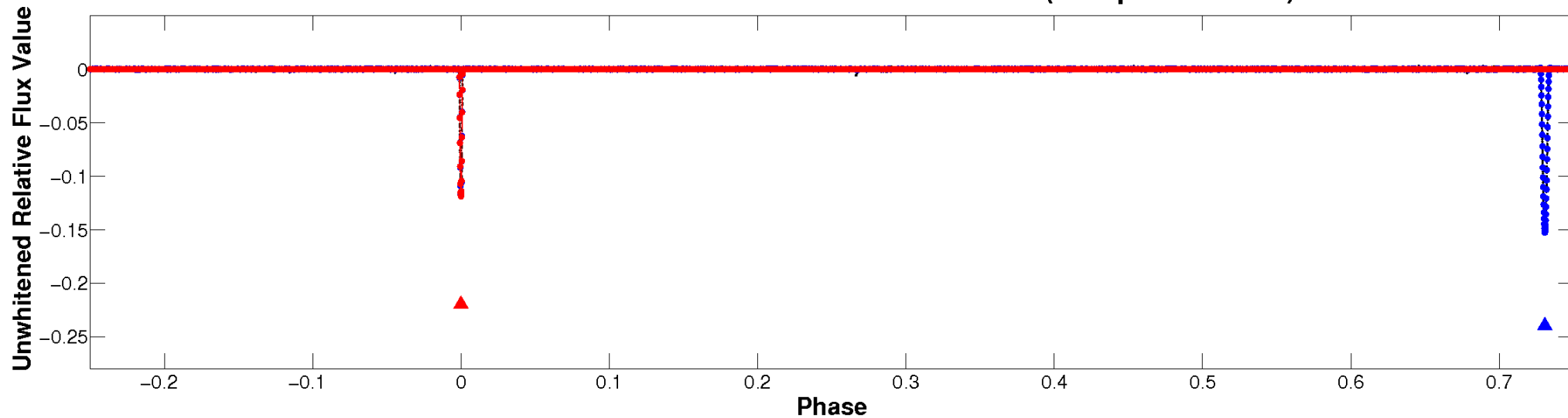
# ALT Odd/Even

TCE 008868907-01

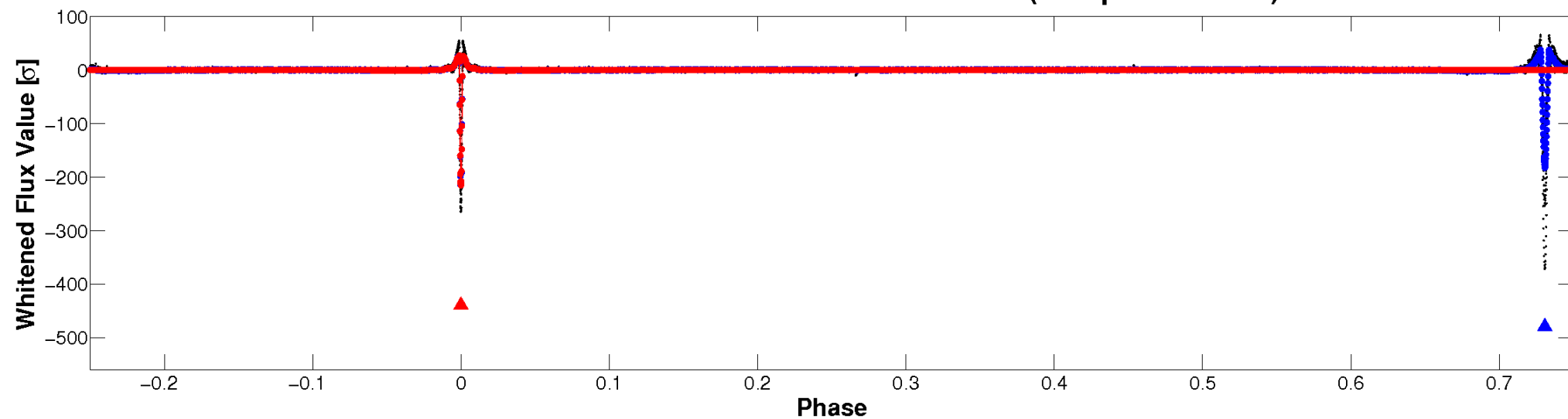


# Non-Whitened Vs. Whitened Light Curve

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

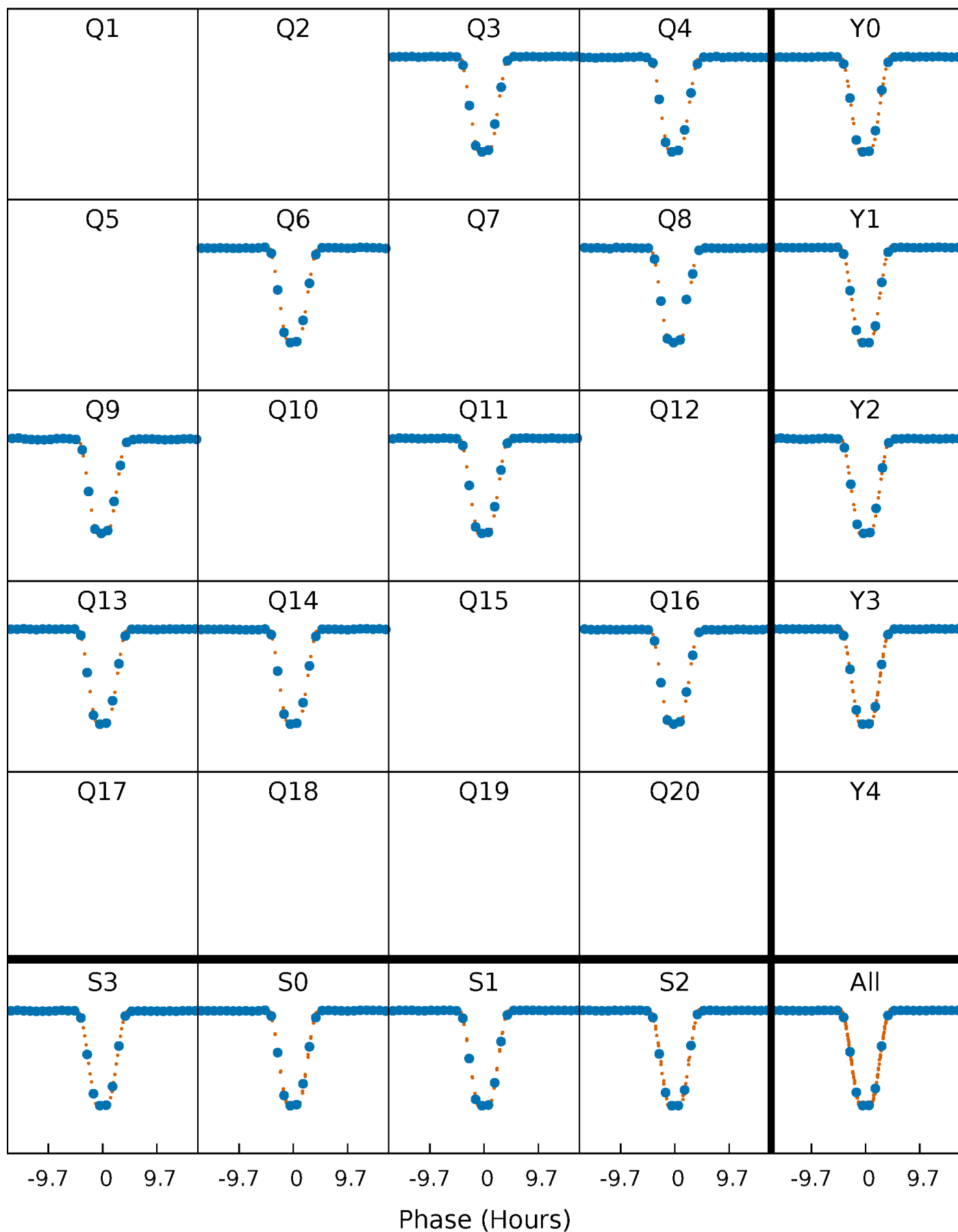


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

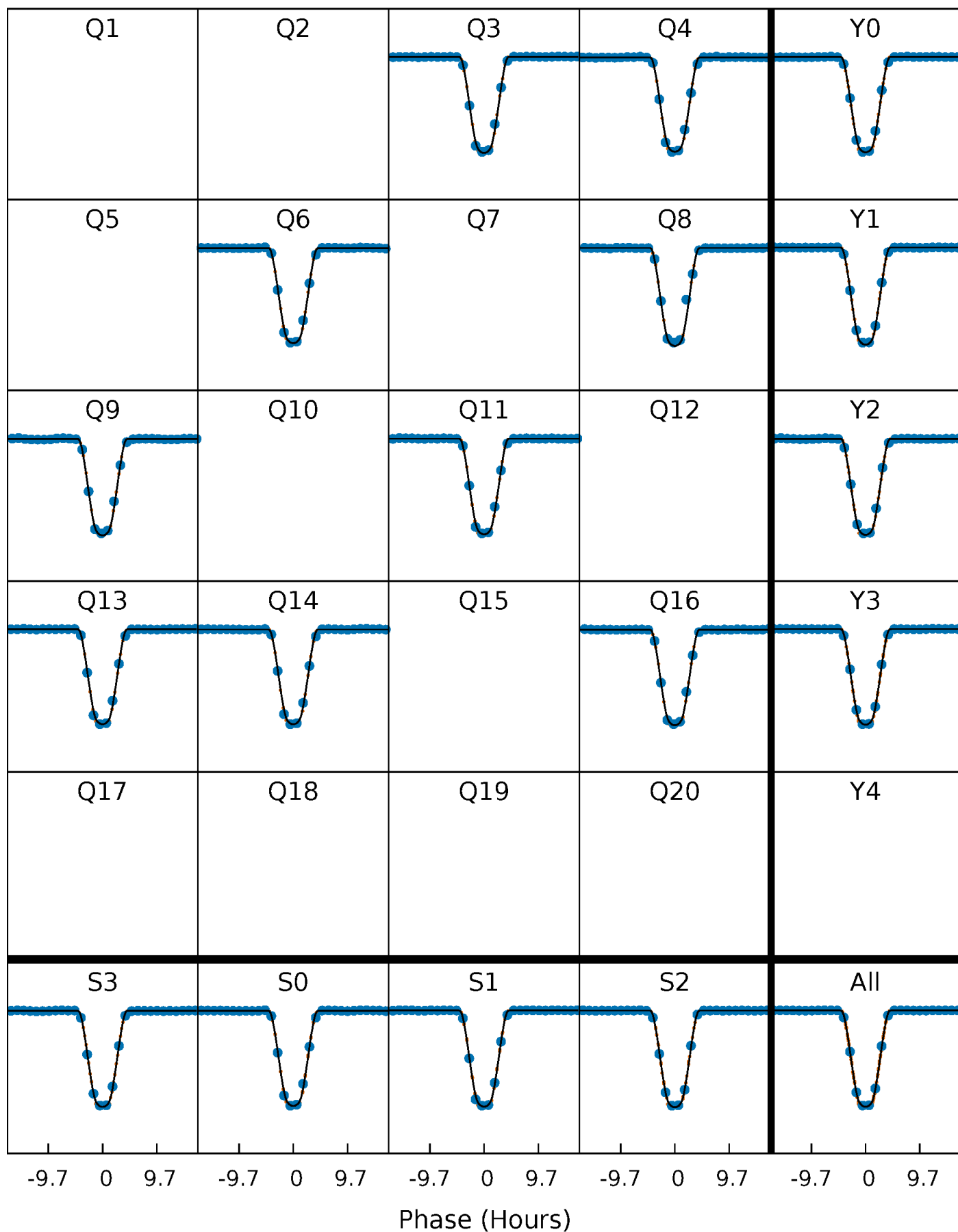
TCE 008868907-01 P=157.322305 Days  $T_0=265.256198$  (BKJD)





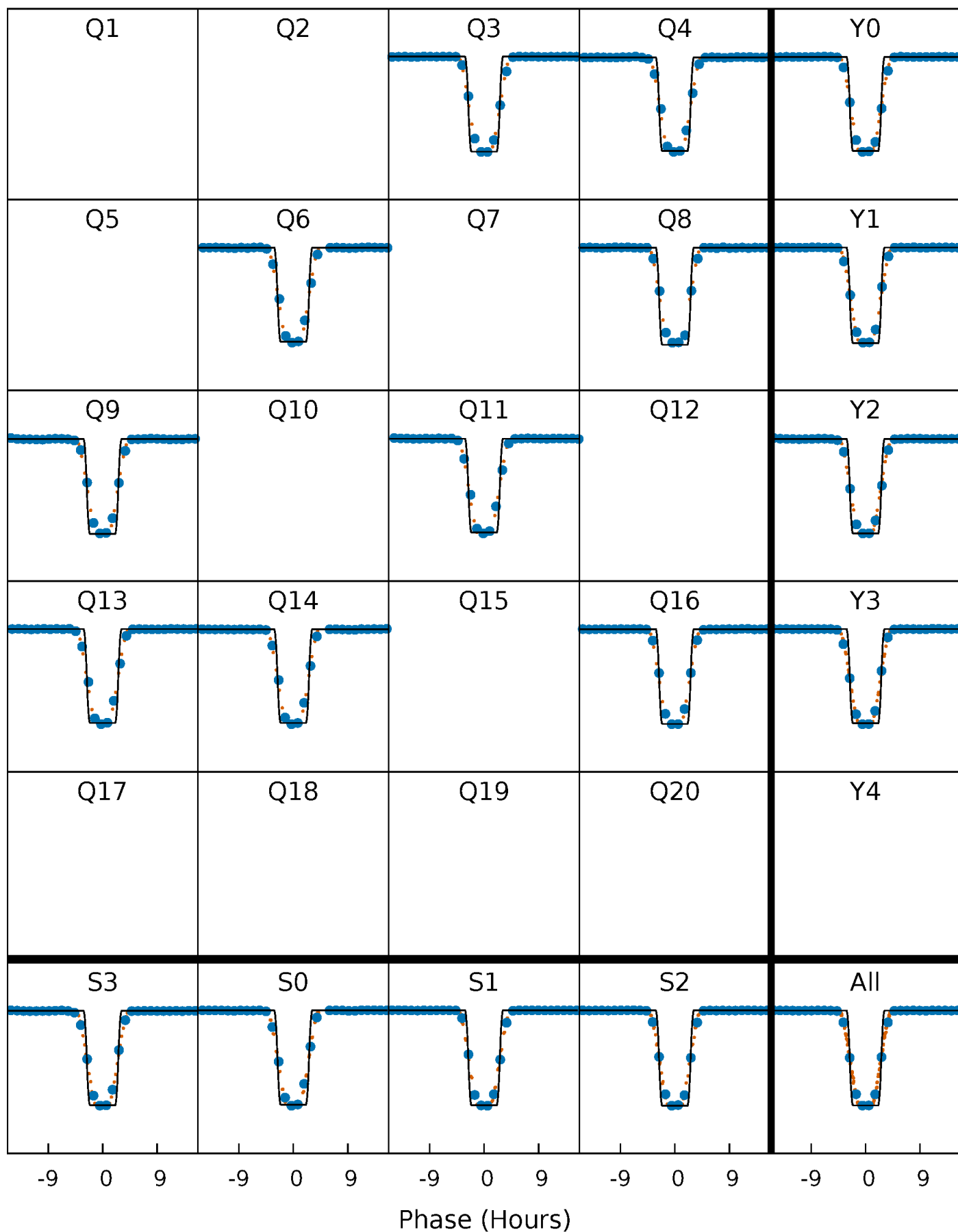
# DV Quarter-Phased Transit Curves

TCE 008868907-01 P=157.322305 Days  $T_0=265.256198$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

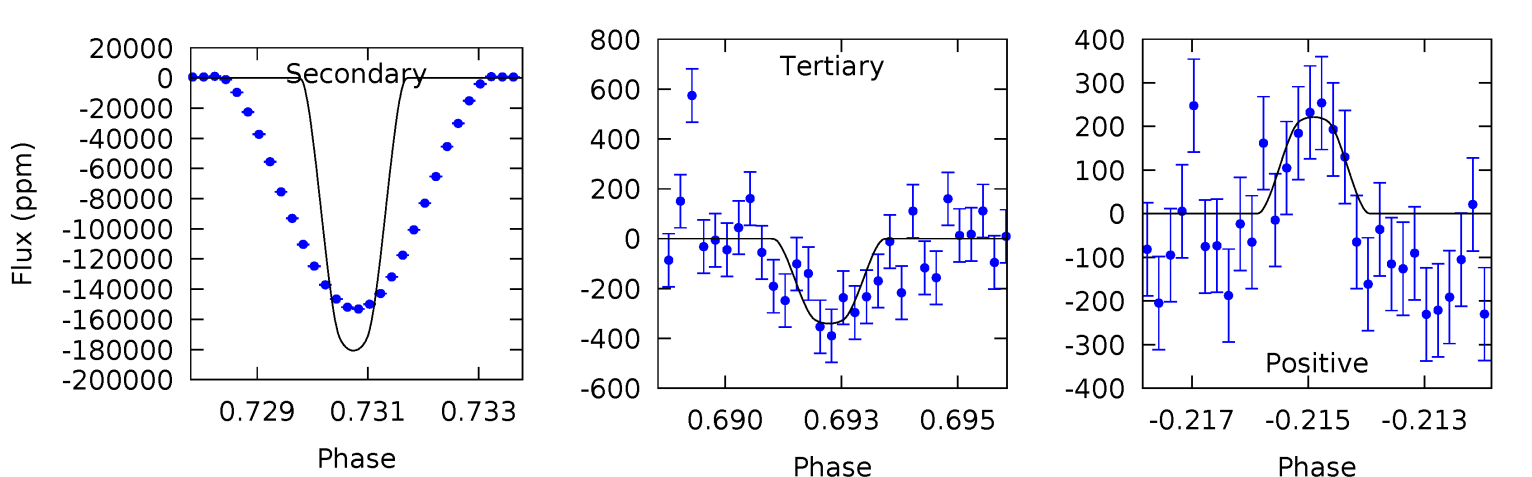
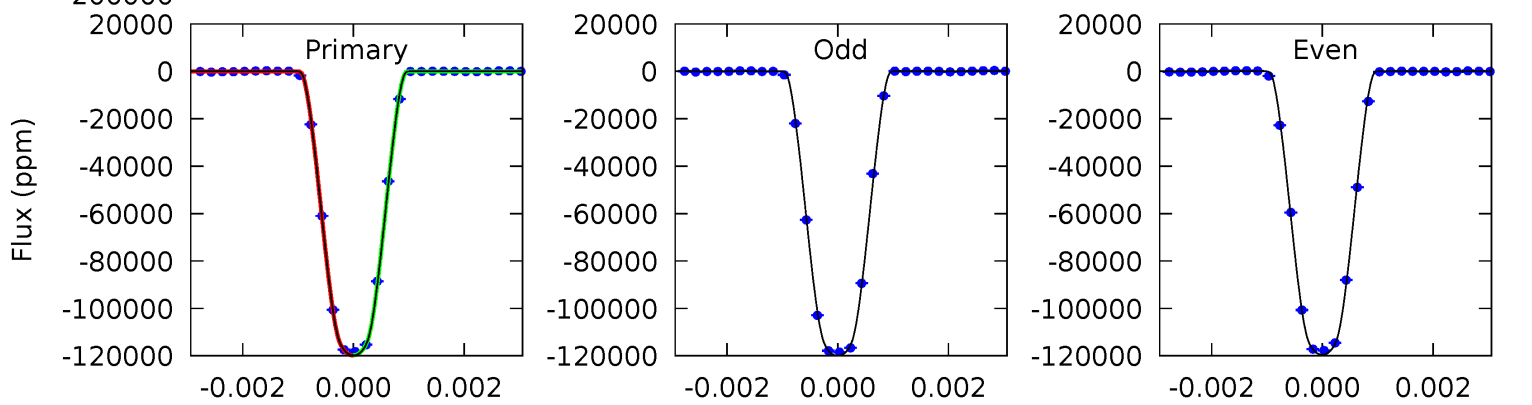
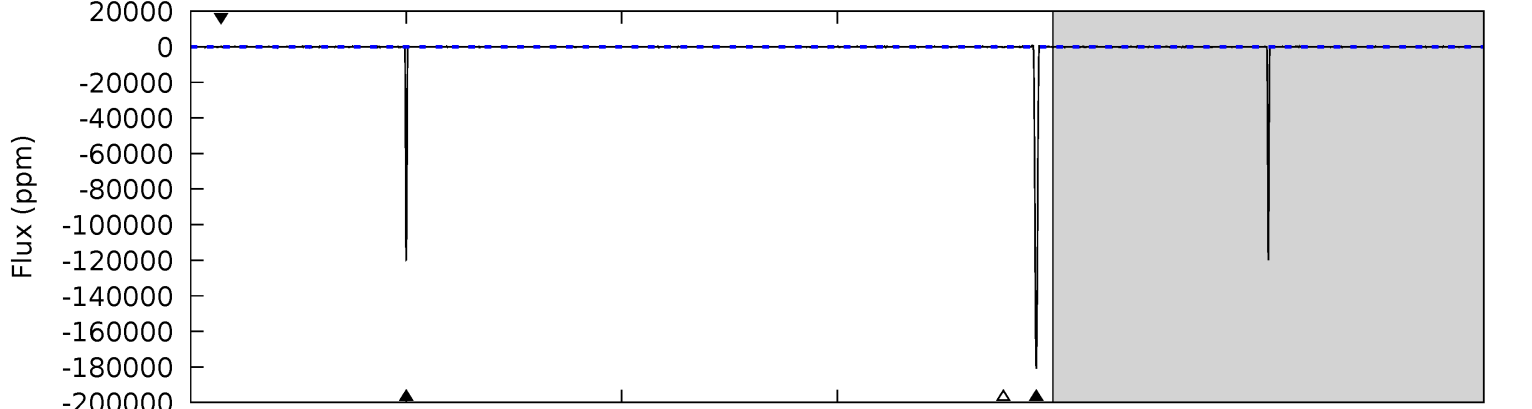
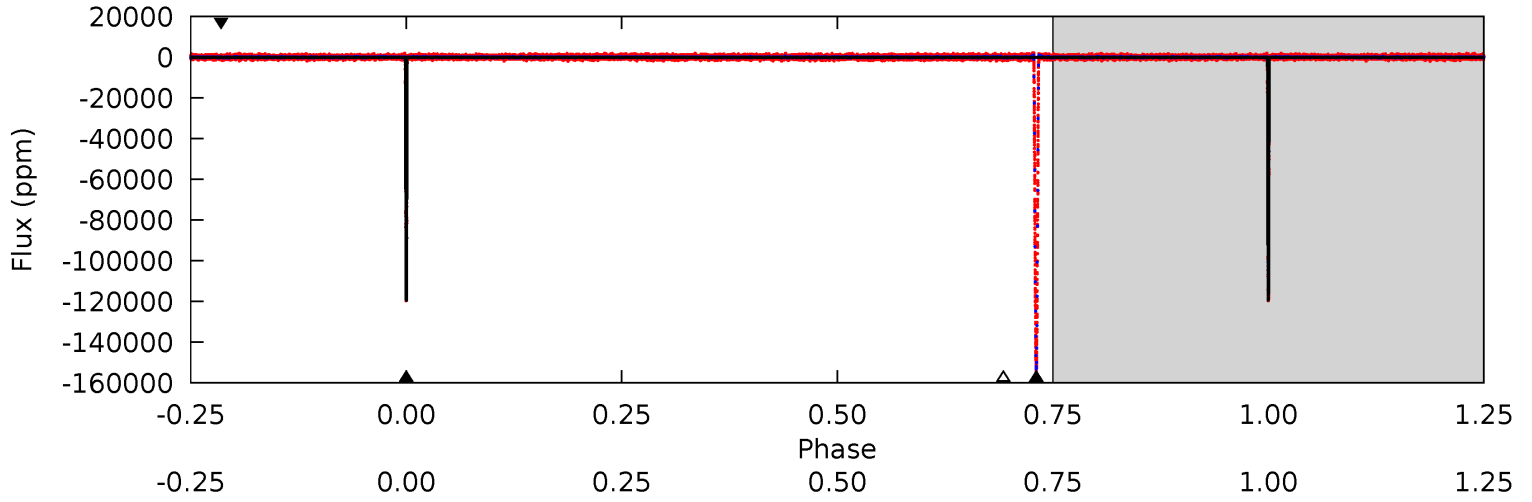
TCE 008868907-01 P=157.323089 Days  $T_0=265.252929$  (BKJD)



# DV Model-Shift Uniqueness Test

008868907-01, P = 157.322305 Days, E = 107.933893 Days

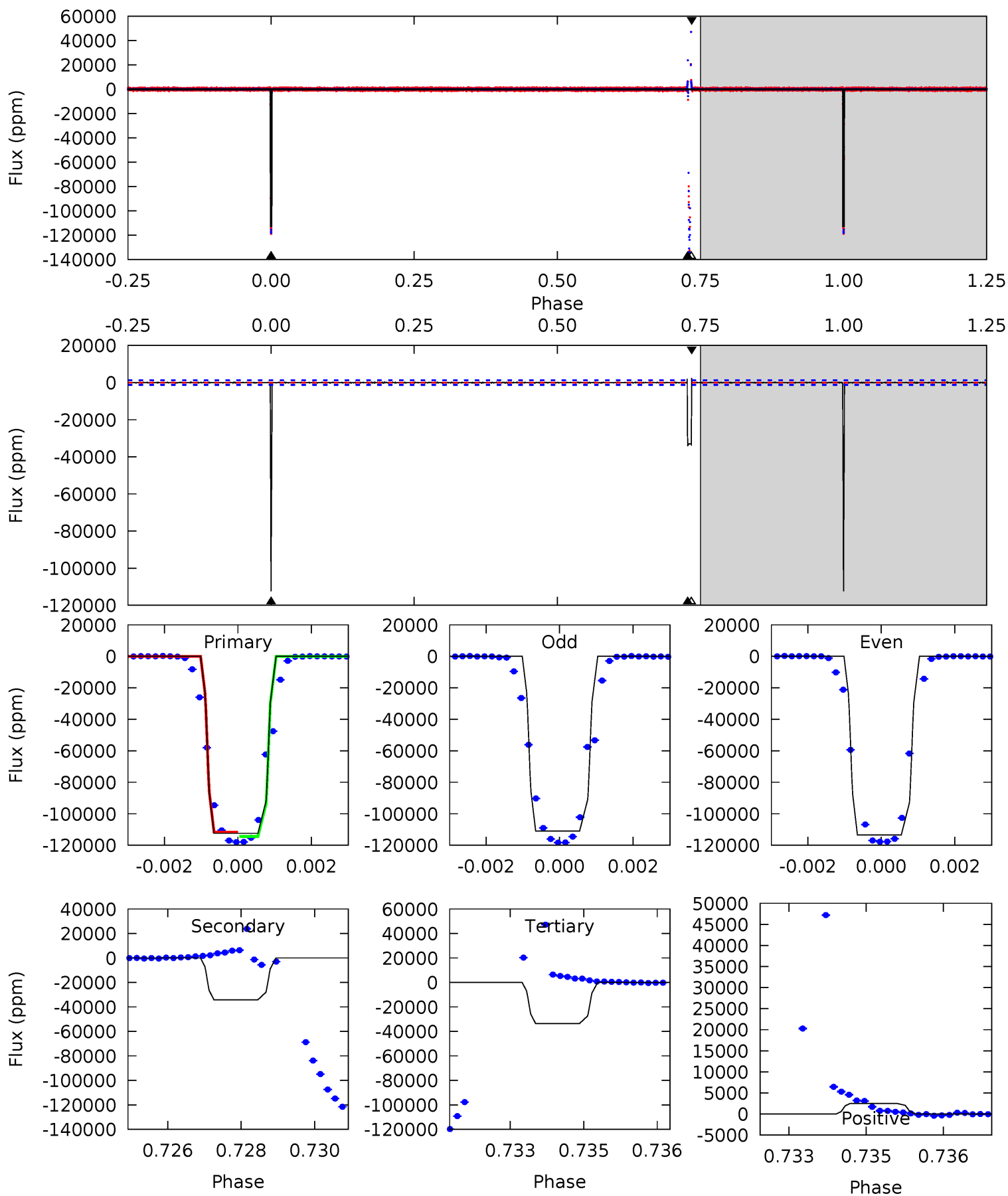
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
2844	4290	8.08	5.26	5.29	3.04	15.0	2836	2839	4281	4284	5.38	1.00	0.00	0



# Alt Model-Shift Uniqueness Test

008868907-01, P = 157.323089 Days, E = 107.929840 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
475.1	144.6	141.7	10.7	5.36	3.15	3.37	333.4	464.4	2.96	133.9	7.85	1.00	0.02	5.87



### Stellar Parameters For KIC 008868907

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6109^{+171}_{-192}$	$4.472^{+0.054}_{-0.216}$	$-0.120^{+0.250}_{-0.350}$	$0.989^{+0.312}_{-0.104}$	$1.056^{+0.137}_{-0.150}$	$1.539^{+0.433}_{-0.809}$
	+3%/-3%	+1%/-5%	+208%/-292%	+32%/-11%	+13%/-14%	+28%/-53%
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 008868907-01 / KOI 3539.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-180731 \pm 42$	$36.83^{+6.38}_{-3.11}$	$502^{+34}_{-26}$	$7344^{+244}_{-261}$	$29603^{+4364}_{-6846}$
Alt.	$-34222 \pm 237$	$37.66^{+7.18}_{-2.92}$	$502^{+39}_{-24}$	$4680^{+109}_{-119}$	$4504^{+650}_{-1222}$

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

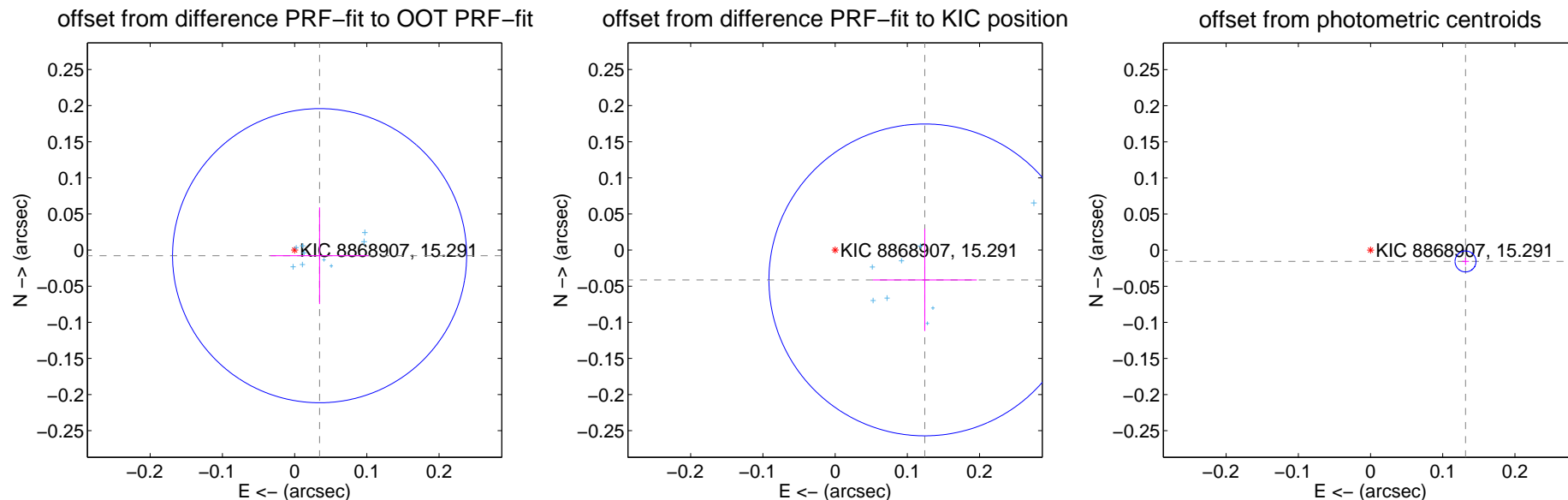
## DV Centroid Data

Supplemental centroid analysis for 008868907-01. Kepler magnitude: 15.29. Transit SNR 1344.34

There are 9 quarters with good PRF difference image offsets

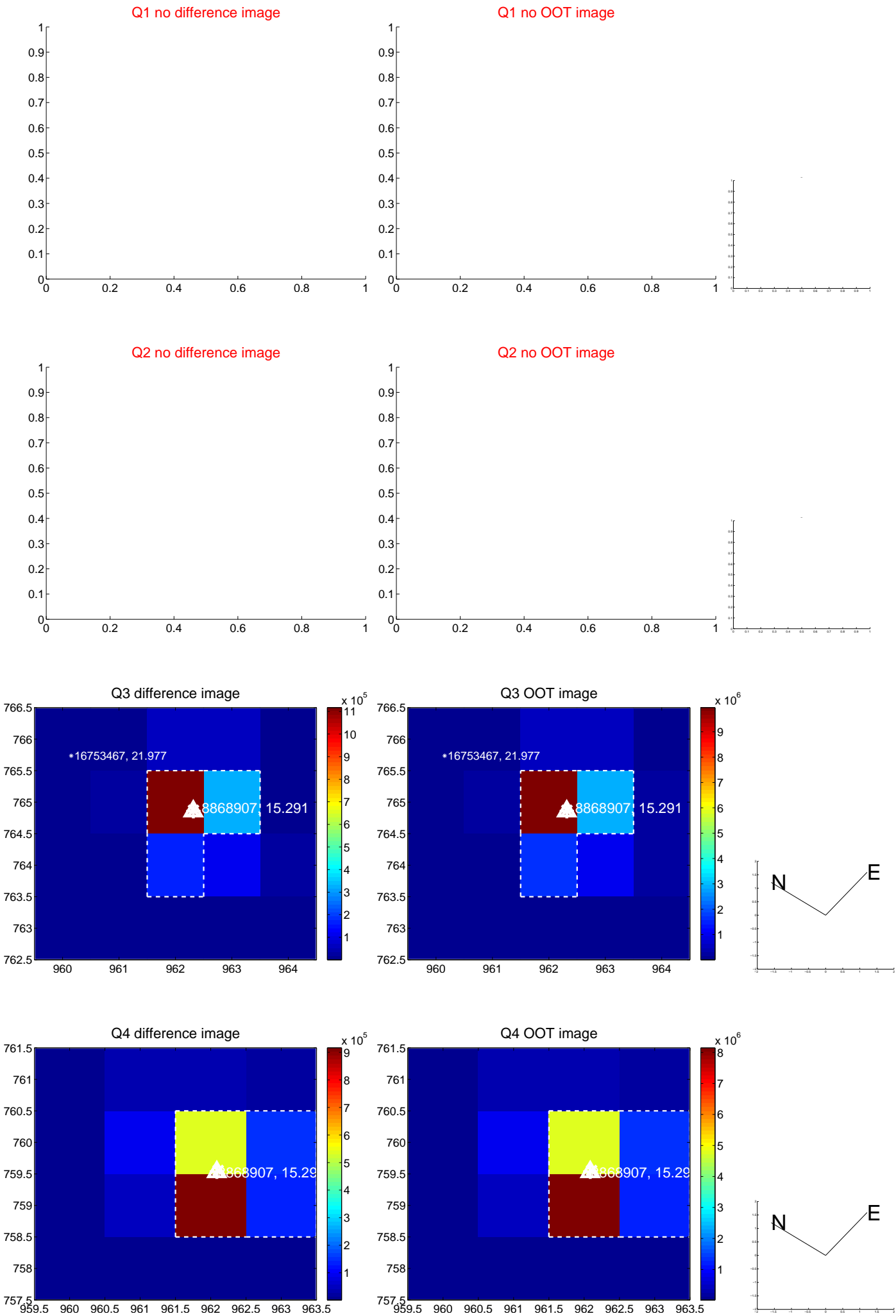
The direct PRF centroid is offset from the target star catalog position by about 0.09 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.035 \pm 0.068$	0.52	$-0.035 \pm 0.068$	$-0.008 \pm 0.067$
PRF-fit source offset from KIC position	$0.131 \pm 0.072$	1.82	$-0.124 \pm 0.072$	$-0.041 \pm 0.071$
photometric centroid source offset	$0.13 \pm 0.00$	27.36	$-0.13 \pm 0.00$	$-0.02 \pm 0.01$

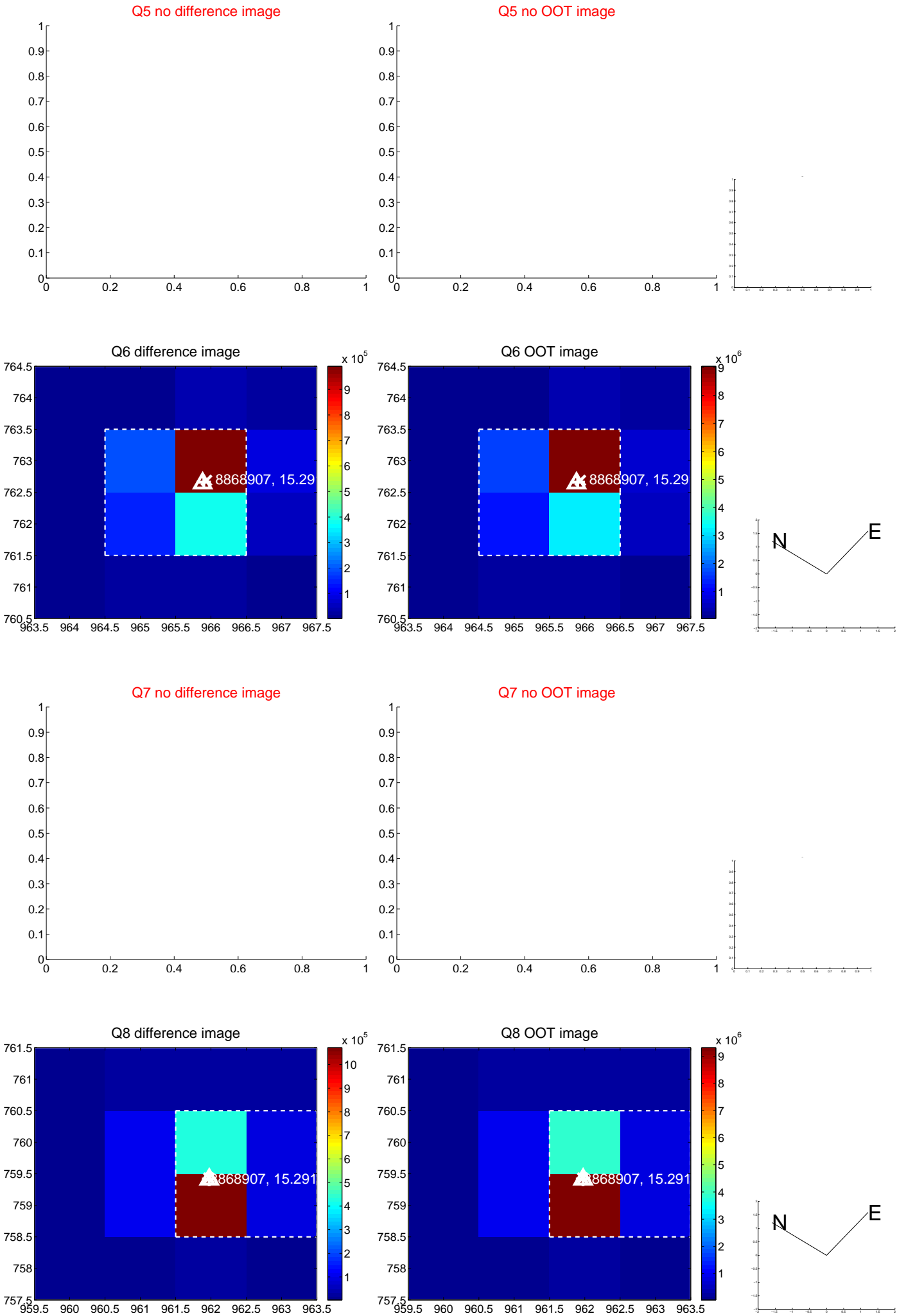


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

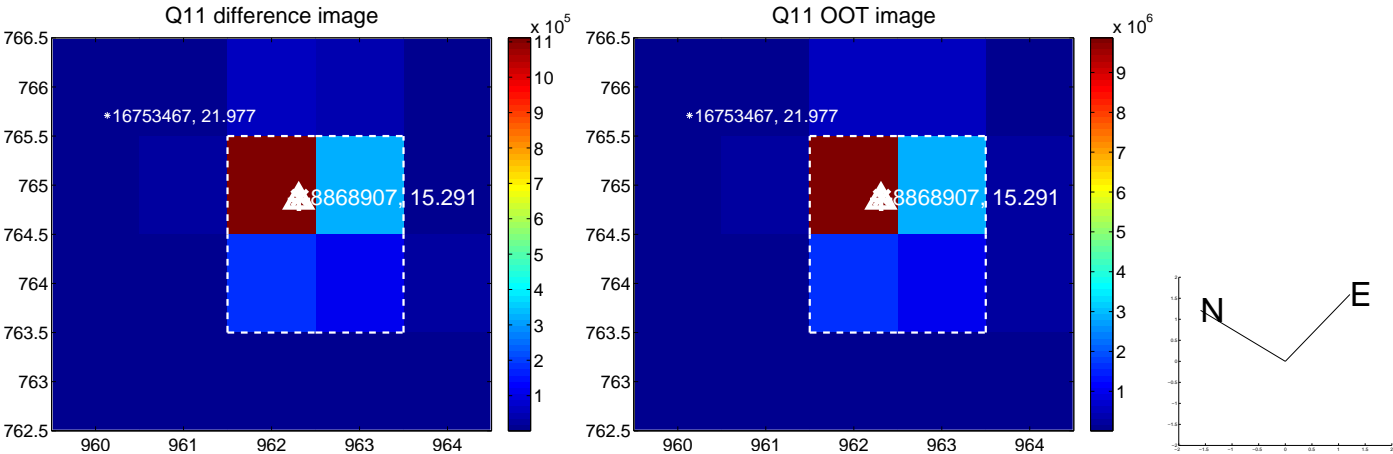
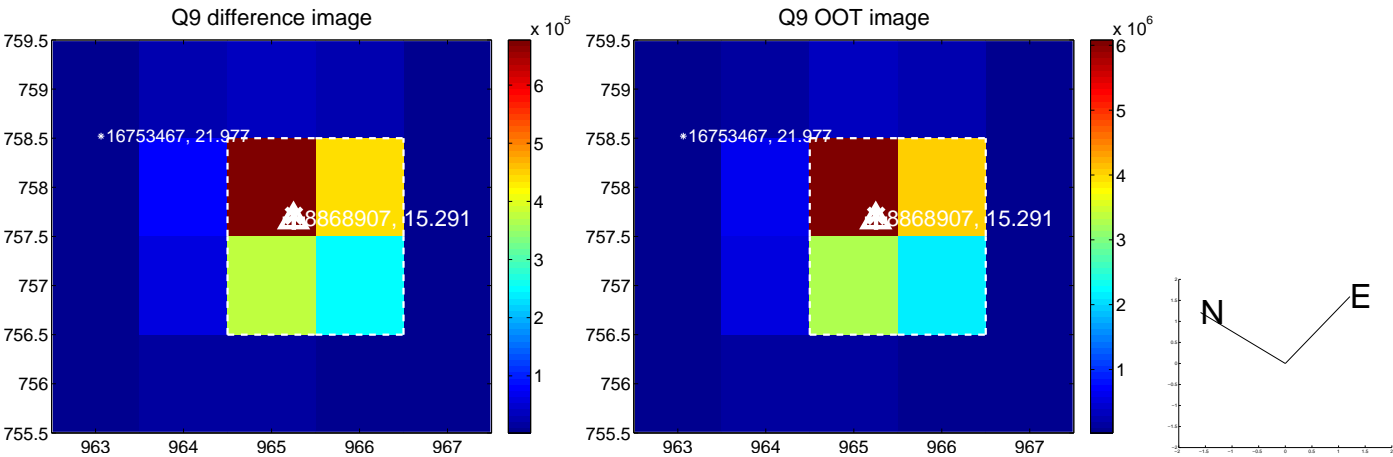


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

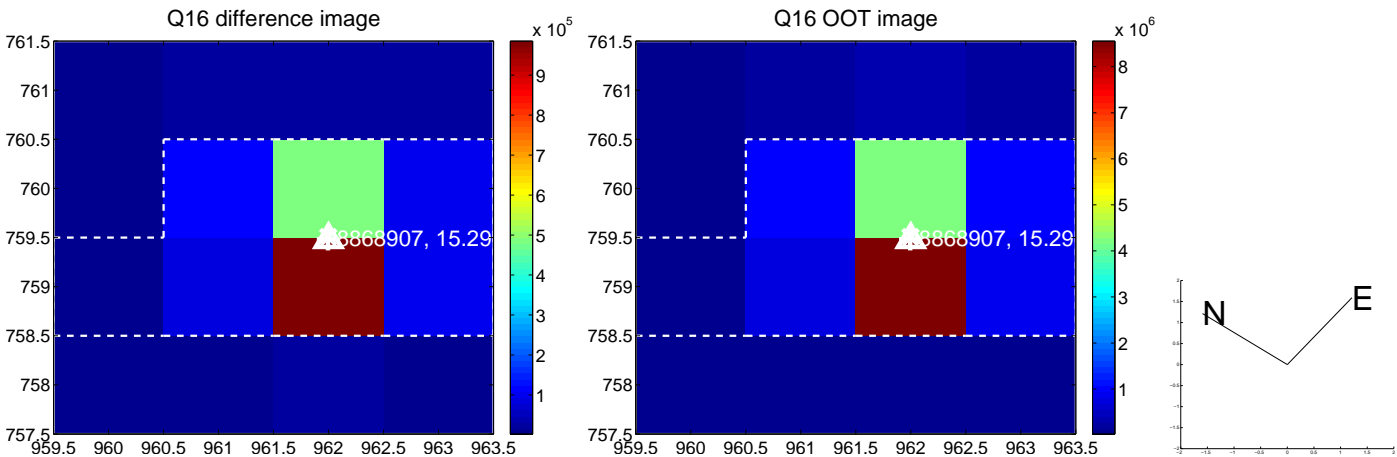
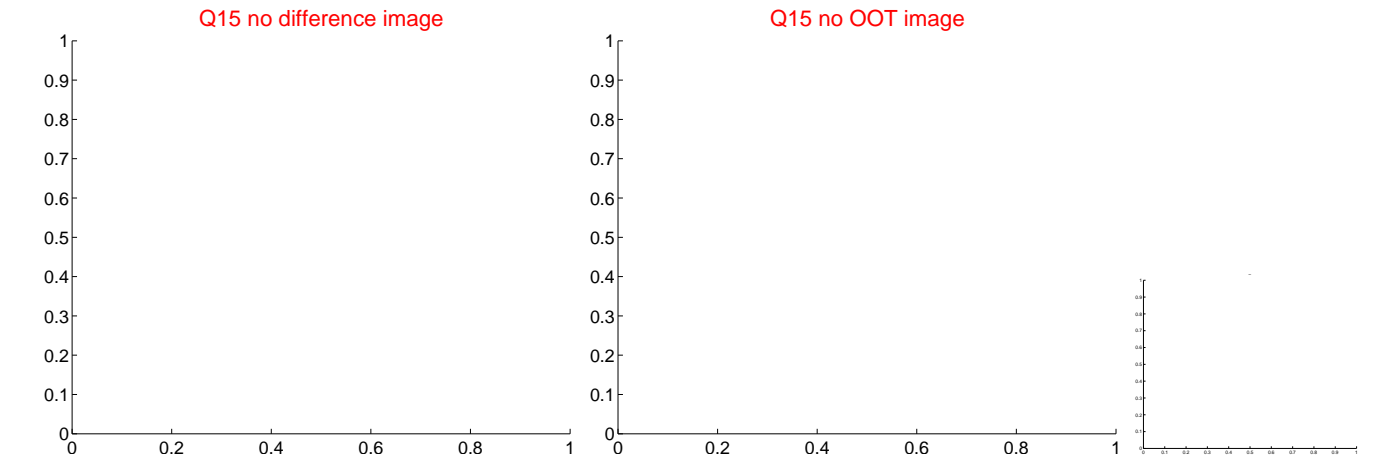
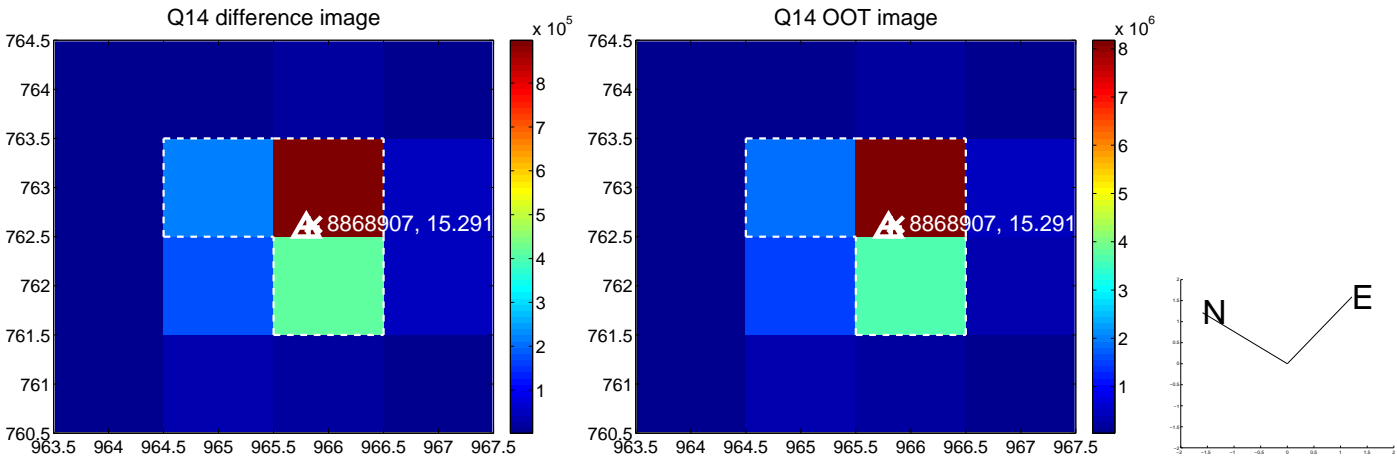
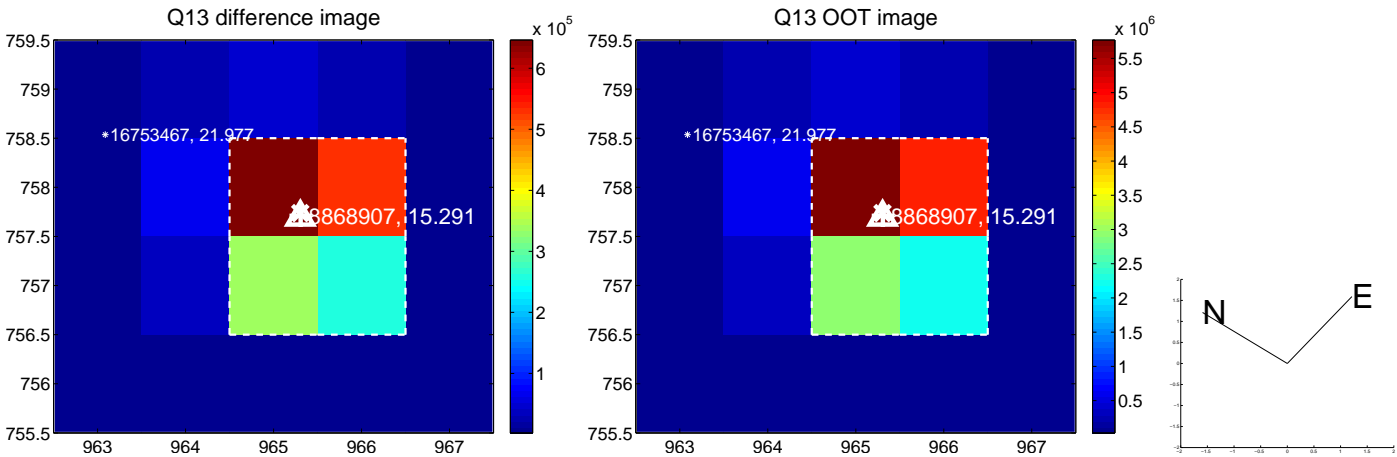




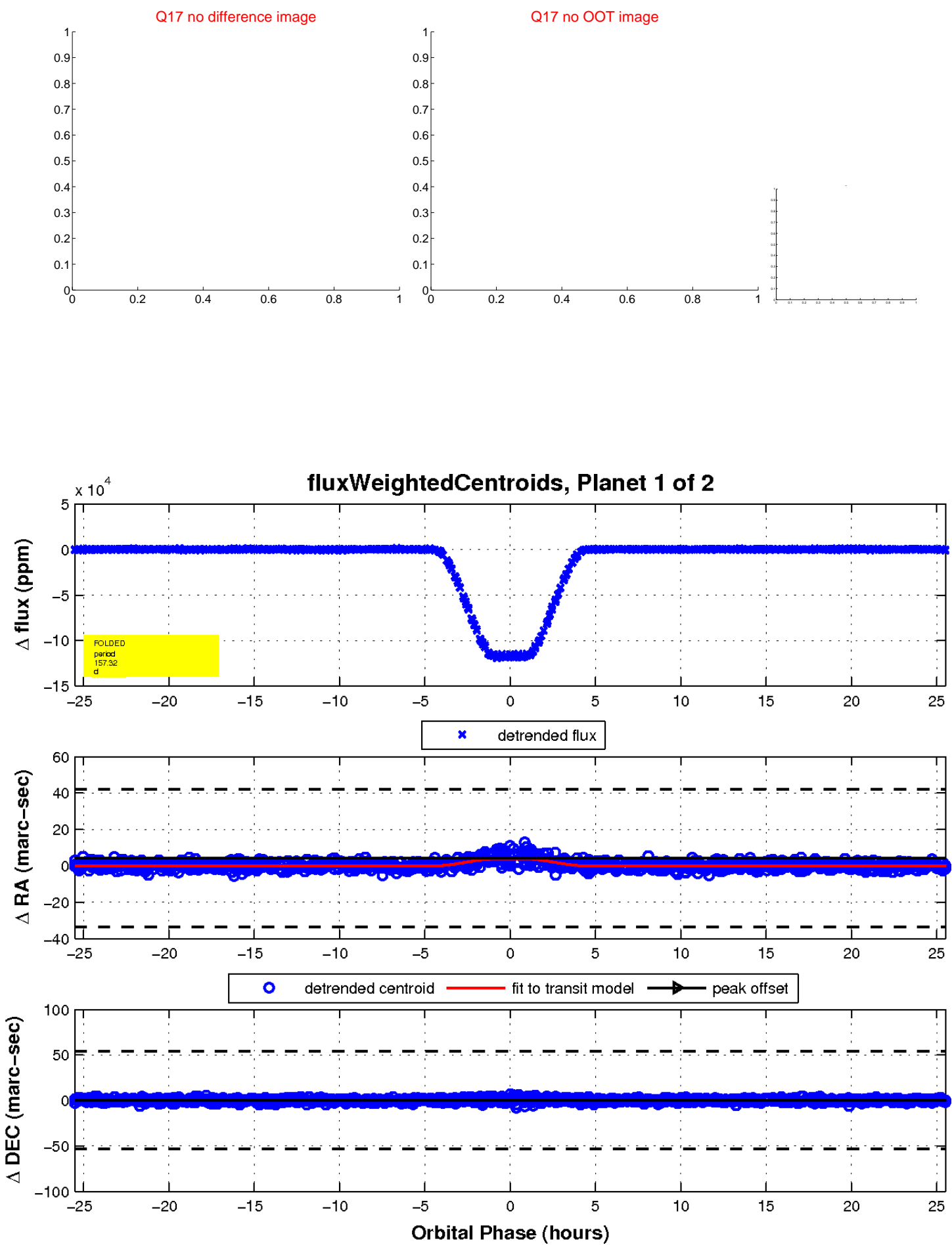
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



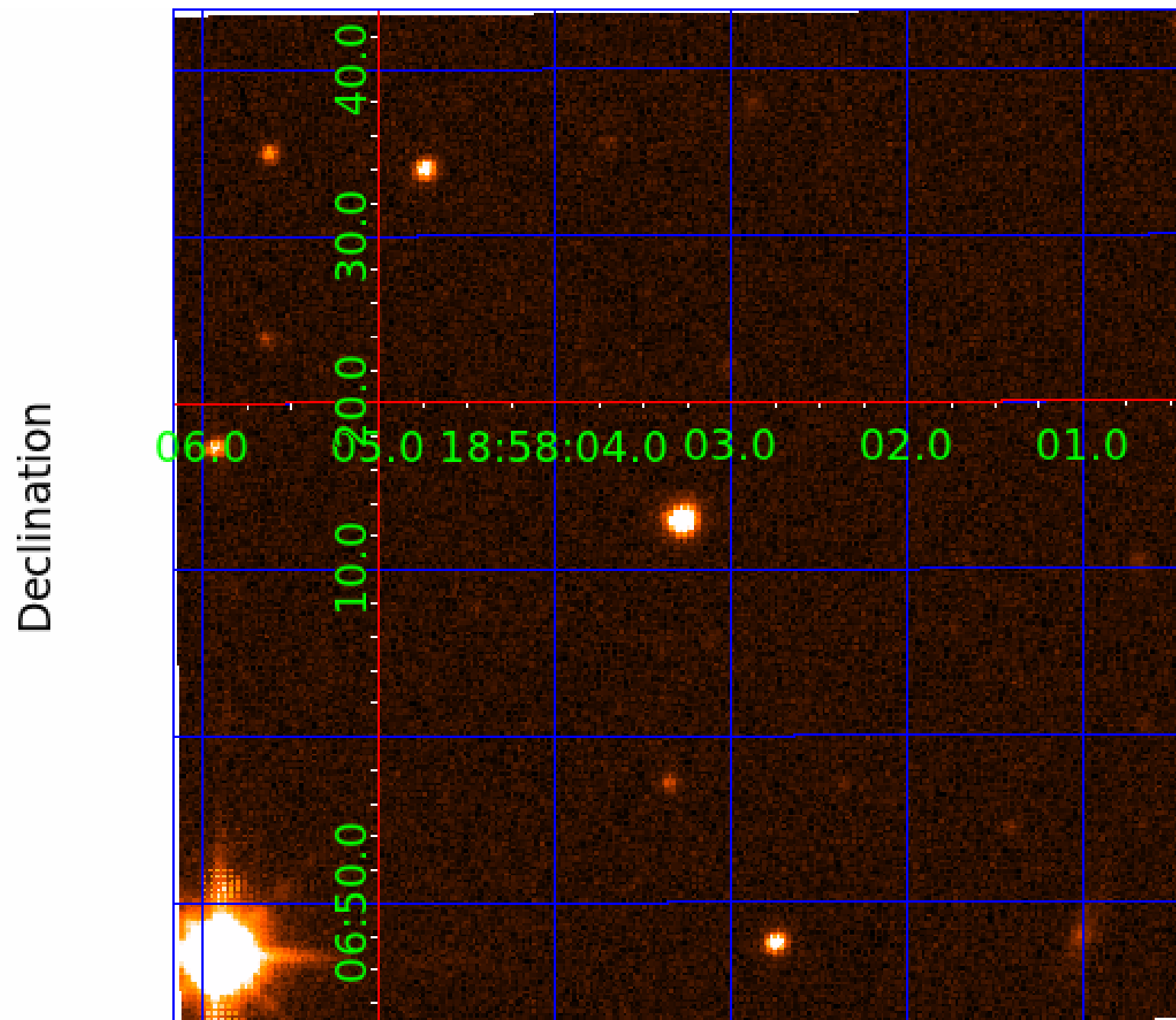
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



UKIRT Image



# KIC 008868907

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008868907-01	OBS	3539.01	157.322305	265.256199	119013.4	8.512	1936.0	1344.3	0.99	6109	35.94	3.61
008868907-02	OBS	No	157.322335	222.902452	154400.1	21.989	2024.7	2326.9	0.99	6109	57.63	3.61

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008868907-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_DV—HAS_SEC_TCE
008868907-02	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.

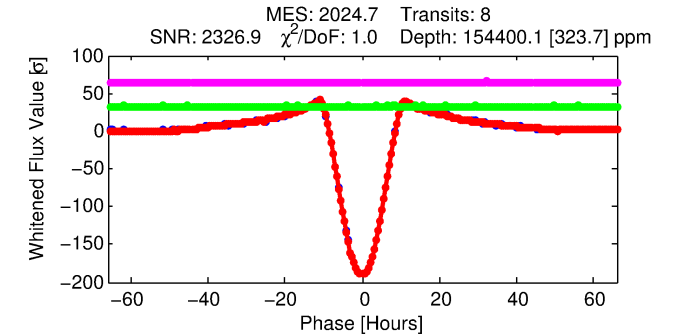
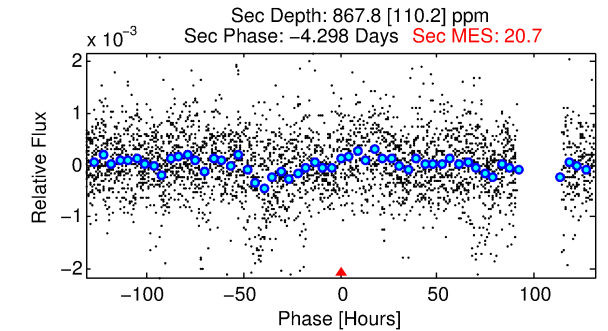
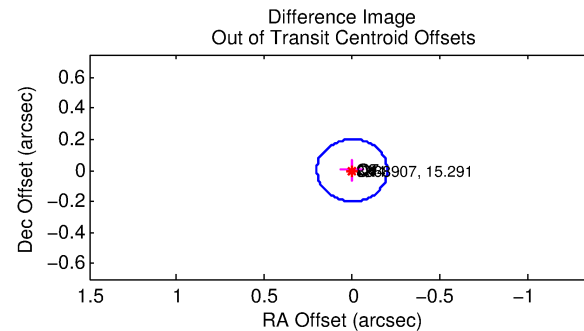
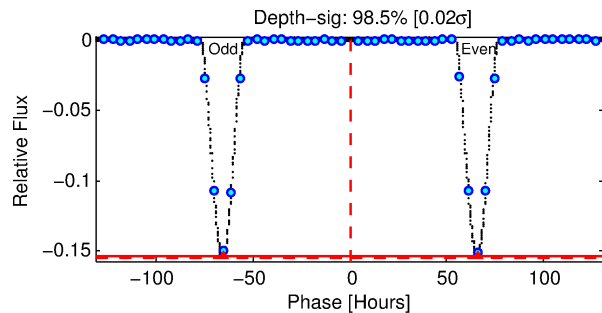
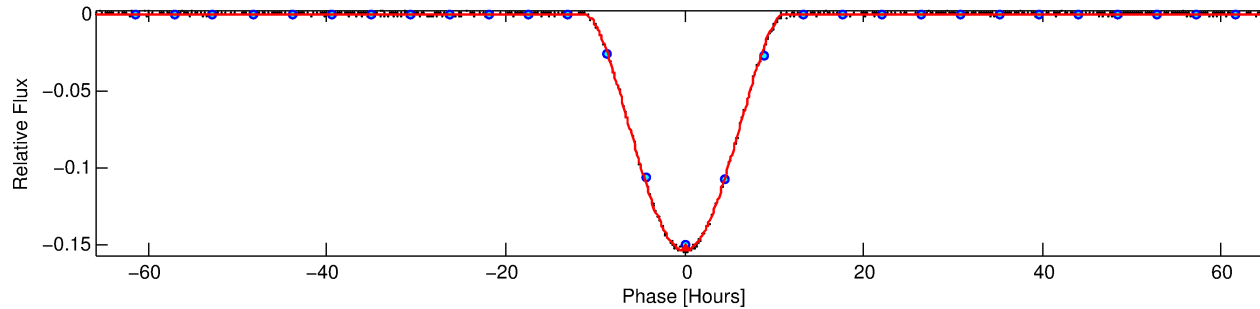
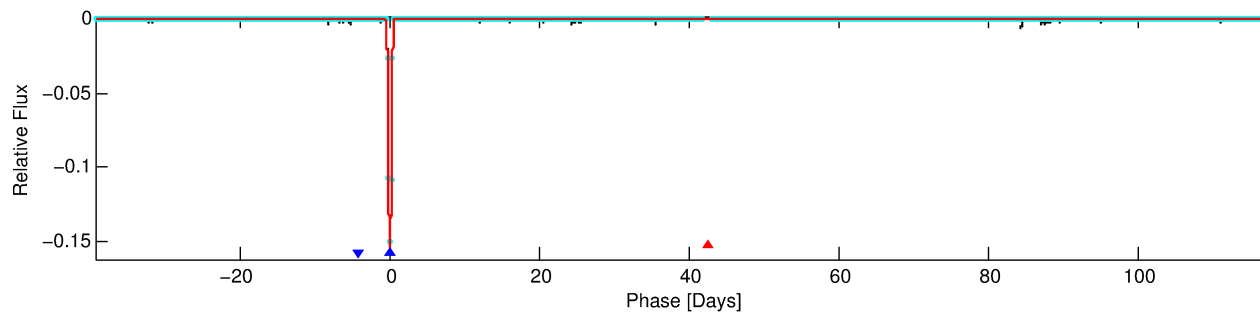
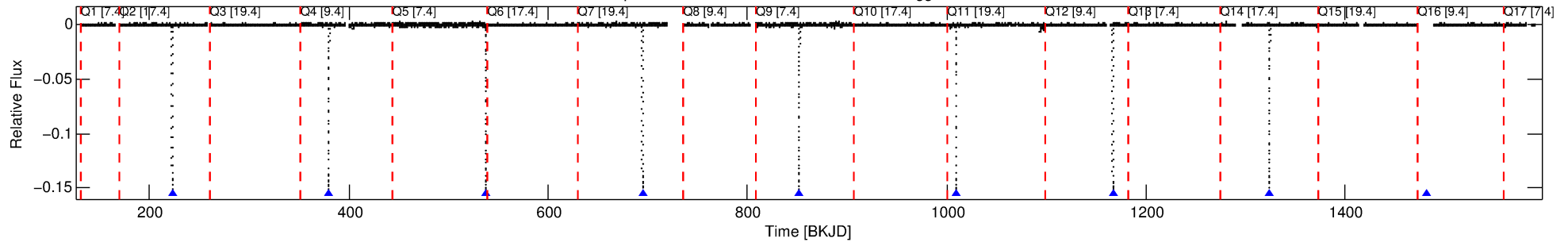
## Ephemeris Match Information For 008868907-02

No Significant Match Found

# DV One-Page Summary

KIC: 8868907 Candidate: 2 of 2 Period: 157.322 d  
KOI: K03539.01 Corr: 1.000

Kp: 15.29 R\*: 0.99 Rs Teff: 6109.0 K Logg: 4.47 Fe/H: -0.120



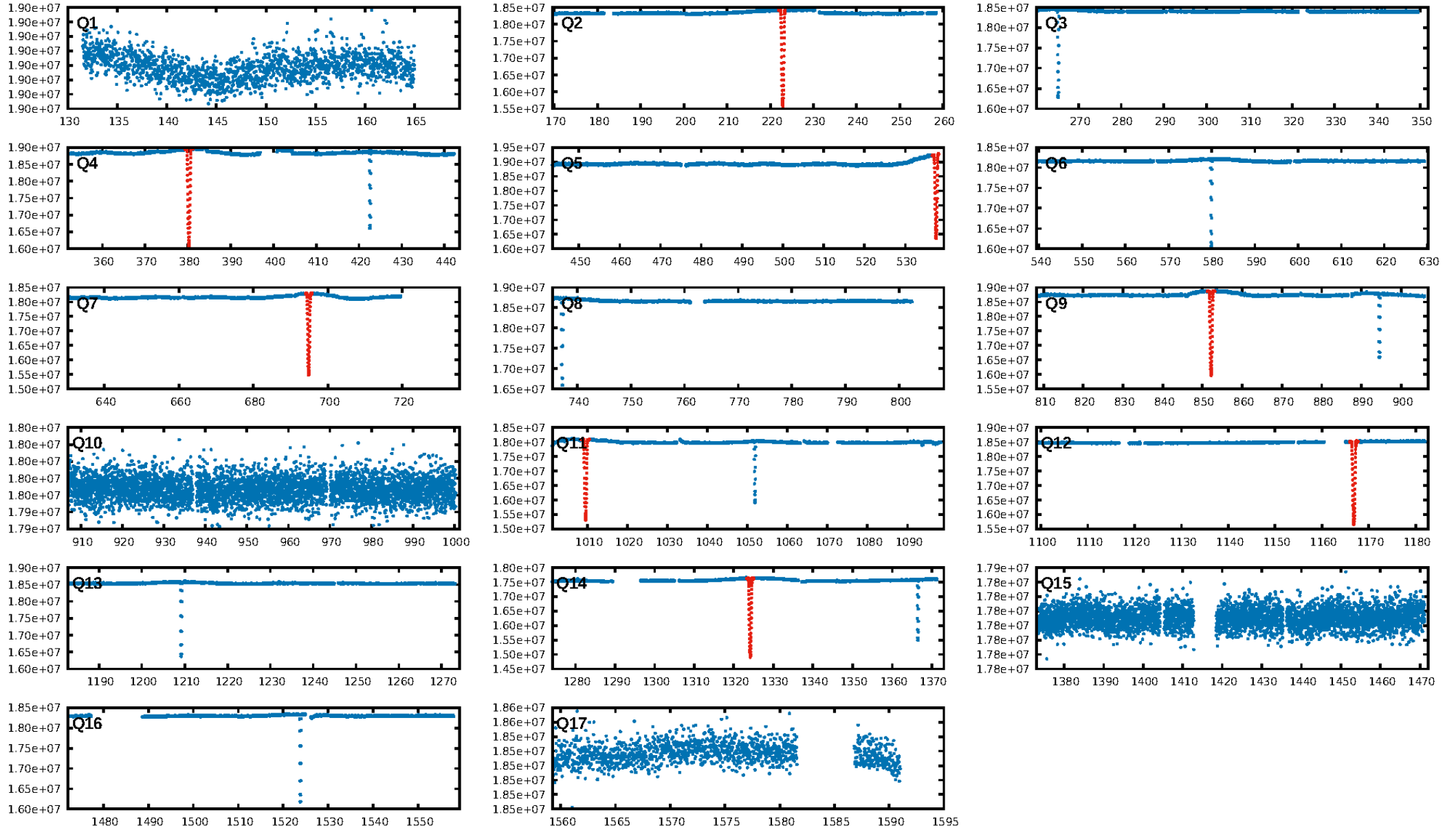
## DV Fit Results:

Period = 157.32233 [0.00004] d  
Epoch = 222.9025 [0.0002] BKJD  
Rp/R\* = 0.5340 [0.0828]  
a/R\* = 67.93 [1.07]  
b = 0.90 [0.12]  
Seff = 3.61 [1.49]  
Teq = 352 [36] K  
Rp = 57.64 [20.26] Re  
a = 0.5812 [0.1557] AU  
Ag = 48.56 [25.06] [1.90σ]  
Teffp = 1435 [128] K [8.12σ]

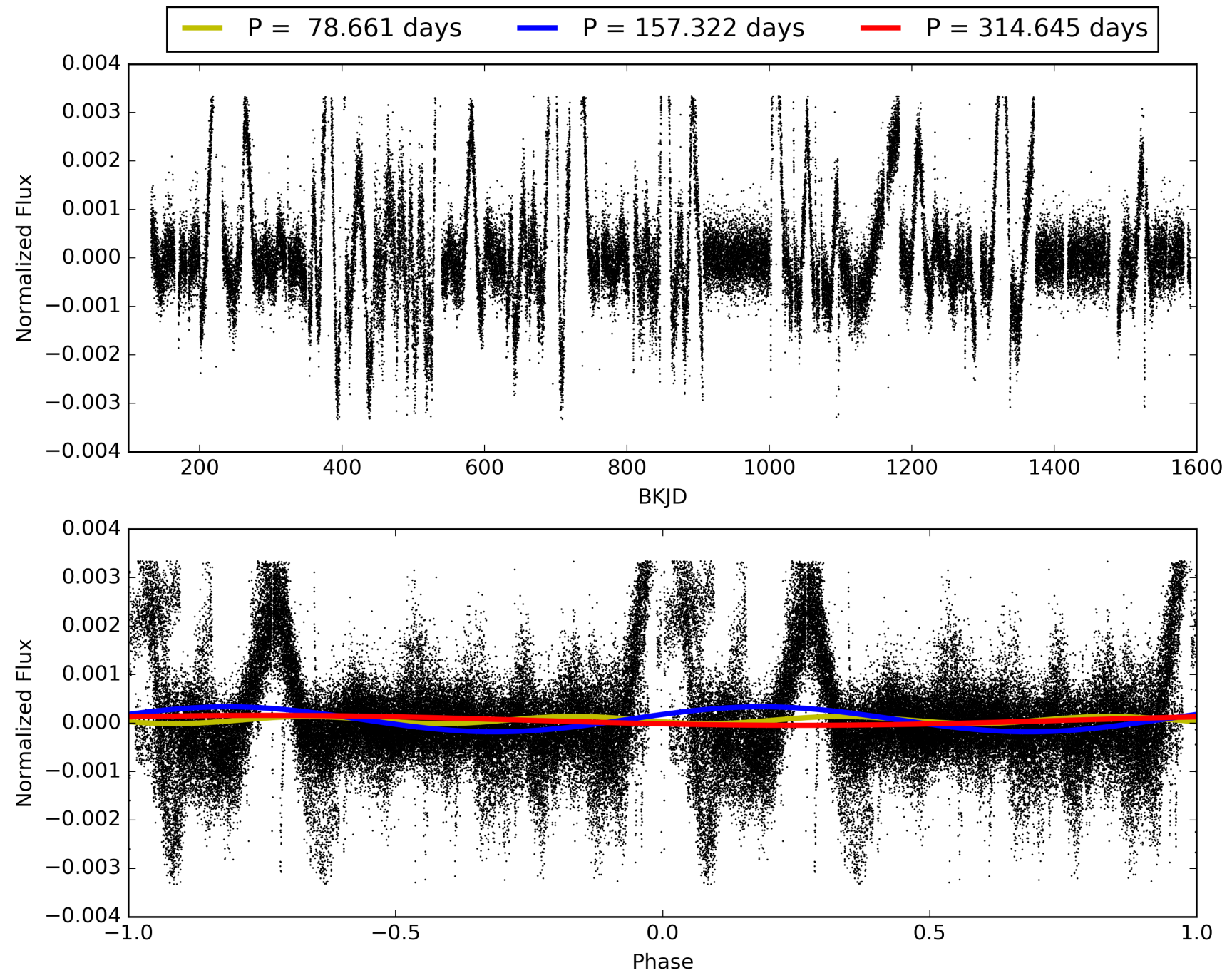
## DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 0.0%  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [8/8]  
GhostDiagnostic-chr: 4.412  
Centroid-sig: 0.0%  
Centroid-so: 0.112 arcsec [37.60σ]  
OotOffset-rm: 0.002 arcsec [0.04σ]  
KicOffset-rm: 0.087 arcsec [1.09σ]  
OotOffset-st: 1/1/1/1 [4]  
KicOffset-st: 1/1/1/1 [4]  
DiffImageQuality-fgm: 1.00 [4/4]  
DiffImageOverlap-fno: 1.00 [4/4]

# TCE 008868907-02, PDC Light Curves



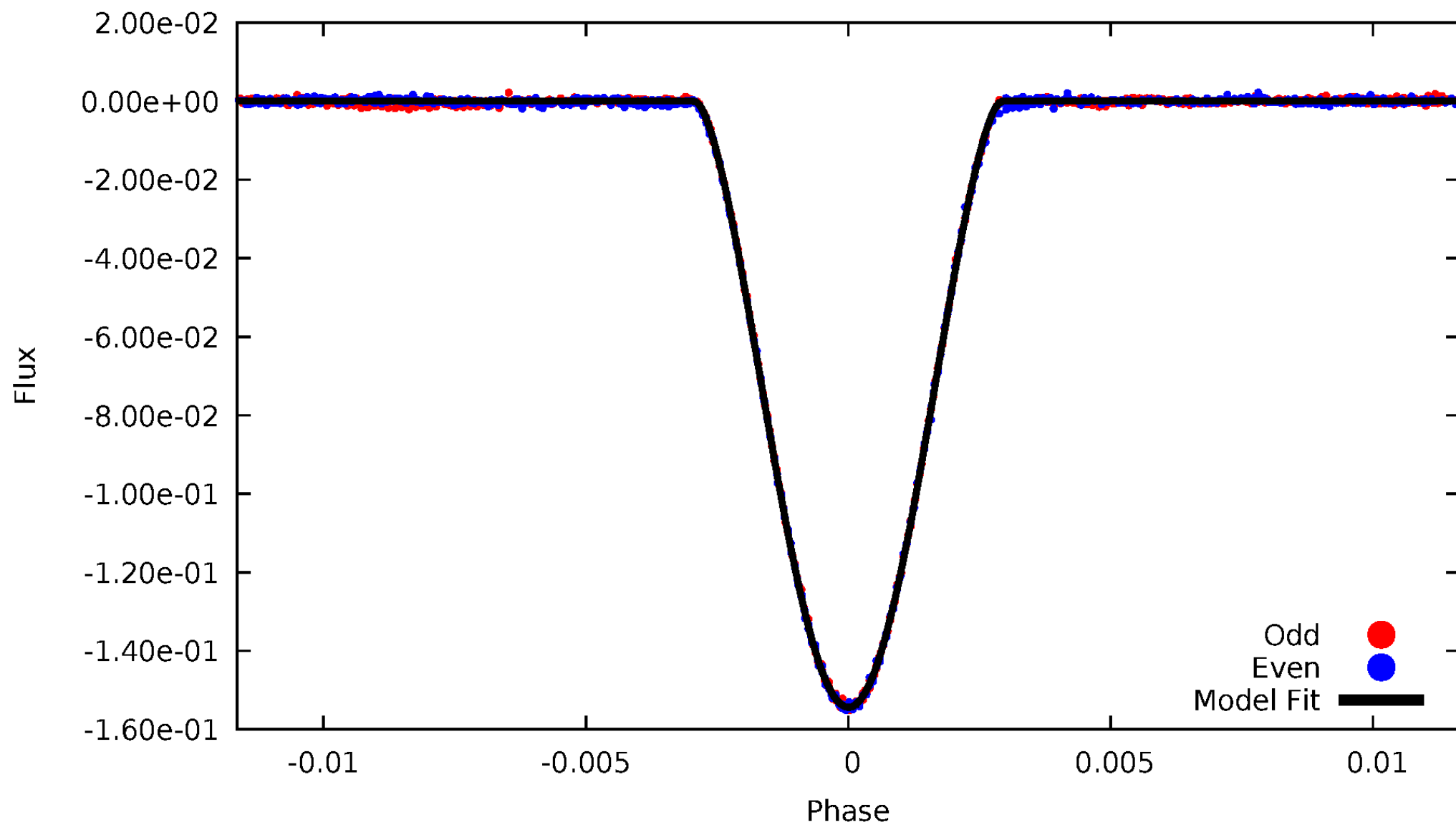
TCE 008868907-02





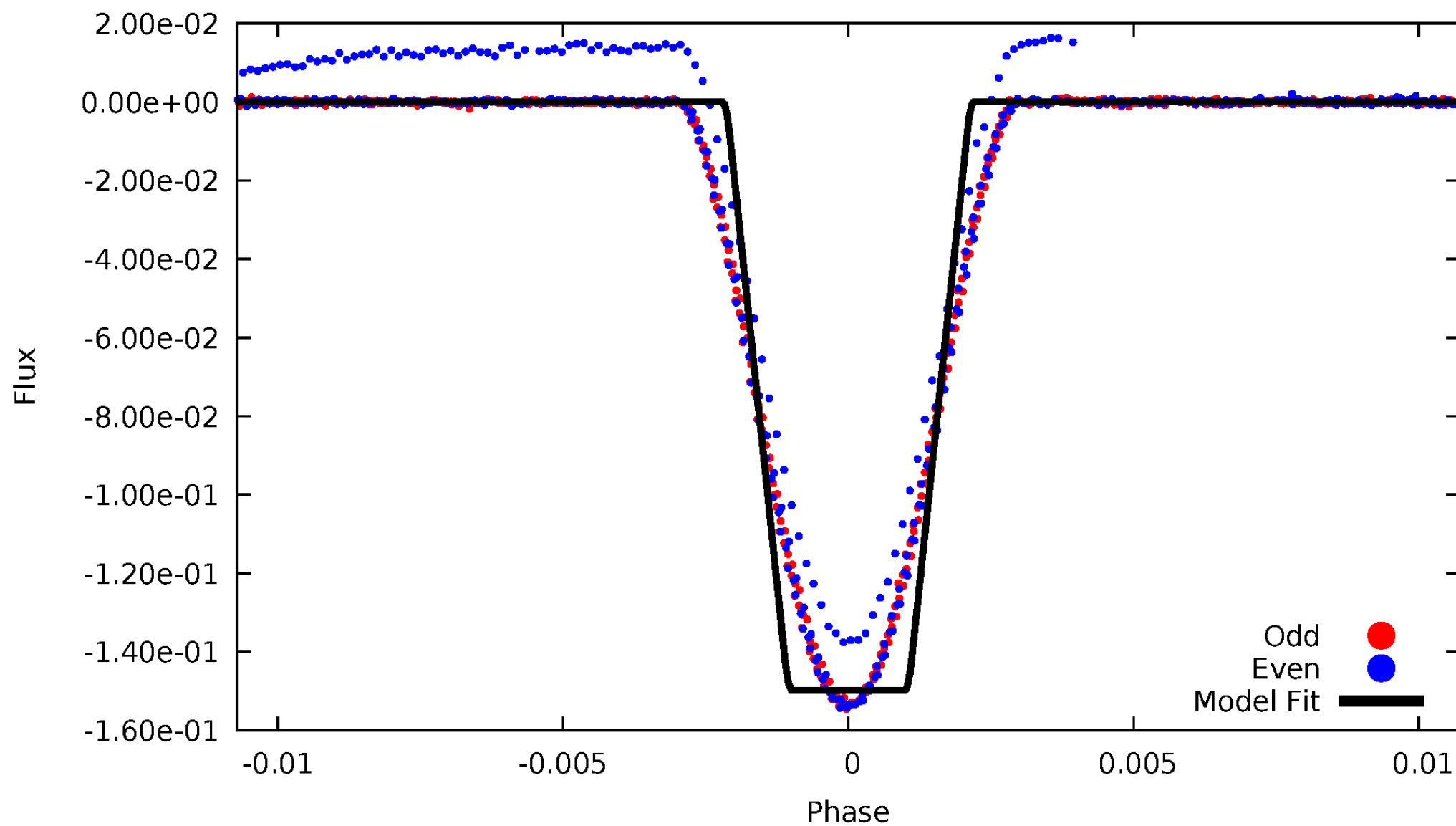
DV Odd/Even

TCE 008868907-02



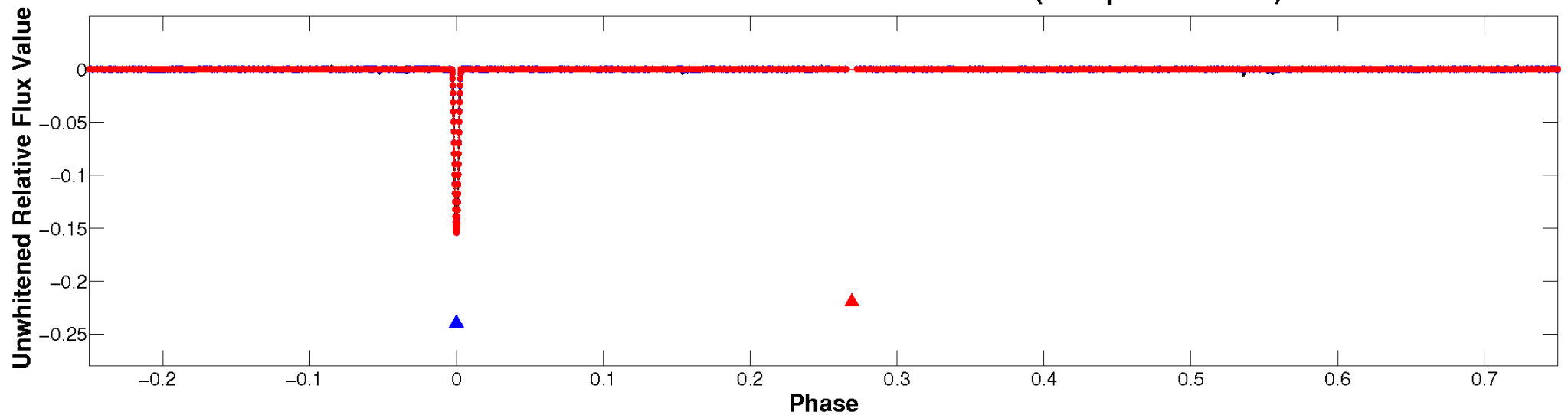
# ALT Odd/Even

TCE 008868907-02

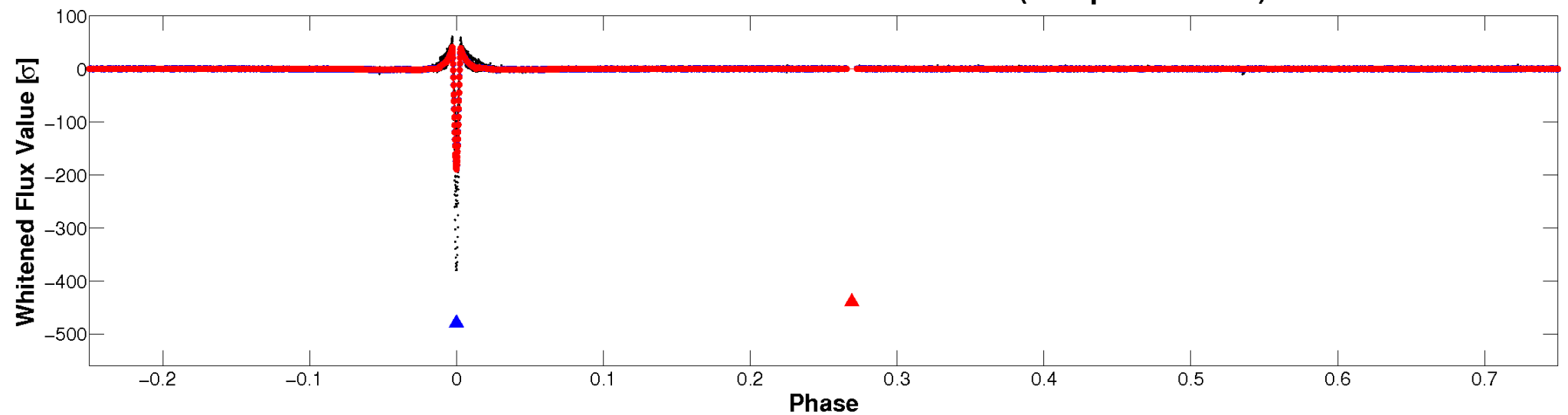


# Non-Whitened Vs. Whitened Light Curve

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

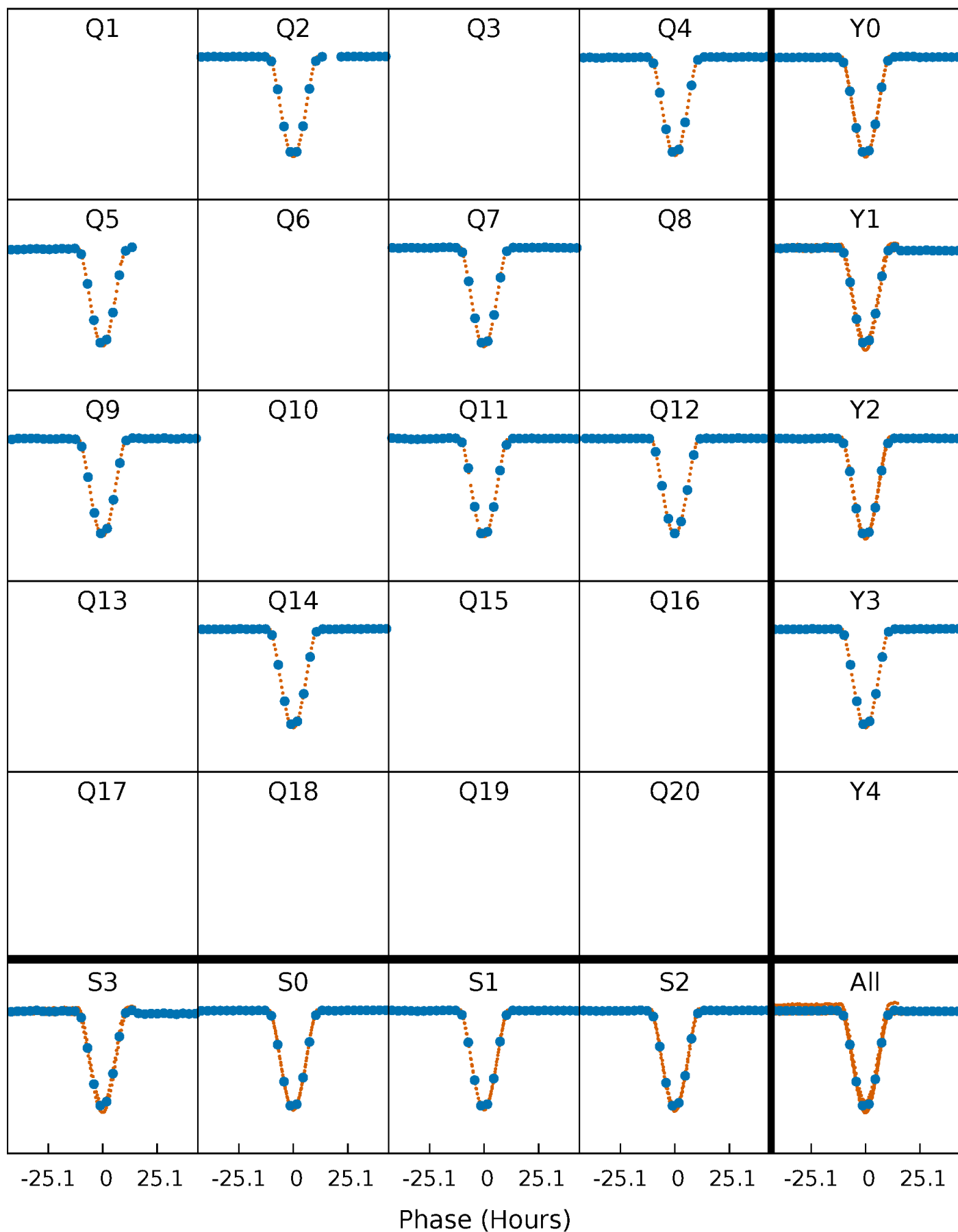


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



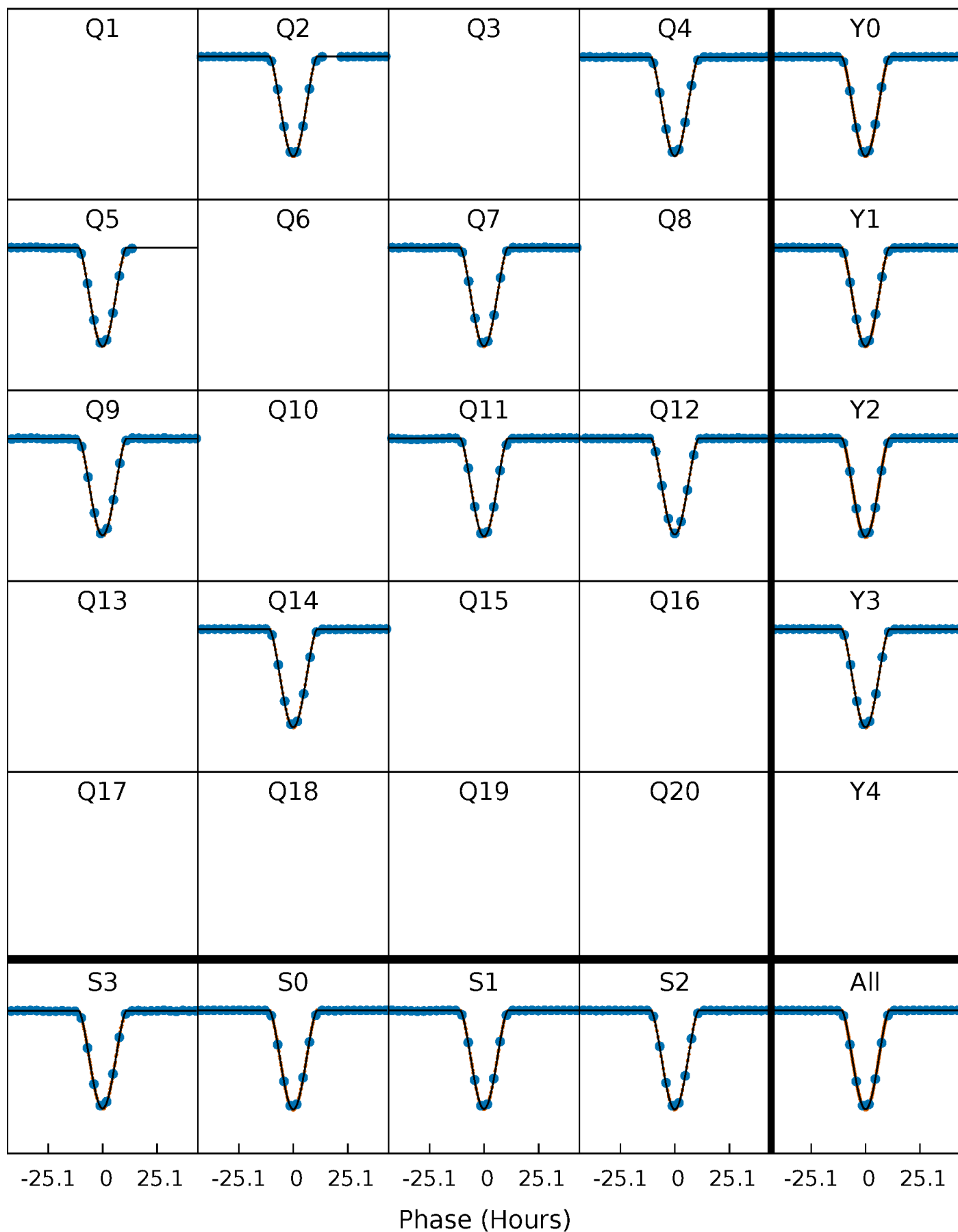
# PDC Quarter-Phased Transit Curves

TCE 008868907-02 P=157.322335 Days  $T_0=222.902452$  (BKJD)



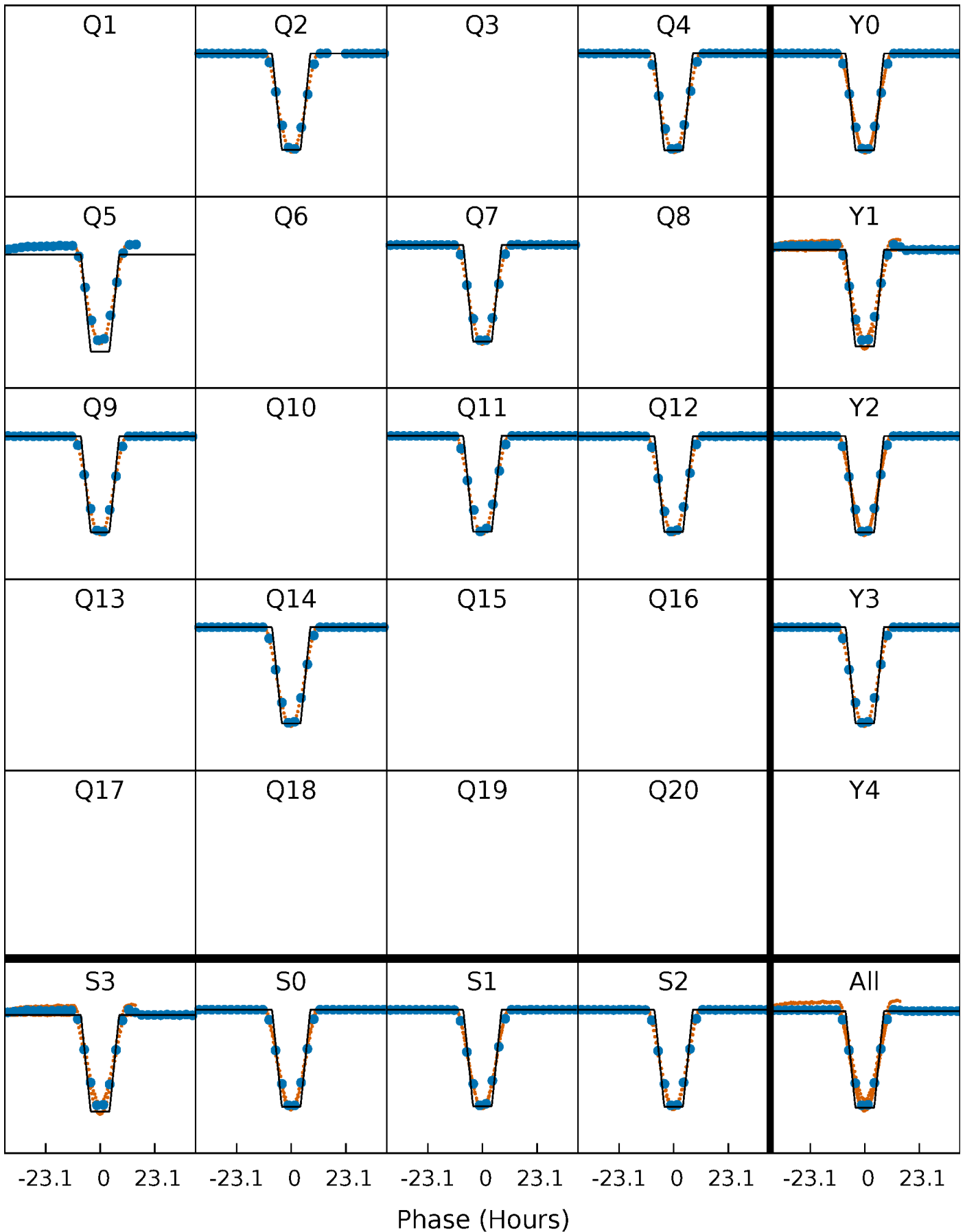
# DV Quarter-Phased Transit Curves

TCE 008868907-02 P=157.322335 Days  $T_0=222.902452$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

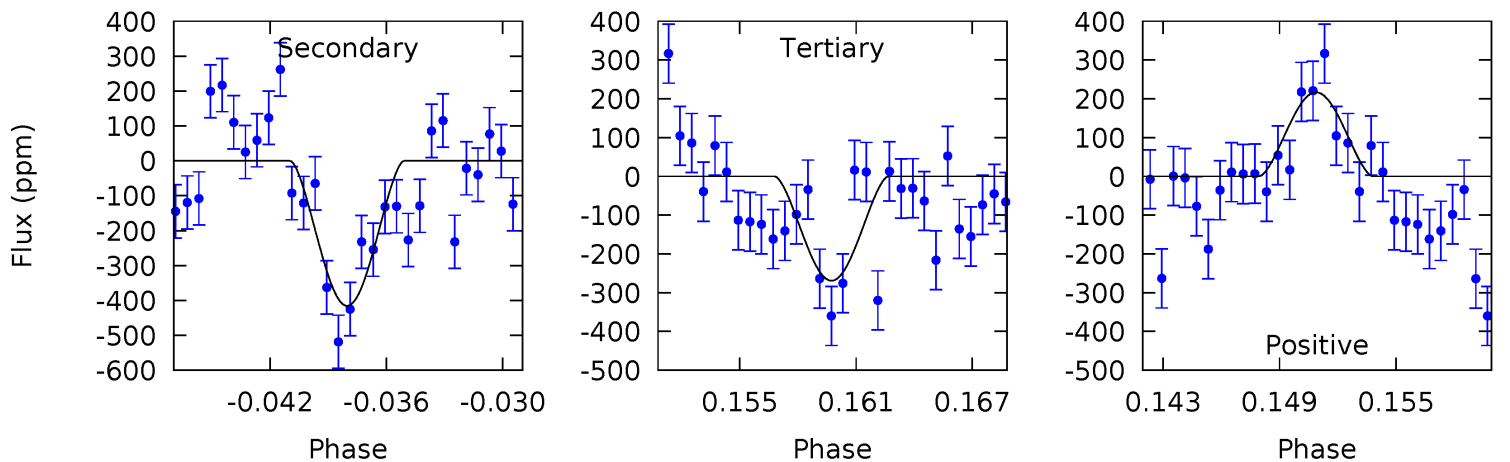
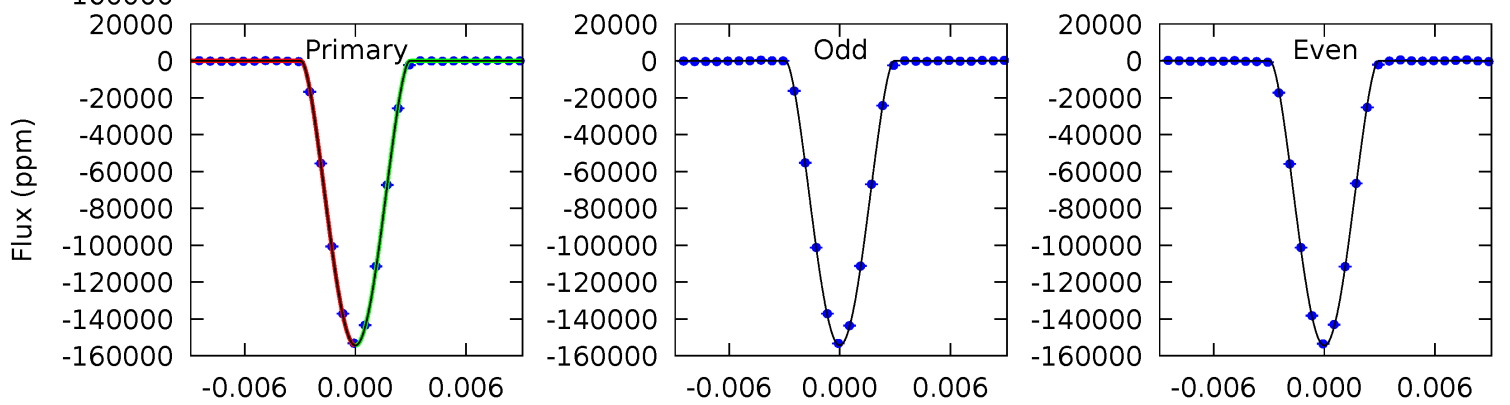
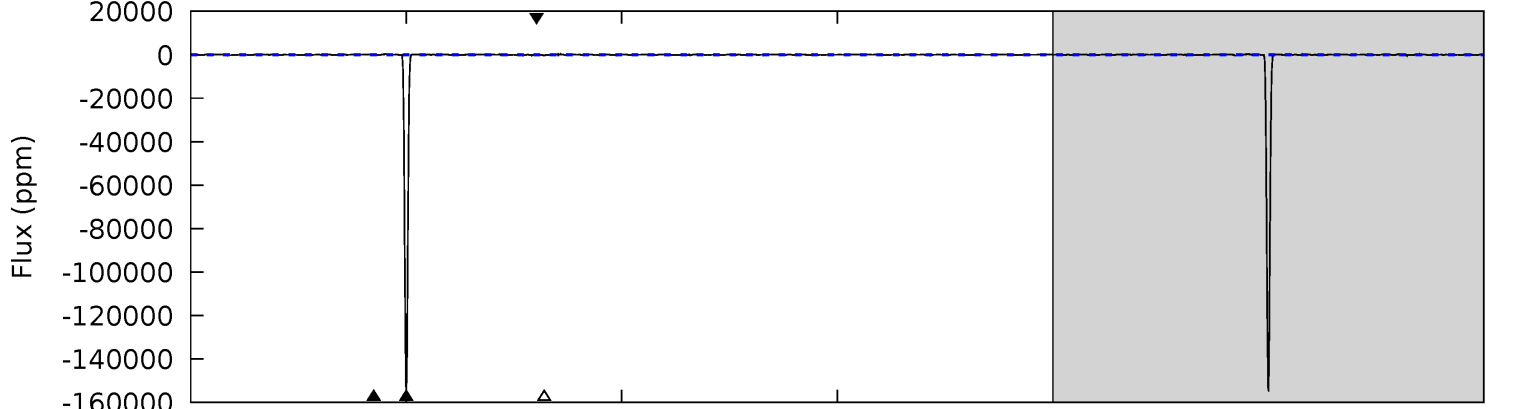
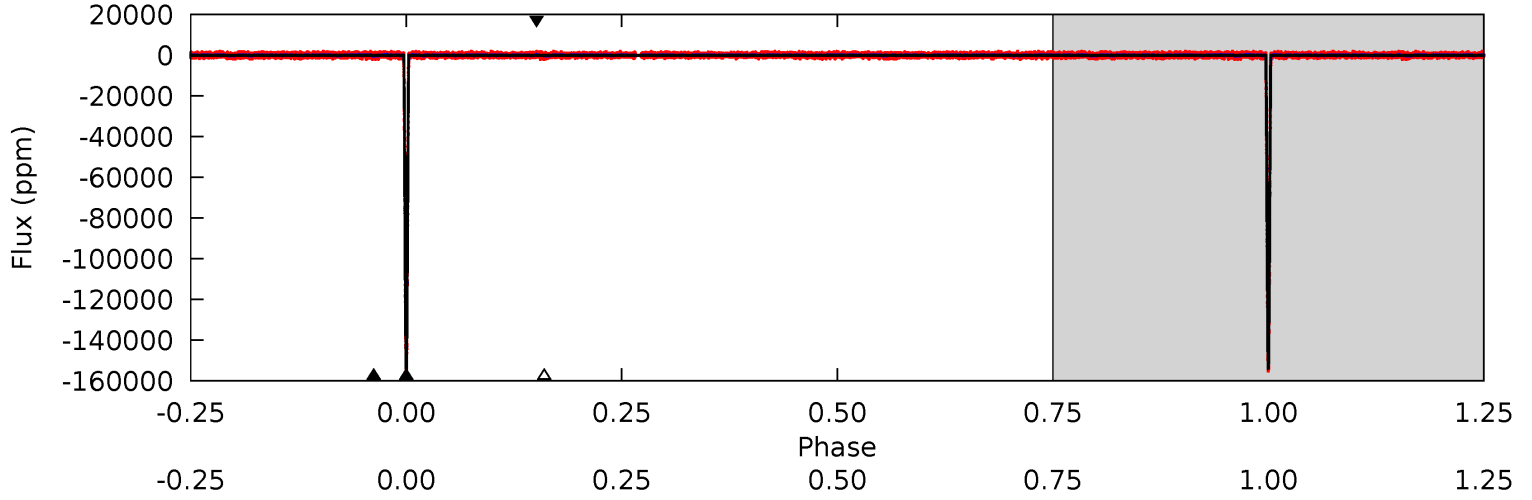
TCE 008868907-02 P=157.324790 Days  $T_0=222.893506$  (BKJD)



# DV Model-Shift Uniqueness Test

008868907-02, P = 157.322335 Days, E = 65.580117 Days

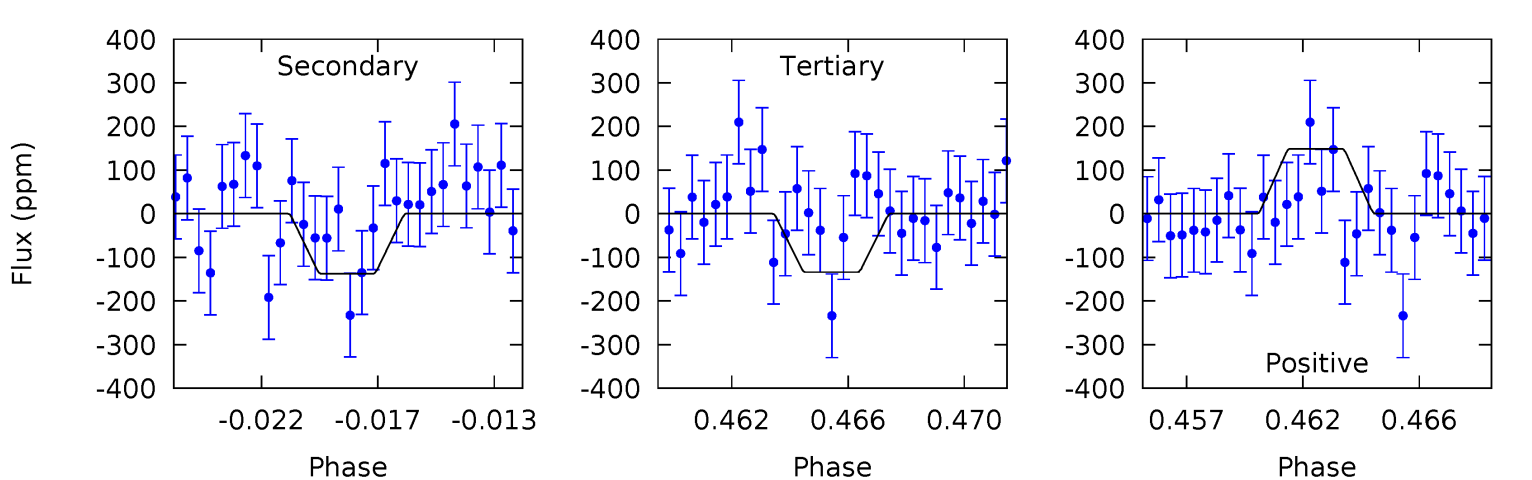
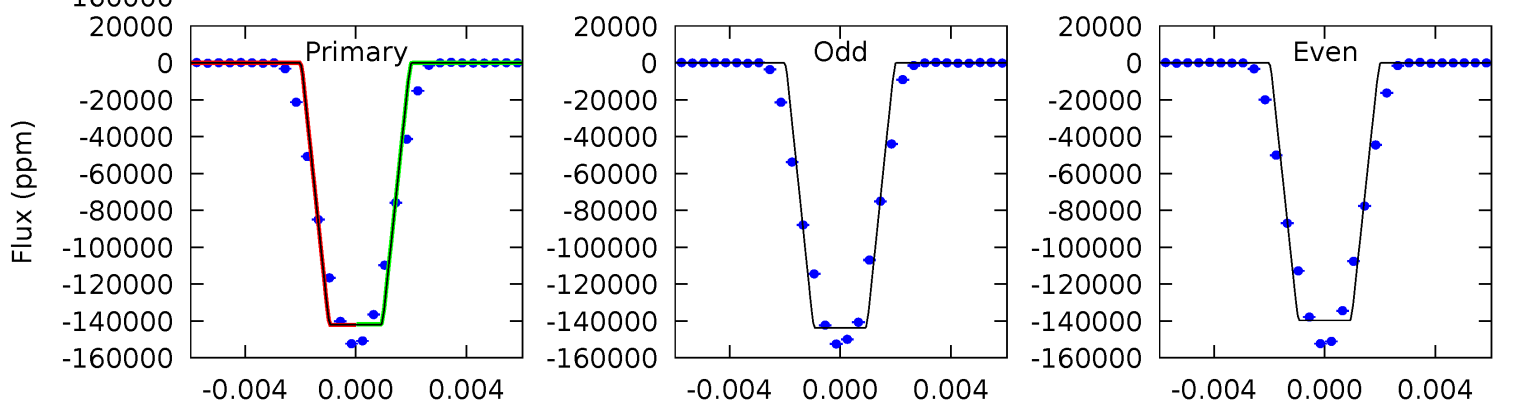
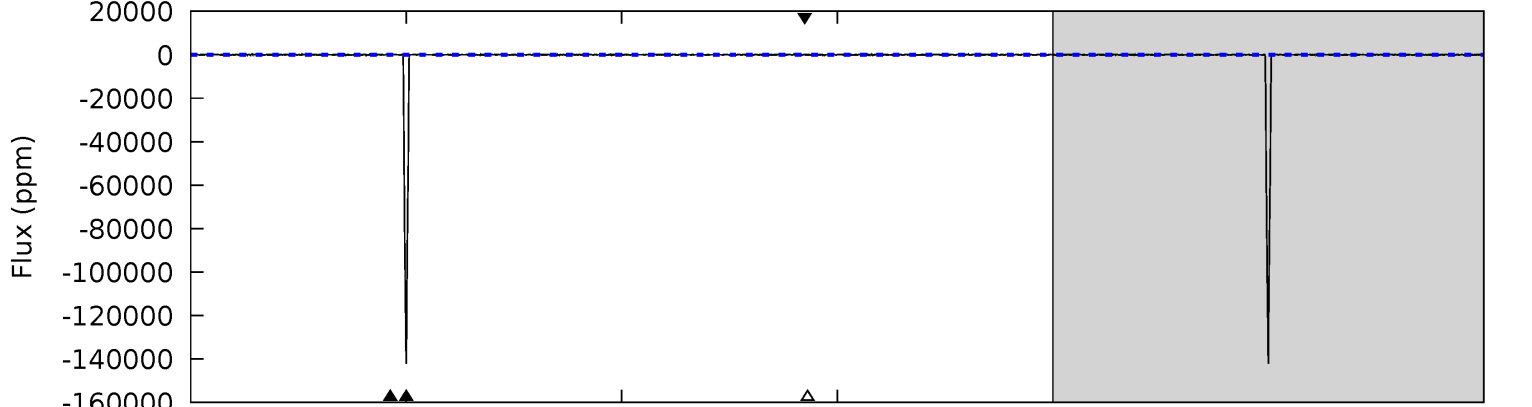
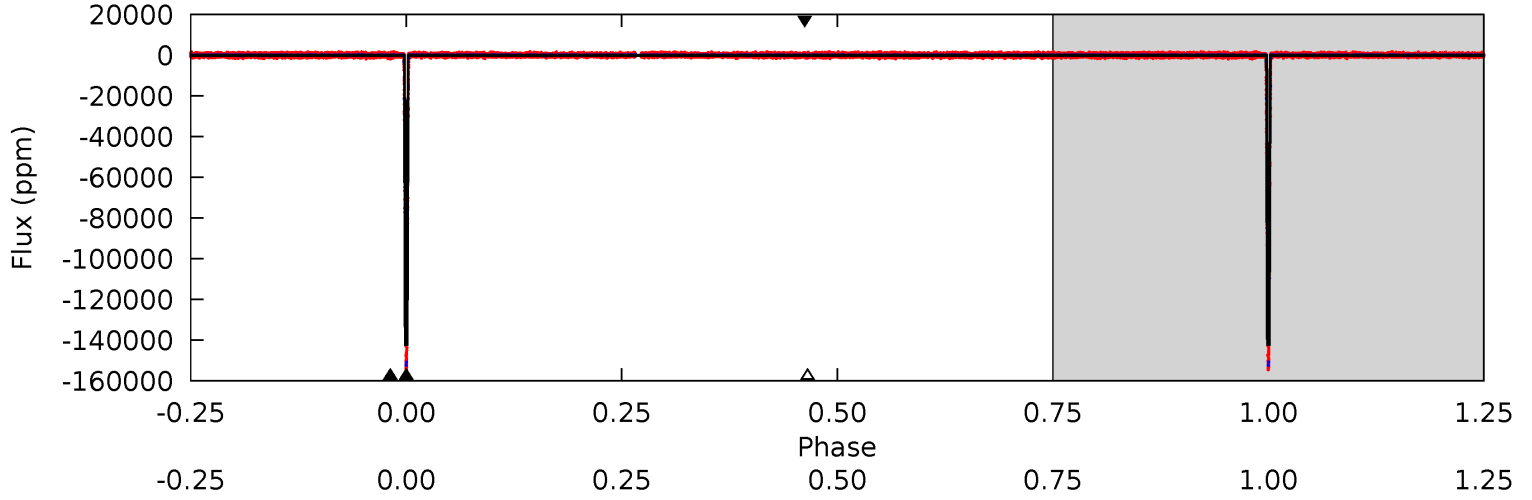
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
6335	17.1	11.0	8.89	5.12	2.75	2.93	6324	6326	6.01	8.16	3.93	1.00	0.00	1.69



# Alt Model-Shift Uniqueness Test

008868907-02, P = 157.324790 Days, E = 65.568716 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
3821	3.69	3.60	4.00	5.18	2.85	0.99	3818	3817	0.09	-0.30	57.1	0.98	0.00	5.31





### Stellar Parameters For KIC 008868907

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6109^{+171}_{-192}$	$4.472^{+0.054}_{-0.216}$	$-0.120^{+0.250}_{-0.350}$	$0.989^{+0.312}_{-0.104}$	$1.056^{+0.137}_{-0.150}$	$1.539^{+0.433}_{-0.809}$
	+3%/-3%	+1%/-5%	+208%/-292%	+32%/-11%	+13%/-14%	+28%/-53%
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 008868907-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-415 \pm 24$	$60.35^{+12.32}_{-11.23}$	$502^{+35}_{-23}$	$2154^{+89}_{-68}$	$21^{+10}_{-6}$
Alt.	$-137 \pm 37$	$43.03^{+11.45}_{-9.95}$	$500^{+37}_{-23}$	$2048^{+129}_{-117}$	$13^{+9}_{-6}$

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

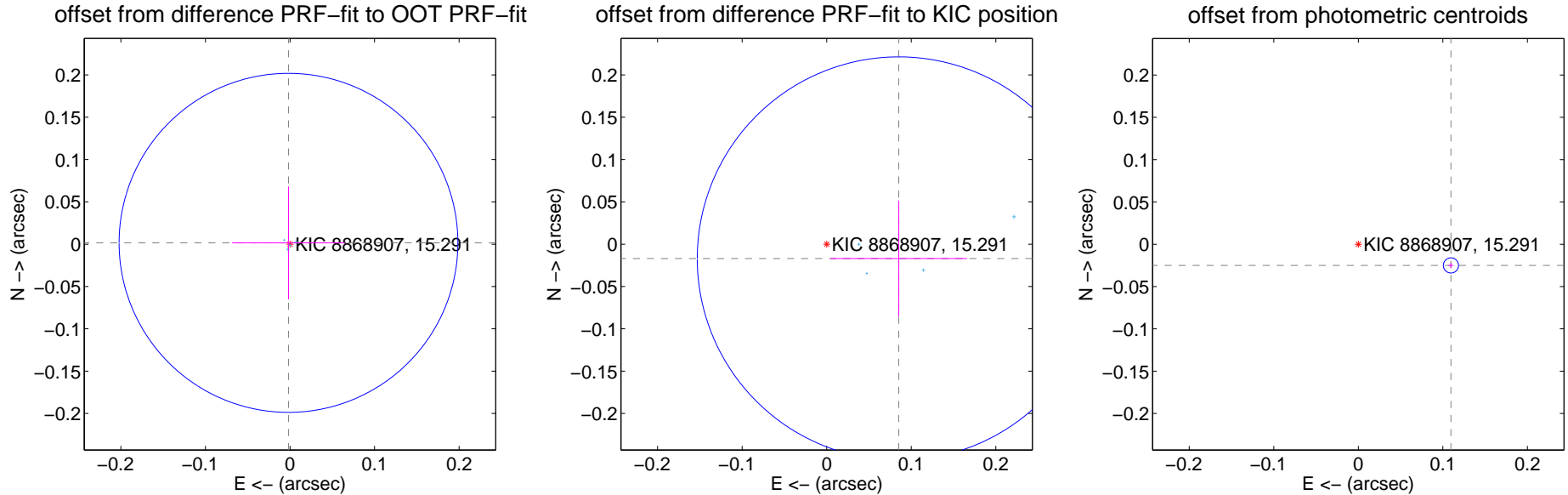
## DV Centroid Data

Supplemental centroid analysis for 008868907-02. Kepler magnitude: 15.29. Transit SNR 2326.94

There are 4 quarters with good PRF difference image offsets

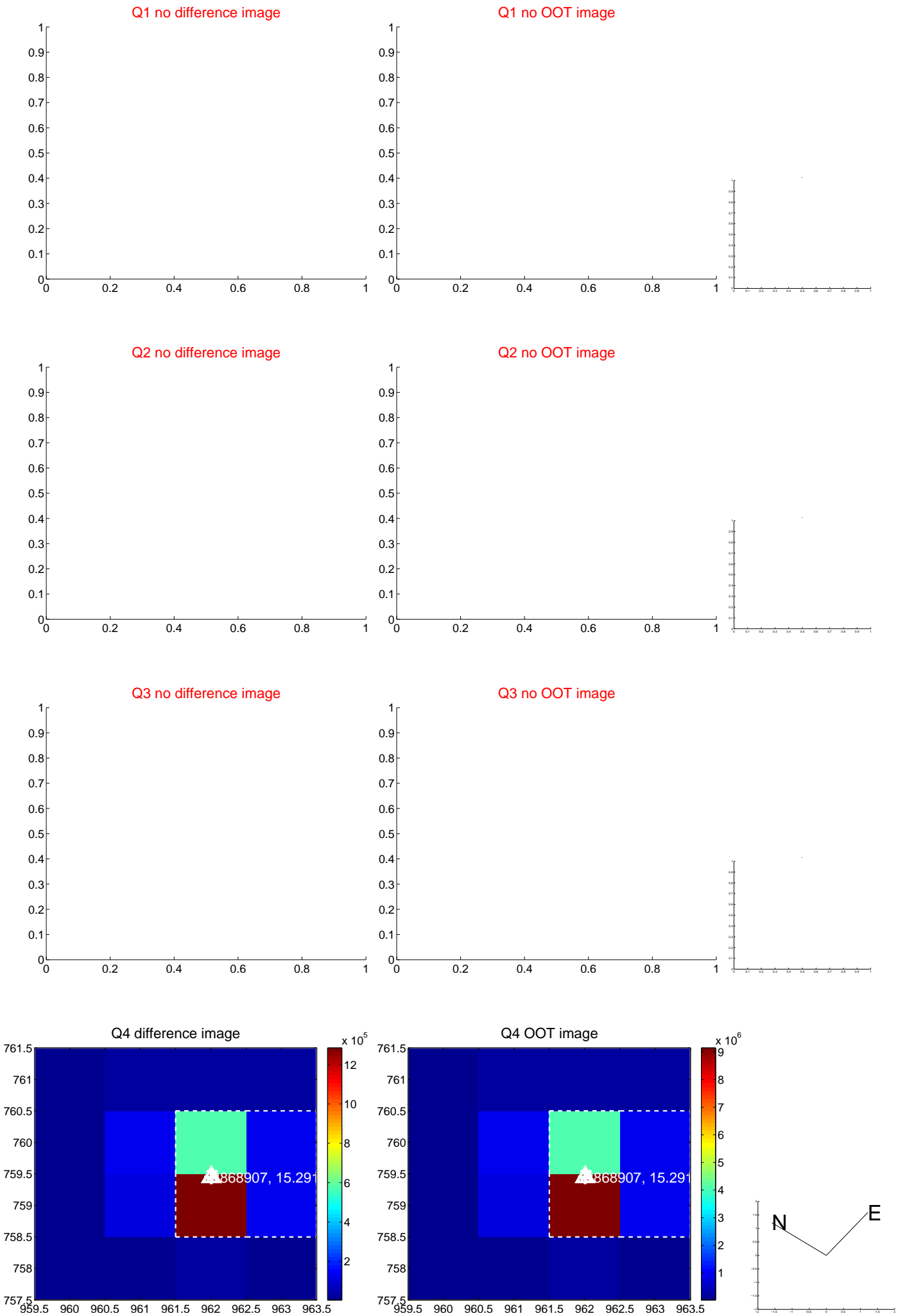
The direct PRF centroid is offset from the target star catalog position by about 0.23 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.002 \pm 0.067$	0.04	$0.002 \pm 0.067$	$0.002 \pm 0.067$
PRF-fit source offset from KIC position	$0.087 \pm 0.079$	1.09	$-0.085 \pm 0.081$	$-0.017 \pm 0.068$
photometric centroid source offset	$0.11 \pm 0.00$	37.60	$-0.11 \pm 0.00$	$-0.03 \pm 0.00$

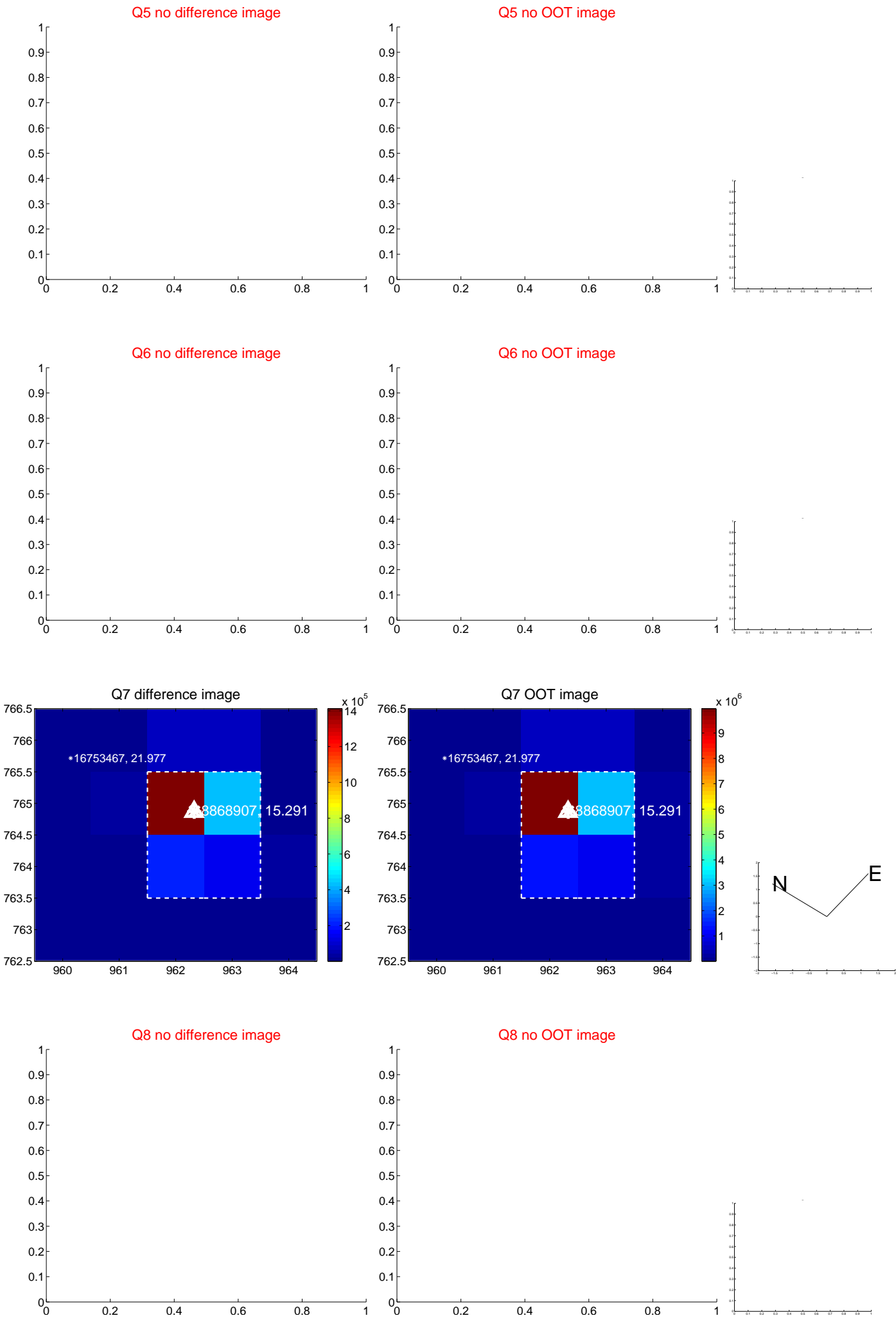


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

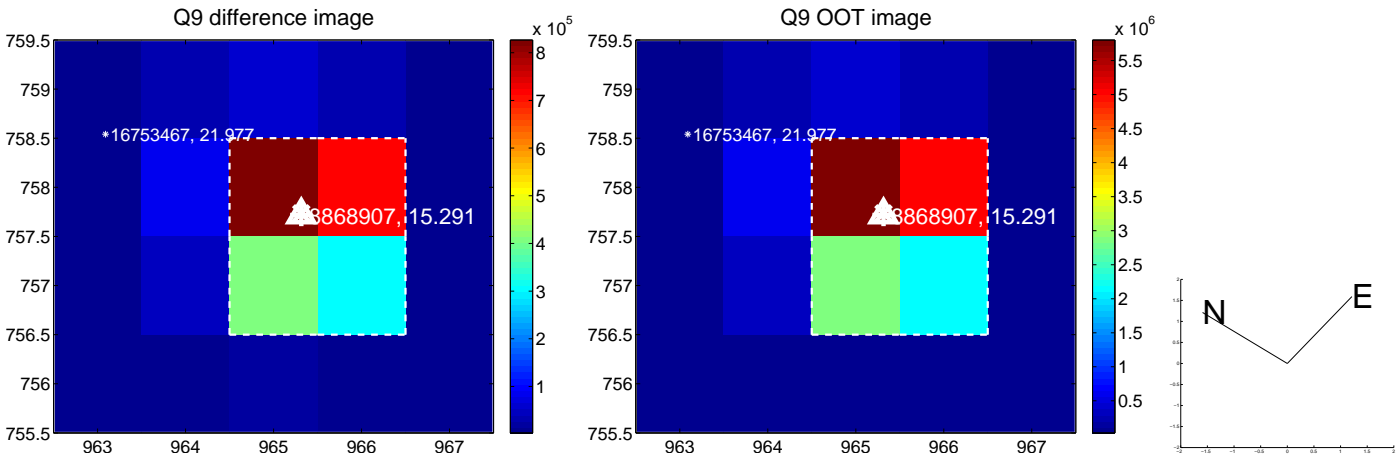
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



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



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

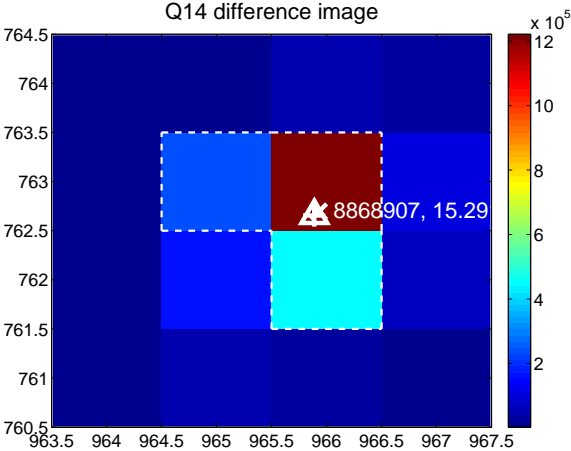
Q13 no difference image



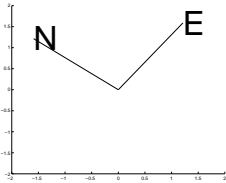
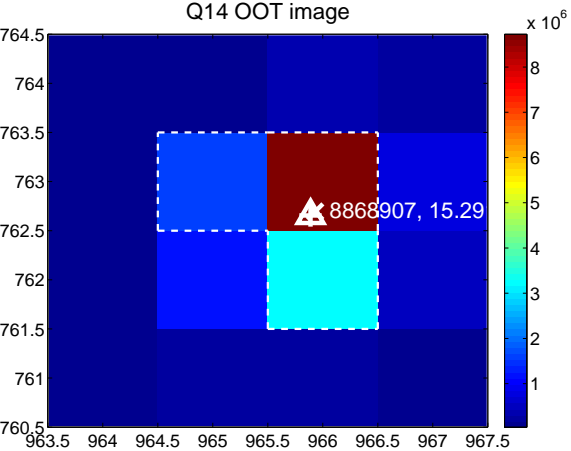
Q13 no OOT image



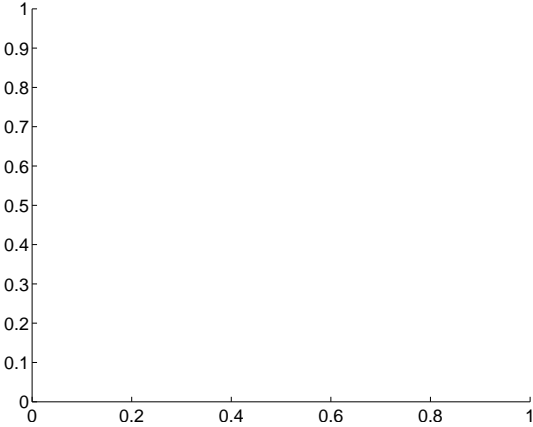
Q14 difference image



Q14 OOT image



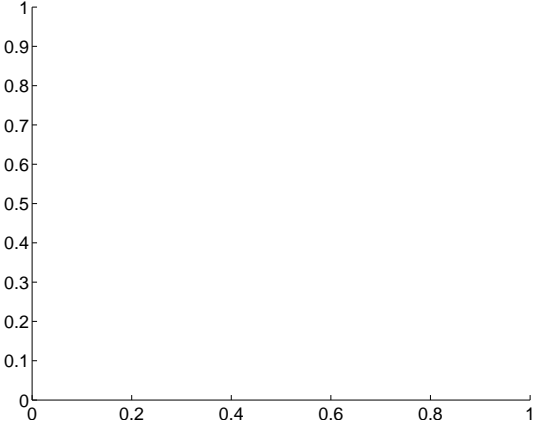
Q15 no difference image



Q15 no OOT image



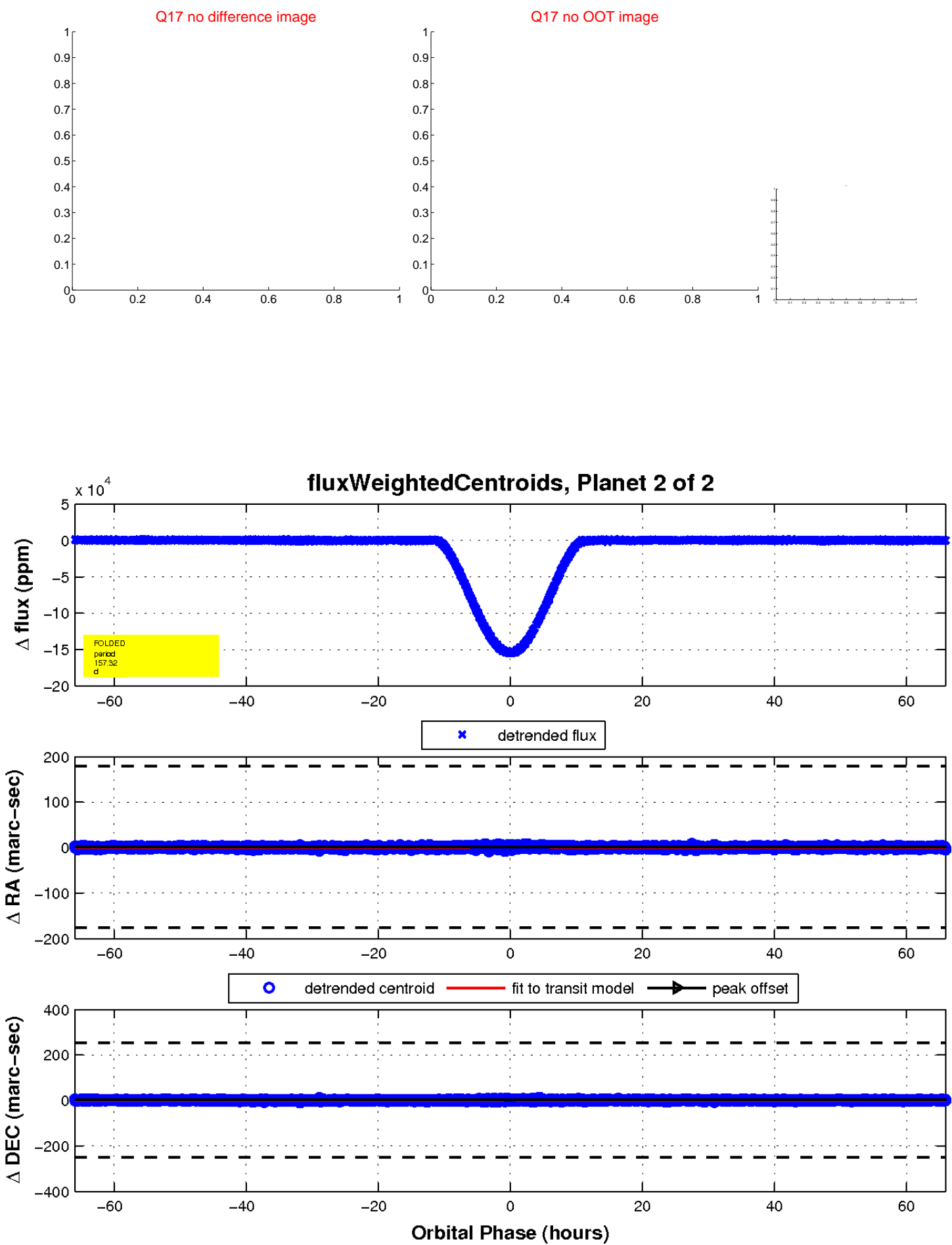
Q16 no difference image



Q16 no OOT image



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



UKIRT Image

